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Working Paper

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PIDS Discussion Paper Series, No. 1996-10

Provided in Cooperation with:

Philippine Institute for Development Studies (PIDS), Philippines

Suggested Citation: Yap, Josef T. (1996) : Can P* Be a Basis for Core Inflation in the Philippines, PIDS Discussion Paper Series, No. 1996-10, Philippine Institute for Development Studies (PIDS), Makati City

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Philippine Institute for Development Studies

Can P^* Be a Basis for Core Inflation in the Philippines?

Josef T. Yap

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September 1996

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CAN P^* BE A BASIS FOR CORE INFLATION IN THE PHILIPPINES?

Josef T. Yap¹

Introduction

Inflation has become the central issue again in economic discussions with the Secretary of Socio-economic Planning and the Governor of the Bangko Sentral ng Pilipinas (BSP) admitting that the inflation rate will likely remain above 10 percent for the first quarter of 1996. A steady, manageable inflation rate is a key ingredient for macroeconomic stability and the BSP is intent to pursue its mandate along this line. This is one reason that the concept of core inflation is being considered as a basis for conducting monetary policy.

Core or "underlying" inflation is defined by the BSP to be the long-run trend in the general price level. The items that are usually excluded from the computation of core inflation are: 1) prices subject to government policy such as taxes and changes in the price of oil and, in some countries, interest rates; 2) components which are volatile and/or seasonal. In this paper we attempt to relate core inflation to the concept of P^* and determine whether it can be applied in the Philippine economy.

Basic Concepts

The P-star (P^*) concept was first developed by the Federal Reserve as a simple, yet comprehensive, indicator of inflationary pressure (Hallman, et al. 1989, 1991). P^* is defined as the price level which is consistent with current money supply and equilibrium in goods and financial markets. As the gap between the actual price level P and P^* is zero in equilibrium, deviations from P and P^* indicate the amount of price adjustment which has not yet materialized and can help predict future movements in the price level.

¹Research Fellow, Philippine Institute for Development Studies. This paper was prepared for a workshop on the definition and measurement of inflation organized by the Bangko Sentral ng Pilipinas and held on 16 February 1996. The usual disclaimer applies.

Calculation of P^* takes the quantity theory of money as the starting point. The simple quantity equation is:

$$PQ = MV \quad (1)$$

where Q is real GDP, P is the GDP price deflator, M is the stock of money and V is the velocity of money. P^* is also considered as the long-run equilibrium price level and, based on Equation (1), defined as the price level consistent with the current value of M , the long-run equilibrium value of velocity (V^*), and the current value of potential real GDP (Q^*):

$$P^* = \frac{MV^*}{Q^*} \quad (2)$$

Following the quantity theory, it is assumed that both Q^* and V^* are determined independently, and, more importantly that both are independent of the money stock. Thus, the equilibrium price level moves proportionally with the stock of money.

As mentioned earlier, any divergence of the price level P^* from the actual price level P , i.e. any positive or negative price gaps $P^* - P$, indicates whether the future price level will accelerate or slow down. An application of this framework is to identify the equilibrium price level through the construction of P^* and then to estimate reduced-form short-run dynamics that drive the actual price level to P^* and thereby are consistent with the long-run constraints imposed by P^* . Such a short-run dynamic model of inflation is given by the following error-correction model:

$$\Delta \ln(P_t) = \sum_{i=1}^N \alpha_i \Delta \ln(P)_{t-i} + \beta (P_{t-1}^* - P_{t-1}) \quad (3)$$

Hoeller and Poret (1991) point out that Equation (3) focuses on the adjustment towards long-run equilibrium levels; hence it does not capture important factors influencing prices in the short run, e.g. indirect tax changes, food or energy price shocks. P^* then provides a measure of where the price level will go after such

transitory shocks have worked themselves out. This is the characterization that links the P^* concept to core inflation.

The idea behind equations (2) and (3) therefore is that any increase in the stock of money which is not accompanied by an increase of real output, will cause an increase of P in the long-run (note that $\beta > 0$). For equation (3) to be a valid representation of the data, however, P and P^* must form a cointegrating relationship in the sense of Engle and Granger (1987). In other words, there should be a tendency for P to approach P^* in the long run.

Calculation of P^*

A key question in implementing the P^* approach is how to measure potential output (Q^*) and trend velocity (V^*). At the outset, it must be determined whether actual output Q and actual velocity V contain a unit root. The presence of unit roots in output and velocity implies that they do not revert to some deterministic time trends or historical averages in the long run. This will rule out the use of (deterministic) time trends or mean values for calculating potential output and equilibrium velocity. Using time trends in the presence of unit root will yield a non-stationary price gap, i.e. $P^* - P$, which is inconsistent with the assumption of the P^* model.

One alternative is to use structural models of the determination of potential output and equilibrium velocity. This was applied by Funke and Hall (1992) to calculate for V^* and subsequently adopted by Reyes and Yap (1993). Earlier versions of the PIDS model used an aggregate production function framework to derive an estimate of potential output.

Another alternative for computing potential output and equilibrium velocity is the use of filters to compute for stochastic trends. The most popular is the Kalman filter although it entails some computational difficulty. Hoeller and Poret use the Hodrick-Prescott filter which is more straightforward.

Once estimates of Q^* and V^* are obtained Equation (2) is then used to estimate P^* . The next step is to determine whether the price gap $P^* - P$ contains a unit root. If it is shown that the

assumptions of the P* model are satisfied, an inflation model built around Equation 3 can be estimated.

Empirical Results

To test for unit roots in a series y_t we apply an augmented Dickey-Fuller test (ADF) by running the following regression:

$$\Delta y_t = \gamma + \delta t + \rho y_{t-1} + \sum \theta_j \Delta y_{t-j} + e_t$$

The null hypothesis is that the series is nonstationary, i.e. $\rho = 0$. For completeness we test three hypotheses, $H_0: \rho = 0$ against $H_A: \rho < 0$; $H_0: \rho = 0, \gamma = 0$ against $H_A: \rho < 0$; and $H_0: \rho = 0, \delta = 0$ against $H_A: \rho < 0$. This is to account for the possibility of a trend stationary series.

Three variables are tested for stationarity: GDP, V1 and V2 using quarterly data over the period 1981-1994. V1 is velocity computed based on narrow money using Equation (1) while V2 is calculated based on broad money or total liquidity. The ADF tests on these three variables show that the null hypothesis of nonstationarity cannot be rejected. Hence it is not possible to apply deterministic time trends or mean values for calculating potential output and equilibrium velocity.

It has been argued that the presence of structural breaks in a time series will bias the test toward the null hypothesis. Given the various crises in the past (e.g. the BOP crisis in 1983), several macroeconomic variables do exhibit structural breaks. Capuno (1994) applying a segmented trend model to Philippine data shows that even if structural breaks are taken into account the tests fail to reject the unit root hypothesis.

Attempts to apply the Kalman filter were not successful. In addition, a software program for the Hodrick-Prescott filter is not available. In order to present some empirical results, Q^* was computed using a time trend and V^* was taken to be the mean value of velocity over the sample period. The corresponding values of P^* (P^*_1 and P^*_2) are plotted against PGDP in Figures 1 and 2.

A unit root test reveals that the resulting price gap (P^*-P) is nonstationary and hence cannot be used in estimating Equation 3.

A preliminary regression shows, however, that the price gap based on total liquidity ($P^*_2 - P$) yields better empirical results which means that broad money seems to be a better anchor for monetary policy.

Concluding Remarks

Further work should focus on estimating more appropriate values of Q^* and V^* . This would assure a more realistic value of P^* and a stationary price gap.

Previous studies using P^* show that the model seems to work better with larger than smaller countries. Kool and Tatom (1994) attribute this to the neglect of the importance of the prevailing exchange rate regime for the determinants of prices and inflation. They proceed by incorporating a foreign price gap to account for the influence of imported inflation especially for small economies. Their empirical results show that the fit of the P^* model improves with the addition of the foreign price gap. It would be useful to include a foreign price gap when estimating Equation (3) for the Philippine case.

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Figure 1: P*1 and PGDP

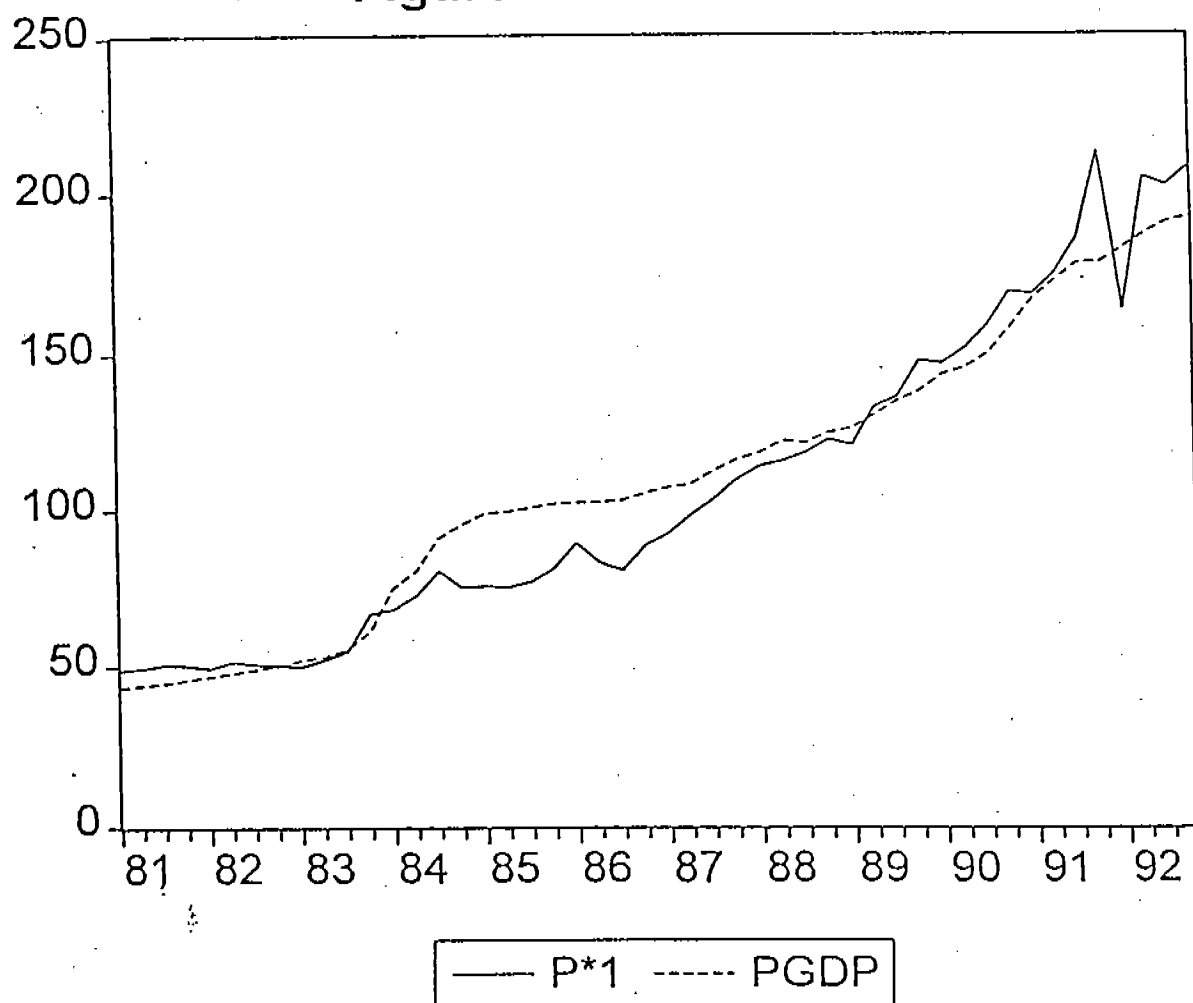


Figure 2: P*2 and PGDP

