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**Working Paper**

## PIDS-BSP annual macroeconometric model for the Philippines: Preliminary estimates and ways forward

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# PIDS-BSP Annual Macroeconometric Model for the Philippines: Preliminary Estimates and Ways Forward

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## **Abstract**

Given new programs and policies in the Philippines, there is a need to formulate a macroeconometric model (MEM) to gain more insights on how the economy and its sectors are affected. This paper discusses the estimation of an annual MEM that will be used for policy analysis and forecasting with respect to the opportunities and challenges brought about by new developments. The formulation of an annual MEM is useful in assisting major macroeconomic stakeholders such as NEDA and the BSP in their conduct of policy simulations, macroeconomic surveillance, and economic analysis. Given this backdrop, PIDS and BSP have collaborated to estimate an annual MEM, which has four blocks, namely, the real sector, fiscal sector, trade sector, and monetary sector. Using an Autoregressive Distributed Lag model approach, these sectors are modeled separately although the linkages with each other are specified. These sectoral models are then put together and a test on the predictive accuracy of the forecast of the overall model is done. Some ways to further improve the annual MEM are provided.

**Keywords:** Autoregressive Distributed Lag Model, Macroeconometric Model, National Income Accounting

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## **1. Introduction**

The Philippine Development Plan 2017-2022 has identified several strategies that need to be implemented in order to improve the ability of the fiscal sector to promote development and inclusive growth. Given this, the Philippine Institute for Development Studies (PIDS) has collaborated with the Bangko Sentral ng Pilipinas (BSP) to build a macroeconometric model (MEM). The formulation of an annual MEM is useful in assisting major macroeconomic stakeholders such as NEDA and the BSP in their conduct of policy simulations, macroeconomic surveillance, and economic analysis.

The development of the PIDS-BSP Annual MEM is useful in policy analysis given various developments at the global and national stage in the past two decades. At the global stage, the country has seen the Global Financial Crisis in 2008, the election of leaders abroad with inward-looking policies, and the trade tension between US and China among other things, unfold. At the national stage, the Philippines has experienced an average gross domestic product (GDP) growth rate of over 6% since 2011. It has witnessed the boom of the Information Technology-Business Process Outsourcing (IT-BPO) sector in the early 2000 and has experienced damages of calamitous proportion in the face of typhoon Ondoy in 2009 and the super typhoon Yolanda in 2013. Several policies such as the government's infrastructure program (dubbed as the Build Build Build) and the tax reform program (Tax Reform for Acceleration and Inclusion) are also underway.

In the past, several MEMs in the Philippines had been done. One of these was the PIDS-NEDA Annual MEM, which had several versions (see Constantino and Yap 1988; Constantino et al 1990; Reyes and Yap 1993). The main objective of these MEMs was to provide a coordinated framework for the formulation of medium-term development plans for the Philippines. It was extensively used during the negotiations involving the country's external debt in the early years of the Aquino administration in the late 1980s. It was also used to evaluate the impact of stabilization policies in the Philippine economy.

Reyes and Yap (1993) version of the PIDS-NEDA Annual MEM followed a structuralist approach to macroeconomics, which subscribed to a less than full-employment equilibrium. In this approach, output is primarily determined from the supply side although the demand side also has a role. There were four major sectors in this MEM: (1) Real Sector, (2) Fiscal Sector, (3) Financial Sector, and (4) External Sector. The model focuses on the Real Sector, which has

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four sub-blocks including production, expenditure, income, wages/employment. GDP was determined by the interaction of the production side and the expenditure side while government spending was assumed to be exogenous. This strong link between the production and expenditures was a significant departure from earlier MEMs such as those in Villanueva (1977). Meanwhile, the financial sector determined the money supply and the interest rates, which were used in the real sector to determine output while the trade sector was disaggregated into various components. This version of the PIDS-NEDA Annual MEM had accounted for the role of infrastructure in output determination and the effect of public capital expenditures on power generation. Power outages had been a big issue in the early 1990s.

The PIDS-BSP annual MEM closely follows the PIDS-NEDA Annual MEM in its attempt to provide a close link between the production and expenditure sub-blocks of the real sector. However, the former has modeled a more disaggregated household final consumption expenditure in order to analyze the effects of consumption-specific taxes and duties. In addition, the wages are also disaggregated to provide better information in the country's production structure. The external sector reflects an updated disaggregation of the goods and services traded by country highlighting the more significant subsectors of the country like Computer Services Exports (BPO) and Tourism. Compared to earlier Philippine MEMs, the accounts in the fiscal sector are also more finely disaggregated and follow more closely the general government income and outlay accounts of the Philippine System of National Accounts.

## **2. Modelling the Philippine economy: A 4-sector model**

Consistent with Reyes and Yap (1993), the theoretical framework of the model is influenced by the structuralist approach to macroeconomics, which takes into account the economy's structural features into policy analysis. The structuralist approach subscribes to the notion of an equilibrium at less than full employment (Taylor, 1991), which to a great extent is observed in the Philippine economy. In 2018, the unemployment and underemployment rates in the country are 5.5% and 17%, respectively.

Following the structuralist approach to obtain equilibrium at less than full-employment, the determination of prices in the sectors follow the fix-price/flex-price method (Hicks, 1985). In the flex-price system, the demand for and supply of commodities determine the price level, which inform producers on whether to expand or contract the quantities they will produce. In the fix-price system, prices can remain unchanged over a period of time although adjustments will eventually be made to address the surplus (shortage) through output contraction (expansion). Sectors are assumed to have excess capacity and producers are operating under a non-competitive scenario where producers practice mark-up pricing. The agricultural sector is assumed to follow the flex-price system while the industrial and services sectors are assumed to follow the fix-price system. This assumption has been made by Reyes and Yap (1993) and is also adapted in this version of the PIDS-BSP Annual MEM as its implications are still observed in the structure of the Philippine economy today.

Similar to Reyes and Yap (1993), the economy is assumed to have four sectors, namely, the real sector, fiscal sector, trade sector, and monetary sector. This version of the PIDS-BSP Annual MEM has 132 behavioral equations, 65, 20, 30, and 17 of which pertain to the real sector, fiscal sector, trade sector, and monetary sector, respectively. The production and expenditure sub-blocks of the real sector are linked by including some household final

consumption expenditures into the determination of some of the sectoral gross value added. The real sector is also linked with the fiscal sector through the inclusion of interest and reverse repurchase rates into the production subsector and with the external sector through relevant import and export items (see Appendix 1 for mapping of variables).

## *2.1. Real Sector*

The real sector is made up of four subsectors: production, expenditure, income, and wage/employment. The aggregation of the GVA or the expenditure items can be used to solve for the GDP. These two subsectors are linked through the inclusion of specific expenditure items into the GVA specifications.

The production subsector has eleven groups: agriculture, industry (disaggregated into construction, electricity and steam, water, manufacturing, mining, and finance), and services (real estate, trade, transportation, and other services). An indicator for weather patterns (proxied by the deviation of rainfall from its long-run average) also affects the agricultural production through the implicit price index. The GVA in each subsector is affected by its corresponding implicit price index and is closely linked with the monetary sector through the real effective exchange rate and reverse repurchase rate and with the external sector through the exports and imports of specific items. Meanwhile, the implicit price index of each group is affected by its compensation index per employee. Some of the implicit price indices, such as those of real estate and other services, are also linked with the monetary sector through the lending rate while the implicit price indices of construction and manufacturing are linked with the external sector through the imports of fuel and machinery.

On the expenditure side, the HFCE has ten groups: (a) alcoholic beverages, (b) non-alcoholic beverages, (c) tobacco, (d) education, (e) food, (f) medical, (g) housing, (h) transportation and communication, (i) utilities, and (j) miscellaneous (which covers the rest of the HFCE items). Each sector is affected by its corresponding price index and the disposable income. In turn, the price indices are affected by the price of imports, real interest rate, and exchange rate to pick up cost effects. The link of expenditure side with the fiscal sector is established through the inclusion of tax rates on prices. In this version of the PIDS-BSP Annual MEM, the effective tax rate of alcoholic beverages and import duties affect the implicit price of food while the import duty affects the implicit price of medical goods.

Among the components of Gross Domestic Capital Formation (GDCF), fixed capital such as construction expenditures (private and public) are modeled as functions of financial variables such as the real interest rate, exchange rate, and T-bill rate. Change in inventory, on the other hand, is affected by the \$/PhP exchange rate, inflation rate, and capital depreciation.

On the income side, net disposable income is the sum of net compensation of domestic employees, net operating surplus from resident producers, property income, net compensation from the rest of the world, taxes on production and on imports and subsidies, and total transfers from abroad. The first three components are modeled in the real sector and are affected by variables from financial sector such as the real interest rate, exchange rate, and inflation.

In terms of employment, that of the agricultural sector is affected by the sectoral wage indices while that of the industry is affected by external factors such as the imports of machinery to account for the sector's increasing intensity of capital use and the exports of BPO services, which have been booming in recent years. Population also plays a role in the determination of



sectoral employment. Meanwhile, the unemployment rate is affected by the labor force while the labor force is affected by the country's exports of services and use of government income. Consistent with Okun's Law, unemployment rate is affected by wages.

## *2.2. Fiscal Sector*

The econometric models in this sector is designed to simulate and/or forecast general government net lending (borrowing) based on separate time-series models of the different sources of government revenues, and on programmed government expenditures taken exogenously. This module interacts with the rest of the PIDS-BSP Annual MEM through its linkages with other institutional sectors of the economy, namely, households and non-profit institutions serving households, corporations, and the external sector. It also interacts with the monetary sector directly through general government debt and debt servicing, and indirectly through the latter's influence on other institutional sectors. More specifically, this block interacts with the rest of the sectors by using variables from other model blocks, e.g. prices from the real sector, interest rates from the monetary sector, and exchange rates from the external sector, as inputs to predict different government accounts (e.g. taxes and other revenues). Variables from the government sector, on the other hand, are important determinants of outcomes in the real sector (e.g. GDP).

Different streams of tax revenues are modelled separately as a function of effective tax rates and the tax base for the good and/or service to be taxed. The effective tax rates are estimated using individual tax rates for separate goods and services weighted by either value or quantity of each good or service that is taxed, depending on the type of tax. For personal income tax revenues, for example, the time series of effective tax rates are calculated using the distribution of household incomes from the triennial Family Income and Expenditure Survey. Missing values are linearly imputed. Its tax base, on the other hand, are proxied by annual aggregate compensation of employees and gross operating surplus estimates from the national accounts.

In this version of the PIDS-BSP Annual MEM, the following tax revenues from the following sources are modelled separately: (a) import taxes and duties, (b) indirect taxes on business and occupations, (c) other indirect taxes, (d) excise taxes on domestic products, (e) direct taxes on business, (f) direct taxes on individuals, and (g) other indirect taxes. Excise taxes are disaggregated further by commodity, including alcoholic beverages, tobacco, petroleum, and minerals. Other government revenues, such as (h) social contributions, (i) property income, and (j) compulsory fees and fines, are also modelled separately using a similar approach used for government tax revenues. These other government revenues are modelled as a function of the effective contribution rate, whenever available, and the effective revenue base of these accounts, or its proxy variables.

Following Yap (2000), government final consumption expenditures (GFCE) are taken as exogenous in the model although a bridge equation linking actual government expenditures on personal services, and maintenance and other operating expenditures with GFCE is specified to ensure internal consistency. Other expenditures, such as on social security benefits and property expense, are modelled using a similar approach to (h) and (i) above.

General government savings may be derived using estimates/forecasts of the above variables. When combined with other government accounts, such as the GDCF and net asset holdings, annual government surplus, and debt stocks may also be calculated. As such, the fiscal sector is able to capture the influence of different macroeconomic factors on the debt position of the

government through these factors' direct and indirect effects on different government incomes and expenditures.

### *2.3 Trade Sector*

The trade sector models the flow of goods, services, capital, and transfers in and out of the country. The different sectors of imports and exports are modelled using demand equations. On the export side, the export demand equation (EDE) models each subsector good/service as a function of foreign demand (usually proxied by world GDP), the price index of the subsector, and relevant exchange rates. The goods for which the EDE is estimated include the key exports of the country in recent years, namely, (a) electronic components, (b) agricultural exports, (c) minerals, and (d) other manufactured goods exports (residual). In recent years, the export of services has grown significantly. As such, the EDE models of (a) computer services exports (BPO), (b) tourism, and (c) other services exports (residual) are also included.

On the import side, the import demand equation (IDE) models each subsector good/service as a function of domestic demand (captured by household consumption, investment, and/or government spending), the import price, and relevant exchange rate. The IDE models of (a) machinery and equipment, (b) material inputs, (c) fuel, (d) agricultural products, and (e) other imports (residual) are also included.

This disaggregation of exports and imports allows the external sector block to capture changes in demand for key Philippine goods and services brought about by the exogenous factors. The impact of sharp increases in the prices of key production inputs such as fuel is also modelled through the imports equation.

The export and import price deflators are specified as functions of domestic prices and previous price deflators. In addition, tariff rates affect the import price deflators. Finally, the total exports and imports are converted to dollars using the US\$-PhP exchange rate. These aggregate accounts enter the Balance of Payments.

### *2.4 Monetary Sector*

The monetary block is mainly concerned with capturing the transmission channels of monetary policy. The primary policy tool of BSP's current monetary policy is the overnight reverse repurchase rate (RRP), which is expected to determine the yield of the 3-month Treasury Bill Rate. The yield of other treasury bills is then modelled following the assumption of the existence of a term structure of interest rates, more commonly known as the yield curve. In addition, the RRP is used to model the various bank rates such as the lending rate, the time deposit rate, and the savings rate. The RRP, treasury bill rate, and effective interest rate are inputs to the real sector. Meanwhile, the real sector feeds into the monetary sector through the effects of GDP on US\$ and JPY nominal exchange rates.

### 3. Empirical strategy

#### 3.1 Autoregressive Distributed Lag Model

The PIDS-BSP Annual MEM will be estimated using an Autoregressive Distributed Lag (ARDL), which is represented by the following:

$$y_t = \alpha_t + \sum_{i=1}^n \alpha_i y_{t-i} + \sum_{k=1}^m \sum_{i=0}^n \beta_{ki} x_{kt-i} + u_t \quad \text{Equation 1}$$

Here,  $u_t$  is assumed to be a white noise error: zero mean [ $E(u_t) = 0$ ], constant variance [ $E(u_t^2) = \sigma^2$ ], and serially uncorrelated [ $E(u_t u_{t-s}) = 0$ ]. ARDL has various advantages. It has an Error Correction representation, which allows for the analysis of short-run and long-run relationships of variables. It is a dynamic single equation, which makes for easy implementation and interpretation. It can be used in series with orders 0 [I(0)] or 1 [I(1)] and it can accommodate different lags in  $x$  and  $y$ .

Given a one explanatory variable  $x$  with one lag, equation 1 becomes

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \beta_0 x_t + \beta_1 x_{t-1} + u_t \quad \text{Equation 2}$$

Equation 2 can be reparameterized to get the following:

$$\Delta y_t = c + (\alpha_1 - 1)y_{t-1} + \beta_0 \Delta x_t + (\beta_1 + \beta_0)x_{t-1} + u_t \quad \text{Equation 3}$$

$$\Delta y_t = c + \theta_0 [y_{t-1} + \theta_1 x_{t-1}] + \beta_0 \Delta x_t + u_t \quad \text{Equation 4}$$

Equation 3 is ARDL in differenced form while equation 4 is the ECM representation of the ARDL in differenced form where  $\theta_0 = \alpha_1 - 1$  and  $\theta_1 = \frac{\beta_1 + \beta_0}{-\theta_0}$ .  $\theta_0 = \alpha_1 - 1$  is the speed of adjustment to the steady state and  $-1 < \theta_0 < 0$  for dynamic stability.  $\theta_1$  is the long-run multiplier while  $\beta_0$  is the short-run multiplier.

#### 3.2. Determination of long-run relationship and pre- and post-estimation routines

The ARDL approach can be used to model a mix of I(0) and I(1) series, which can be implemented using the bounds test procedure developed by Pesaran et al. (2001). The test for the existence of a significant long-run relationship is an F-test for the variables in lagged levels or  $H_0: \theta_0 = \theta_1 = 0$ . The bounds test has the following rules:

- (computed) F-statistic < the lower bound:  $H_0$  of no long-run relationship between the variables cannot be rejected.
- (computed) F-statistic > the upper bound:  $H_0$  of a no long-run relationship is rejected.
- F-statistic falls within the range of the lower and upper bounds: The test is inconclusive.

Since the bounds test is no longer applicable in the presence of series with higher order, unit root tests have been implemented and results indicate that all series are either  $I(0)$  or  $I(1)$ . All variables are in natural logarithms (see appendix 2 for sources and computation).

A battery of tests has been conducted to ensure the adequacy of each specification. A white noise test (Portmanteau test) is implemented to test the adequacy of the model. In this test, the null hypothesis is that residuals follow a white noise process. This means that the residuals have zero mean, constant variance, and are serially uncorrelated. Nevertheless, additional tests for serial correlation (Durbin-Watson test) and heteroscedasticity (Breusch-Pagan test) are implemented. The null hypothesis of the former is that there is no serial correlation while the null hypothesis of the latter is that the residual has constant variance. Results of these tests are found in Appendix 3.

#### 4. Preliminary results

The preliminary equation-by-equation estimates confirm the expected signs. All the specifications have passed the battery of tests and the bounds test indicate that the variables have long-run relationships. Some pertinent results based on the equation-by-equation estimates include the following:

1. The supply side of the agricultural production is not very sensitive to domestic prices, as output cannot increase easily to meet demand. It is, however, more sensitive to the prices of exported agricultural exports, with an increase in the price of foreign agricultural products resulting in a higher GVA for agricultural product.
2. The price indices in the production side are affected by costs in the other sectors, including the exchange rates, lending rates, as well as by labor market costs such as the sectoral wage indices.
3. The HFCE positively affects the GVA of manufacturing, trade, and transportation.
4. Food prices is negatively affected by the country's openness. This potentially captures the positive effect of the country's liberalization of its agricultural markets.
5. The prices of tobacco and medical goods are positively affected by tobacco tax rate and import duties, respectively.
6. Investment is sensitive to various measures of interest rate.
7. Operating surplus is negatively affected by the price of capital (interest rates) and positively by the level of investment in capital formation.
8. Capitalization increases the employment in the industry sector while developments in the BPO, such as increased exports of BPO services, decreases the employment in the industry sector.
9. The long-run parameters on tax rates in the fiscal sector ARDL models are positive and statistically significant, implying that the Philippines is still on the upward-sloping side of the Laffer curve over the estimation period. That is, having higher tax rates may increase government tax income holding other things the same. However, the coefficient must be interpreted with caution as there may be other unobservable factors that may confound the parameter estimates.
10. Models of many government sector accounts have poor fit when using the baseline tax rate and taxable amount as predictors. This suggests that there may be other factors in play, e.g. collection effort, in determining these accounts.
11. Real exports of goods (Agriculture, Mineral Exports and Other Goods) and Real exports of services (Tourism, Other Services) are negatively affected by prices and positively affected by the growth of World economy.

12. In the long run, real exports are positively affected by the depreciation of the real exchange rate while real imports are negatively affected by it.

## 5. Model Validation

There are several measures that can be looked into to determine the extent of the accuracy of the forecast of the MEM. This PIDS-BSP Annual MEM version looked into the mean absolute percentage error (MAPE), which is computed as  $MAPE = \frac{1}{n} \sum_{t=1}^n \left| \frac{Actual_t - Predicted_t}{Actual_t} \right|$ . A lower MAPE indicates a better predictive performance of the forecast system.

Table 1 in appendix 4 shows the in-sample MAPE statistics (2002-2016) of key variables as well as the out-of-sample forecasts for 2017 and 2018. It can be seen that the MAPEs of the in-sample forecasts for the production and expenditures subsectors of the real sector block are relatively low at less than 5%. However, the GDCF and some of its components have relatively high MAPEs (greater than 10%). Similarly, the forecast of some variables in the fiscal sector also has relatively high MAPEs including the import duty, excise tax on domestic product, income taxes on business and individual, total government savings, and total government surplus. The forecasts of some of the external and financial variables also have high MAPEs. These observations are carried over to the 1-step ahead forecasts (2017) and 2-step ahead forecasts (2018), with the latter having a higher MAPE than the former.

## 6. Ways forward

While the challenges of data collection needed for this type of modeling strategy have been addressed, several important areas should be looked into. These include the following:

1. There is a need to strengthen the link of the real sector with the fiscal sector. This can be done by ensuring that relevant taxes are included in the specifications of the implicit price index (IPIN) of the disaggregated HFCEs and their signs conform to *a priori* expectations.
2. There is a need to strengthen the link of the production and expenditure sub-blocks of the real sector. In the current version, only the GVAs of manufacturing, transportation, and trade are affected by the relevant HFCEs. The HFCE-education, for example, can be made to affect the GVA of other services while the HFCE-food can be made to affect the GVA of agriculture.
3. There is a need to strengthen the specifications and linkages of the private and public investments. In their current form, there is no link to analyze crowding-in and crowding-out effects of public investments.
4. The forecasting accuracy of the fiscal sector models may be improved by expanding the sector's linkages with the rest of the PIDS-BSP MEM. This may be difficult to implement however because of the rather short temporal coverage of many of the input data series. Expanding the historical coverage of these series may be an important step moving forward.
5. While the current model incorporates the relationship between the GVA and IPIN of exports or imports in some equations (e.g. Agriculture GVA), there is a need to strengthen the linkage of the export and/or import price indices and the relevant sectors which may be affected by the change in these prices. For instance, the GVA of

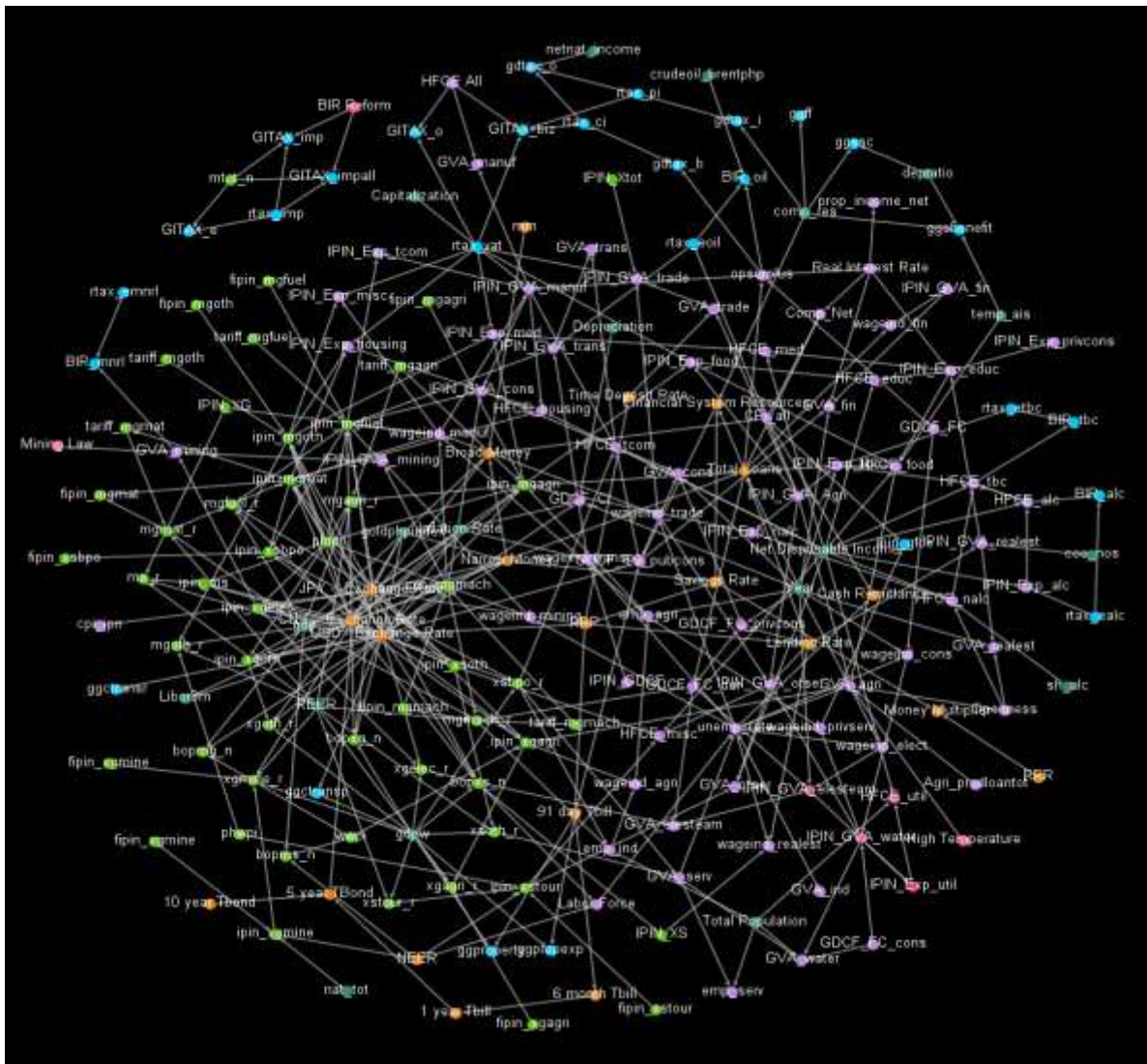
manufacturing may be affected by the IPINs of imports of material inputs, machinery, and fuel.

6. There is a need to streamline the specifications included in the monetary sector. Currently, the model has several T-bill rates although only the 91-day T-bill rate is used in the real sector. In addition, the feedback between the real sector with the monetary sector is somewhat weak. While the exchange rate, lending rate, real interest rate, reverse repurchase rate, and the 91-day T-bill rate are included in the real sector, only the GDP is used in the monetary sector, specifically, in the US\$ and JPY nominal exchange rates.
7. There is a need to analyze the predictive accuracy of the forecasts through the use of other metrics such as the root mean squared error (RMSE), mean absolute prediction error (MAE), and Theil coefficient.

## 7. References

- Constantino, W. and Yap, J. (1988). The impact of trade, trade policy and external shocks on the Philippine economy based on the PIDS-NEDA macroeconometric model. Philippine Institute for Development Studies Working Paper No. 1988-29. Retrieved from [serp-p.pids.gov.ph](http://serp-p.pids.gov.ph)
- Constantino, W., Yap, J., Butiong, R. and dela Paz, A. (1990). The PIDS-NEDA annual macroeconometric model version 1989: A summary. Philippine Institute for Development Studies Working Paper No. 1990-13. Retrieved from [serp-p.pids.gov.ph](http://serp-p.pids.gov.ph)
- Frisch, R. (1933). Propagation problems and impulse problems in dynamic economics. Economic Essays in Honour of Gustav Cassel. Frank Cass. London
- Hicks, J. (1985). Method of dynamic economics. Oxford: Macmillan.
- Orbeta, A. (2002) Education, labor market, and development: A review of the trends and issues in the Philippines for the past 25 Years. PIDS DP 2002-19.
- Pesaran, M. H., Shin, Y. and Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. Journal of Applied Econometrics, 16: 289-326.
- Reyes, C. and Yap, J. (1993). Reestimation of the macroeconomic model. Philippine Institute for Development Studies Discussion Paper Series. Retrieved from [serp-p.pids.gov.ph](http://serp-p.pids.gov.ph)
- Taylor, L. (1983). Structuralist macroeconomics: applicable models for the third world. New York: Basic Books.
- Villanueva, D. (1977). A semi-annual macroeconometric model of the Philippines, 1967-1976. IMF Departmental Memoranda Series 77/89.

## APPENDIX 1: Mapping of variables



## APPENDIX 2: Lists of variables, definition, and sources

| Variables                       | Variable Name  | Sources  | Definition   | Unit           |                |
|---------------------------------|----------------|--|--|----------------|----------------|
| GVA Agriculture, real           | gva_agri_r     | National Accounts, Philippine Statistics Authority | GVA: Gross value added Agriculture at constant prices                                | in million PhP | (2000=100)     |
| GVA Agriculture (demand), real  | gva_agri_r_d   | National Accounts, Philippine Statistics Authority | GVA: Gross value added Agriculture at constant prices (demand side)                  | in million PhP | (2000=100)     |
| GVA Construction, real          | gva_cons_r     | National Accounts, Philippine Statistics Authority | GVA: Gross Value Added in Construction at constant prices                            | in million PhP | (2000=100)     |
| GVA Electricity and Steam, real | gva_elesteam_r | National Accounts, Philippine Statistics Authority | GVA: Gross Gross Value Added in Utilities (Electricity and steam) at constant prices | in million PhP | (2000=100)     |
| GVA Finance, real               | gva_fin_r      | National Accounts, Philippine Statistics Authority | GVA: Gross Value Added in Financial Services at constant prices                      | in million PhP | (2000=100)     |
| GVA Manufacturing, real         | gva_manuf_r    | National Accounts, Philippine Statistics Authority | GVA: Gross Value Added in Manufacturing at constant prices                           | in million PhP | (2000=100)     |
| GVA Mining, real                | gva_mining_r   | National Accounts, Philippine Statistics Authority | GVA: Gross Value Added in Mining at constant prices                                  | in million PhP | (2000=100)     |
| GVA Mining, nominal             | gva_mining_n   | National Accounts, Philippine Statistics Authority | GVA: Gross Value Added in Mining at current prices                                   | in million PhP | Current prices |
| GVA Other Services, real        | gva_otser_r    | National Accounts, Philippine Statistics Authority | GVA: Gross Value Added in Other Services at constant prices                          | in million PhP | (2000=100)     |
| GVA Real Estate, real           | gva_realest_r  | National Accounts, Philippine Statistics Authority | GVA: Gross Value Added in Real Estate at constant prices                             | in million PhP | (2000=100)     |
| GVA Trade, real                 | gva_trade_r    | National Accounts, Philippine Statistics Authority | GVA: Gross Value Added in Trade at constant prices                                   | in million PhP | (2000=100)     |
| GVA Transportation, real        | gva_trans_r    | National Accounts, Philippine Statistics Authority | GVA: Gross Value Added in Transportation at constant prices                          | in million PhP | (2000=100)     |
| GVA Water, real                 | gva_water_r    | National Accounts, Philippine Statistics Authority | GVA: Gross Value Added in Utilities (Water) at constant prices                       | in million PhP | (2000=100)     |
| GVA Electricity , real          | gva_elect_r    | National Accounts, Philippine Statistics Authority | GVA: Gross Value Added in Electricity at constant prices                             | in million PhP | (2000=100)     |
| GVA Industry, real              | gva_ind_r      | National Accounts, Philippine Statistics Authority | GVA: Gross Value Added in Industry Sector at constant prices                         | in million PhP | (2000=100)     |
| GVA Service, real               | gva_serv_r     | National Accounts, Philippine Statistics Authority | GVA: Gross Value Added in Services Sector at constant prices                         | in million PhP | (2000=100)     |
| GDP, real                       | gdp_r          | National Accounts, Philippine Statistics Authority | Gross Domestic Product at constant prices  | in million PhP | (2000=100)     |
| GDP, nominal                    | gdp_n          | National Accounts, Philippine Statistics Authority | Gross Domestic Product at current prices   | in million PhP | Current prices |



| Variables                      | Variable Name     | Sources  | Definition  | Unit   |            |
|--------------------------------|-------------------|--|---|--------|------------|
| IPIN GVA Construction          | ipin_gva_cons     | National Accounts, Philippine Statistics Authority | Implicit Price Index: Nominal GVA/Real GVA in Construction                                    |        | (2000=100) |
| IPIN GVA Electricity and Steam | ipin_gva_elesteam | National Accounts, Philippine Statistics Authority | Implicit Price Index: Nominal GVA/Real GVA in Utilities (Electricity and Steam)               |        | (2000=100) |
| IPIN GVA Finance               | ipin_gva_fin      | National Accounts, Philippine Statistics Authority | Implicit Price Index: Nominal GVA/Real GVA in Financial Services                              |        | (2000=100) |
| IPIN GVA Manufacturing         | ipin_gva_manuf    | National Accounts, Philippine Statistics Authority | Implicit Price Index: Nominal GVA/Real GVA in Manufacturing                                   |        | (2000=100) |
| IPIN GVA Mining                | ipin_gva_mining   | National Accounts, Philippine Statistics Authority | Implicit Price Index: Nominal GVA/Real GVA in Mining  |        | (2000=100) |
| IPIN GVA Other Services        | ipin_gva_otser    | National Accounts, Philippine Statistics Authority | Implicit Price Index: Nominal GVA/Real GVA in Other Services                                  |        | (2000=100) |
| IPIN GVA Real Estate           | ipin_gva_realest  | National Accounts, Philippine Statistics Authority | Implicit Price Index: Nominal GVA/Real GVA in Real Estate                                     |        | (2000=100) |
| IPIN GVA Trade                 | ipin_gva_trade    | National Accounts, Philippine Statistics Authority | Implicit Price Index: Nominal GVA/Real GVA in Trade   |        | (2000=100) |
| IPIN GVA Transportation        | ipin_gva_trans    | National Accounts, Philippine Statistics Authority | Implicit Price Index: Nominal GVA/Real GVA in Transportation                                  |        | (2000=100) |
| IPIN GVA Water                 | ipin_gva_water    | National Accounts, Philippine Statistics Authority | Implicit Price Index: Nominal GVA/Real GVA in Utilities (Water)                               |        | (2000=100) |
| HFCE - Alcohol                 | HFCE_alc_r        | National Accounts, Philippine Statistics Authority | Household Final Consumption Expenditure in Alcoholic Beverages at constant prices             | in PhP | (2000=100) |
| HFCE - Education               | HFCE_educ_r       | National Accounts, Philippine Statistics Authority | Household Final Consumption Expenditure in Education at constant prices                       | in PhP | (2000=100) |
| HFCE - Food                    | HFCE_food_r       | National Accounts, Philippine Statistics Authority | Household Final Consumption Expenditure in Food at constant prices                            | in PhP | (2000=100) |
| HFCE - Medical                 | HFCE_med_r        | National Accounts, Philippine Statistics Authority | Household Final Consumption Expenditure in Medical Care at constant prices                    | in PhP | (2000=100) |
| HFCE - Housing                 | HFCE_housing_r    | National Accounts, Philippine Statistics Authority | Household Final Consumption Expenditure in Housing at constant prices                         | in PhP | (2000=100) |
| HFCE - Non-Alcoholic           | HFCE_nalc_r       | National Accounts, Philippine Statistics Authority | Household Final Consumption Expenditure in Non-Alcoholic Beverages at constant prices         | in PhP | (2000=100) |
| HFCE - Miscellaneous           | HFCE_misc_r       | National Accounts, Philippine Statistics Authority | Household Final Consumption Expenditure in Miscellaneous or Others, N.E.C. at constant prices | in PhP | (2000=100) |
| HFCE - Tobacco                 | HFCE_tbc_r        | National Accounts, Philippine Statistics Authority | Household Final Consumption Expenditure in Tobacco at constant prices                         | in PhP | (2000=100) |

| Variables                                    | Variable Name      | Sources  | Definition   | Unit           |                |
|--|--------------------|--|--|----------------|----------------|
| HFCE - Transportation and Communication      | HFCE_tcom_r        | National Accounts, Philippine Statistics Authority | Household Final Consumption Expenditure in Transportation and Communication at constant prices                 | in PhP         | (2000=100)     |
| HFCE - Utilities                             | HFCE_util_r        | National Accounts, Philippine Statistics Authority | Household Final Consumption Expenditure in Fuel, light, water at constant prices                               | in PhP         | (2000=100)     |
| IPIN HFCE - Alcohol                          | ipin_exp_alc_n     | National Accounts, Philippine Statistics Authority | Implicit Price Index: Nominal HFCE/Real HFCE in Alcoholic Beverages  |                | (2000=100)     |
| IPIN HFCE - Education                        | ipin_exp_educ_n    | National Accounts, Philippine Statistics Authority | Implicit Price Index: Nominal HFCE/Real HFCE in Education  |                | (2000=100)     |
| IPIN HFCE - Food                             | ipin_exp_food_n    | National Accounts, Philippine Statistics Authority | Implicit Price Index: Nominal HFCE/Real HFCE in Food   |                | (2000=100)     |
| IPIN HFCE - Medical                          | ipin_exp_med_n     | National Accounts, Philippine Statistics Authority | Implicit Price Index: Nominal HFCE/Real HFCE in Medical Care   |                | (2000=100)     |
| IPIN HFCE - Housing                          | ipin_exp_housing_n | National Accounts, Philippine Statistics Authority | Implicit Price Index: Nominal HFCE/Real HFCE in Housing  |                | (2000=100)     |
| IPIN HFCE - Non-Alcoholic                    | ipin_exp_nalc_n    | National Accounts, Philippine Statistics Authority | Implicit Price Index: Nominal HFCE/Real HFCE in Non-Alcoholic Beverages  |                | (2000=100)     |
| IPIN HFCE - Miscellaneous                    | ipin_exp_misc_n    | National Accounts, Philippine Statistics Authority | Implicit Price Index: Nominal HFCE/Real HFCE in Miscellaneous or Others, N.E.C.                                |                | (2000=100)     |
| IPIN HFCE - Tobacco                          | ipin_exp_tbc_n     | National Accounts, Philippine Statistics Authority | Implicit Price Index: Nominal HFCE/Real HFCE in Tobacco  |                | (2000=100)     |
| IPIN HFCE - Transportation and Communication | ipin_exp_tcom_n    | National Accounts, Philippine Statistics Authority | Implicit Price Index: Nominal HFCE/Real HFCE in Transportation and Communication                               |                | (2000=100)     |
| IPIN HFCE - Utilities                        | ipin_exp_util_n    | National Accounts, Philippine Statistics Authority | Implicit Price Index: Nominal HFCE/Real HFCE in Fuel, light, water   |                | (2000=100)     |
| GDCF - Fixed - Durables, real                | gdcf_fc_dur_r      | National Accounts, Philippine Statistics Authority | Durable Equipment investments under Fixed Capital in Gross Domestic Capital Formation, at real prices          | in million PhP | (2000=100)     |
| GDCF - Fixed - Private Construction, real    | gdcf_fc_privcons_r | National Accounts, Philippine Statistics Authority | Investments in private construction under Gross Domestic Capital Formation, at real prices                     | in million PhP | (2000=100)     |
| Compensation of Residents                    | comp_res           | National Accounts, Philippine Statistics Authority | Compensation from resident producers   | in million PhP | Current prices |
| Operating Surplus                            | opsurplus_net      | National Accounts, Philippine Statistics Authority | Operating Surplus, net   | in million PhP | Current prices |
| Net Compensation                             | comp_net           | National Accounts, Philippine Statistics Authority | Sum of compensation from resident producers and from rest of the world, less compensation to rest of the world | in million PhP | Current prices |

| Variables                 | Variable Name  | Sources  | Definition  | Unit           |                |
|---------------------------|----------------|--|---|----------------|----------------|
| Net National Income       | netnat_income  | National Accounts, Philippine Statistics Authority     | Sum of Net Compensation of Employees, Operating Surplus, Property Income, Taxes on Production and on Imports, less subsidies  | in million PhP | Current prices |
| Net Disposable Income     | netdisp_income | National Accounts, Philippine Statistics Authority     | Sum of Net National Income and Current Transfers from Rest of the World, less Current Transfer from Rest of the World   | in million PhP | Current prices |
| Domestic Demand, Real     | dd_r           | National Accounts, Philippine Statistics Authority     |   | in million PhP | Current prices |
| Openness, Nominal         | openness_n     | National Accounts, Philippine Statistics Authority     | Sum of imports and exports in current prices, divided by GDP  | percentage     |                |
| Employment in Agriculture | emp_agri       | Authors' Calculations, Philippine Statistics Authority | Consists of persons in the labor force in Agriculture who are reported either as at work or with a job or business although not at work. Persons at work are those who did some work, even for an hour during the reference period. | in thousands   |                |
| Employment in Industry    | emp_ind        | Authors' Calculations, Philippine Statistics Authority | Consists of persons in the labor force in Industry who are reported either as at work or with a job or business although not at work. Persons at work are those who did some work, even for an hour during the reference period.    | in thousands   |                |
| Employment in Service     | emp_serv       | Authors' Calculations, Philippine Statistics Authority | Consists of persons in the labor force in Services who are reported either as at work or with a job or business although not at work. Persons at work are those who did some work, even for an hour during the reference period.    | in thousands   |                |
| Labor Force               | lf             | Authors' Calculations, Philippine Statistics Authority | Refers to the population 15 years old and over who contribute to the production of goods and services in the country. It comprises the employed and unemployed.   | in thousands   |                |
| Unemployment Rate         | unemp_rate     | Authors' Calculations, Philippine Statistics Authority | Percentage of the total number of unemployed persons to the total number of persons in the labor force.   | Percent        |                |
| Total Employment (AIS)    | temp_ais       | Authors' Calculations, Philippine Statistics Authority | Total Employment (Agriculture+ Industry+Services)   | in thousands   |                |
| Wage Index Agriculture    | wageind_agri   | Authors' Calculations, Philippine Statistics Authority | Indexed to 1978 from Agricultural Wage Rates of Farm Workers by Type of Farm Workers, Type  |                | (1978=100)     |

| Variables                         | Variable Name    | Sources  | Definition   | Unit           |            |
|-----------------------------------|------------------|--|--|----------------|------------|
| Wage Index Construction           | wageind_cons     | Index of Compensation Per Employee in Non-Agricultural Industries, Philippine Statistics Authority | Receipts of the employees be it in the form of cash or in-kind, including contributions of the employers such as insurance and pension in Construction.          |                | (1978=100) |
| Wage Index Electricity and Steam  | wageind_elect    | Index of Compensation Per Employee in Non-Agricultural Industries, Philippine Statistics Authority | Receipts of the employees be it in the form of cash or in-kind, including contributions of the employers such as insurance and pension in Electricity and Steam. |                | (1978=100) |
| Wage Index Finance                | wageind_fin      | Index of Compensation Per Employee in Non-Agricultural Industries, Philippine Statistics Authority | Receipts of the employees be it in the form of cash or in-kind, including contributions of the employers such as insurance and pension in Financial Services.    |                | (1978=100) |
| Wage Index Manufacturing          | wageind_manuf    | Index of Compensation Per Employee in Non-Agricultural Industries, Philippine Statistics Authority | Receipts of the employees be it in the form of cash or in-kind, including contributions of the employers such as insurance and pension in Manufacturing.         |                | (1978=100) |
| Wage Index Mining                 | wageind_mining   | Index of Compensation Per Employee in Non-Agricultural Industries, Philippine Statistics Authority | Receipts of the employees be it in the form of cash or in-kind, including contributions of the employers such as insurance and pension in Mining.                |                | (1978=100) |
| Wage Index - Private Service      | wageind_privserv | Index of Compensation Per Employee in Non-Agricultural Industries, Philippine Statistics Authority | Receipts of the employees be it in the form of cash or in-kind, including contributions of the employers such as insurance and pension in Private Service.       |                | (1978=100) |
| Wage Index Real Estate            | wageind_realest  | Index of Compensation Per Employee in Non-Agricultural Industries, Philippine Statistics Authority | Receipts of the employees be it in the form of cash or in-kind, including contributions of the employers such as insurance and pension in Real Estate.           |                | (1978=100) |
| Wage Index Trade                  | wageind_trade    | Index of Compensation Per Employee in Non-Agricultural Industries, Philippine Statistics Authority | Receipts of the employees be it in the form of cash or in-kind, including contributions of the employers such as insurance and pension in Trade.                 |                | (1978=100) |
| Wage Index Transportation         | wageind_transpo  | Index of Compensation Per Employee in Non-Agricultural Industries, Philippine Statistics Authority | Receipts of the employees be it in the form of cash or in-kind, including contributions of the employers such as insurance and pension in Transportation.        |                | (1978=100) |
| GDCF - Fixed - Construction, real | gdcf_fc_cons_r   | National Accounts, Philippine Statistics Authority   | Construction under Fixed Capital in Gross Domestic Capital Formation, at constant prices   | in million PhP | (2000=100) |

| Variables  | Variable Name | Sources  | Definition  | Unit           |                |
|--|---------------|--|---|----------------|----------------|
| GDCF - Fixed, real                                 | gdcf_fc_r     | National Accounts, Philippine Statistics Authority   | Fixed Capital under Gross Domestic Capital Formation consisting Construction, Durable Equipment, and Breeding Stock & Orchard Development   | in million PhP | (2000=100)     |
| GDCF, real   | gdcf_r        | National Accounts, Philippine Statistics Authority   | Gross Domestic Capital Formation is the sum of fixed capital, changes in inventories and intellectual property products, at constant prices | in million PhP | (2000=100)     |
| GDCF, nominal                                      | gdcf_n        | National Accounts, Philippine Statistics Authority   | Gross Domestic Capital Formation is the sum of fixed capital, changes in inventories and intellectual property products, at current prices  | in million PhP | (2000=100)     |
| BIR - Excise Taxes                                 | BIR_excise    | Bureau of Internal Revenue   | Excise Taxes  | in million PhP | Current prices |
| CPI from IPIN HFCE, regress                        | cpi_hfce      |  |   |                |                |
| Import Duties and Excise Taxes                     | gitax_impall  |  |   |                |                |
| Taxes in Business and Occupation                   | gitax_biz     | The National Accounts of the Philippines, National Statistical Coordination Board/Philippine Statistical Authority | Taxes in Business and Occ.  | in million PhP | Current prices |
| Other Indirect Taxes                               | gitax_o       | The National Accounts of the Philippines, National Statistical Coordination Board/Philippine Statistical Authority | Other Indirect Taxes  | in million PhP | Current prices |
| BIR - Alcohol Products                             | BIR_alc       | Bureau of Internal Revenue   | Alcohol Products  | in million PhP | Current prices |
| BIR - Tobacco Products (including inspection fees) | BIR_tbc       | Bureau of Internal Revenue   | Tobacco Products (including inspection fees)  | in million PhP | Current prices |
| BIR - Petroleum Products                           | BIR_oil       | Bureau of Internal Revenue   | Petroleum Products  | in million PhP | Current prices |
| BIR - Mineral Products                             | BIR_mnrl      | Bureau of Internal Revenue   | Mineral Products  | in million PhP | Current prices |
| Excise Tax on Domestic Product                     | gitax_dp      | The National Accounts of the Philippines, National Statistical Coordination Board/Philippine Statistical Authority | Excise Tax on Domestic Product  | in million PhP | Current prices |
| Income Tax on Business                             | gdtax_b       | The National Accounts of the Philippines, National Statistical Coordination Board/Philippine Statistical Authority | Income Tax on Business  | in million PhP | Current prices |
| Income Tax on Individual                           | gdtax_i       | The National Accounts of the Philippines, National Statistical Coordination Board/Philippine Statistical Authority | Income Tax on Individual  | in million PhP | Current prices |
| Other Direct Taxes                                 | gdtax_o       | The National Accounts of the Philippines, National Statistical Coordination Board/Philippine Statistical Authority | Other Direct Taxes  | in million PhP | Current prices |

| Variables                                 | Variable Name      | Sources   | Definition                                      | Unit           |                |
|---|--------------------|---|---|----------------|----------------|
| Compulsory fees and fines                 | ggff               | General Government, Income and Outlay Account, National Statistical Coordination Board/Philippine Statistical Authority | Compulsory fees and fines                       | in million PhP | Current prices |
| Govt property income                      | ggproperty         | General Government, Income and Outlay Account, National Statistical Coordination Board/Philippine Statistical Authority | Government property income                      | in million PhP | Current prices |
| Social security contributions             | ggssc              | General Government, Income and Outlay Account, National Statistical Coordination Board/Philippine Statistical Authority | Social security contributions                   | in million PhP | Current prices |
| Govt property expenditure                 | ggpropexp          | General Government, Income and Outlay Account, National Statistical Coordination Board/Philippine Statistical Authority | Government property expenditure                 | in million PhP | Current prices |
| Social security benefits                  | ggsbenefit         | General Government, Income and Outlay Account, National Statistical Coordination Board/Philippine Statistical Authority | Social security benefits                        | in million PhP | Current prices |
| Implicit Price Index, Government Spending | ipin_gfce          |   |   |                |                |
| Total Indirect Taxes                      | i_tot_indirect_tax |   |   |                |                |
| Total Direct Taxes                        | i_tot_direct_tax   |   |   |                |                |
| Total Taxes                               | i_tot_tax          |   |   |                |                |
| Total Govt Income                         | i_tot_gov_inc      |   |   |                |                |
| Total Govt Expenditure                    | i_tot_gov_exp      |   |   |                |                |
| Total Govt Savings                        | i_tot_govt_sav     |   |   |                |                |
| Total Govt Surplus                        | i_gov_surp         |   |   |                |                |
| Total Govt Debt                           | i_gov_debt         |   |   |                |                |
| IPIN Agricultural Imports                 | ipin_mgagri        | Authors' calculations. Implicit Price = Nominal value / Real value  | Implicit Price Deflator of Agricultural Imports | Unit           |                |
| IPIN Fuel Imports                         | ipin_mgfuel        | Authors' calculations. Implicit Price = Nominal value / Real value  | Implicit Price Deflator of Fuel Imports         |                |                |
| IPIN Machinery Imports                    | ipin_mgmach        | Authors' calculations. Implicit Price = Nominal value / Real value  | Implicit Price Deflator of Machinery Imports    |                |                |
| IPIN Materials Imports                    | ipin_mgmat         | Authors' calculations. Implicit Price = Nominal value / Real value  | Implicit Price Deflator of Materials Imports    |                |                |

| Variables                    | Variable Name | Sources   | Definition  | Unit           |            |
|------------------------------|---------------|---|---|----------------|------------|
| IPIN Other Good Imports      | ipin_mgoth    | Authors' calculations. Implicit Price = Nominal value / Real value  | Implicit Price Deflator of Other Goods Imports  |                |            |
| IPIN Electronic Exports      | ipin_xgelec   | Authors' calculations. Implicit Price = Nominal value / Real value  | Implicit Price Deflator of Electronic Exports   |                |            |
| IPIN Agricultural Exports    | ipin_xgagri   | Authors' calculations. Implicit Price = Nominal value / Real value  | Implicit Price Deflator of Agricultural Exports   |                |            |
| IPIN Mineral Exports         | ipin_xgmine   | Authors' calculations. Implicit Price = Nominal value / Real value  | Implicit Price Deflator of Mineral Exports  |                |            |
| IPIN Other Good Exports      | ipin_xgoth    | Authors' calculations. Implicit Price = Nominal value / Real value  | Implicit Price Deflator of Other Goods Exports  |                |            |
| IPIN Service Imports         | ipin_ms       | Authors' calculations. Implicit Price = Nominal value / Real value  | Implicit Price Deflator of Services Imports   |                |            |
| IPIN BPO Service Exports     | ipin_xsbpo    | Authors' calculations. Implicit Price = Nominal value / Real value  | Implicit Price Deflator of BPO Services Exports   |                |            |
| IPIN Tourism Service Exports | ipin_xstour   | Authors' calculations. Implicit Price = Nominal value / Real value  | Implicit Price Deflator of Tourism Exports  |                |            |
| IPIN Other Service Exports   | ipin_xsoth    | Authors' calculations. Implicit Price = Nominal value / Real value  | Implicit Price Deflator of Other Services Exports   |                |            |
| Electronic Exports, real     | xgelec_r      | Authors' calculations. Values are based on proportions derived from the PSA National Income Accounts. These derived proportions were then used to divide the value of Total Exports from the PIDS-Economic and Social Database. | Electronic Exports. Since the PSA National Income Accounts have multiple disaggregation differing through the years, categories were regrouped. The technical notes on the Trade Sector Dataset provide a complete enumeration.   | in million PhP | (2000=100) |
| Agricultural Exports, real   | xgagri_r      | Authors' calculations. Values are based on proportions derived from the PSA National Income Accounts. These derived proportions were then used to divide the value of Total Exports from the PIDS-Economic and Social Database. | Agricultural Exports. Since the PSA National Income Accounts have multiple disaggregation differing through the years, categories were regrouped. The technical notes on the Trade Sector Dataset provide a complete enumeration. | in million PhP | (2000=100) |
| Mineral Exports, real        | xgmine_r      | Authors' calculations. Values are based on proportions derived from the PSA National Income Accounts. These derived proportions were then used to divide the value of Total Exports from the PIDS-Economic and Social Database. | Mineral Exports. Since the PSA National Income Accounts have multiple disaggregation differing through the years, categories were regrouped. The technical notes on the Trade Sector Dataset provide a complete enumeration.      | in million PhP | (2000=100) |

| Variables                            | Variable Name | Sources   | Definition  | Unit            |                |
|--------------------------------------|---------------|---|---|-----------------|----------------|
| Other Good Exports, real             | xgoth_r       | Authors' calculations. Values are based on proportions derived from the PSA National Income Accounts. These derived proportions were then used to divide the value of Total Exports from the PIDS-Economic and Social Database. | Other Goods Exports. Since the PSA National Income Accounts have multiple disaggregation differing through the years, categories were regrouped. The technical notes on the Trade Sector Dataset provide a complete enumeration.      | in million PhP  | (2000=100)     |
| BPO Service Exports, real            | xsbpo_r       | Authors' calculations. Values are based on proportions derived from the PSA National Income Accounts. These derived proportions were then used to divide the value of Total Exports from the PIDS-Economic and Social Database. | BPO Services Exports. Since the PSA National Income Accounts have multiple disaggregation differing through the years, categories were regrouped. The technical notes on the Trade Sector Dataset provide a complete enumeration.     | in million PhP  | (2000=100)     |
| Tourism Service Exports, real        | xstour_r      | Authors' calculations. Values are based on proportions derived from the PSA National Income Accounts. These derived proportions were then used to divide the value of Total Exports from the PIDS-Economic and Social Database. | Tourism Services Exports. Since the PSA National Income Accounts have multiple disaggregation differing through the years, categories were regrouped. The technical notes on the Trade Sector Dataset provide a complete enumeration. | in million PhP  | (2000=100)     |
| Other Service Exports                | xsoth_r       | Authors' calculations. Values are based on proportions derived from the PSA National Income Accounts. These derived proportions were then used to divide the value of Total Exports from the PIDS-Economic and Social Database. | Other Services Exports. Since the PSA National Income Accounts have multiple disaggregation differing through the years, categories were regrouped. The technical notes on the Trade Sector Dataset provide a complete enumeration.   | in million PhP  | (2000=100)     |
| BOP - Total Good Exports, nominal    | bopxg_n       | Bangko Sentral ng Pilipinas   | Total Goods Exports, Credit   | in million US\$ | Current prices |
| BOP - Total Service Exports, nominal | bopxs_n       | Bangko Sentral ng Pilipinas   | Total Services Exports, Credit  | in million US\$ | Current prices |
| Agricultural Imports, real           | mgagri_r      | Authors' calculations. Values are based on proportions derived from the PSA National Income Accounts. These derived proportions were then used to divide the value of Total Imports from the PIDS-Economic and Social Database. | Agricultural Imports. Since the PSA National Income Accounts have multiple disaggregation differing through the years, categories were regrouped. The technical notes on the Trade Sector Dataset provide a complete enumeration.     | in million PhP  | (2000=100)     |
| Fuel Imports, real                   | mgfuel_r      | Authors' calculations. Values are based on proportions derived from the PSA National Income Accounts. These derived proportions were then used to divide the value of Total Imports from the PIDS-Economic and Social Database. | Fuel Imports. Since the PSA National Income Accounts have multiple disaggregation differing through the years, categories were regrouped. The technical notes on the Trade Sector Dataset provide a complete enumeration.             | in million PhP  | (2000=100)     |



| Variables                            | Variable Name | Sources   | Definition   | Unit            |                |
|--------------------------------------|---------------|---|--|-----------------|----------------|
| Machinery Imports, real              | mgmach_r      | Authors' calculations. Values are based on proportions derived from the PSA National Income Accounts. These derived proportions were then used to divide the value of Total Imports from the PIDS-Economic and Social Database. | Machinery Imports. Since the PSA National Income Accounts have multiple disaggregation differing through the years, categories were regrouped. The technical notes on the Trade Sector Dataset provide a complete enumeration.   | in million PhP  | (2000=100)     |
| Materials Imports, real              | mgmat_r       | Authors' calculations. Values are based on proportions derived from the PSA National Income Accounts. These derived proportions were then used to divide the value of Total Imports from the PIDS-Economic and Social Database. | Materials Imports. Since the PSA National Income Accounts have multiple disaggregation differing through the years, categories were regrouped. The technical notes on the Trade Sector Dataset provide a complete enumeration.   | in million PhP  | (2000=100)     |
| Other Good Imports, real             | mgoth_r       | Authors' calculations. Values are based on proportions derived from the PSA National Income Accounts. These derived proportions were then used to divide the value of Total Imports from the PIDS-Economic and Social Database. | Other Goods Imports. Since the PSA National Income Accounts have multiple disaggregation differing through the years, categories were regrouped. The technical notes on the Trade Sector Dataset provide a complete enumeration. | in million PhP  | (2000=100)     |
| Total Service Imports, real          | ms_r          | Authors' calculations. Values are based on proportions derived from the PSA National Income Accounts. These derived proportions were then used to divide the value of Total Imports from the PIDS-Economic and Social Database. | Total Services Imports   | in million PhP  | (2000=100)     |
| BOP -Total Good Imports, nominal     | bopmg_n       | Bangko Sentral ng Pilipinas   | Total Goods Exports, Debit   | in million US\$ | Current prices |
| BOP - Total Service Imports, nominal | bopms_n       | Bangko Sentral ng Pilipinas   | Total Services Exports, Debit  | in million US\$ | Current prices |
| Total Export of Goods, Real          | xg_r          | Authors' calculations. Values are based on proportions derived from the PSA National Income Accounts. These derived proportions were then used to divide the value of Total Exports from the PIDS-Economic and Social Database. | Total Goods Exports  | in million PhP  | (2000=100)     |
| Total Export of Services, Real       | xs_r          | Authors' calculations. Values are based on proportions derived from the PSA National Income Accounts. These derived proportions were then used to divide the value of Total Exports from the PIDS-Economic and Social Database. | Total Services Exports   | in million PhP  | (2000=100)     |
| Total Exports, Real                  | xtot_r        | PIDS-Economic and Social Database   | Total Exports of Goods and Services  | in million PhP  | (2000=100)     |
| Total Import of Goods, Real          | mg_r          | Authors' calculations. Values are based on proportions derived from the PSA National Income Accounts. These derived proportions were  | Total Goods Imports  | in million PhP  | (2000=100)     |

| Variables                         | Variable Name | Sources  | Definition  | Unit                          |
|-----------------------------------|---------------|--|---|-------------------------------|
|                                   |               | then used to divide the value of Total Imports from the PIDS-Economic and Social Database. |   |                               |
| Total Imports, Real               | mtot_r        | PIDS-Economic and Social Database  | Total Imports of Goods and Services   | in million PhP (2000=100)     |
| Total Imports, Nominal            | mtot_n        | PIDS-Economic and Social Database  | Total Imports of Goods and Services   | in million PhP Current prices |
| Net Exports(real)                 | netx_tot      |  |   |                               |
| M1                                | narrowmoney   | Bangko Sentral ng Pilipinas  | Consists of currency in circulation (or currency outside depository corporations) and peso demand deposits.   | in million PhP                |
| M3                                | broadmoney    | Bangko Sentral ng Pilipinas  | Consists of M2 plus peso deposit substitutes, such as promissory notes and commercial papers (i.e., securities other than shares included in broad money)   | in million PhP                |
| Total Loans                       | loans         | Bangko Sentral ng Pilipinas  |   |                               |
| Resources of the Financial System | fsresources   | Bangko Sentral ng Pilipinas  | Excludes the Bangko Sentral ng Pilipinas; amount includes allowance for probable losses. Includes Investment Houses, Finance Companies, Investment Companies, Securities Dealers/Brokers, Pawnshops, Lending Investors, Non Stocks Savings and Loan Associations, Credit Card Companies (which are under BSP supervision), and Private and Government Insurance Companies (i.e., SSS and GSIS). | in billion PhP                |
| Cash Remittances                  | cashremit     | Bangko Sentral ng Pilipinas  | Overseas Filipinos' Cash Remittances  | In Thousand US\$              |
| Money Multiplier                  | mm            |  |   |                               |
| Inflation* (actual forecast)      | Inf_hfce_all  |  |   |                               |

## APPENDIX 3: Equation-by-equation estimates

Note: Figures in parentheses are standard errors.

### Real Sector

#### 1. Gross Value Added – Agriculture, Real

Estimation Period: 1982 – 2016

$$\begin{aligned}
 \Delta GVA \text{ Agriculture, Real} = & \underbrace{-0.566 \text{ } GVA \text{ Agriculture, Real}_{t-1}}_{\text{Adjustment}} \\
 & + 4.291 \text{ } (0.880) + 0.066 \text{ } IPIN \text{ } GVA \text{ Agriculture} \text{ } (0.024) - 0.019 \text{ } High \text{ Temperature} \text{ } (0.011) \\
 & + 0.247 \text{ } IPIN, \text{ Agricultural Exports} \text{ } (0.015) + 0.039 \text{ } Total \text{ Agricultural Production Loan} \text{ } (0.013) \\
 & \underbrace{\hspace{10em}}_{\text{Long-run}} \\
 & + 0.336 \text{ } \Delta GVA \text{ Agriculture, Real}_{t-1} \text{ } (0.131) + 0.630 \text{ } \Delta GVA \text{ Agriculture, Real}_{t-2} \text{ } (0.124) - 0.110 \text{ } \Delta IPIN \text{ Agricultural Exports} \text{ } (0.029) \\
 & - 0.058 \text{ } \Delta IPIN \text{ Agricultural Exports}_{t-1} \text{ } (0.022) - 0.040 \text{ } \Delta IPIN \text{ Agricultural Exports}_{t-2} \text{ } (0.018) \\
 & - 0.011 \text{ } \Delta Total \text{ Agricultural Production Loan} \text{ } (0.008) - 0.014 \text{ } \Delta Total \text{ Agricultural Production Loan}_{t-1} \text{ } (0.007) \\
 & - 0.052 \text{ } \Delta Total \text{ Agricultural Production Loan}_{t-2} \text{ } (0.007) \\
 & \underbrace{\hspace{10em}}_{\text{Short-run}}
 \end{aligned}$$

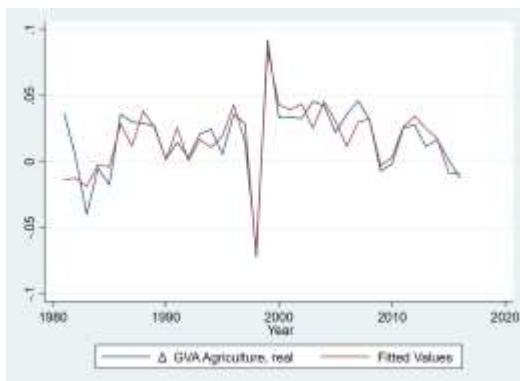
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 7.433          | -4.968         | $\chi^2 (33)$           | $\chi^2 (16)$           | 0.010     | 0.013 | 0.840          |
| [0.001, 0.007] | [0.001, 0.010] | 0.542                   | 8.739                   |           |       |                |
|                |                | [0.461]                 | [0.923]                 |           |       |                |

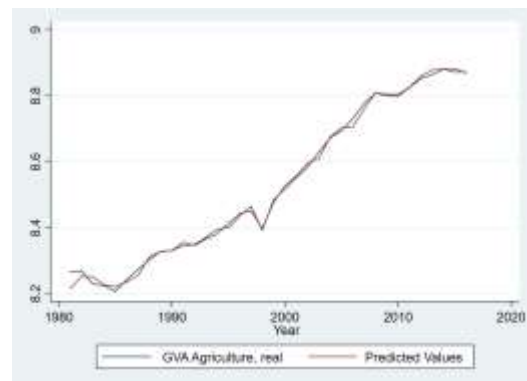
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) GVA Agriculture, Real are 0.022, 0.030, -0.072, and 0.098 respectively.

Figure 1. Actual v. Predicted GVA Agriculture, Real, along with residuals

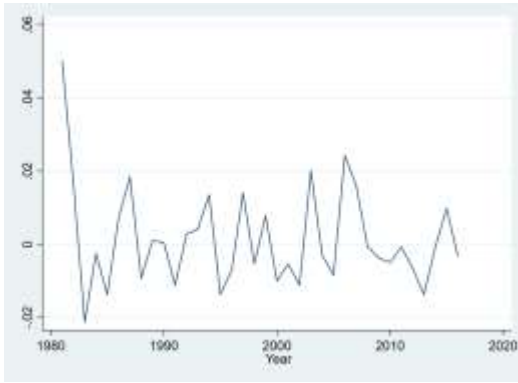
Panel A: Log first-difference



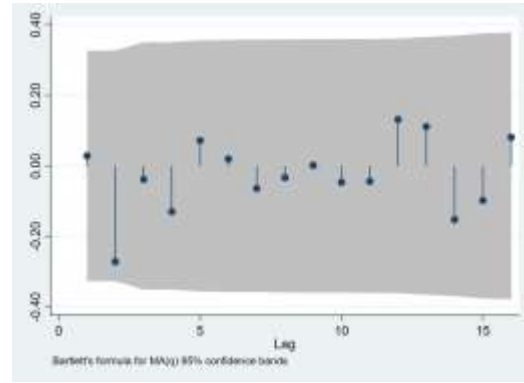
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 2. Gross Value Added – Agriculture (Demand), Real

Estimation Period: 1971 – 2016

$$\begin{aligned}
 \Delta GVA \text{ Agriculture (Demand), Real} = & \underbrace{-0.266 GVA \text{ Agriculture (Demand), Real}_{t-1}}_{\text{Adjustment}} \\
 & + 1.418 \underbrace{-0.218 IPIN \text{ GVA Agriculture}}_{(0.495)} \\
 & + 0.306 \underbrace{\text{Compensation of Residents}}_{(0.059)} + 0.094 \underbrace{\text{Real Effective Exchange Rate}}_{(0.089)} \\
 & - 0.108 \underbrace{\Delta \text{Compensation of Residents}}_{(0.043)} - 0.162 \underbrace{\Delta \text{Compensation of Residents}_{t-1}}_{(0.044)} \\
 & - 0.101 \underbrace{\Delta \text{Real Effective Exchange Rate}}_{(0.031)} - 0.054 \underbrace{\Delta \text{Real Effective Exchange Rate}_{t-1}}_{(0.027)}
 \end{aligned}$$

Long-run

Short-run

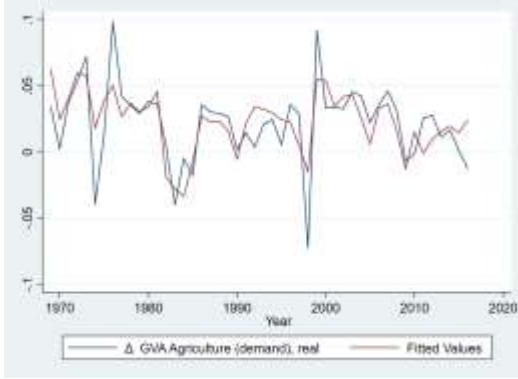
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 6.220          | -3.551         | $\chi^2 (44)$           | $\chi^2 (22)$           | 0.016     | 0.021 | 0.522          |
| [0.002, 0.013] | [0.010, 0.081] | [0.430]                 | [0.949]                 |           |       |                |

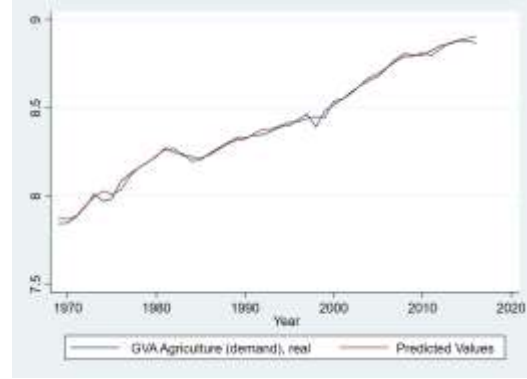
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) GVA Agriculture (Demand), Real are 0.022, 0.030, -0.072, and 0.098 respectively.

Figure 1. Actual v. Predicted GVA Agriculture (Demand), Real, along with residuals

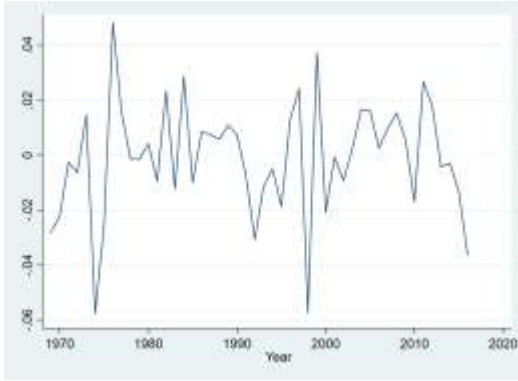
Panel A: Log first-difference



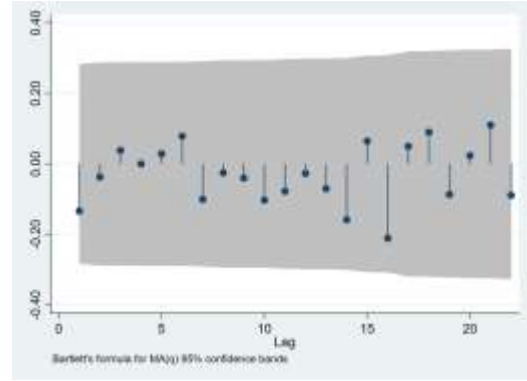
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



### 3. Gross Value Added – Construction, Real

Estimation Period: 1977 – 2016

$$\begin{aligned}
 \Delta GVA \text{ Construction, Real} = & \underbrace{-0.495 \text{ GVA Construction, Real}_{t-1}}_{\text{Adjustment}} \\
 & + 4.718 \text{ (0.876)} - 0.445 \text{ IPIN GVA Construction (0.169)} - 0.771 \text{ Real Effective Exchange Rate (0.171)} \\
 & - 0.123 \text{ Lending Rate (0.143)} + 0.303 \text{ Resources of the Financial System (0.140)} \\
 & \underbrace{- 0.215 \Delta GVA \text{ Construction, Real}_{t-1} + 0.143 \Delta \text{IPIN GVA Construction (0.293)} - 1.183 \Delta \text{IPIN GVA Construction}_{t-1} \text{ (0.308)}}_{\text{Long-run}} \\
 & + 0.346 \Delta \text{Real Effective Exchange Rate (0.134)} + 0.327 \Delta \text{Lending Rate (0.107)} \\
 & \underbrace{\hspace{10em}}_{\text{Short-run}}
 \end{aligned}$$

Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 8.021          | -4.040         | $\chi^2$ (38)           | $\chi^2$ (19)           | 0.061     | 0.087 | 0.795          |
| [0.000, 0.002] | [0.003, 0.050] | [0.703]                 | [0.657]                 |           |       |                |

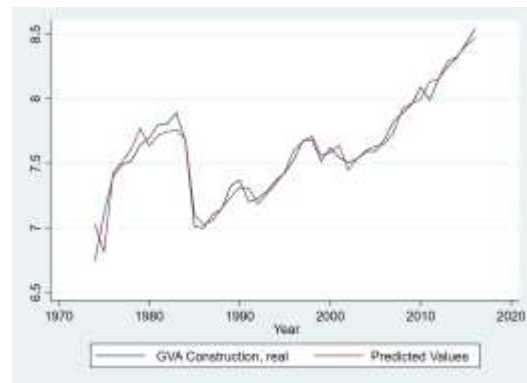
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) GVA Construction, Real are 0.043, 0.147, -0.655, and 0.362 respectively.

Figure 1. Actual v. Predicted GVA Construction, Real, along with residuals

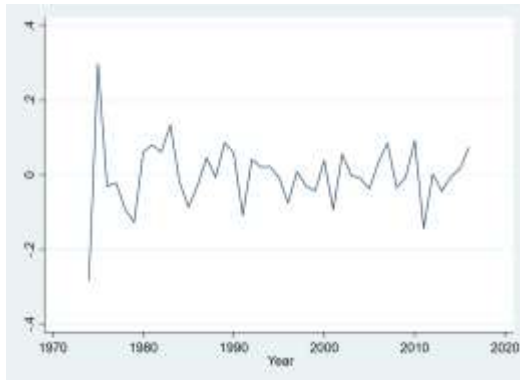
Panel A: Log first-difference



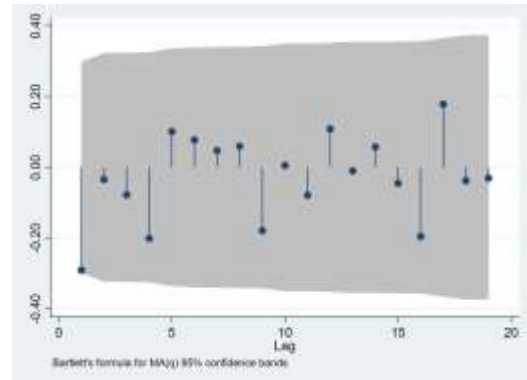
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



#### 4. Gross Value Added – Electricity and Steam, Real

Estimation Period: 1977 – 2016

$$\begin{aligned}
 \Delta GVA \text{ Electricity and Steam, Real} = & \underbrace{-0.249 \text{ GVA Electricity and Steam, Real}_{t-1}}_{\text{Adjustment}} \\
 & + 0.055 \text{ IPIN GVA Electricity and Steam} \\
 & + 0.533 \text{ Capital Formation – Fixed – Durables, Real} + 0.232 \text{ Electronic Exports, Real} \\
 & \underbrace{-0.410 \Delta GVA \text{ Electricity and Steam, Real}_{t-1} - 0.167 \Delta \text{IPIN GVA Electricity and Steam}}_{\text{Short-run}}
 \end{aligned}$$

(0.079) (0.239) (0.147) (0.149) (0.093) (0.129) (0.079)

Long-run

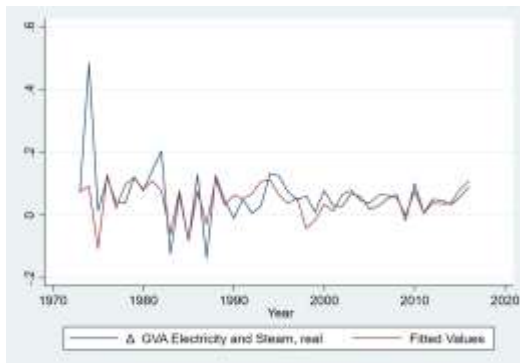
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 6.616          | -3.132         | $\chi^2(38)$            | $\chi^2(20)$            | 0.041     | 0.074 | 0.528          |
| [0.002, 0.010] | [0.030, 0.165] | 0.933                   | 8.423                   |           |       |                |
|                |                | [0.333]                 | [0.988]                 |           |       |                |

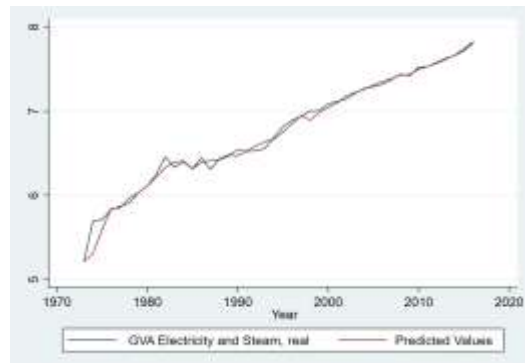
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) GVA Electricity and Steam, Real are 0.065, 0.087, -0.136, and 0.482 respectively.

Figure 1. Actual v. Predicted GVA Electricity and Steam, Real, along with residuals

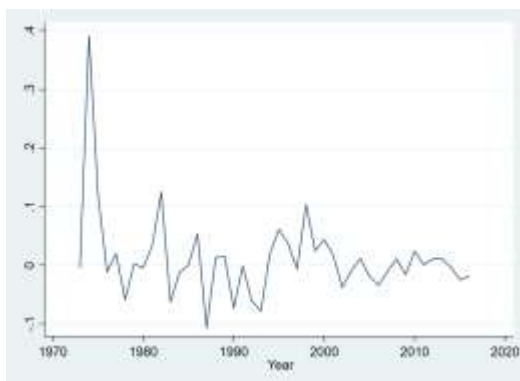
Panel A: Log first-difference



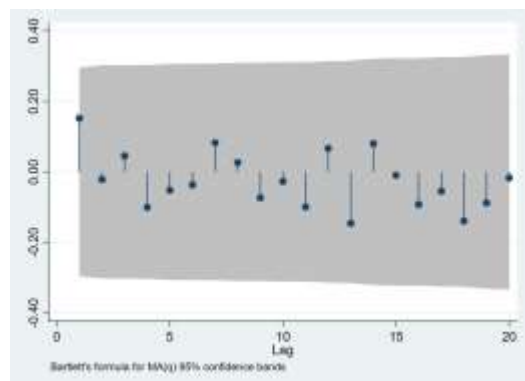
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 5. Gross Value Added – Finance, Real

Estimation Period: 1989 – 2016

$$\begin{aligned}
 \Delta GVA \text{ Finance, Real} = & \underbrace{-0.390 GVA \text{ Finance, Real}_{t-1}}_{\text{Adjustment}} \\
 & + 2.314 \quad +0.446 IPIN \text{ GVA Finance} - 0.454 \text{ Reverse Repurchase Rate} \\
 & \quad (0.349) \quad \quad (0.059) \quad \quad (0.061) \\
 & + 0.097 \text{ Capital Formation – Fixed – Construction, Real} \\
 & \quad (0.117) \\
 & \underbrace{\hspace{10em}}_{\text{Long-run}} \\
 & - 0.418 \Delta IPIN \text{ GVA Finance} + 0.287 \Delta IPIN \text{ GVA Finance}_{t-1} + 0.228 \Delta \text{Reverse Repurchase Rate} \\
 & \quad (0.107) \quad \quad (0.107) \quad \quad (0.040) \\
 & + 0.163 \Delta \text{Reverse Repurchase Rate}_{t-1} + 0.083 \Delta \text{Reverse Repurchase Rate}_{t-2} \\
 & \quad (0.036) \quad \quad (0.031) \\
 & + 0.306 \Delta \text{Capital Formation – Fixed – Construction, Real} \\
 & \quad (0.062) \\
 & + 0.318 \Delta \text{Capital Formation – Fixed – Construction, Real}_{t-1} \\
 & \quad (0.053) \\
 & + 0.100 \Delta \text{Capital Formation – Fixed – Construction, Real}_{t-2} \\
 & \quad (0.049) \\
 & \underbrace{\hspace{10em}}_{\text{Short-run}}
 \end{aligned}$$

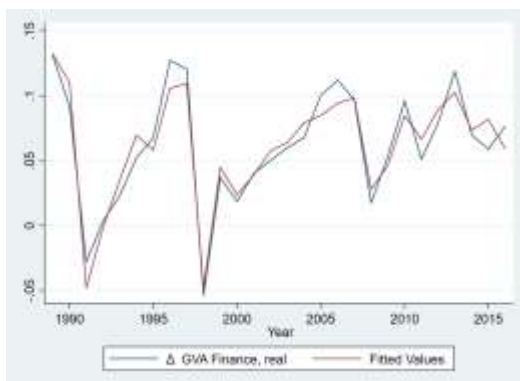
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 11.999         | -5.153         | $\chi^2(26)$            | $\chi^2(12)$            | 0.010     | 0.012 | 0.918          |
| [0.000, 0.002] | [0.001, 0.007] | [0.368]                 | [0.199]                 |           |       |                |

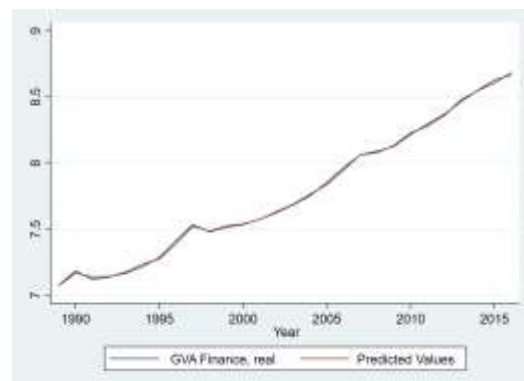
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) GVA Finance, Real are 0.057, 0.073, -0.211, and 0.146 respectively.

Figure 1. Actual v. Predicted GVA Finance, Real, along with residuals

Panel A: Log first-difference

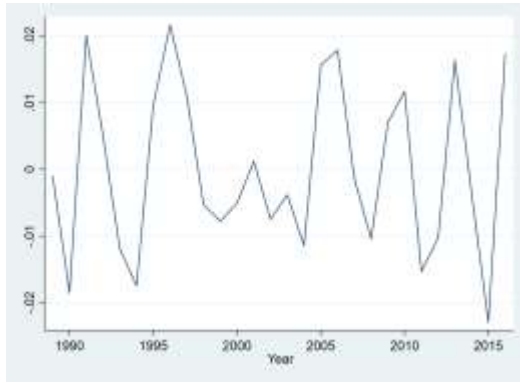


Panel B: Log level

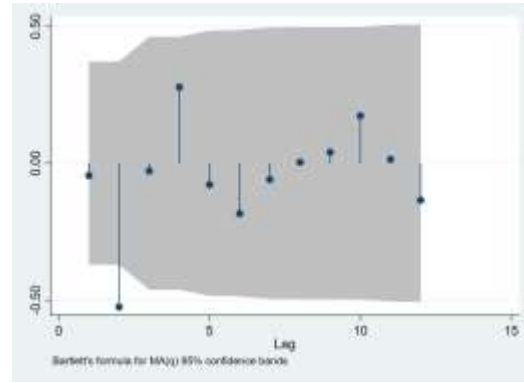




Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 6. Gross Value Added – Manufacturing, Real

Estimation Period: 1979 – 2016

$$\begin{aligned}
 \Delta GVA \text{ Manufacturing, Real} = & \underbrace{-0.508 \Delta GVA \text{ Manufacturing, Real}_{t-1}}_{\text{Adjustment} \quad (0.152)} \\
 & \underbrace{-2.627 - 0.185 \Delta IPIN \text{ GVA Manufacturing} + 1.023 \Delta \text{Household Consumption} - \text{Total}}_{\text{Long-run} \quad (0.918) \quad (0.025) \quad (0.052)} \\
 & + 0.156 \Delta GVA \text{ Manufacturing, Real}_{t-1} - 0.124 \Delta IPIN \text{ GVA Manufacturing} - 0.138 \Delta IPIN \text{ GVA Manufacturing}_{t-1} \\
 & \quad (0.165) \quad (0.078) \quad (0.083) \\
 & + 0.304 \Delta \text{Household Consumption} - \text{Total} + 0.115 \Delta \text{Household Consumption} - \text{Total}_{t-1} \\
 & \quad (0.481) \quad (0.421) \\
 & \underbrace{\hspace{10em}}_{\text{Short-run}}
 \end{aligned}$$

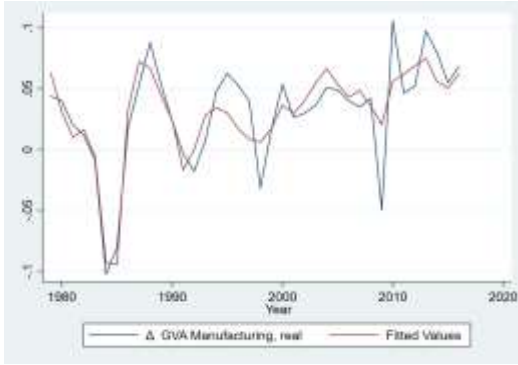
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 5.346          | -3.341         | $\chi^2(36)$<br>0.004   | $\chi^2(17)$<br>10.123  | 0.016     | 0.021 | 0.742          |
| [0.017, 0.051] | [0.019, 0.079] | [0.949]                 | [0.898]                 |           |       |                |

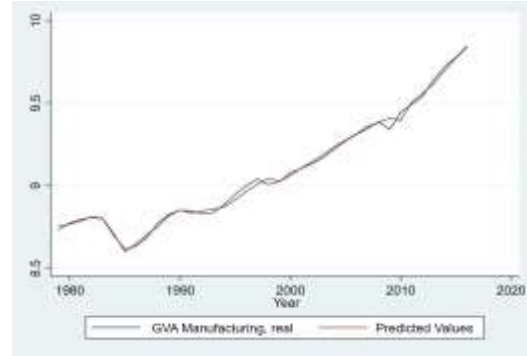
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) GVA Manufacturing, Real are 0.037, 0.042, -0.102, and 0.137 respectively.

Figure 1. Actual v. Predicted GVA Manufacturing, Real, along with residuals

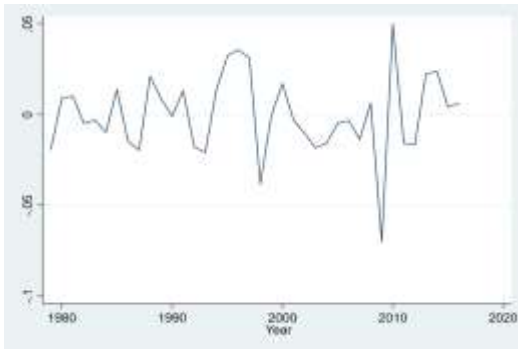
Panel A: Log first-difference



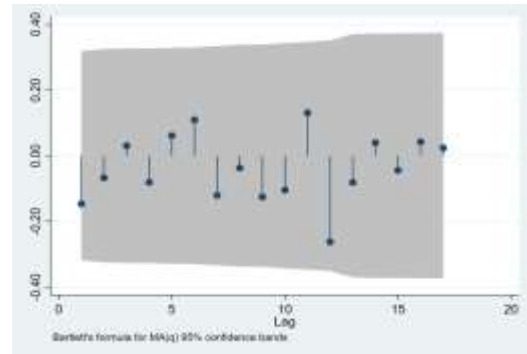
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 7. Gross Value Added – Mining, Real

Estimation Period: 1990 – 2016

$$\begin{aligned}
 \Delta GVA \text{ Mining, Real} = & \underbrace{-0.919 GVA \text{ Mining, Real}_{t-1}}_{\text{Adjustment}} \\
 & - 10.629 - 0.226 IPIN \text{ GVA Mining} - 0.538 IPIN \text{ Electronic Exports} \\
 & \quad (3.038) \quad (0.152) \quad (0.070) \\
 & + 0.813 World \text{ GDP, Real} + 0.269 Gold \text{ Price PHP} \\
 & \quad (0.176) \quad (0.135) \\
 & \quad \quad \quad \text{Long-run} \\
 & - 0.278 \Delta IPIN \text{ GVA Mining} + 0.361 \Delta IPIN \text{ Electronic Exports} - 0.358 \Delta World \text{ GDP, Real} \\
 & \quad (0.191) \quad (0.138) \quad (0.284) \\
 & - 0.400 \Delta World \text{ GDP, Real}_{t-1} + 0.048 \Delta World \text{ GDP, Real}_{t-2} - 0.574 \Delta World \text{ GDP, Real}_{t-3} \\
 & \quad (0.215) \quad (0.208) \quad (0.243) \\
 & \quad \quad \quad \text{Short-run}
 \end{aligned}$$

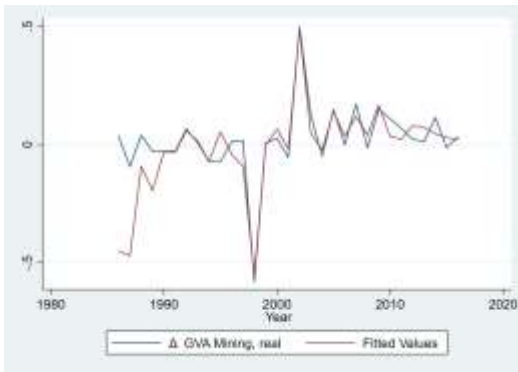
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 12.104         | -6.552         | $\chi^2 (25)$           | $\chi^2 (13)$           | 0.071     | 0.126 | 0.901          |
| [0.000, 0.001] | [0.000, 0.001] | [0.880]                 | [0.499]                 |           |       |                |

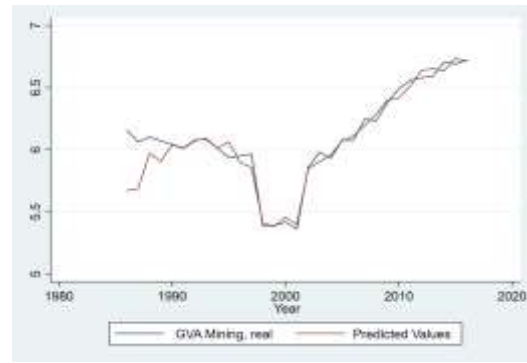
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) GVA Mining, Real are 0.037, 0.134, -0.579, and 0.495 respectively.

Figure 1. Actual v. Predicted GVA Mining, Real, along with residuals

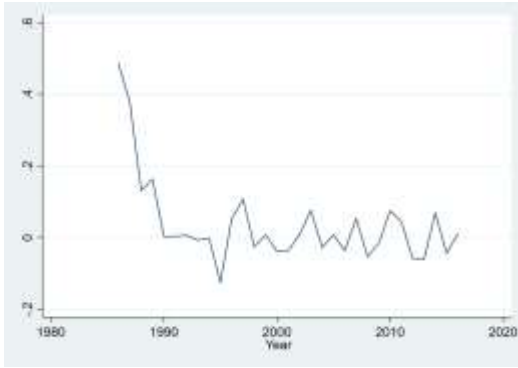
Panel A: Log first-difference



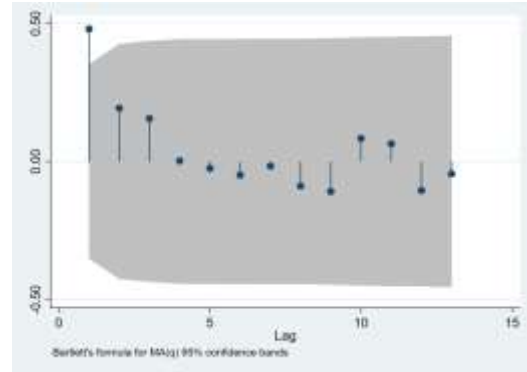
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 8. Gross Value Added – Other Services, Real

Estimation Period: 1984 – 2016

$$\begin{aligned}
 \Delta GVA \text{ Other Services, Real} = & \underbrace{-0.462 \text{ GVA Other Services, Real}_{t-1}}_{\text{Adjustment}} \\
 & \underbrace{-0.914 - 0.839 IPIN \text{ GVA Other Services, Real} - 0.044 IPIN \text{ Tourism Service Exports}}_{\text{Long-run}} \\
 & \quad \underbrace{+ 0.928 \text{ Net Disposable Income}}_{\text{Short-run}}
 \end{aligned}$$

(0.202)                      (0.046)                      (0.017)                      (0.030)

-0.516  $\Delta IPIN$  GVA Other Services

(0.063)

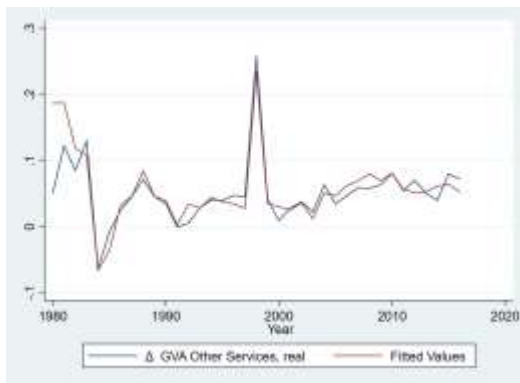
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 20.584         | -6.862         | $\chi^2$ (31)           | $\chi^2$ (16)           | 0.016     | 0.028 | 0.915          |
| [0.000, 0.000] | [0.000, 0.000] | 0.660                   | 12.050                  |           |       |                |
|                |                | [0.416]                 | [0.740]                 |           |       |                |

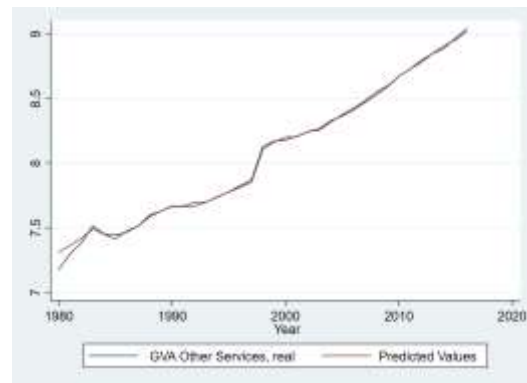
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) GVA Other Services, Real are 0.049, 0.043, -0.063, and 0.258 respectively.

Figure 1. Actual v. Predicted GVA Other Services, Real, along with residuals

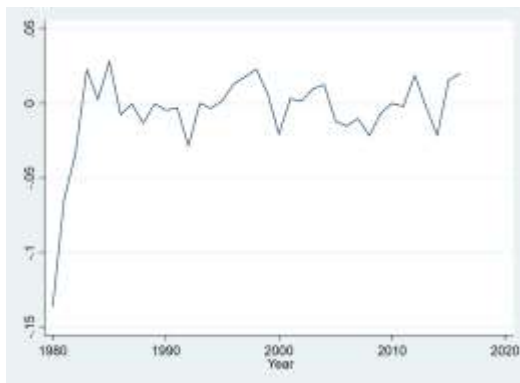
Panel A: Log first-difference



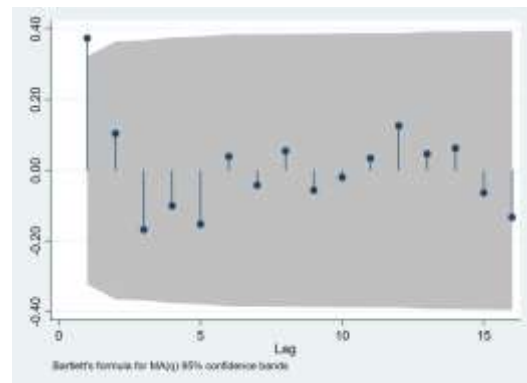
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 9. Gross Value Added – Real Estate, Real

Estimation Period: 1979 – 2016

$$\begin{aligned}
 \Delta GVA \text{ Real Estate, Real} = & \underbrace{-0.635 GVA \text{ Real Estate, Real}_{t-1}}_{\text{Adjustment}} \\
 & - 42.605 - 0.796 IPIN \text{ GVA Real Estate} + 4.069 \text{ Total Population} \\
 & (11.904) \quad (0.068) \quad (0.713) \\
 & + 0.134 \text{ Capital Formation – Fixed – Construction, Real} \\
 & (0.058) \\
 & + 0.092 \text{ Tourism Service Exports, Real} + 0.210 \text{ Compensation of Residents} \\
 & (0.024) \quad (0.113) \\
 & \underbrace{\hspace{10em}}_{\text{Long-run}} \\
 & - 1.108 \Delta IPIN \text{ GVA Real Estate} - 2.981 \Delta \text{Total Population} + 3.176 \Delta \text{Total Population}_{t-1} \\
 & (0.187) \quad (0.126) \quad (0.262) \\
 & - 0.461 \Delta \text{Capital Formation – Fixed – Construction, Real} \\
 & (0.053) \\
 & + 0.104 \Delta \text{Capital Formation – Fixed – Construction, Real}_{t-1} \\
 & (0.053) \\
 & \underbrace{\hspace{10em}}_{\text{Short-run}}
 \end{aligned}$$

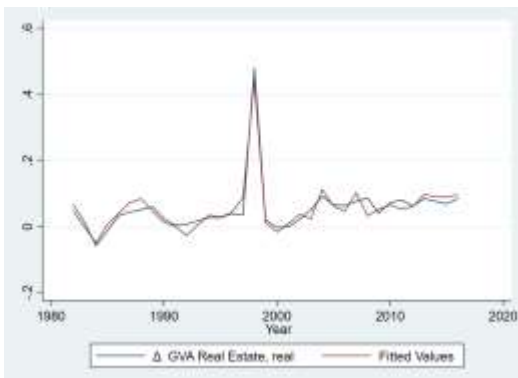
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
|                |                | $\chi^2 (33)$           | $\chi^2 (15)$           |           |       |                |
| 16.790         | -6.806         | 2.001                   | 16.525                  | 0.017     | 0.021 | 0.928          |
| [0.000, 0.000] | [0.000, 0.001] | [0.157]                 | [0.348]                 |           |       |                |

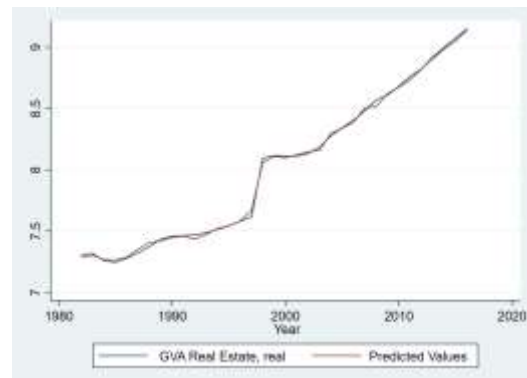
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) GVA Real Estate, Real are 0.042, 0.071, -0.058, and 0.480 respectively.

Figure 1. Actual v. Predicted GVA Real Estate, Real, along with residuals

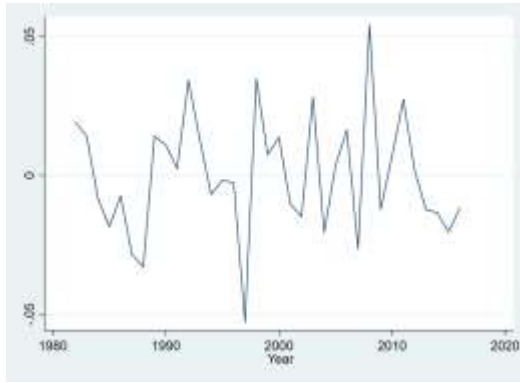
Panel A: Log first-difference



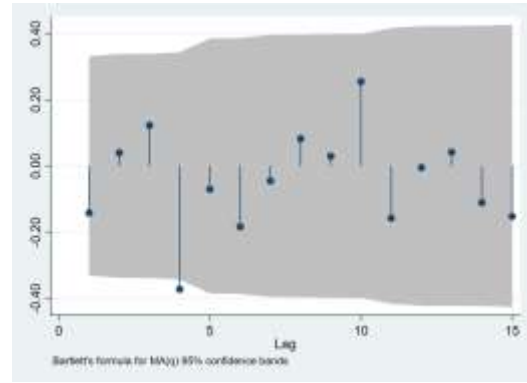
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 10. Gross Value Added – Trade, Real

Estimation Period: 1981 – 2016

$$\begin{aligned}
 \Delta GVA Trade, Real = & \underbrace{-0.539 GVA Trade, Real_{t-1}}_{\text{Adjustment} \quad (0.143)} \\
 & - \underbrace{4.501 - 0.339 IPIN GVA Trade + 1.181 Household Consumption - Total}_{\text{Long-run}} \\
 & \quad (1.225) \quad (0.062) \quad (0.055) \\
 & \quad + 0.257 IPIN GVA Agriculture \quad (0.070) \\
 & \underbrace{-0.360 \Delta IPIN GVA Trade + 0.168 \Delta IPIN GVA Agriculture}_{\text{Short-run}} \\
 & \quad (0.076) \quad (0.072)
 \end{aligned}$$

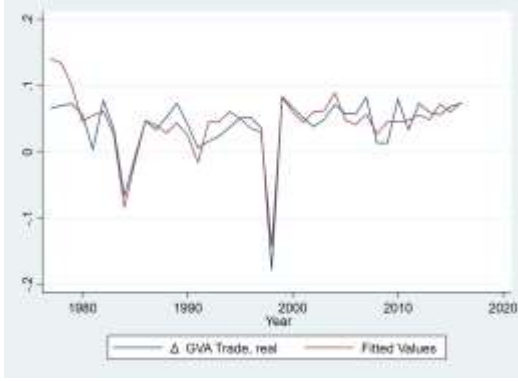
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
|                |                | $\chi^2 (34)$           | $\chi^2 (18)$           |           |       |                |
| 4.398          | -3.770         | 1.098                   | 16.256                  | 0.019     | 0.025 | 0.820          |
| [0.021, 0.078] | [0.007, 0.058] | [0.294]                 | [0.574]                 |           |       |                |

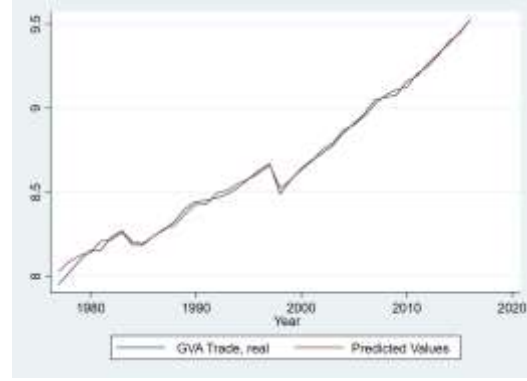
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) GVA Trade, Real are 0.042, 0.042, -0.177, and 0.083 respectively.

Figure 1. Actual v. Predicted GVA Trade, Real, along with residuals

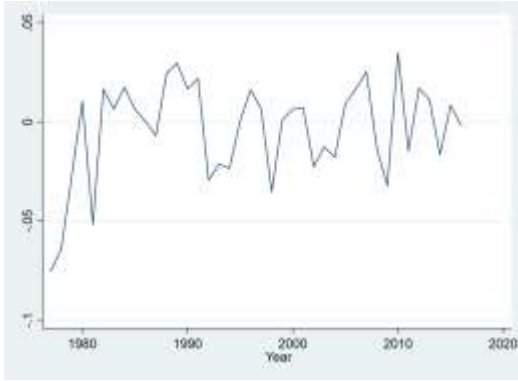
Panel A: Log first-difference



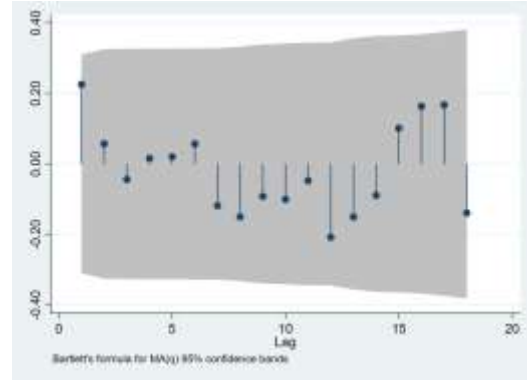
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 11. Gross Value Added – Transportation, Real

Estimation Period: 1984 – 2016

$$\begin{aligned}
 \Delta GVA \text{ Transportation, Real} = & \underbrace{-0.910 GVA \text{ Transportation, Real}_{t-1}}_{\text{Adjustment}} \\
 & - 33.414 - 0.459 IPIN \text{ GVA Transportation} + 0.569 HFCE \text{ Transportation and Communication} \\
 & \quad (4.858) \quad (0.071) \quad (0.105) \\
 & + 2.168 \text{ Total Population} + 0.009 IPIN \text{ Electronic Exports} \\
 & \quad (0.320) \quad (0.026) \\
 & \quad \quad \quad \text{Long-run} \\
 & + 0.550 \Delta GVA \text{ Transportation, Real}_{t-1} + 0.323 \Delta GVA \text{ Transportation, Real}_{t-2} + 0.402 \Delta GVA \text{ Transportation, Real}_{t-3} \\
 & \quad (0.098) \quad (0.091) \quad (0.086) \\
 & - 0.325 \Delta HFCE \text{ Transportation and Communication} - 0.860 \Delta HFCE \text{ Transportation and Communication}_{t-1} \\
 & \quad (0.220) \quad (0.211) \\
 & - 0.322 \Delta HFCE \text{ Transportation and Communication}_{t-2} + 0.404 \Delta HFCE \text{ Transportation and Communication}_{t-3} \\
 & \quad (0.196) \quad (0.191) \\
 & + 1.307 \Delta \text{Total Population} - 0.130 \Delta IPIN \text{ Electronic Exports} \\
 & \quad (0.651) \quad (0.026) \\
 & \quad \quad \quad \text{Short-run}
 \end{aligned}$$

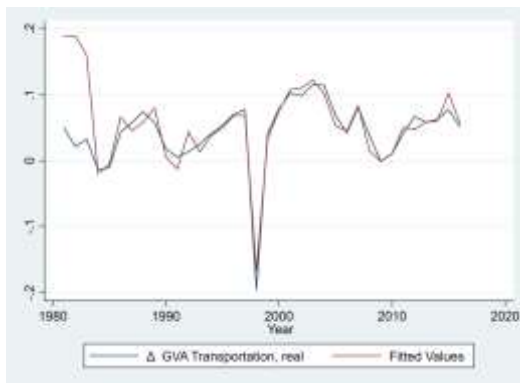
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 15.710         | -7.575         | $\chi^2 (31)$           | $\chi^2 (16)$           | 0.021     | 0.044 | 0.934          |
| [0.000, 0.000] | [0.000, 0.000] | [0.132]                 | [0.384]                 |           |       |                |

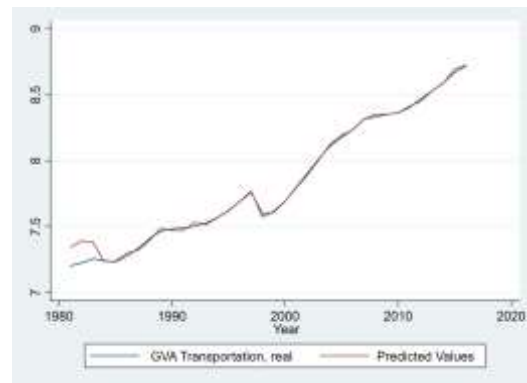
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) GVA Transportation, Real are 0.050, 0.047, -0.195, and 0.115 respectively.

Figure 1. Actual v. Predicted GVA Transportation, Real, along with residuals

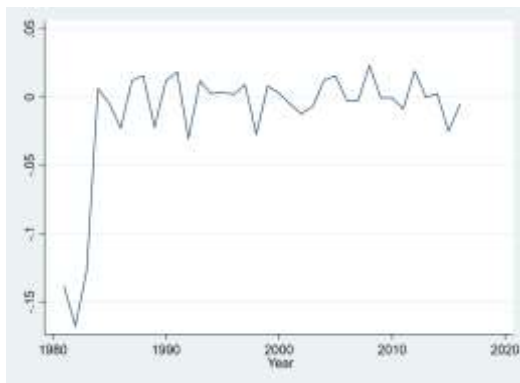
Panel A: Log first-difference



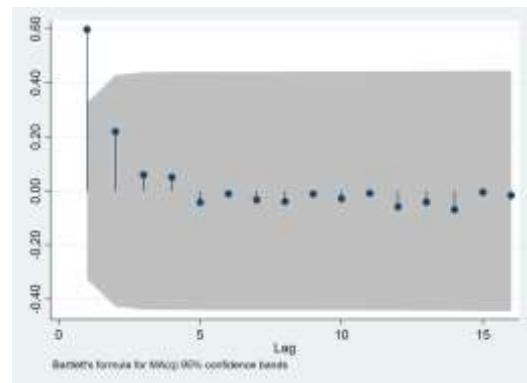
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals





## 12. Gross Value Added – Water, Real

Estimation Period: 1983 – 2016

$$\begin{aligned}
 \Delta GVA\ Water, Real = & \underbrace{-0.976\ GVA\ Water, Real_{t-1}}_{\text{Adjustment}} \\
 & - 57.793 - 0.546\ IPIN\ GVA\ Water + 3.482\ Total\ Population \\
 & \quad (7.499) \quad (0.052) \quad (0.230) \\
 & + 0.706\ GVA\ Service, Real \\
 & \quad (0.094) \\
 & - 0.448\ Capital\ Formation - Fixed - Construction, Real \\
 & \quad (0.050) \\
 & \underbrace{\quad \quad \quad}_{\text{Long-run}} \\
 & - 0.018\ \Delta IPIN\ GVA\ Water + 0.065\ \Delta IPIN\ GVA\ Water_{t-1} - 0.172\ \Delta IPIN\ GVA\ Water_{t-2} \\
 & \quad (0.080) \quad (0.046) \quad (0.049) \\
 & - 4.521\ \Delta Total\ Population - 0.003\ \Delta Capital\ Formation - Fixed - Construction, Real \\
 & \quad (0.159) \quad (0.046) \\
 & + 0.126\ \Delta Capital\ Formation - Fixed - Construction, Real_{t-1} \\
 & \quad (0.051) \\
 & \underbrace{\quad \quad \quad}_{\text{Short-run}}
 \end{aligned}$$

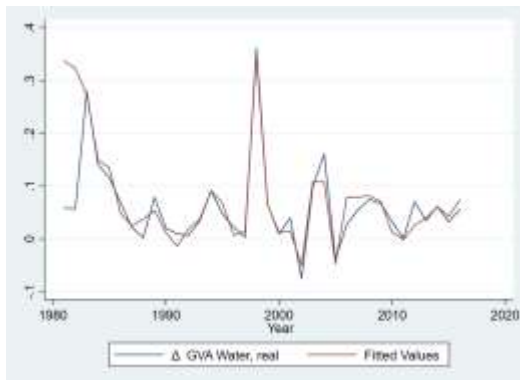
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 22.856         | -7.697         | $\chi^2(32)$            | $\chi^2(16)$            | 0.029     | 0.067 | 0.932          |
| [0.000, 0.000] | [0.000, 0.000] | [0.942]                 | [0.935]                 |           |       |                |

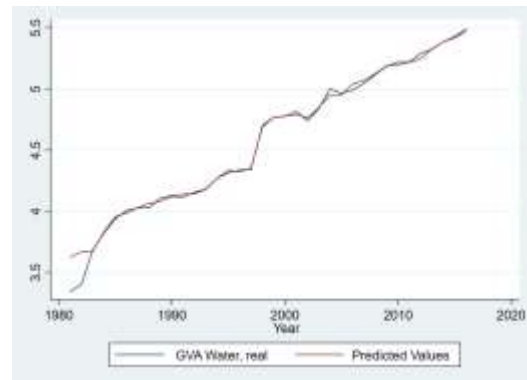
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) GVA Water, Real are 0.072, 0.090, -0.075, and 0.361 respectively.

Figure 1. Actual v. Predicted GVA Water, Real, along with residuals

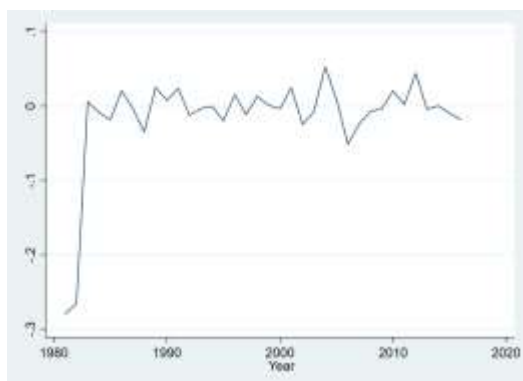
Panel A: Log first-difference



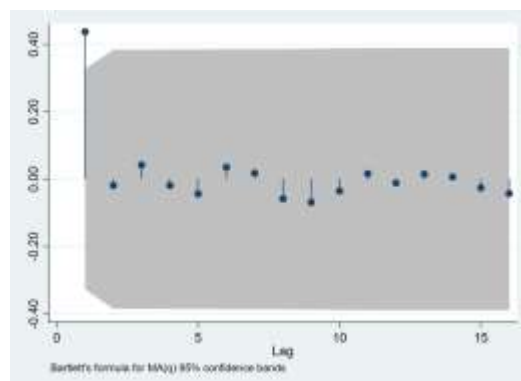
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



### 13. Implicit Price Index of Gross Value Added - Construction

Estimation Period: 1971 – 2016

$$\begin{aligned}
 \Delta IPIN\ GVA, Construction = & \underbrace{-0.467\ IPIN\ GVA, Construction_{t-1}}_{\text{Adjustment}} \\
 & - 0.221 + 0.922\ IPIN\ GVA, Manufacturing \\
 & \quad (0.162) \quad (0.033) \\
 & + 0.059\ IPIN, Fuel Imports + 0.073\ Machinery Imports, Real \\
 & \quad (0.022) \quad (0.025) \\
 & \quad \quad \quad \text{Long-run} \\
 & + 0.579\ \Delta IPIN\ GVA, Manufacturing + 0.096\ \Delta Machinery Imports, Real \\
 & \quad (0.133) \quad (0.027) \\
 & \quad \quad \quad \text{Short-run}
 \end{aligned}$$

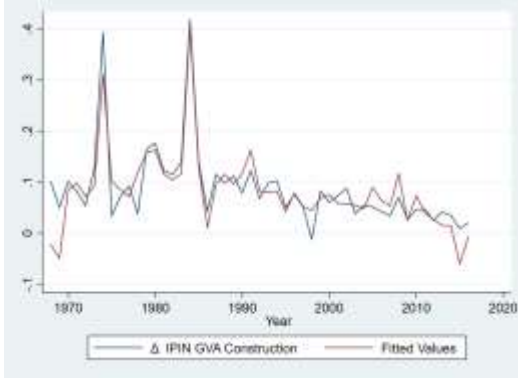
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
|                |                | $\chi^2$ (44)           | $\chi^2$ (22)           |           |       |                |
| 4.167          | -3.688         | 1.509                   | 12.315                  | 0.027     | 0.037 | 0.844          |
| [0.022, 0.085] | [0.007, 0.065] | [0.219]                 | [0.950]                 |           |       |                |

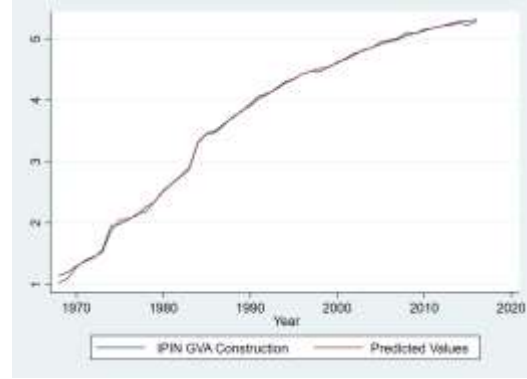
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN GVA – Construction are 0.087, 0.077, -0.011, and 0.417 respectively.

Figure 1. Actual v. Predicted IPIN GVA – Construction, along with residuals

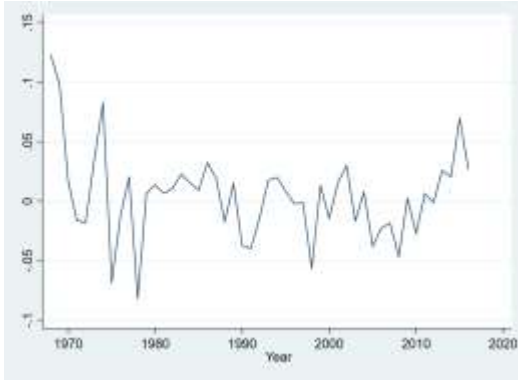
Panel A: Log first-difference



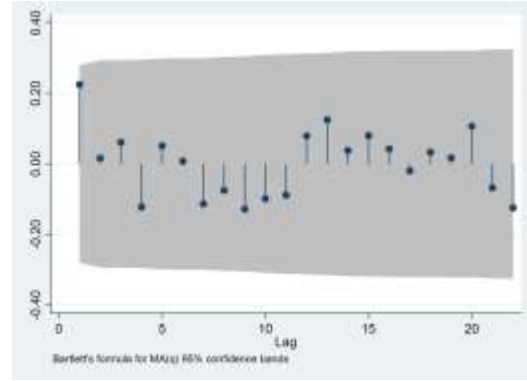
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



#### 14. Implicit Price Index of Gross Value Added – Electricity and Steam

Estimation Period: 1984 – 2016

$$\begin{aligned}
 \Delta IPIN\ GVA, Electricity\ and\ Steam = & \underbrace{-0.725\ IPIN\ GVA, Electricity\ and\ Steam_{t-1}}_{\text{Adjustment}} \\
 & -21.418 + 0.844\ Wage\ Index, Electricity\ and\ Steam \\
 & \quad (4.688) \quad (0.238) \\
 & + 0.710\ IPIN\ Capital\ Formation - Fixed - Durables + 1.451\ Total\ Population \\
 & \quad (0.077) \quad (0.195) \\
 & \quad \quad \quad \text{Long-run} \\
 & -0.457\ \Delta Wage\ Index, Electricity\ and\ Steam - 0.325\ \Delta Wage\ Index, Electricity\ and\ Steam_{t-1} \\
 & \quad (0.136) \quad (0.112) \\
 & + 0.382\ \Delta IPIN\ Capital\ Formation - Fixed - Durables + 0.382\ \Delta IPIN\ Capital\ Formation - Fixed - Durables_{t-1} \\
 & \quad (0.137) \quad (0.132) \\
 & \quad \quad \quad \text{Short-run}
 \end{aligned}$$

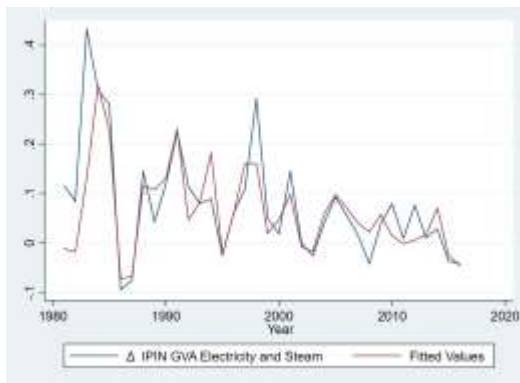
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 8.764          | -5.428         | $\chi^2(31)$            | $\chi^2(16)$            | 0.043     | 0.070 | 0.803          |
| [0.001, 0.003] | [0.000, 0.002] | [0.117]                 | [0.983]                 |           |       |                |

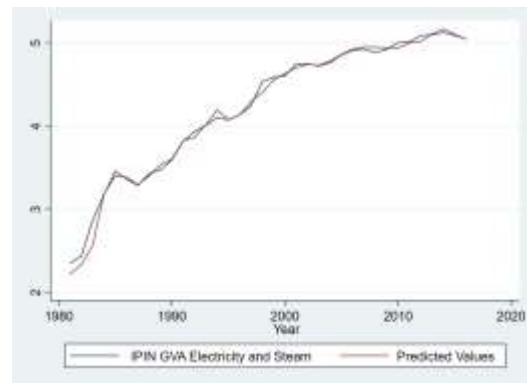
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN GVA, Electricity and Steam are 0.084, 0.108, -0.094, and 0.432 respectively.

Figure 1. Actual v. Predicted IPIN GVA, Electricity and Steam, along with residuals

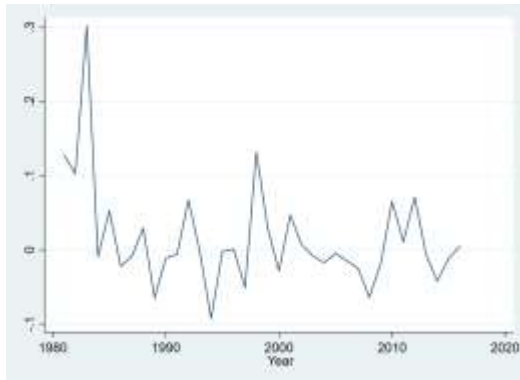
Panel A: Log first-difference



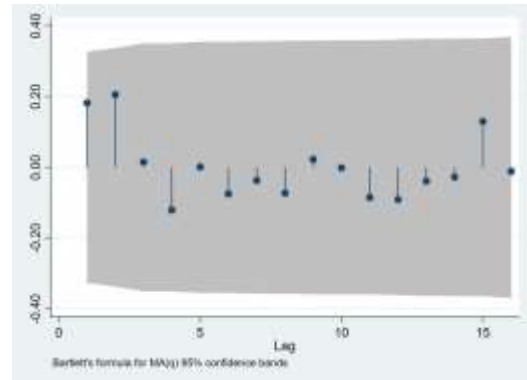
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 15. Implicit Price Index of Gross Value Added – Finance

Estimation Period: 1986 – 2016

$$\begin{aligned}
 \Delta IPIN\ GVA, Finance = & \underbrace{-0.168\ IPIN\ GVA, Finance_{t-1}}_{\text{Adjustment}} \\
 & \underbrace{-0.359 + 1.160\ Wage\ Index, Finance + 0.536\ USD\ Nominal\ Exchange\ Rate}_{\text{Long-run}} \\
 & \underbrace{-0.245\ \Delta IPIN\ GVA, Finance_{t-1} - 0.406\ \Delta IPIN\ GVA, Finance_{t-2} - 0.271\ \Delta IPIN\ GVA, Finance_{t-3} - 0.360\ \Delta Wage\ Index, Finance - 0.151\ \Delta Wage\ Index, Finance_{t-1} - 0.321\ \Delta Wage\ Index, Finance_{t-2} - 0.327\ \Delta Wage\ Index, Finance_{t-3} + 0.277\ \Delta USD\ Nominal\ Exchange\ Rate}_{\text{Short-run}}
 \end{aligned}$$

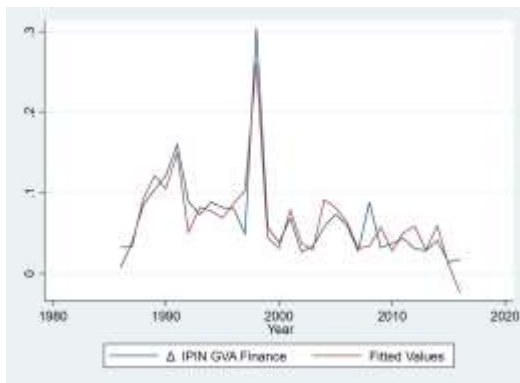
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 10.605         | -4.666         | $\chi^2(29)$            | $\chi^2(13)$            | 0.017     | 0.022 | 0.824          |
| [0.001, 0.003] | [0.001, 0.008] | [0.341]                 | [0.304]                 |           |       |                |

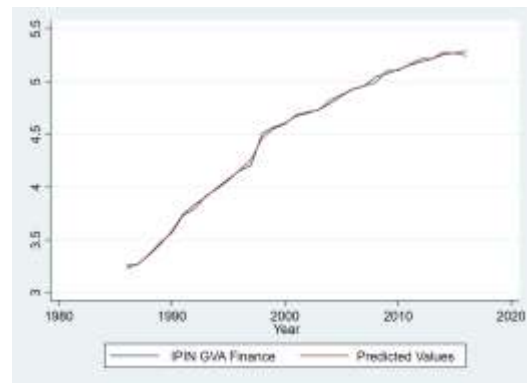
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN GVA – Finance are 0.092, 0.077, 0.007, and 0.407 respectively.

Figure 1. Actual v. Predicted IPIN GVA – Finance, along with residuals

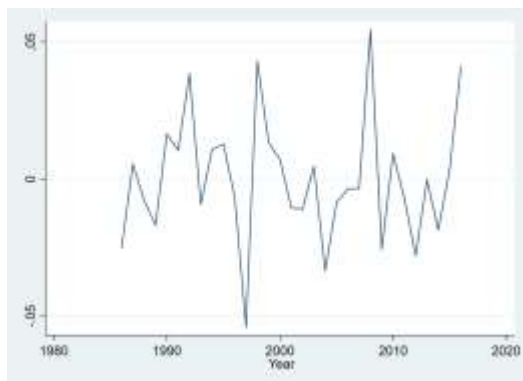
Panel A: Log first-difference



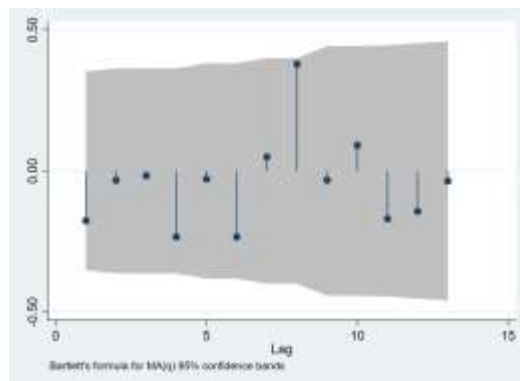
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 16. Implicit Price Index of Gross Value Added – Manufacturing

Estimation Period: 1983 – 2016

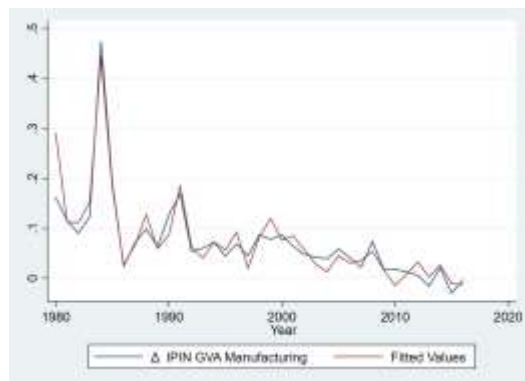
$$\begin{aligned}
 \Delta IPIN\ GVA, Manufacturing = & \underbrace{-0.312\ IPIN\ GVA, Manufacturing_{t-1}}_{\text{Adjustment}} \\
 & - 2.008 \quad + 0.077\ Wage\ Index, Manufacturing \\
 & (0.608) \quad (0.124) \\
 & + 0.723\ Operating\ Surplus \\
 & (0.045) \quad (0.071) \\
 & \underbrace{\hspace{10em}}_{\text{Long-run}} \\
 & + 0.422\ \Delta IPIN\ GVA, Manufacturing_{t-1} \quad \Delta Wage\ Index, Manufacturing \\
 & (0.128) \quad (0.) \\
 & \Delta Operating\ Surplus \quad \Delta Operating\ Surplus_{t-1} \\
 & (0.) \quad (0.) \\
 & \underbrace{\hspace{10em}}_{\text{Short-run}}
 \end{aligned}$$

Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |      |                |
|----------------|----------------|-------------------------|-------------------------|-----------|------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE | R <sup>2</sup> |
|                |                | $\chi^2(32)$            | $\chi^2(16)$            |           |      |                |
| 8.586          | -5.218         | 2.396                   | 9.461                   |           |      |                |
| [0.001, 0.003] | [0.000, 0.003] | [0.121]                 | [0.893]                 |           |      |                |

Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN GVA – Manufacturing are 0.082, 0.080, -0.030, and 0.473 respectively.

Panel A: Log first-difference



The graph displays the historical and predicted Gross Value Added (GVA) in the manufacturing sector of IPIN from 1980 to 2020. The Y-axis represents GVA in US\$ million, ranging from 2.5 to 5.0. The X-axis represents the Year, ranging from 1980 to 2020. The black line represents the actual IPIN GVA Manufacturing, and the red line represents the predicted values. The data shows a consistent upward trend, starting at approximately 2.5 million in 1980 and reaching nearly 5.0 million by 2020. The predicted values closely track the historical data, indicating a high level of forecast accuracy.

| Year | IPIN GVA Manufacturing (US\$ million) | Predicted Values (US\$ million) |
|------|---------------------------------------|---------------------------------|
| 1980 | 2.5                                   | 2.5                             |
| 1985 | 3.2                                   | 3.2                             |
| 1990 | 3.8                                   | 3.8                             |
| 1995 | 4.2                                   | 4.2                             |
| 2000 | 4.6                                   | 4.6                             |
| 2005 | 4.8                                   | 4.8                             |
| 2010 | 4.9                                   | 4.9                             |
| 2015 | 5.0                                   | 5.0                             |
| 2020 | 5.0                                   | 5.0                             |

Estimation Period: 1983– 2016

42

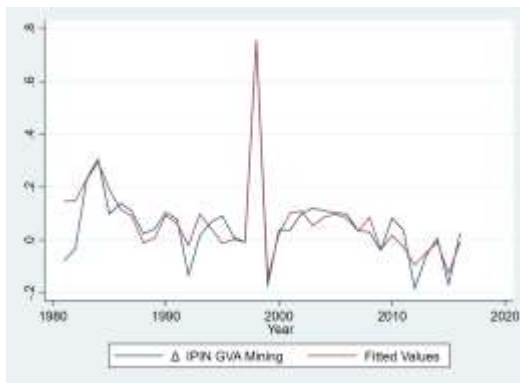
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 13.949         | -7.171         | $\chi^2(32)$            | $\chi^2(16)$            | 0.044     | 0.067 | 0.908          |
| [0.000, 0.000] | [0.000, 0.000] | [0.332]                 | [0.654]                 |           |       |                |

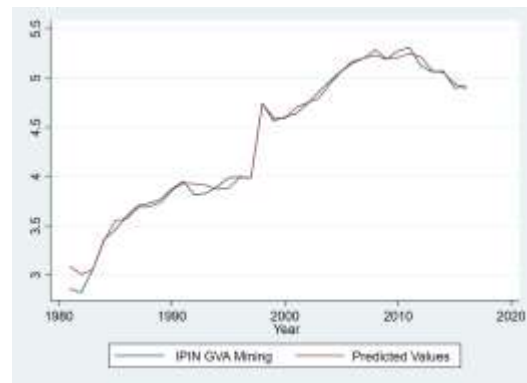
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN GVA – Mining are 0.079, 0.185, -0.453, and 0.755 respectively.

Figure 1. Actual v. Predicted IPIN GVA – Mining, along with residuals

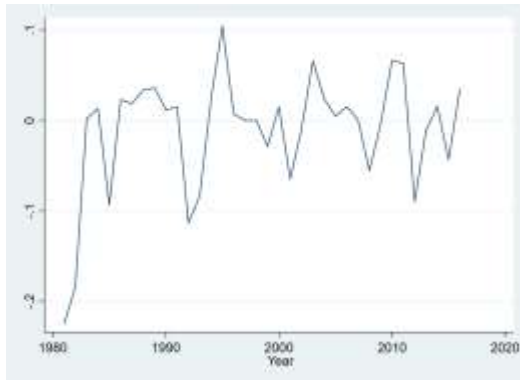
Panel A: Log first-difference



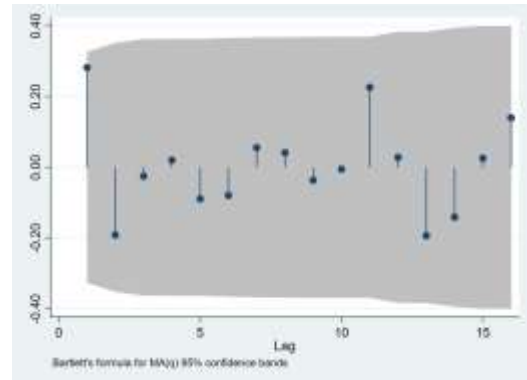
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals





## 18. Implicit Price Index of Gross Value Added – Other Services

Estimation Period: 1983 – 2016

$$\begin{aligned}
 \Delta IPIN \text{ GVA, Other Services} = & \underbrace{-0.309 IPIN \text{ GVA, Other Services}_{t-1}}_{\text{Adjustment}} \\
 & - 2.056 + 1.074 IPIN \text{ GVA, Agriculture} + 1.044 \text{ Wage Index, Trade} \\
 & \quad (0.505) \quad (0.123) \quad (0.210) \\
 & + 0.416 \text{ Lending Rate} + 0.089 IPIN \text{ GVA, Water} \\
 & \quad (0.092) \quad (0.114) \\
 & \quad \quad \quad \text{Long-run} \\
 & - 0.259 \Delta \text{Wage Index, Trade} - 0.240 \Delta \text{Wage Index, Trade}_{t-1} - 0.062 \Delta \text{Lending Rate} \\
 & \quad (0.071) \quad (0.076) \quad (0.036) \\
 & - 0.091 \Delta \text{Lending Rate}_{t-1} + 0.175 \Delta IPIN \text{ GVA, Water} \\
 & \quad (0.035) \quad (0.050) \\
 & \quad \quad \quad \text{Short-run}
 \end{aligned}$$

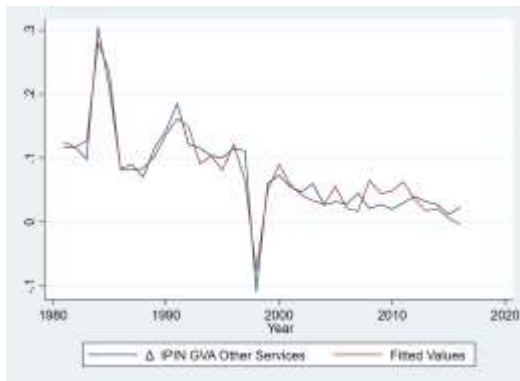
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 21.072         | -6.092         | $\chi^2(32)$            | $\chi^2(16)$            | 0.016     | 0.020 | 0.903          |
| [0.000, 0.000] | [0.000, 0.001] | 0.011                   | 20.628                  |           |       |                |
|                |                | [0.916]                 | [0.193]                 |           |       |                |

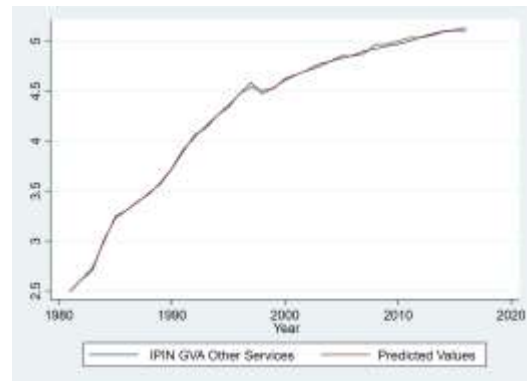
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN GVA – Other Services are 0.079, 0.061, -0.108, and 0.303 respectively.

Figure 1. Actual v. Predicted IPIN GVA – Other Services, along with residuals

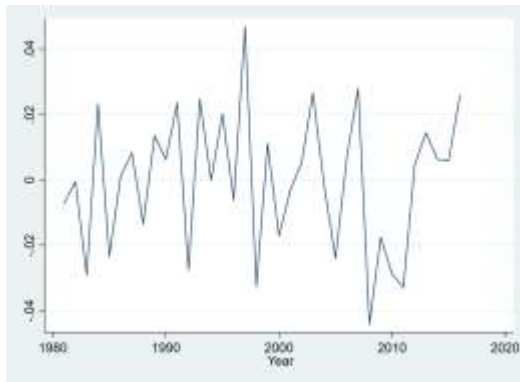
Panel A: Log first-difference



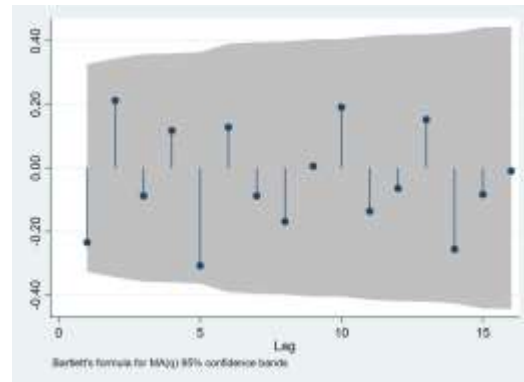
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



### 19. Implicit Price Index of Gross Value Added – Real Estate

Estimation Period: 1977 – 2016

$$\Delta IPIN\ GVA, Real\ Estate_t = \underbrace{-0.171\ IPIN\ GVA, Real\ Estate_{t-1}}_{(0.043)\ \text{Adjustment}} - \underbrace{1.495 + 0.654\ Lending\ Rate + 0.806\ Net\ Compensation}_{(0.420)\ (0.155)\ (0.041)\ \text{Long-run}}$$

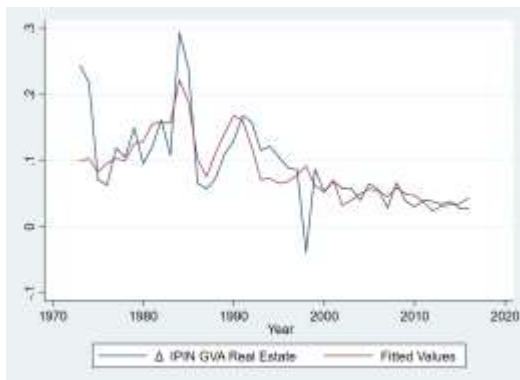
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 25.328         | -3.901         | $\chi^2(38)$            | $\chi^2(20)$            | 0.029     | 0.043 | 0.678          |
| [0.000, 0.000] | [0.004, 0.027] | [0.107]                 | [0.224]                 |           |       |                |

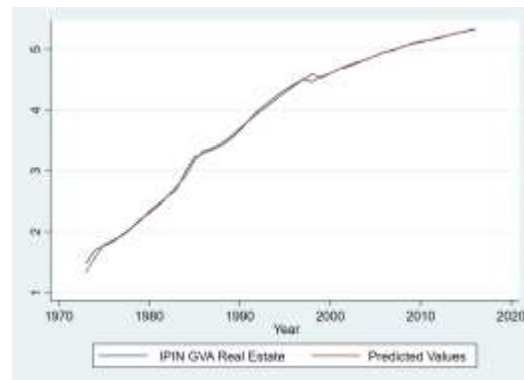
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN GVA – Real Estate are 0.090, 0.063, -0.038, and 0.294 respectively.

Figure 1. Actual v. Predicted IPIN GVA – Real Estate, along with residuals

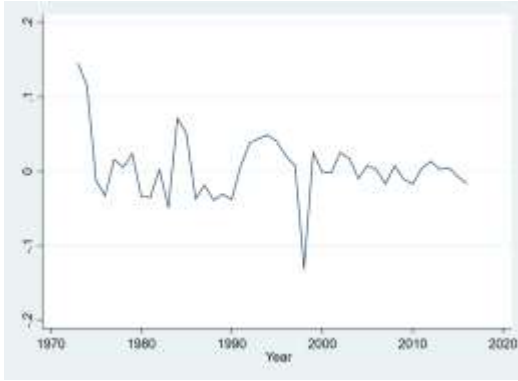
Panel A: Log first-difference



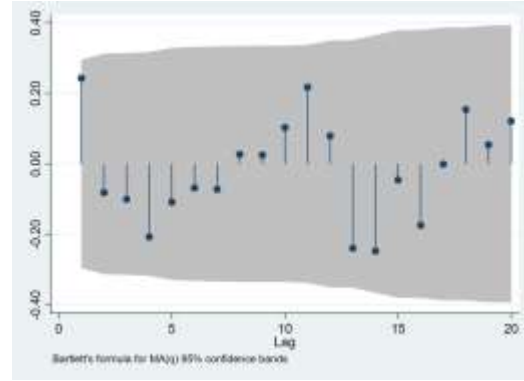
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 20. Implicit Price Index of Gross Value Added – Trade

Estimation Period: 1983 – 2016

$$\begin{aligned}
 \Delta IPIN\ GVA, Trade = & \underbrace{-0.690\ IPIN\ GVA, Trade_{t-1}}_{\text{Adjustment}} \\
 & + 3.072 \quad + 0.752\ IPIN\ GVA, Real\ Estate \\
 & \quad (1.335) \quad (0.050) \\
 & \underbrace{-0.629\ Wage\ Index, Trade - 0.152\ Import\ Duties\ Tax\ Rate}_{\text{Long-run}} \\
 & \quad (0.313) \quad (0.058) \\
 & + 0.373\ \Delta IPIN\ GVA, Real\ Estate - 0.554\ \Delta IPIN\ GVA, Real\ Estate_{t-1} - 1.050\ \Delta IPIN\ GVA, Real\ Estate_{t-2} \\
 & \quad (0.285) \quad (0.278) \quad (0.284) \\
 & - 0.460\ \Delta IPIN\ GVA, Real\ Estate_{t-3} - 0.113\ \Delta Wage\ Index, Trade + 0.058\ \Delta Wage\ Index, Trade_{t-1} \\
 & \quad (0.251) \quad (0.251) \quad (0.189) \\
 & \underbrace{- 0.388\ \Delta Wage\ Index, Trade_{t-2} - 0.567\ \Delta Wage\ Index, Trade_{t-3}}_{\text{Short-run}} \\
 & \quad (0.184) \quad (0.181)
 \end{aligned}$$

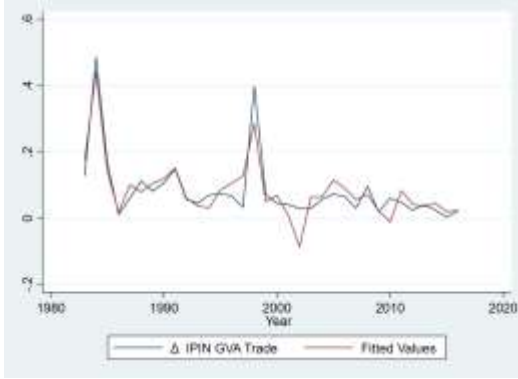
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
|                |                | $\chi^2(32)$            | $\chi^2(15)$            |           |       |                |
| 7.964          | -4.453         | 0.388                   | 21.979                  | 0.031     | 0.042 | 0.813          |
| [0.001, 0.007] | [0.002, 0.017] | [0.533]                 | [0.108]                 |           |       |                |

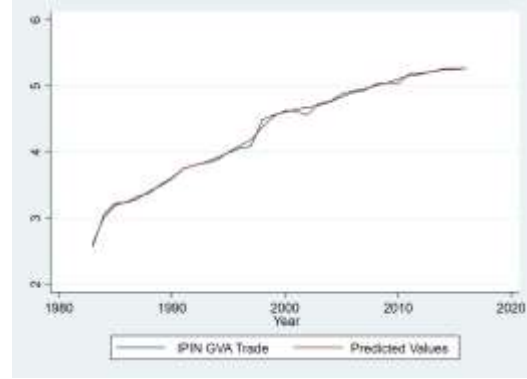
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN GVA – Trade are 0.096, 0.093, 0.002, and 0.486 respectively.

Figure 1. Actual v. Predicted IPIN GVA – Trade, along with residuals

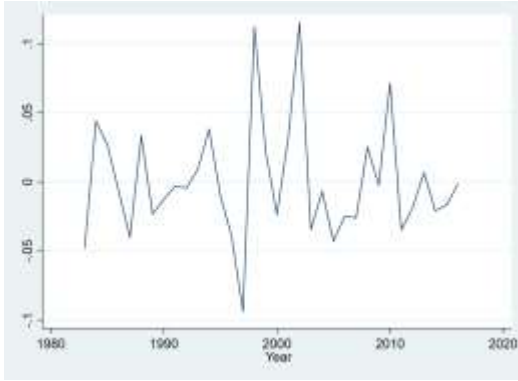
Panel A: Log first-difference



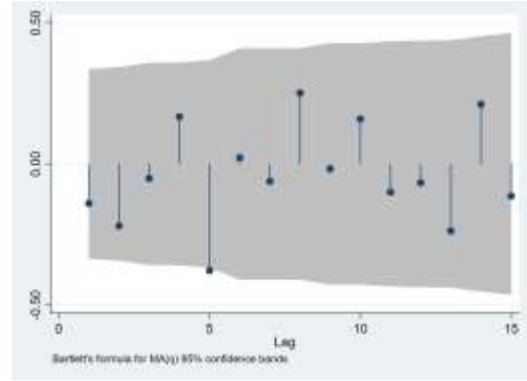
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 21. Implicit Price Index of Gross Value Added – Transportation

Estimation Period: 1983 – 2016

$$\begin{aligned}
 \Delta IPIN\ GVA, Transportation &= \underbrace{-0.639\ IPIN\ GVA, Transportation_{t-1}}_{\text{Adjustment}} \\
 &\quad -1.131 + 0.934\ Wage\ Index, Transportation + 0.317\ IPIN, Fuel Imports \\
 &\quad \quad \quad (0.927) \quad \quad \quad (0.188) \quad \quad \quad (0.025) \\
 &\quad \quad \quad + 0.272\ Petroleum\ Tax\ Rate + 0.092\ IPIN, Electronics Exports \\
 &\quad \quad \quad (0.089) \quad \quad \quad (0.088) \\
 &\quad \quad \quad \underbrace{\hspace{10em}}_{\text{Long-run}} \\
 &= -1.092\ \Delta Wage\ Index, Transportation - 0.312\ \Delta Wage\ Index, Transportation_{t-1} - 0.350\ \Delta Wage\ Index, Transportation_{t-2} \\
 &\quad \quad \quad (0.245) \quad \quad \quad (0.182) \quad \quad \quad (0.172) \\
 &\quad \quad \quad - 0.145\ \Delta IPIN, Fuel Imports - 0.147\ \Delta Petroleum\ Tax\ Rate + 0.115\ \Delta IPIN, Electronics Exports \\
 &\quad \quad \quad (0.059) \quad \quad \quad (0.058) \quad \quad \quad (0.062) \\
 &\quad \quad \quad \underbrace{\hspace{10em}}_{\text{Short-run}}
 \end{aligned}$$

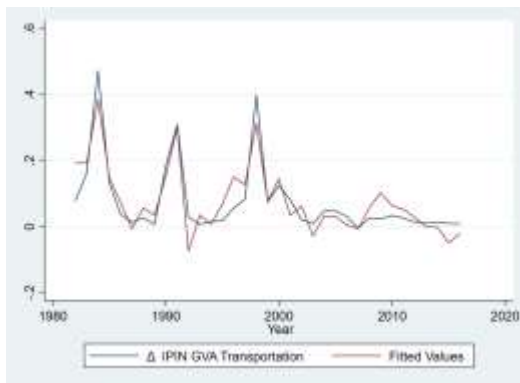
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 9.129          | -6.212         | $\chi^2(32)$            | $\chi^2(15)$            | 0.037     | 0.047 | 0.841          |
| [0.000, 0.002] | [0.000, 0.001] | [0.110]                 | [0.143]                 |           |       |                |

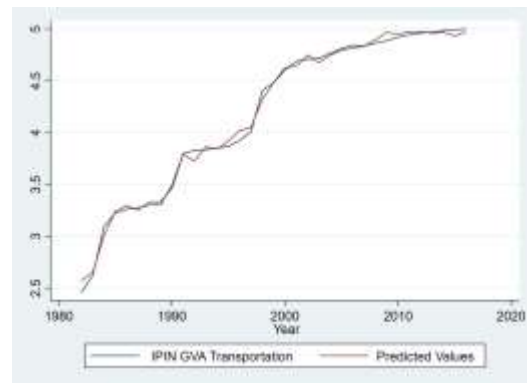
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN GVA – Transportation are 0.087, 0.101, -0.004, and 0.471 respectively.

Figure 1. Actual v. Predicted IPIN GVA – Transportation, along with residuals

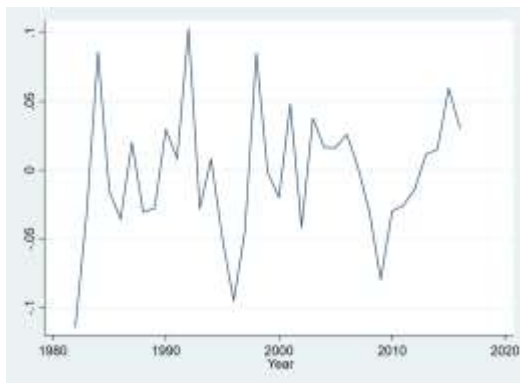
Panel A: Log first-difference



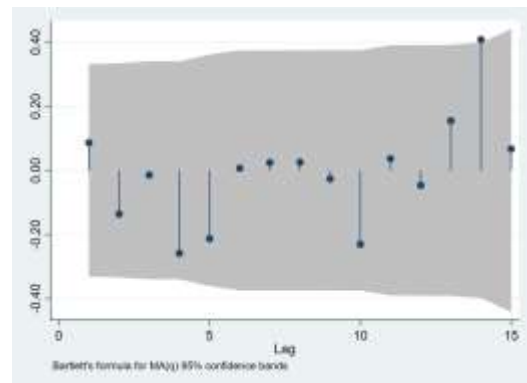
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 22. Implicit Price Index of Gross Value Added – Water

Estimation Period: 1983 – 2016

$$\begin{aligned}
 \Delta IPIN\ GVA, Water = & \underbrace{-0.469\ IPIN\ GVA, Water_{t-1}}_{\text{Adjustment}} \\
 & - 2.470 + 0.030\ Wage\ Index, Private\ Service \\
 & \quad (1.091) \quad (0.179) \\
 & + 0.962\ Capital\ Formation - Fixed - Construction + 1.169\ Wage\ Index, Construction \\
 & \quad (0.122) \quad (0.464) \\
 & \quad \quad \quad \text{Long-run} \\
 & - 0.197\ \Delta Wage\ Index, Private\ Service + 0.114\ \Delta Wage\ Index, Private\ Service_{t-1} + 0.041\ \Delta Wage\ Index, Private\ Service_{t-2} \\
 & \quad (0.140) \quad (0.133) \quad (0.133) \\
 & - 0.885\ \Delta Wage\ Index, Private\ Service_{t-3} - 0.446\ \Delta Capital\ Formation - Fixed - Construction \\
 & \quad (0.132) \quad (0.196) \\
 & - 0.552\ \Delta Wage\ Index, Construction - 0.483\ \Delta Wage\ Index, Construction_{t-1} \\
 & \quad (0.218) \quad (0.215) \\
 & \quad \quad \quad \text{Short-run}
 \end{aligned}$$

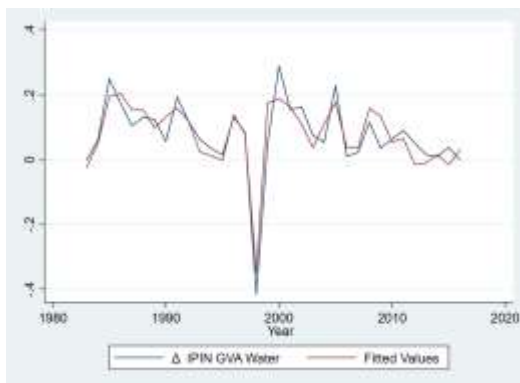
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 9.488          | -5.003         | $\chi^2(32)$            | $\chi^2(15)$            | 0.038     | 0.048 | 0.815          |
| [0.000, 0.002] | [0.000, 0.006] | 0.983                   | 21.007                  |           |       |                |
|                |                | [0.321]                 | [0.136]                 |           |       |                |

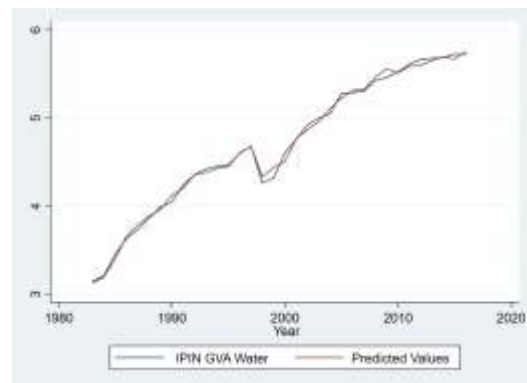
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN GVA – Water are 0.088, 0.108, -0.415, and 0.287 respectively.

Figure 1. Actual v. Predicted IPIN GVA – Water, along with residuals

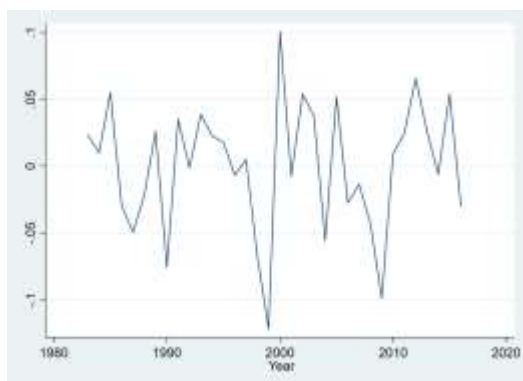
Panel A: Log first-difference



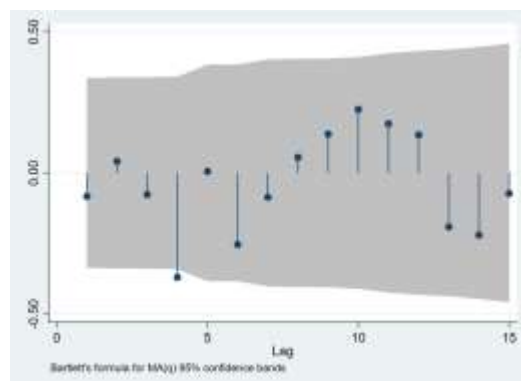
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



### 23. Household Final Consumption Expenditure – Alcohol

Estimation Period: 1981 – 2016

$$\begin{aligned}
 \Delta HFCE, Alcohol = & \underbrace{-0.438 HFCE, Alcohol_{t-1}}_{\text{Adjustment}} \\
 & - 2.610 \quad -1.356 IPIN HFCE, Alcohol \\
 & (1.027) \quad (0.119) \\
 & + 0.586 Net Disposable Income + 1.301 HFCE, Tobacco \\
 & (0.119) \quad (0.350) \\
 & \underbrace{\hspace{10em}}_{\text{Long-run}} \\
 & + 0.135 \Delta IPIN HFCE, Alcohol_{t-1} + 0.343 \Delta IPIN HFCE, Alcohol_{t-2} - 0.529 \Delta HFCE, Tobacco \\
 & (0.189) \quad (0.179) \quad (0.281) \\
 & - 0.759 \Delta HFCE, Tobacco_{t-1} - 0.780 \Delta HFCE, Tobacco_{t-2} - 0.766 \Delta HFCE, Tobacco_{t-3} \\
 & (0.353) \quad (0.289) \quad (0.285) \\
 & \underbrace{\hspace{10em}}_{\text{Short-run}}
 \end{aligned}$$

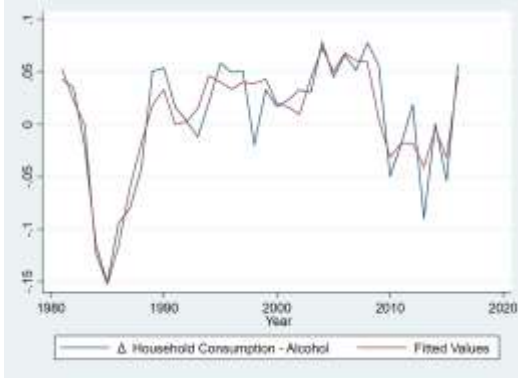
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 16.405         | -7.757         | $\chi^2(34)$            | $\chi^2(16)$            | 0.017     | 0.022 | 0.844          |
| [0.000, 0.000] | [0.000, 0.000] | 0.046                   | 13.249                  |           |       |                |
|                |                | [0.829]                 | [0.654]                 |           |       |                |

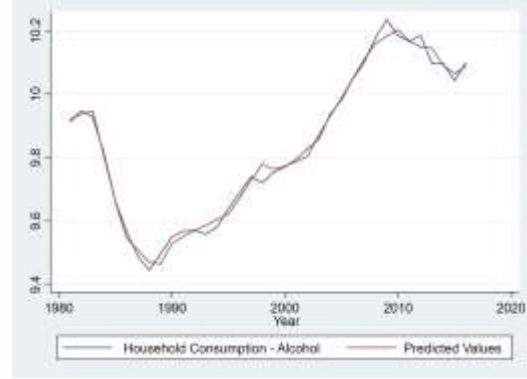
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) HFCE – Alcohol are 0.010, 0.057, -0.151, and 0.093 respectively.

Figure 1. Actual v. Predicted HFCE – Alcohol, along with residuals

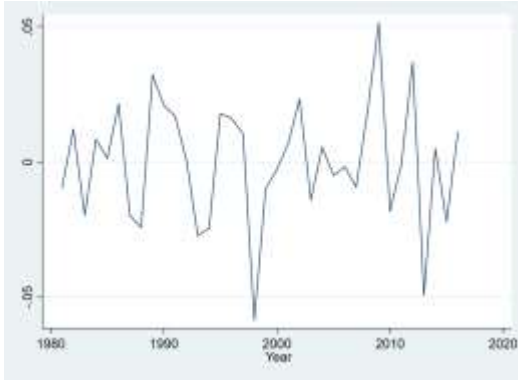
Panel A: Log first-difference



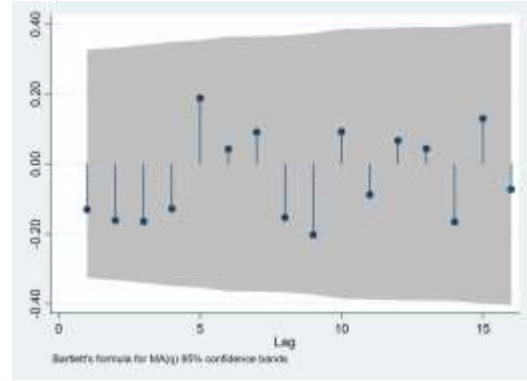
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 24. Household Final Consumption Expenditure – Education

Estimation Period: 1990 – 2016

$$\begin{aligned}
 \Delta HFCE, Education = & \underbrace{-0.530 HFCE, Education_{t-1}}_{(0.069) \text{ Adjustment}} \\
 & - 1.483 \quad -0.906 IPIN HFCE, Education \\
 & (0.415) \quad (0.097) \\
 & + 1.398 Net Disposable Income - 0.601 IPIN HFCE, Food \\
 & (0.069) \quad (0.) \\
 & \underbrace{\hspace{10em}}_{Long-run} \\
 & - 0.385 \Delta IPIN HFCE, Education + 0.172 \Delta IPIN HFCE, Education_{t-1} + 0.319 \Delta IPIN HFCE, Education_{t-2} \\
 & (0.106) \quad (0.118) \quad (0.097) \\
 & + 0.242 \Delta IPIN HFCE, Education_{t-3} - 0.793 \Delta Net Disposable Income - 0.500 \Delta Net Disposable Income_{t-1} \\
 & (0.094) \quad (0.149) \quad (0.145) \\
 & + 1.038 \Delta IPIN HFCE, Food + 0.298 \Delta IPIN HFCE, Food_{t-1} \\
 & (0.139) \quad (0.153) \\
 & \underbrace{\hspace{10em}}_{Short-run}
 \end{aligned}$$



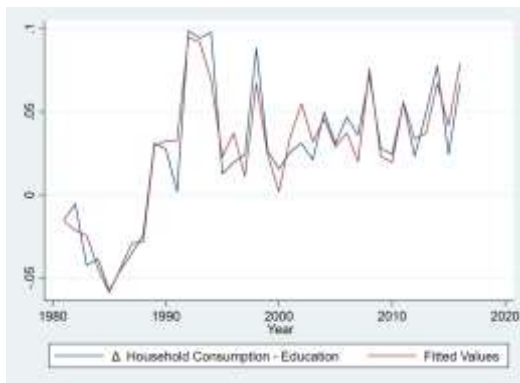
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 21.548         | -7.663         | $\chi^2$ (34)           | $\chi^2$ (16)           | 0.009     | 0.012 | 0.903          |
| [0.000, 0.000] | [0.000, 0.000] | [0.230]                 | [0.701]                 |           |       |                |

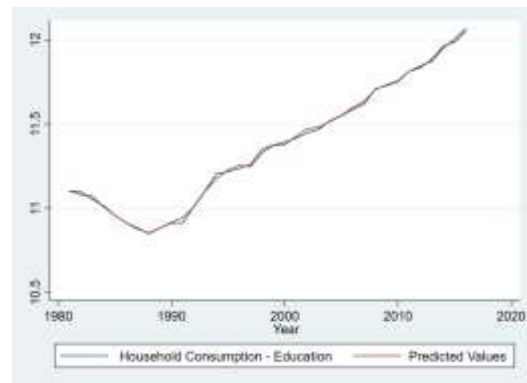
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) HFCE – Education are 0.025, 0.039, -0.057, and 0.098 respectively.

Figure 1. Actual v. Predicted HFCE – Education, along with residuals

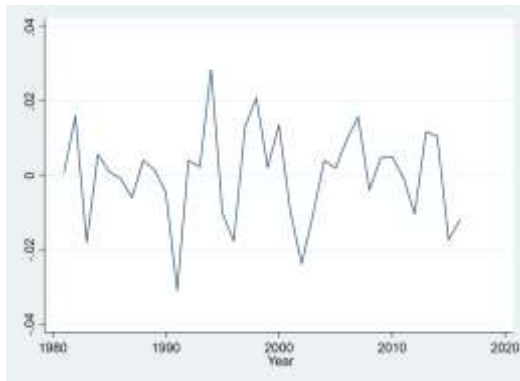
Panel A: Log first-difference



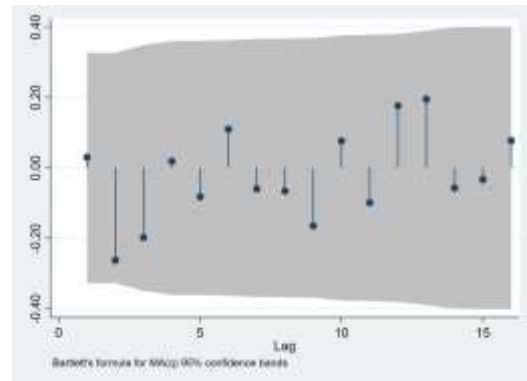
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 25. Household Final Consumption Expenditure – Food

Estimation Period: 1980 – 2016

$$\begin{aligned}
 \Delta HFCE, Food = & \underbrace{-0.257 HFCE, Food_{t-1}}_{\text{Adjustment}} \\
 & - 2.927 \quad -0.774 IPIN HFCE, Food - 0.286 IPIN HFCE, Education \\
 & \quad (0.807) \quad (0.200) \quad (0.104) \\
 & + 0.315 IPIN HFCE, Tobacco + 0.403 Net Disposable Income + 2.209 Total Employment \\
 & \quad (0.169) \quad (0.112) \quad (0.367) \\
 & \underbrace{-0.235 \Delta Total Employment}_{\text{Short-run}} \\
 & \quad (0.123)
 \end{aligned}$$

Long-run

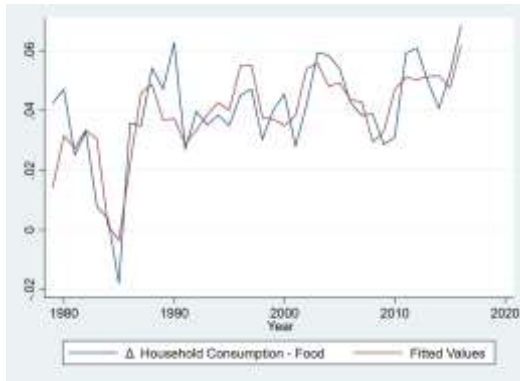
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 8.847          | -4.683         | $\chi^2 (35)$           | $\chi^2 (17)$           | 0.008     | 0.010 | 0.648          |
| [0.000, 0.001] | [0.001, 0.024] | [0.370]                 | [0.749]                 |           |       |                |

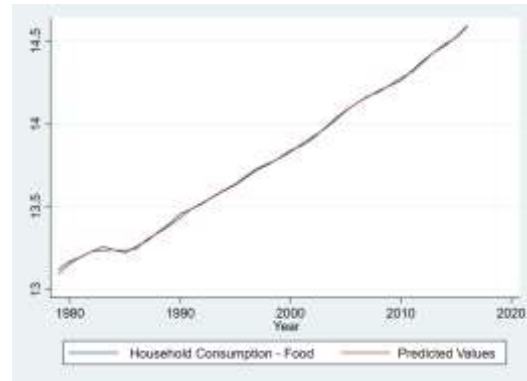
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) HFCE – Food are 0.039, 0.016, -0.017, and 0.068 respectively.

Figure 1. Actual v. Predicted HFCE – Food, along with residuals

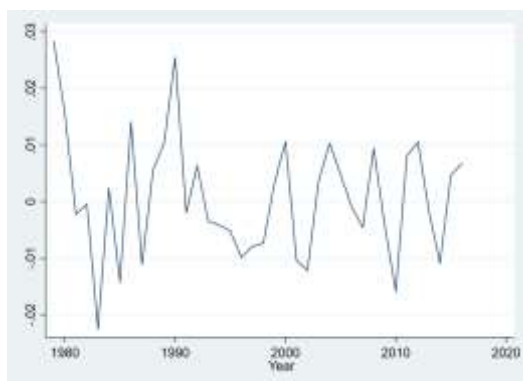
Panel A: Log first-difference



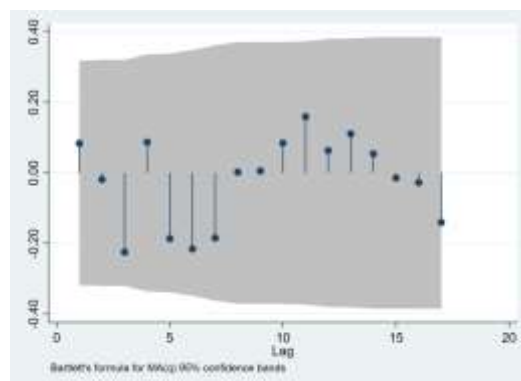
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 26. Household Final Consumption Expenditure – Medical

Estimation Period: 1979 – 2016

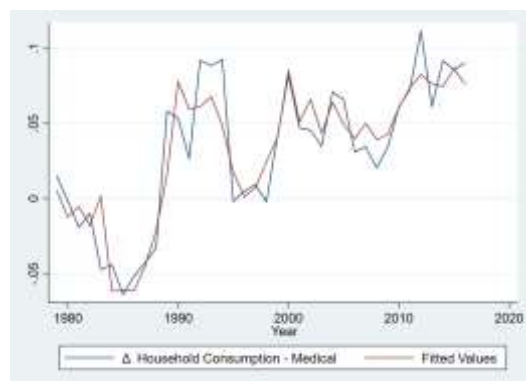
$$\begin{aligned}
 \Delta HFCE, Medical = & \underbrace{-0.297 HFCE, Medical_{t-1}}_{\text{Adjustment}} \\
 & -0.418 \quad -2.852 IPIN HFCE, Medical \\
 & (0.445) \quad (0.286) \\
 & +1.248 Net Disposable Income + 1.452 IPIN HFCE, Education \\
 & (0.151) \quad (0.362) \\
 & \underbrace{\hspace{10em}}_{\text{Long-run}} \\
 & +0.447 \Delta HFCE, Medical_{t-1} + 0.082 \Delta IPIN HFCE, Medical + 0.592 \Delta IPIN HFCE, Medical_{t-1} \\
 & (0.130) \quad (0.407) \quad (0.347) \\
 & -0.198 \Delta Net Disposable Income - 0.343 \Delta Net Disposable Income_{t-1} \\
 & (0.174) \quad (0.179) \\
 & -0.090 \Delta IPIN HFCE, Education - 0.320 \Delta IPIN HFCE, Education_{t-1} \\
 & (0.351) \quad (0.) \\
 & \underbrace{\hspace{10em}}_{\text{Short-run}}
 \end{aligned}$$

Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 4.901          | -4.201         | $\chi^2(36)$            | $\chi^2(17)$            | 0.014     | 0.019 | 0.829          |
| [0.012, 0.054] | [0.003, 0.025] | [0.650]                 | [0.359]                 |           |       |                |

Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) HFCE – Medical are 0.031, 0.047, -0.063, and 0.111 respectively.


Panel A: Log first-difference



The graph displays the trend of household medical consumption over a 40-year period. The consumption starts at approximately 10.7 in 1980, dips to a low of about 10.4 in 1988, and then rises steadily to reach approximately 11.9 by 2015. The predicted values for the period 2015-2020 continue this upward trend, reaching about 12.2 by 2020.

| Year | Household Consumption - Medical | Predicted Values |
|------|---------------------------------|------------------|
| 1980 | 10.7                            | -                |
| 1985 | 10.6                            | -                |
| 1988 | 10.4                            | -                |
| 1990 | 10.5                            | -                |
| 1995 | 10.8                            | -                |
| 2000 | 10.9                            | -                |
| 2005 | 11.2                            | -                |
| 2010 | 11.4                            | -                |
| 2015 | 11.7                            | 11.7             |
| 2020 | -                               | 12.2             |

The graph displays the annual growth rate of the U.S. economy over a 35-year period. The y-axis is labeled with values -0.05, 0, and 0.05. The x-axis is labeled 'Year' and ranges from 1980 to 2020. The line shows a general upward trend from the early 1980s, peaking at approximately 0.045 in 1989. It then fluctuates, with a notable dip to about -0.02 in 2009, followed by a recovery to around 0.015 by 2015.



Barlett formula for 95% confidence bands

Estimation Period: 1981 – 2016

55

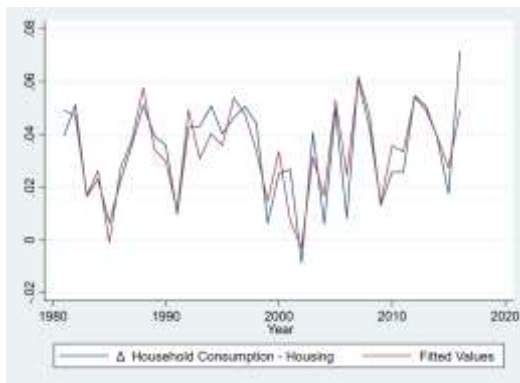
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 10.604         | -6.734         | $\chi^2 (34)$           | $\chi^2 (16)$           | 0.006     | 0.008 | 0.780          |
| [0.000, 0.001] | [0.000, 0.000] | [0.512]                 | [0.792]                 |           |       |                |

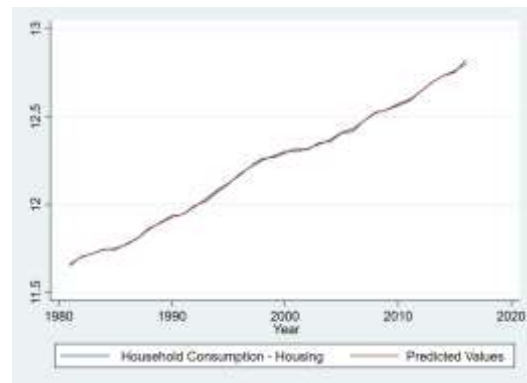
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) HFCE – Housing are 0.036, 0.019, -0.008, and 0.074 respectively.

Figure 1. Actual v. Predicted HFCE – Housing, along with residuals

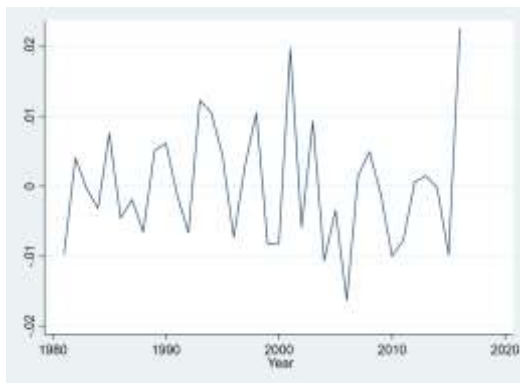
Panel A: Log first-difference



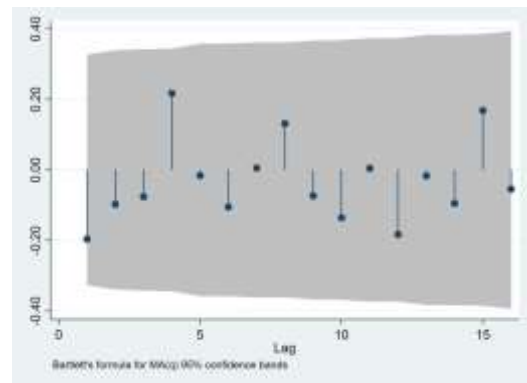
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 28. Household Final Consumption Expenditure – Non-alcoholic Beverages

Estimation Period: 1981 – 2016

$$\begin{aligned}
 \Delta HFCE, Non - alcohol &= \underbrace{-0.355 HFCE, Non - alcohol_{t-1}}_{(0.085) \text{ Adjustment}} \\
 &+ \underbrace{0.855}_{(0.433)} \underbrace{-0.242 IPIN}_{(0.150)} \underbrace{HFCE, Non - alcohol}_{(0.042)} + \underbrace{0.350 Net Disposable Income}_{(0.042)} \\
 &\quad - \underbrace{0.891 Share of CPI, Alcohol}_{(0.289)} - \underbrace{0.266 Openness}_{(0.061)} \\
 &\quad \underbrace{+ 0.472 \Delta HFCE, Non - alcohol}_{(0.120)} + \underbrace{0.238 \Delta HFCE, Non - alcohol}_{(0.140)} \\
 &\quad - \underbrace{0.252 \Delta HFCE, Non - alcohol}_{(0.148)} + \underbrace{0.187 \Delta IPIN}_{(0.076)} HFCE, Non - alcohol \\
 &\quad \underbrace{\hspace{10em}}_{\text{Short-run}}
 \end{aligned}$$

Long-run

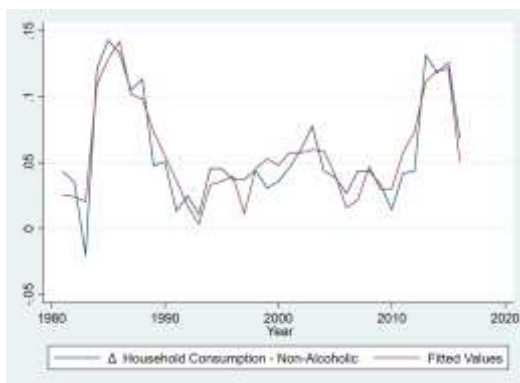
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 9.506          | -4.149         | $\chi^2(34)$            | $\chi^2(16)$            | 0.013     | 0.015 | 0.838          |
| [0.000, 0.001] | [0.003, 9.506] | [0.281]                 | [0.687]                 |           |       |                |

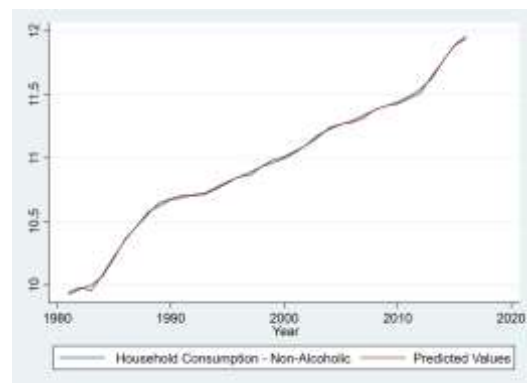
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) HFCE – Non-alcoholic Beverages are 0.057, 0.039, -0.020, and 0.142 respectively.

Figure 1. Actual v. Predicted HFCE – Non-alcoholic Beverages, along with residuals

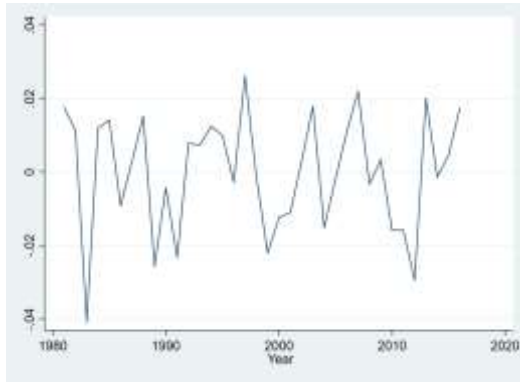
Panel A: Log first-difference



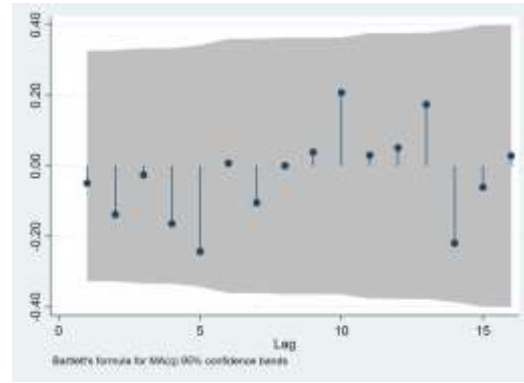
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 29. Household Final Consumption Expenditure – Miscellaneous

Estimation Period: 1984 – 2016

$$\begin{aligned}
 \Delta HFCE, \text{Miscellaneous} = & \underbrace{\frac{-271 HFCE, \text{Miscellaneous}_{t-1}}{(0.048)}}_{\text{Adjustment}} \\
 & - 0.305 + 1.087 \text{ Net Disposable Income} - 1.101 \text{ IPIN GVA, Other Services} \\
 & \quad (0.395) \quad (0.103) \quad (0.100) \\
 & - 0.117 \text{ IPIN, Tourism Service Exports} + 0.299 \text{ Other Service Exports} \\
 & \quad (0.057) \quad (0.063) \\
 & \quad \quad \quad \text{Long-run} \\
 & - 0.110 \Delta \text{Net Disposable Income} + 0.020 \Delta \text{IPIN, Tourism Service Exports} + 0.040 \Delta \text{IPIN, Tourism Service Exports} \\
 & \quad (0.055) \quad (0.008) \quad (0.007) \\
 & \quad + 0.042 \Delta \text{IPIN, Tourism Service Exports} + 0.038 \Delta \text{Other Service Exports} \\
 & \quad \quad (0.007) \quad (0.007) \\
 & \quad - 0.060 \Delta \text{Other Service Exports} - 0.019 \Delta \\
 & \quad \quad (0.006) \quad (0.012) \\
 & \quad \quad \quad \text{Short-run}
 \end{aligned}$$

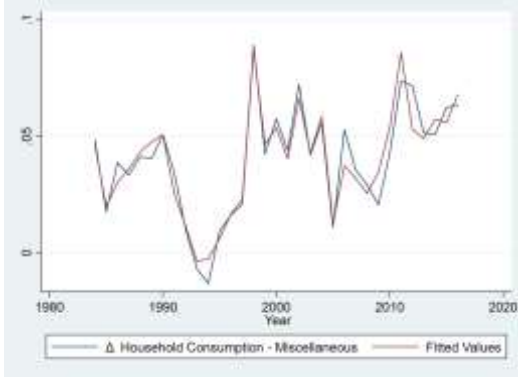
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
|                |                | $\chi^2 (31)$           | $\chi^2 (14)$           |           |       |                |
| 34.147         | -5.565         | 0.623                   | 14.473                  | 0.005     | 0.007 | 0.906          |
| [0.000, 0.000] | [0.000, 0.004] | [0.429]                 | [0.415]                 |           |       |                |

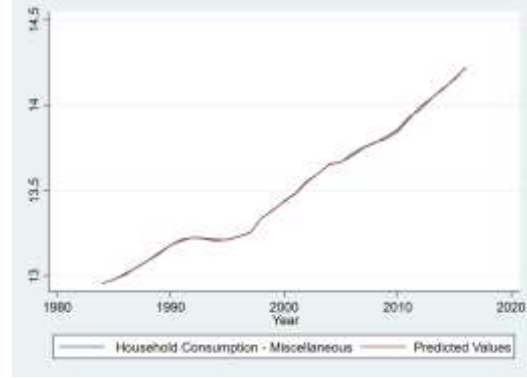
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) HFCE – Miscellaneous are 0.039, 0.022, -0.013, and 0.089 respectively.

Figure 1. Actual v. Predicted HFCE – Miscellaneous, along with residuals

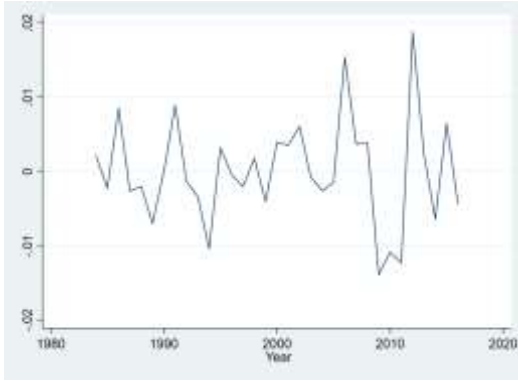
Panel A: Log first-difference



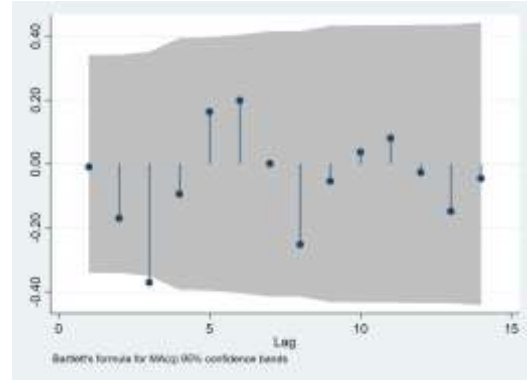
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



### 30. Household Final Consumption Expenditure – Tobacco

Estimation Period: 1981 – 2016

$$\begin{aligned}
 \Delta HFCE, Tobacco_t = & \underbrace{-0.655 HFCE, Tobacco_{t-1}}_{\text{Adjustment}} \\
 & + 2.890 - 0.599 IPIN HFCE, Tobacco + 0.408 Net Compensation \\
 & \quad (0.434) \quad (0.156) \quad (0.122) \\
 & + 0.512 HFCE, Non - alcohol - 0.324 HFCE, Alcohol \\
 & \quad (0.061) \quad (0.114) \\
 & \quad \quad \quad \text{Long-run} \\
 & + 1.019 \Delta HFCE, Tobacco_{t-1} + 0.011 \Delta HFCE, Tobacco_{t-2} + 0.247 \Delta HFCE, Tobacco_{t-3} \\
 & \quad (0.134) \quad (0.107) \quad (0.111) \\
 & + 0.297 \Delta IPIN HFCE, Tobacco + 0.480 \Delta IPIN HFCE, Tobacco_{t-1} - 0.009 \Delta Net Compensation \\
 & \quad (0.111) \quad (0.093) \quad (0.082) \\
 & - 0.528 \Delta Net Compensation_{t-1} - 0.141 \Delta HFCE, Non - alcohol + 0.157 \Delta HFCE, Non - alcohol_{t-1} \\
 & \quad (0.085) \quad (0.088) \quad (0.091) \\
 & - 0.426 \Delta HFCE, Non - alcohol_{t-2} + 0.315 \Delta HFCE, Alcohol - 0.225 \Delta HFCE, Alcohol_{t-1} \\
 & \quad (0.100) \quad (0.070) \quad (0.048) \\
 & \quad \quad \quad \text{Short-run}
 \end{aligned}$$



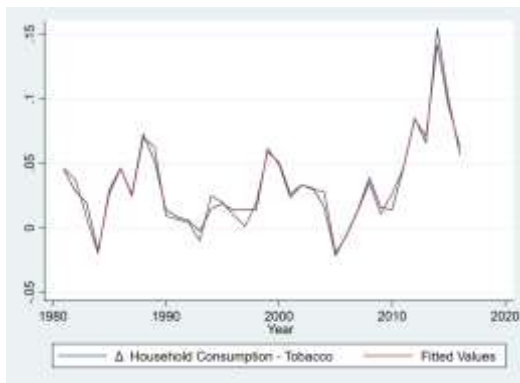
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 19.254         | -8.391         | $\chi^2 (34)$           | $\chi^2 (16)$           | 0.004     | 0.006 | 0.967          |
| [0.000, 0.000] | [0.000, 0.000] | [0.358]                 | [0.413]                 |           |       |                |

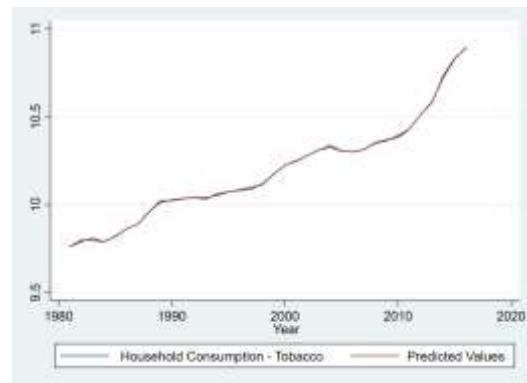
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) HFCE – Tobacco are 0.033, 0.032, -0.021, and 0.153 respectively.

Figure 1. Actual v. Predicted HFCE – Tobacco, along with residuals

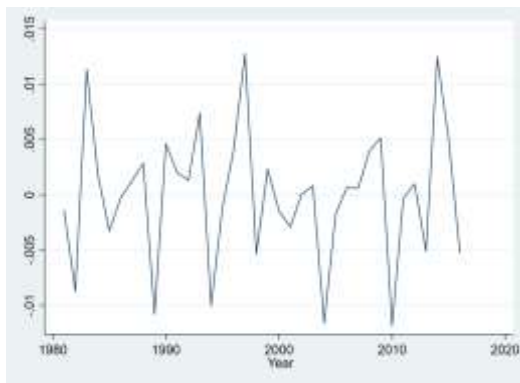
Panel A: Log first-difference



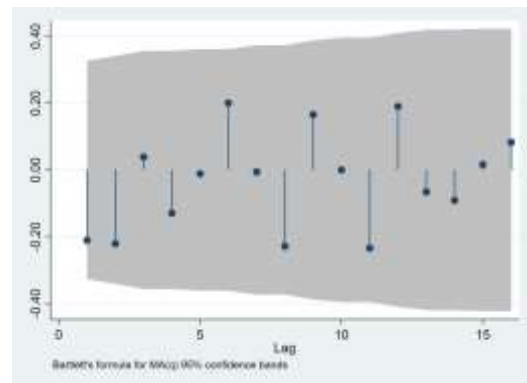
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



### 31. Household Final Consumption Expenditure – Transportation and Communication

Estimation Period: 1984 – 2016

$$\begin{aligned}
 \Delta HFCE, \text{Transportation and Communication} = & \underbrace{-0.189 HFCE, \text{Transportation and Communication}_{t-1}}_{\text{Adjustment}} \\
 & \underbrace{+ 0.709 + 1.220 \text{ Net Disposable Income} - 0.351 \text{ Capital Formation} - \text{Fixed} - \text{Public Construction, Real}}_{\text{Long-run}} \\
 & \underbrace{- 1.226 \text{ IPIN GVA Manufacturing} - 0.104 \text{ BPO Service Exports, Real}}_{\text{Short-run}} \\
 & + 0.058 \Delta \text{Capital Formation} - \text{Fixed} - \text{Public Construction, Real}
 \end{aligned}$$

(0.199)                      (0.137)                      (0.110)                      (0.235)                      (0.038)                      (0.015)

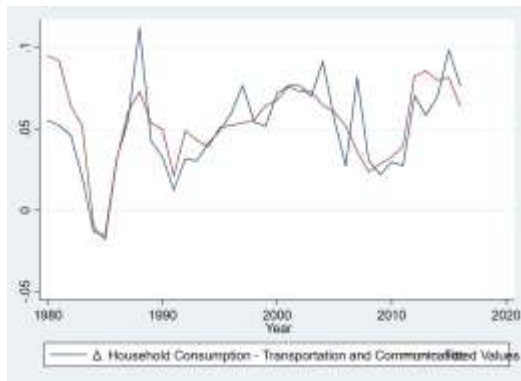
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 8.863          | -4.512         | $\chi^2 (31)$           | $\chi^2 (16)$           | 0.013     | 0.018 | 0.694          |
| [0.000, 0.002] | [0.001, 0.023] | 0.703                   | 11.661                  |           |       |                |
|                |                | [0.401]                 | [0.766]                 |           |       |                |

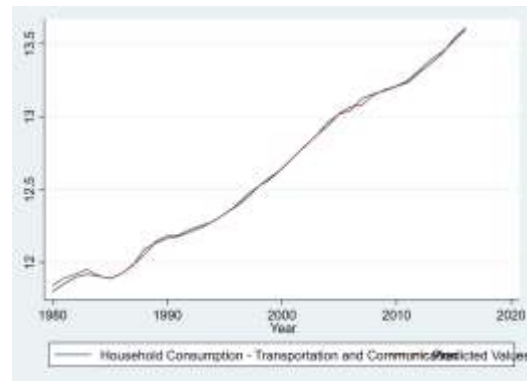
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) HFCE – Transportation and Communication are 0.050, 0.027, -0.015, and 0.112 respectively.

Figure 1. Actual v. Predicted HFCE – Transportation and Communication, along with residuals

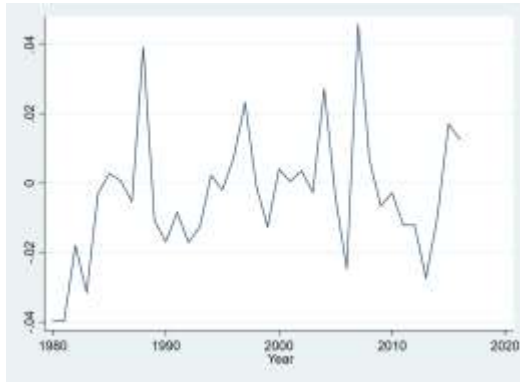
Panel A: Log first-difference



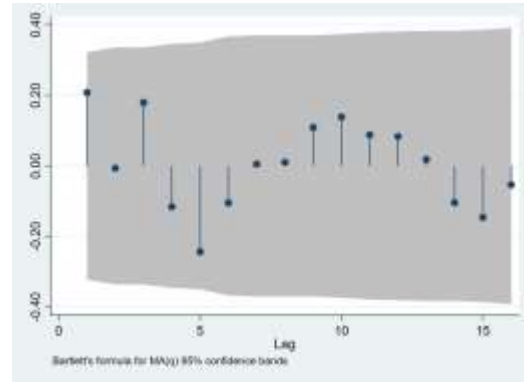
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



### 32. Household Final Consumption Expenditure – Utilities

Estimation Period: 1983 – 2016

$$\begin{aligned}
 \Delta HFCE, Utilities = & \underbrace{-0.645 HFCE, Utilities_{t-1}}_{\text{Adjustment}} \\
 & - 30.487 \quad -0.339 IPIN HFCE - Utilities \\
 & (12.926) \quad (0.103) \\
 & + 0.063 Net Disposable Income + 3.274 Total Population \\
 & (0.176) \quad (0.729) \\
 & \underbrace{\hspace{10em}}_{\text{Long-run}} \\
 & + 0.648 \Delta HFCE, Utilities_{t-1} + 0.506 \Delta HFCE, Utilities_{t-2} - 0.068 \Delta IPIN HFCE - Utilities \\
 & (0.216) \quad (0.240) \quad (0.110) \\
 & + 0.240 \Delta IPIN HFCE - Utilities_{t-1} + 0.220 \Delta IPIN HFCE - Utilities_{t-2} \\
 & (0.135) \quad (0.151) \\
 & + 0.197 \Delta Net Disposable Income - 0.097 \Delta Net Disposable Income_{t-1} - 0.339 \Delta Net Disposable Income_{t-2} \\
 & (0.207) \quad (0.163) \quad (0.232) \\
 & - 3.410 \Delta Total Population - 2.689 \Delta Total Population_{t-1} - 0.480 \Delta Total Population_{t-2} \\
 & (0.236) \quad (0.298) \quad (0.856) \\
 & \underbrace{\hspace{10em}}_{\text{Short-run}}
 \end{aligned}$$

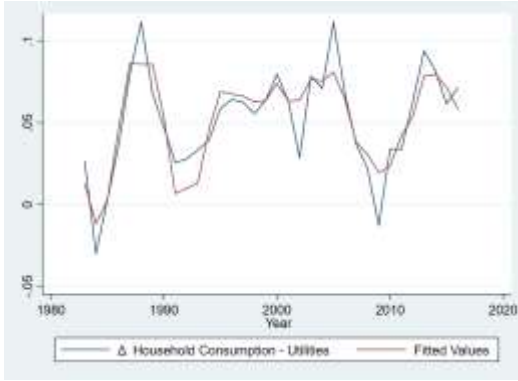
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 4.411          | -3.665         | $\chi^2$ (32)           | $\chi^2$ (15)           | 0.011     | 0.014 | 0.779          |
| [0.023, 0.093] | [0.010, 0.066] | [0.652]                 | [0.587]                 |           |       |                |

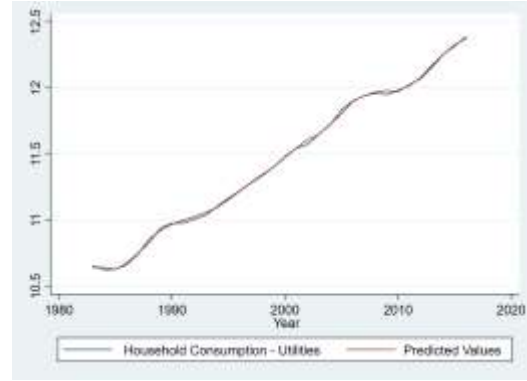
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Household Consumption - Utilities are 0.049, 0.030, -0.030, and 0.111 respectively.

Figure 1. Actual v. Predicted Household Consumption - Utilities, along with residuals

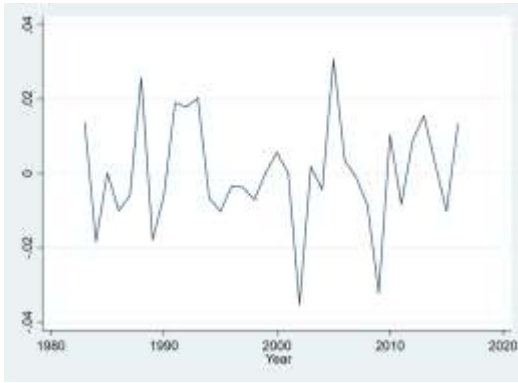
Panel A: Log first-difference



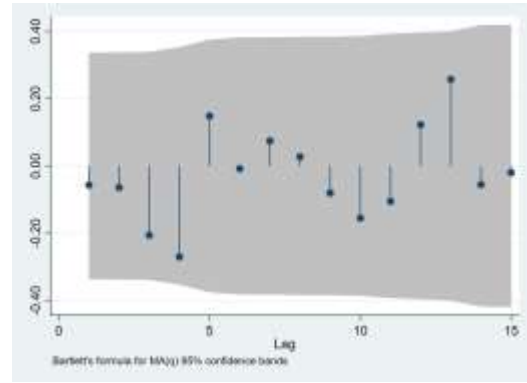
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



### 33. Implicit Price Index Household Final Consumption Expenditure - Alcohol

Estimation Period: 1981 – 2016

$$\begin{aligned}
 \Delta IPIN HFCE - Alcohol = & \underbrace{-0.542 IPIN HFCE - Alcohol_{t-1}}_{\text{Adjustment}} \\
 & + 1.792 \quad + 0.720 IPIN GVA Agriculture - 0.068 IPIN Other Good Imports - 0.115 Effective Tax Rate, Import Duties \\
 & \quad (0.482) \quad \quad (0.066) \quad \quad (0.078) \quad \quad (0.030) \\
 & \quad + 0.676 Effective Tax Rate, Alcoholic Beverages (Share of Price) \\
 & \quad \quad \quad (0.208) \\
 & \quad \quad \quad \text{Long-run} \\
 & + 0.129 \Delta IPIN Other Good Imports + 0.088 \Delta IPIN Other Good Imports_{t-1} + 0.121 \Delta IPIN Other Good Imports_{t-2} \\
 & \quad \quad (0.047) \quad \quad (0.042) \quad \quad (0.039) \\
 & + 0.069 \Delta Effective Tax Rate, Import Duties - 0.158 \Delta Effective Tax Rate, Alcoholic Beverages (Share of Price) \\
 & \quad \quad (0.021) \quad \quad \quad (0.076) \\
 & \quad \quad \quad \text{Short-run}
 \end{aligned}$$

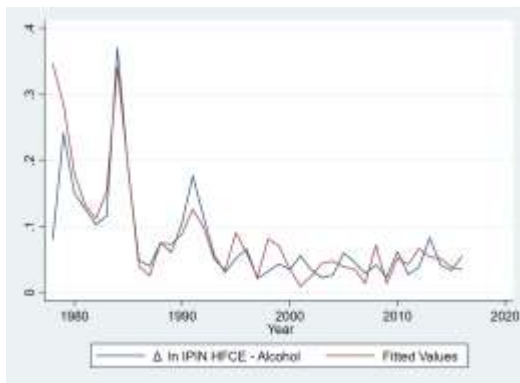
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 18.725         | -6.880         | $\chi^2$ (34)           | $\chi^2$ (17)           | 0.025     | 0.048 | 0.880          |
| [0.000, 0.000] | [0.000, 0.000] | [0.227]                 | [0.993]                 |           |       |                |

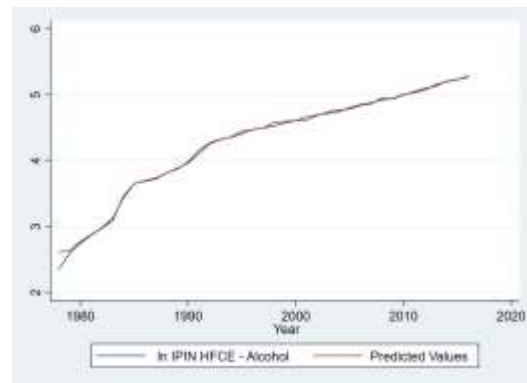
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN HFCE – Alcohol are 0.077, 0.069, 0.021, and 0.370 respectively.

Figure 1. Actual v. Predicted IPIN HFCE – Alcohol, along with residuals

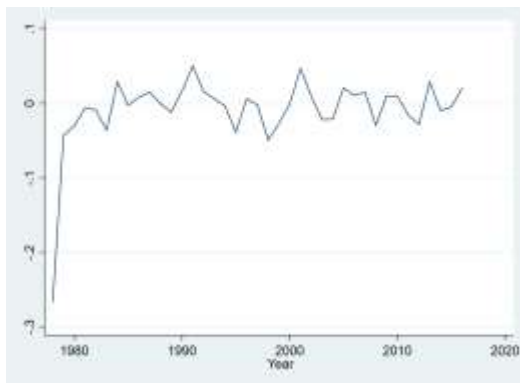
Panel A: Log first-difference



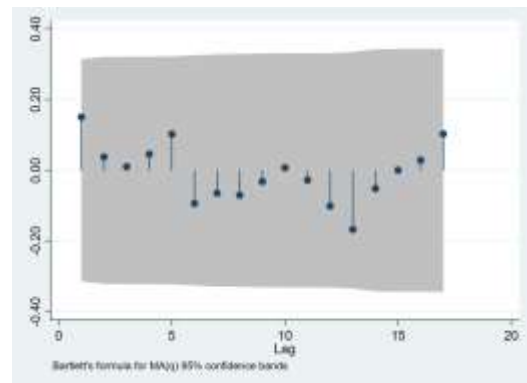
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



### 34. Implicit Price Index Household Final Consumption Expenditure - Education

Estimation Period: 1989 – 2016

$$\begin{aligned}
 \Delta IPIN\ HFCE - Education = & \underbrace{-0.241\ IPIN\ HFCE - Education_{t-1}}_{(0.069)\ \text{Adjustment}} \\
 & - 0.265 + 0.140\ Real\ Interest\ Rate + 0.266\ IPIN\ GVA\ Real\ Estate \\
 & \quad (0.177) \quad (0.065) \quad (0.233) \\
 & \quad + 0.971\ IPIN\ Private\ Construction \\
 & \quad (0.280) \\
 & \underbrace{\hspace{10em}}_{Long-run} \\
 & + 0.087\ \Delta IPIN\ HFCE - Education_{t-1} + 0.442\ \Delta IPIN\ HFCE - Education_{t-2} - 0.029\ \Delta Real\ Interest\ Rate \\
 & \quad (0.206) \quad (0.222) \quad (0.010) \\
 & - 0.013\ \Delta Real\ Interest\ Rate_{t-1} + 0.037\ \Delta IPIN\ GVA\ Real\ Estate - 0.259\ \Delta IPIN\ GVA\ Real\ Estate_{t-1} \\
 & \quad (0.006) \quad (0.119) \quad (0.132) \\
 & - 0.371\ \Delta IPIN\ GVA\ Real\ Estate_{t-2} - 0.212\ \Delta IPIN\ GVA\ Real\ Estate_{t-3} \\
 & \quad (0.131) \quad (0.126) \\
 & \underbrace{\hspace{10em}}_{Short-run}
 \end{aligned}$$

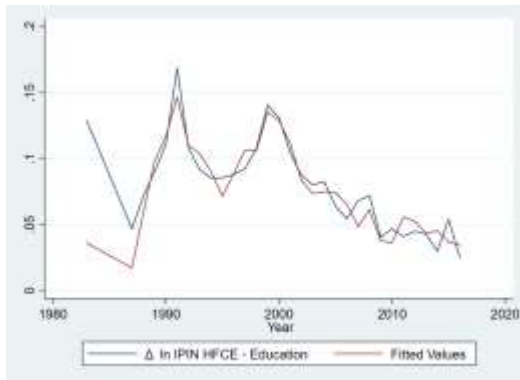
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
|                |                | $\chi^2(26)$            | $\chi^2(13)$            |           |       |                |
| 9.249          | -3.486         | 0.216                   | 10.521                  | 0.012     | 0.020 | 0.903          |
| [0.001, 0.006] | [0.017, 0.091] | [0.642]                 | [0.650]                 |           |       |                |

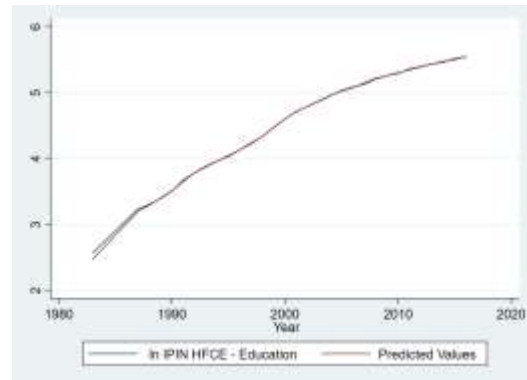
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN HFCE – Education are 0.097, 0.063, 0.024, and 0.396 respectively.

Figure 1. Actual v. Predicted IPIN HFCE – Education, along with residuals

Panel A: Log first-difference



Panel B: Log level



The graph illustrates the annual growth rate of the U.S. economy over a 35-year period. The vertical axis (y-axis) measures the growth rate, with major grid lines at -0.05, 0, 0.05, and 0.1. The horizontal axis (x-axis) shows the years from 1980 to 2020, with labels every 10 years. The data line starts at approximately 0.09 in 1980, drops sharply to about -0.005 by 1990, and then fluctuates between 0 and 0.02 for the remainder of the period shown.

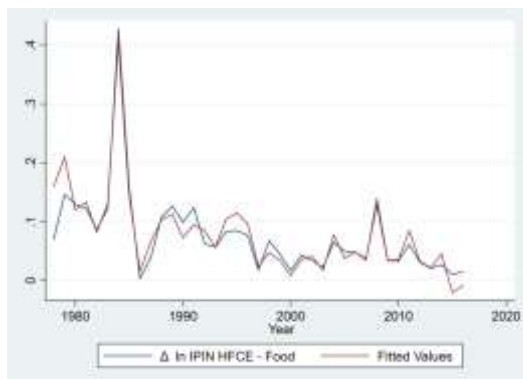
Estimation Period: 1981 – 2016

$$\begin{aligned} \Delta IPIN_{HFCE, Food} = & \underbrace{-0.765 IPIN_{HFCE, Food}_{t-1}}_{\text{Adjustment}} \\ & + 0.715 \quad + 0.161 IPIN_{Agricultural Imports} + 0.870 IPIN_{GVA, Agriculture} \\ & \quad (0.100) \quad \quad (0.021) \quad \quad (0.019) \\ & - 0.072 Openness - 3.124 Value Added Tax Rate \\ & \quad (0.033) \quad \quad (0.175) \\ & \underbrace{\hspace{15em}}_{\text{Long-run}} \\ & + 2.997 \Delta Value Added Tax Rate \\ & \quad (0.124) \\ & \underbrace{\hspace{15em}}_{\text{Short-run}} \end{aligned}$$

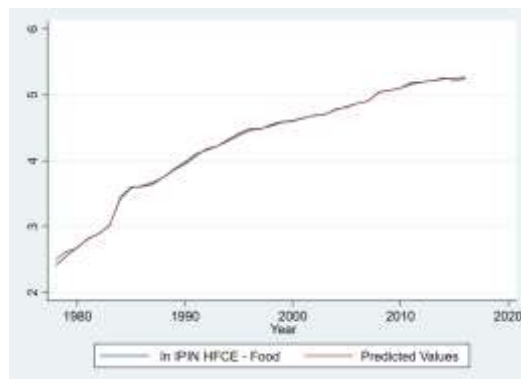
| Bounds Tests   |                | Heteroskedasticity Test        | Autocorrelation Test                     | Model Fit |       |                |
|----------------|----------------|--------------------------------|--|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan<br>$\chi^2$ (34) | Portmanteau Q-Statistic<br>$\chi^2$ (17) | MAE       | RMSE  | R <sup>2</sup> |
| 110.085        | -19.171        | 1.152                          | 27.299                                   | 0.016     | 0.023 | 0.950          |
| [0.000, 0.000] | [0.000, 0.000] | [0.283]                        | [0.053]                                  |           |       |                |

Figure 1. Actual v. Predicted IPIN HFCE – Food, along with residuals

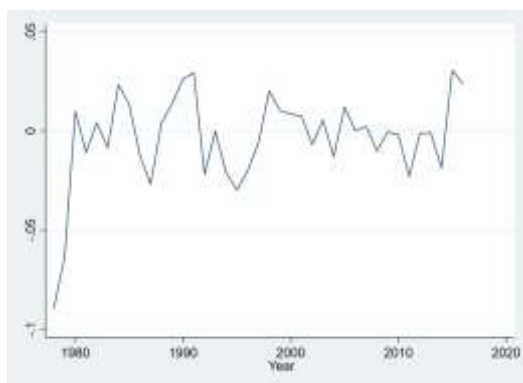
Panel A: Log first-difference



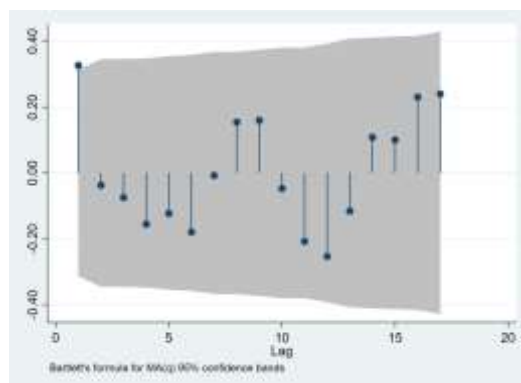
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



### 36. Implicit Price Index Household Final Consumption Expenditure – Medical

Estimation Period: 1990 – 2016

$$\begin{aligned}
 \Delta IPIN HFCE, Medical = & \underbrace{\frac{-0.718 IPIN HFCE, Medical_{t-1}}{(0.056)}}_{\text{Adjustment}} \\
 & - 29.911 + 2.543 \text{ Total Population} \\
 & \quad (3.169) \quad (0.097) \\
 & + 0.086 \text{ Import Duties Tax Rate} + 0.507 \\
 & \quad (0.022) \quad (0.032) \\
 & \underbrace{\hspace{10em}}_{\text{Long-run}} \\
 & - 0.041 \Delta \text{Import Duties Tax Rate} \\
 & \quad (0.019) \\
 & \underbrace{\hspace{10em}}_{\text{Short-run}}
 \end{aligned}$$



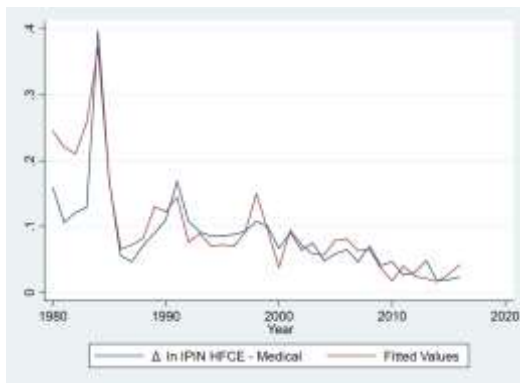
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 75.331         | -12.668        | $\chi^2(31)$            | $\chi^2(16)$            | 0.024     | 0.039 | 0.917          |
| [0.000, 0.000] | [0.000, 0.000] | [0.155]                 | [0.123]                 |           |       |                |

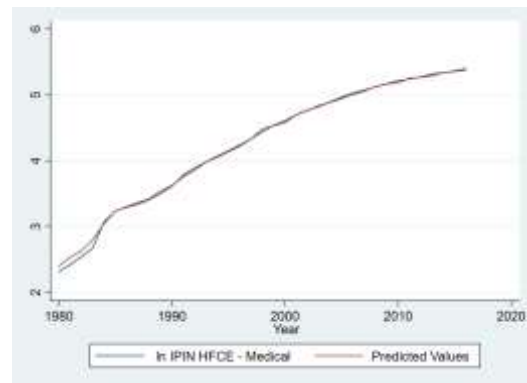
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN HFCE – Medical are 0.090, 0.065, 0.017, and 0.396 respectively.

Figure 1. Actual v. Predicted IPIN HFCE – Medical, along with residuals

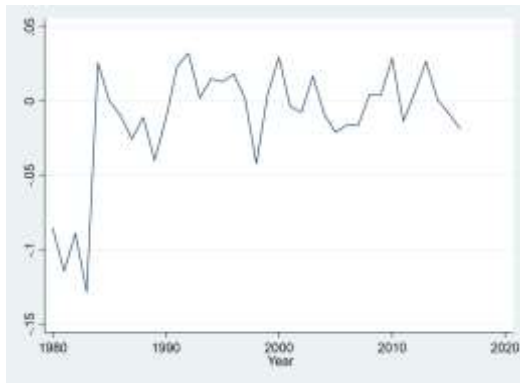
Panel A: Log first-difference



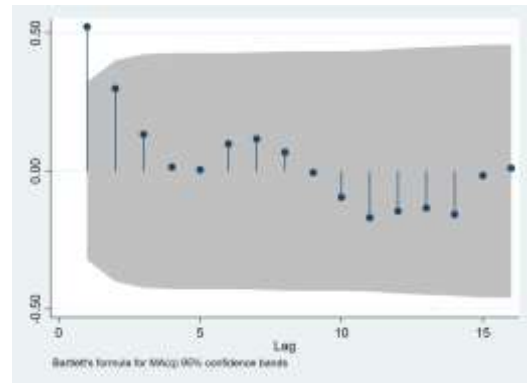
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



### 37. Implicit Price Index Household Final Consumption Expenditure – Housing

Estimation Period: 1980 – 2016

$$\begin{aligned}
 \Delta IPIN\ HFCE, Housing = & \underbrace{- IPIN\ HFCE, Housing_{t-1}}_{\text{Adjustment}} \\
 & + 2.381 + 0.152 IPIN, Materials Imports \\
 & \quad (0.577) \quad (0.181) \\
 & + 0.747 IPIN, Other Goods Imports + 2.194 Value Added Tax Rate \\
 & \quad (0.162) \quad (0.465) \\
 & \underbrace{\hspace{10em}}_{\text{Long-run}} \\
 & + 0.150 \Delta IPIN, Materials Imports \\
 & \quad (0.057) \\
 & \underbrace{\hspace{10em}}_{\text{Short-run}}
 \end{aligned}$$

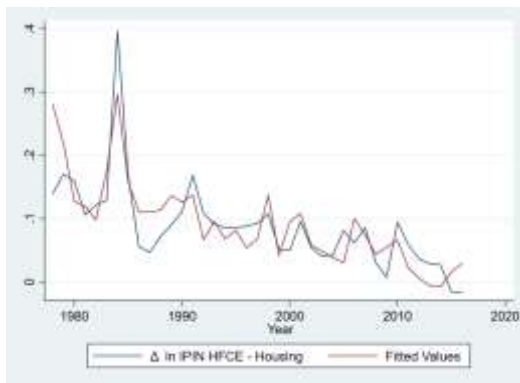
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 9.574          | -4.635         | $\chi^2 (35)$           | $\chi^2 (17)$           | 0.033     | 0.042 | 0.717          |
| [0.000, 0.001] | [0.001, 0.010] | [0.000]                 | [0.832]                 |           |       |                |

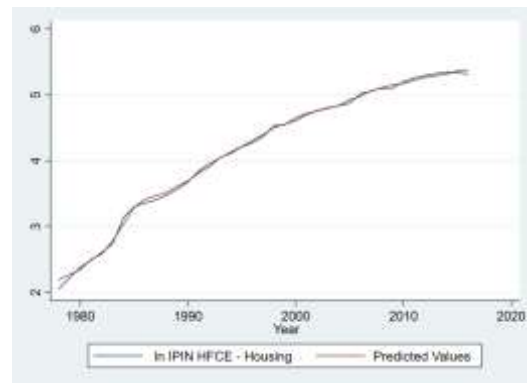
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN HFCE – Housing are 0.087, 0.069, -0.016, and 0.396 respectively.

Figure 1. Actual v. Predicted IPIN HFCE – Housing, along with residuals

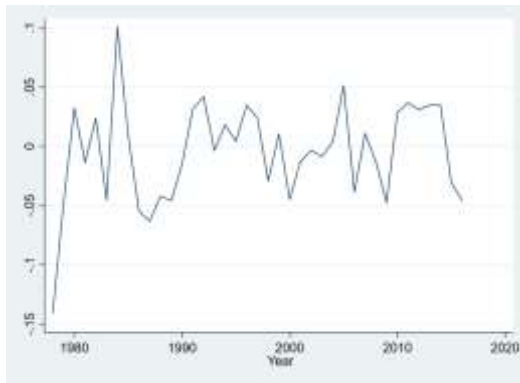
Panel A: Log first-difference



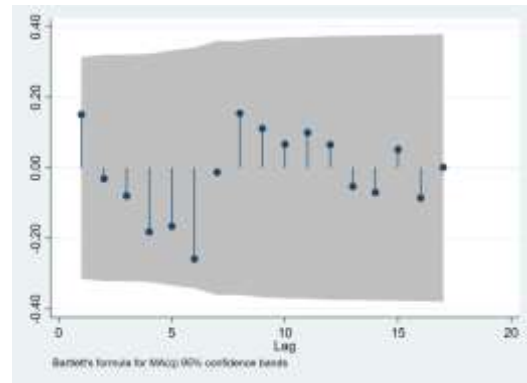
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



### 38. Implicit Price Index Household Final Consumption Expenditure – Non-Alcoholic Beverages

Estimation Period: 1981 – 2016

$$\begin{aligned}
 \Delta IPIN HFCE, Non - alcohol = & \underbrace{-0.460 HFCE, Non - alcohol_{t-1}}_{\text{Adjustment} \quad (0.098)} \\
 & + \underbrace{0.356 + 0.106 IPIN, Agricultural Imports + 0.839 IPIN GVA, Agriculture}_{\text{Long-run} \quad (0.091) \quad (0.034) \quad (0.043)} \\
 & + \underbrace{0.239 \Delta HFCE, Non - alcohol_{t-1} + 0.218 \Delta IPIN GVA, Agriculture}_{\text{Short-run} \quad (0.066) \quad (0.096)}
 \end{aligned}$$

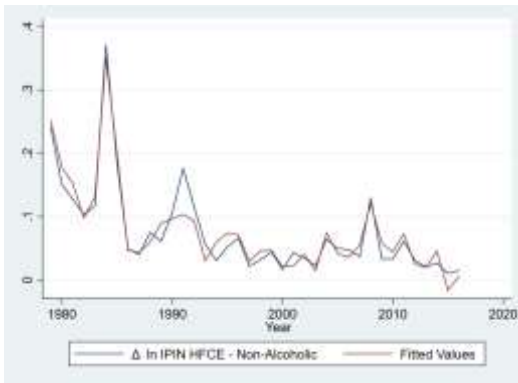
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 9.095          | -4.674         | $\chi^2$ (34)           | $\chi^2$ (17)           | 0.015     | 0.019 | 0.912          |
| [0.001, 0.003] | [0.001, 0.005] | [0.470]                 | [0.730]                 |           |       |                |

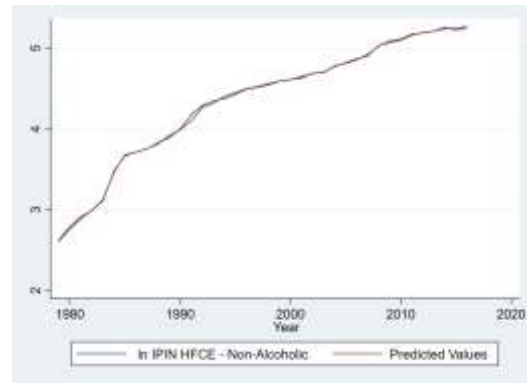
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN HFCE – Non-Alcohol are 0.076, 0.071, 0.010, and 0.370 respectively.

Figure 1. Actual v. Predicted IPIN HFCE – Non-Alcohol, along with residuals

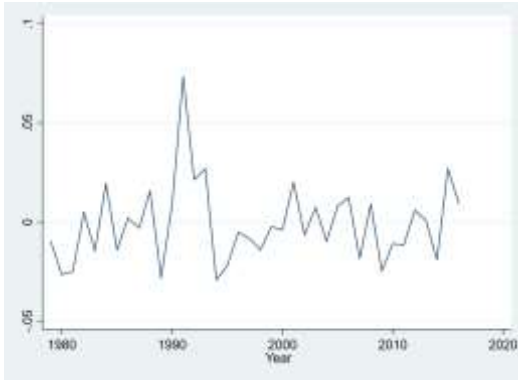
Panel A: Log first-difference



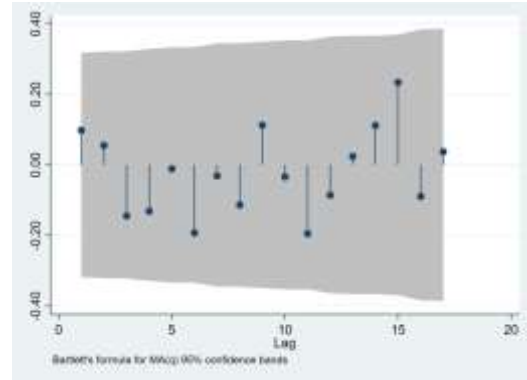
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



### 39. Implicit Price Index Household Final Consumption Expenditure – Miscellaneous

Estimation Period: 1990 – 2016

$$\begin{aligned}
 \Delta IPIN HFCE, Miscellaneous = & \underbrace{-0.352 IPIN HFCE, Miscellaneous_{t-1}}_{\text{Adjustment}} \\
 & -0.422 + 0.134 \text{ Reverse Repurchase Rate} \\
 & \underbrace{-2.095 IPIN HFCE, Education + 3.300 IPIN HFCE, Medical}_{\text{Long-run}}
 \end{aligned}$$

(0.097)                      (0.221)                      (0.081)                      (0.565)                      (0.603)

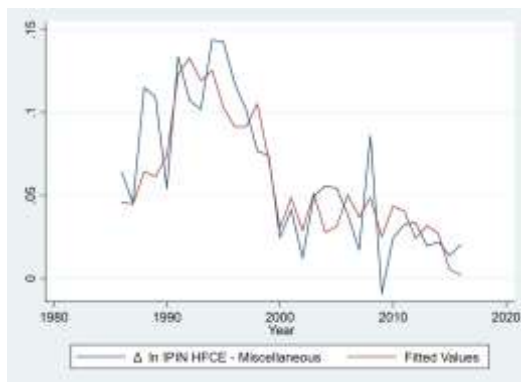
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 19.981         | -3.607         | $\chi^2(25)$<br>1.021   | $\chi^2(13)$<br>8.751   | 0.018     | 0.022 | 0.784          |
| [0.000, 0.000] | [0.013, 0.081] | [0.312]                 | [0.791]                 |           |       |                |

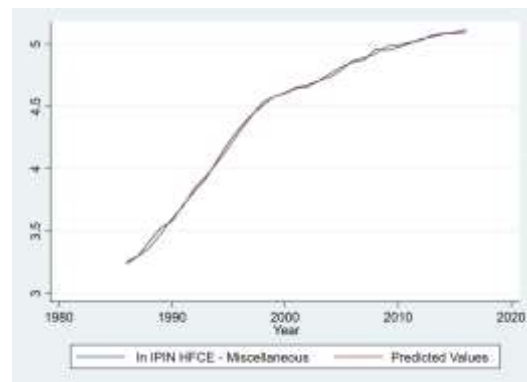
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN HFCE – Miscellaneous are 0.084, 0.079, -0.009, and 0.464 respectively.

Figure 1. Actual v. Predicted IPIN HFCE – Miscellaneous, along with residuals

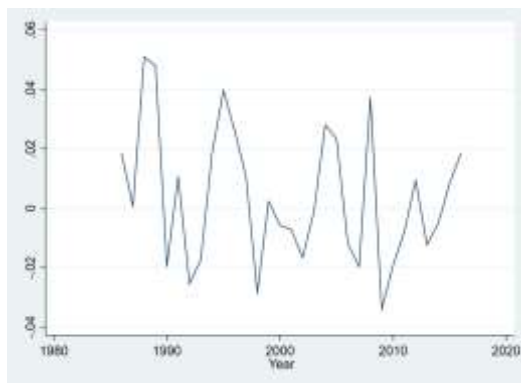
Panel A: Log first-difference



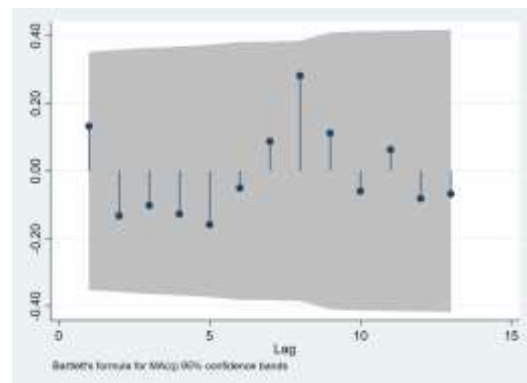
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



#### 40. Implicit Price Index Household Final Consumption Expenditure – Tobacco

Estimation Period: 1982 – 2016

$$\begin{aligned}
 \Delta IPIN\ HFCE, Tobacco_t = & \underbrace{-1.514\ IPIN\ HFCE, Tobacco_{t-1}}_{\text{Adjustment}} \\
 & + 0.056\ (0.203) + 0.120\ Tobacco\ Tax\ Rate\ (Share\ of\ Price)\ (0.009) + 0.705\ IPIN\ GVA, Agriculture\ (0.014) \\
 & + 0.087\ IPIN, Agricultural\ Imports\ (0.014) + 0.149\ Wage\ Index, Manufacturing\ (0.023) + 0.247\ USD\ Nominal\ Exchange\ Rate\ (0.015) \\
 & \underbrace{-0.524\ \Delta IPIN\ GVA, Agriculture\ (0.128) - 0.155\ \Delta USD\ Nominal\ Exchange\ Rate\ (0.061)}_{\text{Short-run}}
 \end{aligned}$$

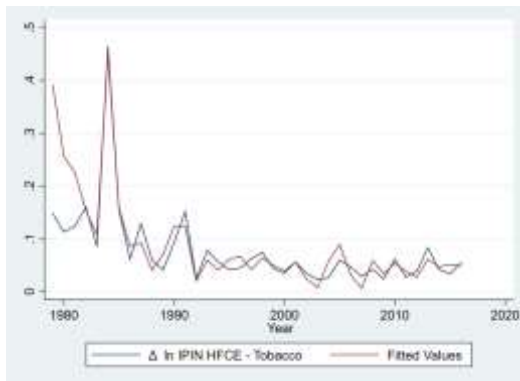
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
|                |                | $\chi^2(33)$            | $\chi^2(17)$            |           |       |                |
| 16.292         | -9.006         | 0.229                   | 14.426                  | 0.027     | 0.051 | 0.939          |
| [0.000, 0.000] | [0.000, 0.000] | [0.631]                 | [0.636]                 |           |       |                |

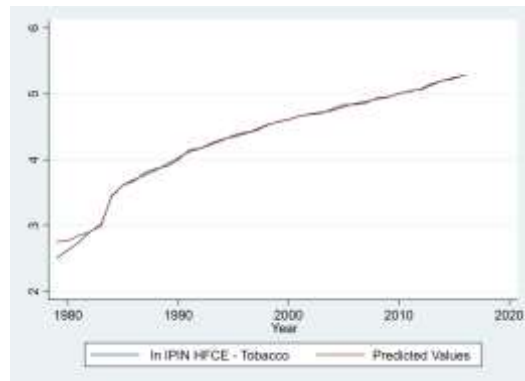
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN HFCE – Tobacco are 0.076, 0.075, 0.022, and 0.464 respectively.

Figure 1. Actual v. Predicted IPIN HFCE – Tobacco, along with residuals

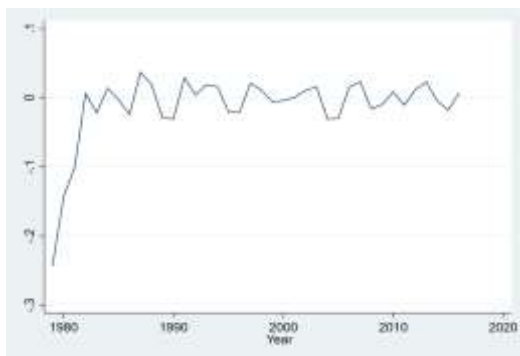
Panel A: Log first-difference



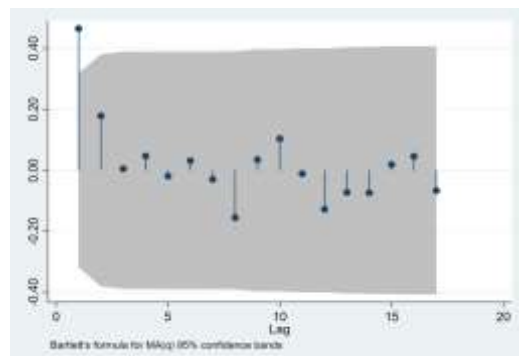
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



#### 41. Implicit Price Index Household Final Consumption Expenditure – Transportation and Communication

Estimation Period: 1981 – 2016

$$\begin{aligned}
 &\Delta IPIN\ HFCE, Transportation\ and\ Communication \\
 &= \underbrace{-0.441\ IPIN\ HFCE, Transportation\ and\ Communication_{t-1}}_{\text{Adjustment}} \\
 &\quad + \underbrace{0.374\ +\ 0.124\ IPIN, Fuel\ Imports\ +\ 0.832\ IPIN\ GVA, Manufacturing}_{\text{Long-run}} \\
 &\quad + \underbrace{0.456\ \Delta IPIN\ HFCE, Transportation\ and\ Communication_{t-1} + 0.630\ \Delta IPIN\ GVA, Manufacturing - 0.548\ \Delta IPIN\ GVA, Manufacturing_{t-1}}_{\text{Short-run}}
 \end{aligned}$$

(0.106) (0.129) (0.030) (0.050) (0.141) (0.156) (0.184)

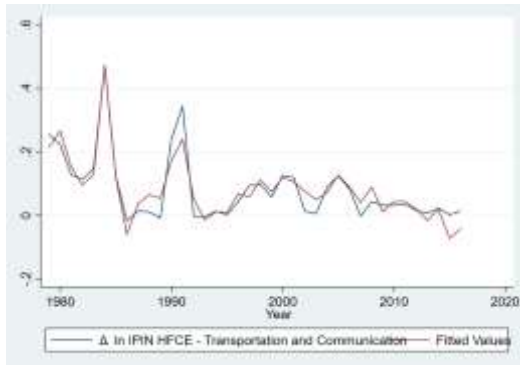
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 6.133          | -4.149         | $\chi^2$ (34)           | $\chi^2$ (17)           | 0.029     | 0.038 | 0.857          |
| [0.009, 0.029] | [0.003, 0.017] | [0.625]                 | [0.396]                 |           |       |                |

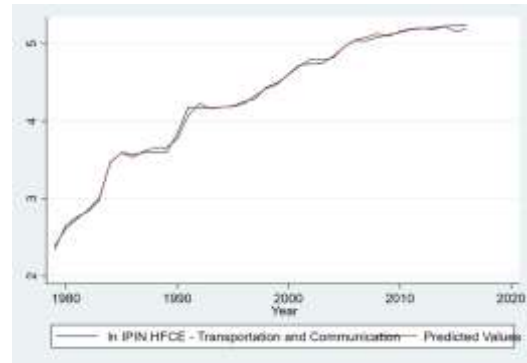
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN HFCE – Transportation and Communication are 0.083, 0.104, -0.017, and 0.468 respectively.

Figure 1. Actual v. Predicted IPIN HFCE – Transportation and Communication, along with residuals

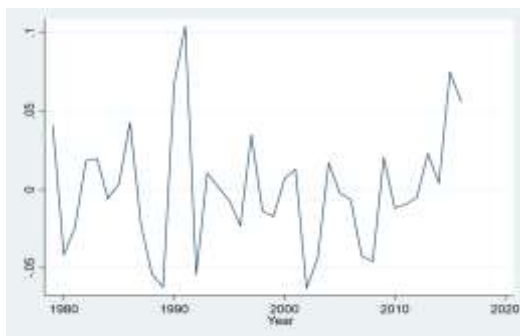
Panel A: Log first-difference



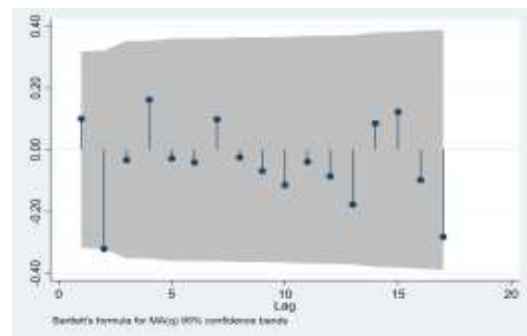
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 42. Implicit Price Index Household Final Consumption Expenditure – Utilities

Estimation Period: 1981 – 2016

$$\begin{aligned}
 \Delta IPIN\ HFCE, Utilities_t = & \underbrace{-0.881\ IPIN\ HFCE, Utilities_{t-1}}_{(0.139)} \\
 & \underbrace{+ 0.750\ + 0.656\ IPIN\ GVA, Water + 0.100\ IPIN\ GVA, Electricity and Steam}_{(0.284)\ (0.072)\ (0.120)} \\
 & \underbrace{+ 0.099\ USD\ Nominal\ Exchange\ Rate + 0.186\ JPY\ Nominal\ Exchange\ Rate}_{(0.097)\ (0.050)} \\
 & \text{Long-run} \\
 & + 0.249\ \Delta IPIN\ HFCE, Utilities_{t-1} - 0.379\ \Delta IPIN\ HFCE, Utilities_{t-2} - 0.266\ \Delta IPIN\ GVA, Water \\
 & \quad (0.127) \quad (0.126) \quad (0.103) \\
 & - 0.345\ \Delta IPIN\ GVA, Water_{t-1} + 0.022\ \Delta IPIN\ GVA, Water_{t-2} - 0.130\ \Delta IPIN\ GVA, Water_{t-3} \\
 & \quad (0.082) \quad (0.068) \quad (0.060) \\
 & - 0.012\ \Delta IPIN\ GVA, Electricity and Steam + 0.319\ \Delta IPIN\ GVA, Electricity and Steam_{t-1} \\
 & \quad (0.112) \quad (0.097) \\
 & + 0.418\ \Delta IPIN\ GVA, Electricity and Steam_{t-2} + 0.172\ \Delta IPIN\ GVA, Electricity and Steam_{t-3} \\
 & \quad (0.084) \quad (0.079) \\
 & + 0.334\ \Delta USD\ Nominal\ Exchange\ Rate - 0.101\ \Delta JPY\ Nominal\ Exchange\ Rate \\
 & \quad (0.116) \quad (0.072) \\
 & \text{Short-run}
 \end{aligned}$$

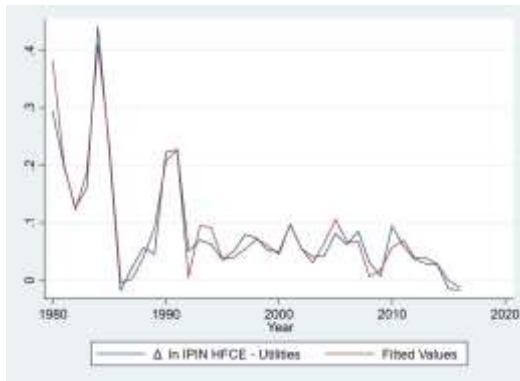
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
|                |                | $\chi^2(34)$            | $\chi^2(16)$            |           |       |                |
| 11.653         | -6.296         | 0.219                   | 6.928                   | 0.016     | 0.023 | 0.950          |
| [0.000, 0.001] | [0.000, 0.001] | [0.639]                 | [0.974]                 |           |       |                |

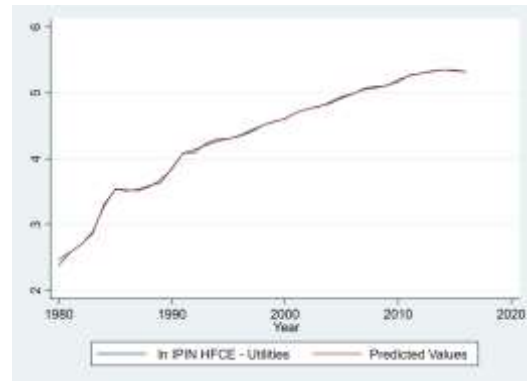
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN HFCE – Utilities are 0.091, 0.094, -0.018, and 0.441 respectively.

Figure 1. Actual v. Predicted IPIN HFCE – Utilities, along with residuals

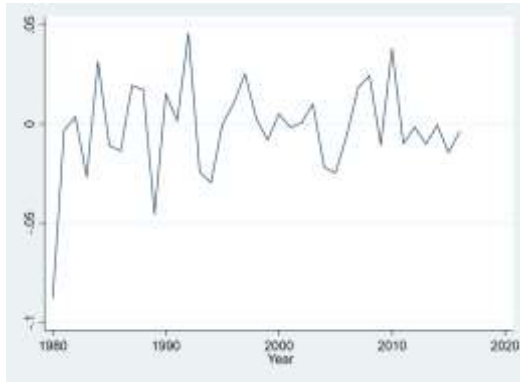
Panel A: Log first-difference



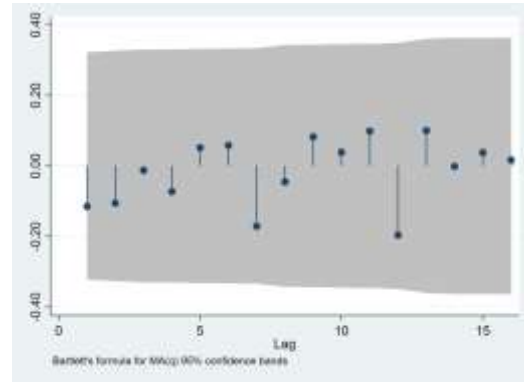
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



### 43. Capital Formation – Change in Inventory, Real

Estimation Period: 1968 – 2016

$$\begin{aligned}
 \Delta \text{Change in Inventory} = & \underbrace{- \text{Change in Inventory}_{t-1}}_{\text{Adjustment}} \\
 & - 3.348 * 10^5 + 1.345 * 10^3 \text{ USD Nominal Exchange Rate} \\
 & \quad (1.508 * 10) \quad (0.524) \\
 & - 2.451 * 10^3 \text{ Depreciation of Assets} - 147.409 \text{ Inflation Rate} \\
 & \quad (0.604) \quad (0.719) \\
 & \quad \text{Long-run} \\
 & - \Delta 1.148 * 10^3 \Delta \text{USD Nominal Exchange Rate} + 1.001 * 10^3 \Delta \text{Depreciation of Assets} \\
 & \quad (0.001) \quad (0.074) \\
 & + 126.825 \Delta \text{Inflation Rate} + 177.592 \Delta \text{Year} \\
 & \quad (0.645) \quad (0.354) \\
 & \quad \text{Short-run}
 \end{aligned}$$

Table A1. Summary of model tests

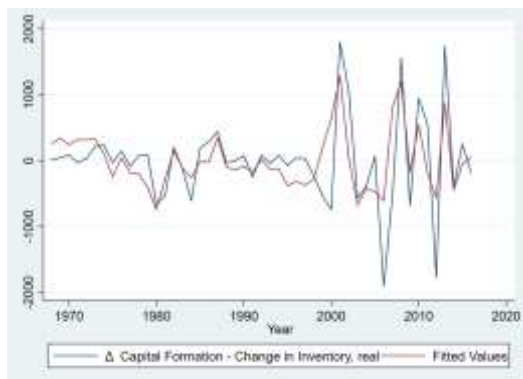
| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |         |                |
|----------------|----------------|-------------------------|-------------------------|-----------|---------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE    | R <sup>2</sup> |
| 7.192          | -5.279         | $\chi^2 (47)$           | $\chi^2 (22)$           | 359.095   | 505.143 | 0.427          |
| [0.003, 0.012] | [0.000, 0.005] | 1.361                   | 16.246                  |           |         |                |
|                |                | [0.243]                 | [0.803]                 |           |         |                |

Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Change in Inventory are 1.054, 563.583, -1905.255, and 1796.208 respectively.

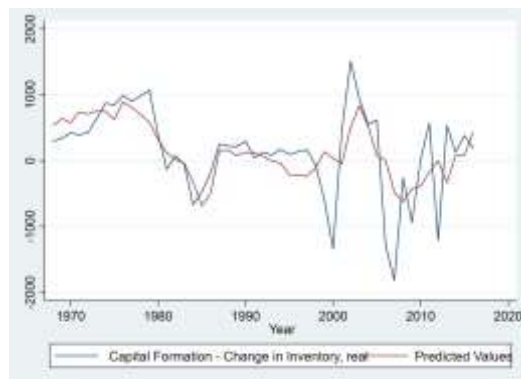


Figure 1. Actual v. Predicted Change in Inventory, along with residuals

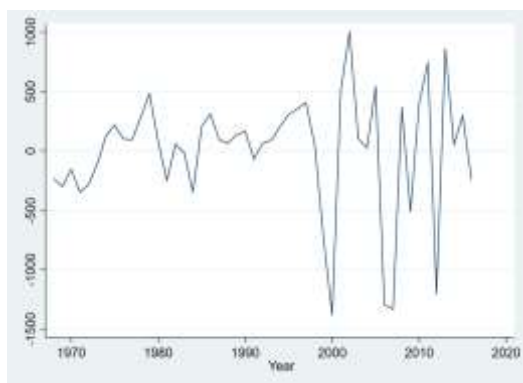
Panel A: Log first-difference



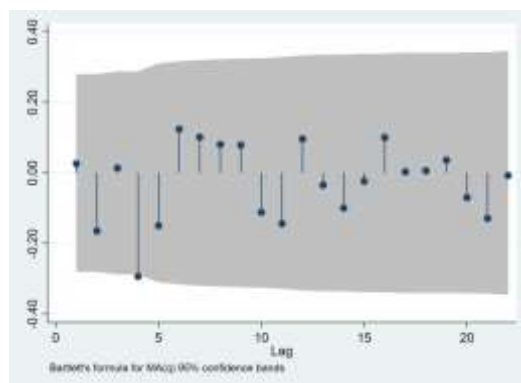
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



#### 44. Capital Formation – Fixed – Durables, Real

Estimation Period: 1990 – 2016

$$\begin{aligned}
 \Delta Durables = & \underbrace{-0.855 Durables_{t-1}}_{(0.160) \text{ Adjustment}} \\
 & - 2.555 + 0.700 Machinery Imports, Real \\
 & \quad (1.734) \quad (0.096) \\
 & - 0.477 Reverse Repurchase Rate + 0.917 USD Real Exchange Rate \\
 & \quad (0.033) \quad (0.244) \\
 & \quad \quad \quad \text{Long-run} \\
 & + 0.699 \Delta Durables + 0.118 \Delta Machinery Imports, Real - 0.385 \Delta Machinery Imports, Real \\
 & \quad (0.188) \quad (0.121) \quad (0.101) \\
 & + 0.180 \Delta Reverse Repurchase Rate - 1.127 \Delta USD Real Exchange Rate - 0.593 \Delta USD Real Exchange Rate \\
 & \quad (0.095) \quad (0.309) \quad (0.227) \\
 & \quad \quad \quad \text{Short-run}
 \end{aligned}$$

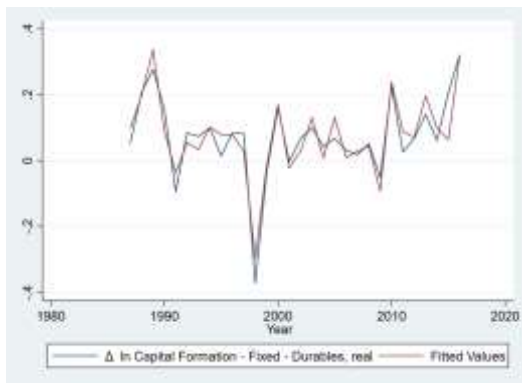
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 8.609          | -5.323         | $\chi^2(25)$            | $\chi^2(13)$            | 0.037     | 0.047 | 0.839          |
| [0.002, 0.008] | [0.000, 0.005] | [0.465]                 | [0.925]                 |           |       |                |

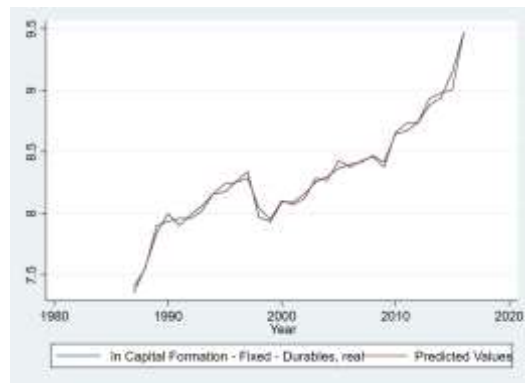
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Durables are 0.082, 0.217, -0.447, and 1.402 respectively.

Figure 1. Actual v. Predicted Durables, along with residuals

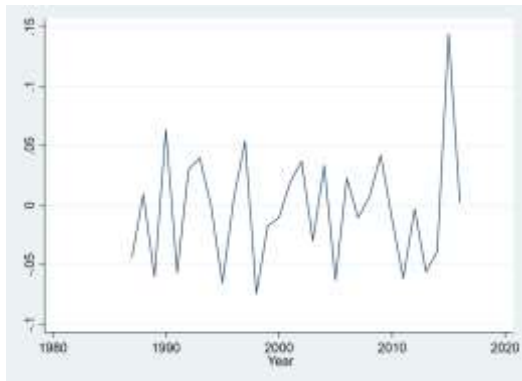
Panel A: Log first-difference



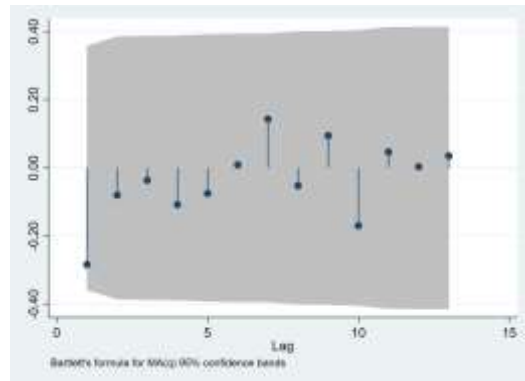
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



#### 45. Capital Formation - Fixed - Private Construction, Real

Estimation Period: 1977 – 2016

$$\Delta Private\ Construction = \underbrace{-0.381\ Private\ Construction_{t-1}}_{(0.066)\text{ Adjustment}} + \underbrace{+13.557 + 0.778\ Durables - 0.631\ Lending\ Rate}_{(4.388)\ (0.150)\ (0.143)\ Long-run} - \underbrace{0.006\ \Delta Year}_{(0.)\ Short-run}$$

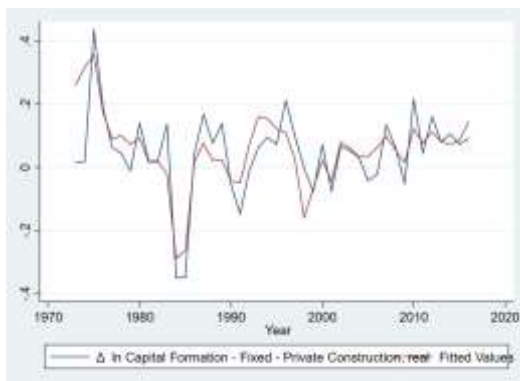
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
|                |                | $\chi^2$ (38)           | $\chi^2$ (20)           |           |       |                |
| 21.066         | -5.765         | 2.348                   | 9.007                   | 0.064     | 0.088 | 0.662          |
| [0.000, 0.000] | [0.000, 0.001] | [0.125]                 | [0.982]                 |           |       |                |

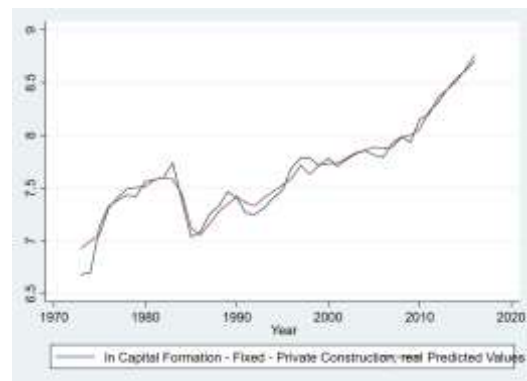
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Private Construction are 0.040, 0.151, -0.491, and 0.435 respectively.

Figure 1. Actual v. Predicted Private Construction, along with residuals

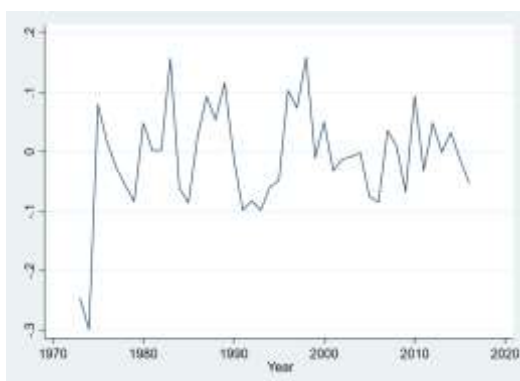
Panel A: Log first-difference



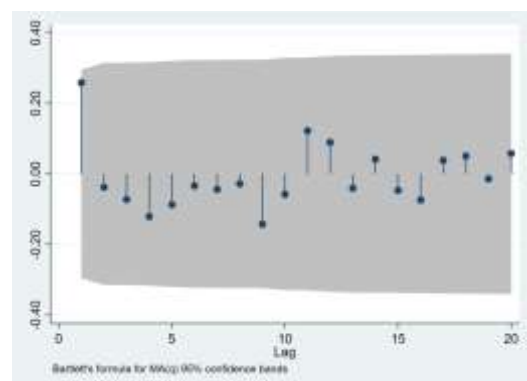
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



#### 46. Capital Formation - Fixed - Public Construction, Real

Estimation Period: 1974 – 2016

$$\begin{aligned}
 \Delta \text{Public Construction} = & \underbrace{-0.666 \text{ Public Construction}_{t-1}}_{\text{Adjustment}} \\
 & + 3.835 \quad + 0.576 \text{ Resources of the Financial System} \\
 & \quad (0.602) \quad \quad (0.099) \\
 & + 0.223 \text{ 91day TBill Rate} - 1.072 \text{ USD Nominal Exchange Rate} \\
 & \quad (0.070) \quad \quad (0.) \\
 & \underbrace{\quad \quad \quad}_{\text{Long-run}} \\
 & + 0.247 \Delta \text{Public Construction}_{t-1} \\
 & \quad (0.115) \\
 & \underbrace{\quad \quad \quad}_{\text{Short-run}}
 \end{aligned}$$

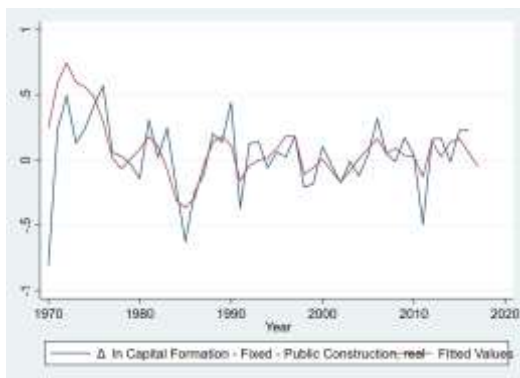
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
|                |                | $\chi^2(41)$            | $\chi^2(21)$            |           |       |                |
| 11.099         | -6.124         | 0.190                   | 12.281                  | 0.156     | 0.232 | 0.561          |
| [0.000, 0.000] | [0.000, 0.000] | [0.662]                 | [0.931]                 |           |       |                |

Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Public Construction are 0.079, 0.298, -0.804, and 1.311 respectively.

Figure 1. Actual v. Predicted , along with residuals

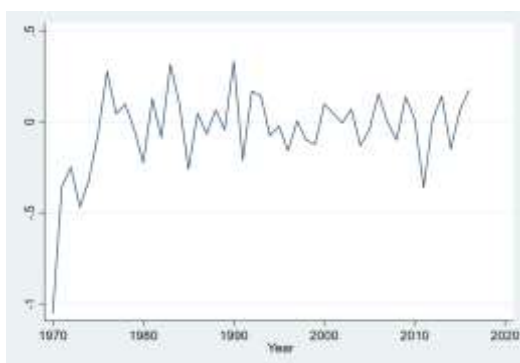
Panel A: Log first-difference



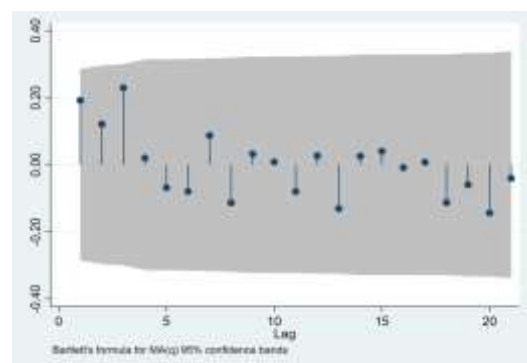
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 47. Net Compensation

Estimation Period: 1996 – 2016

$$\begin{aligned}
 \Delta \text{Net Compensation} = & \underbrace{-0.604 \text{ Net Compensation}_{t-1}}_{\text{Adjustment}} \\
 & + 1.207 \text{ (0.425)} + 0.104 \text{ Real Interest Rate (0.037)} \\
 & + 2.616 \text{ CPI, Philippines (0.143)} + 0.051 \text{ Total Loans (0.058)} \\
 & \underbrace{\phantom{+ 1.207 \text{ (0.425)} + 0.104 \text{ Real Interest Rate (0.037)} + 2.616 \text{ CPI, Philippines (0.143)} + 0.051 \text{ Total Loans (0.058)}}_{\text{Long-run}} \\
 & + 1.381 \Delta \text{CPI, Philippines (0.545)} - 0.736 \Delta \text{CPI, Philippines}_{t-1} \text{ (0.356)} + 0.219 \Delta \text{Total Loans (0.056)} \\
 & \underbrace{\phantom{+ 1.381 \Delta \text{CPI, Philippines (0.545)} - 0.736 \Delta \text{CPI, Philippines}_{t-1} \text{ (0.356)} + 0.219 \Delta \text{Total Loans (0.056)}}_{\text{Short-run}}
 \end{aligned}$$

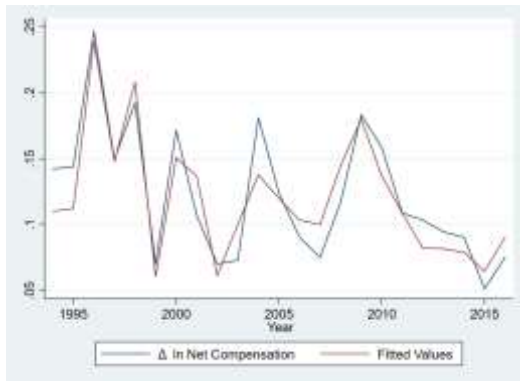
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 7.379          | -3.593         | $\chi^2 (19)$           | $\chi^2 (9)$            | 0.017     | 0.020 | 0.856          |
| [0.006, 0.021] | [0.017, 0.086] | 0.086                   | 6.387                   |           |       |                |
|                |                | [0.768]                 | [0.700]                 |           |       |                |

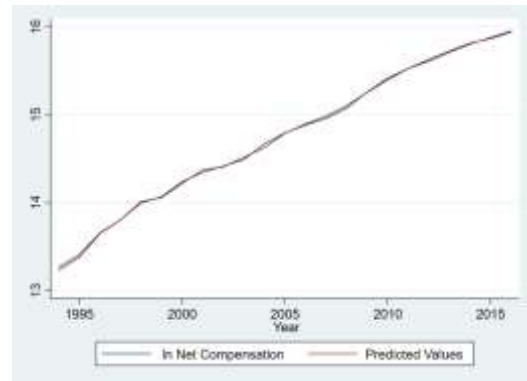
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Net Compensation are , , , and respectively.

Figure 1. Actual v. Predicted Net Compensation, along with residuals

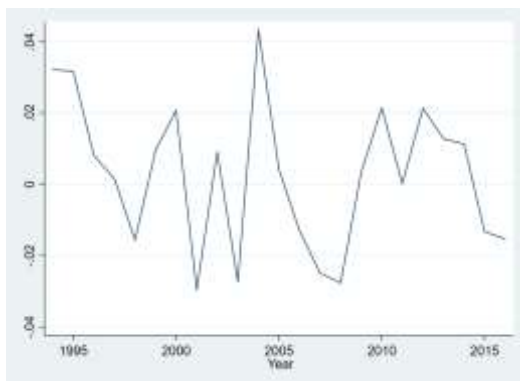
Panel A: Log first-difference



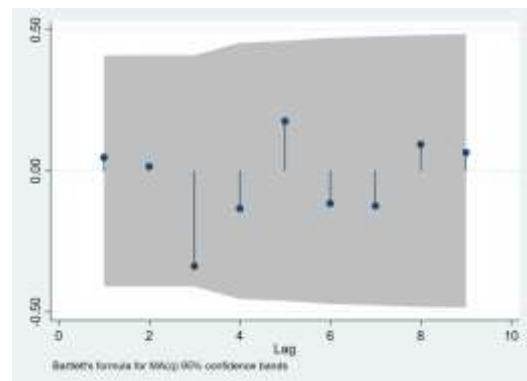
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 48. Operating Surplus

Estimation Period: 1996 – 2016

$$\begin{aligned}
 \Delta \text{Operating Surplus} = & \underbrace{-0.133 \text{ Operating Surplus}_{t-1}}_{\text{Adjustment}} \\
 & + 1.060 \text{ } (0.218) - 0.307 \text{ Real Interest Rate } (0.071) \\
 & \underbrace{-0.326 \text{ Total Loans} + 1.389 \text{ Capital Formation} - \text{Fixed, Real}}_{\text{Long-run}} \\
 & \quad (0.356) \quad (0.541) \\
 & \underbrace{-0.114 \Delta \text{Total Loans}}_{\text{Short-run}} \\
 & \quad (0.070)
 \end{aligned}$$

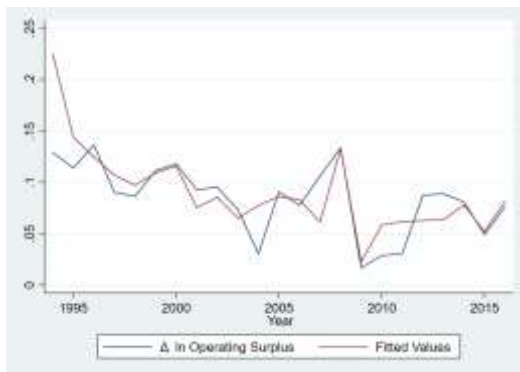
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
|                |                | $\chi^2 (19)$           | $\chi^2 (9)$            |           |       |                |
| 5.892          | -3.865         | 1.719                   | 5.573                   | 0.018     | 0.028 | 0.622          |
| [0.013, 0.041] | [0.010, 0.058] | [0.189]                 | [0.781]                 |           |       |                |

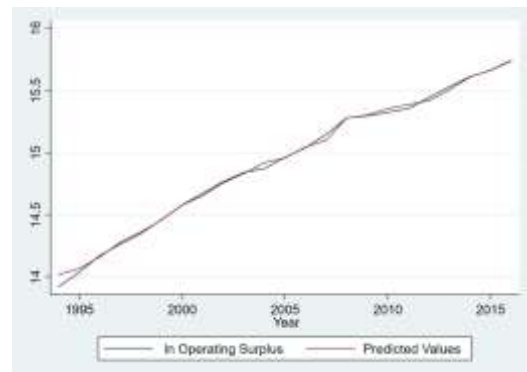
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Operating Surplus are 0.125, 0.082, 0.016, and 0.443 respectively.

Figure 1. Actual v. Predicted Operating Surplus, along with residuals

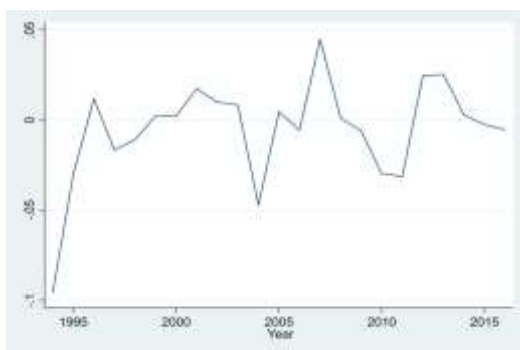
Panel A: Log first-difference



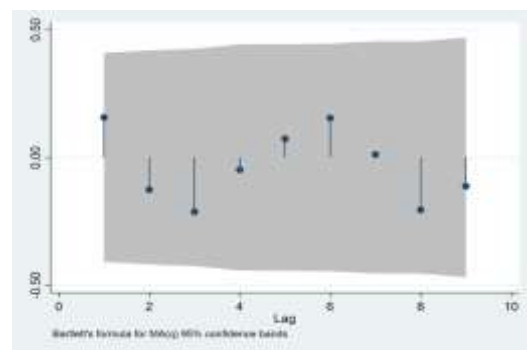
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 49. Net Property Income

Estimation Period: 1990 – 2016

$$\Delta \text{Net Property Income} = \underbrace{-0.639 \text{ Net Property Income}_{t-1}}_{\text{Adjustment}} + \underbrace{-3.089 \times 10^5 + 1.805 \times 10^5 \text{ Reverse Repurchase Rate}}_{\text{Long-run}}$$

(0.156) (0.453)

(7.463 \* 10<sup>4</sup>)

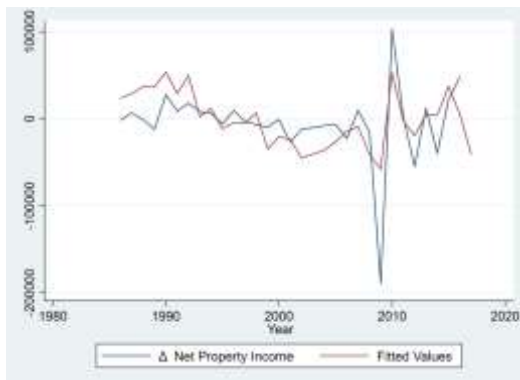
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit             |                       |                |
|----------------|----------------|-------------------------|-------------------------|-----------------------|-----------------------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE                   | RMSE                  | R <sup>2</sup> |
| 8.667          | -4.084         | $\chi^2(25)$            | $\chi^2(13)$            | 2.583*10 <sup>4</sup> | 3.494*10 <sup>4</sup> | 0.419          |
| [0.008, 0.015] | [0.004, 0.011] | [0.112]                 | [0.233]                 |                       |                       |                |

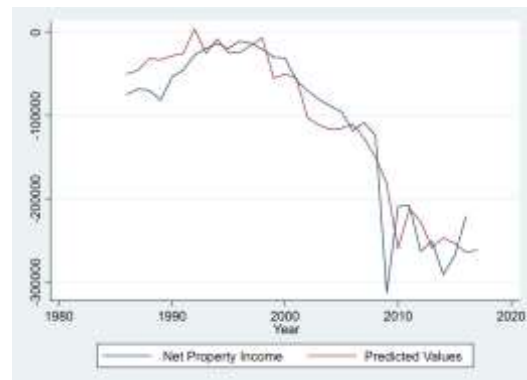
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Net Property Income are , , and respectively.

Figure 1. Actual v. Predicted Net Property Income, along with residuals

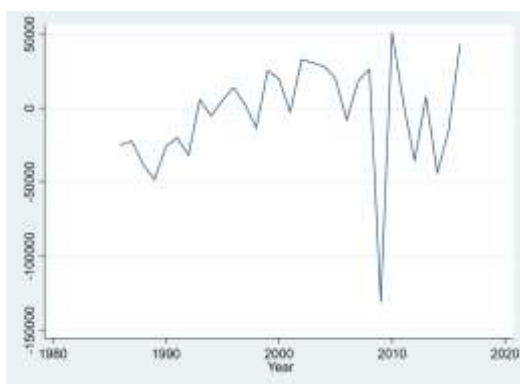
Panel A: Log first-difference



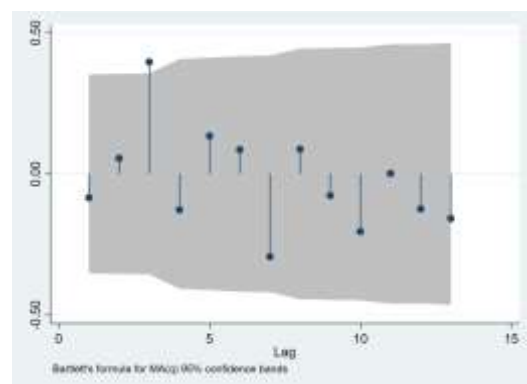
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 50. Employment in Agriculture

Estimation Period: 1982 – 2016

$$\begin{aligned}
 \Delta \text{Employment in Agriculture} = & \underbrace{-0.830 \text{ Employment in Agriculture}_{t-1}}_{\text{Adjustment}} \\
 & + 23.854 + 0.270 \text{ IPIN, Agricultural Imports} - 0.354 \text{ Wage Index, Private Service} \\
 & \quad (4.247) \quad (0.026) \quad (0.054) \\
 & \quad - 0.214 \text{ Wage Index, Manufacturing} + 0.376 \text{ Wage Index, Agriculture} \\
 & \quad (0.047) \quad (0.101) \\
 & \quad \text{Long-run} \\
 & - 0.188 \Delta \text{IPIN, Agricultural Imports} - 0.156 \Delta \text{IPIN, Agricultural Imports}_{t-1} - 0.108 \Delta \text{IPIN, Agricultural Imports}_{t-2} \\
 & \quad (0.035) \quad (0.027) \quad (0.026) \\
 & + 0.118 \Delta \text{Wage Index, Private Service} + 0.221 \Delta \text{Wage Index, Private Service}_{t-1} - 0.254 \Delta \text{Wage Index, Manufacturing} \\
 & \quad (0.047) \quad (0.046) \quad (0.057) \\
 & \quad + 0.260 \Delta \text{Wage Index, Agriculture} - 0.349 \Delta \text{Wage Index, Agriculture}_{t-1} \\
 & \quad (0.130) \quad (0.118) \\
 & \quad - 0.250 \Delta \text{Wage Index, Agriculture}_{t-2} - 0.007 \Delta \text{Year} \\
 & \quad (0.082) \quad (0.001) \\
 & \quad \text{Short-run}
 \end{aligned}$$

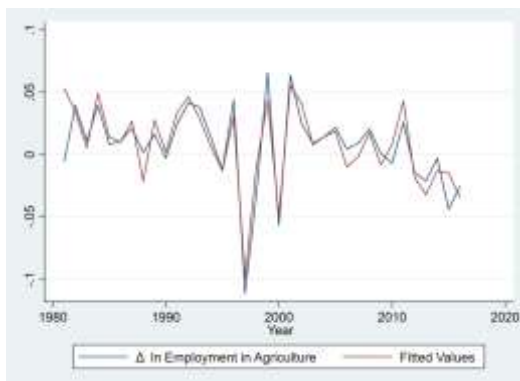
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 15.283         | -7.525         | $\chi^2(33)$            | $\chi^2(16)$            | 0.011     | 0.015 | 0.875          |
| [0.000, 0.000] | [0.000, 0.000] | 0.270                   | 9.603                   |           |       |                |
|                |                | [0.602]                 | [0.886]                 |           |       |                |

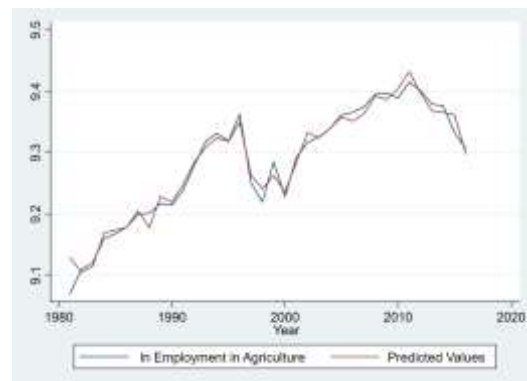
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Employment in Agriculture are 0.009, 0.035, -0.111, and 0.071 respectively.

Figure 1. Actual v. Predicted Employment in Agriculture, along with residuals

Panel A: Log first-difference

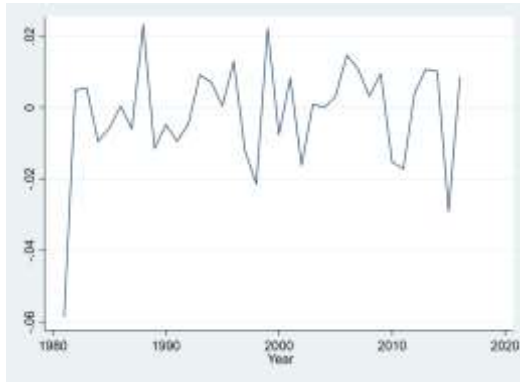


Panel B: Log level

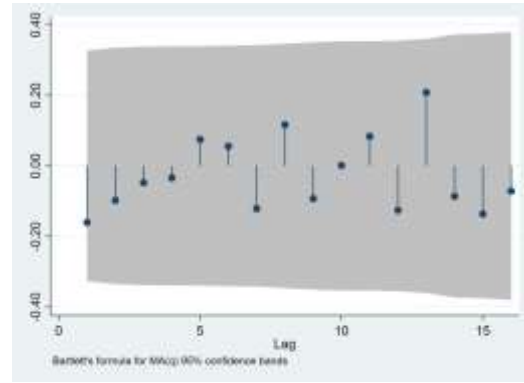




Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 51. Employment in Industry

Estimation Period: 1984 – 2016

$$\begin{aligned}
 \Delta \text{Employment in Industry} = & \underbrace{-0.963 \text{ Employment in Industry}_{t-1}}_{\text{Adjustment}} \\
 & - 9.875 + 0.187 \text{ Machinery Imports, Real} \\
 & \quad (2.092) \quad (0.015) \\
 & \underbrace{-0.083 \text{ BPO Service Exports, Real} + 0.959 \text{ Total Population}}_{\text{Long-run}} \\
 & \quad (0.013) \quad (0.) \\
 & - 0.009 \Delta \text{Machinery Imports, Real} - 0.101 \Delta \text{Machinery Imports, Real}_{t-1} - 0.077 \Delta \text{Machinery Imports, Real}_{t-2} \\
 & \quad (0.025) \quad (0.021) \quad (0.027) \\
 & + 0.043 \Delta \text{BPO Service Exports, Real} + 0.054 \Delta \text{BPO Service Exports, Real}_{t-1} + 0.033 \Delta \text{BPO Service Exports, Real}_{t-2} \\
 & \quad (0.014) \quad (0.012) \quad (0.13) \\
 & - 0.049 \Delta \text{Total Population} - 1.533 \Delta \text{Total Population}_{t-1} - 2.024 \Delta \text{Total Population}_{t-2} \\
 & \quad (0.665) \quad (0.831) \quad (0.724) \\
 & \underbrace{\hspace{15em}}_{\text{Short-run}}
 \end{aligned}$$

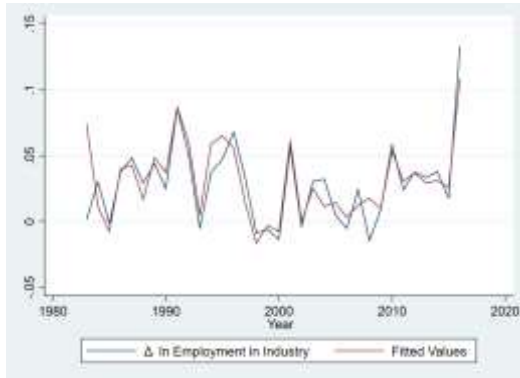
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
|                |                | $\chi^2 (31)$           | $\chi^2 (15)$           |           |       |                |
| 11.714         | -5.721         | 0.927                   | 6.632                   | 0.011     | 0.017 | 0.838          |
| [0.000, 0.001] | [0.000, 0.002] | [0.335]                 | [0.967]                 |           |       |                |

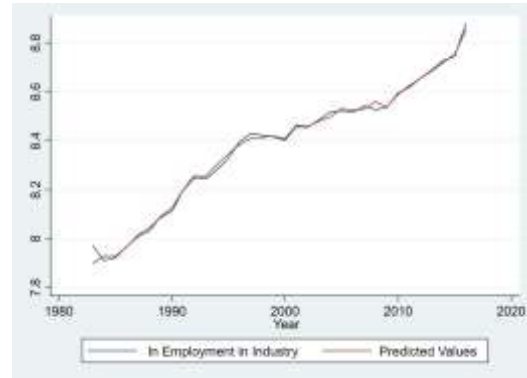
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Employment in Industry are 0.031, 0.034, -0.014, and 0.132 respectively.

Figure 1. Actual v. Predicted Employment in Industry, along with residuals

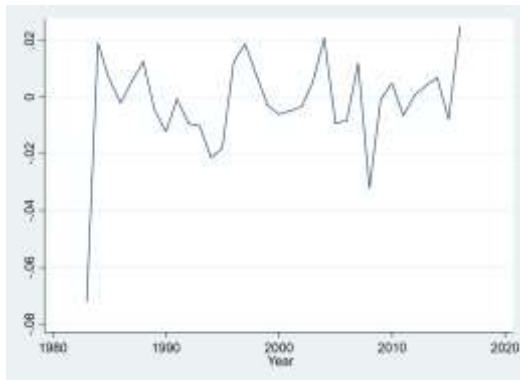
Panel A: Log first-difference



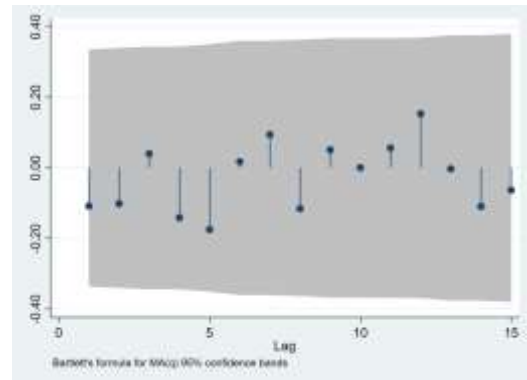
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 52. Employment in Service

Estimation Period: 1984 – 2016

$$\begin{aligned}
 \Delta \text{Employment in Service} = & \underbrace{-0.967 \text{ Employment in Service}_{t-1}}_{\text{Adjustment}} \\
 & \underbrace{-19.275 + 0.105 \text{ GVA Service, Real} + 1.560 \text{ Total Population}}_{\text{Long-run}} \\
 & \underbrace{+ 0.422 \Delta \text{Employment in Service}_{t-1} + 0.509 \Delta \text{Employment in Service}_{t-2} + 0.549 \Delta \text{Employment in Service}_{t-3}}_{\text{Short-run}} \\
 & \underbrace{-1.184 \Delta \text{Total Population} - 0.969 \Delta \text{Total Population}_{t-1}}_{\text{Short-run}}
 \end{aligned}$$

(0.191) (4.052) (0.034) (0.073) (0.197) (0.183) (0.196) (0.536) (0.512)

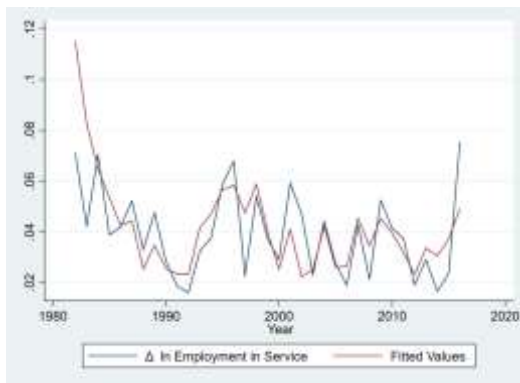
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 9.106          | -5.048         | $\chi^2 (31)$           | $\chi^2 (15)$           | 0.010     | 0.014 | 0.540          |
| [0.001, 0.005] | [0.000, 0.003] | [0.634]                 | [0.472]                 |           |       |                |

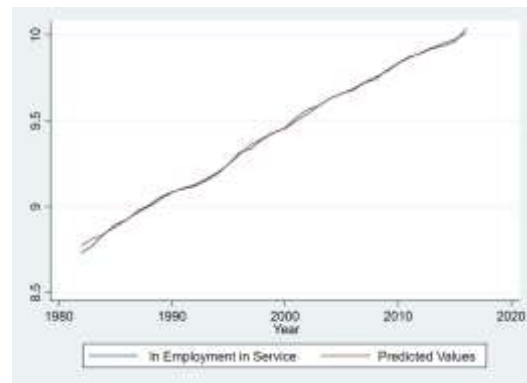
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Employment in Service are 0.040, 0.018, 0.016, and 0.082 respectively.

Figure 1. Actual v. Predicted Employment in Service, along with residuals

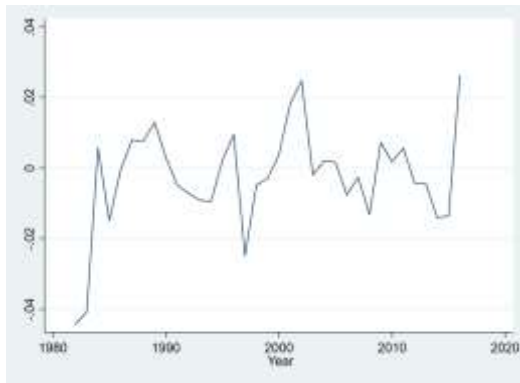
Panel A: Log first-difference



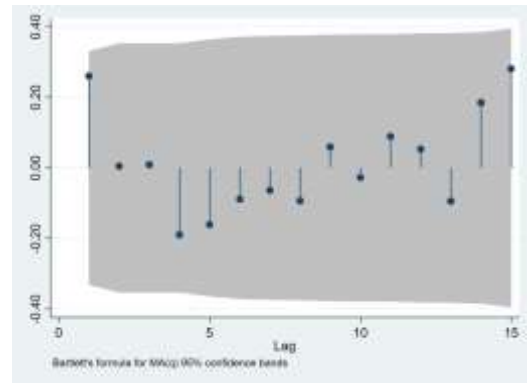
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



### 53. Labor Force

Estimation Period: 1982 – 2016

$$\begin{aligned}
 \Delta \text{Labor Force} = & \underbrace{-0.596 \text{ Labor Force}_{t-1}}_{\text{Adjustment}} \\
 & + 4.957 + 0.086 \text{ Total Use of Government Income} \\
 & \quad (1.043) \quad (0.026) \\
 & - 0.053 \text{ Export of Services, Real} + 0.117 \text{ Compensation of Residents} \\
 & \quad (0.012) \quad (0.026) \\
 & \underbrace{\hspace{10em}}_{\text{Long-run}}
 \end{aligned}$$

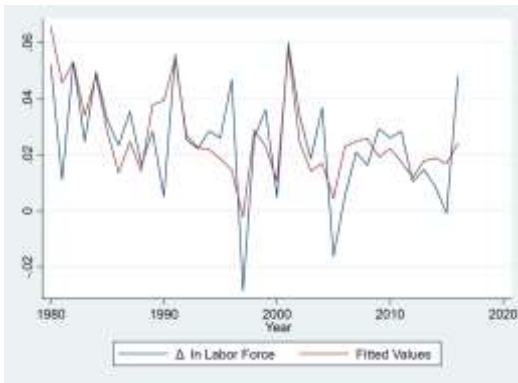
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 7.418          | -4.579         | $\chi^2(33)$            | $\chi^2(16)$            | 0.10      | 0.014 | 0.497          |
| [0.001, 0.006] | [0.001, 0.012] | [0.227]                 | [0.266]                 |           |       |                |

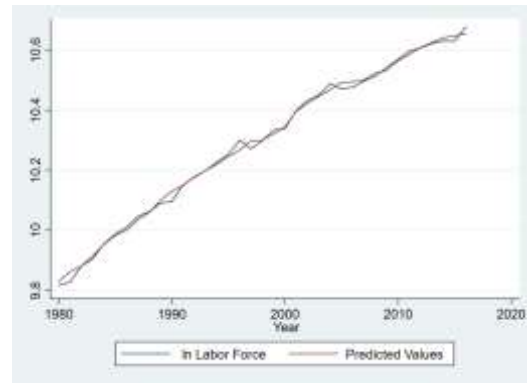
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Labor Force are 0.026, 0.025, -0.033, and 0.092 respectively.

Figure 1. Actual v. Predicted Labor Force, along with residuals

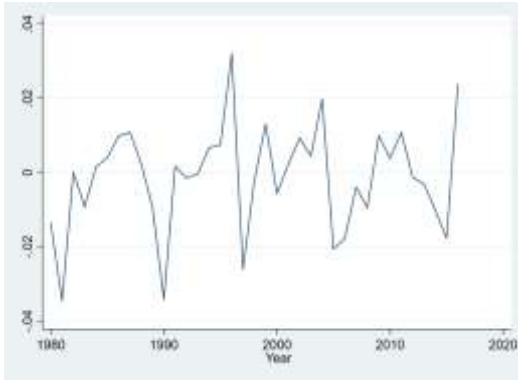
Panel A: Log first-difference



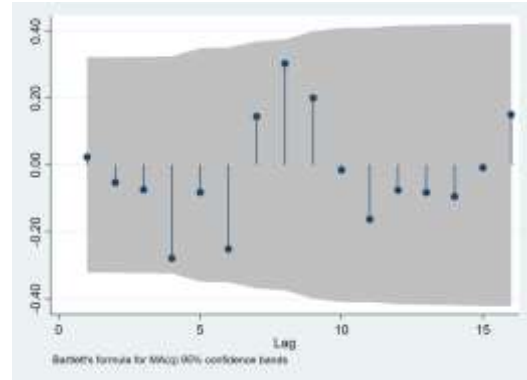
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 54. Unemployment Rate

Estimation Period: 1967 – 2016

$$\begin{aligned}
 \Delta \text{Unemployment Rate} = & \underbrace{-1.354 \text{ Unemployment Rate}_{t-1}}_{\text{Adjustment}} \\
 & \underbrace{+ 10.720 - 0.660 \text{ Labor Force} + 0.501}_{\text{Long-run}} \\
 & \underbrace{+ 1.144 \Delta \text{Labor Force} + 1.738 \Delta \text{Labor Force}_{t-1} + 2.056 \Delta \text{Labor Force}_{t-2} - 0.430 \Delta}_{\text{Short-run}}
 \end{aligned}$$

(0.135) (1.228) (0.056) (0.033) (0.650) (0.665) (0.663) (0.112)

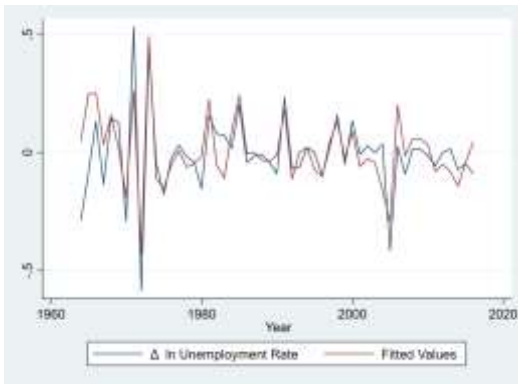
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 33.846         | -10.014        | $\chi^2$ (48)           | $\chi^2$ (24)           | 0.079     | 0.109 | 0.718          |
| [0.000, 0.000] | [0.000, 0.000] | [0.837]                 | [0.977]                 |           |       |                |

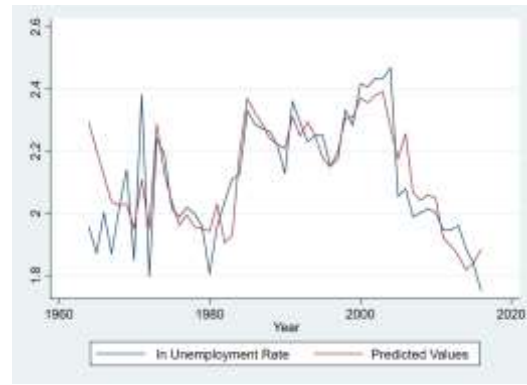
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Unemployment Rate are -0.004, 0.190, -0.584, and 0.531 respectively.

Figure 1. Actual v. Predicted Unemployment Rate, along with residuals

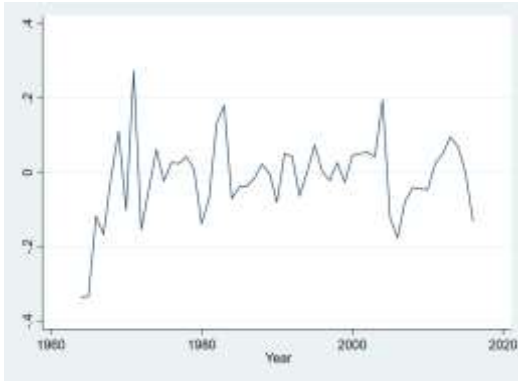
Panel A: Log first-difference



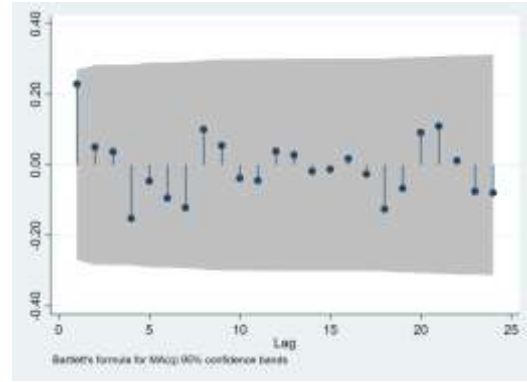
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 55. Wage Index – Agriculture

Estimation Period: 1982 – 2016

$$\begin{aligned}
 \Delta \text{Wage Index, Agriculture} = & \underbrace{-1.216 \text{ Wage Index, Agriculture}_{t-1}}_{\text{Adjustment}} \\
 & \underbrace{-1.295 + 0.691 \text{ Employment in Industry} - 0.134 \text{ IPIN, Agricultural Exports}}_{\text{Long-run}} \\
 & \underbrace{+ 0.345 \Delta \text{Wage Index, Agriculture}_{t-1} - 0.531 \Delta \text{Employment in Industry} + 0.084 \Delta \text{IPIN, Agricultural Exports} + 0.073 \Delta \text{IPIN, Agricultural Exports}_{t-1}}_{\text{Short-run}}
 \end{aligned}$$

(0.179) (0.138) (0.028) (0.011) (0.138) (0.187) (0.031) (0.026)

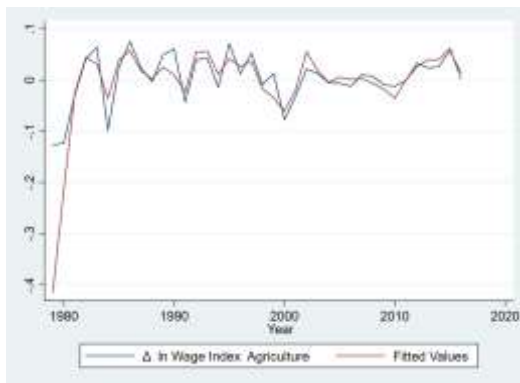
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 15.547         | -6.787         | $\chi^2(33)$            | $\chi^2(17)$            | 0.026     | 0.053 | 0.658          |
| [0.000, 0.000] | [0.000, 0.000] | [0.136]                 | [0.955]                 |           |       |                |

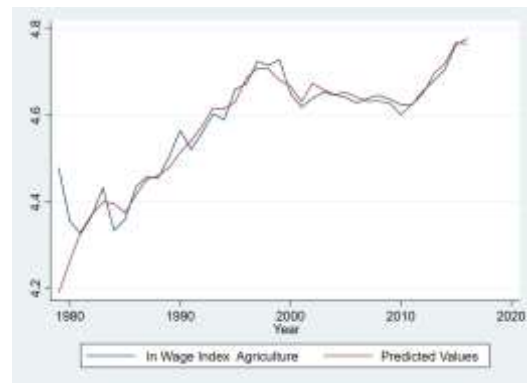
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Wage Index – Agriculture are 0.008, 0.056, -0.127, and 0.201 respectively.

Figure 1. Actual v. Predicted Wage Index – Agriculture, along with residuals

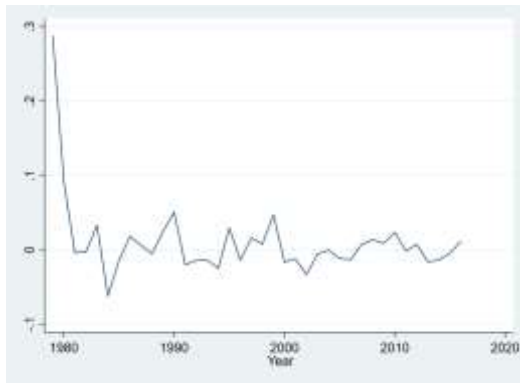
Panel A: Log first-difference



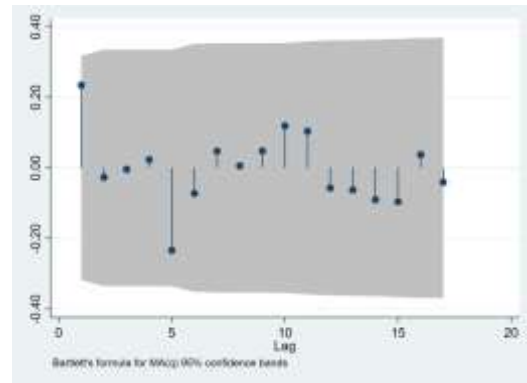
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 56. Wage Index – Construction

Estimation Period: 1980 – 2016

$$\begin{aligned}
 \Delta \text{Wage Index, Construction} = & \underbrace{-0.489 \text{ Wage Index, Construction}_{t-1}}_{\text{Adjustment}} \\
 & \underbrace{-26.487 + 0.531 \text{ Unemployment Rate} - 0.377 \text{ IPIN, Capital Formation}}_{\text{Long-run}} \\
 & \underbrace{-0.200 \Delta \text{Unemployment Rate} + 0.140 \Delta \text{IPIN, Capital Formation} + 0.014 \Delta \text{Year}}_{\text{Short-run}}
 \end{aligned}$$

(0.121) (9.379) (0.184) (0.150) (0.089) (0.139) (0.004)

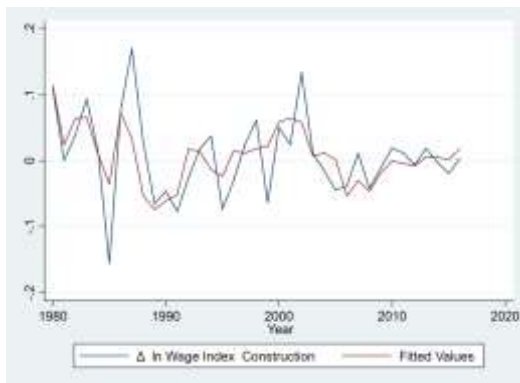
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 7.680          | -4.037         | $\chi^2$ (35)           | $\chi^2$ (16)           | 0.031     | 0.045 | 0.458          |
| [0.008, 0.023] | [0.015, 0.053] | [0.905]                 | [0.265]                 |           |       |                |

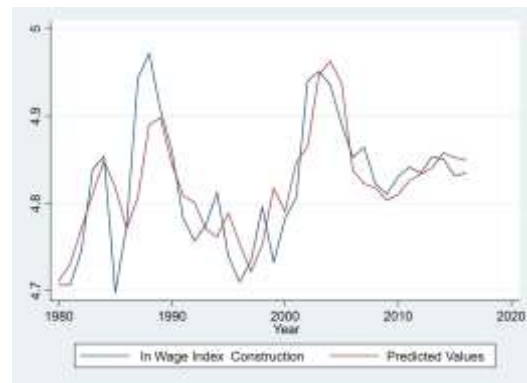
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Wage Index – Construction are 0.006, 0.062, -0.156, and 0.170 respectively.

Figure 1. Actual v. Predicted Wage Index – Construction, along with residuals

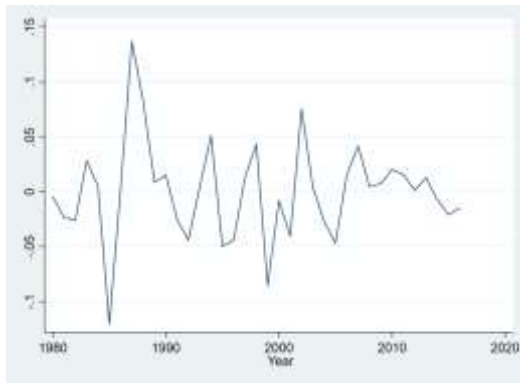
Panel A: Log first-difference



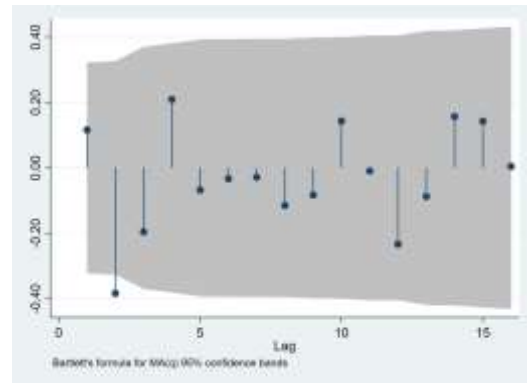
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 57. Wage Index – Electricity and Steam

Estimation Period: 1983 – 2016

$$\begin{aligned}
 \Delta \text{Wage Index, Electricity and Steam} = & \underbrace{-0.701 \text{ Wage Index, Electricity and Steam}_{t-1}}_{\text{Adjustment}} \\
 & \underbrace{-11.090 + 0.220}_{\text{Long-run}} \\
 & \underbrace{+0.007 \Delta \text{Year}}_{\text{Short-run}}
 \end{aligned}$$

(0.178) (5.118) (0.145) (0.002)

Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 7.785          | -3.936         | $\chi^2(32)$            | $\chi^2(16)$            | 0.054     | 0.080 | 0.342          |
| [0.036, 0.058] | [0.020, 0.041] | 0.011                   | 18.949                  |           |       |                |
|                |                | [0.914]                 | [0.271]                 |           |       |                |

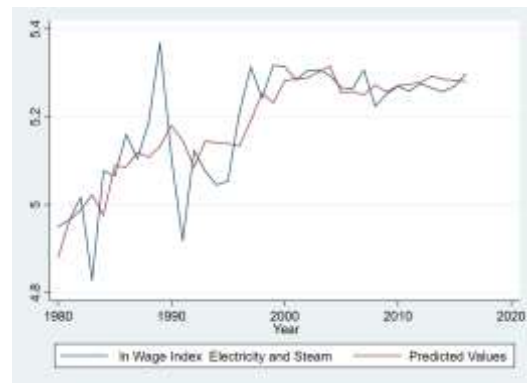
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Wage Index – Electricity and Steam are 0.014, 0.103, -0.259, and 0.248 respectively.

Figure 1. Actual v. Predicted Wage Index – Electricity and Steam, along with residuals

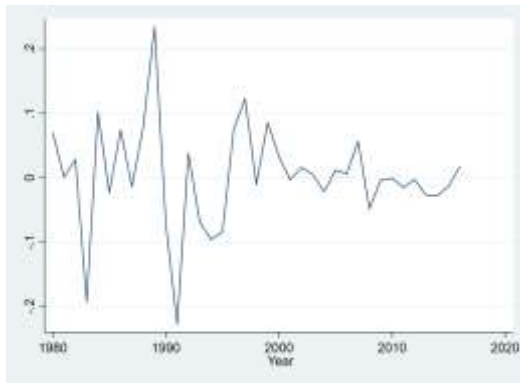
Panel A: Log first-difference



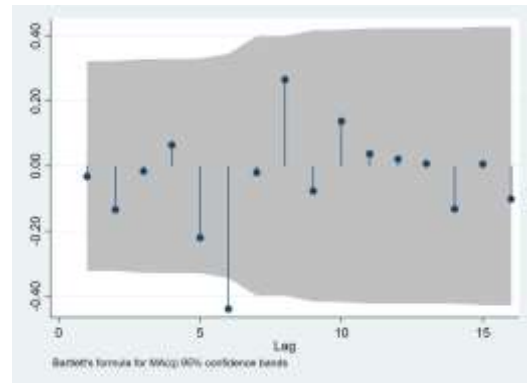
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals





## 58. Wage Index – Finance

Estimation Period: 1990 – 2016

$$\begin{aligned}
 \Delta \text{Wage Index, Finance} = & \underbrace{-1.226 \text{ Wage Index, Finance}_{t-1}}_{\text{Adjustment}} \\
 & + \underbrace{3.333}_{(0.410)} + \underbrace{0.258 \text{ Reverse Repurchase Rate}}_{(0.020)} + \underbrace{0.417 \text{ USD Nominal Exchange Rate}}_{(0.031)} \\
 & + 0.423 \Delta \text{Wage Index, Finance}_{t-1} + 0.453 \Delta \text{Wage Index, Finance}_{t-2} - 0.228 \Delta \text{Reverse Repurchase Rate} \\
 & - 0.297 \Delta \text{Reverse Repurchase Rate}_{t-1} - 0.219 \Delta \text{Reverse Repurchase Rate}_{t-2} \\
 & - 0.710 \Delta \text{USD Nominal Exchange Rate} - 0.787 \Delta \text{USD Nominal Exchange Rate}_{t-1} \\
 & - 0.478 \Delta \text{USD Nominal Exchange Rate}_{t-2} - 0.403 \Delta \text{USD Nominal Exchange Rate}_{t-3} \\
 & \underbrace{\hspace{10em}}_{\text{Short-run}}
 \end{aligned}$$

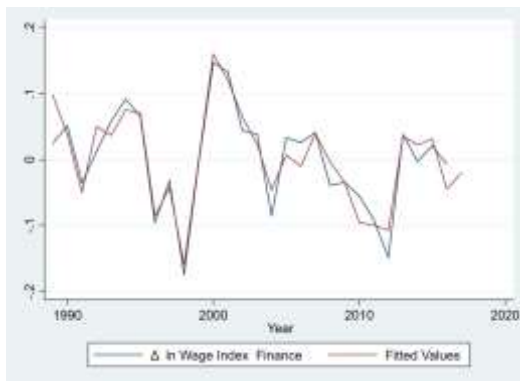
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 26.354         | -8.794         | $\chi^2(25)$<br>2.397   | $\chi^2(12)$<br>7.308   | 0.020     | 0.026 | 0.906          |
| [0.000, 0.000] | [0.000, 0.000] | [0.121]                 | [0.836]                 |           |       |                |

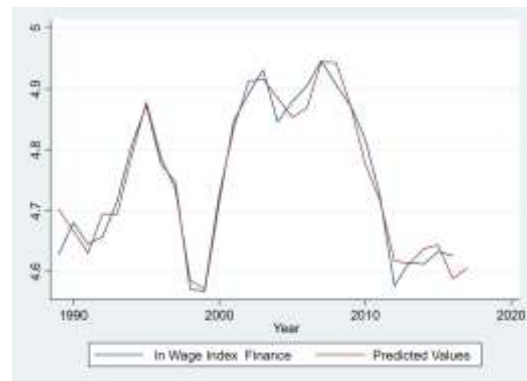
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Wage Index – Finance are 0.006, 0.090, -0.253, and 0.194 respectively.

Figure 1. Actual v. Predicted Wage Index – Finance, along with residuals

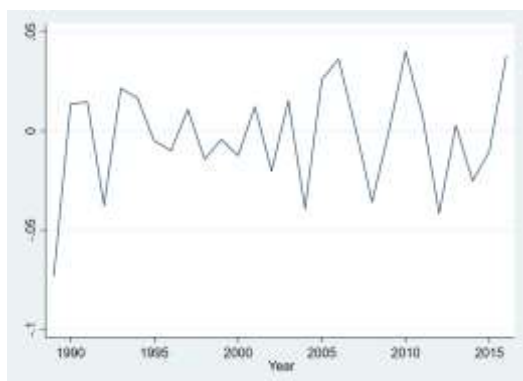
Panel A: Log first-difference



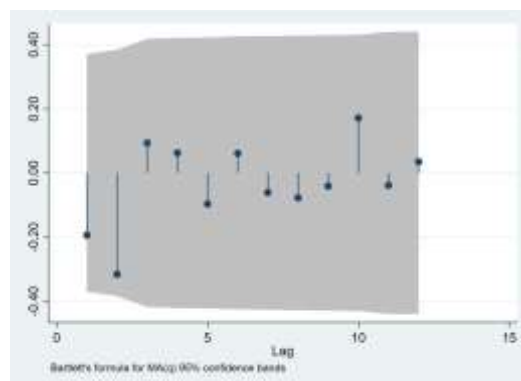
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



### 59. Wage Index – Manufacturing

Estimation Period: 1981 – 2016

$$\begin{aligned}
 \Delta \text{Wage Index, Manufacturing} = & \underbrace{-0.413 \text{ Wage Index, Manufacturing}_{t-1}}_{\text{Adjustment}} \\
 & + \underbrace{1.853 \text{ (0.388)} + 0.390 \text{ IPIN, Materials Imports (0.138)} - 0.942 \text{ IPIN, Machinery Imports (0.215)} - 0.119 \text{ IPIN, Fuel Imports (0.033)} + 0.415 \text{ IPIN, Export Goods (0.187)}}_{\text{Long-run}} \\
 & + \underbrace{0.215 \Delta \text{Wage Index, Manufacturing}_{t-1} \text{ (0.129)} - 0.306 \Delta \text{IPIN, Materials Imports (0.080)} - 0.105 \Delta \text{IPIN, Fuel Imports (0.045)} - 0.074 \Delta \text{IPIN, Fuel Imports}_{t-1} \text{ (0.040)}}_{\text{Short-run}}
 \end{aligned}$$

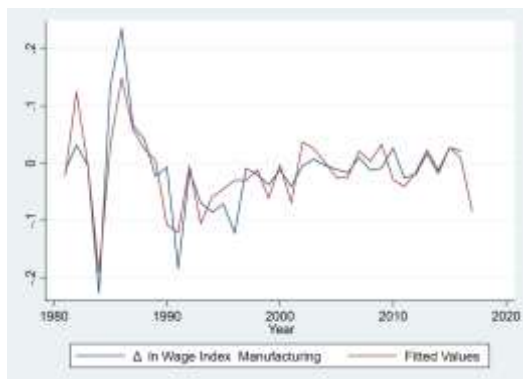
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
|                |                | $\chi^2 (34)$           | $\chi^2 (16)$           |           |       |                |
| 7.122          | -4.705         | 0.739                   | 15.076                  | 0.029     | 0.042 | 0.678          |
| [0.001, 0.006] | [0.001, 0.016] | [0.389]                 | [0.519]                 |           |       |                |

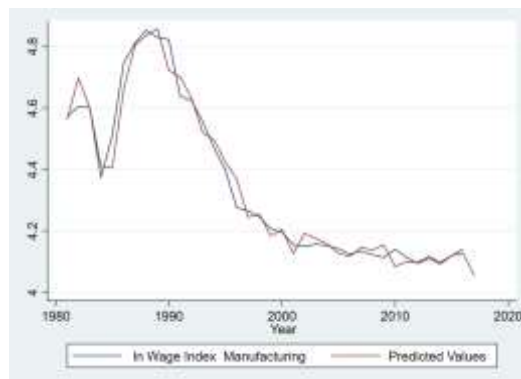
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Wage Index – Manufacturing are -0.012, 0.074, -0.226, and 0.234 respectively.

Figure 1. Actual v. Predicted Wage Index – Manufacturing, along with residuals

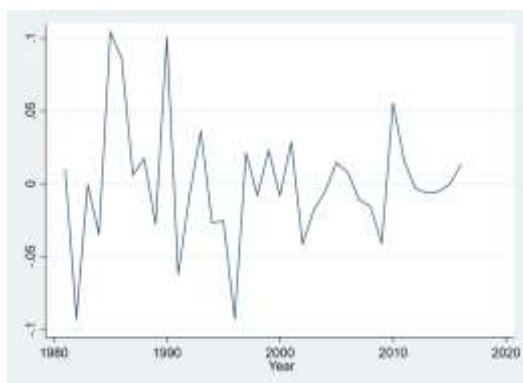
Panel A: Log first-difference



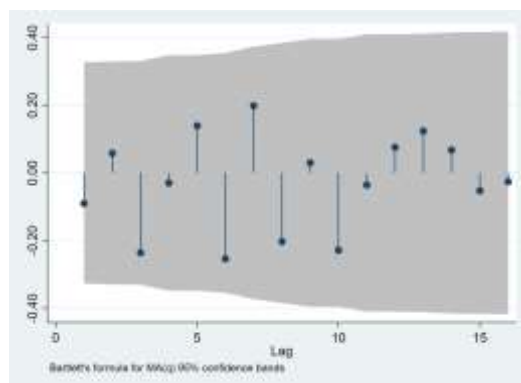
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 60. Wage Index – Mining

Estimation Period: 1983 – 2016

$$\begin{aligned}
 \Delta \text{Wage Index, Mining} = & \underbrace{-0.529 \text{ Wage Index, Mining}_{t-1}}_{\text{Adjustment}} \\
 & + \underbrace{3.466 - 0.665 \text{ Unemployment Rate} + 0.468 \text{ IPIN Machinery Imports}}_{\text{Long-run}} \\
 & + 0.074 \Delta \text{Wage Index, Mining}_{t-1} + 0.299 \Delta \text{Wage Index, Mining}_{t-2} + 0.504 \Delta \text{Unemployment Rate} \\
 & + 0.414 \Delta \text{Unemployment Rate}_{t-1} + 0.350 \Delta \text{Unemployment Rate}_{t-2} \\
 & - 0.095 \Delta \text{IPIN Machinery Imports} - 0.362 \Delta \text{IPIN Machinery Imports}_{t-1} \\
 & \underbrace{\hspace{10em}}_{\text{Short-run}}
 \end{aligned}$$

(0.102) (0.734) (0.158) (0.047) (0.144) (0.139) (0.166) (0.158) (0.152) (0.080) (0.080)

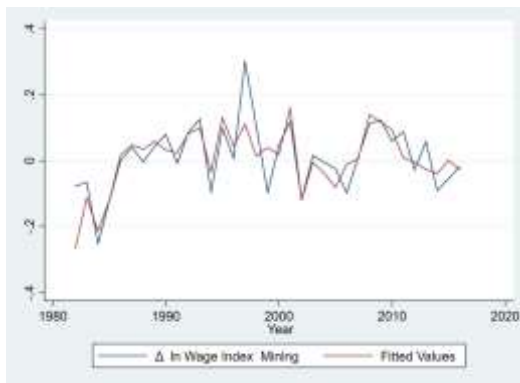
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 9.082          | -5.094         | $\chi^2(32)$            | $\chi^2(15)$            | 0.047     | 0.065 | 0.654          |
| [0.001, 0.005] | [0.000, 0.003] | [0.345]                 | [0.239]                 |           |       |                |

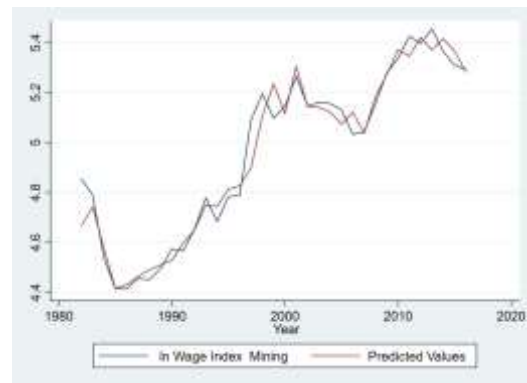
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Wage Index – Mining are 0.015, 0.100, -0.252, and 0.301 respectively.

Figure 1. Actual v. Predicted Wage Index – Mining, along with residuals

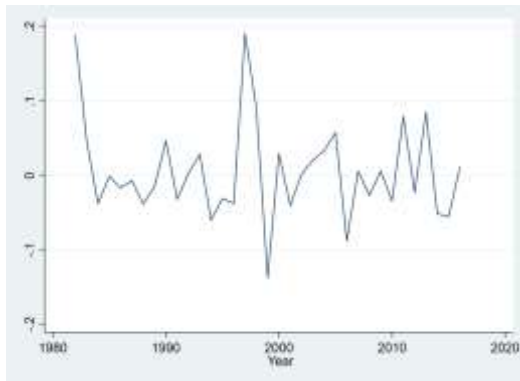
Panel A: Log first-difference



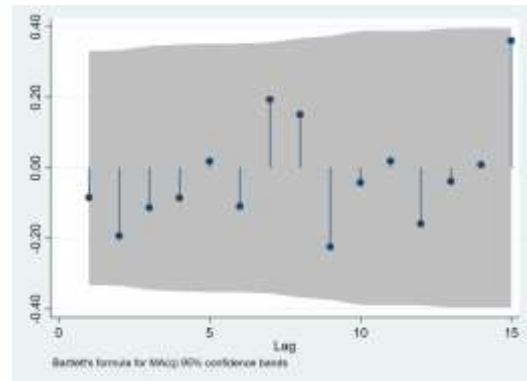
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 61. Wage Index – Private Service

Estimation Period: 1983 – 2016

$$\begin{aligned} \Delta \text{Wage Index, Private Service} = & \underbrace{-0.320 \text{ Wage Index, Private Service}_{t-1}}_{\text{Adjustment}} \\ & \underbrace{- 29.775 + 0.882 \text{ Unemployment Rate}}_{\text{Long-run}} \\ & \underbrace{+ 0.343 \Delta \text{Wage Index, Private Service}_{t-1} + 0.015 \Delta \text{Year}}_{\text{Short-run}} \\ & \quad (0.106) \quad (0.297) \quad (0.168) \quad (0.005) \end{aligned}$$

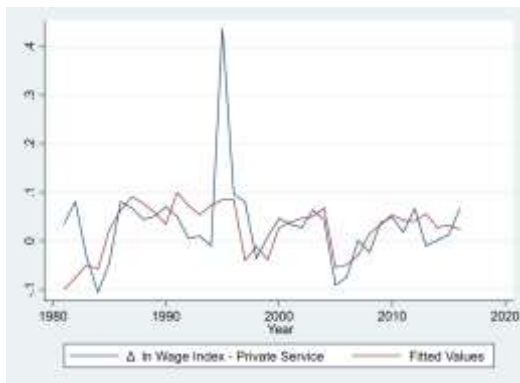
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
|                |                | $\chi^2 (32)$           | $\chi^2 (16)$           |           |       |                |
| 4.919          | -3.015         | 1.185                   | 12.173                  | 0.049     | 0.079 | 0.276          |
| [0.171, 0.241] | [0.135, 0.211] | [0.276]                 | [0.731]                 |           |       |                |

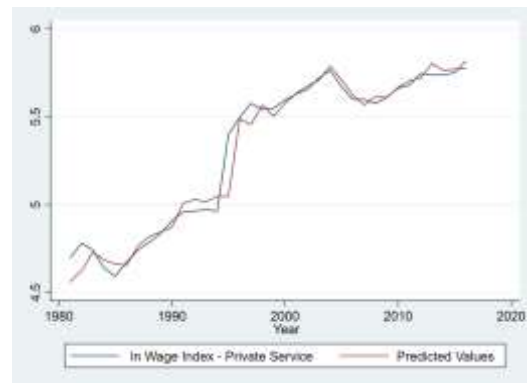
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Wage Index – Private Service are 0.032, 0.084, -0.106, and 0.437 respectively.

Figure 1. Actual v. Predicted Wage Index – Private Service, along with residuals

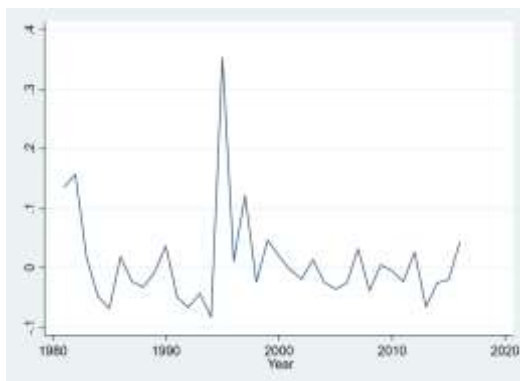
Panel A: Log first-difference



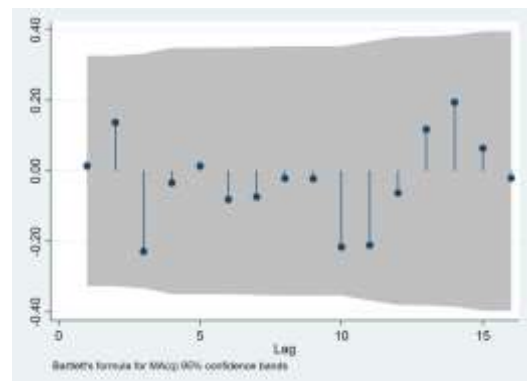
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 62. Wage Index – Real Estate

Estimation Period: 1990 – 2016

$$\begin{aligned}
 \Delta \text{Wage Index, Real Estate} = & \underbrace{-0.884 \text{ Wage Index, Real Estate}_{t-1}}_{\text{Adjustment}} \\
 & + 36.819 \text{ (12.584)} - 0.020 \text{ Unemployment Rate (0.101)} \\
 & - 0.392 \text{ Lending Rate (0.133)} - 0.178 \text{ IPIN, Service Exports (0.043)} \\
 & \underbrace{\phantom{-0.392 \text{ Lending Rate (0.133)} - 0.178 \text{ IPIN, Service Exports (0.043)}}}_{\text{Long-run}} \\
 & + 0.330 \Delta \text{Lending Rate (0.095)} + 0.287 \Delta \text{Lending Rate}_{t-1} \text{ (0.106)} + 0.016 \Delta \text{Year (0.006)} \\
 & \underbrace{\phantom{+ 0.330 \Delta \text{Lending Rate (0.095)} + 0.287 \Delta \text{Lending Rate}_{t-1} \text{ (0.106)} + 0.016 \Delta \text{Year (0.006)}}}_{\text{Short-run}}
 \end{aligned}$$

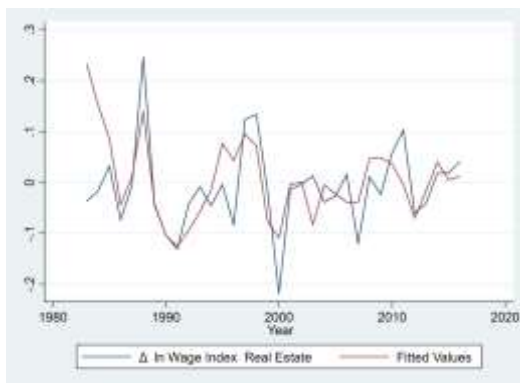
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
|                |                | $\chi^2 (29)$           | $\chi^2 (15)$           |           |       |                |
| 6.195          | -4.716         | 0.753                   | 15.777                  | 0.055     | 0.077 | 0.545          |
| [0.014, 0.044] | [0.004, 0.024] | [0.385]                 | [0.396]                 |           |       |                |

Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Wage Index – Real Estate are -0.010, 0.082, -0.218, and 0.245 respectively.

Figure 1. Actual v. Predicted Wage Index – Real Estate, along with residuals

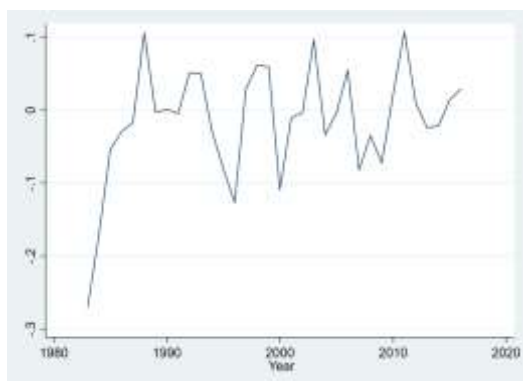
Panel A: Log first-difference



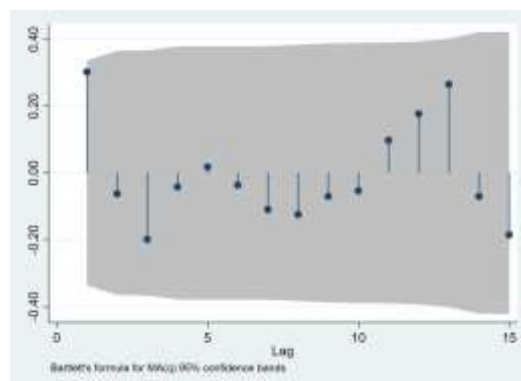
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



### 63. Wage Index – Trade

Estimation Period: 1983 – 2016

$$\begin{aligned}
 \Delta \text{Wage Index, Trade} = & \underbrace{-0.779 \text{ Wage Index, Trade}_{t-1}}_{\text{Adjustment}} \\
 & + \underbrace{4.381 + 0.140 \text{ Unemployment Rate} - 0.303 \text{ Wage Index, Manufacturing}}_{\text{Long-run}} \\
 & \underbrace{+ 0.577 \Delta \text{Wage Index, Trade}_{t-1} + 0.420 \Delta \text{Wage Index, Trade}_{t-2} + 0.502 \Delta \text{Wage Index, Manufacturing}}_{\text{Short-run}}
 \end{aligned}$$

(0.201) (1.173) (0.080) (0.057) (0.164) (0.179) (0.181)

Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 5.265          | -3.873         | $\chi^2(32)$            | $\chi^2(15)$            | 0.045     | 0.057 | 0.550          |
| [0.020, 0.056] | [0.006, 0.031] | 1.394                   | 12.150                  |           |       |                |
|                |                | [0.237]                 | [0.667]                 |           |       |                |

Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ )Wage Index – Trade are 0.001, 0.081, -0.324, and 0.175 respectively.

Figure 1. Actual v. Predicted Wage Index – Trade, along with residuals

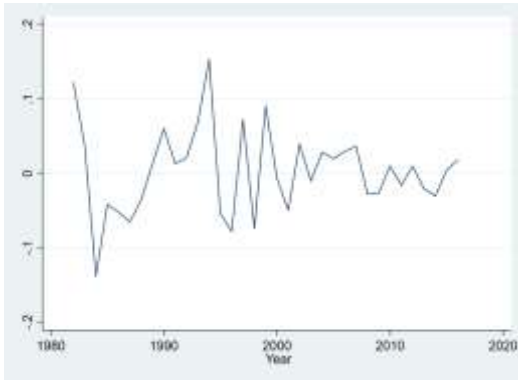
Panel A: Log first-difference



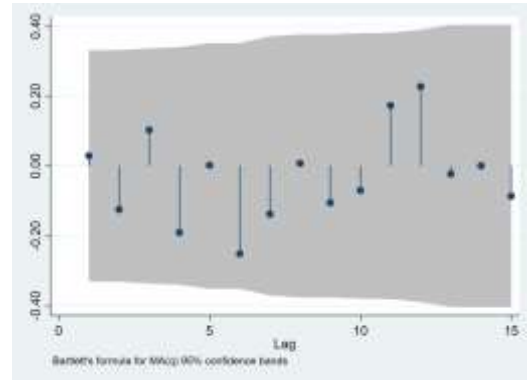
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



#### 64. Wage Index – Transportation

Estimation Period: 1983 – 2016

$$\begin{aligned}
 \Delta Wage\ Index, Transportation = & \underbrace{-0.737\ Wage\ Index, Transportation_{t-1}}_{\text{Adjustment}} \\
 & + 2.600 + 0.123\ Unemployment\ Rate \\
 & \quad (0.613) \quad (0.079) \\
 & + 0.309\ IPIN, Capital\ Formation + 0.187\ Inflation\ Rate \\
 & \quad (0.054) \quad (0.039) \\
 & \quad \quad \quad \text{Long-run} \\
 & + 0.403\ \Delta Wage\ Index, Transportation_{t-1} - 0.025\ \Delta Unemployment\ Rate - 0.181\ \Delta Unemployment\ Rate_{t-1} \\
 & \quad (0.177) \quad (0.092) \quad (0.100) \\
 & - 0.280\ \Delta Unemployment\ Rate_{t-2} - 0.924\ \Delta IPIN, Capital\ Formation - 0.643\ \Delta IPIN, Capital\ Formation_{t-1} \\
 & \quad (0.095) \quad (0.188) \quad (0.234) \\
 & - 0.580\ \Delta IPIN, Capital\ Formation_{t-2} - 0.107\ \Delta Inflation\ Rate - 0.107\ \Delta Inflation\ Rate_{t-1} \\
 & \quad (0.221) \quad (0.033) \quad (0.019) \\
 & \quad \quad \quad \text{Short-run}
 \end{aligned}$$



Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 10.023         | -3.734         | $\chi^2 (32)$           | $\chi^2 (16)$           | 0.030     | 0.042 | 0.780          |
| [0.000, 0.002] | [0.009, 0.059] | [0.804]                 | [0.214]                 |           |       |                |

Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Wage Index – Transportation are 0.023, 0.072, -0.176, and 0.145 respectively.

Figure 1. Actual v. Predicted Wage Index – Transportation, along with residuals

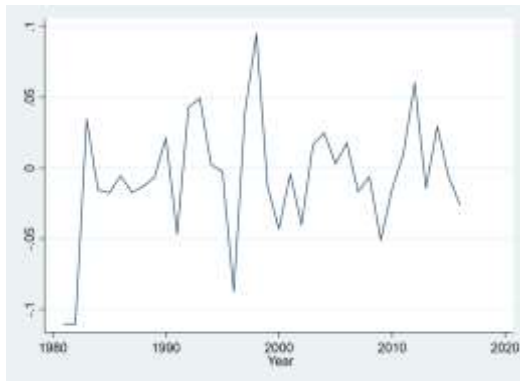
Panel A: Log first-difference



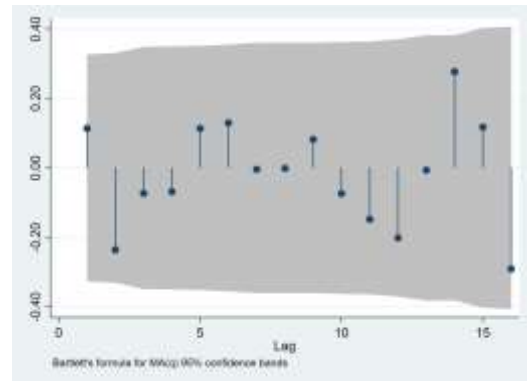
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 65. Consumer Price Index, Philippines

Estimation Period: 1981 – 2016

$$\begin{aligned}
 \Delta CPI, Philippines = & \underbrace{-0.771 CPI, Philippines_{t-1}}_{\text{Adjustment}} \\
 & - 2.457 + 0.204 Broad Money + 0.121 Petroleum Tax Rate \\
 & \quad (0.427) \quad (0.021) \quad (0.024) \\
 & + 0.688 IPIN GVA, Agriculture - 0.360 Value Added Tax Rate \\
 & \quad (0.049) \quad (0.128) \\
 & \quad \quad \quad \text{Long-run} \\
 & - 0.240 \Delta Broad Money - 0.007 \Delta Broad Money_{t-1} - 0.152 \Delta Broad Money_{t-2} \\
 & \quad (0.096) \quad (0.078) \quad (0.085) \\
 & + 0.194 \Delta Broad Money_{t-3} - 0.084 \Delta Petroleum Tax Rate - 0.063 \Delta Petroleum Tax Rate_{t-1} \\
 & \quad (0.086) \quad (0.019) \quad (0.022) \\
 & - 0.074 \Delta Petroleum Tax Rate_{t-2} - 0.068 \Delta Petroleum Tax Rate_{t-3} + 0.027 \Delta IPIN GVA, Agriculture \\
 & \quad (0.015) \quad (0.020) \quad (0.120) \\
 & + 0.191 \Delta IPIN GVA, Agriculture_{t-1} + 0.402 \Delta Value Added Tax Rate + 0.328 \Delta Value Added Tax Rate_{t-1} \\
 & \quad (0.060) \quad (0.134) \quad (0.140) \\
 & \quad \quad \quad \text{Short-run}
 \end{aligned}$$

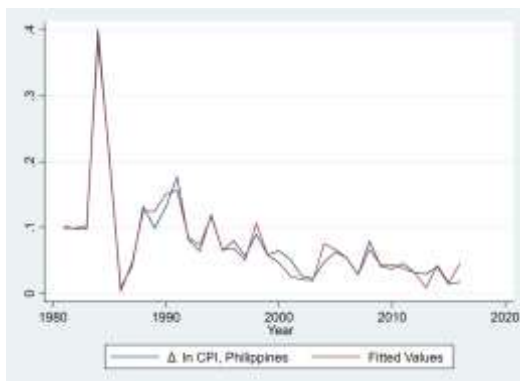
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 11.217         | -6.194         | $\chi^2 (34)$           | $\chi^2 (16)$           | 0.009     | 0.012 | 0.966          |
| [0.000, 0.001] | [0.000, 0.001] | 0.721                   | 8.868                   |           |       |                |
|                |                | [0.395]                 | [0.918]                 |           |       |                |

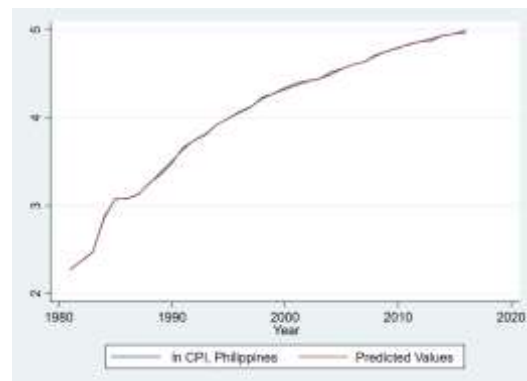
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Consumer Price Index, Philippines are 0.079, 0.069, -0.007, and 0.399 respectively.

Figure 1. Actual v. Predicted Consumer Price Index, Philippines, along with residuals

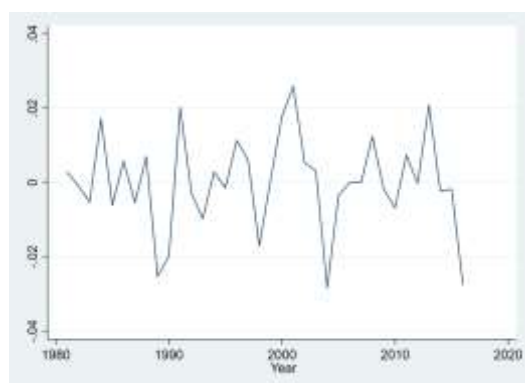
Panel A: Log first-difference



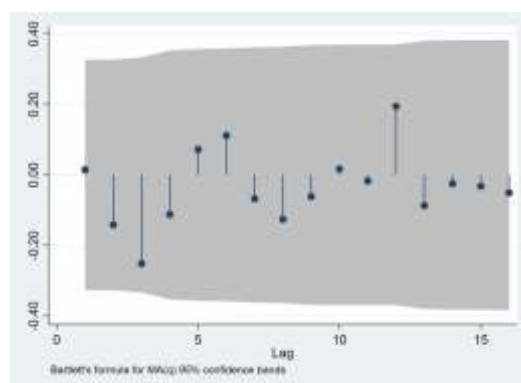
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## Fiscal Sector

### 1. Import Duties

Estimation Period: 1990 – 2016

$$\begin{aligned}
 \Delta \text{Import Duties} = & \underbrace{-0.790 \text{ Import duties}_{t-1}}_{\text{Adjustment}} \\
 & \underbrace{-2.764 + 1.020 \text{ Total Imports, Nominal}_{t-1} + 0.118 \text{ Import Duties}_{t-1} + 1.256 \text{ BIR 2011 Reform}_{t-1}}_{\text{Long-run}} \\
 & \underbrace{-0.051 \Delta \text{Total Imports, Nominal} - 1.506 \Delta \text{Total Imports, Nominal}_{t-1} + 0.093 \Delta \text{Import Duties} - 0.993 \Delta \text{BIR 2011 Reform}}_{\text{Short-run}}
 \end{aligned}$$

(2.414) (0.198) (0.028) (0.139) (0.467) (0.462) (0.024) (0.145)

Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 19.906         | 0.019          | $\chi^2(25)$            | $\chi^2(12)$            | 0.138     | 0.184 | 0.821          |
| [0.000, 0.000] | [0.000, 0.000] | 0.662                   | 13.201                  |           |       |                |
|                |                | [0.415]                 | [0.354]                 |           |       |                |

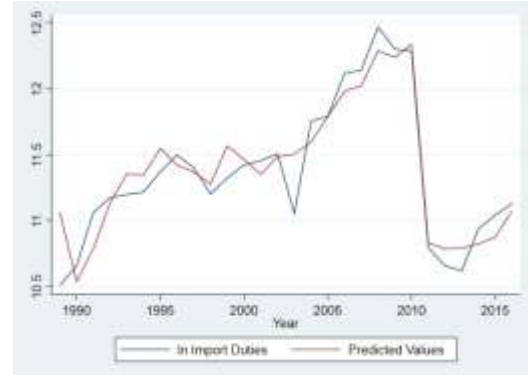
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Import Duties are 0.099, 0.316, -1.486, and 0.702 respectively.

Figure 1. Actual v. Predicted 91-day T-bill Rate, along with residuals

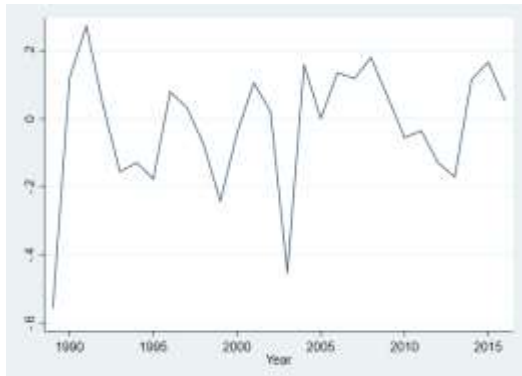
Panel A: Log first-difference



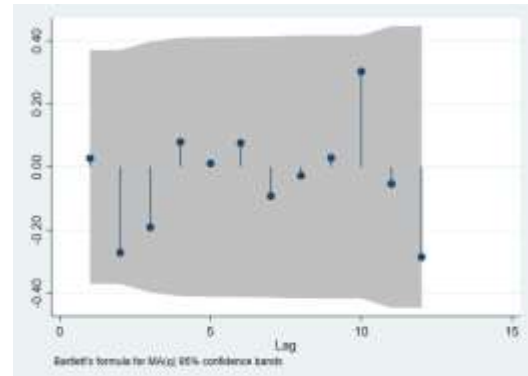
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 2. Excise Tax on Imports

Estimation Period: 1990 – 2016

$$\begin{aligned}
 \Delta \text{Import Duties and Excise Taxes} = & \underbrace{-0.873 \text{ Import Duties and Excise Taxes}_{t-1}}_{\text{Adjustment} \quad (0.101)} \\
 & - 3.338 + 1.042 \text{ Total Imports, Nominal}_{t-1} + 0.119 \text{ Import duties}_{t-1} - 0.916 \text{ BIR 2011 Reform}_{t-1} \\
 & \quad (2.125) \quad (0.155) \quad (0.022) \quad (0.111) \\
 & \quad \text{Long-run} \\
 & + 0.174 \Delta \text{Import Duties and Excise Taxes}_{t-1} + 0.060 \Delta \text{Total Imports, Nominal} - 1.599 \Delta \text{Total Imports, Nominal}_{t-1} \\
 & \quad (0.097) \quad (0.403) \quad (0.404) \\
 & + 0.104 \Delta \text{Import Duties} - 0.800 \text{ BIR 2011 Reform} \\
 & \quad (0.022) \quad (0.122) \\
 & \quad \text{Short-run}
 \end{aligned}$$

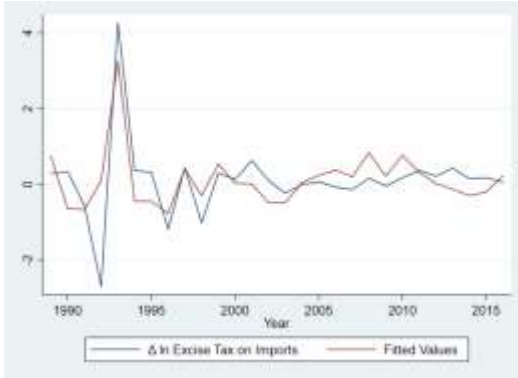
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 8.000          | -4.750         | $\chi^2(25)$<br>0.079   | $\chi^2(12)$<br>3.516   | 0.505     | 0.723 | 0.510          |
| [0.003, 0.010] | [0.001, 0.006] | [0.777]                 | [0.990]                 |           |       |                |

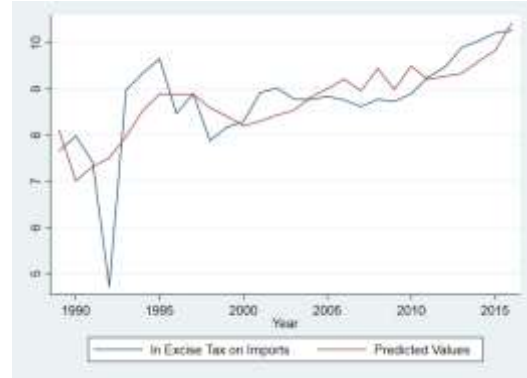
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Excise Tax on Imports are 0.089, 1.361, -4.770, and 4.770 respectively.

Figure 1. Actual v. Predicted Excise Tax on Imports, along with residuals

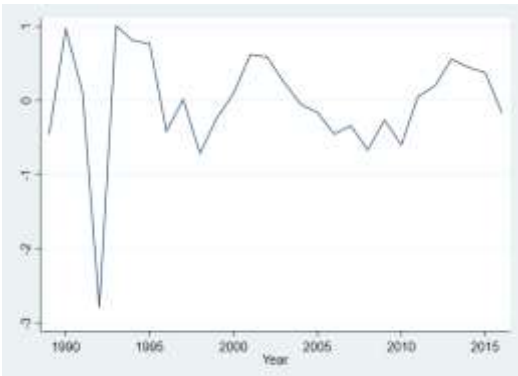
Panel A: Log first-difference



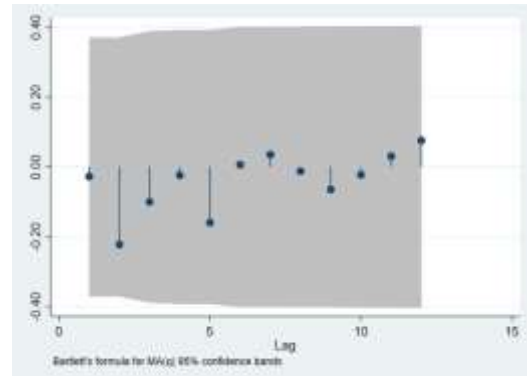
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



### 3. Import Duties and Excise Taxes

Estimation Period: 1990 – 2016

$$\begin{aligned}
 \Delta \text{Import Duties and Excise Taxes} = & \underbrace{\frac{-0.873 \text{ Import Duties and Excise Taxes}_{t-1}}{(0.101)}}_{\text{Adjustment}} \\
 & - 3.338 + 1.042 \text{ Total Imports, Nominal}_{t-1} + 0.119 \text{ Import duties}_{t-1} - 0.916 \text{ BIR 2011 Reform}_{t-1} \\
 & \underbrace{\quad (2.125) \quad (0.155) \quad (0.022) \quad (0.111) \quad}_{\text{Long-run}} \\
 & + 0.174 \Delta \text{Import Duties and Excise Taxes}_{t-1} + 0.060 \Delta \text{Total Imports, Nominal} - 1.599 \Delta \text{Total Imports, Nominal}_{t-1} \\
 & \quad (0.097) \quad (0.403) \quad (0.404) \\
 & + 0.104 \Delta \text{Import Duties} - 0.800 \Delta \text{BIR 2011 Reform} \\
 & \quad (0.022) \quad (0.122) \\
 & \underbrace{\hspace{10em}}_{\text{Short-run}}
 \end{aligned}$$

Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 22.190         | -8.569         | $\chi^2(25)$            | $\chi^2(12)$            | 0.120     | 0.174 | 0.846          |
| [0.000, 0.000] | [0.000, 0.000] | 0.471                   | 12.195                  |           |       |                |
|                |                | [0.492]                 | [0.430]                 |           |       |                |

Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Import Duties and Excise Taxes are 0.096, 0.302, -1.325, and 0.655 respectively.

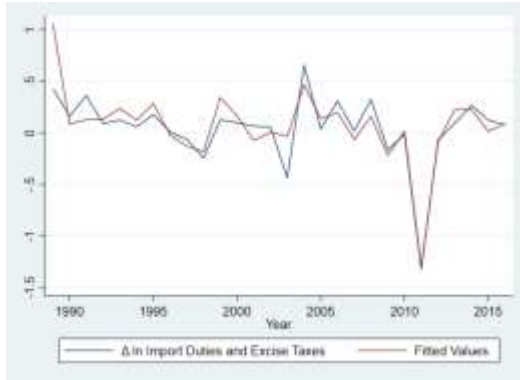
#### 4. Taxes in Business and Occupation

Estimation Period: 1990 – 2016

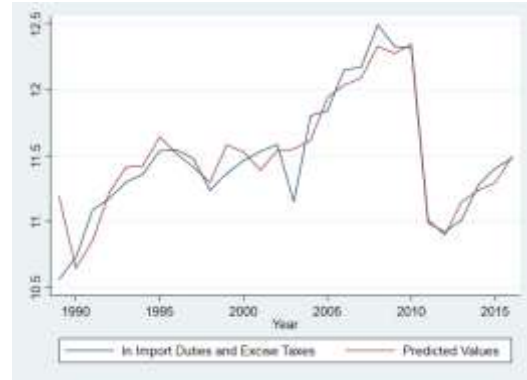
$$\Delta \text{Taxes on Business and Occupation} = \underbrace{-0.726 \text{ Taxes in Business and Occupation}_{t-1}}_{(0.109) \text{ Adjustment}}$$

Figure 1. Actual v. Predicted Import Duties and Excise Taxes, along with residuals

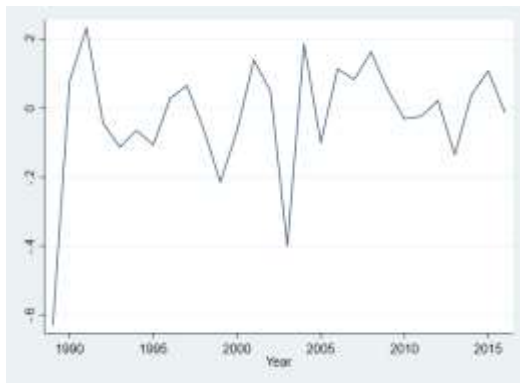
Panel A: Log first-difference



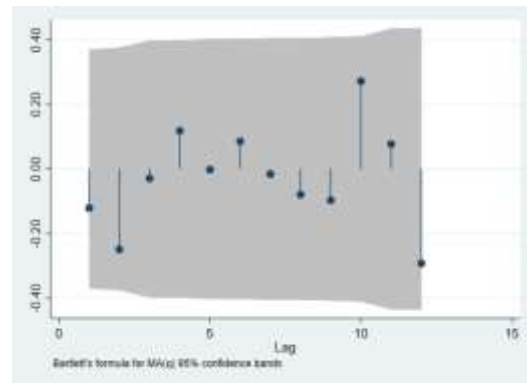
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



$$\begin{aligned} &+ 10.960 - 0.542 \text{ HFCE All Goods, Nominal}_{t-1} - 17.461 \text{ Corporate Income Tax Rate}_{t-1} \\ &\quad (2.971) \quad (0.284) \quad (0.474) \\ &+ 37.378 \text{ Personal Income Tax Rate}_{t-1} + 31.613 \text{ Value Added Tax Rate}_{t-1} \\ &\quad (0.790) \quad (0.311) \end{aligned}$$

Long-run

$$\begin{aligned} &+ 0.103 \Delta \text{HFCE All Goods, Nominal} - 0.337 \Delta \text{HFCE All Goods, Nominal}_{t-1} + 2.691 \Delta \text{HFCE All Goods, Nominal}_{t-2} \\ &\quad (0.823) \quad (0.735) \quad (0.860) \\ &+ 1.723 \text{ Corporate Income Tax Rate} + 12.615 \text{ Personal Income Tax Rate} + 0.512 \text{ Personal Income Tax Rate}_{t-1} \\ &\quad (0.400) \quad (0.288) \quad (0.210) \\ &- 49.555 \text{ Personal Income Tax Rate}_{t-2} + 22.978 \text{ Value Added Tax Rate} \\ &\quad (0.923) \quad (0.945) \end{aligned}$$

Short-run

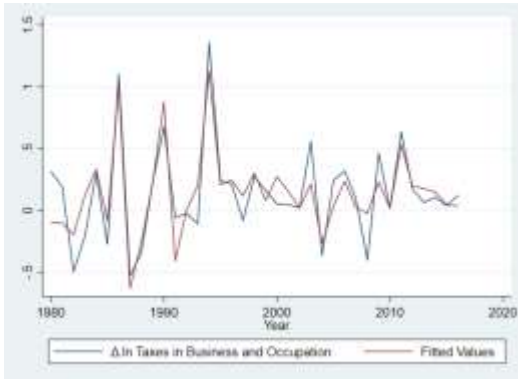
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 11.159         | -6.624         | $\chi^2(35)$            | $\chi^2(16)$            | 0.147     | 0.191 | 0.755          |
| [0.000, 0.000] | [0.000, 0.000] | [0.342]                 | [0.714]                 |           |       |                |

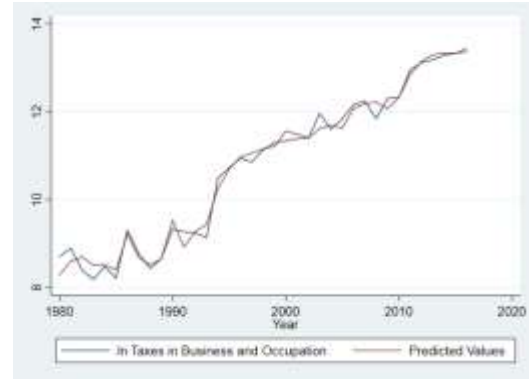
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ )Taxes in Business and Occupation are 0.151, 0.351, -0.530, and 1.356 respectively.

Figure 1. Actual v. Predicted Taxes in Business and Occupation, along with residuals

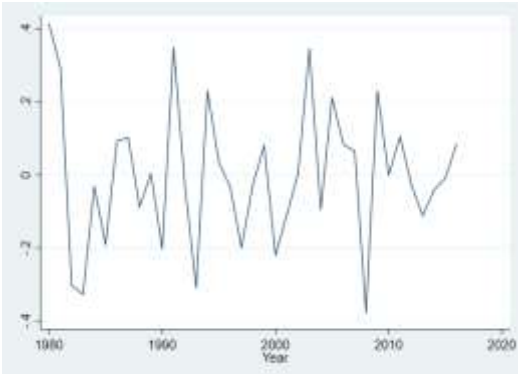
Panel A: Log first-difference



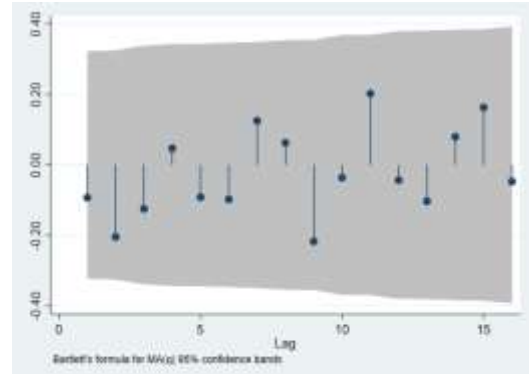
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 5. Other Indirect Taxes

Estimation Period: 1979 – 2016

$$\begin{aligned}
 \Delta \text{Other Indirect Taxes} = & \underbrace{-0.493 \text{ Other Indirect Taxes}_{t-1}}_{\text{Adjustment}} \\
 & \underbrace{-3.009 + 1.078 \text{ HFCE All Goods, Nominal}_{t-1} + 7.671 \text{ Value Added Tax Rate}_{t-1}}_{\text{Long-run}} \\
 & \underbrace{+0.325 \Delta \text{Other Indirect Taxes}_{t-1} + 0.513 \Delta \text{HFCE All Goods, Nominal} + 3.782 \Delta \text{Value Added Tax Rate}}_{\text{Short-run}}
 \end{aligned}$$

(0.113) (0.878) (0.116) (0.956) (0.134) (0.117) (0.121)

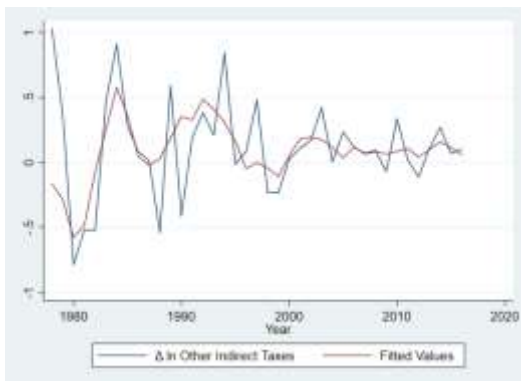
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 7.014          | -4.346         | $\chi^2(36)$            | $\chi^2(17)$            | 0.220     | 0.330 | 0.397          |
| [0.004, 0.013] | [0.001, 0.010] | [0.851]                 | [0.137]                 |           |       |                |

Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Other Indirect Taxes are 0.130, 0.351, -0.785, and 1.028 respectively.

Figure 1. Actual v. Predicted Other Indirect Taxes, along with residuals

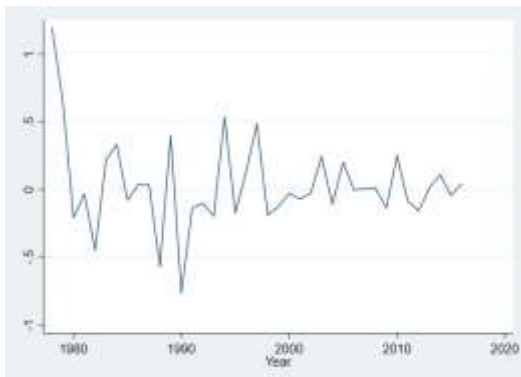
Panel A: Log first-difference



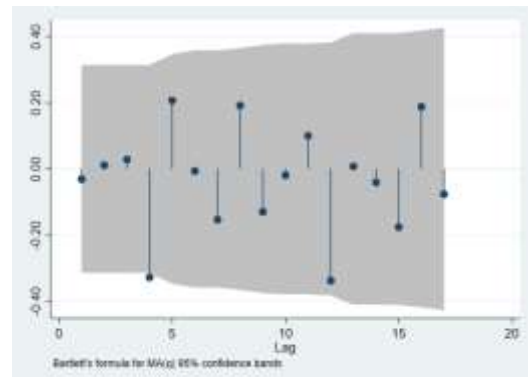
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals





## 6. BIR – Alcoholic Products

Estimation Period: 1982 – 2016

$$\begin{aligned}
 \Delta BIR - Alcoholic Products = & \underbrace{-0.532 BIR - Alcoholic Products_{t-1}}_{\text{Adjustment}} \\
 & - 0.420 + 0.830 HFCE - Tobacco, Nominal_{t-1} + 23.601 \text{ Share of Price Tax Rate, Alcoholic Beverages}_{t-1} \\
 & \quad (0.278) \quad (0.059) \quad (0.142) \\
 & \quad \quad \quad \text{Long-run} \\
 & + 0.314 \Delta BIR - Alcoholic Products_{t-1} + 0.204 \Delta BIR - Alcoholic Products_{t-2} + 0.450 \Delta BIR - Alcoholic Products_{t-3} \\
 & \quad (0.152) \quad (0.126) \quad (0.129) \\
 & + 0.821 \Delta HFCE - Tobacco, Nominal_{t-1} - 0.520 \Delta HFCE - Tobacco, Nominal_{t-2} - 0.965 \Delta HFCE - Tobacco, Nominal_{t-3} \\
 & \quad (0.288) \quad (0.324) \quad (0.322) \\
 & \quad + 0.134 \Delta HFCE - Tobacco, Nominal_{t-4} - 1.110 \Delta HFCE - Tobacco, Nominal_{t-5} \\
 & \quad \quad (0.337) \quad (0.314) \\
 & \quad + 19.906 \Delta \text{Share of Price Tax Rate, Alcoholic Beverages}_{t-1} \\
 & \quad \quad (0.131) \\
 & \quad - 22.067 \Delta \text{Share of Price Tax Rate, Alcoholic Beverages}_{t-2} \\
 & \quad \quad (0.303) \\
 & \quad \quad \quad \text{Short-run}
 \end{aligned}$$

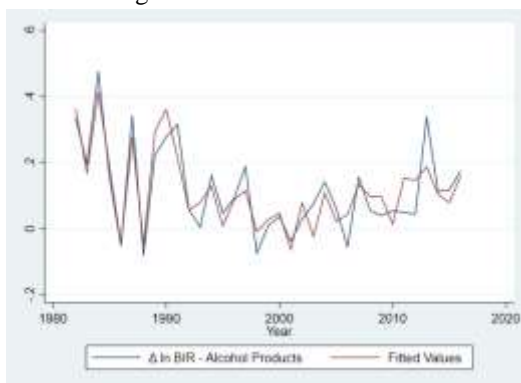
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 6.850          | -4.372         | $\chi^2(33)$<br>1.582   | $\chi^2(15)$<br>18.083  | 0.050     | 0.061 | 0.784          |
| [0.006, 0.023] | [0.002, 0.012] | [0.208]                 | [0.258]                 |           |       |                |

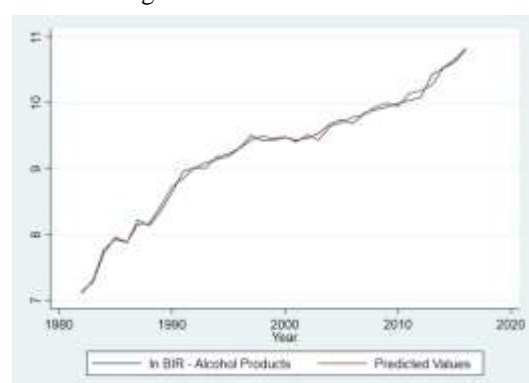
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) BIR – Alcoholic Products are 0.120, 0.128, -0.081, and 0.474 respectively.

Figure 1. Actual v. Predicted BIR – Alcoholic Products, along with residuals

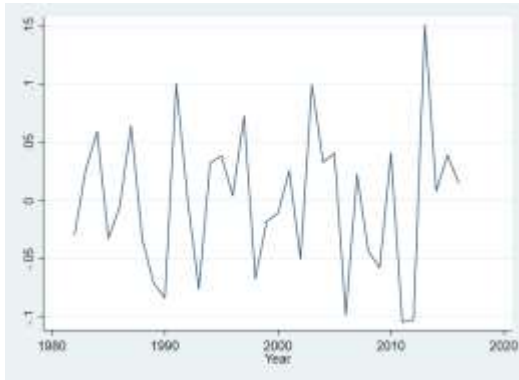
Panel A: Log first-difference



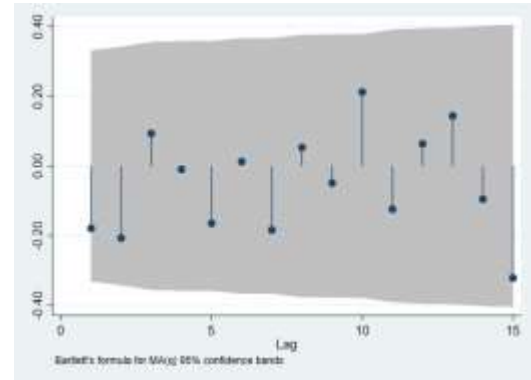
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 7. BIR – Tobacco Products

Estimation Period: 1979 – 2016

$$\begin{aligned}
 \Delta BIR - Tobacco\ Products = & \underbrace{-0.717\ BIR - Tobacco\ Products_{t-1}}_{\text{Adjustment}} \\
 & \underbrace{-0.282 + 0.949\ HFCE - Alcohol, Nominal_{t-1} - 1.016\ Share\ of\ Price\ Tax\ Rate, Tobacco_{t-1}}_{\text{Long-run}} \\
 & \underbrace{-0.219\ \Delta HFCE - Alcohol, Nominal - 0.641\ \Delta HFCE - Alcohol, Nominal_{t-1} + 7.039\ \Delta Share\ of\ Price\ Tax\ Rate, Tobacco}_{\text{Short-run}}
 \end{aligned}$$

(0.139) (0.287) (0.037) (0.971) (0.306) (0.321) (0.063)

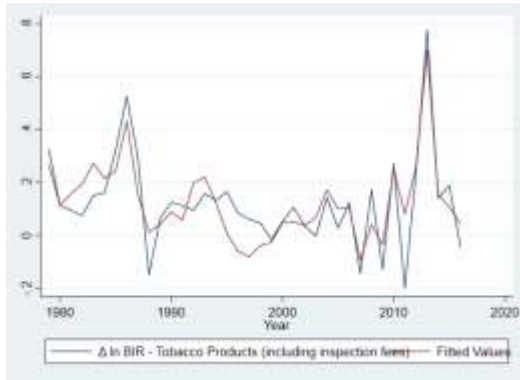
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 19.214         | -5.123         | $\chi^2(36)$            | $\chi^2(17)$            | 0.074     | 0.094 | 0.710          |
| [0.000, 0.000] | [0.000, 0.002] | [0.402]                 | [0.231]                 |           |       |                |

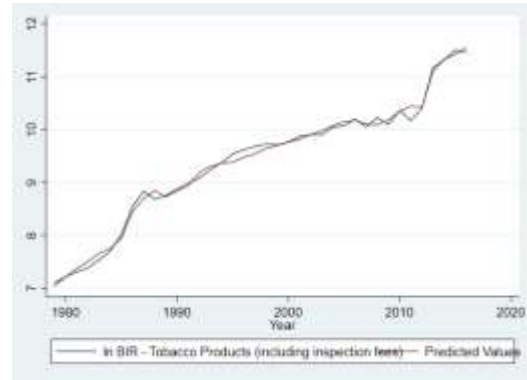
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) BIR – Tobacco Products are 0.124, 0.175, -0.199, and 0.776 respectively.

Figure 1. Actual v. Predicted BIR – Tobacco Products, along with residuals

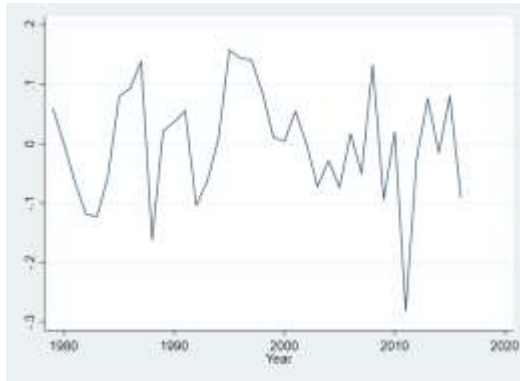
Panel A: Log first-difference



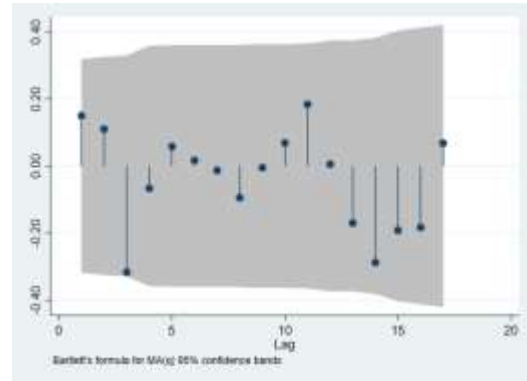
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 8. BIR – Petroleum Products

Estimation Period: 1981 – 2016

$$\begin{aligned}
 \Delta BIR - Petroleum Products = & \underbrace{\frac{-0.871 BIR - Petroleum Products_{t-1}}{(0.129)}}_{\text{Adjustment}} \\
 & + \underbrace{3.430 + 0.414 Operating Surplus_{t-1} - 0.382 Crude Oil - Brent_{t-1} - 0.006 Petroleum Tax Rate_{t-1}}_{\text{Long-run}} \\
 & \quad \underbrace{+ 0.360 \Delta Operating Surplus - 0.084 \Delta Crude Oil - Brent + 0.098 \Delta Crude Oil - Brent_{t-1} + 0.007 \Delta Petroleum Tax Rate}_{\text{Short-run}} \\
 & \quad \quad \quad (0.052) \quad (0.030) \\
 & \quad \quad \quad (0.043) \quad (0.000)
 \end{aligned}$$

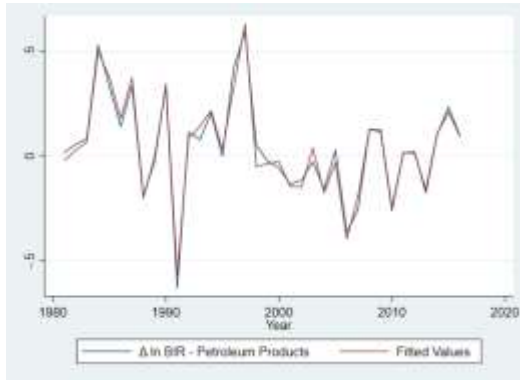
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
|                |                | $\chi^2 (34)$           | $\chi^2 (16)$           |           |       |                |
| 14.283         | -6.734         | 0.012                   | 25.387                  | 0.030     | 0.038 | 0.974          |
| [0.000, 0.000] | [0.000, 0.000] | [0.912]                 | [0.063]                 |           |       |                |

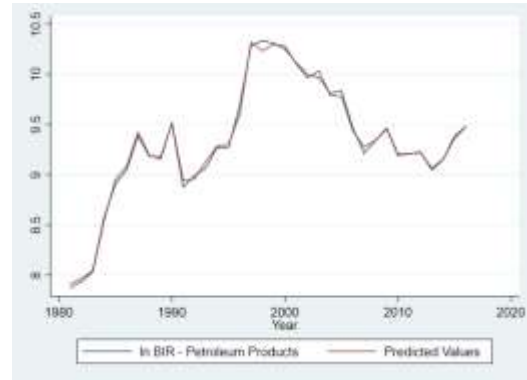
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) BIR – Petroleum Products are 0.050, 0.235, -0.633, and 0.594 respectively.

Figure 1. Actual v. Predicted BIR – Petroleum Products, along with residuals

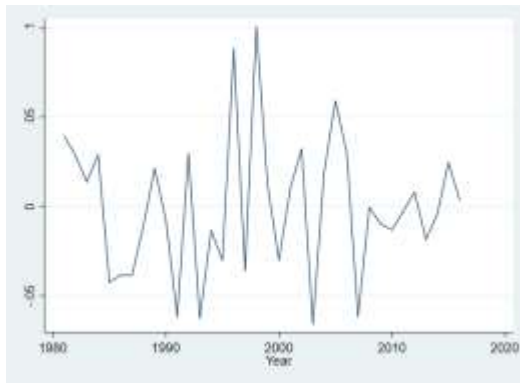
Panel A: Log first-difference



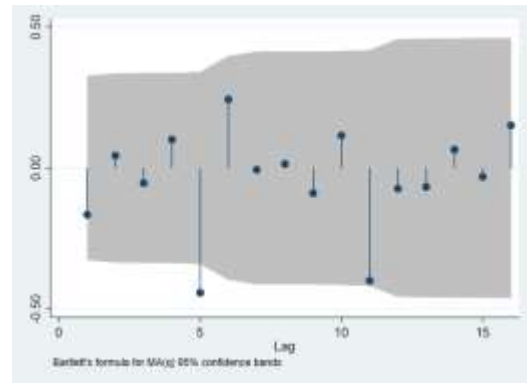
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 9. BIR – Mineral Products

Estimation Period: 1981 – 2016

$$\begin{aligned} \Delta BIR - Mineral Products = & \underbrace{\frac{-0.308 BIR - Mineral Products_{t-1}}{(0.122)}}_{Adjustment} \\ & - \underbrace{1.694 + 1.033_{t-1} + 44.441 Mineral Products Tax Rate_{t-1}}_{Long-run} \\ & \underbrace{+ 0.319 \Delta + 43.799 \Delta Mineral Products Tax Rate}_{Short-run} \\ & \quad \quad \quad (0.121) \quad \quad \quad (0.815) \end{aligned}$$

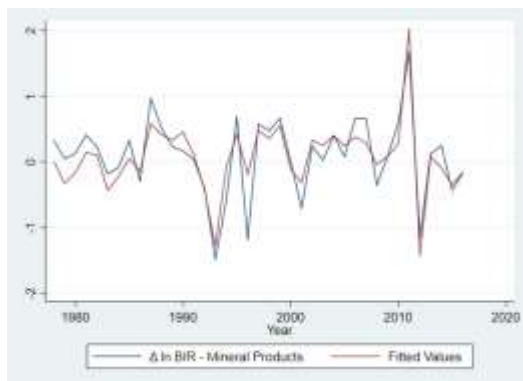
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 2.767          | -2.520         | $\chi^2$ (34)           | $\chi^2$ (17)           | 0.226     | 0.287 | 0.787          |
| [0.169, 0.328] | [0.112, 0.290] | [0.764]                 | [0.145]                 |           |       |                |

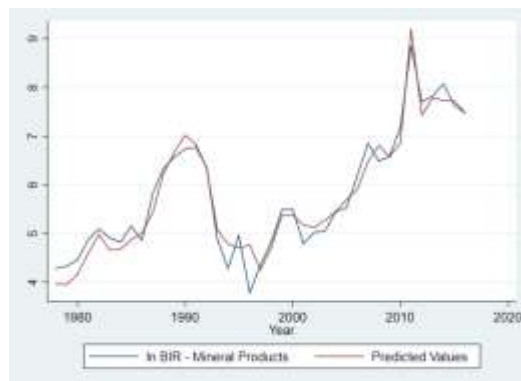
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) BIR – Mineral Products are 0.090, 0.599, -1.481, and 1.676 respectively.

Figure 1. Actual v. Predicted BIR – Mineral Products, along with residuals

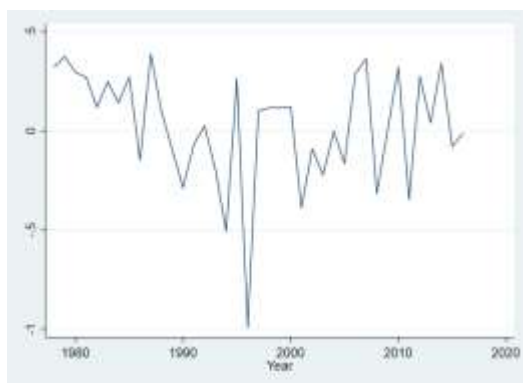
Panel A: Log first-difference



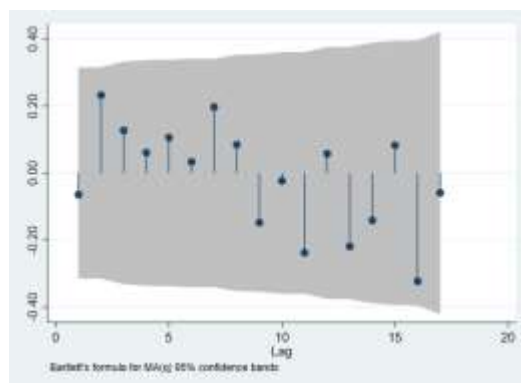
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 10. Income Tax on Business

Estimation Period: 1969– 2016

$$\begin{aligned}
 \Delta \text{Income Tax on Business} = & \underbrace{\frac{-0.429 \text{ Income Tax on Business}_{t-1}}{(0.102)}}_{\text{Adjustment}} \\
 & - \underbrace{\frac{2.813}{(0.799)} + \frac{1.310 \text{ Operating Surplus}_{t-1}}{(0.051)} - \frac{2.554 \text{ Corporate Income Tax Rate}_{t-1}}{(0.913)}}_{\text{Long-run}} \\
 & + \underbrace{\frac{0.563 \Delta \text{Operating Surplus}}{(0.140)} - \frac{1.097 \Delta \text{Corporate Income Tax Rate}}{(0.463)}}_{\text{Short-run}}
 \end{aligned}$$

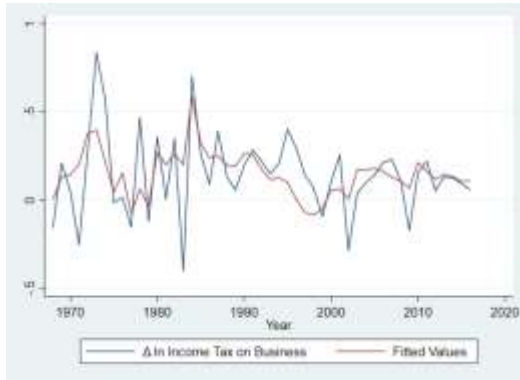
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 6.272          | -4.186         | $\chi^2 (46)$           | $\chi^2 (22)$           | 0.138     | 0.190 | 0.299          |
| [0.006, 0.019] | [0.002, 0.013] | [0.612]                 | [0.988]                 |           |       |                |

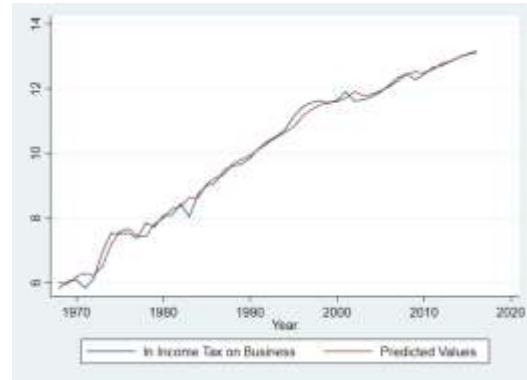
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Income Tax on Business are 0.145, 0.232, -0.401, and 0.836 respectively.

Figure 1. Actual v. Predicted Income Tax on Business, along with residuals

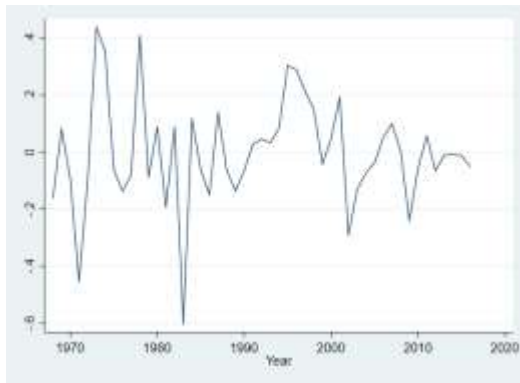
Panel A: Log first-difference



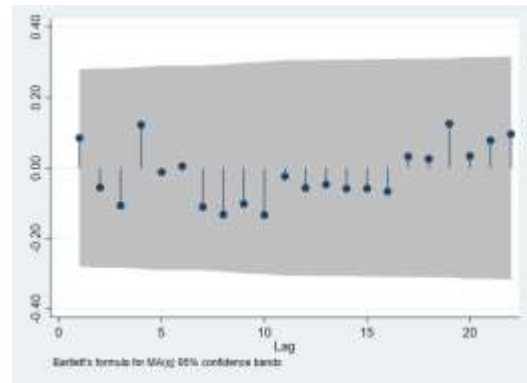
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 11. Income Tax on Individual

Estimation Period: 1969 – 2016

$$\begin{aligned}
 \Delta \text{Income Tax on Individual} = & \underbrace{-0.471 \text{ Income Tax on Individual}_{t-1}}_{\text{Adjustment}} \\
 & - 0.589 + 0.758 \text{ Compensation of Residents}_{t-1} + 11.845 \text{ Personal Income Tax Rate}_{t-1} \\
 & \underbrace{(1.108) \quad (0.227) \quad (0.453)}_{\text{Long-run}} \\
 & + 0.358 \Delta \text{Compensation of Residents} + 5.591 \text{ Personal Income Tax Rate} \\
 & \underbrace{(0.166) \quad (0.783)}_{\text{Short-run}}
 \end{aligned}$$

Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 4.900          | -3.480         | $\chi^2(46)$            | $\chi^2(22)$            | 0.184     | 0.280 | 0.250          |
| [0.022, 0.061] | [0.012, 0.063] | [0.813]                 | [0.910]                 |           |       |                |

Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Income Tax on Individual are 0.148, 0.317, -1.241, and 1.097 respectively.

Panel A: Log first-difference



The graph displays the income tax on individual from 1970 to 2020. The Y-axis ranges from 4 to 14, and the X-axis ranges from 1970 to 2020. The black line represents the actual income tax on individual, and the red line represents the predicted values. The two lines are very close, indicating high predictive accuracy. The tax amount starts around 5.5 in 1970, rises to about 8.5 in 1980, dips slightly, then continues to rise steadily to approximately 13.5 by 2020.

| Year | In Income Tax on Individual | Predicted Values |
|------|-----------------------------|------------------|
| 1970 | 5.5                         | 5.5              |
| 1975 | 7.5                         | 7.5              |
| 1980 | 8.5                         | 8.5              |
| 1985 | 8.8                         | 8.8              |
| 1990 | 9.8                         | 9.8              |
| 1995 | 10.8                        | 10.8             |
| 2000 | 11.2                        | 11.2             |
| 2005 | 11.8                        | 11.8             |
| 2010 | 12.5                        | 12.5             |
| 2015 | 13.2                        | 13.2             |
| 2020 | 13.5                        | 13.5             |

The graph displays the annual number of deaths from AIDS in the United States from 1970 to 2020. The y-axis represents the number of deaths, ranging from -10 to 20. The x-axis represents the year, from 1970 to 2020. The data shows a sharp increase starting around 1980, peaking around 1985, and then fluctuating with a general downward trend towards 2020.

Estimation Period: 1969 – 2016

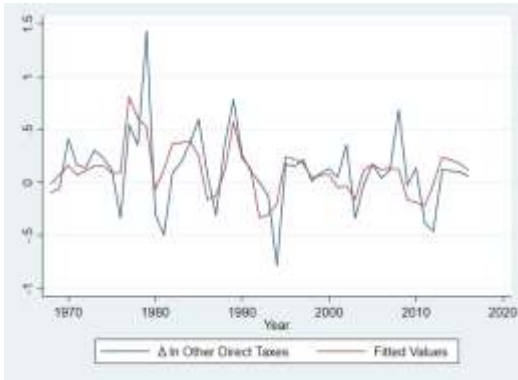
$$\begin{aligned} \Delta \text{Other Direct Taxes} &= \underbrace{-0.456 \text{ Other Direct Taxes}_{t-1}}_{(0.099) \text{ Adjustment}} \\ &- \underbrace{1.347 \text{ Net National Income}_{t-1} + 0.966 \text{ Corporate Income Tax Rate}_{t-1} - 6.427 \text{ Personal Income Tax Rate}_{t-1}}_{(1.594) \quad (0.303) \quad (0.251) \quad (0.493) \text{ Long-run}} \\ &+ \underbrace{0.440 \Delta \text{Net National Income} + 0.350 \Delta \text{Corporate Income Tax Rate} + 19.731 \Delta \text{Personal Income Tax Rate}}_{(0.159) \quad (0.125) \quad (0.092) \text{ Short-run}} \end{aligned}$$

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 6.550          | -4.604         | $\chi^2(46)$<br>0.590   | $\chi^2(22)$<br>17.799  | 0.195     | 0.269 | 0.414          |
| [0.001, 0.008] | [0.001, 0.009] | [0.442]                 | [0.717]                 |           |       |                |

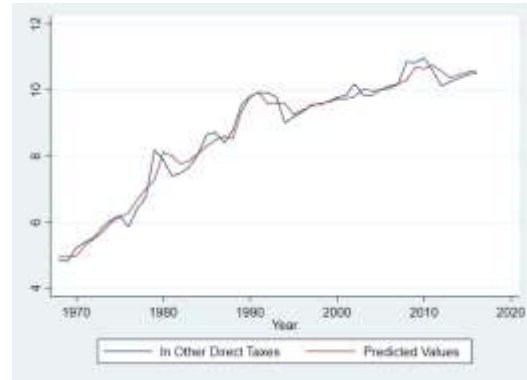
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Figure 1. Actual v. Predicted Other Direct Taxes, along with residuals

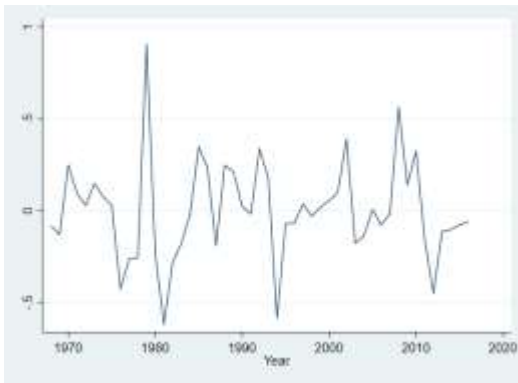
Panel A: Log first-difference



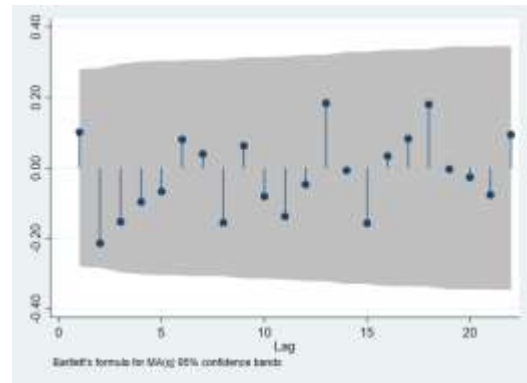
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



### 13. Compulsory Fees and Fines

Estimation Period: 1970 – 2016

$$\begin{aligned} \Delta \text{Compulsory Fees and Fines} = & \underbrace{-0.458 \text{ Compulsory Fees and Fines}_{t-1}}_{\text{Adjustment}} \\ & \underbrace{-2.983 + 1.229 \text{ Compensation of Residents}_{t-1}}_{\text{Long-run}} \\ & \underbrace{+0.563 \Delta \text{Compensation of Residents}}_{\text{Short-run}} \end{aligned}$$

(0.114) (0.848) (0.042) (0.144)

Table A1. Summary of model tests

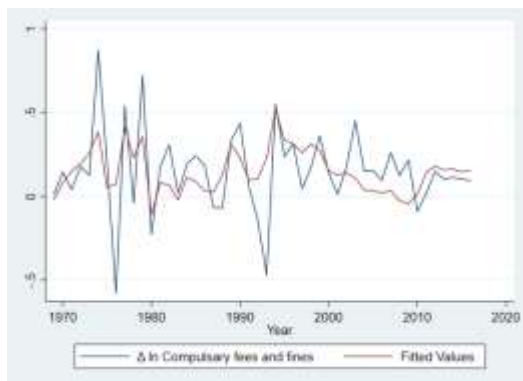
| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 8.185          | -4.015         | $\chi^2 (45)$           | $\chi^2 (22)$           | 0.151     | 0.210 | 0.271          |
| [0.006, 0.012] | [0.003, 0.008] | 0.429                   | 27.730                  |           |       |                |
|                |                | [0.512]                 | [0.184]                 |           |       |                |

Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Compulsory Fees and Fines are 0.149, 0.250, -0.577, and 0.869 respectively.

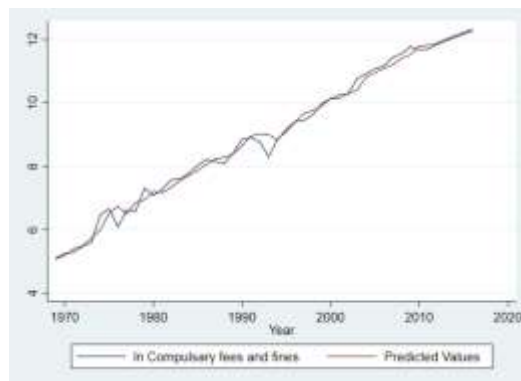


Figure 1. Actual v. Predicted Compulsory Fees and Fines, along with residuals

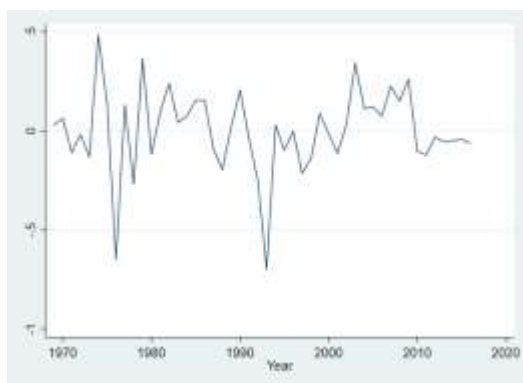
Panel A: Log first-difference



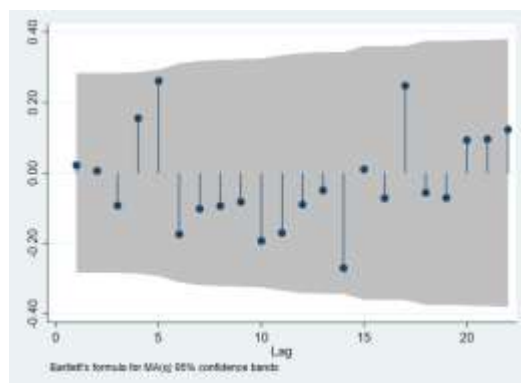
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



#### 14. Other Current Transfers, Received

Estimation Period: 1950 – 2016

$$\begin{aligned} \Delta \text{Other Current Transfers, Received} = & \underbrace{-0.241 \text{ Other Current Transfers, Received}_{t-1}}_{\text{Adjustment}} \quad (0.072) \\ & + \underbrace{0.388 + 2.150 \text{ USD Nominal Exchange Rate}_{t-1}}_{\text{Long-run}} \quad (0.243) \quad (0.302) \\ & + \underbrace{0.519 \Delta \text{USD Nominal Exchange Rate}}_{\text{Short-run}} \quad (0.146) \end{aligned}$$

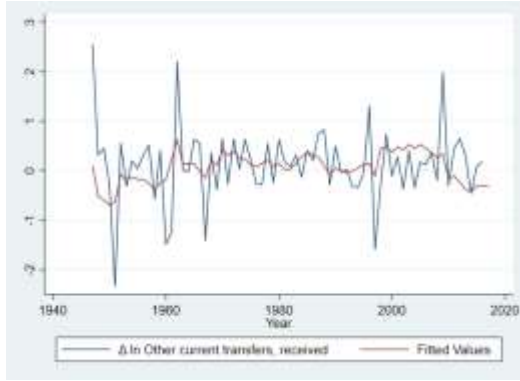
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 6.406          | -3.341         | $\chi^2$ (65)           | $\chi^2$ (33)           | 0.524     | 0.707 | 0.166          |
| [0.019, 0.036] | [0.016, 0.043] | [0.496]                 | [0.824]                 |           |       |                |

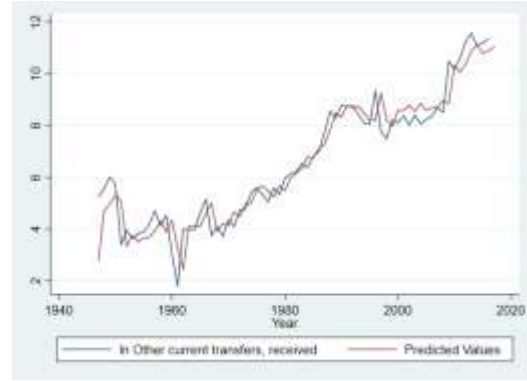
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Other Current Transfers, Received are 0.123, 0.750, -2.335, and 2.358 respectively.

Figure 1. Actual v. Predicted Other Current Transfers, along with residuals

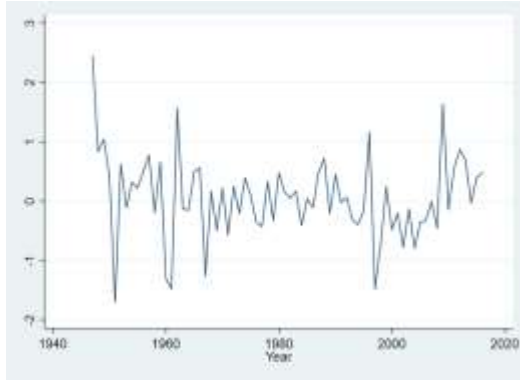
Panel A: Log first-difference



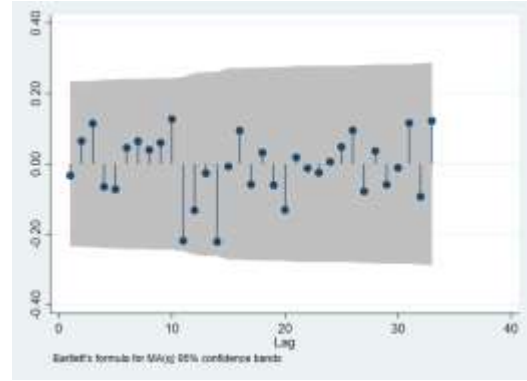
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 15. Government Property Income

Estimation Period: 1971 – 2016

$$\begin{aligned}
 \Delta \text{Government Property Income} = & \underbrace{-0.352 \text{ Government Property Income}_{t-1}}_{\text{Adjustment}} \\
 & \underbrace{-4.372 + 1.114 \text{ World GDP, Nominal}_{t-1} + 0.005 \text{ 91day TBill Rate}_{t-1}}_{\text{Long-run}} \\
 & \underbrace{+0.392 \Delta \text{World GDP, Nominal} - 0.007 \Delta \text{91day TBill Rate} - 0.006 \Delta \text{91day TBill Rate}_{t-1} - 0.040 \Delta \text{91day TBill Rate}_{t-2}}_{\text{Short-run}}
 \end{aligned}$$

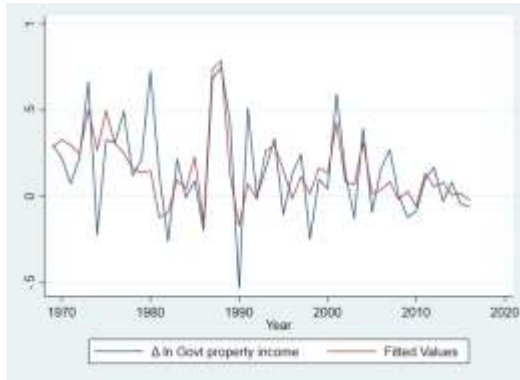
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 7.883          | -3.466         | $\chi^2(44)$            | $\chi^2(22)$            | 0.140     | 0.187 | 0.525          |
| [0.001, 0.006] | [0.013, 0.063] | [0.706]                 | [0.279]                 |           |       |                |

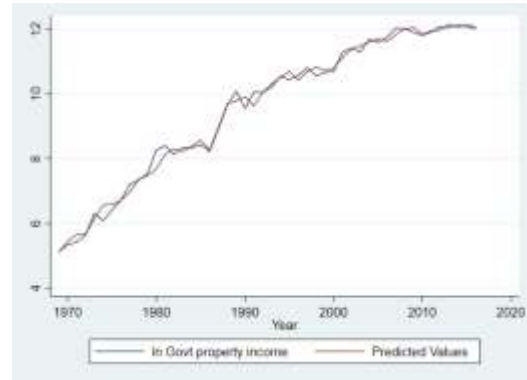
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Government Property Income are 0.148, 0.276 - 0.534, and 0.888 respectively.

Figure 1. Actual v. Predicted Government Property Income, along with residuals

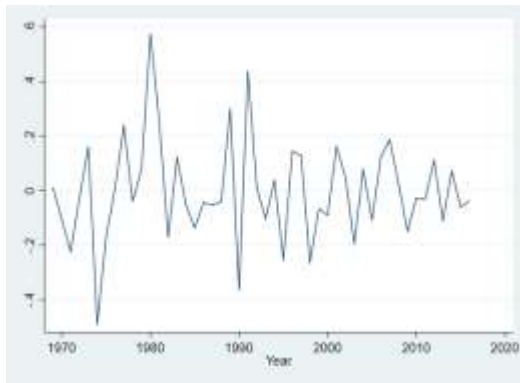
Panel A: Log first-difference



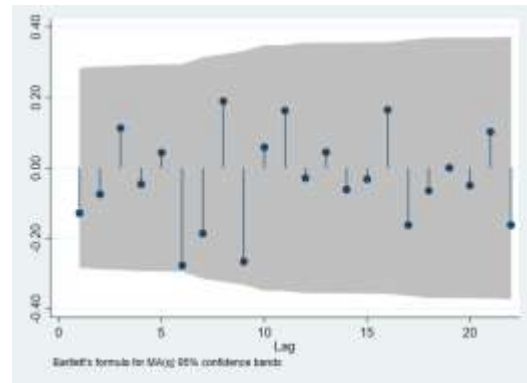
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 16. Social Security Contributions

Estimation Period: 1981 – 2016

$$\begin{aligned}
 \Delta \text{Social Security Contributions} = & \underbrace{-0.496 \text{ Social Security Contributions}_{t-1}}_{\text{Adjustment}} \\
 & + 5.098 + 1.036 \text{ Social Security Benefits}_{t-1} - 0.973 \text{ Employment in Industry} \\
 & \quad (2.797) \quad (0.088) \quad (0.448) \\
 & + 0.118 \text{ Employment in Service} - 0.356 \text{ Employment in Agriculture} \\
 & \quad (0.252) \quad (0.463) \\
 & \quad \quad \quad \text{Long-run} \\
 & + 0.416 \Delta \text{Social Security Contributions}_{t-1} + 0.358 \Delta \text{Social Security Contributions}_{t-2} + 0.176 \Delta \text{Social Security Benefits} \\
 & \quad (0.113) \quad (0.140) \quad (0.176) \\
 & - 0.386 \Delta \text{Social Security Benefits}_{t-1} - 0.302 \Delta \text{Social Security Benefits}_{t-2} - 0.755 \Delta \text{Employment in Agriculture} \\
 & \quad (0.144) \quad (0.157) \quad (0.291) \\
 & \quad \quad \quad \text{Short-run}
 \end{aligned}$$

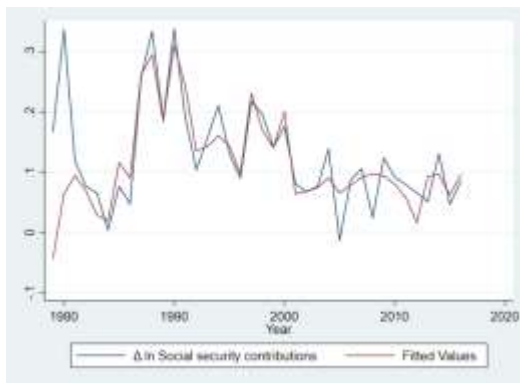
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 7.548          | -4.394         | $\chi^2$ (34)           | $\chi^2$ (17)           | 0.037     | 0.064 | 0.836          |
| [0.001, 0.005] | [0.002, 0.028] | [0.655]                 | [0.879]                 |           |       |                |

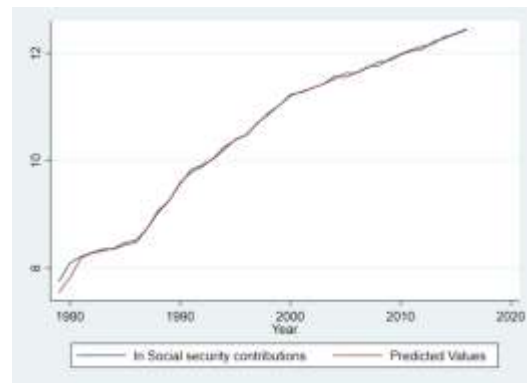
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Social Security Contributions are 0.139, 0.097, -0.050, and 0.369 respectively.

Figure 1. Actual v. Predicted Social Security Contributions, along with residuals

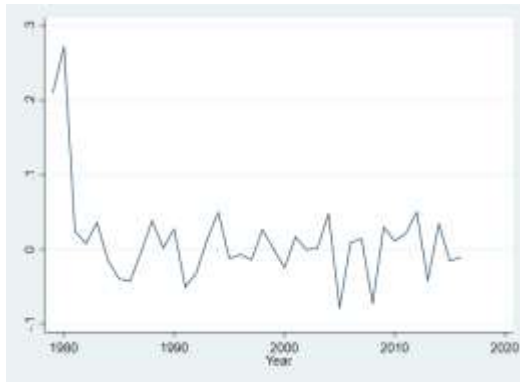
Panel A: Log first-difference



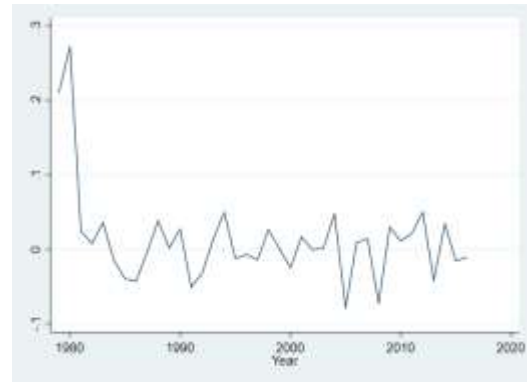
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



Estimation Period: 1974 – 2016

Table A1. Summary of model tests

Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Other Current Transfers, Paid are 0.105, 0.326, -0.673, and 1.410 respectively.

Panel A: Log first-difference



## 18. Government Property Expenditure

Estimation Period: 1969 – 2016

$$\begin{aligned} \Delta \text{Government Property Expenditure} = & \underbrace{-0.377 \text{ Government Property Expenditure}_{t-1}}_{\text{Adjustment}} \quad (0.086) \\ & \underbrace{-7.660 + 1.507 \text{ World GDP, Nominal}_{t-1} + 0.061 \text{ 91day TBill Rate}_{t-1}}_{\text{Long-run}} \quad (1.933) \quad (0.042) \quad (0.012) \\ & \underbrace{+0.569 \Delta \text{World GDP, Nominal} + 0.023 \Delta \text{91day TBill Rate}}_{\text{Short-run}} \quad (0.138) \quad (0.004) \end{aligned}$$

Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 14.111         | -4.363         | $\chi^2(46)$            | $\chi^2(23)$            | 0.111     | 0.166 | 0.490          |
| [0.000, 0.000] | [0.001, 0.008] | [0.238]                 | [0.733]                 |           |       |                |

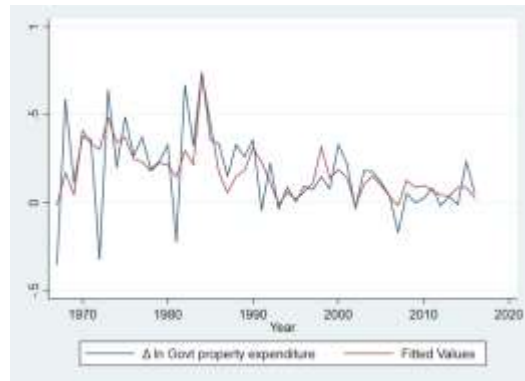
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Government Property Expenditure are 0.173, 0.227, -0.350, and 0.743 respectively.

Figure 1. Actual v. Predicted Government Property Expenditure, along with residuals

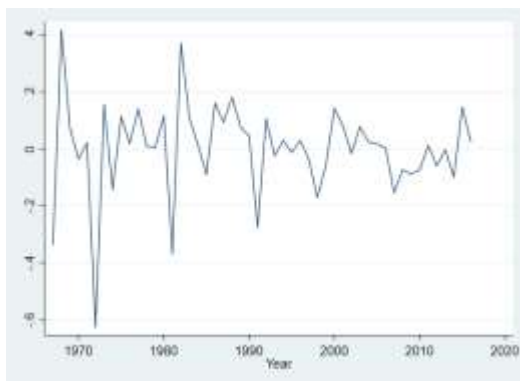
Panel A: Log first-difference



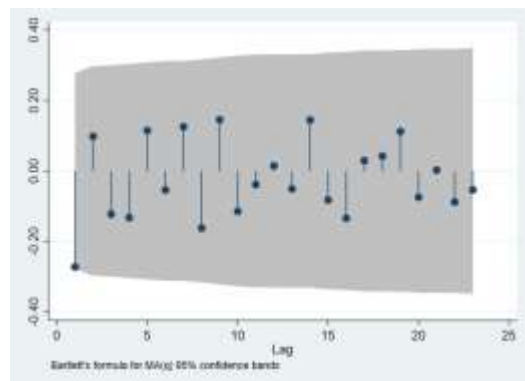
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 19. Social Security Benefits

Estimation Period: 1981 – 2016

$$\begin{aligned}
 \Delta \text{Social Security Benefits} = & \underbrace{-0.334 \text{ Social Security Benefits}_{t-1}}_{\text{Adjustment}} \\
 & - 4.530 + 0.389 \text{ Compensation of Residents} + 2.256 \text{ Employment in Industry} \\
 & \quad (1.536) \quad (0.133) \quad (0.632) \\
 & + 0.393 \text{ JPY Nominal Exchange Rate} + 0.242 \text{ USD Nominal Exchange Rate} \\
 & \quad (0.169) \quad (0.224) \\
 & \quad \text{Long-run} \\
 & + 0.288 \Delta \text{Social Security Benefits} + 0.415 \Delta \text{Compensation of Residents} \\
 & \quad (0.141) \quad (0.175) \\
 & + 0.121 \Delta \text{Compensation of Residents}_{t-1} + 0.332 \Delta \text{Compensation of Residents}_{t-2} \\
 & \quad (0.132) \quad (0.128) \\
 & \quad \text{Short-run}
 \end{aligned}$$

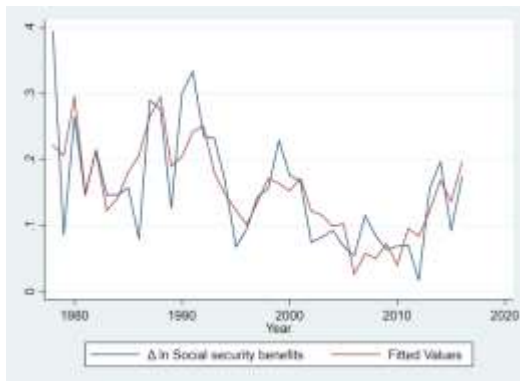
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
|                |                | $\chi^2 (34)$           | $\chi^2 (17)$           |           |       |                |
| 5.805          | -4.939         | 1.814                   | 23.404                  | 0.040     | 0.054 | 0.664          |
| [0.003, 0.019] | [0.000, 0.010] | [0.177]                 | [0.136]                 |           |       |                |

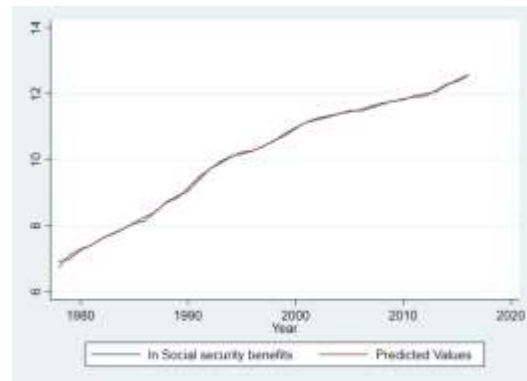
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Social Security Benefits are 0.185, 0.110, 0.016, and 0.606 respectively.

Figure 1. Actual v. Predicted Social Security Benefits, along with residuals

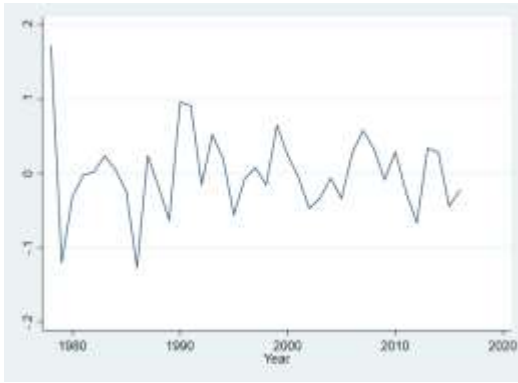
Panel A: Log first-difference



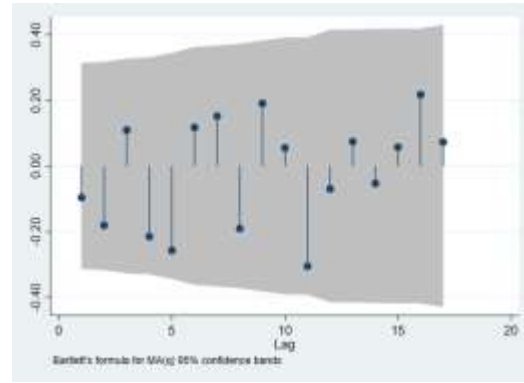
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 20. Implicit Price Index, Government Spending

Estimation Period: 1981 – 2016

$$\begin{aligned}
 \Delta IPIN, Government\ Spending = & \underbrace{-0.376 IPIN, Government\ Spending_{t-1}}_{\text{Adjustment}} \\
 & \underbrace{-2.264 + 0.291 Wage\ Index, Private\ Service_{t-1} + 1.007 CPI_{t-1}}_{\text{Long-run}} \\
 & \underbrace{+ 0.493 \Delta IPIN, Government\ Spending_{t-1} + 0.110 \Delta Wage\ Index, Private\ Service}_{\text{Short-run}} \\
 & \quad + 0.704 \Delta CPI - 0.406 \Delta CPI_{t-1} \\
 & \quad (0.118) \quad (0.042) \\
 & \quad (0.073) \quad (0.104)
 \end{aligned}$$

Table A1. Summary of model tests

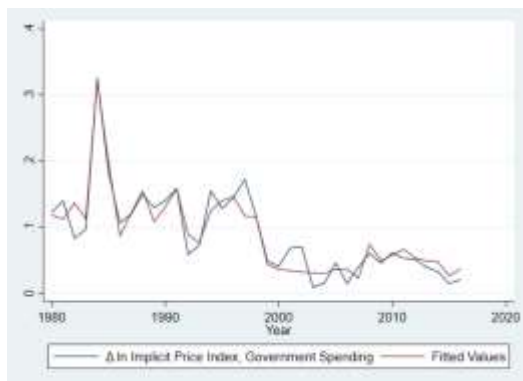
| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 7.277          | -4.185         | $\chi^2(34)$<br>0.030   | $\chi^2(16)$<br>23.819  | 0.015     | 0.020 | 0.894          |
| [0.004, 0.013] | [0.002, 0.016] | [0.860]                 | [0.093]                 |           |       |                |

Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Implicit Price Index, Government Spending are 0.069, 0.074, -0.256, and 0.326 respectively.

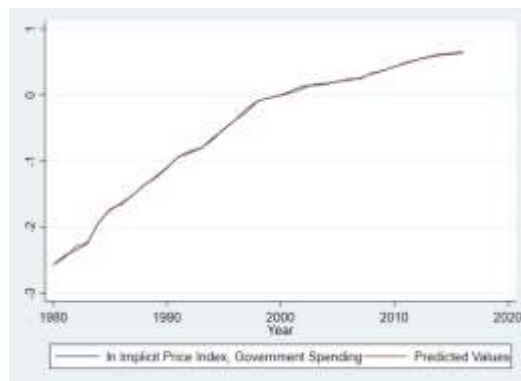


Figure 1. Actual v. Predicted Implicit Price Index, Government Spending, along with residuals

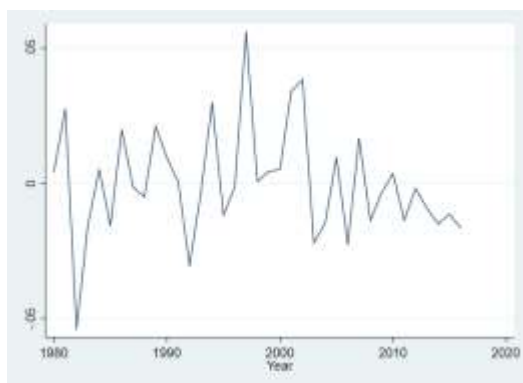
Panel A: Log first-difference



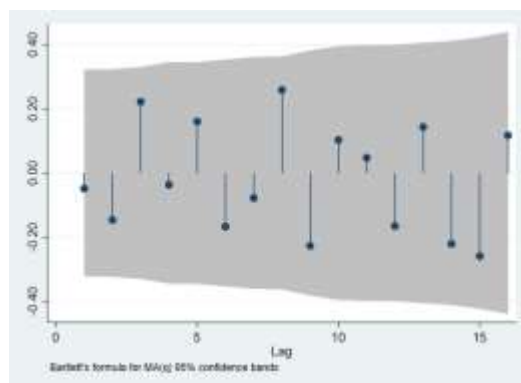
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## Trade Sector

### 1. Implicit Price Index – Agricultural Imports

Estimation Period: 1974 – 2017

$$\begin{aligned}
 \Delta IPIN, Agricultural Imports_t = & \underbrace{-0.788 IPIN, Agricultural Imports_{t-1}}_{\text{Adjustment}} \\
 & - 5.041 + 0.964 Foreign IPIN, Agricultural Imports + 1.178 USD Nominal Exchange Rate \\
 & \quad (2.016) \quad (0.193) \quad (0.387) \\
 & - 0.048 JPY Nominal Exchange Rate - 0.208 CNY Nominal Exchange Rate \\
 & \quad (0.218) \quad (0.149) \\
 & - 0.499 Tariff, Agricultural Imports - 0.227 Philippine Retail Price Index \\
 & \quad (0.140) \quad (0.165) \\
 & \quad \quad \quad \underbrace{+ 0.210 \Delta Import Duties}_{\text{Short-run}} \\
 & \quad \quad \quad (0.126)
 \end{aligned}$$

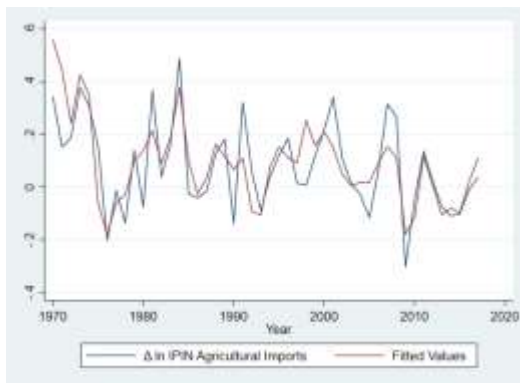
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 6.711          | -6.574         | $\chi^2(42)$            | $\chi^2(22)$            | 0.087     | 0.114 | 0.579          |
| [0.000, 0.003] | [0.000, 0.001] | [0.194]                 | [0.832]                 |           |       |                |

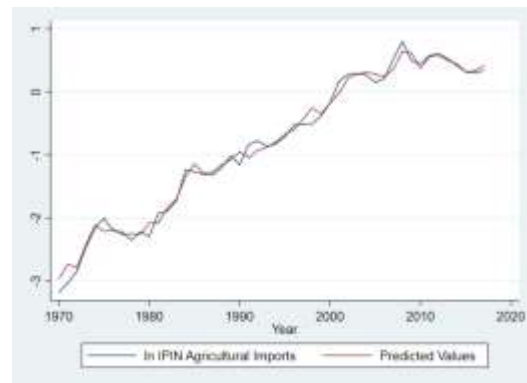
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN – Agricultural Imports are 0.074, 0.169, -0.301, and 0.487 respectively.

Figure 1. Actual v. Predicted IPIN – Agricultural Imports, along with residuals

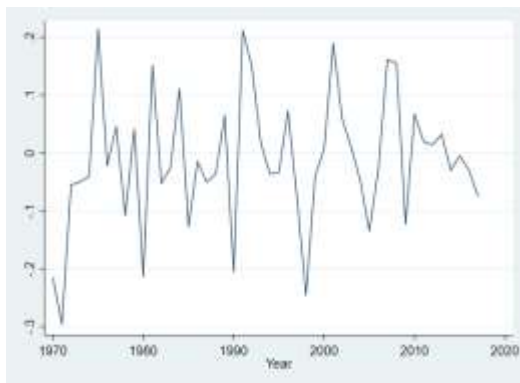
Panel A: Log first-difference



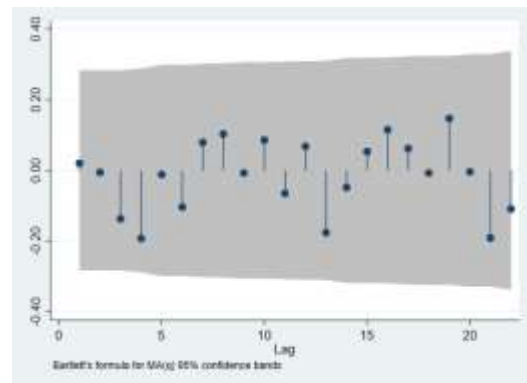
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 2. Implicit Price Index – Fuel Imports

Estimation Period: 1974 – 2017

$$\begin{aligned}
 \Delta IPIN, Fuel Imports = & \underbrace{-0.828 IPIN, Fuel Imports_{t-1}}_{\text{Adjustment}} \\
 & - 6.361 + 1.014 Foreign IPIN, Fuel Imports + 1.593 USD Nominal Exchange Rate \\
 & (0.830) \quad (0.071) \quad (0.235) \\
 & - 0.250 JPY Nominal Exchange Rate - 0.461 CNY Nominal Exchange Rate \\
 & (0.138) \quad (0.164) \\
 & - 0.282 Tariff, Fuel Imports - 0.166 Philippine Retail Price Index \\
 & (0.061) \quad (0.126) \\
 & \underbrace{\hspace{10em}}_{\text{Long-run}} \\
 & + 0.268 \Delta JPY Nominal Exchange Rate + 0.267 \Delta Tariff, Fuel Imports + 0.489 \Delta Tariff, Fuel Imports_{t-1} \\
 & (0.137) \quad (0.178) \quad (0.177) \\
 & + 0.260 \Delta Tariff, Fuel Imports_{t-2} + 0.489 \Delta Tariff, Fuel Imports_{t-3} \\
 & (0.169) \quad (0.161) \\
 & \underbrace{\hspace{10em}}_{\text{Short-run}}
 \end{aligned}$$

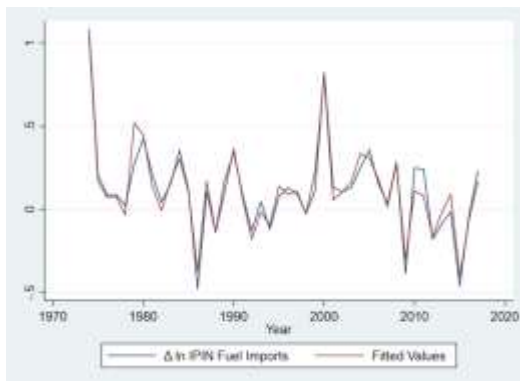
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 55.252         | -16.205        | $\chi^2 (42)$<br>0.943  | $\chi^2 (20)$<br>14.587 | 0.053     | 0.070 | 0.930          |
| [0.000, 0.000] | [0.000, 0.000] | [0.331]                 | [0.799]                 |           |       |                |

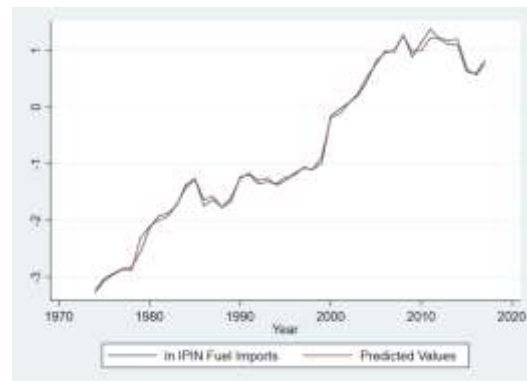
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN – Fuel Imports are 0.120, 0.261, -0.476, and 1.083 respectively.

Figure 1. Actual v. Predicted IPIN – Fuel Imports, along with residuals

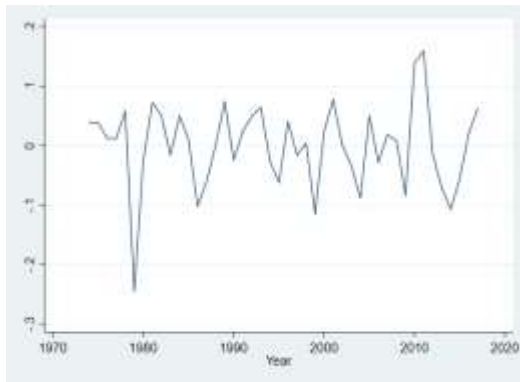
Panel A: Log first-difference



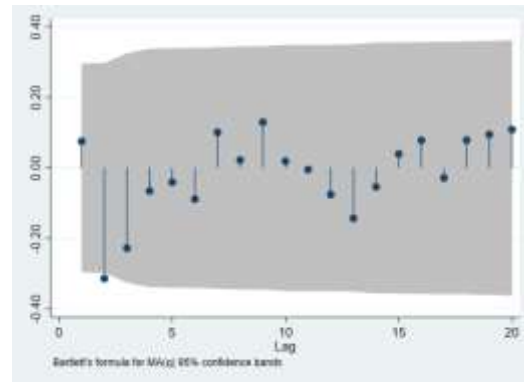
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



### 3. Implicit Price Index – Machinery Imports

Estimation Period: 1974 – 2017

$$\begin{aligned}
 \Delta IPIN, Machinery Imports = & \underbrace{-0.547 IPIN, Machinery Imports_{t-1}}_{\text{Adjustment}} \\
 & \underbrace{-1.688 + 1.243 USD Nominal Exchange Rate - 0.879 CNY Nominal Exchange Rate + 0.139 IPIN, Fuel Imports}_{\text{Long-run}} \\
 & \underbrace{+ 0.411 \Delta CNY Nominal Exchange Rate + 0.615 \Delta CNY Nominal Exchange Rate_{t-1} + 0.192 \Delta IPIN, Fuel Imports}_{\text{Short-run}}
 \end{aligned}$$

(0.443) (0.101) (0.200) (0.065) (0.157) (0.157) (0.066)

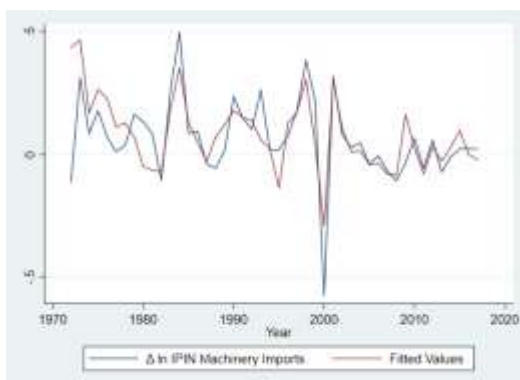
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 8.908          | -4.851         | $\chi^2(42)$            | $\chi^2(21)$            | 0.085     | 0.127 | 0.619          |
| [0.000, 0.001] | [0.000, 0.005] | [0.104]                 | [0.685]                 |           |       |                |

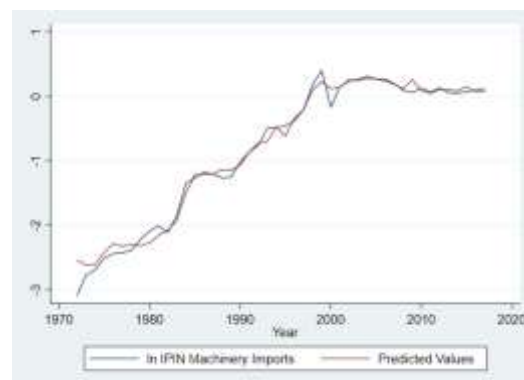
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN – Machinery Imports are 0.073, 0.168, -0.573, and 0.168 respectively.

Figure 1. Actual v. Predicted IPIN – Machinery Imports, along with residuals

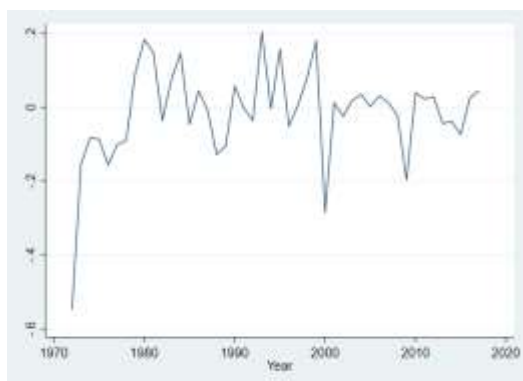
Panel A: Log first-difference



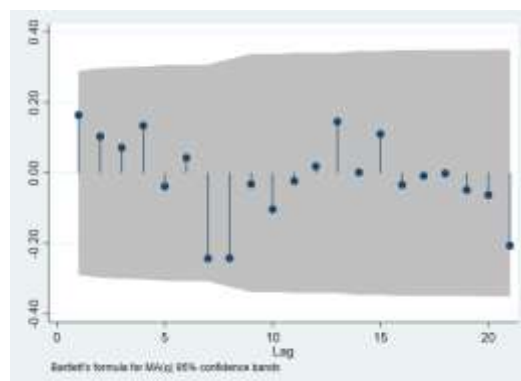
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



#### 4. Implicit Price Index – Materials Imports

Estimation Period: 1990 – 2016

$$\begin{aligned}
 \Delta IPIN, Materials Imports = & \underbrace{-0.355 IPIN, Materials Imports_{t-1}}_{\text{Adjustment}} \\
 & + 5.126 \quad -2.223 Foreign IPIN, Materials Imports - 2.087 USD Nominal Exchange Rate \\
 & \quad (1.474) \quad (0.800) \quad (0.103) \\
 & + 1.554 JPY Nominal Exchange Rate + 0.140 CNY Nominal Exchange Rate \\
 & \quad (0.502) \quad (0.171) \\
 & - 0.242 Tariff, Materials Imports + 1.112 Philippine Retail Price Index \\
 & \quad (0.135) \quad (0.543) \\
 & \quad \quad \quad \text{Long-run} \\
 & + 0.430 \Delta Foreign IPIN, Materials Imports + 0.357 \Delta Foreign IPIN, Materials Imports_{t-1} \\
 & \quad (0.178) \quad (0.122) \\
 & + 0.869 \Delta USD Nominal Exchange Rate - 0.210 \Delta JPY Nominal Exchange Rate \\
 & \quad (0.214) \quad (0.122) \\
 & + 0.357 \Delta Philippine Retail Price Index \\
 & \quad (0.172) \\
 & \quad \quad \quad \text{Short-run}
 \end{aligned}$$

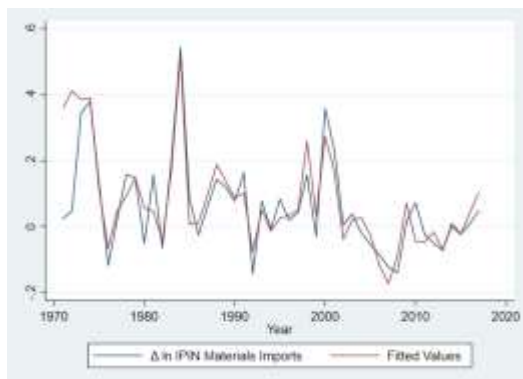
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 6.776          | -4.105         | $\chi^2(42)$<br>0.048   | $\chi^2(21)$<br>10.318  | 0.054     | 0.088 | 0.858          |
| [0.000, 0.003] | [0.003, 0.082] | [0.826]                 | [0.974]                 |           |       |                |

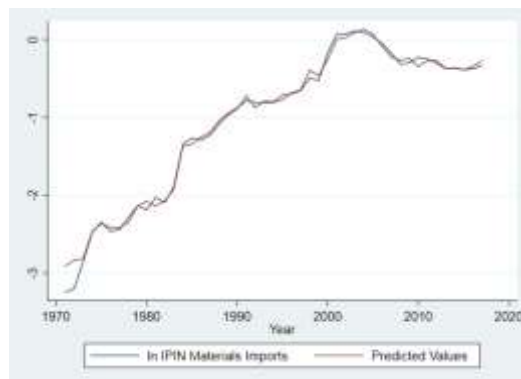
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN – Materials Imports are 0.070, 0.150, -0.143, and 0.541 respectively.

Figure 1. Actual v. Predicted IPIN – Materials Imports, along with residuals

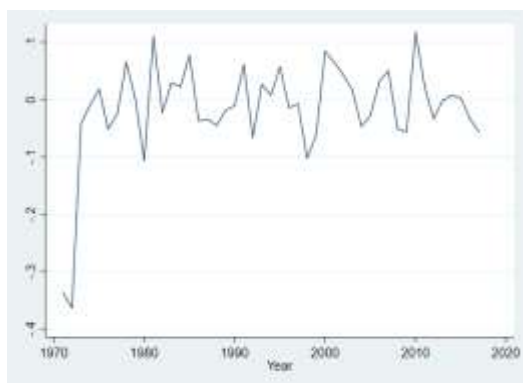
Panel A: Log first-difference



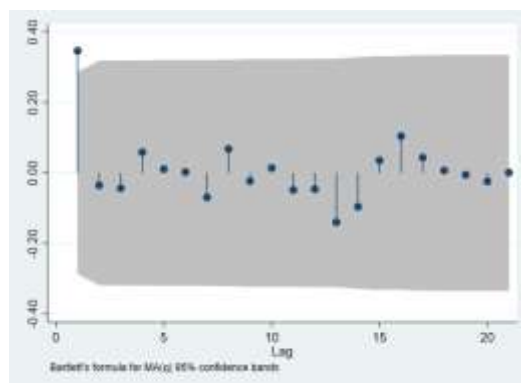
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 5. Implicit Price Index – Other Good Imports

Estimation Period: 1974 – 2017

$$\begin{aligned}
 \Delta IPIN, Other\ Good\ Imports_t = & \underbrace{-0.563\ IPIN, Other\ Good\ Imports_{t-1}}_{\text{Adjustment}} \\
 & - 7.565 + 0.841\ Foreign\ IPIN, Other\ Good\ Imports + 2.565\ USD\ Nominal\ Exchange\ Rate \\
 & (1.424) \quad (0.208) \quad (0.450) \\
 & - 0.988\ JPY\ Nominal\ Exchange\ Rate - 0.680\ CNY\ Nominal\ Exchange\ Rate \\
 & (0.325) \quad (0.180) \\
 & \underbrace{\hspace{10em}}_{\text{Long-run}} \\
 & + 0.341\ \Delta CNY\ Nominal\ Exchange\ Rate \\
 & (0.149) \\
 & \underbrace{\hspace{10em}}_{\text{Short-run}}
 \end{aligned}$$

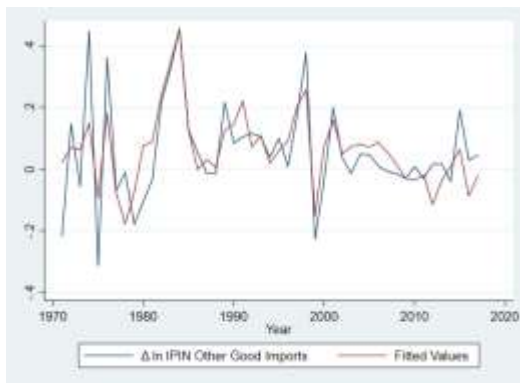
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 10.962         | -6.288         | $\chi^2(42)$            | $\chi^2(21)$            | 0.077     | 0.102 | 0.622          |
| [0.000, 0.000] | [0.000, 0.000] | [0.715]                 | [0.620]                 |           |       |                |

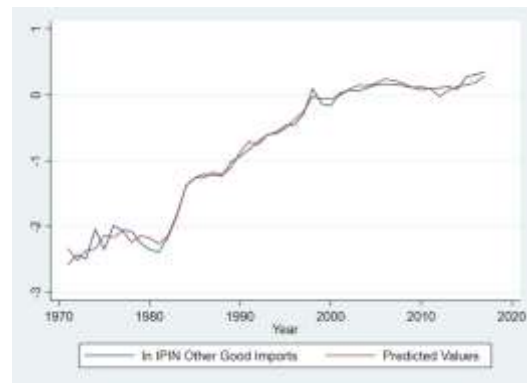
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN – Other Good Imports are 0.078, 0.201, -0.312, and 0.948 respectively.

Figure 1. Actual v. Predicted IPIN – Other Good Imports, along with residuals

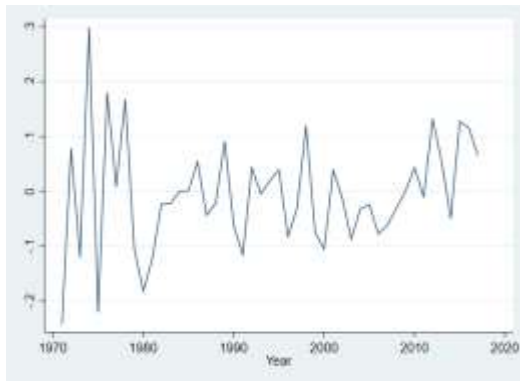
Panel A: Log first-difference



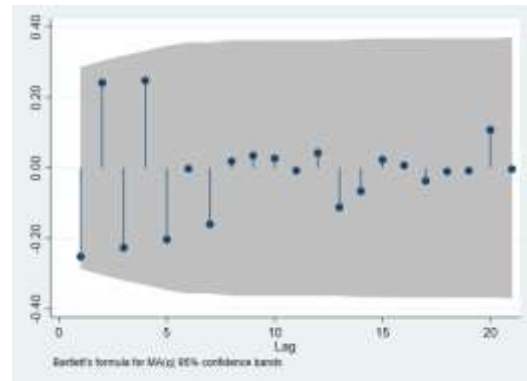
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 6. Implicit Price Index – Electronics Exports

Estimation Period: 1977 – 2017

$$\begin{aligned}
 \Delta IPIN, Electronics Exports = & \underbrace{-0.624 IPIN, Electronics Exports_{t-1}}_{(0.082) \text{ Adjustment}} \\
 & - 0.666 \quad -0.045 \text{ Philippine Retail Price Index} + 1.140 \text{ USD Nominal Exchange Rate} \\
 & (1.062) \quad (0.189) \quad (0.368) \\
 & + 0.310 \text{ JPY Nominal Exchange Rate} - 1.672 \text{ CNY Nominal Exchange Rate} \\
 & (0.284) \quad (0.209) \\
 & \underbrace{\hspace{10em}}_{Long-run} \\
 & + 1.179 \Delta CNY \text{ Nominal Exchange Rate} + 0.768 \Delta CNY \text{ Nominal Exchange Rate}_{t-1} \\
 & (0.196) \quad (0.229) \\
 & + 0.803 \Delta CNY \text{ Nominal Exchange Rate}_{t-2} \\
 & (0.203) \\
 & \underbrace{\hspace{10em}}_{Short-run}
 \end{aligned}$$

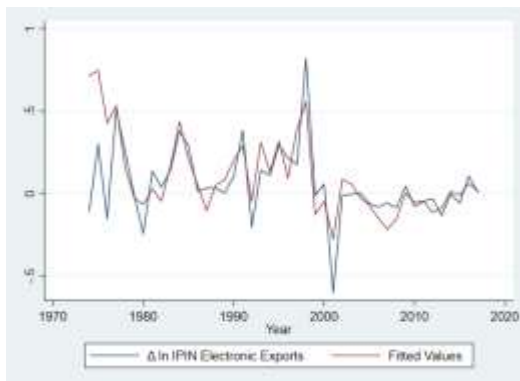
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
|                |                | $\chi^2 (39)$           | $\chi^2 (20)$           |           |       |                |
| 17.470         | -7.957         | 0.019                   | 12.856                  | 0.120     | 0.197 | 0.750          |
| [0.000, 0.000] | [0.000, 0.000] | [0.890]                 | [0.883]                 |           |       |                |

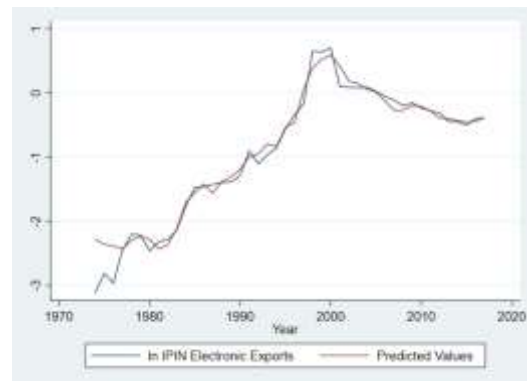
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN – Electronics Exports are 0.059, 0.222, -0.600, and 0.819 respectively.

Figure 1. Actual v. Predicted IPIN – Electronics Exports, along with residuals

Panel A: Log first-difference

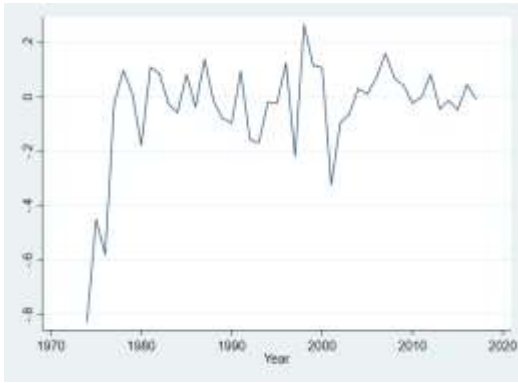


Panel B: Log level

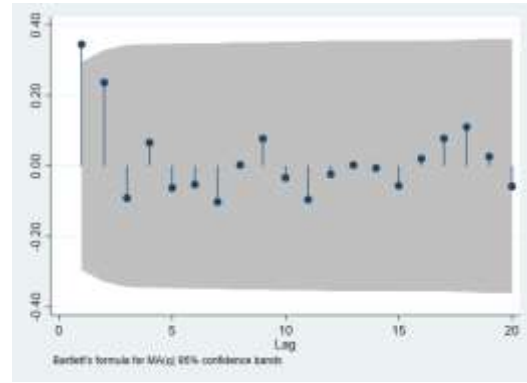




Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 7. Implicit Price Index – Agricultural Exports

Estimation Period: 1974 – 2017

$$\begin{aligned}
 \Delta IPIN, Agricultural\ Exports = & \underbrace{-0.546\ IPIN, Agricultural\ Exports_{t-1}}_{\text{Adjustment}} \\
 & \underbrace{-4.158 + 0.764\ World\ Wholesale\ Price\ Index_{t-1} + 0.813\ USD\ Nominal\ Exchange\ Rate_{t-1}}_{\text{Long-run}} \\
 & \quad (1.127) \quad (0.107) \quad (0.509) \\
 & \quad + 0.502\ CNY\ Nominal\ Exchange\ Rate_{t-1} - 0.529\ JPY\ Nominal\ Exchange\ Rate_{t-1} \\
 & \quad (0.240) \quad (0.367) \\
 & \quad + 1.173\ \Delta World\ Wholesale\ Price\ Index - 0.322\ \Delta World\ Wholesale\ Price\ Index_{t-1} \\
 & \quad (0.537) \quad (0.507) \\
 & \quad - 1.936\ \Delta World\ Wholesale\ Price\ Index_{t-2} - 0.960\ \Delta World\ Wholesale\ Price\ Index_{t-3} \\
 & \quad (0.558) \quad (0.487) \\
 & \quad + 0.444\ \Delta USD\ Nominal\ Exchange\ Rate + 0.343\ \Delta CNY\ Nominal\ Exchange\ Rate \\
 & \quad (0.234) \quad (0.233) \\
 & \quad - 0.063\ \Delta CNY\ Nominal\ Exchange\ Rate_{t-1} - 0.680\ \Delta CNY\ Nominal\ Exchange\ Rate_{t-2} \\
 & \quad (0.226) \quad (0.) \\
 & \quad - 0.289\ \Delta JPY\ Nominal\ Exchange\ Rate \\
 & \quad (0.) \\
 & \underbrace{\hspace{10em}}_{\text{Short-run}}
 \end{aligned}$$

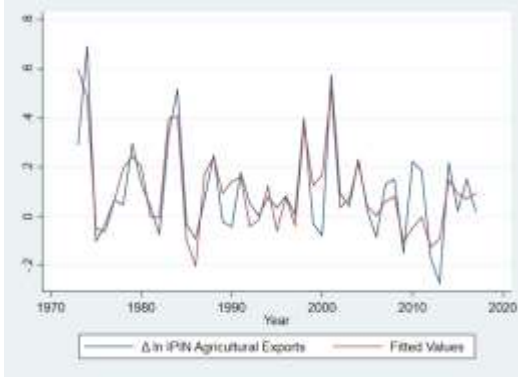
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 5.435          | -4.063         | $\chi^2(42)$            | $\chi^2(20)$            | 0.087     | 0.112 | 0.704          |
| [0.003, 0.022] | [0.003, 0.046] | [0.817]                 | [0.943]                 |           |       |                |

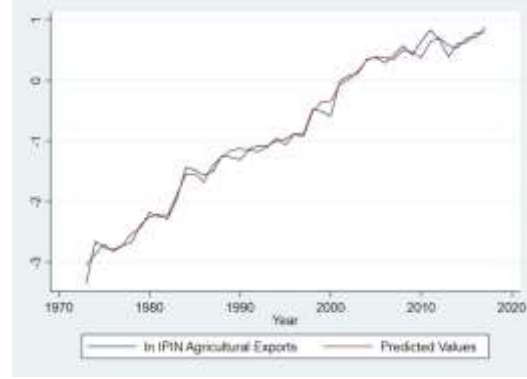
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN – Agricultural Exports are 0.092, 0.193, -0.273, and 0.692 respectively.

Figure 1. Actual v. Predicted IPIN – Agricultural Exports, along with residuals

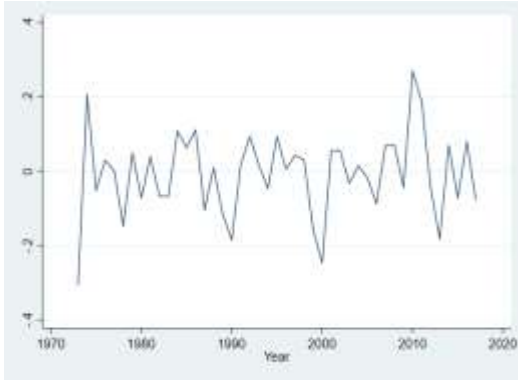
Panel A: Log first-difference



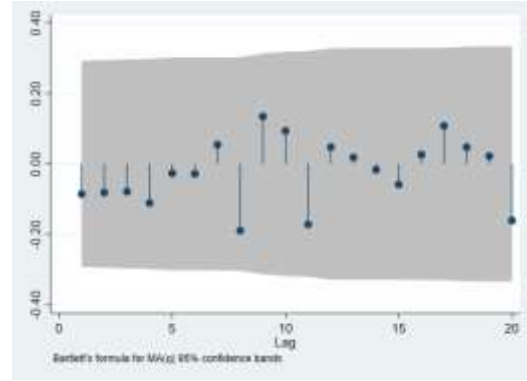
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 8. Implicit Price Index – Mineral Exports

Estimation Period: 1971 – 2017

$$\begin{aligned}
 \Delta IPIN, Mineral Exports = & \underbrace{-0.522 IPIN, Mineral Exports_{t-1}}_{\text{Adjustment}} \\
 & - 4.665 + 1.199 Foreign IPIN, Mineral Exports \\
 & \quad (0.954) \quad (0.145) \\
 & + 1.139 Nominal Effective Exchange Rate + 0.032 Total Natural Disasters \\
 & \quad (0.070) \quad (0.013) \\
 & \quad \quad \quad \text{Long-run} \\
 & + 0.282 \Delta IPIN, Mineral Exports_{t-1} + 0.016 \Delta IPIN, Mineral Exports_{t-2} \\
 & \quad (0.090) \quad (0.081) \\
 & + 0.262 \Delta IPIN, Mineral Exports_{t-3} + 0.229 \Delta Foreign IPIN, Mineral Exports \\
 & \quad (0.078) \quad (0.129) \\
 & - 0.006 \Delta Total Natural Disasters - 0.015 \Delta Total Natural Disasters_{t-1} \\
 & \quad (0.005) \quad (0.004) \\
 & \quad \quad \quad \text{Short-run}
 \end{aligned}$$

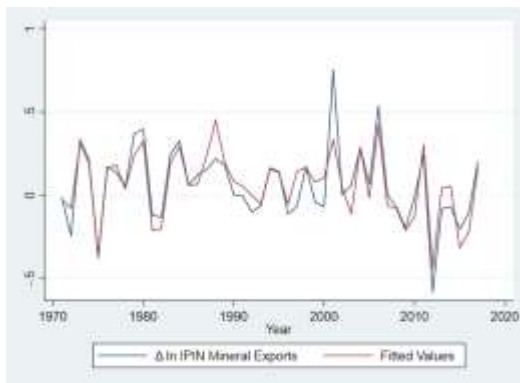
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 9.062          | -5.574         | $\chi^2(45)$            | $\chi^2(21)$            | 0.079     | 0.110 | 0.767          |
| [0.000, 0.001] | [0.000, 0.001] | [0.173]                 | [0.710]                 |           |       |                |

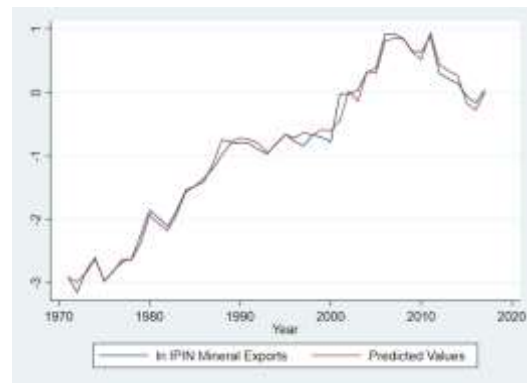
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN – Mineral Exports are 0.084, 0.257, -0.584, and 0.953 respectively.

Figure 1. Actual v. Predicted IPIN – Mineral Exports, along with residuals

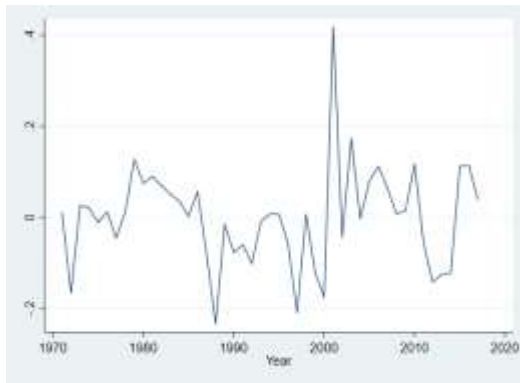
Panel A: Log first-difference



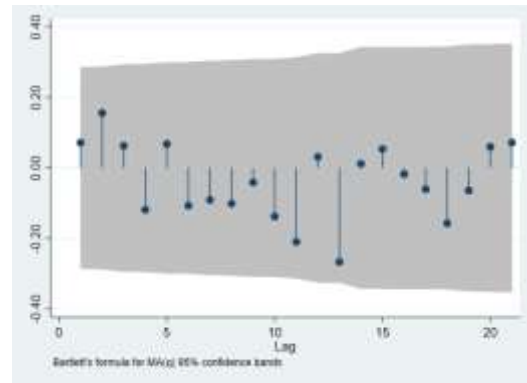
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 9. Implicit Price Index – Other Good Exports

Estimation Period: 1974 – 2017

$$\begin{aligned}
 \Delta IPIN, Other\ Good\ Exports_t = & \underbrace{-0.459 IPIN, Other\ Good\ Exports_{t-1}}_{\text{Adjustment}} \\
 & - 3.131 - 0.268 \text{ Philippine Retail Price Index} + 2.261 \text{ USD Nominal Exchange Rate} \\
 & \quad (1.059) \quad (0.266) \quad (0.548) \\
 & - 0.263 \text{ JPY Nominal Exchange Rate} - 0.428 \text{ CNY Nominal Exchange Rate} \\
 & \quad (0.438) \quad (0.267) \\
 & \underbrace{\hspace{10em}}_{\text{Long-run}}
 \end{aligned}$$

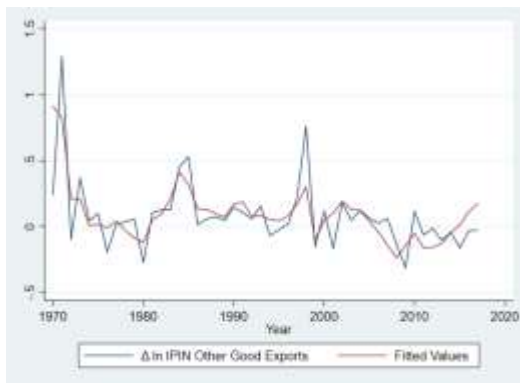
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 8.266          | -5.271         | $\chi^2(42)$            | $\chi^2(22)$            | 0.123     | 0.178 | 0.521          |
| [0.000, 0.001] | [0.000, 0.004] | [0.144]                 | [0.753]                 |           |       |                |

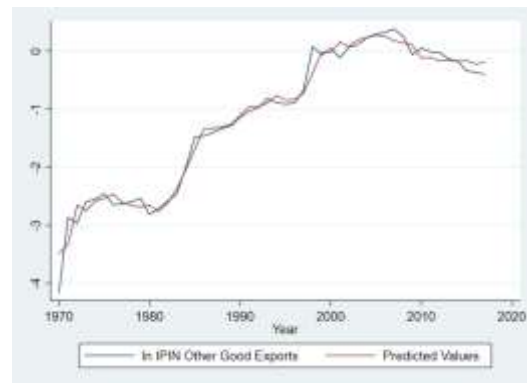
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN – Other Good Exports are 0.074, 0.268, -0.499, and 1.289 respectively.

Figure 1. Actual v. Predicted, along with residuals

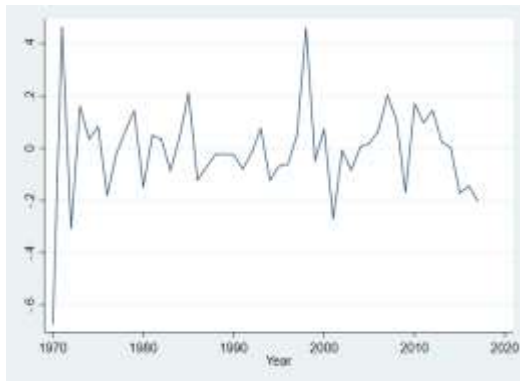
Panel A: Log first-difference



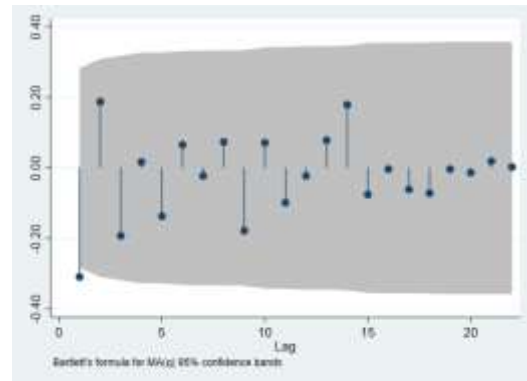
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 10. Implicit Price Index – Service Imports

Estimation Period: 1984 – 2017

$$\begin{aligned}
 \Delta IPIN, Service Imports = & \underbrace{-0.604 IPIN, Service Imports_{t-1}}_{\text{Adjustment}} \\
 & - 2.206 + 0.554 \text{ Philippine Retail Price Index} \\
 & \quad (0.630) \quad (0.105) \\
 & + 0.613 \text{ USD Nominal Exchange Rate} - 0.643 \text{ CNY Nominal Exchange Rate} \\
 & \quad (0.152) \quad (0.101) \\
 & \underbrace{+ 0.256 \Delta CNY \text{ Nominal Exchange Rate}}_{\text{Short-run}} \\
 & \quad (0.116)
 \end{aligned}$$

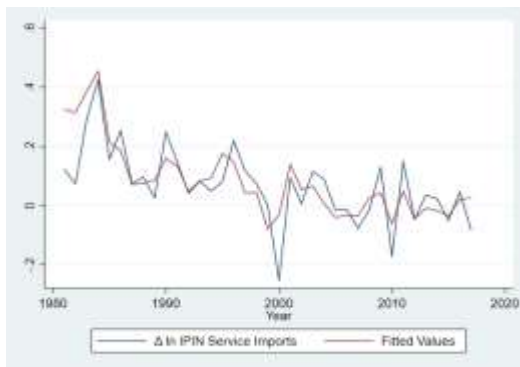
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
|                |                | $\chi^2 (32)$           | $\chi^2 (16)$           |           |       |                |
| 14.691         | -4.896         | 0.807                   | 11.805                  | 0.064     | 0.085 | 0.680          |
| [0.000, 0.000] | [0.000, 0.006] | [0.368]                 | [0.757]                 |           |       |                |

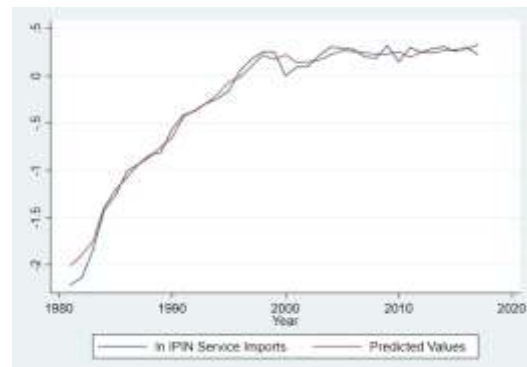
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN – Service Imports are 0.069, 0.125, -0.252, and 0.424 respectively.

Figure 1. Actual v. Predicted IPIN – Service Imports, along with residuals

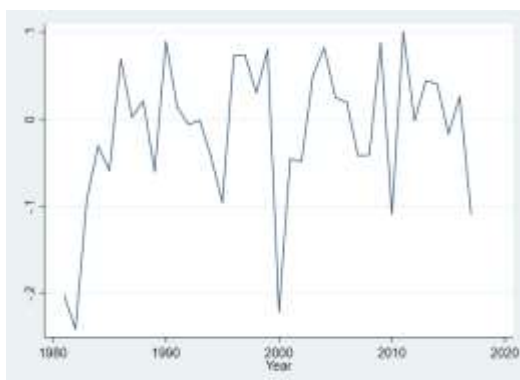
Panel A: Log first-difference



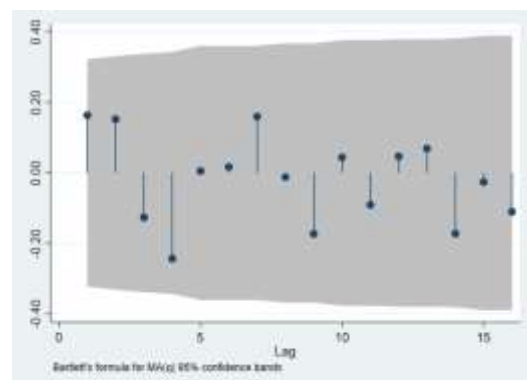
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 11. Implicit Price Index – BPO Service Exports

Estimation Period: 1984 – 2017

$$\begin{aligned}
 \Delta IPIN, BPO \text{ Service Exports}_t = & \underbrace{-0.798 IPIN, BPO \text{ Service Exports}_{t-1}}_{\text{Adjustment}} \\
 & - 1.073 + 0.683 \text{ Foreign } IPIN, BPO \text{ Service Exports}_t + 2.024 \text{ USD Nominal Exchange Rate} \\
 & \quad (3.166) \quad (0.182) \quad (0.732) \\
 & + 1.713 IPIN, \text{Materials Imports}_t + 0.321 IPIN, \text{Fuel Imports}_t \\
 & \quad (0.583) \quad (0.126) \\
 & \quad \text{Long-run} \\
 & + 0.239 \Delta IPIN, BPO \text{ Service Exports}_{t-1} + 0.364 \Delta IPIN, BPO \text{ Service Exports}_{t-2} - 0.307 \Delta IPIN, \text{Fuel Imports}_t \\
 & \quad (0.150) \quad (0.156) \quad (0.176) \\
 & \quad \text{Short-run}
 \end{aligned}$$

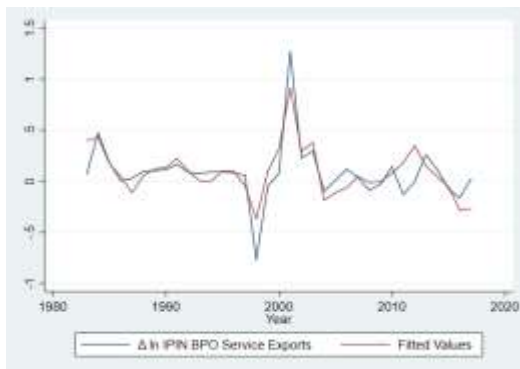
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
|                |                | $\chi^2 (32)$           | $\chi^2 (15)$           |           |       |                |
| 10.067         | -5.355         | 0.580                   | 14.808                  | 0.118     | 0.164 | 0.683          |
| [0.000, 0.001] | [0.000, 0.005] | [0.445]                 | [0.465]                 |           |       |                |

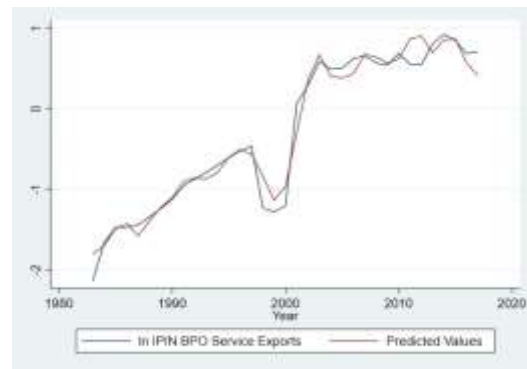
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN – BPO Service Exports are 0.084, 0.272, -0.767, and 1.271 respectively.

Figure 1. Actual v. Predicted IPIN – BPO Service Exports, along with residuals

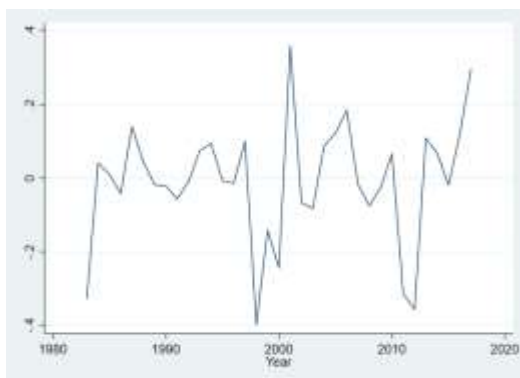
Panel A: Log first-difference



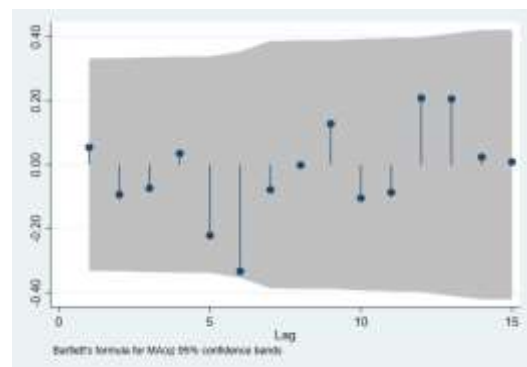
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 12. Implicit Price Index – Tourism Service Exports

Estimation Period: 1984 – 2017

$$\begin{aligned} \Delta IPIN, \text{Tourism Service Exports} = & \underbrace{-0.590 IPIN, \text{Tourism Service Exports}_{t-1}}_{\text{Adjustment}} \\ & + \underbrace{2.650}_{(4.616)} - \underbrace{1.338}_{(0.042)} \text{Foreign } IPIN, \text{Tourism Service Exports} \\ & - \underbrace{0.407}_{(0.401)} \text{Nominal Effective Exchange Rate} + \underbrace{2.939}_{(0.248)} \text{Philippine Wholesale Price Index} \end{aligned}$$

Long-run

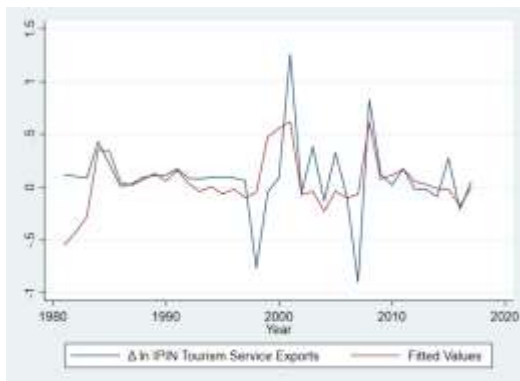
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
|                |                | $\chi^2 (32)$           | $\chi^2 (16)$           |           |       |                |
| 4.113          | -3.616         | 1.236                   | 14.355                  | 0.206     | 0.310 | 0.362          |
| [0.030, 0.098] | [0.011, 0.078] | [0.266]                 | [0.572]                 |           |       |                |

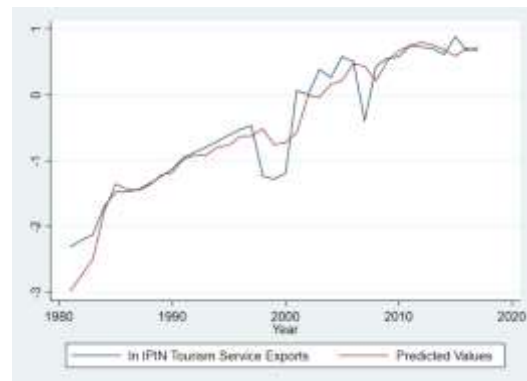
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN – Tourism Service Exports are 0.084, 0.0342, -0.900, and 1.256 respectively.

Figure 1. Actual v. Predicted IPIN – Tourism Service Exports, along with residuals

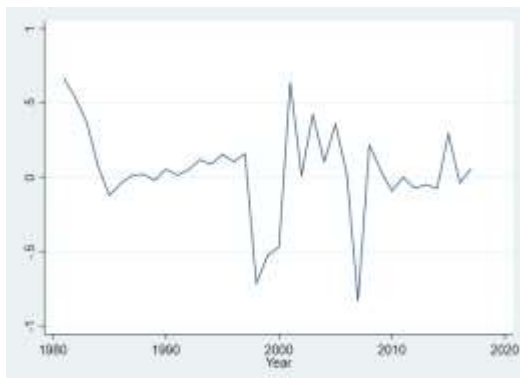
Panel A: Log first-difference



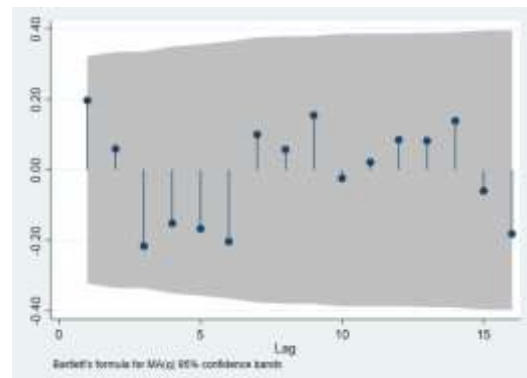
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



### 13. Implicit Price Index – Other Service Exports

Estimation Period: 1984 – 2017

$$\begin{aligned}
 \Delta IPIN, Other Service Exports = & \underbrace{-0.727 IPIN, Other Service Exports_{t-1}}_{\text{Adjustment}} \\
 & \underbrace{-15.905 + 2.616 \text{ Philippine Retail Price Index} + 1.503 \text{ USD Nominal Exchange Rate}}_{\text{Long-run}} \\
 & \quad (3.752) \quad (0.497) \quad (0.777) \\
 & \quad -1.631 \text{ JPY Nominal Exchange Rate} + 1.218 \text{ CNY Nominal Exchange Rate} \\
 & \quad (0.712) \quad (0.303) \\
 & + 0.336 \Delta IPIN, Other Service Exports_{t-1} + 0.407 \Delta IPIN, Other Service Exports_{t-2} + 0.036 \Delta \text{USD Nominal Exchange Rate} \\
 & \quad (0.151) \quad (0.152) \quad (0.730) \\
 & -0.031 \Delta \text{USD Nominal Exchange Rate}_{t-1} - 2.761 \Delta \text{USD Nominal Exchange Rate}_{t-2} \\
 & \quad (0.730) \quad (0.617) \\
 & + 0.787 \Delta \text{USD Nominal Exchange Rate}_{t-3} + 0.329 \Delta \text{JPY Nominal Exchange Rate} \\
 & \quad (0.398) \quad (0.469) \\
 & + 0.644 \Delta \text{JPY Nominal Exchange Rate}_{t-1} + 1.566 \Delta \text{JPY Nominal Exchange Rate}_{t-2} \\
 & \quad (0.424) \quad (0.474) \\
 & -0.326 \Delta \text{CNY Nominal Exchange Rate} - 1.027 \Delta \text{CNY Nominal Exchange Rate}_{t-1} \\
 & \quad (0.414) \quad (0.407) \\
 & \underbrace{\hspace{10cm}}_{\text{Short-run}}
 \end{aligned}$$

Table A1. Summary of model tests

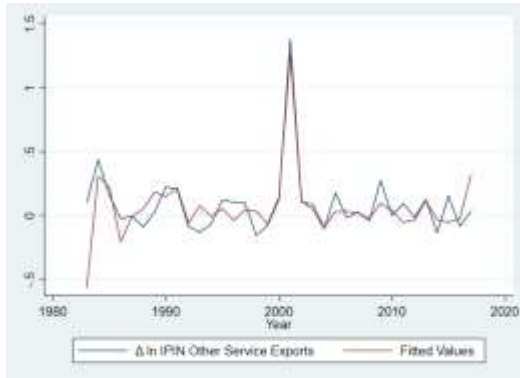
| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 6.933          | -4.829         | $\chi^2 (32)$<br>0.353  | $\chi^2 (15)$<br>5.256  | 0.103     | 0.159 | 0.804          |
| [0.002, 0.013] | [0.001, 0.014] | [0.552]                 | [0.989]                 |           |       |                |

Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) IPIN – Other Service Exports are 0.089, 0.253, -0.155, and 1.380 respectively.

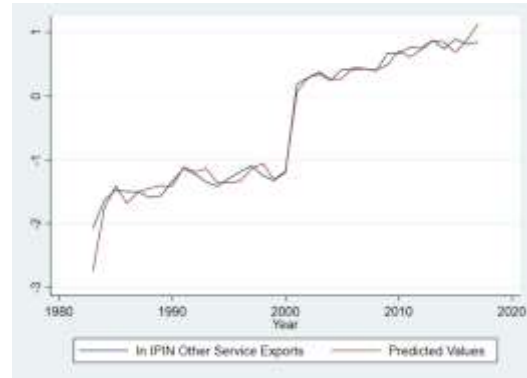


Figure 1. Actual v. Predicted IPIN – Other Service Exports, along with residuals

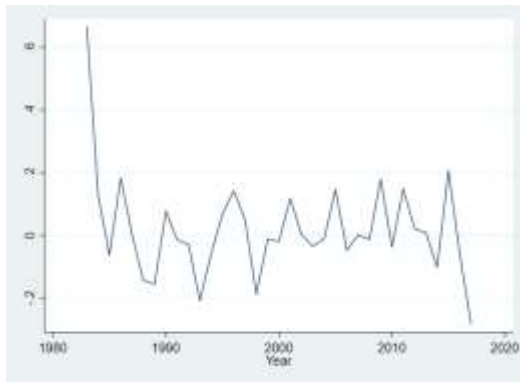
Panel A: Log first-difference



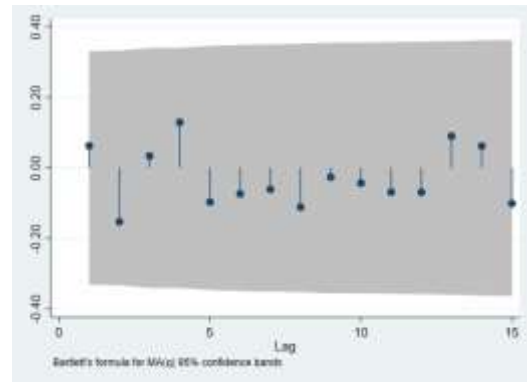
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



#### 14. Electronics Exports, Real

Estimation Period: 1977 – 2016

$$\begin{aligned}
 \Delta \text{Electronics Exports, Real} = & \underbrace{-0.303 \text{ Electronics Exports, Real}_{t-1}}_{\text{Adjustment}} \\
 & - 1.108 \quad -0.900 \text{ IPIN, Electronics Exports} \\
 & \quad (1.497) \quad \quad (0.467) \\
 & + 3.241 \text{ Consumer Price Index, China} + 1.284 \text{ Real Effective Exchange Rate} \\
 & \quad (0.767) \quad \quad (0.635) \\
 & \quad \quad \quad \text{Long-run} \\
 & - 0.636 \Delta \text{IPIN, Electronics Exports} - 0.653 \Delta \text{Consumer Price Index, China} - 1.447 \Delta \text{Consumer Price Index, China}_{t-1} \\
 & \quad (0.129) \quad \quad (0.679) \quad \quad (0.781) \\
 & \quad \quad \quad \text{Short-run}
 \end{aligned}$$

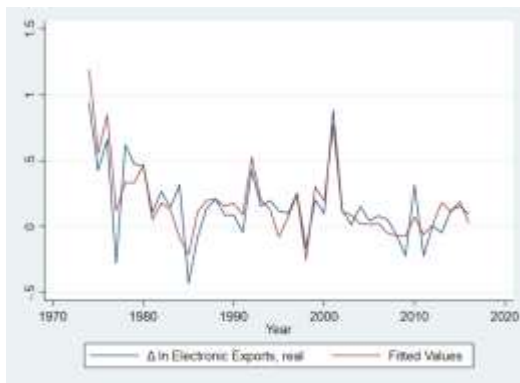
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 8.528          | -5.014         | $\chi^2$ (38)           | $\chi^2$ (19)           | 0.113     | 0.149 | 0.625          |
| [0.000, 0.002] | [0.000, 0.004] | [0.379]                 | [0.626]                 |           |       |                |

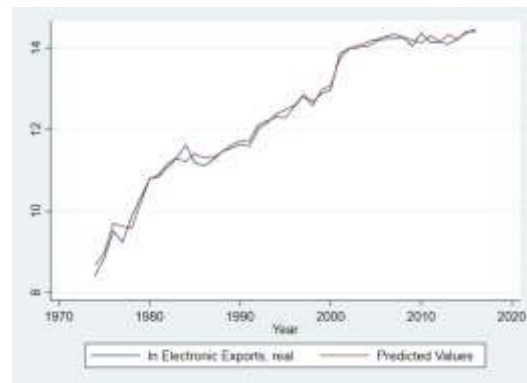
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Electronics Exports, Real are 0.163, 0.273, -0.429, and 0.937 respectively.

Figure 1. Actual v. Predicted, along with residuals

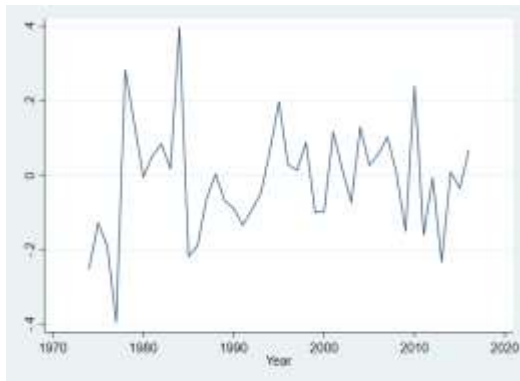
Panel A: Log first-difference



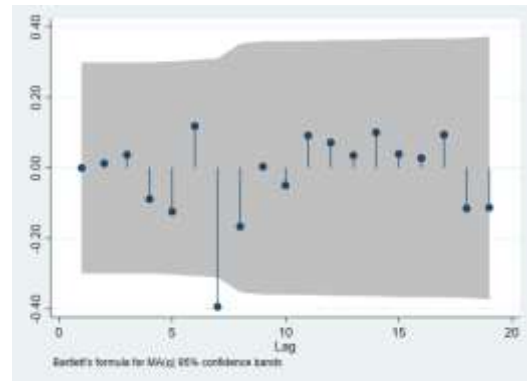
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 15. Agricultural Exports, Real

Estimation Period: 1971 – 2016

$$\begin{aligned}
 \Delta \text{Agricultural Exports, Real} = & \underbrace{-0.719 \text{ Agricultural Exports, Real}_{t-1}}_{\text{Adjustment}} \\
 & - 6.258 + 0.486 \text{ World GDP, Real} - 0.672 \text{ IPIN, Agricultural Exports} \\
 & \quad (4.025) \quad (0.195) \quad (0.169) \\
 & + 1.431 \text{ Foreign IPIN, Agricultural Exports} + 0.689 \text{ USD Real Exchange Rate} \\
 & \quad (0.324) \quad (0.255) \\
 & \quad \text{Long-run} \\
 & + 0.384 \Delta \text{World GDP, Real} - 0.822 \Delta \text{World GDP, Real}_{t-1} \\
 & \quad (0.267) \quad (0.186) \\
 & - 0.807 \Delta \text{Foreign IPIN, Agricultural Exports} - 0.413 \Delta \text{Foreign IPIN, Agricultural Exports}_{t-1} \\
 & \quad (0.196) \quad (0.145) \\
 & - 0.366 \Delta \text{Foreign IPIN, Agricultural Exports}_{t-2} - 0.556 \Delta \text{USD Real Exchange Rate} \\
 & \quad (0.146) \quad (0.300) \\
 & \quad \text{Short-run}
 \end{aligned}$$

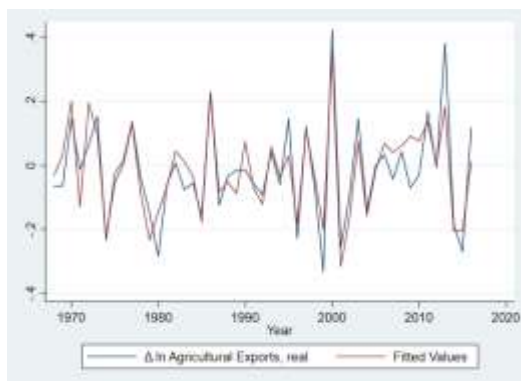
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 16.168         | -6.820         | $\chi^2(44)$            | $\chi^2(22)$            | 0.056     | 0.072 | 0.779          |
| [0.000, 0.000] | [0.000, 0.000] | [0.216]                 | [0.219]                 |           |       |                |

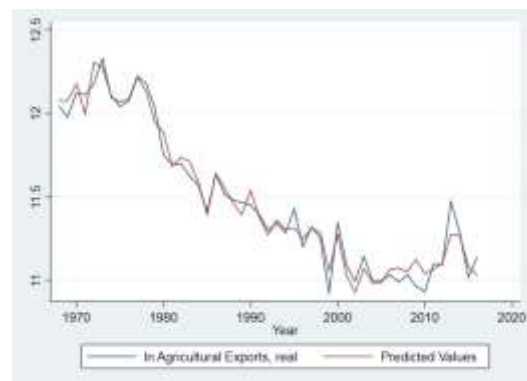
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Agricultural Exports, Real are -0.013, 0.159, -0.330, and 0.423 respectively.

Figure 1. Actual v. Predicted Agricultural Exports, Real, along with residuals

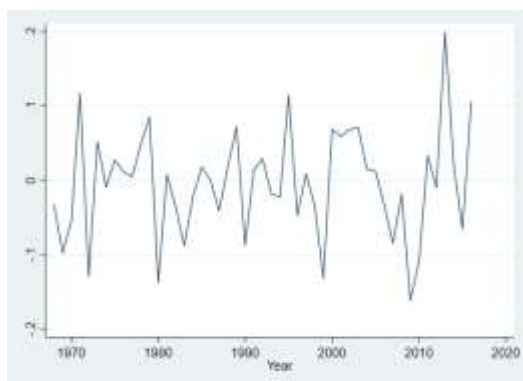
Panel A: Log first-difference



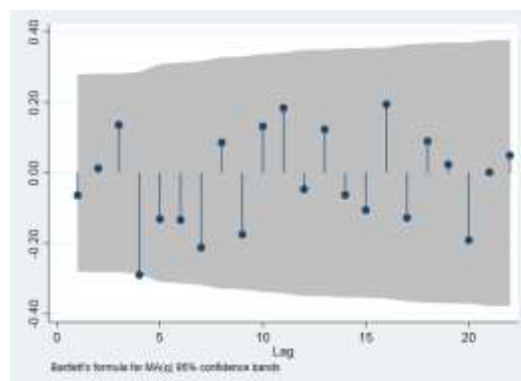
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 16. Mineral Exports, Real

Estimation Period: 1974 – 2016

$$\begin{aligned}
 \Delta \text{Mineral Exports, Real} = & \underbrace{-1.158 \text{ Mineral Exports, Real}_{t-1}}_{\text{Adjustment}} \\
 & - 5.537 + 0.856 \text{ World GDP, Real} - 0.656 \text{ IPIN, Mineral Exports} \\
 & \quad (2.207) \quad (0.092) \quad (0.073) \\
 & - 1.195 \text{ USD Real Exchange Rate} + 0.920 \text{ CNY Real Exchange Rate} \\
 & \quad (0.156) \quad (0.113) \\
 & \quad \text{Long-run} \\
 & + 0.378 \Delta \text{Mineral Exports, Real}_{t-1} + 0.289 \Delta \text{Mineral Exports, Real}_{t-2} - 0.085 \Delta \text{World GDP, Real} \\
 & \quad (0.122) \quad (0.111) \quad (0.346) \\
 & - 0.788 \Delta \text{World GDP, Real}_{t-1} - 1.191 \Delta \text{USD Real Exchange Rate} \\
 & \quad (0.273) \quad (0.402) \\
 & \quad \text{Short-run}
 \end{aligned}$$

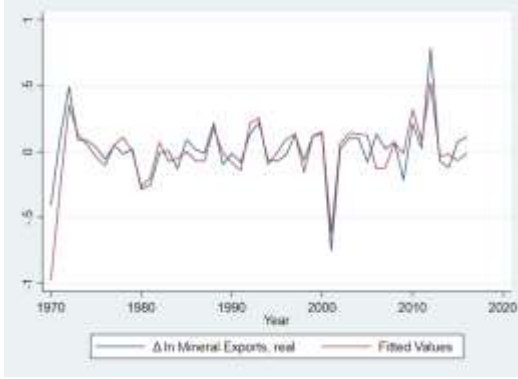
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 15.407         | -7.814         | $\chi^2(41)$            | $\chi^2(21)$            | 0.097     | 0.140 | 0.745          |
| [0.000, 0.000] | [0.000, 0.000] | 0.756                   | 11.730                  |           |       |                |
|                |                | [0.384]                 | [0.946]                 |           |       |                |

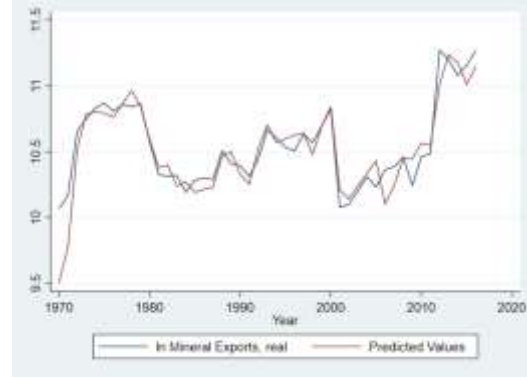
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Mineral Exports, Real are 0.023, 0.215, -0.747, and 0.784 respectively.

Figure 1. Actual v. Predicted Mineral Exports, Real, along with residuals

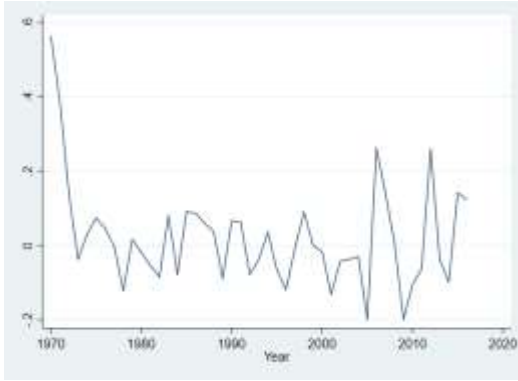
Panel A: Log first-difference



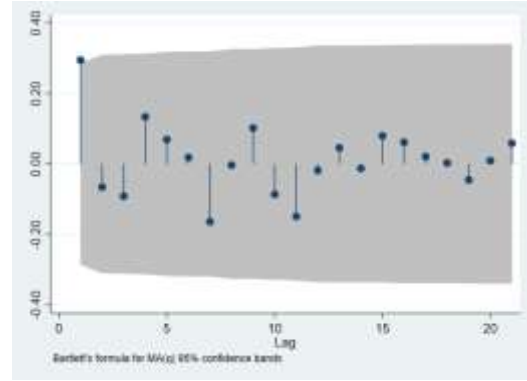
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 17. Other Good Exports, Real

Estimation Period: 1973 – 2016

$$\Delta \text{Other Good Exports, Real} = \underbrace{-0.879 \text{ Other Good Exports, Real}_{t-1}}_{\text{Adjustment}} \quad (0.139)$$

$$\begin{aligned} & -0.054 + 1.008 \text{ World GDP, Real} - 0.568 \text{ IPIN, Other Good Exports} \\ & \quad (2.149) \quad (0.085) \quad (0.085) \\ & -2.053 \text{ USD Real Exchange Rate} + 0.519 \text{ JPY Real Exchange Rate} \\ & \quad (0.255) \quad (0.139) \end{aligned}$$

Long-run

$$\begin{aligned} & +0.263 \Delta \text{Other Good Exports, Real}_{t-1} + 0.009 \Delta \text{World GDP, Real} - 0.869 \Delta \text{World GDP, Real}_{t-1} \\ & \quad (0.133) \quad (0.361) \quad (0.339) \\ & -0.239 \Delta \text{IPIN, Other Good Exports} + 0.087 \Delta \text{IPIN, Other Good Exports}_{t-1} + 0.294 \Delta \text{IPIN, Other Good Exports}_{t-2} \\ & \quad (0.131) \quad (0.131) \quad (0.074) \\ & +1.020 \Delta \text{USD Real Exchange Rate} + 1.620 \Delta \text{USD Real Exchange Rate}_{t-1} + 1.305 \Delta \text{USD Real Exchange Rate}_{t-2} \\ & \quad (0.441) \quad (0.403) \quad (0.325) \\ & -0.438 \Delta \text{JPY Real Exchange Rate} - 0.463 \Delta \text{JPY Real Exchange Rate}_{t-1} - 0.389 \Delta \text{JPY Real Exchange Rate}_{t-2} \\ & \quad (0.223) \quad (0.213) \quad (0.195) \end{aligned}$$

Short-run

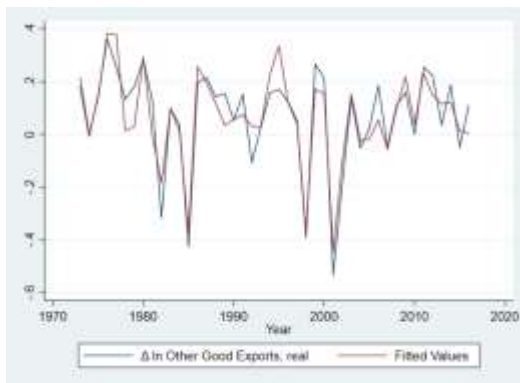
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 11.210         | -6.316         | $\chi^2(42)$            | $\chi^2(20)$            | 0.059     | 0.076 | 0.838          |
| [0.000, 0.000] | [0.000, 0.001] | [0.987]                 | [0.273]                 |           |       |                |

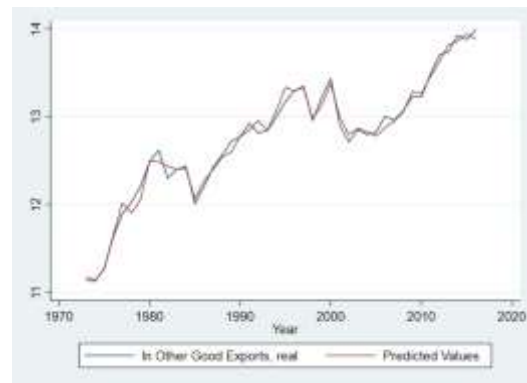
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Other Good Exports, Real are 0.072, 0.218, -0.534, and 0.634 respectively.

Figure 1. Actual v. Predicted Other Good Exports, Real, along with residuals

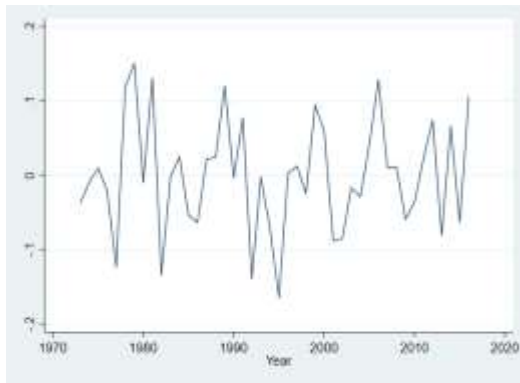
Panel A: Log first-difference



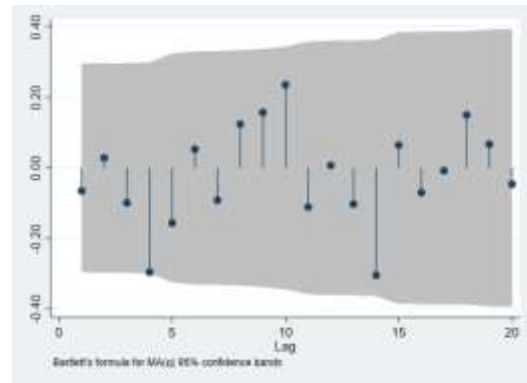
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 18. BPO Service Exports, Real

Estimation Period: 1984 – 2016

$$\begin{aligned}
 \Delta BPO \text{ Service Exports, Real} = & \underbrace{-0.994 BPO \text{ Service Exports, Real}_{t-1}}_{\text{Adjustment}} \\
 & + 29.808 - 0.129 \text{ World GDP, Real} + 0.614 \text{ IPIN, BPO Service Exports} \\
 & \quad (4.567) \quad (0.177) \quad (0.174) \\
 & - 0.328 \text{ GVA Service, Real} - 2.999 \text{ USD Real Exchange Rate} \\
 & \quad (0.250) \quad (0.236) \\
 & \underbrace{\quad \quad \quad}_{\text{Long-run}} \\
 & - 0.819 \Delta \text{IPIN, BPO Service Exports} - 0.546 \Delta \text{IPIN, BPO Service Exports}_{t-1} \\
 & \quad (0.119) \quad (0.154) \\
 & - 0.546 \Delta \text{IPIN, BPO Service Exports}_{t-2} + 1.615 \Delta \text{USD Real Exchange Rate} \\
 & \quad (0.133) \quad (0.628) \\
 & \underbrace{\quad \quad \quad}_{\text{Short-run}}
 \end{aligned}$$

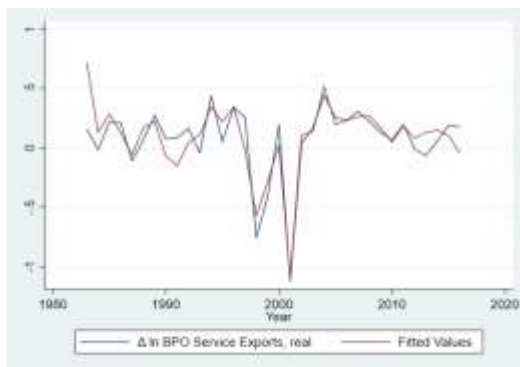
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
|                |                | $\chi^2 (31)$           | $\chi^2 (15)$           |           |       |                |
| 11.287         | -6.428         | 1.781                   | 10.960                  | 0.113     | 0.153 | 0.843          |
| [0.000, 0.000] | [0.000, 0.001] | [0.181]                 | [0.755]                 |           |       |                |

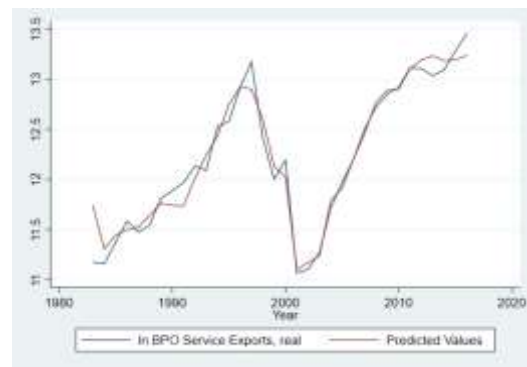
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) BPO Service Exports, Real are 0.072, 0.297, -1.125, and 0.444 respectively.

Figure 1. Actual v. Predicted BPO Service Exports, Real, along with residuals

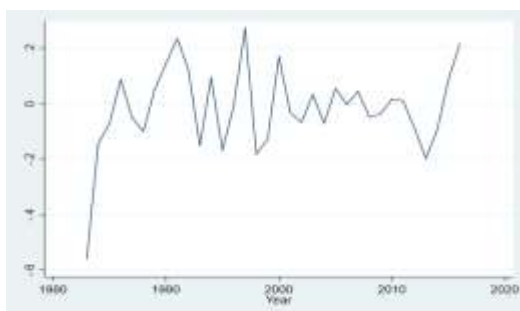
Panel A: Log first-difference



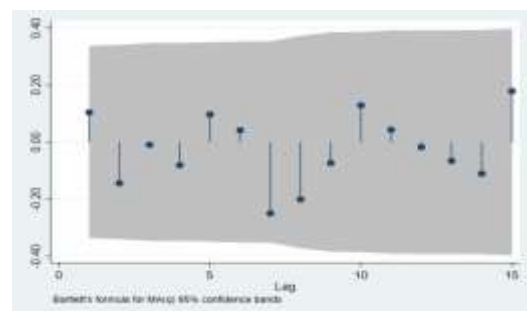
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 19. Tourism Service Exports, Real

Estimation Period: 1984 – 2016

$$\begin{aligned}
 \Delta \text{Tourism Service Exports, Real} = & \underbrace{-0.838 \text{ Tourism Service Exports, Real}_{t-1}}_{\text{Adjustment}} \\
 & - 1.932 + 0.646 \text{ World GDP, Real} \\
 & \quad (2.798) \quad (0.150) \\
 & - 0.458 \text{ IPIN, Tourism Service Exports} + 0.212 \text{ Real Effective Exchange Rate} \\
 & \quad (0.149) \quad (0.182) \\
 & \quad \text{Long-run} \\
 & + 0.361 \Delta \text{Tourism Service Exports} + 0.188 \Delta \text{Tourism Service Exports} - 1.494 \Delta \text{World GDP, Real} \\
 & \quad (0.088) \quad (0.094) \quad (0.502) \\
 & - 1.031 \Delta \text{World GDP, Real} - 0.325 \Delta \text{IPIN, Tourism Service Exports} + 1.195 \Delta \text{Real Effective Exchange Rate} \\
 & \quad (0.498) \quad (0.153) \quad (0.279) \\
 & + 1.084 \Delta \text{Real Effective Exchange Rate} + 0.504 \Delta \text{Real Effective Exchange Rate} \\
 & \quad (0.330) \quad (0.202) \\
 & \quad \text{Short-run}
 \end{aligned}$$

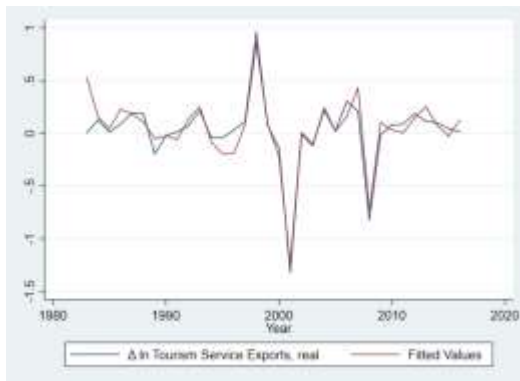
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 8.852          | -4.863         | $\chi^2(31)$            | $\chi^2(15)$            | 0.088     | 0.129 | 0.922          |
| [0.001, 0.004] | [0.001, 0.008] | 0.208                   | 12.230                  |           |       |                |
|                |                | [0.647]                 | [0.661]                 |           |       |                |

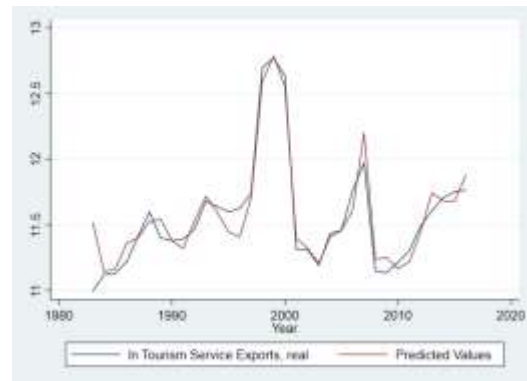
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Tourism Service Exports, Real are 0.035, 0.330, -1.319, and 0.958 respectively.

Figure 1. Actual v. Predicted Tourism Service Exports, Real, along with residuals

Panel A: Log first-difference

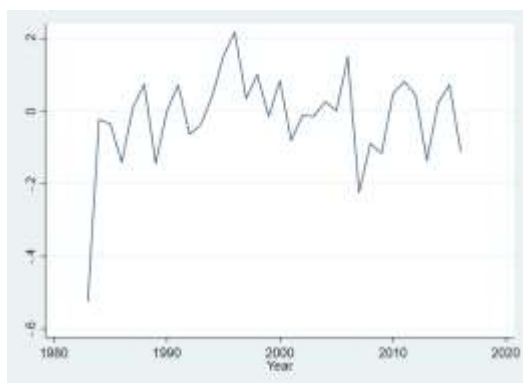


Panel B: Log level

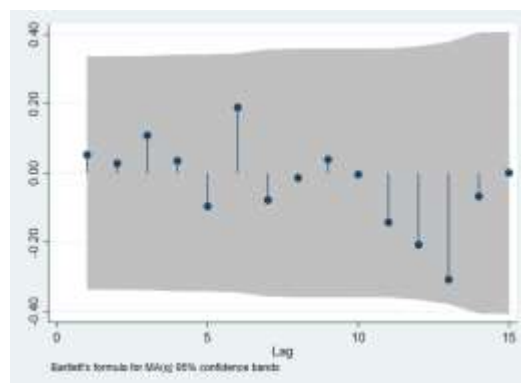




Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 20. Other Service Exports

Estimation Period: 1984 – 2016

$$\begin{aligned}
 \Delta \text{Other Service Exports} = & \underbrace{- \text{Other Service Exports}_{t-1}}_{\text{Adjustment}} \quad (0.916) \\
 & - 3.774 \quad -0.425 \text{ World GDP, Real} - 0.595 \text{ IPIN, Other Service Exports} \\
 & (2.353) \quad (0.132) \quad (0.091) \\
 & + 2.144 \text{ GVA Service, Real} + 0.982 \text{ Real Effective Exchange Rate} \\
 & (0.402) \quad (0.222) \\
 & \underbrace{\hspace{10em}}_{\text{Long-run}} \\
 & - 0.047 \Delta \text{IPIN, Other Service Exports} + 0.209 \Delta \text{IPIN, Other Service Exports}_{t-1} \\
 & (0.916) \quad (0.099) \\
 & - 1.113 \Delta \text{Real Effective Exchange Rate} - 1.089 \Delta \text{Real Effective Exchange Rate}_{t-1} \\
 & (0.193) \quad (0.194) \\
 & \underbrace{\hspace{10em}}_{\text{Short-run}}
 \end{aligned}$$

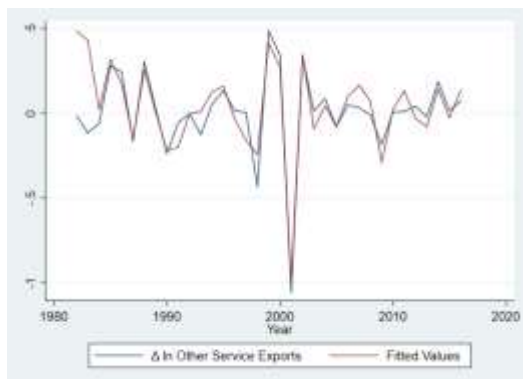
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 15.617         | -7.071         | $\chi^2(31)$            | $\chi^2(15)$            | 0.093     | 0.148 | 0.899          |
| [0.000, 0.000] | [0.000, 0.000] | [0.251]                 | [0.840]                 |           |       |                |

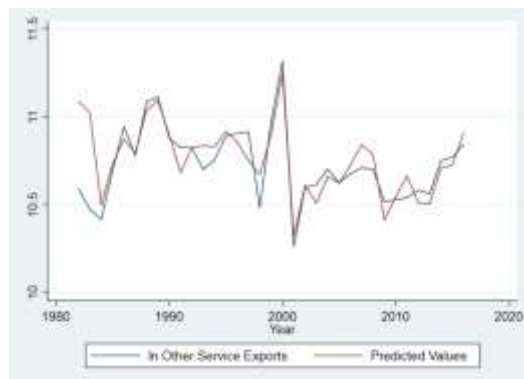
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Other Service Exports are 0.007, 0.251, -1.056, and 0.489 respectively.

Figure 1. Actual v. Predicted Other Service Exports, along with residuals

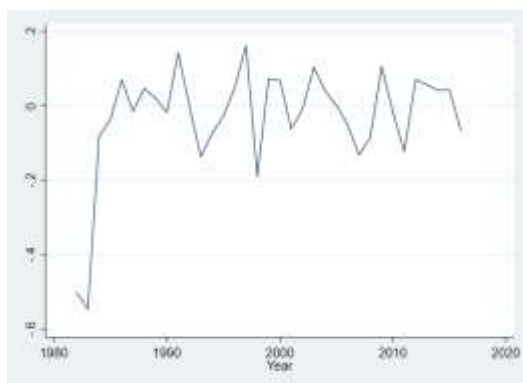
Panel A: Log first-difference



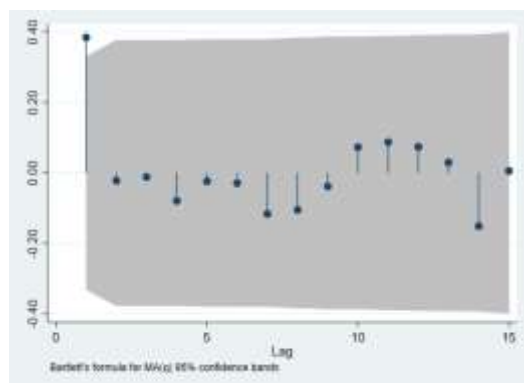
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 21. Balance of Payments – Total Goods Exports, Nominal

Estimation Period: 1981 – 2016

$$\begin{aligned}
 \Delta \text{Total Goods Exports, Nominal} = & \underbrace{-0.387 \text{ Total Goods Exports, Nominal}_{t-1}}_{\text{Adjustment}} \\
 & - 3.803 + 1.253 \text{ World GDP, Nominal} - 1.334 \text{ USD Nominal Exchange Rate} \\
 & \quad (2.780) \quad (0.240) \quad (0.581) \\
 & + 0.135 \text{ JPY Nominal Exchange Rate} - 0.914 \text{ CNY Nominal Exchange Rate} \\
 & \quad (0.474) \quad (0.) \\
 & \quad \quad \quad \text{Long-run} \\
 & - 0.142 \Delta \text{Total Goods Exports, Nominal}_{t-1} + 0.027 \Delta \text{Total Goods Exports, Nominal}_{t-2} \\
 & \quad (0.122) \quad (0.116) \\
 & - 0.334 \Delta \text{Total Goods Exports, Nominal}_{t-3} + 0.884 \Delta \text{World GDP, Nominal} - 0.383 \Delta \text{World GDP, Nominal}_{t-1} \\
 & \quad (0.111) \quad (0.302) \quad (0.217) \\
 & - 0.481 \Delta \text{JPY Nominal Exchange Rate} + 0.358 \Delta \text{CNY Nominal Exchange Rate} \\
 & \quad (0.183) \quad (0.177) \\
 & \quad \quad \quad \text{Short-run}
 \end{aligned}$$

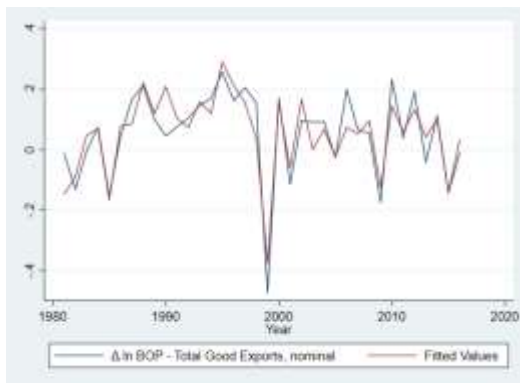
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 8.765          | -3.998         | $\chi^2(34)$            | $\chi^2(16)$            | 0.050     | 0.064 | 0.800          |
| [0.000, 0.002] | [0.004, 0.055] | [0.632]                 | [0.769]                 |           |       |                |

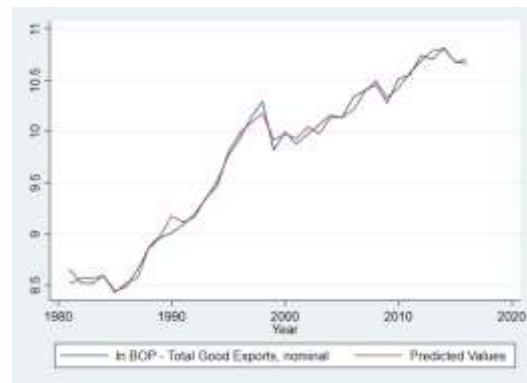
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) BOP – Total Goods Exports, Nominal are 0.066, 0.147, -0.471, and 0.295 respectively.

Figure 1. Actual v. Predicted BOP – Total Goods Exports, Nominal, along with residuals

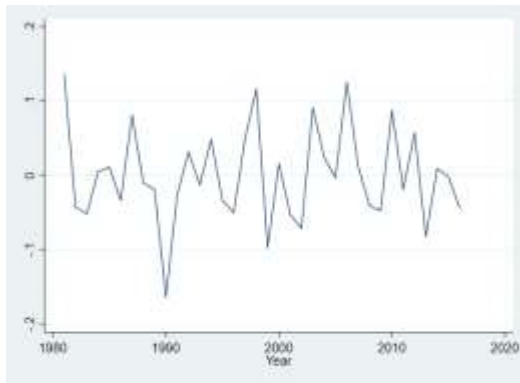
Panel A: Log first-difference



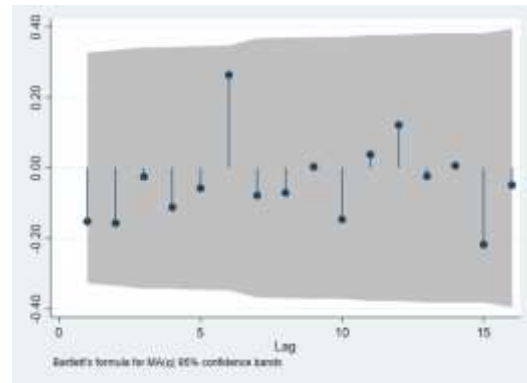
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 22. Balance of Payments - Total Service Exports, Nominal

Estimation Period: 1990 – 2016

$$\begin{aligned}
 \Delta \text{Total Service Exports, Nominal} = & \underbrace{\frac{-\text{Total Service Exports, Nominal}_{t-1}}{(0.104)}}_{\text{Adjustment}} \\
 & - 11.650 + 1.996 \text{ World GDP, Nominal} - 2.510 \text{ USD Nominal Exchange Rate} \\
 & \quad (4.603) \quad (0.276) \quad (0.449) \\
 & - 0.711 \text{ JPY Nominal Exchange Rate} - 1.680 \text{ CNY Nominal Exchange Rate} + 0.688 \text{ IPIN, Total Service Exports} \\
 & \quad (0.333) \quad (0.262) \quad (0.203) \\
 & \quad \quad \quad \text{Long-run} \\
 & - 0.551 \Delta \text{World GDP, Nominal} + 0.352 \Delta \text{World GDP, Nominal}_{t-1} \\
 & \quad (0.437) \quad (0.278) \\
 & + 1.287 \Delta \text{World GDP, Nominal}_{t-2} + 1.064 \Delta \text{USD Nominal Exchange Rate} \\
 & \quad (0.275) \quad (0.488) \\
 & \quad \quad \quad \text{Short-run}
 \end{aligned}$$

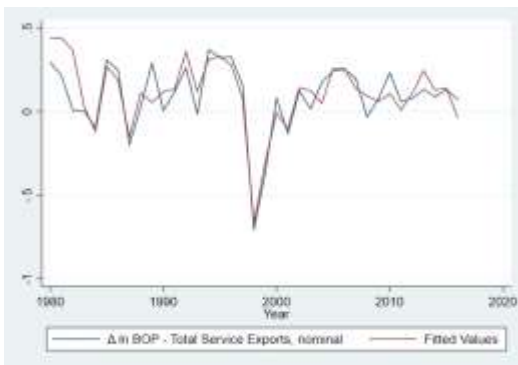
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
|                |                | $\chi^2 (32)$           | $\chi^2 (16)$           |           |       |                |
| 14.183         | -5.074         | 0.006                   | 11.581                  | 0.079     | 0.107 | 0.845          |
| [0.000, 0.000] | [0.000, 0.013] | [0.934]                 | [0.772]                 |           |       |                |

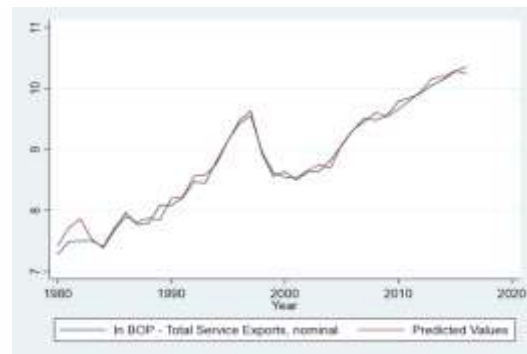
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) BOP - Total Service Exports, Nominal are 0.096, 0.205, -0.705, and 0.370 respectively.

Figure 1. Actual v. Predicted BOP - Total Service Exports, Nominal, along with residuals

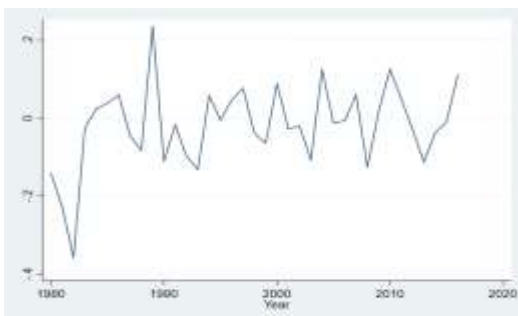
Panel A: Log first-difference



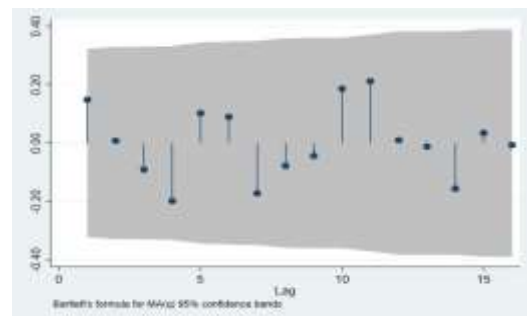
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



### 23. Agricultural Imports, Real

Estimation Period: 1974 – 2016

$$\begin{aligned}
 \Delta \text{Agricultural Imports, Real} = & \underbrace{-0.740 \text{ Agricultural Imports, Real}_{t-1}}_{\text{Adjustment}} \\
 & + 9.111 \quad -0.325 \text{ GDP, Real} - 0.752 \text{ IPIN, Agricultural Imports} - 0.345 \text{ Real Effective Exchange Rate} \\
 & \quad (5.860) \quad (0.461) \quad (0.177) \quad (0.280) \\
 & + 1.140 \text{ Philippine Retail Price Index} - 0.282 \text{ Tariff, Agricultural Imports} \\
 & \quad (0.144) \quad (0.) \\
 & \quad \text{Long-run} \\
 & + 0.027 \Delta \text{GDP, Real} + 1.849 \Delta \text{GDP, Real}_{t-1} \\
 & \quad (0.905) \quad (0.920) \\
 & + 1.508 \Delta \text{GDP, Real}_{t-2} - 0.429 \Delta \text{IPIN, Agricultural Imports} \\
 & \quad (0.832) \quad (0.160) \\
 & \quad \text{Short-run}
 \end{aligned}$$

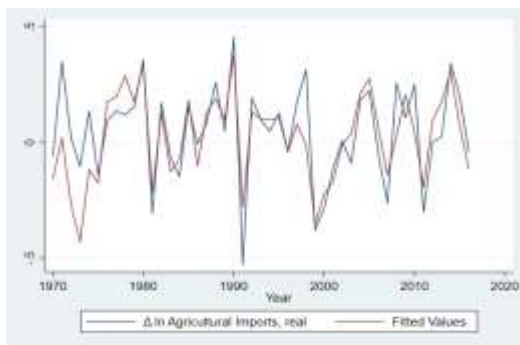
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
|                |                | $\chi^2(41)$            | $\chi^2(21)$            |           |       |                |
| 5.747          | -5.496         | 1.764                   | 19.737                  | 0.102     | 0.135 | 0.701          |
| [0.001, 0.012] | [0.000, 0.004] | [0.184]                 | [0.537]                 |           |       |                |

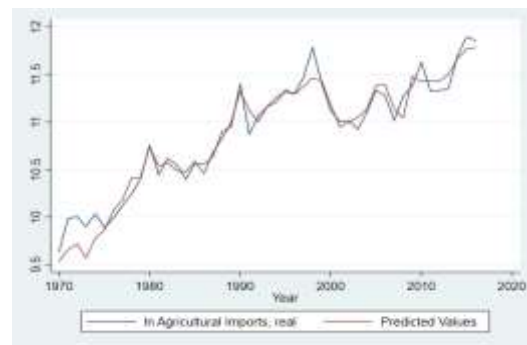
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Agricultural Imports, Real are 0.041, 0.205, -0.528, and 0.453 respectively.

Figure 1. Actual v. Predicted Agricultural Imports, Real, along with residuals

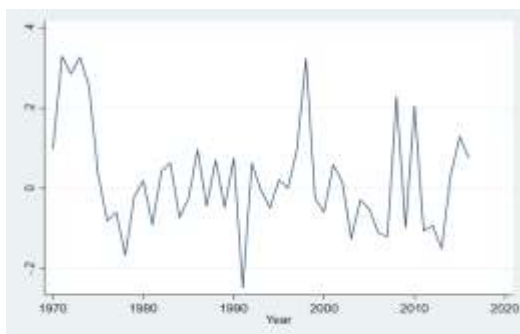
Panel A: Log first-difference



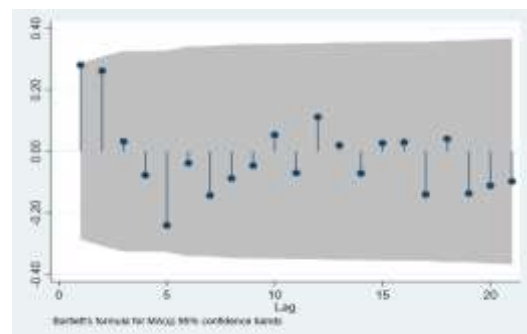
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 24. Fuel Imports, Real

Estimation Period: 1974 – 2016

$$\begin{aligned}
 \Delta \text{Fuel Imports, Real} = & \underbrace{-0.484 \text{ Fuel Imports, Real}_{t-1}}_{\text{Adjustment}} \\
 & - 2.791 + 1.261 \text{ GDP, Real} - 0.471 \text{ IPIN, Fuel Imports} \\
 & \quad (1.390) \quad (0.197) \quad (0.060) \\
 & - 0.515 \text{ CNY Real Exchange Rate} + 0.468 \text{ JPY Real Exchange Rate} \\
 & \quad (0.131) \quad (0.171) \\
 & \quad \text{Long-run} \\
 & + 0.286 \Delta \text{CNY Real Exchange Rate} - 0.366 \Delta \text{JPY Real Exchange Rate} \\
 & \quad (0.119) \quad (0.103) \\
 & - 0.083 \Delta \text{JPY Real Exchange Rate}_{t-1} - 0.243 \Delta \text{JPY Real Exchange Rate}_{t-2} \\
 & \quad (0.098) \quad (0.091) \\
 & \quad \text{Short-run}
 \end{aligned}$$

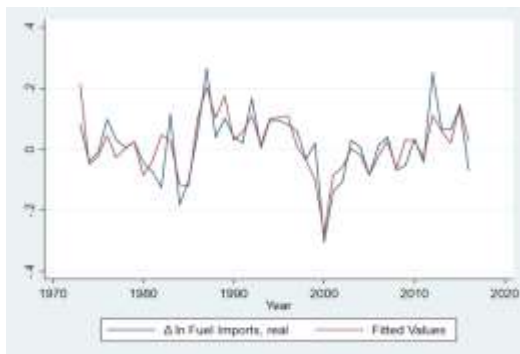
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 15.015         | -7.688         | $\chi^2(41)$            | $\chi^2(20)$            | 0.043     | 0.059 | 0.709          |
| [0.000, 0.000] | [0.000, 0.000] | [0.384]                 | [0.151]                 |           |       |                |

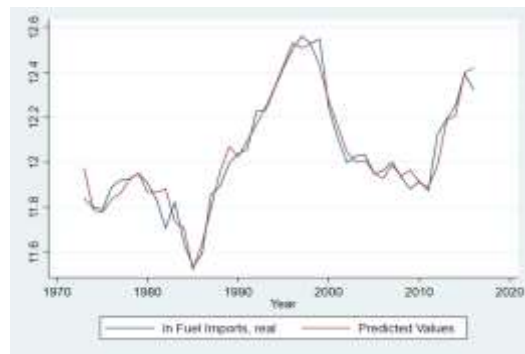
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Fuel Imports, Real are 0.020, 0.104, -0.304, and 0.264 respectively.

Figure 1. Actual v. Predicted Fuel Imports, Real, along with residuals

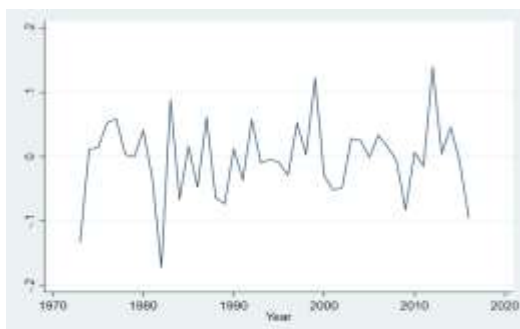
Panel A: Log first-difference



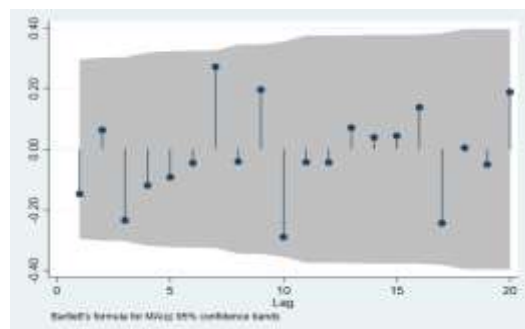
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 25. Machinery Imports, Real

Estimation Period: 1974 – 2016

$$\begin{aligned}
 \Delta \text{Machinery Imports, Real} = & \underbrace{-0.360 \text{ Machinery Imports, Real}_{t-1}}_{\text{Adjustment}} \\
 & - 7.806 + 2.548 \text{ GDP, Real} + 0.572 \text{ IPIN, Machinery Imports} - 0.971 \text{ Foreign IPIN, Machinery Imports} \\
 & \quad (3.850) \quad (0.712) \quad (0.179) \quad (0.170) \\
 & - 1.124 \text{ Real Effective Exchange Rate} + 1.078 \text{ Tariff, Machinery Imports} \\
 & \quad (0.389) \quad (0.339) \\
 & \quad \text{Long-run} \\
 & + 0.305 \Delta \text{Machinery Imports, Real}_{t-1} + 1.663 \Delta \text{GDP, Real} \\
 & \quad (0.104) \quad (0.805) \\
 & + 0.190 \Delta \text{Foreign IPIN, Machinery Imports} - 0.435 \Delta \text{Tariff, Machinery Imports} \\
 & \quad (0.074) \quad (0.173) \\
 & \quad \text{Short-run}
 \end{aligned}$$

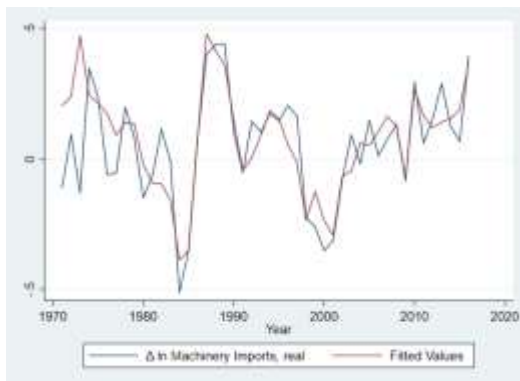
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 8.536          | -5.920         | $\chi^2(41)$            | $\chi^2(21)$            | 0.094     | 0.140 | 0.792          |
| [0.000, 0.001] | [0.000, 0.002] | [0.394]                 | [0.977]                 |           |       |                |

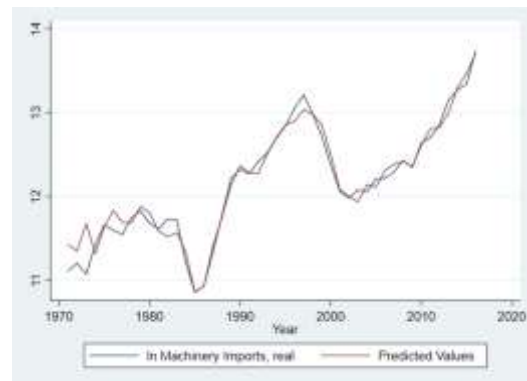
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Machinery Imports, Real are 0.053, 0.207, -0.512, and 0.441 respectively.

Figure 1. Actual v. Predicted Machinery Imports, Real, along with residuals

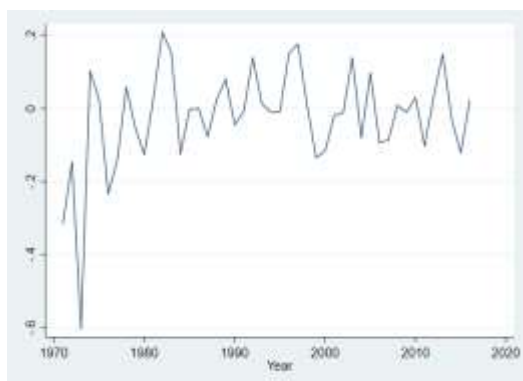
Panel A: Log first-difference



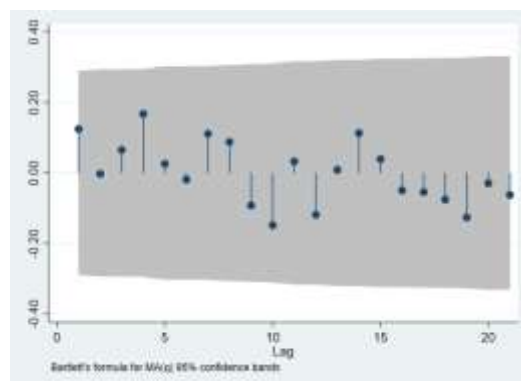
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 26. Materials Imports, Real

Estimation Period: 1974 – 2017

$$\begin{aligned}
 \Delta \text{Materials Imports, Real} = & \underbrace{-0.693 \text{ Materials Imports, Real}_{t-1}}_{\text{Adjustment}} \\
 & - 5.254 + 1.592 \text{ GDP, Real} - 0.653 \text{ Foreign IPIN, Materials Imports} \\
 & \quad (2.032) \quad (0.212) \quad (0.216) \\
 & - 0.853 \text{ Tariff, Materials Imports} + 0.130 \text{ IPIN, Machinery Imports} \\
 & \quad (0.160) \quad (0.127) \\
 & \quad \quad \quad \text{Long-run} \\
 & + 0.332 \Delta \text{Materials Imports}_{t-1} + 0.333 \Delta \text{Materials Imports}_{t-2} + 1.849 \Delta \text{GDP, Real} \\
 & \quad (0.131) \quad (0.114) \quad (0.806) \\
 & - 1.945 \Delta \text{GDP, Real}_{t-1} - 1.451 \Delta \text{GDP, Real}_{t-2} + 3.612 \Delta \text{GDP, Real}_{t-3} \\
 & \quad (0.973) \quad (0.154) \quad (0.985) \\
 & + 0.597 \Delta \text{Foreign IPIN, Material Imports} + 0.830 \Delta \text{Foreign IPIN, Material Imports}_{t-1} \\
 & \quad (0.227) \quad (0.239) \\
 & - 0.833 \Delta \text{IPIN, Machinery Imports} - 0.352 \Delta \text{IPIN, Machinery Imports}_{t-1} \\
 & \quad (0.150) \quad (0.201) \\
 & \quad \quad \quad \text{Short-run}
 \end{aligned}$$

Table A1. Summary of model tests

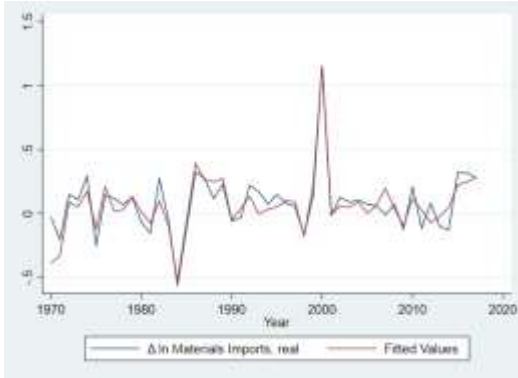
| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 9.647          | -6.313         | $\chi^2(42)$            | $\chi^2(22)$            | 0.076     | 0.101 | 0.863          |
| [0.000, 0.001] | [0.000, 0.000] | [0.864]                 | [0.982]                 |           |       |                |

Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Materials Imports, Real are 0.077, 0.230, -0.562, and 1.154 respectively.

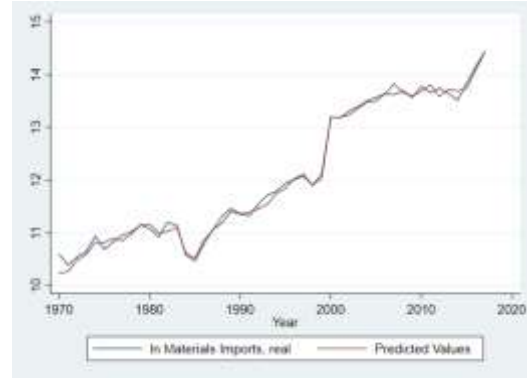


Figure 1. Actual v. Predicted Materials Imports, Real, along with residuals

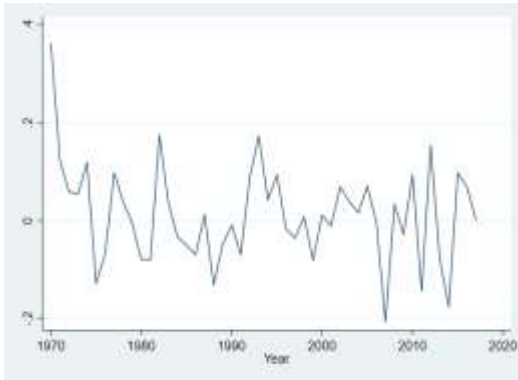
Panel A: Log first-difference



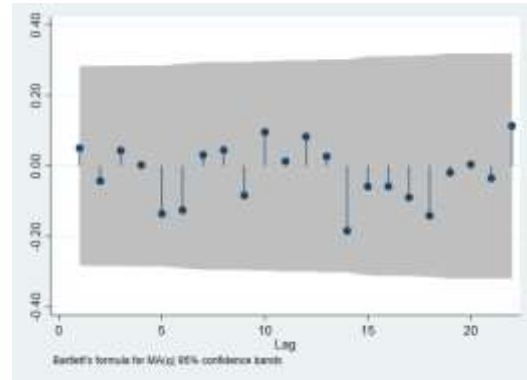
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 27. Other Goods Imports, Real

Estimation Period: 1971 – 2016

$$\begin{aligned}
 \Delta \text{Other Goods Imports, Real} = & \underbrace{-0.319 \text{ Other Goods Imports, Real}_{t-1}}_{\text{Adjustment}} \\
 & + 11.368 - 1.567 \text{ GDP, Real} + 0.323 \text{ IPIN, Other Goods Imports} \\
 & \quad (3.155) \quad (0.824) \quad (0.246) \\
 & + 0.839 \text{ Philippine Wholesale Price Index} - 0.870 \text{ Real Effective Exchange Rate} \\
 & \quad (0.238) \quad (0.558) \\
 & \quad \text{Long-run} \\
 & + 1.933 \Delta \text{GDP, Real} - 0.748 \Delta \text{IPIN, Other Goods Imports} - 0.106 \Delta \text{IPIN, Other Goods Imports}_{t-1} \\
 & \quad (0.966) \quad (0.135) \quad (0.134) \\
 & + 0.411 \Delta \text{IPIN, Other Goods Imports}_{t-2} - 0.363 \Delta \text{IPIN, Other Goods Imports}_{t-3} \\
 & \quad (0.129) \quad (0.113) \\
 & + 0.481 \Delta \text{Philippine Wholesale Price Index} - 0.631 \Delta \text{Philippine Wholesale Price Index}_{t-1} \\
 & \quad (0.242) \quad (0.245) \\
 & + 0.249 \Delta \text{Real Effective Exchange Rate} + 0.274 \Delta \text{Real Effective Exchange Rate}_{t-1} \\
 & \quad (0.199) \quad (0.167) \\
 & + 0.703 \Delta \text{Real Effective Exchange Rate}_{t-2} + 0.368 \Delta \text{Real Effective Exchange Rate}_{t-3} \\
 & \quad (0.154) \quad (0.153) \\
 & \quad \text{Short-run}
 \end{aligned}$$

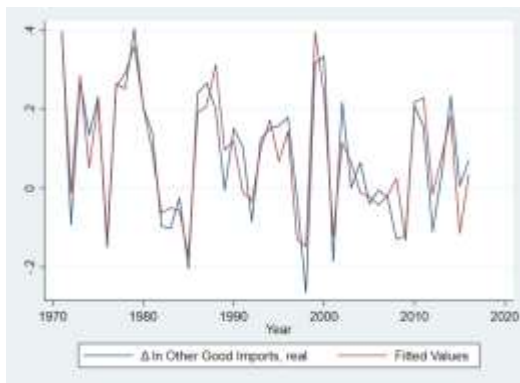
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 7.346          | -3.719         | $\chi^2(44)$            | $\chi^2(21)$            | 0.055     | 0.067 | 0.838          |
| [0.000, 0.004] | [0.007, 0.079] | [0.240]                 | [0.227]                 |           |       |                |

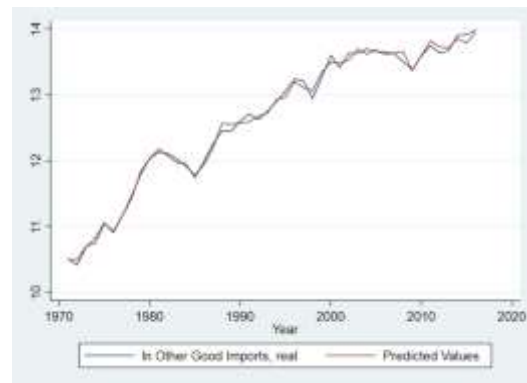
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Other Goods Imports, Real are 0.064, 0.192, -0.618, and 0.404 respectively.

Figure 1. Actual v. Predicted Other Goods Imports, Real, along with residuals

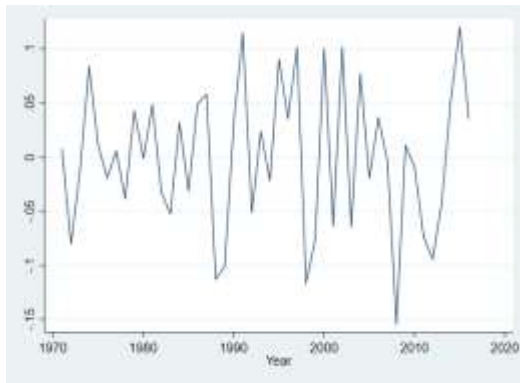
Panel A: Log first-difference



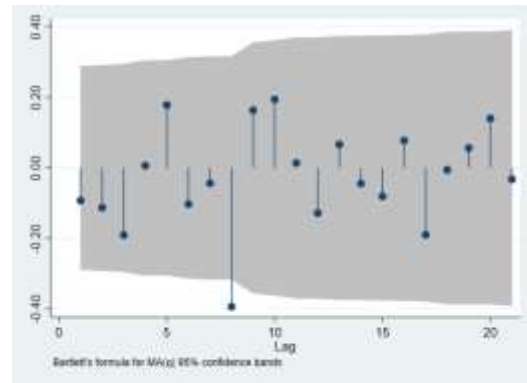
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 28. Total Service Imports, Real

Estimation Period: 1984 – 2016

$$\begin{aligned}
 \Delta \text{Total Service Imports, Real} = & \underbrace{-0.936 \text{ Total Service Imports, Real}_{t-1}}_{\text{Adjustment}} \\
 & + 13.243 \quad -0.878 \text{ IPIN, Service Imports} \quad -0.334 \text{ World GDP, Real} \\
 & \quad (2.063) \quad (0.095) \quad (0.105) \\
 & + 1.440 \text{ World Wholesale Price Index} \quad -0.281 \text{ Real Effective Exchange Rate} \\
 & \quad (0.089) \quad (0.080) \\
 & \quad \text{Long-run} \\
 & -0.044 \Delta \text{IPIN, Service Imports} + 0.281 \Delta \text{IPIN, Service Imports}_{t-1} \\
 & \quad (0.131) \quad (0.106) \\
 & -1.912 \Delta \text{World Wholesale Price Index} \quad -1.933 \Delta \text{World Wholesale Price Index}_{t-1} \\
 & \quad (0.339) \quad (0.337) \\
 & -1.458 \Delta \text{World Wholesale Price Index}_{t-2} + \Delta \text{Real Effective Exchange Rate} \\
 & \quad (0.359) \quad (0.107) \\
 & \quad \text{Short-run}
 \end{aligned}$$

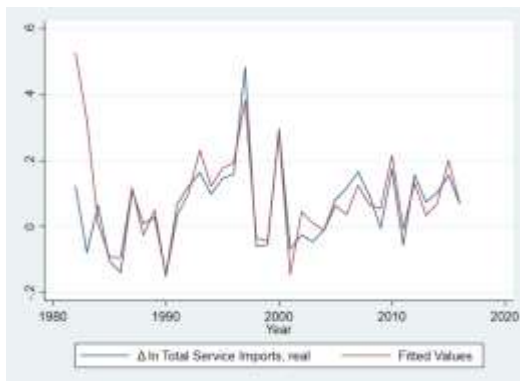
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 17.133         | -8.091         | $\chi^2(31)$            | $\chi^2(15)$            | 0.057     | 0.105 | 0.878          |
| [0.000, 0.000] | [0.000, 0.000] | [0.159]                 | [0.933]                 |           |       |                |

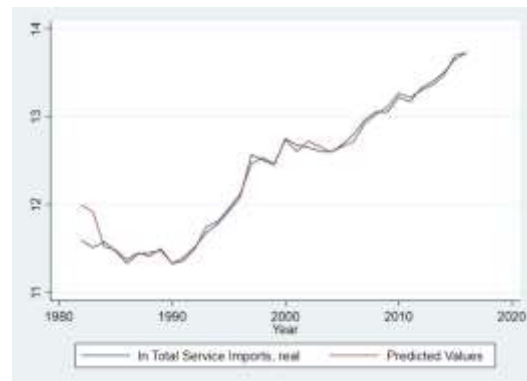
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Total Service Imports, Real are 0.067, 0.123, -0.148, and 0.483 respectively.

Figure 1. Actual v. Predicted Total Service Imports, Real, along with residuals

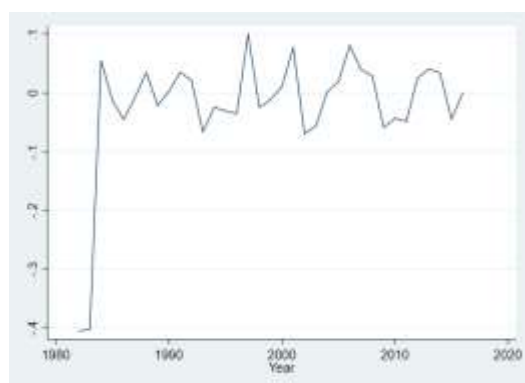
Panel A: Log first-difference



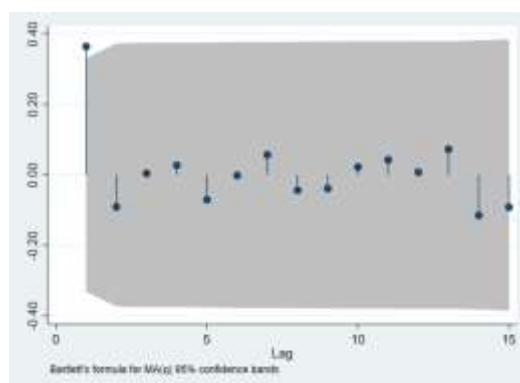
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 29. Balance of Payments – Total Goods Imports, Nominal

Estimation Period: 1981 – 2016

$$\begin{aligned}
 \Delta \text{Total Goods Imports, Nominal} = & \underbrace{-0.564 \text{ Total Goods Imports, Nominal}_{t-1}}_{\text{Adjustment}} \\
 & + 7.300 \text{ (1.554)} - 0.602 \text{ GDP, Nominal (0.271)} + 1.749 \text{ World Wholesale Price Index (0.315)} \\
 & - 0.509 \text{ USD Nominal Exchange Rate (0.095)} + 0.254 \text{ CNY Nominal Exchange Rate (0.197)} \\
 & \underbrace{\hspace{10em}}_{\text{Long-run}} \\
 & + 0.030 \Delta \text{Total Goods Imports, Nominal}_{t-1} \text{ (0.108)} + 0.189 \Delta \text{Total Goods Imports, Nominal}_{t-2} \text{ (0.081)} + 0.841 \Delta \text{GDP, Nominal (0.260)} \\
 & + 0.430 \Delta \text{GDP, Nominal}_{t-1} \text{ (0.267)} - 0.030 \Delta \text{World Wholesale Price Index (0.269)} - 1.128 \Delta \text{World Wholesale Price Index}_{t-1} \text{ (0.272)} \\
 & - 0.427 \Delta \text{USD Nominal Exchange Rate (0.136)} - 0.766 \Delta \text{USD Nominal Exchange Rate}_{t-1} \text{ (0.146)} \\
 & \underbrace{\hspace{10em}}_{\text{Short-run}}
 \end{aligned}$$

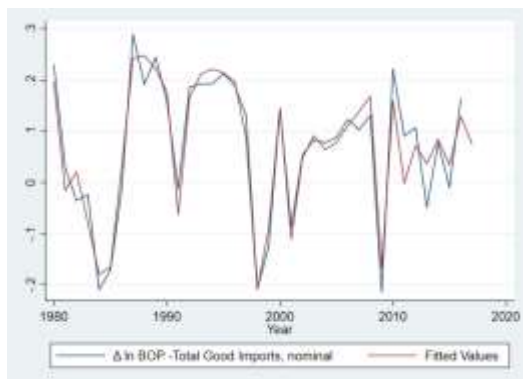
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 12.927         | -6.329         | $\chi^2$ (34)           | $\chi^2$ (16)           | 0.031     | 0.038 | 0.915          |
| [0.000, 0.000] | [0.000, 0.001] | 0.376                   | 22.388                  |           |       |                |
|                |                | [0.539]                 | [0.131]                 |           |       |                |

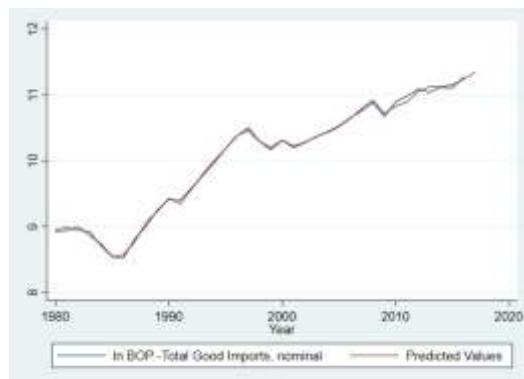
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) BOP – Total Goods Imports, Nominal are 0.076, 0.137, -0.215, and 0.289 respectively.

Figure 1. Actual v. Predicted BOP – Total Goods Imports, Nominal, along with residuals

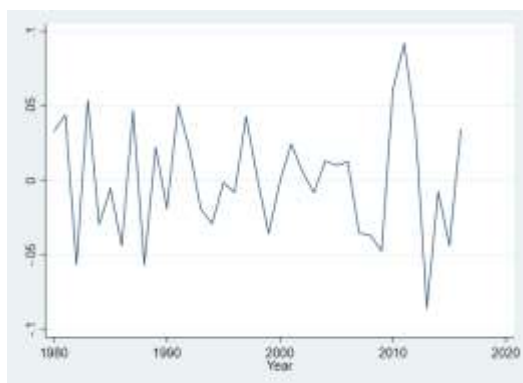
Panel A: Log first-difference



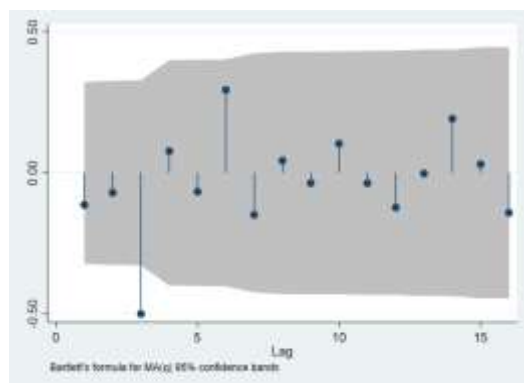
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



### 30. Balance of Payments – Total Service Imports, Nominal

Estimation Period: 1981 – 2016

$$\begin{aligned}
 \Delta \text{Total Service Imports, Nominal} = & \underbrace{-0.954 \text{ Total Service Imports, Nominal}_{t-1}}_{\text{Adjustment} \quad (0.101)} \\
 & + 18.277 \text{ } (2.062) - 1.406 \text{ GDP, Nominal}_{t-1} \text{ } (0.117) + 2.925 \text{ World Wholesale Price Index}_{t-1} \text{ } (0.148) \\
 & - 1.092 \text{ Nominal Effective Exchange Rate}_{t-1} \text{ } (0.061) \\
 & \underbrace{+ 0.332 \Delta \text{Total Service Imports, Nominal}_{t-1} + 1.101 \Delta \text{GDP, Nominal}_{t-1} + 0.940 \Delta \text{GDP, Nominal}_{t-1} - 1.609 \Delta \text{World Wholesale Price Index}_{t-1}}_{\text{Long-run}} \\
 & - 2.704 \Delta \text{World Wholesale Price Index}_{t-1} \text{ } (0.521) + 0.640 \Delta \text{Nominal Effective Exchange Rate}_{t-1} \text{ } (0.182) \\
 & \underbrace{\hspace{10em}}_{\text{Short-run}}
 \end{aligned}$$

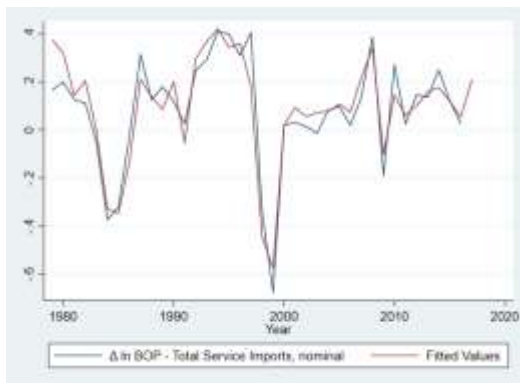
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 23.367         | -9.401         | $\chi^2$ (34)           | $\chi^2$ (17)           | 0.065     | 0.082 | 0.895          |
| [0.000, 0.000] | [0.000, 0.000] | [0.760]                 | [0.793]                 |           |       |                |

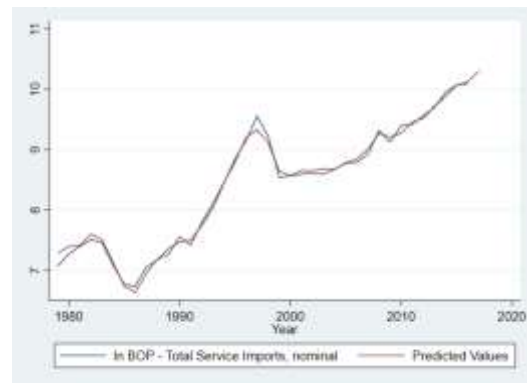
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) BOP – Total Service Imports, Nominal are 0.085, 0.226, -0.674, and 0.409 respectively.

Figure 1. Actual v. Predicted BOP – Total Service Imports, Nominal, along with residuals

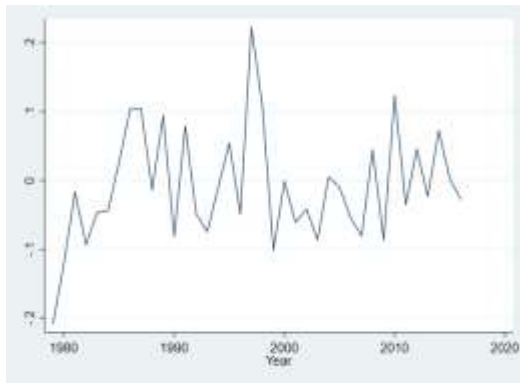
Panel A: Log first-difference



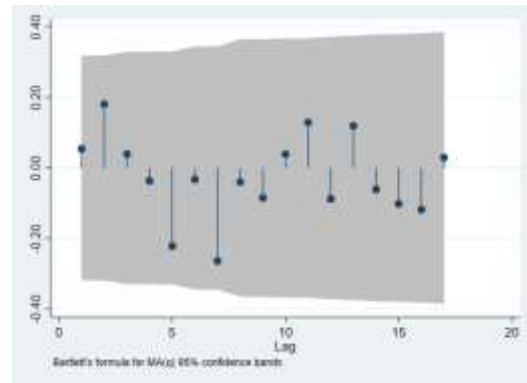
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## Monetary Sector

### 1. 91-day T-Bill Rate

Estimation Period: 1990 – 2017

$$\Delta 91\text{day TBill Rate} = \underbrace{-0.652 \text{ 91day TBill Rate}_{t-1}}_{(0.171) \text{ Adjustment}} - \underbrace{1.160 + 1.716 \text{ Reverse Repurchase Rate}}_{(0.414) \text{ Long-run} \quad (0.227)}$$

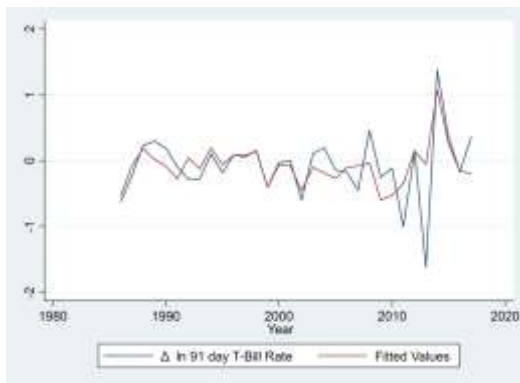
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 7.243          | -3.805         | $\chi^2(26)$            | $\chi^2(14)$            | 0.237     | 0.376 | 0.366          |
| [0.016, 0.031] | [0.007, 0.019] | [0.855]                 | [0.876]                 |           |       |                |

Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) 91-day T-Bill Rate are -0.021, 0.417, -1.614, and 1.373 respectively.

Figure 1. Actual v. Predicted 91-day T-Bill Rate, along with residuals

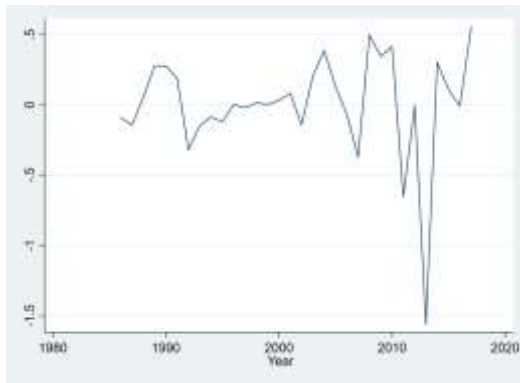
Panel A: Log first-difference



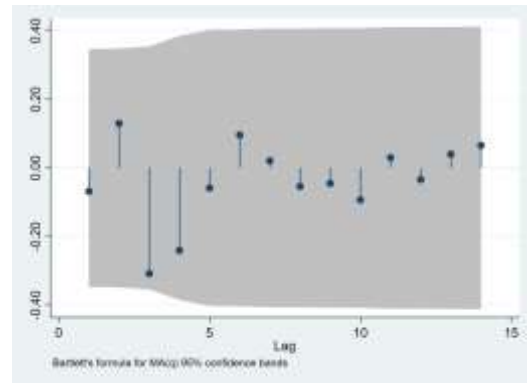
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 2. 6-month T-Bill Rate

Estimation Period: 1970 – 2017

$$\begin{aligned}
 \Delta 6\text{month TBill Rate} = & \underbrace{-0.961 \text{ 6month TBill Rate}_{t-1}}_{\text{Adjustment}} \\
 & \underbrace{+ 0.188 + 0.952 \text{ 91day TBill Rate}}_{\text{Long-run}} \\
 & \quad (0.029) \quad (0.013)
 \end{aligned}$$

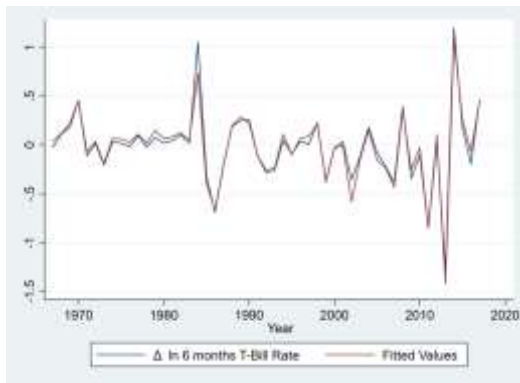
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 579.207        | -32.684        | $\chi^2(46)$            | $\chi^2(23)$            | 0.049     | 0.073 | 0.962          |
| [0.000, 0.000] | [0.000, 0.000] | [0.332]                 | [0.524]                 |           |       |                |

Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) 6-month T-Bill Rate are -0.019, 0.383, -1.290, and 1.198 respectively.

Figure 1. Actual v. Predicted 6-month T-Bill Rate, along with residuals

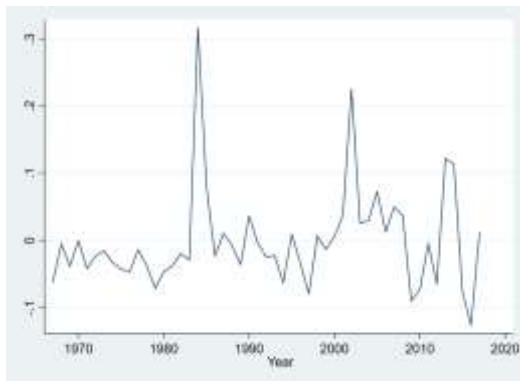
Panel A: Log first-difference



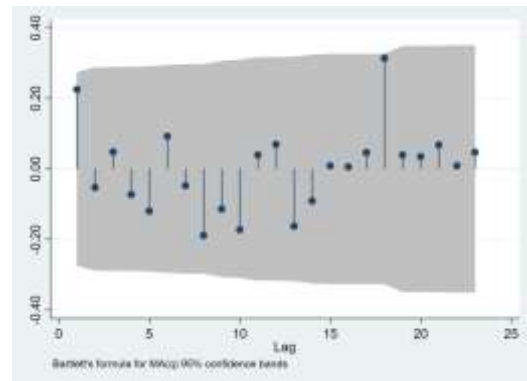
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals





### 3. 1-year T-Bill Rate

Estimation Period: 1990 – 2017

$$\begin{aligned} \Delta 1\text{year TBill Rate} = & \underbrace{-0.924 \text{ 1year TBill Rate}_{t-1}}_{\text{Adjustment}} \\ & \underbrace{+0.130 + 0.913 \text{ 6month TBill Rate} + 0.055 \text{ Reverse Repurchase Rate}}_{\text{Long-run}} \\ & \underbrace{+0.172 \Delta \text{Reverse Repurchase Rate}}_{\text{Short-run}} \end{aligned}$$

(0.036) (0.070) (0.039) (0.070) (0.087)

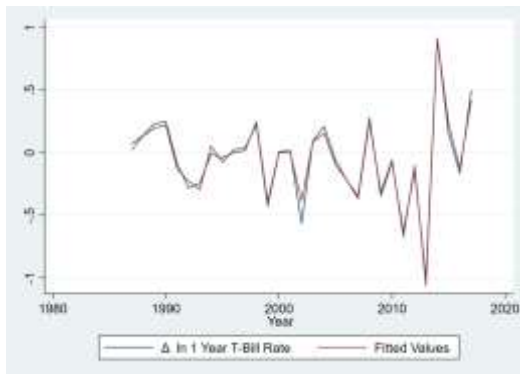
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 329.441        | -25.169        | $\chi^2(26)$            | $\chi^2(13)$            | 0.038     | 0.050 | 0.979          |
| [0.000, 0.000] | [0.000, 0.000] | 0.805                   | 14.485                  |           |       |                |
|                |                | [0.369]                 | [0.340]                 |           |       |                |

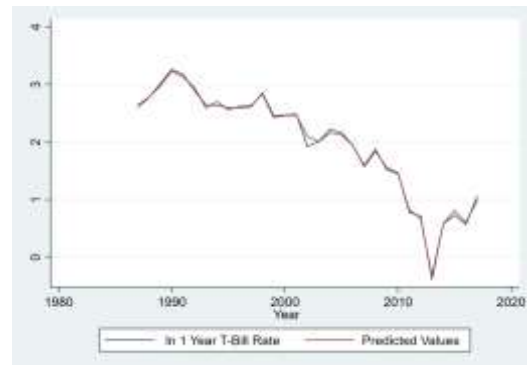
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) 1-year T-Bill Rate are , , , and respectively.

Figure 1. Actual v. Predicted 1-year T-Bill Rate, along with residuals

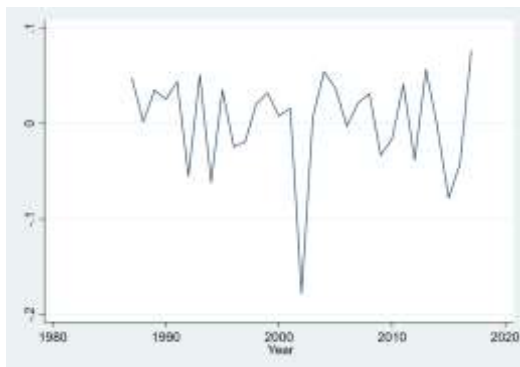
Panel A: Log first-difference



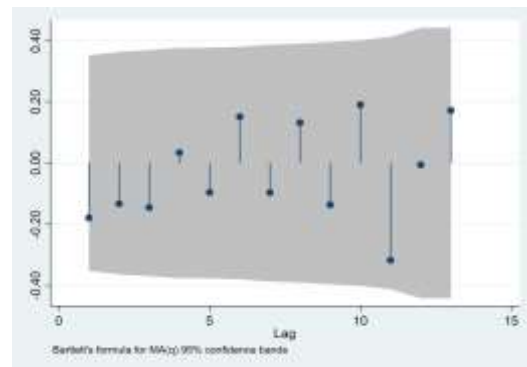
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



#### 4. 5-year T-Bond Rate

Estimation Period: 1974 – 2017

$$\begin{aligned} \Delta 5\text{year TBond Rate} = & \underbrace{-0.486 \text{ 5year TBond Rate}_{t-1}}_{\text{Adjustment}} \\ & + \underbrace{0.369 + 0.761 \text{ 1year TBill Rate}}_{\text{Long-run}} \\ & + \underbrace{0.295 \Delta 1\text{year TBill Rate}}_{\text{Short-run}} \end{aligned}$$

(0.136) (0.120) (0.034) (0.105)

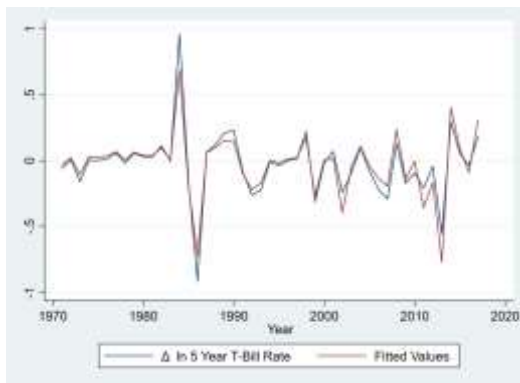
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 6.737          | -3.564         | $\chi^2(42)$            | $\chi^2(21)$            | 0.057     | 0.082 | 0.891          |
| [0.017, 0.033] | [0.010, 0.027] | 0.394                   | 13.201                  |           |       |                |
|                |                | [0.529]                 | [0.901]                 |           |       |                |

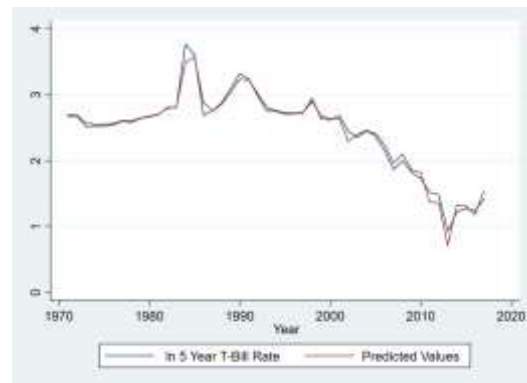
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) 5-year T-Bond Rate are -0.027, 0.252, -0.913, and 0.958 respectively.

Figure 1. Actual v. Predicted 5-year T-Bond Rate, along with residuals

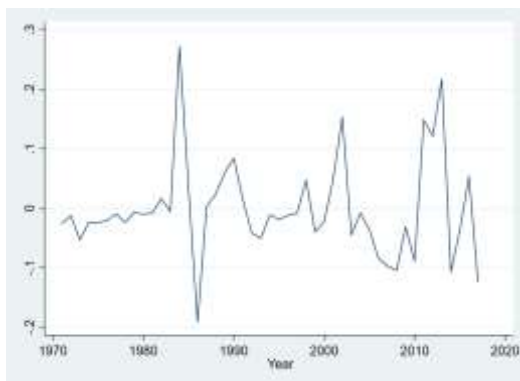
Panel A: Log first-difference



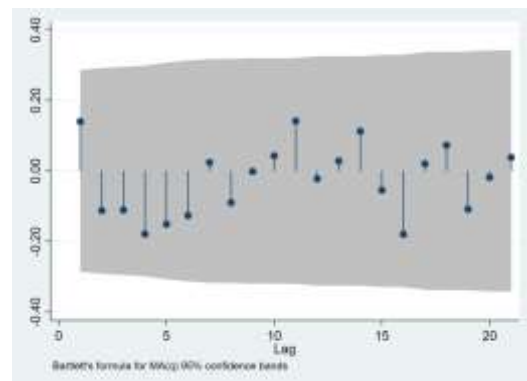
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 5. 10-year T-Bond Rate

Estimation Period: 1998 – 2017

$$\Delta 10\text{year TBond Rate} = \underbrace{-0.855}_{(0.094)} \Delta 10\text{year TBond Rate}_{t-1} + \underbrace{0.375}_{(0.084)} + \underbrace{0.844}_{(0.035)} 5\text{year TBond Rate}$$

*Adjustment* *Long-run*

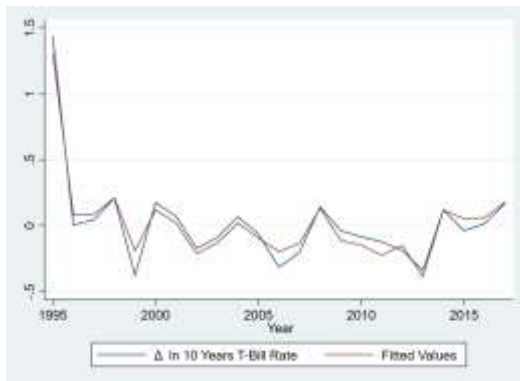
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 41.965         | -9.018         | $\chi^2(18)$            | $\chi^2(9)$             | 0.059     | 0.073 | 0.831          |
| [0.000, 0.000] | [0.000, 0.000] | [0.100]                 | [0.103]                 |           |       |                |

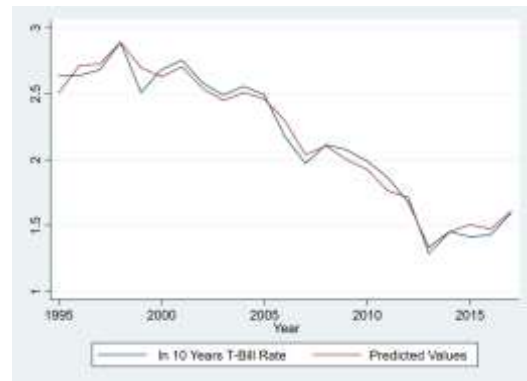
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) 10-year T-Bond Rate are 0.017, 0.350, -0.379, and 1.435 respectively.

Figure 1. Actual v. Predicted 10-year T-Bond Rate, along with residuals

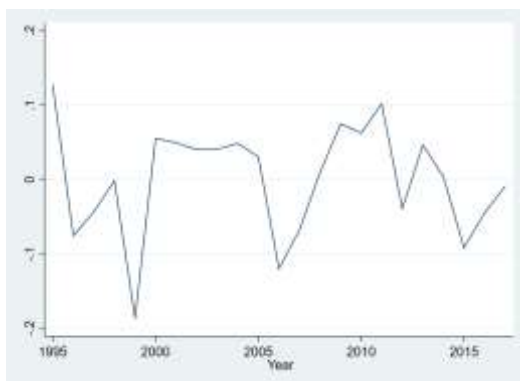
Panel A: Log first-difference



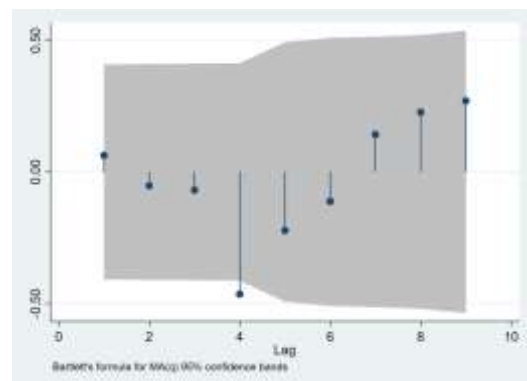
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 6. Lending Rate

Estimation Period: 1990 – 2017

$$\begin{aligned}
 \Delta \text{Lending Rate} = & \underbrace{-0.830 \text{ Lending Rate}_{t-1}}_{\text{Adjustment}} \\
 & + \underbrace{732}_{(0.165)} + \underbrace{0.459 \text{ Reverse Repurchase Rate}}_{(0.118)} \\
 & - \underbrace{0.774 \text{ 6month TBill Rate}}_{(0.343)} + \underbrace{1.018 \text{ 1year TBill Rate}}_{(0.395)} \\
 & + \underbrace{0.354 \Delta \text{1year TBill Rate}_{t-1}}_{\text{Short-run}} \\
 & \quad \quad \quad (0.140)
 \end{aligned}$$

Long-run

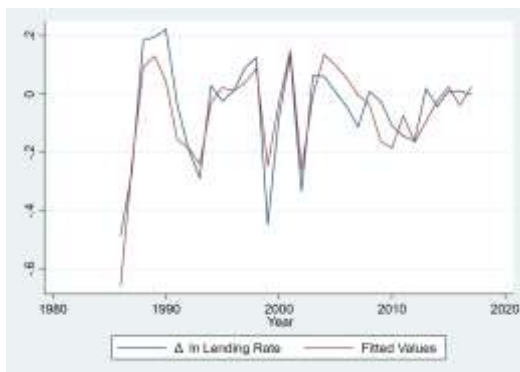
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
|                |                | $\chi^2 (26)$           | $\chi^2 (14)$           |           |       |                |
| 10.272         | -5.997         | 1.810                   | 17.366                  | 0.069     | 0.086 | 0.651          |
| [0.000, 0.001] | [0.000, 0.001] | [0.178]                 | [0.237]                 |           |       |                |

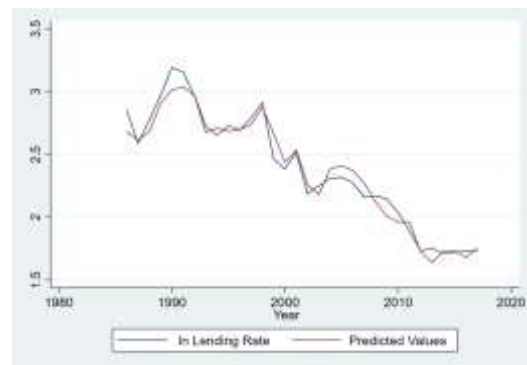
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Lending Rate are -0.017, 0.164, -0.487, and 0.324 respectively.

Figure 1. Actual v. Predicted Lending Rate, along with residuals

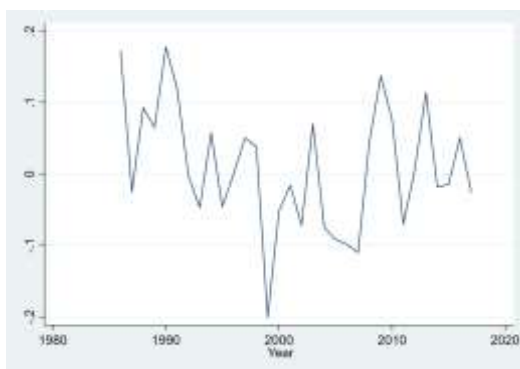
Panel A: Log first-difference



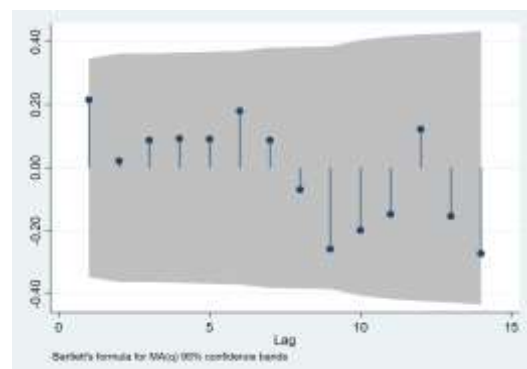
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 7. Time Deposit Rate

Estimation Period: 1990 – 2017

$$\Delta \text{Time Deposit Rate} = \underbrace{-0.549 \text{ Time Deposit Rate}_{t-1}}_{(0.106) \text{ Adjustment}} - \underbrace{0.210 + 0.519 \text{ Reverse Repurchase Rate} + 0.560 \text{ 91day TBill Rate}}_{(0.198) \quad (0.286) \quad (0.159) \text{ Long-run}}$$

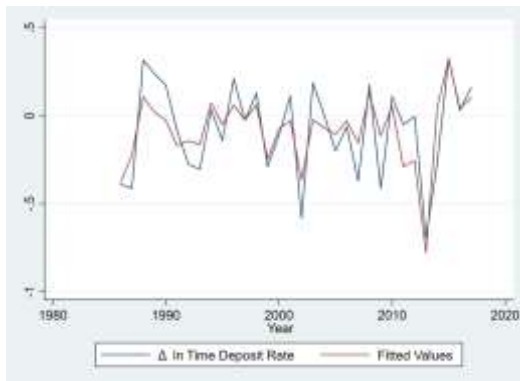
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 13.715         | -5.148         | $\chi^2(26)$            | $\chi^2(14)$            | 0.123     | 0.152 | 0.631          |
| [0.000, 0.000] | [0.000, 0.002] | [0.315]                 | [0.141]                 |           |       |                |

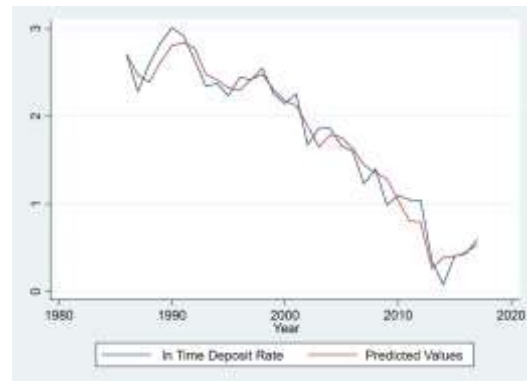
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Time Deposit Rate are -0.024, 0.209, -0.695, and 0.457 respectively.

Figure 1. Actual v. Predicted Time Deposit Rate, along with residuals

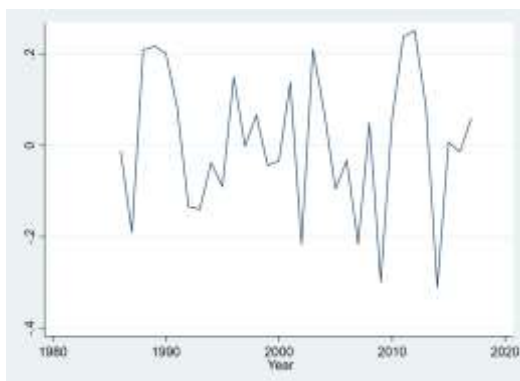
Panel A: Log first-difference



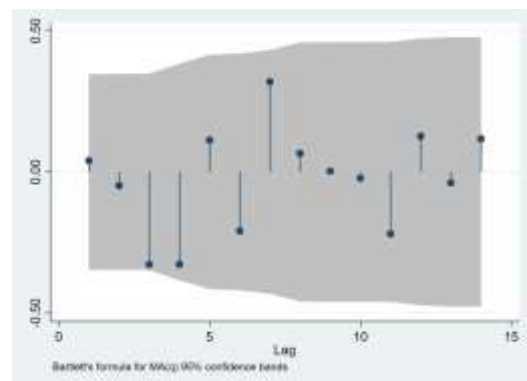
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 8. Savings Interest Rate

Estimation Period: 1990 – 2017

$$\Delta \text{Savings Interest Rate} = \underbrace{-0.419 \text{ Savings Interest Rate}_{t-1}}_{\text{Adjustment}} + \underbrace{-1.145 + 1.934 \text{ Reverse Repurchase Rate}}_{\text{Long-run}}$$

(0.094)                      (0.214)                      (0.160)

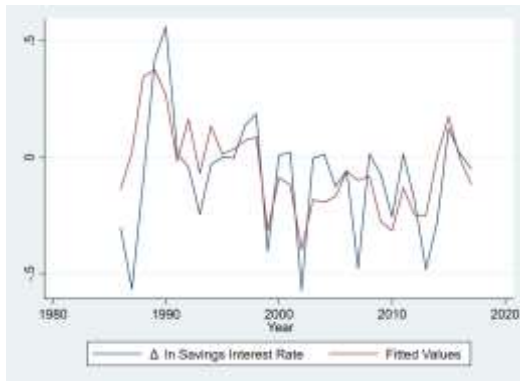
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 12.795         | -4.438         | $\chi^2(26)$            | $\chi^2(14)$            | 0.151     | 0.200 | 0.505          |
| [0.001, 0.002] | [0.002, 0.005] | [0.680]                 | [0.191]                 |           |       |                |

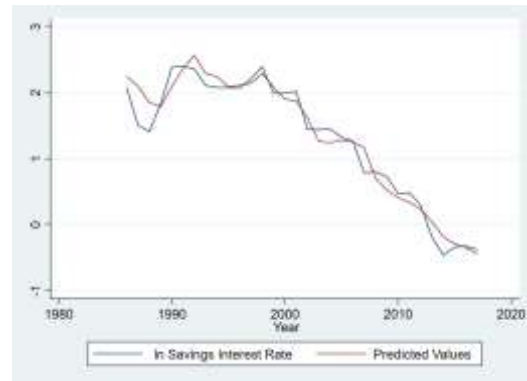
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Savings Interest Rate are -0.016, 0.209, -0.573, and 0.560 respectively.

Figure 1. Actual v. Predicted Savings Interest Rate, along with residuals

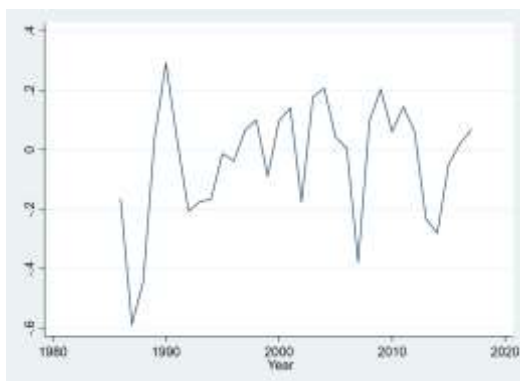
Panel A: Log first-difference



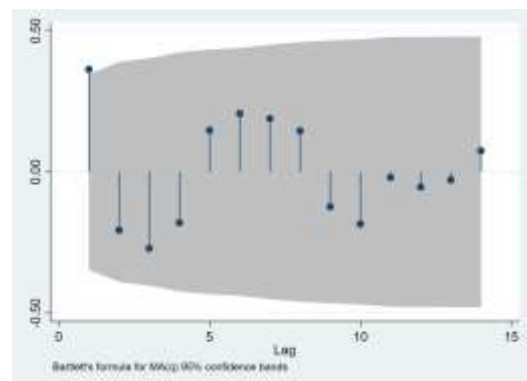
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 9. Narrow Money

Estimation Period: 1989 – 2017

$$\begin{aligned}
 \Delta \text{Narrow Money} = & \underbrace{-0.884 \text{ Narrow Money}_{t-1}}_{\text{Adjustment}} \\
 & - 6.217 + 1.458 \text{ GDP, Nominal} - 0.137 \text{ Savings Interest Rate} \\
 & \quad (1.262) \quad (0.037) \quad (0.024) \\
 & - 0.214 \text{ Gold Price PHP} - 0.268 \text{ USD Nominal Exchange Rate} \\
 & \quad (0.055) \quad (0.071) \\
 & \quad \quad \quad \text{Long-run} \\
 & - 0.108 \Delta \text{Narrow Money}_{t-1} + 0.400 \Delta \text{Narrow Money}_{t-2} + 0.157 \Delta \text{Gold Price PHP} \\
 & \quad (0.143) \quad (0.171) \quad (0.050) \\
 & + 0.247 \Delta \text{USD Nominal Exchange Rate} + 0.140 \Delta \text{USD Nominal Exchange Rate}_{t-1} \\
 & \quad (0.080) \quad (0.064) \\
 & \quad + 0.238 \Delta \text{USD Nominal Exchange Rate}_{t-2} \\
 & \quad (0.078) \\
 & \quad \quad \quad \text{Short-run}
 \end{aligned}$$

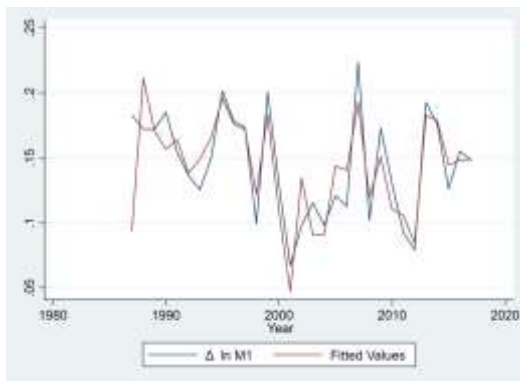
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 11.415         | -5.715         | $\chi^2(27)$            | $\chi^2(13)$            | 0.018     | 0.024 | 0.794          |
| [0.000, 0.001] | [0.000, 0.004] | [0.543]                 | [0.673]                 |           |       |                |

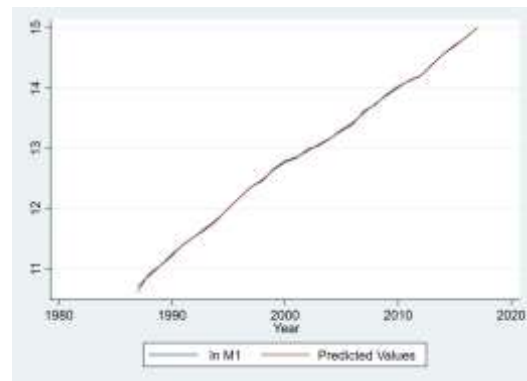
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Narrow Money are 0.135, 0.056, -0.072, and 0.262 respectively.

Figure 1. Actual v. Predicted Narrow Money, along with residuals

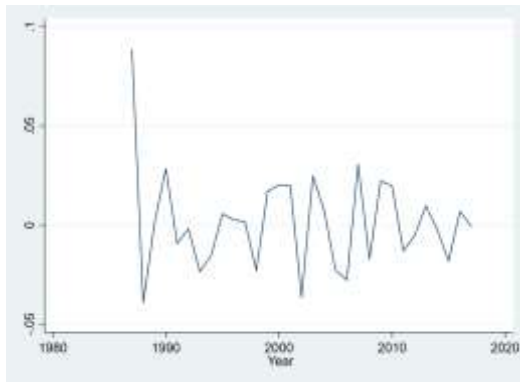
Panel A: Log first-difference



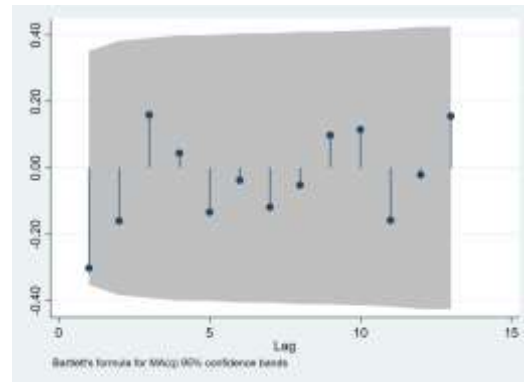
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 10. Broad Money

Estimation Period: 1984 – 2017

$$\begin{aligned}
 \Delta \text{Broad Money} = & \underbrace{-0.596 \text{ Broad Money}_{t-1}}_{\text{Adjustment}} \\
 & + 0.912 \text{ (0.368)} + 0.976 \text{ Narrow Money (0.024)} + 0.114 \text{ Money Multiplier (0.050)} \\
 & \underbrace{-0.163 \text{ Lending Rate (0.128)} + 0.151 \text{ Savings Interest Rate (0.042)}}_{\text{Long-run}} \\
 & - 0.373 \Delta \text{Broad Money (0.099)} + 0.136 \Delta \text{Money Multiplier (0.038)} + 0.198 \Delta \text{Lending Rate (0.047)} \\
 & \underbrace{+ 0.073 \Delta \text{Lending Rate (0.037)} - 0.105 \Delta \text{Savings Interest Rate (0.029)}}_{\text{Short-run}}
 \end{aligned}$$

Table A1. Summary of model tests

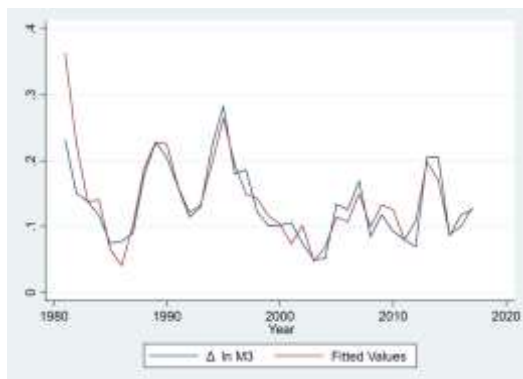
| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
|                |                | $\chi^2 (32)$           | $\chi^2 (16)$           |           |       |                |
| 11.470         | -7.199         | 0.336                   | 11.383                  | 0.020     | 0.031 | 0.870          |
| [0.000, 0.000] | [0.000, 0.000] | [0.561]                 | [0.785]                 |           |       |                |

Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Broad Money are 0.143, 0.068, 0.049, and 0.360 respectively.

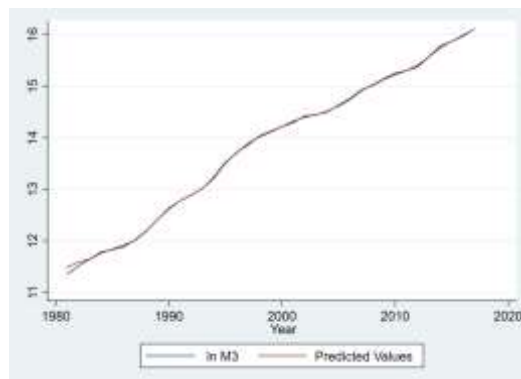


Figure 1. Actual v. Predicted Broad Money, along with residuals

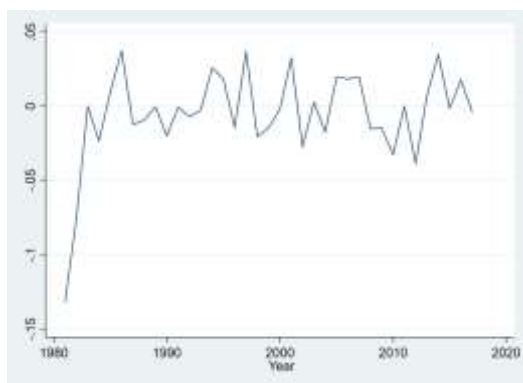
Panel A: Log first-difference



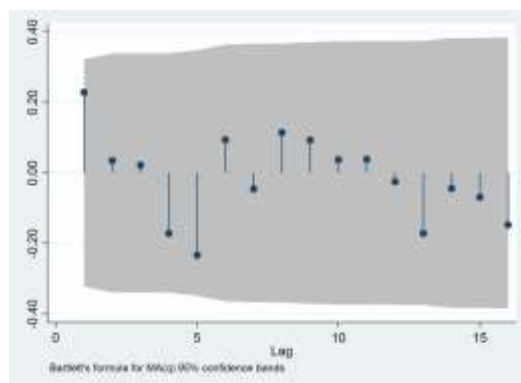
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 11. Total Loans

Estimation Period: 1995 – 2017

$$\begin{aligned}
 \Delta Total\ Loans = & \underbrace{-0.638\ Total\ Loans_{t-1}}_{\text{Adjustment}} \\
 & + 5.238 - 0.435\ Lending\ Rate + 1.463\ Broad\ Money \\
 & \quad (1.613) \quad (0.155) \quad (0.122) \\
 & + 0.497\ Money\ Multiplier - 3.501\ CPI,\ USA \\
 & \quad (0.135) \quad (0.756) \\
 & \quad \quad \quad \underbrace{\hspace{10em}}_{\text{Long-run}} \\
 & + 0.911\ \Delta Total\ Loans + 0.257\ \Delta Lending\ Rate \\
 & \quad (0.089) \quad (0.070) \\
 & - 0.522\ \Delta Broad\ Money + 5.373\ \Delta CPI,\ USA \\
 & \quad (0.206) \quad (0.985) \\
 & \quad \quad \quad \underbrace{\hspace{10em}}_{\text{Short-run}}
 \end{aligned}$$

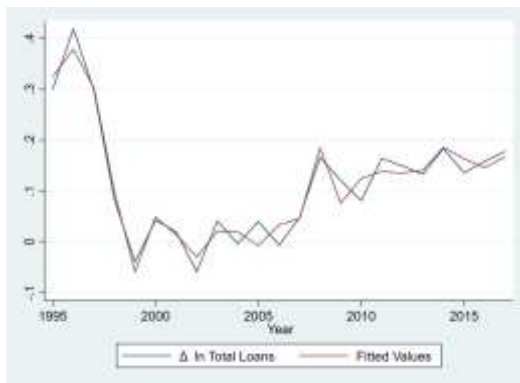
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 14.787         | -6.161         | $\chi^2(21)$            | $\chi^2(9)$             | 0.021     | 0.025 | 0.949          |
| [0.000, 0.001] | [0.000, 0.003] | [0.761]                 | [0.005]                 |           |       |                |

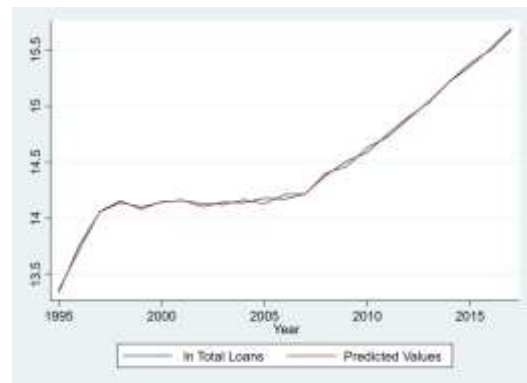
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Total Loans are 0.120, 0.115, -0.059, and 0.419 respectively.

Figure 1. Actual v. Predicted Total Loans, along with residuals

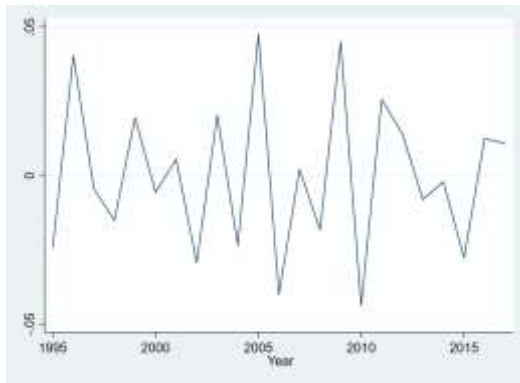
Panel A: Log first-difference



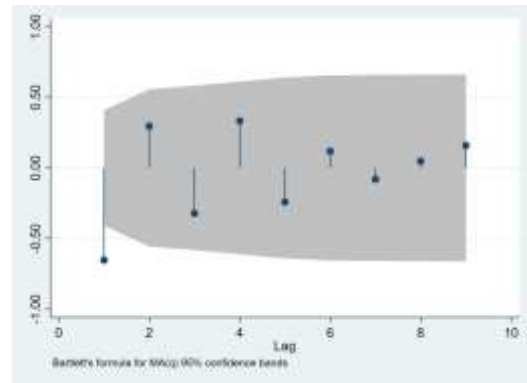
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 12. Resources of the Financial System

Estimation Period: 1990 – 2016

$$\begin{aligned}
 \Delta \text{Resources of the Financial System} = & \underbrace{-0.643 \text{ Resources of the Financial System}_{t-1}}_{\text{Adjustment}} \\
 & + 0.061 \text{ Savings Interest Rate} + 0.256 \text{ Total Loans} \\
 & \quad (0.842) \quad (0.062) \quad (0.060) \\
 & + 0.364 \text{ Compensation of Residents} \\
 & \quad (0.086) \\
 & \underbrace{\hspace{10em}}_{\text{Long-run}}
 \end{aligned}$$

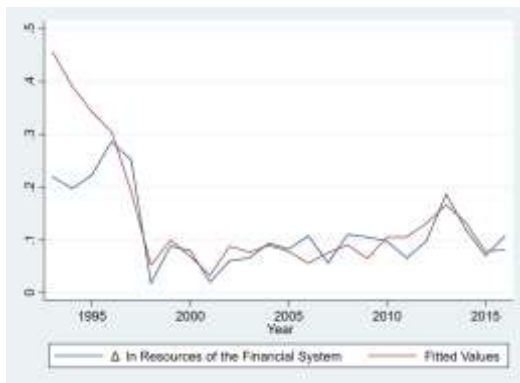
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
|                |                | $\chi^2 (19)$           | $\chi^2 (10)$           |           |       |                |
| 17.951         | -7.214         | 0.299                   | 9.453                   | 0.042     | 0.071 | 0.817          |
| [0.000, 0.000] | [0.000, 0.000] | [0.584]                 | [0.489]                 |           |       |                |

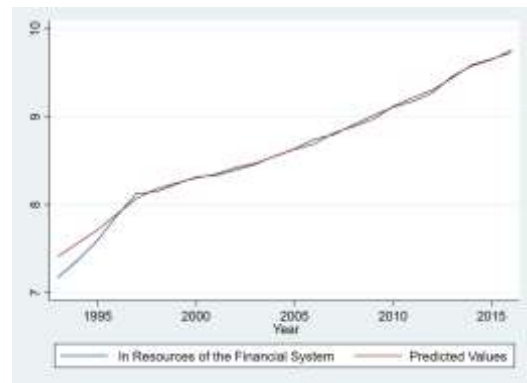
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Resources of the Financial System are 0.147, 0.106, -0.213, and 0.427 respectively.

Figure 1. Actual v. Predicted Resources of the Financial System, along with residuals

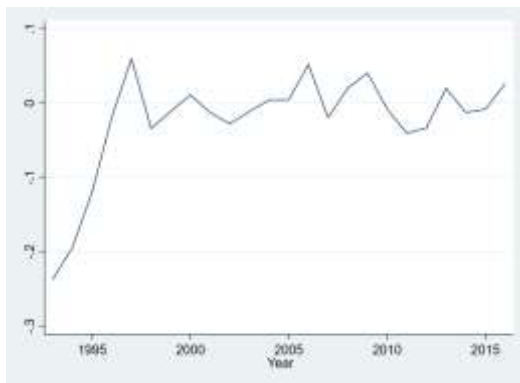
Panel A: Log first-difference



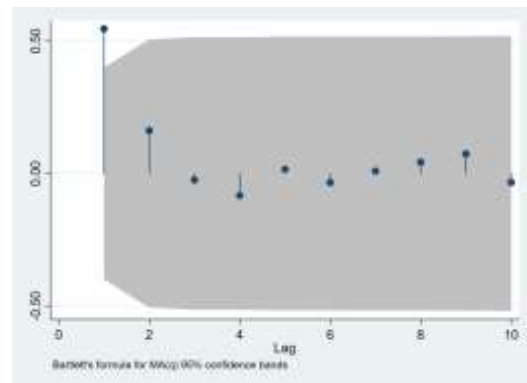
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



### 13. Cash Remittances

Estimation Period: 1974 – 2016

$$\begin{aligned}
 \Delta \text{Cash Remittances} = & \underbrace{-0.275 \text{ Cash Remittances}_{t-1}}_{\text{Adjustment}} \\
 & + \underbrace{2.197 + 1.112 \text{ CPI, Philippines} - 1.419 \text{ Unemployment Rate}}_{\text{Long-run}} \\
 & + 0.218 \Delta \text{Cash Remittances}_{t-1} - 0.203 \Delta \text{Cash Remittances}_{t-2} - 1.116 \Delta \text{CPI, Philippines} \\
 & - 0.119 \Delta \text{CPI, Philippines}_{t-1} - 0.911 \Delta \text{CPI, Philippines}_{t-2} + 0.535 \Delta \text{Unemployment Rate} \\
 & \underbrace{\hspace{10em}}_{\text{Short-run}}
 \end{aligned}$$

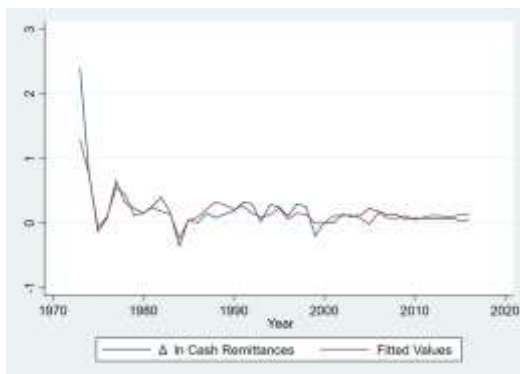
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 11.358         | -3.739         | $\chi^2(41)$            | $\chi^2(20)$            | 0.100     | 0.194 | 0.709          |
| [0.000, 0.036] | [0.007, 0.036] | [0.989]                 | [0.999]                 |           |       |                |

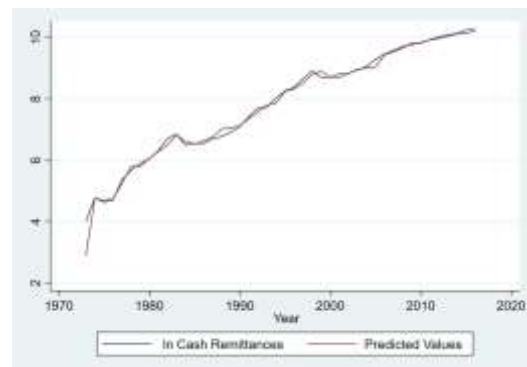
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Cash Remittances are 0.168, 0.397, -0.693, and 2.397 respectively.

Figure 1. Actual v. Predicted Cash Remittances, along with residuals

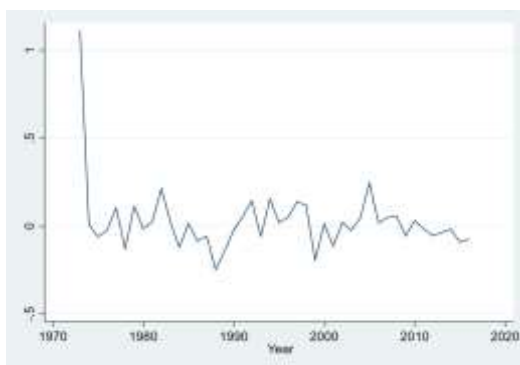
Panel A: Log first-difference



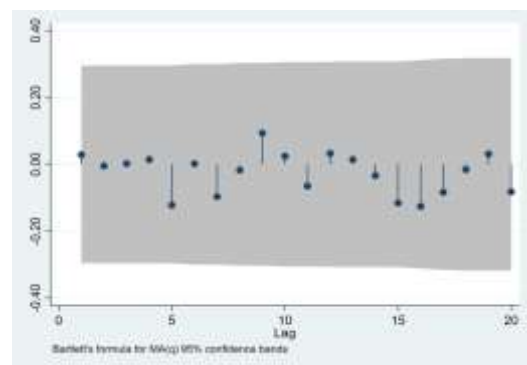
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 14. USD Nominal Exchange Rate

Estimation Period: 1987 – 2016

$$\begin{aligned}
 \Delta \text{USD Nominal Exchange Rate} = & \underbrace{-0.382 \text{ USD Nominal Exchange Rate}_{t-1}}_{\text{Adjustment}} \\
 & + 5.979 \text{ } (4.318) - 0.658 \text{ GDP, Real } (0.838) + 0.412 \text{ Narrow Money } (0.202) \\
 & - 0.917 \text{ Gold Price PHP } (0.262) - 0.968 \text{ Reverse Repurchase Rate } (0.303) \\
 & + 0.000 \text{ Inflation Rate } (0.077) + 0.055 \text{ London Interbank Overnight Rate 3 months } (0.) \\
 & \underbrace{-1.846 \Delta \text{GDP, Real } (0.670) - 0.952 \Delta \text{Narrow Money } (0.335) + 0.204 \Delta \text{Reverse Repurchase Rate } (0.98)}_{\text{Short-run}}
 \end{aligned}$$

*Long-run*

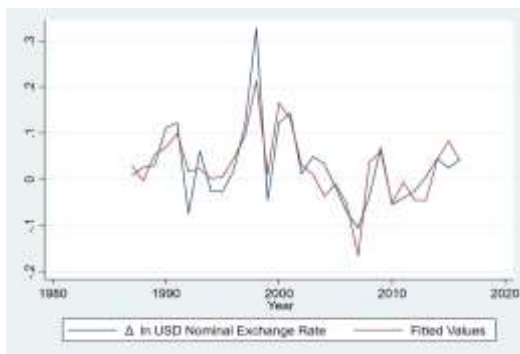
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 4.540          | -4.517         | $\chi^2 (28)$           | $\chi^2 (13)$           | 0.035     | 0.044 | 0.720          |
| [0.009, 0.056] | [0.002, 0.046] | [0.157]                 | [0.731]                 |           |       |                |

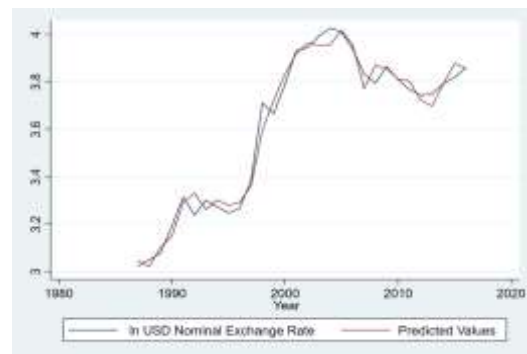
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) USD Nominal Exchange Rate are 0.044, 0.099, -0.106, and 0.429 respectively.

Figure 1. Actual v. Predicted USD Nominal Exchange Rate, along with residuals

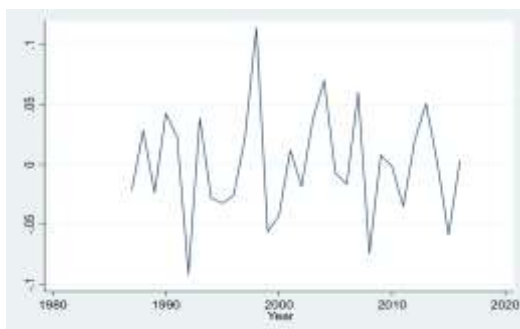
Panel A: Log first-difference



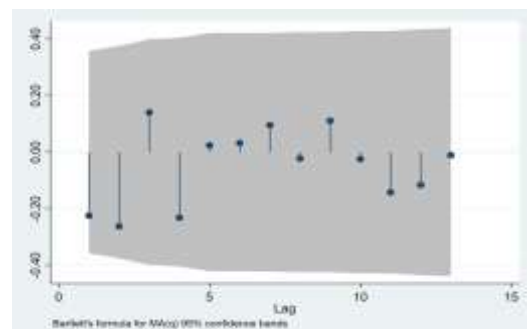
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 15. JPY Nominal Exchange Rate

Estimation Period: 1987 – 2016

$$\begin{aligned}
 \Delta \text{JPY Nominal Exchange Rate} = & \underbrace{-0.601 \text{ JPY Nominal Exchange Rate}_{t-1}}_{\text{Adjustment}} \\
 & + 16.255 - 0.301 \text{ CPI, Japan} - 2.332 \text{ GDP, Real} + 0.878 \text{ Narrow Money} \\
 & \quad (8.900) \quad (0.814) \quad (0.689) \quad (0.256) \\
 & - 0.271 \text{ Gold Price, PHP} - 0.558 \text{ Reverse Repurchase Rate} + 0.154 \text{ Inflation Rate} \\
 & \quad (0.182) \quad (0.246) \quad (0.057) \\
 & \quad \text{Long-run} \\
 & \underbrace{-0.862 \Delta \text{Narrow Money} + 0.405 \Delta \text{Gold Price, PHP}}_{\text{Short-run}} \\
 & \quad (0.345) \quad (0.171)
 \end{aligned}$$

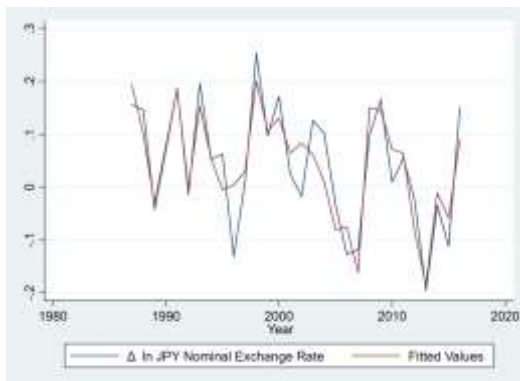
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
|                |                | $\chi^2 (28)$           | $\chi^2 (13)$           |           |       |                |
| 9.460          | -5.902         | 0.107                   | 13.701                  | 0.042     | 0.052 | 0.779          |
| [0.000, 0.001] | [0.000, 0.005] | [0.743]                 | [0.395]                 |           |       |                |

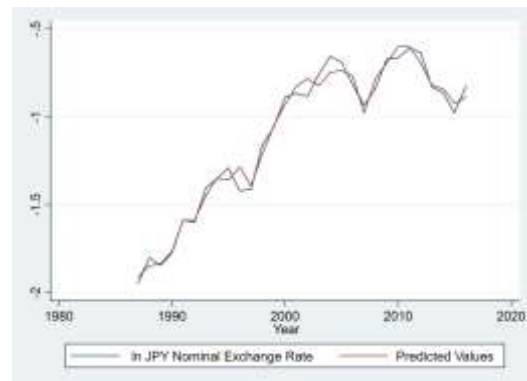
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) JPY Nominal Exchange Rate are 0.070, 0.132, -0.196, and 0.437 respectively.

Figure 1. Actual v. Predicted JPY Nominal Exchange Rate, along with residuals

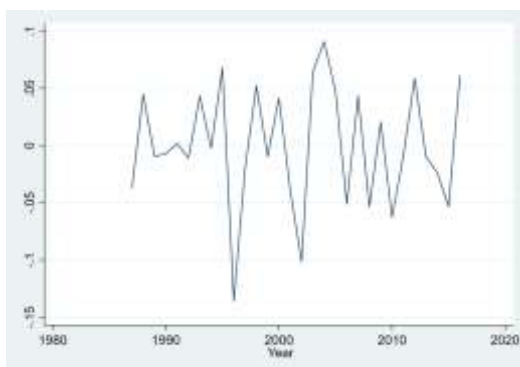
Panel A: Log first-difference



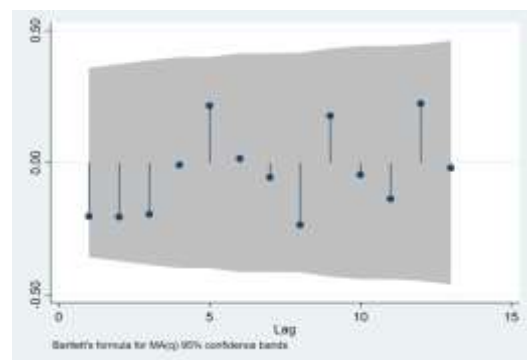
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 16. CNY Nominal Exchange Rate

Estimation Period: 1990 – 2016

$$\begin{aligned}
 \Delta \text{CNY Nominal Exchange Rate} = & \underbrace{-0.261 \text{ CNY Nominal Exchange Rate}_{t-1}}_{\text{Adjustment}} \\
 & + 1.384 \quad +0.472 \text{ USD Nominal Exchange Rate} - 0.249 \text{ Broad Money} \\
 & \quad (0.412) \quad (0.283) \quad (0.144) \\
 & \quad - 0.611 \text{ 5year TBond Rate} \\
 & \quad (0.192) \\
 & \underbrace{+0.751 \Delta \text{USD Nominal Exchange Rate} - 0.685 \Delta \text{Broad Money} + 0.110 \Delta \text{5year TBond Rate}}_{\text{Short-run}} \\
 & \quad (0.148) \quad (0.239) \quad (0.055)
 \end{aligned}$$

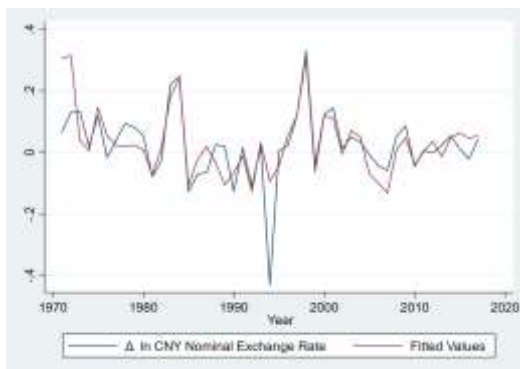
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 6.644          | -4.070         | $\chi^2(42)$            | $\chi^2(21)$            | 0.051     | 0.079 | 0.648          |
| [0.002, 0.009] | [0.003, 0.030] | [0.115]                 | [0.983]                 |           |       |                |

Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) CNY Nominal Exchange Rate are 0.023, 0.113, -0.428, and 0.328 respectively.

Figure 1. Actual v. Predicted CNY Nominal Exchange Rate, along with residuals

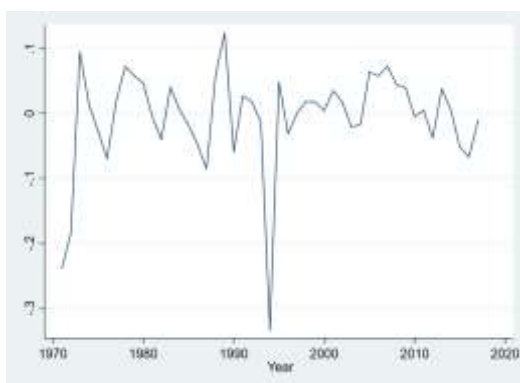
Panel A: Log first-difference



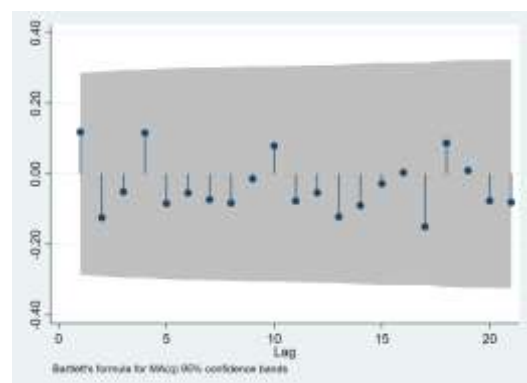
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals



## 17. Money Multiplier

Estimation Period: 1984 – 2017

$$\begin{aligned} \Delta \text{Money Multiplier} = & \underbrace{-0.647 \text{ Money Multiplier}_{t-1}}_{\text{Adjustment}} \\ & + \underbrace{1.592 \text{ Reserve Requirement Ratio} - 0.506 \text{ Reserve Requirement Ratio} + 0.042 \text{ Savings Interest Rate}}_{\text{Long-run}} \\ & - \underbrace{0.159 \Delta \text{Reserve Requirement Ratio}}_{\text{Short-run}} \end{aligned}$$

(0.164) (0.426) (0.035) (0.005) (0.080)

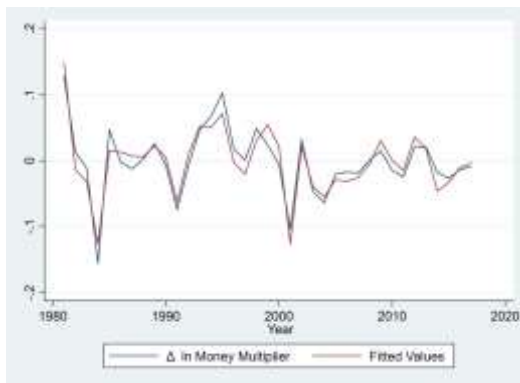
Table A1. Summary of model tests

| Bounds Tests   |                | Heteroskedasticity Test | Autocorrelation Test    | Model Fit |       |                |
|----------------|----------------|-------------------------|-------------------------|-----------|-------|----------------|
| F-Statistic    | t-statistic    | Breusch-Pagan           | Portmanteau Q-Statistic | MAE       | RMSE  | R <sup>2</sup> |
| 5.577          | -3.925         | $\chi^2(32)$            | $\chi^2(16)$            | 0.015     | 0.017 | 0.867          |
| [0.015, 0.043] | [0.005, 0.027] | 0.013                   | 21.767                  |           |       |                |
|                |                | [0.908]                 | [0.150]                 |           |       |                |

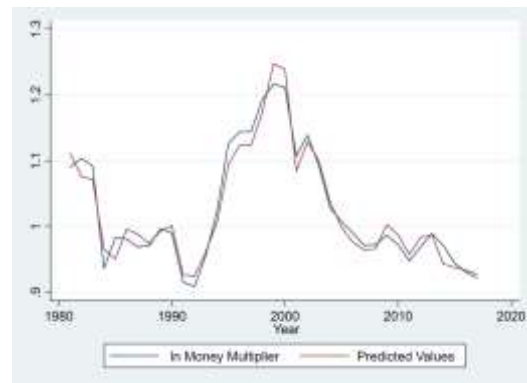
Figures in [] are p-values. Mean/SD/Min/Max of first-differenced ( $\Delta$ ) Money Multiplier are -0.001, 0.050, -0.155, and 0.127 respectively.

Figure 1. Actual v. Predicted Money Multiplier, along with residuals

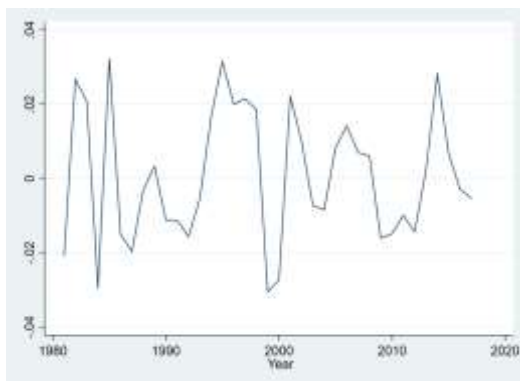
Panel A: Log first-difference



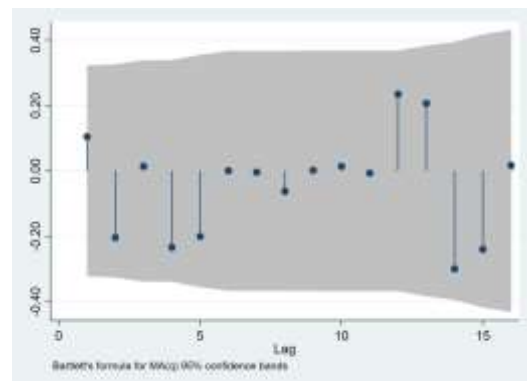
Panel B: Log level



Panel C: Model Residuals



Panel D: Autocorrelation of Residuals





## APPENDIX 4: Test of the predictive accuracy

Table 1. Test of the predictive accuracy of forecasts: MAPE

|  | In-sample forecast | Out-sample forecast |       |
|--|--------------------|---------------------|-------|
|  | 2002-2016          | 2017                | 2018  |
| GDP, real                                    | 0.021              | 0.024               | 0.029 |
| GDP, nominal                                 | 0.011              | 0.005               | 0.003 |
| Nominal GDP (exp)                            | 0.022              | 0.019               | 0.08  |
| GVA Agriculture, real                        | 0.018              | 0.017               | 0.006 |
| GVA Agriculture (demand), real               | 0.008              | 0.002               | 0.012 |
| GVA Construction, real                       | 0.059              | 0.158               | 0.129 |
| GVA Electricity and Steam, real              | 0.041              | 0.069               | 0.057 |
| GVA Finance, real                            | 0.031              | 0.01                | 0.031 |
| GVA Manufacturing, real                      | 0.051              | 0.078               | 0.09  |
| GVA Mining, real                             | 0.093              | 0.057               | 0.124 |
| GVA Mining, nominal                          | 0.096              | 0.102               | 0.148 |
| GVA Other Services, real                     | 0.029              | 0.031               | 0.072 |
| GVA Real Estate, real                        | 0.016              | 0.034               | 0.067 |
| GVA Trade, real                              | 0.044              | 0.072               | 0.088 |
| GVA Transportation, real                     | 0.039              | 0.088               | 0.186 |
| GVA Water, real                              | 0.049              | 0.016               | 0.018 |
| IPIN GVA Construction                        | 0.052              | 0.011               | 0.037 |
| IPIN GVA Electricity and Steam               | 0.026              | 0.027               | 0.072 |
| IPIN GVA Finance                             | 0.03               | 0.032               | 0.095 |
| IPIN GVA Manufacturing                       | 0.07               | 0.031               | 0.041 |
| IPIN GVA Mining                              | 0.073              | 0.047               | 0.027 |
| IPIN GVA Other Services                      | 0.038              | 0.019               | 0.035 |
| IPIN GVA Real Estate                         | 0.021              | 0.024               | 0.095 |
| IPIN GVA Trade                               | 0.075              | 0.118               | 0.156 |
| IPIN GVA Transportation                      | 0.048              | 0.1                 | 0.114 |
| IPIN GVA Water                               | 0.056              | 0.016               | 0.062 |
| HFCE - Alcohol                               | 0.031              | 0.113               | 0.435 |
| HFCE - Education                             | 0.031              | 0.042               | 0.073 |
| HFCE - Food                                  | 0.016              | 0.015               | 0.009 |
| HFCE - Medical                               | 0.027              | 0.085               | 0.169 |
| HFCE - Housing                               | 0.022              | 0.125               | 0.078 |
| HFCE - Non-Alcoholic                         | 0.045              | 0.084               | 0.222 |
| HFCE - Miscellaneous                         | 0.017              | 0.01                | 0.03  |
| HFCE - Tobacco                               | 0.039              | 0.014               | 0.034 |
| HFCE - Transportation and Communication      | 0.031              | 0.002               | 0.004 |
| HFCE - Utilities                             | 0.042              | 0.047               | 0.086 |
| IPIN HFCE - Alcohol                          | 0.022              | 0.072               | 0.203 |
| IPIN HFCE - Education                        | 0.013              | 0.03                | 0.104 |
| IPIN HFCE - Food                             | 0.016              | 0.033               | 0.014 |
| IPIN HFCE - Medical                          | 0.026              | 0.145               | 0.285 |
| IPIN HFCE - Housing                          | 0.032              | 0.07                | 0.065 |
| IPIN HFCE - Non-Alcoholic                    | 0.014              | 0.005               | 0.012 |
| IPIN HFCE - Miscellaneous                    | 0.078              | 0.005               | 0.012 |
| IPIN HFCE - Tobacco                          | 0.019              | 0.049               | 0.05  |
| IPIN HFCE - Transportation and Communication | 0.043              | 0.02                | 0.027 |
| IPIN HFCE - Utilities                        | 0.022              | 0.06                | 0.1   |
| Inflation Rate                               | 0.257              | 0.048               | 0.21  |

|   | <b>In-sample forecast</b> | <b>Out-sample forecast</b> |             |
|---|---------------------------|----------------------------|-------------|
|   | <b>2002-2016</b>          | <b>2017</b>                | <b>2018</b> |
| GDCF - Fixed - Durables, real                                   | 0.176                     | 0.105                      | 0.033       |
| GDCF - Fixed - Private Construction, real                       | 0.077                     | 0.058                      | 0.18        |
| GDCF - Fixed - Construction, real                               | 0.058                     | 0.174                      | 0.154       |
| GDCF - Fixed, real  | 0.104                     | 0.119                      | 0.071       |
| GDCF, real  | 0.106                     | 0.107                      | 0.064       |
| GDCF, nominal   | 0.106                     | 0.049                      | 0.039       |
| Compensation of Residents                                       | 0.021                     | 0.075                      | 0.016       |
| Operating Surplus   | 0.035                     | 0.05                       | 0.037       |
| Net Compensation  | 0.011                     | 0.021                      | 0.027       |
| Net National Income   | 0.019                     | 0.003                      | 0.036       |
| Net Disposable Income   | 0.021                     | 0.007                      | 0.033       |
| Compensation plus Net Operating Surplus from Resident Producers | 0.024                     | 0.032                      | 0.012       |
| Domestic Demand, Real   | 0.069                     | 0.096                      | 0.102       |
| Employment in Agriculture                                       | 0.018                     | 0.068                      | 0.009       |
| Employment in Industry  | 0.012                     | 0.023                      | 0.072       |
| Employment in Service   | 0.011                     | 0.008                      | 0.005       |
| Total Employment (AIS)  | 0.009                     | 0.01                       | 0.015       |
| Labor Force   | 0.007                     | 0.009                      | 0.005       |
| Unemployment Rate   | 0.041                     | 0.123                      | 0.123       |
| Wage Index Agriculture  | 0.021                     | 0.011                      | 0.056       |
| Wage Index Construction   | 0.021                     | 0.023                      | 0.059       |
| Wage Index Electricity and Steam                                | 0.019                     | 0.055                      | 0.083       |
| Wage Index Finance  | 0.053                     | 0.095                      | 0.092       |
| Wage Index Manufacturing  | 0.038                     | 0.142                      | 0.226       |
| Wage Index Mining   | 0.058                     | 0.008                      | 0.001       |
| Wage Index Private Service                                      | 0.043                     | 0.003                      | 0.502       |
| Wage Index Real Estate  | 0.036                     | 0.075                      | 0.12        |
| Wage Index Trade  | 0.055                     | 0.086                      | 0.121       |
| Wage Index Transportation                                       | 0.046                     | 0.062                      | 0.046       |
| HFCE - Education, Nominal                                       | 0.025                     | 0.013                      | 0.024       |
| HFCE - Food, Nominal  | 0.022                     | 0.047                      | 0.024       |
| HFCE - Medical, Nominal   | 0.018                     | 0.048                      | 0.068       |
| HFCE - Housing, Nominal   | 0.032                     | 0.063                      | 0.018       |
| HFCE - Non-Alcoholic, Nominal                                   | 0.051                     | 0.079                      | 0.231       |
| HFCE - Miscellaneous, Nominal                                   | 0.082                     | 0.015                      | 0.042       |
| HFCE - Tobacco, Nominal   | 0.047                     | 0.032                      | 0.159       |
| HFCE - Transportation and Communication, Nominal                | 0.048                     | 0.037                      | 0.079       |
| HFCE - Utilities, Nominal                                       | 0.044                     | 0.032                      | 0.082       |
| BIR - Excise Taxes  | 0.053                     | 0.05                       | 0.073       |
| Import Duties and Excise Taxes                                  | 0.153                     | 0.051                      | 0.09        |
| Taxes in Business and Occupation                                | 0.12                      | 0.158                      | 0.837       |
| Other Indirect Taxes  | 0.088                     | 0.019                      | 0.07        |
| BIR - Alcohol Products  | 0.087                     | 0.006                      | 0.131       |
| BIR - Tobacco Products (including inspection fees)              | 0.07                      | 0.07                       | 0.285       |
| BIR - Petroleum Products  | 0.042                     | 0.032                      | 0.024       |
| BIR - Mineral Products  | 0.084                     | 0.099                      | 1.554       |
| Excise Tax on Domestic Product                                  | 0.224                     | 0.086                      | 0.21        |
| Income Tax on Business  | 0.143                     | 0.067                      | 0.202       |
| Income Tax on Individual  | 0.164                     | 0.093                      | 0.589       |
| Other Direct Taxes  | 0.236                     | 0.066                      | 0.922       |

|                                      | <b>In-sample forecast</b> | <b>Out-sample forecast</b> |             |
|--------------------------------------|---------------------------|----------------------------|-------------|
|                                      | <b>2002-2016</b>          | <b>2017</b>                | <b>2018</b> |
| Compulsary fees and fines            | 0.175                     | 0.061                      | 0.158       |
| Govt property income                 | 0.095                     | 0.06                       | 0.153       |
| Social security contributions        | 0.067                     | 0.054                      | 0.24        |
| Govt property expenditure            | 0.099                     | 0.088                      | 0.117       |
| Social security benefits             | 0.059                     | 0.151                      | 0.236       |
| Total Indirect Taxes                 | 0.139                     | 0.11                       | 0.364       |
| Total Direct Taxes                   | 0.1                       | 0.078                      | 0.181       |
| Total Taxes                          | 0.054                     | 0.027                      | 0.357       |
| Total Govt Income                    | 0.047                     | 0.008                      | 0.23        |
| Total Govt Expenditure               | 0.021                     | 0.002                      | 0.008       |
| Total Govt Savings                   | 0.291                     | 0.072                      | 2.036       |
| Total Govt Surplus                   | 0.63                      | 0.125                      | 2.149       |
| Total Govt Debt                      | 0.0523                    | 0.0146                     | 0.3634      |
| IPIN Agricultural Imports            | 0.067                     | 0.227                      | 0.491       |
| IPIN Fuel Imports                    | 0.079                     | 0.02                       | 0.011       |
| IPIN Machinery Imports               | 0.094                     | 0.196                      | 0.161       |
| IPIN Materials Imports               | 0.043                     | 0.129                      | 0.219       |
| IPIN Other Good Imports              | 0.073                     | 0.072                      | 0.123       |
| IPIN Electronic Exports              | 0.132                     | 0.083                      | 0.24        |
| IPIN Agricultural Exports            | 0.061                     | 0.107                      | 0.325       |
| IPIN Mineral Exports                 | 0.129                     | 0.203                      | 0.388       |
| IPIN Other Good Exports              | 0.103                     | 0.236                      | 0.846       |
| IPIN Service Imports                 | 0.073                     | 0.067                      | 0.055       |
| IPIN BPO Service Exports             | 0.13                      | 0.08                       | 0.277       |
| IPIN Tourism Service Exports         | 0.257                     | 0.658                      | 2.573       |
| IPIN Other Service Exports           | 0.129                     | 0.176                      | 1.408       |
| Electronic Exports, real             | 0.153                     | 0.24                       | 0.413       |
| Agricultural Exports, real           | 0.068                     | 0.397                      | 0.442       |
| Mineral Exports, real                | 0.154                     | 0.422                      | 0.607       |
| Other Good Exports, real             | 0.084                     | 0.269                      | 0.48        |
| BPO Service Exports, real            | 0.134                     | 0.418                      | 0.553       |
| Tourism Service Exports, real        | 0.163                     | 0.511                      | 0.737       |
| Other Service Exports                | 0.064                     | 0.276                      | 0.633       |
| BOP - Total Good Exports, nominal    | 0.052                     | 0.234                      | 0.194       |
| BOP - Total Service Exports, nominal | 0.059                     | 0.149                      | 0.012       |
| Agricultural Imports, real           | 0.121                     | 0.203                      | 0.406       |
| Fuel Imports, real                   | 0.096                     | 0.11                       | 0.131       |
| Machinery Imports, real              | 0.182                     | 0.128                      | 0.043       |
| Materials Imports, real              | 0.13                      | 0.321                      | 0.429       |
| Other Good Imports, real             | 0.149                     | 0.058                      | 0.016       |
| Total Service Imports, real          | 0.05                      | 0.035                      | 0.137       |
| BOP -Total Good Imports, nominal     | 0.042                     | 0.125                      | 0.138       |
| BOP - Total Service Imports, nominal | 0.052                     | 0.068                      | 0.239       |
| Total Export of Goods, Real          | 0.106                     | 0.259                      | 0.442       |
| Total Export of Services, Real       | 0.108                     | 0.425                      | 0.593       |
| Total Exports, Real                  | 0.086                     | 0.293                      | 0.471       |
| Total Import of Goods, Real          | 0.095                     | 0.129                      | 0.197       |
| Total Imports, Real                  | 0.084                     | 0.099                      | 0.14        |
| Net Exports(real)                    | 6.862                     | 1.213                      | 1.789       |
| 91 day T-Bill Rate                   | 0.47                      | 0.475                      | 0.475       |

|                                   | <b>In-sample forecast<br/>2002-2016</b> | <b>Out-sample forecast</b> |             |
|-----------------------------------|---|----------------------------|-------------|
|                                   |   | <b>2017</b>                | <b>2018</b> |
| 6 months T-Bill Rate              | 0.378                                   | 0.452                      | 0.087       |
| 1 Year T-Bill Rate                | 0.308                                   | 0.45                       | 0.016       |
| 5 Year T-Bill Rate                | 0.151                                   | 0.229                      | 0.022       |
| 10 Years T-Bill Rate              | 0.158                                   | 0.162                      | 0.129       |
| Lending Rate                      | 0.098                                   | 0.029                      | 0.066       |
| Time Deposit Rate                 | 0.205                                   | 0.234                      | 0.093       |
| Savings Interest Rate             | 0.186                                   | 0.076                      | 0.095       |
| Real Interest Rate                | 0.388                                   | 0.008                      | 3.279       |
| M1                                | 0.022                                   | 0.03                       | 0.053       |
| M3                                | 0.034                                   | 0.012                      | 0.024       |
| Total Loans                       | 0.031                                   | 0.054                      | 0.042       |
| Resources of the Financial System | 0.038                                   | 0.044                      | 0.127       |
| Cash Remittances                  | 0.094                                   | 0.093                      | 0.364       |
| Money Multiplier                  | 0.009                                   | 0.004                      | 0.011       |

## APPENDIX 5: Documentation of creating consistent data series

1. Total and sectoral employment (*tot\_emp*, *emp\_agri*, *emp\_ind*, *emp\_ser*).

Total employment data have the following breaks:

Break 1: Past week reference period and covered household population 10 years old and over (1956-1976 August).

Break 2: Past quarter reference period and covered household population 15 years old and over (1976-1987 first quarter) in thousands

Break 3: Past week reference period (July 1986-2016)

Since there is an overlap in 1986 between breaks 2 and 3, a factor is computed using two overlapping data on total employment. We use this factor to find the total employment data in 1985 that is consistent with the break 3 series. Since there is now an overlap in breaks 2 and 3 in 1985, a factor is computed again, which is used to get the data in 1984. This is done until the series has reached 1956 (the first year of the break 1 series).

In terms of sectoral employment, there is a consistent data series from 1991 to 2016. To get employment shares for the earlier years, Orbeta (2002) has recorded sectoral employment shares in 1978, 1980, 1985, and 1990. A linear extrapolation has been done using this information. This completes the series in sectoral employment shares for 1978-2016. Using this series and the total employment generated above, sectoral employment data (level) are generated.

2. Labor Force (*lf*) and Unemployment Rate (*unemp\_rate*).

Similar to the employment data, labor force data and unemployment rate data have three breaks. To get data series earlier than 1986, a procedure similar to (1) is followed.

3. Wage index for Agriculture (*wageind\_agri*).

These data are derived from the Nominal Agricultural Wage Rates of Farm Workers by Type of Farm Workers published by the PSA. These are divided by the CPI and indexed to 1978 prices to be consistent with the wage index for other sectors, all of which are publicly available.

4. Compensation of Employees, From the Rest of the World (ROW), net and Property Income, Net

The official data for these variables originally contained 4 breaks (1946-1994, 1980-1998, 1995-2009 and 2009-present). Right Side Scaling adjustment using raising factor was utilized in order to harmonize the series.

5. Components of Gross Domestic Capital Formation (Fixed Capital + Change in Inventories) (*gdcf\_fc\_n* and *gdcf\_ci\_n*)

These components have two data series due to changes in base years. One series (from 1946 to 2000) at 1985 prices and another series (from 1998 to 2016) at 2000 prices. In order to create a

single time-series, the shares of these components are computed using the Total GDCF, which are also available in 2 series. The computed shares are then multiplied by the *Total GDCF* (at 2000 prices), which are available from 1946-2016, to create a series of Fixed Capital and Change in Inventories at 2000 prices from 1946-1997.

6. Components Gross Domestic Capital Formation: Construction, Intellectual Property Product, Durable Equipment, Breeding Stock and Orchard Development (*gdcf\_fc\_cons\_n*, *gdcf\_fc\_ipp\_n*, *gdcf\_fc\_dur\_n*, *gdcf\_ci\_n*, and *gdcf\_fc\_breed\_n*)

Similar to (5), these components have two data series due to rebasing. A similar procedure done in (5) is also done to create data series at 2000 prices. The computed shares are then multiplied by the *Fixed Capital* generated in (5) to get the data on Construction, Intellectual Property Product, Durable Equipment, Breeding Stock and Orchard Development.

7. Gross Domestic Capital Formation components: Public Construction, Private Construction, (*gdcf\_fc\_pubcons\_n*, *gdcf\_fc\_privcons\_n*)

Similar to (5), these components have two data series due to rebasing. A similar procedure done in (5) is also done to create data series at 2000 prices. The computed shares are then multiplied by the *Total Construction* (at 2000 prices) to get the data series for Public Construction and Private Construction at 2000 prices.

8. Goods export categories include electric components exports, agricultural exports, mineral components exports, and other manufactured goods exports. Electric components are being modelled as this is a growing export product for the Philippines in recent years. Agricultural exports are a staple as well as with mineral components exports. Other manufactured goods are lumped together.

Services export categories include computer services exports (business process outsourcing), tourism exports, and other services exports. Considering that the Philippines has a growing BPO industry, singling out these services is important for policy analysis. Tourism exports are also a growing sector in the Philippines. Other services exports are lumped together.

Goods import categories include machinery and equipment imports, material inputs imports, fuel imports, rice/agricultural imports, and other imports. Machinery and equipment together with material inputs are important goods for the growth of industry which is why these have been singled out as individual categories. Fuel imports are likewise a staple. With the increased importation of rice, agricultural imports have been singled out as well. Other imports are lumped together.

Services imports are lumped only as total services imports. No breakdown has been made for this.

## 9. Regrouping of PSA National Income Accounts' Goods Exports Categories

Table 1 PSA National Income Accounts (1967-1991), Goods Exports

| Export Categories<br>PSA National Income Accounts (1967-1991) | Regrouped Goods Export Categories |              |         |                                |
|---|-----------------------------------|--------------|---------|--------------------------------|
|   | Electronics                       | Agricultural | Mineral | Other<br>Manufactured<br>Goods |
| 1. Semiconductors and electronic microcircuits                |                                   |              |         |                                |
| 2. Garments   |                                   |              |         |                                |
| 3. Crude coconut oil  |                                   |              |         |                                |
| 4. Bars, rods of copper                                       |                                   |              |         |                                |
| 5. Gold from copper ores                                      |                                   |              |         |                                |
| 6. Banana and plantains                                       |                                   |              |         |                                |
| 7. Lumbers  |                                   |              |         |                                |
| 8. Copper concentrates  |                                   |              |         |                                |
| 9. Shrimp and prawns  |                                   |              |         |                                |
| 10. Canned pineapple  |                                   |              |         |                                |
| 11. Iron agglomerates   |                                   |              |         |                                |
| 12. Centrifugal sugar   |                                   |              |         |                                |
| 13. Copra oil, cake & meal                                    |                                   |              |         |                                |
| 14. Coffee, not roasted                                       |                                   |              |         |                                |
| 15. Plywood, ordinary   |                                   |              |         |                                |
| 16. Prepared tuna   |                                   |              |         |                                |
| 17. Desiccated coconut  |                                   |              |         |                                |
| 18. Logs  |                                   |              |         |                                |
| 19. Others  |                                   |              |         |                                |
| 20. Monetization of gold                                      |                                   |              |         |                                |

Table 2 PSA National Income Accounts (1991-2000), Goods Exports

| Export Categories<br>PSA National Income Accounts (1991-2000) | Regrouped Goods Export Categories |              |         |                                |
|---|-----------------------------------|--------------|---------|--------------------------------|
|   | Electronics                       | Agricultural | Mineral | Other<br>Manufactured<br>Goods |
| 1. Garments   |                                   |              |         |                                |
| 2. Semiconductors and electric microcircuits                  |                                   |              |         |                                |
| 3. Finished electrical machinery                              |                                   |              |         |                                |
| 4. Other products manufactured                                |                                   |              |         |                                |
| 5. Ignition wiring sets                                       |                                   |              |         |                                |
| 6. Crude coconut oil  |                                   |              |         |                                |
| 7. Bars, rods of copper                                       |                                   |              |         |                                |
| 8. Shrimps and prawns   |                                   |              |         |                                |
| 9. Gold from copper ores                                      |                                   |              |         |                                |
| 10. Banana and plantains                                      |                                   |              |         |                                |
| 11. Transmission apparatus                                    |                                   |              |         |                                |
| 12. Copper concentrates                                       |                                   |              |         |                                |
| 13. Canned pineapple  |                                   |              |         |                                |
| 14. Desiccated coconut  |                                   |              |         |                                |
| 15. Centrifugal sugar   |                                   |              |         |                                |
| 16. Liquefied petrol, gas                                     |                                   |              |         |                                |
| 17. Petroleum naphtha   |                                   |              |         |                                |
| 18. Baskets, basketwares                                      |                                   |              |         |                                |
| 19. Prepared tuna   |                                   |              |         |                                |
| 20. Iron agglomerates   |                                   |              |         |                                |
| 21. Copra oil, cake & meal                                    |                                   |              |         |                                |
| 22. Tennis, gym & sports shoes                                |                                   |              |         |                                |

|                          |  |  |  |  |
|--------------------------|--|--|--|--|
| 23. Others               |  |  |  |  |
| 24. Monetization of gold |  |  |  |  |

Table 3 PSA National Income Accounts (1998-2017), Goods Exports

| Export Categories<br>PSA National Income Accounts (1998-2017)      | Regrouped Goods Export Categories |              |         |                          |
|--|-----------------------------------|--------------|---------|--------------------------|
|  | Electronics                       | Agricultural | Mineral | Other Manufactured Goods |
| 1. Electric components   |                                   |              |         |                          |
| 2. Principal agricultural products                                 |                                   |              |         |                          |
| 3. Principal fishery products                                      |                                   |              |         |                          |
| 4. Articles of apparel and clothing accessories                    |                                   |              |         |                          |
| 5. Basketworks   |                                   |              |         |                          |
| 6. Cathodes & sections of cathodes and of refined copper           |                                   |              |         |                          |
| 7. Ignition wiring sets  |                                   |              |         |                          |
| 8. Metal components  |                                   |              |         |                          |
| 9. Other products manufactured from materials on consignment basis |                                   |              |         |                          |
| 10. Petroleum products   |                                   |              |         |                          |
| 11. Others   |                                   |              |         |                          |

## 10. Regrouping of PSA National Income Accounts' Goods Imports Categories

Table 4 PSA National Income Accounts (1967-1999), Goods Imports

| Import Categories<br>PSA National Income Accounts (1967-1999) | Regrouped Goods Import Categories |                 |      |                     |        |
|---|-----------------------------------|-----------------|------|---------------------|--------|
|   | Machinery and equipment           | Material inputs | Fuel | Rice / Agricultural | Others |
| 1. Mineral fuels, lubricants, and related materials           |                                   |                 |      |                     |        |
| 2. Machinery other than electrical machinery                  |                                   |                 |      |                     |        |
| 3. Base metals  |                                   |                 |      |                     |        |
| 4. Electrical machinery, apparatus, & appliances              |                                   |                 |      |                     |        |
| 5. Cereals & cereal products                                  |                                   |                 |      |                     |        |
| 6. Transport equipment  |                                   |                 |      |                     |        |
| 7. Chemical elements and compounds                            |                                   |                 |      |                     |        |
| 8. Manufacture of metals                                      |                                   |                 |      |                     |        |
| 9. Textile yarns  |                                   |                 |      |                     |        |
| 10. Artificial resins and plastic materials                   |                                   |                 |      |                     |        |
| 11. Dairy products  |                                   |                 |      |                     |        |
| 12. Textile fibers  |                                   |                 |      |                     |        |
| 13. Fertilizers manufacturing                                 |                                   |                 |      |                     |        |
| 14. Feeding stuff   |                                   |                 |      |                     |        |
| 15. Paper products  |                                   |                 |      |                     |        |
| 16. Others  |                                   |                 |      |                     |        |
| 17. Imports on consignment                                    |                                   |                 |      |                     |        |

Table 5 PSA National Income Accounts (1998-2017), Goods Imports

| Import Categories<br>PSA National Income Accounts (1998-2017) | Regrouped Goods Import Categories |                 |      |                     |        |
|---|-----------------------------------|-----------------|------|---------------------|--------|
|   | Machinery and equipment           | Material inputs | Fuel | Rice / Agricultural | Others |
| 1. Electronics  |                                   |                 |      |                     |        |
| 2. Mineral fuels  |                                   |                 |      |                     |        |
| 3. Machinery and mechanical appliances                        |                                   |                 |      |                     |        |



|   |  |  |  |  |  |
|---|--|--|--|--|--|
| 4. Base metals                          |  |  |  |  |  |
| 5. Transport equipment                  |  |  |  |  |  |
| 6. Textile yarns                        |  |  |  |  |  |
| 7. Electrical machinery                 |  |  |  |  |  |
| 8. Artificial resins                    |  |  |  |  |  |
| 9. Chemical products                    |  |  |  |  |  |
| 10. Cereals                             |  |  |  |  |  |
| 11. Dairy products                      |  |  |  |  |  |
| 12. Medical and pharmaceutical products |  |  |  |  |  |
| 13. Paper products                      |  |  |  |  |  |
| 14. Feedstuff                           |  |  |  |  |  |
| 15. Metalliferous ores and metal scrap  |  |  |  |  |  |
| 16. Others                              |  |  |  |  |  |
| 17. Imports on consignment              |  |  |  |  |  |

# 11. Regrouping of PSA National Income Accounts' Services Exports Categories

| Export Categories<br>PSA National Income Accounts (1980-2017) | Regrouped Services Export Categories |         |        |
|---|--------------------------------------|---------|--------|
|   | BPO                                  | Tourism | Others |
| 1. Transportation   |                                      |         |        |
| 2. Insurance  |                                      |         |        |
| 3. Travel   |                                      |         |        |
| 4. Government   |                                      |         |        |
| 5. Miscellaneous services                                     |                                      |         |        |

Note: Since there is a lack of data that fully identifies the BPO industry in the PSA National Income Accounts, the bulk of the 'miscellaneous services' was used as a proxy. This decision was made based on a key informant interview with the IT and Business Process Association of the Philippines (IBPAP) in 20 March 2018 where the bulk of the 'miscellaneous services' item is actually the BPO industry. IBPAP also states that the BPO industry has already been in existence since the 1980s. In fact, pioneer firms at the time still operate at present.

# 12. Bureau of Internal Revenue (BIR) Tax Collections

The BIR has different tax data series, i.e., 1967-1982, 1983-1989, 1990-1993, 2011-2016. Tax collections were aggregated to broader tax groups to have consistent time series.

# 13. Effective tax rates

Commodity-specific effective tax rates were calculated using the official tax schedules weighted by actual or proxy measures for each commodity-schedule pair. For example, for the effective individual income tax rate, tax schedules from the different Internal Revenue Codes were applied to the distribution of per capita income from the Family Income and Expenditure Surveys.

# 14. Household Final Consumption Expenditure (HFCE)

Older National Accounts HFCE series from NSCB and PSA were harmonized to newer series by using the ratio of the value of the older series to the newer series at series breaks. Some consumption items were aggregated for consistency across time. Others that require more detailed breakdown, e.g. tobacco and alcoholic beverages, were disaggregated from a more aggregated series using ratios derived from the triennial Family Income and Expenditure Surveys.

15. General Government Income and Outlay Account

The General Government Income and Outlay Account estimates from NSCB and PSA were harmonized using a similar technique employed for HFCE. Older National Accounts HFCE series from NSCB and PSA were harmonized to newer series by using the ratio of the value of the older series to the newer series at series breaks.