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Estimating the Determinants of Financial Euroization in Albania

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ESTIMATING THE DETERMINANTS OF FINANCIAL EUROIZATION IN ALBANIA

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Abstract

This paper examines the phenomenon of financial euroization in Albania, focusing on the liability side of the banking system. It explores some of the main theoretical and empirical determinants of deposit euroization in the context of the high euroization rates originating in the transition period of the early 1990s. Despite gradual improvements in the macroeconomic framework, euroization rates have continued to be persistent throughout, long after the reversal of the original triggers of such phenomenon. The high level of euroization entails policy relevant concerns for euroized economies, as it has been shown to have potential adverse effects on macroeconomic policies and financial stability, issues of vital importance for a central bank. Using a VAR framework to capture the simultaneous dynamic relationships between macroeconomic aggregates, this paper finds evidence that euroization rates are highly persistent in Albania, while being influenced by several factors such as interest rate differentials, exchange rates, and credit euroization.

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1. INTRODUCTION

The literature refers to dollarization as the process of substituting away from domestic currency to a foreign currency to carry out the main functions of money as a medium of exchange and/or as a store of value. Three main types of dollarization/euroization[2] are broadly recognized: monetary dollarization or currency substitution – the substitution of domestic currency with foreign currency for transaction purposes; financial dollarization, also known as asset dollarization – economic agents' holding of foreign currency assets and liabilities; and real dollarization – the indexation of wages, real estate and/or durable goods prices in foreign currency (Nicolo et al, 2003). Though all of these three types are present in the Albanian economy, this study mainly focuses on asset euroization. Thus, its main contribution is to understand the theoretical and empirical determinants of deposit euroization in Albania, and document its time trends. In general, a better understanding of the determinants of euroization is critical in determining and undertaking the appropriate mix of policy measures for monetary or macroprudential regulators.

The main motivation to investigate the euroization phenomenon in the context of Albania is derived from the lack of empirical research that focuses on the specifics of Albanian euroization. Most of the research studies for European countries that include Albania in their data conduct their analysis and draw conclusions for the whole pool of countries, ignoring the specifics of each country. In addition, except for some sporadic descriptive analysis on the factors affecting the high euroization rates, a full empirical analysis has been lacking for the case of Albania. This fact becomes even more relevant, given the already existing vast literature and empirical work on other euroized countries in the region with similar economic traits and experiences.

In terms of policy making, the high level of euroization raises several concerns. A high level of euroization has been shown to have potential adverse effects on macroeconomic policies and financial stability, including reduction or loss of control of monetary and exchange rate policy, loss of seigniorage and increased foreign exchange risk in the financial system and other sectors (Kokenyne et al., IMF 2010). In terms of financial stability, liquidity risk and solvency risk are worrisome for a central bank. As Levy-Yeyati (2006) points out, prudential regulations requiring banks to match their portfolio currencies, neither eliminate the currency exposure of firms/households indebted in foreign currency, nor protects the banking sector from a deposit run in anticipation of a solvency problem. In addition, devaluation of the currency affects the solvency of financial institutions and their clients (Driessen, 2005). In terms of macroeconomic policies, evidence has shown that high euroization rates undermine the effectiveness of monetary policy (Brown and Stix, 2015). In extreme cases, the central bank cannot step in as a lender of last resort, being limited to the use of international reserves. Understanding the determinants of

[2] Depending on the currency of denomination, it could be USD, Euro or some other currency. Since its introduction the euro has been the mostly widely used currency in Albania, and dollarization and euroization will be used interchangeably in the remainder of the paper.

financial euroization both theoretically and empirically is thus important to obtain a better functioning monetary policy transmission mechanism.

Furthermore, Albania has been long aspiring to become a member of the EU and during the two decades of governance under a free-market economy it has been working towards fulfilling the economic criteria for joining the EU and later on, the Eurozone. Seen in the context of this trajectory, issues of euroization, credibility of the domestic currency, stability of the exchange rate, and other related concerns are naturally of paramount importance. Thus a thorough comprehension of the factors behind the prevalent high euroization rates is important not only for the general macroeconomic stability of the country, but also essential for fulfilling the Maastricht Criteria.

Hence, the purpose of this study is to analyze and empirically estimate the factors that have affected the high financial euroization of the Albanian banking system, given its important implications in terms of financial stability, policy making and/or the country's prospects to join the EU. To this end, this paper employs a VAR methodology, which is detailed later. The main findings of the analysis can be summarized as follows. First, I find that euroization is affected by variables like interest rate differentials, exchange rates, credit euroization and average price level. Second, I find that euroization exhibits high persistence, proving the existence of the hysteresis effect. As the number of lags increases, the explanatory power of its past values reduces and other variables gain ground. Interest rate differential of deposits and the exchange rate explain on average around 25-30% and 3-5% of the variation in deposit euroization, respectively. Meanwhile credit euroization and the consumer price index share a modest explanatory power in the variance of deposit euroization.

The structure of the paper is as follows: Section 2 provides a literature review of the main prevailing theories on the determinants of euroization. Backed up by empirical findings in other countries, Section 3 follows with some stylized facts regarding several candidate macroeconomic variables that might have affected euroization in Albania. Section 4 describes the methodology and econometric technique used to analyze these factors empirically, which are Johansen cointegration procedure and vector error correction model. The last section concludes and paves the path for future research.

2. LITERATURE REVIEW

The wide range of views and theories on dollarization/euroization fall into one of three broad categories: currency substitution, asset substitution and liability substitution. The early literature focuses on currency substitution, and deals mainly with dollarization in Latin American countries, where such phenomenon is very widespread. Asset substitution comprises a similar strand of theory focusing on economic agents' substitution of their financial assets, in which agents, along with keeping cash balances in a foreign currency, also hold part of their savings in foreign currency. This aspect has been thoroughly discussed by Ize and Levy-Yeyati in a series of papers in which they group the prevailing theories into three main views: the portfolio view, the market failure view, and the institutional view. More recent literature focuses on the phenomenon of financial euroization in post-transition European countries, which has expanded to include not only the substitution on the asset side (deposit euroization), but also on the liability side (credit euroization).

Some of these theories focus on explaining financial dollarization from the perspective of economic agents (depositors) and their hedging decisions related to currency holdings, while others incorporate the banks' perspective as well, and their role in incentivizing the use of foreign currency by hedging through currency matching.

Currency substitution

The analysis of dollarization determinants in the early literature has mainly dealt with the dynamics of the demand for cash in foreign currency, known as the currency substitution view. These theories capture the negative relationship between the demand for local currency holdings and the inflation rate. As inflation increases, it diminishes the purchasing power of local currency inducing agents to substitute away to foreign currency. This view assumes that dollarization should decrease with price stability (Ize & Levy-Yeyati 2003, Levy-Yeyati 2006). However, as developments in transition countries in the 1990s showed, dollarization levels not only remained high, but increased further even after inflation rates went down and stabilized at low levels (Levy-Yeyati 2003). In his study of Latin American countries (Argentina, Bolivia, Peru, Mexico and Uruguay) with prolonged episodes of high inflation, Savastano (1996) finds that dollarization persistence is related to past rates of inflation (inflation memories) and lack of credibility in the local currency. Other studies, such as Guidotti and Rodriguez (1992) find that such persistence is related to the benefits of network externalities of using foreign currency, even after the opportunity cost of holding domestic currency has decreased. They illustrate their point using the experience of several Latin American countries that have been successful in curbing inflation, but where the degree of dollarization has actually increased, instead of going down. This view suggests that as foreign currency is used for transaction purposes, externalities become so high that once they exceed a certain threshold level they reduce the costs of using foreign currency.

Feige and Dean (2004) also find similar results for central, eastern and southern Europe, where despite indications of stabilizing inflation risks, the use of foreign currency in carrying out transactions is so widespread that it practically becomes inevitable and irreversible due to the high costs associated with these externalities. Meanwhile, other theories view this behavior more as a hysteresis, also termed the ratchet effect, where depositors get used to holding foreign currency deposits and do not reverse them back to domestic currency due to some behavioral inertia or habit (Honohan and Shi, 2003, Brown and Stix, 2014).

Asset substitution

The persistence of financial euroization is very well captured through this strand of theory, which considers dollarization from the perspective of asset substitution. *The portfolio view* – contrary to the currency substitution view, which establishes the link between dollarization and the level of inflation – considers the volatility of inflation instead, and is analyzed in detail by Ize and Levy-Yeyati (2003). They use panel data on a set of countries to explain dollarization levels as the choice of economic agents on a portfolio of currencies, based on the real return on each of these currencies. Given that the value of asset returns in domestic currency is affected by the inflation rate and those in foreign currency by the exchange rate, economic agents chose their currency composition of their asset portfolio of currencies by minimizing the variance of this portfolio, given known values of the variances of inflation and exchange rates. Assuming uncovered interest rate parity, if the volatility of the inflation rate exceeds that of the exchange rate, the foreign currency becomes more attractive, inducing financial dollarization which may remain persistent even in low inflation environments (Ize and Levy-Yeyati, 2003).

Adding banks' perspective in the equation

These views focus on explaining financial dollarization from the perspective of economic agents (depositors) and their hedging decisions related to currency holdings. Ize and Levy-Yeyati (2003) in their minimum variance portfolio assume banks are risk-neutral[3]. Given that they ignore aspects of the financial intermediation process, another group of studies assumes banks are risk averse and incorporate in their models the banks' behavior and the related implications for the dollarization level.

The *market failure view*, in broad terms, suggests that as economic agents engage in foreign currency financial activities, such as borrowing and lending, financial euroization increases, while the risks from the exchange rate are ignored. The presence of market imperfections/externalities such as moral hazard and/or asymmetric information, encourage borrowing or lending in foreign currency, without fully internalizing the risks associated with them. One such example is the high positive correlation between currency and default risk (exchange rate risk and credit risk which

[3] Ize and Levy Yeyati (1998) examine determinants of both deposits and credit euroization in a minimum variance portfolio model.

suggests that foreign currency debtors often go bankrupt in cases of devaluation without seemingly taking into account (ex-ante) the possibility of exchange rate fluctuations. Other cases include currency-blind prudential regulation, both in the cases of deposit insurance or implicit debtor guarantees. Such views assert that the costs in default situations associated with exchange rate risk are reduced in the presence of insurance and guarantees, which combined with higher interest rates in local currency (reflecting devaluation risk premia), make foreign currency borrowing/ lending more attractive (Broda and Levy-Yeyati 2003; Levy-Yeyati 2006).

Broda and Levy-Yeyati (2003) propose a model where banks, by choosing the optimal currency composition of their liabilities play a role in incentivizing dollar deposits, causing in turn balance sheet imbalances due to currency mismatches. They find proof that currency-blind regulations, which introduce equal treatment of local and foreign currency deposits – despite the fact that dollar deposits are the source of risk in the event of default –, are a prime driver of dollarization. Hence they examine whether it is in the banks' interest to attract foreign currency deposits, scrutinizing the tradeoff between the low interest rates in foreign currency and the default risk associated with the currency mismatch of their assets and liabilities. Thus, the incentive to dollarize according to this model depends on the interaction between default risk and currency risk.

The *institutional view* argues that the quality and credibility of institutions are important determinants of financial dollarization. Certain equilibria involving financial dollarization can be induced by the credibility of the government, which through its behavior and policies shapes and orientates economic agents' expectations related to inflation bias, interest rates or exchange rates (Levy-Yeyati 2006). De Nicolo et al (2003) in a cross-sectional study of dollarization level determinants find that the credibility of macroeconomic policies and the quality of institutions are key factors of variations in dollarization across countries. Neanidis and Savva (2009) find that loan dollarization in a sample of transition countries is diminished with increasing quality of institutions and higher financial integration.

Liabilities substitution (loan euroization)

As lending in foreign currency has become more prevalent, recent research has focused on both types of euroization, credit and deposit euroization, also known as financial euroization. A significant number of these studies have focused on the study of the phenomenon in transition economies that have faced high rates of financial euroization. Catao and Terrones (2000) are among the first to point out this gap in the literature on dollarization, highlighting the continuous attention on currency substitution and deposit dollarization, while pointing out the lack of work on loan dollarization. They develop a partial equilibrium banking model for Latin American countries with a focus on the banking side. They find that equilibrium dollarization is affected by external interest rates and default risk, which in turn depend on a number of factors such as the initial dollarization level, the degree of bank competition, banks' cost structure and the

availability of tradable collateral in the economy: dollarization increases with devaluation expectations, as well as with increased competition in domestic loan markets, and increased tradable collateral. They also show that deposit dollarization does not always move along with loan dollarization.

Furthermore, Basso et al. (2007) develop a model for a sample of transition economies, building on the minimum variance portfolio approach by including banks' perspective in the model. They unveil the impact of interest rate differentials and the presence of foreign banks on the dollarization of the financial sector. Their findings suggest that the introduction of financial instruments to accumulate foreign liabilities, enhanced by the increasing presence of foreign bank subsidiaries in transition countries and their easy access to foreign funds from their parent banks, has introduced some imperfect competition in the market, affecting local currency and foreign currency interest rate differentials. Their results show that a widening of interest rate differentials increases loan dollarization, while it has a negative effect on deposit dollarization. Luca and Petrova (2008) also incorporate banks, as well as firms' behavior in a portfolio allocation model with a sample of 21 CEE countries. They analyze the credit market on the assumption that banks are risk averse and find that credit dollarization is both an outcome of deposit dollarization, and banks' willingness to match currency portfolios beyond regulatory requirements. They show the increase in net foreign assets is negatively related to loan dollarization. Furthermore, Arteta (2005) examines a broad set of 96 countries and finds that floating exchange rate regimes encourage deposit dollarization more strongly than credit dollarization, enhancing as such the mismatches of banks' balance sheets. Neanidis and Savva (2009) estimate an empirical model for a group of transition countries and find that currency depositors are more sensitive in highly dollarized countries, reacting faster to local currency depreciation by increasing dollar deposits. The also find that in the short run, loan dollarization is positively correlated with deposit dollarization due to banks' tendency of currency matching portfolios, and that higher dollarization is affected by growing interest rate differentials.

There are also a limited number of studies that focus on dollarization in Albania, or CESEE countries including Albania. Xhepa (2002) discusses euroization patterns in Albania in the light of real convergence of macroeconomic indicators like average prices, GDP per capita, capital markets, labor mobility and economic structure in general towards the EU economy. Tase (2005) discusses the main determinants of currency substitution, seen from the perspective of businesses and households. She finds that household savings from private transfers are kept in foreign currency deposits, while puzzlingly; an increase in trade is associated with reduction in currency substitution for businesses. In terms of financial intermediation, currency substitution of deposits is associated with currency substitution of loans. Luci et al (2006) attempt at reestimating the euroization level in Albania, including both foreign currency deposits and foreign currency cash in circulation, estimating the latter through surveys[4]. They also provide a discussion about the

[4] Since the use of foreign currency does not leave a paper trail, its exact measurement is almost impossible.

implications of this reestimated level of euroization on monetary policy and the country's perspective towards the European Monetary Union. Furthermore, Shijaku (2013) empirically assesses foreign currency lending and finds that minimum variance portfolio, foreign currency deposits, interest rate differentials and the exchange rate are significant determinants. On a more micro level, the OeNB[5] conducts regular biannual surveys on the use of foreign-currency denominated assets in general and the euro in particular in CESEE countries, collecting information at the household level about their holdings of cash in euro, their saving behavior and debt, as well as their economic opinions, expectations and experiences regarding the use of euro. In the analysis of the results, it is continuously noticed that Albanian households perceive the euro as very stable and trustworthy and they rank among the highest of the region in terms of trusting the EU.

Nonetheless, existing work that focuses on Albania only provides an analytical discussion of the phenomenon of euroization, while coming short of empirical findings on the liability side of the banking system. My contribution to the literature, apart from a broad theoretical discussion, is a comprehensive assessment of the determinants of deposit euroization in Albania in an empirical framework.

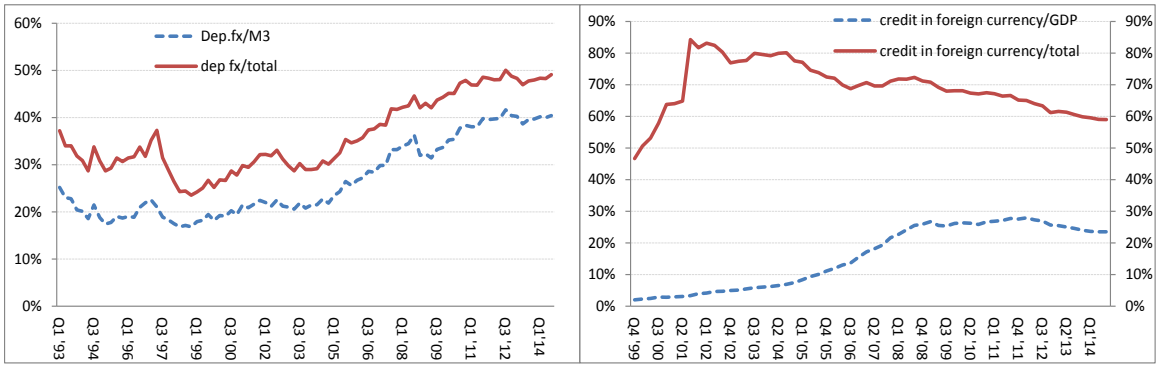
[5] OeNB (Oesterreichische National Bank) Euro Survey.

3. EUROIZATION IN ALBANIA

Partial dollarization/euroization – like in most emerging and developing economies – has been present in the Albanian economy since its transition from a centrally-planned to a free-market economy. Foreign currency has been widely used as medium of exchange, unit of account and store of value, constituting both currency and asset substitution. Due to the lack of data and difficulties in measuring foreign currency cash holdings by domestic economic agents, this paper mainly focuses on the analysis of asset substitution. With the introduction of the euro in the Euro area, the composition of financial asset portfolios marked a shift from the US dollar (and the German mark to a certain extent) to euro, suggesting the country's clear orientation towards the EU integration and accession perspectives in the future.

The ratio of foreign currency deposits to broad money[6] stands at almost 40%, while foreign currency deposits actually make up almost half of the total stock of deposits[7]. Figure 1 shows the increasing pattern of various measures of euroization on both the asset and liability side of the banking system. Other countries in the region like Serbia, Macedonia, Croatia etc. record even higher rates of euroization. The common denominator of all these countries is a similar political and historical framework. As some theory suggests, euroization is a reaction of economic agents to economic and political instabilities (Kokenyne et al, 2010) and might have originally affected the euroization of the banking systems.

Figure1. Financial euroization rates in Albania



Source: Bank of Albania

As an ex-communist country in transition, the macroeconomic framework in Albania until the mid to late 1990s shows a picture of high rates of inflation and devaluation of the exchange rate, motivating economic agents to hedge against such risks by substituting away from the local

[6] Conventional measures of euroization include the ratio of foreign currency deposits to total deposits or to broad money, and a rule of thumb suggests that economies with ratios of the latter above 30% are considered highly euroized.

[7] More than 80% of the total stock of foreign currency deposits is comprised of household deposits.

currency to foreign currency. The double-digit inflation rates during most part of the 1990s fueled the demand for foreign currency, as economic agents shifted their cash and asset holdings in other currencies perceived as stronger, such as the US dollar and the German mark. Meanwhile, the exchange rate has mainly followed a depreciation pattern up until the second half of 2003, when it started to show some appreciating tendency. Nonetheless, in late 2008 following the global financial crisis and the spread of the psychological effects in the domestic exchange markets, the exchange rate again exhibited a depreciating trend for a few years until it stabilized at a new level, reflecting the reshaping of its main determinants. Empirical evidence has shown that the instability of the exchange rate due to a high and volatile inflation rate encourages residents to denominate contracts in foreign currency, so as to ensure more purchasing power in terms of domestic consumption[8].

Furthermore, despite macroeconomic indicators gradually improving in the beginning of the millennium in Albania, euroization remained persistent. With the opening of the country's borders, the economy faced large inflows of foreign currency. The capital and financial accounts recorded high inflows of foreign capital investments, especially FDIs, while trade and business developments with countries in the region increased the demand for foreign currency for transaction purposes. High rates of euroization were particularly supported by the large flow of emigrant remittances from neighboring countries, amounting to/totaling more than 15% of GDP in the late 1990s and the beginning of the 2000s. Remittances became an important source of savings in the Albanian banking system, seemingly deposited in original currency (Tase 2005).

The other side of the banking system also shows the credit portfolio in foreign currency growing much faster than the one in domestic currency, continuously comprising more than 60% of the total credit stock. High credit euroization rates have been fueled by both supply and demand factors. On the demand side, lower interest rates in USD, and later euro, have encouraged borrowing in foreign currency. As Guidotti and Rodriguez (1992) point out, it is not surprising for currencies that provide the cheapest financial services to gain market share. The ever reducing gap of interest rate differentials between the domestic currency and the main foreign currency, euro, shows the general convergence process towards the EU interest rates as well as the easing domestic monetary policy in the course of the recent global financial crisis. On the supply side, banks' ample liquidity base and their easy access to foreign financing[9] has enabled them to intermediate these funds into the credit channel, consistent with banks' currency matching and risk-averse behavior (Luca and Petrova, 2008). Cuaresma et al (2011) highlight this dependence path between foreign currency loans and deposits and future expectations as important in determining the currency structure of credit, and eventually deposits.

[8] See Ize and Yeyati (2005).
[9] Over 90% of the banking system capital in Albania is foreign owned.

In addition, currency-blind deposit insurance schemes and the central bank's role as a lender of last resort seems to have encouraged deposit euroization[10], introducing moral hazard as foreign currency deposits carry exchange rate risk that is not accounted for. The Deposit Insurance Agency in Albania, since its creation in 2002, has been providing insurance at the same rate for both local and foreign currency deposits. As such, banks are more willing to increase their risk taking behavior and take advantage of the lower cost funding, by transferring the exchange rate risk to these institutions that provide insurance. In the meantime, the central bank of Albania exerts its role as a lender of last resort by assisting all banks irrespective of the currency composition of their portfolios. However, the central bank has also imposed prudential regulations that aim at the minimization of the currency mismatch imbalances, such as raising the demand for capital expenditures for banks' unhedged loan portfolios towards the end of 2008.

To sum up, the broad picture shows that deposit euroization has followed a steady growth path in the long run. The effects of the most recent financial crisis included a partial withdrawal of foreign currency deposits in the last quarter of 2008 and the first half of 2009, reducing deposit euroization ratios in the short-run. But as deposits flowed back into the banking system and the total stock of deposits replenished within the year, the ratio has been following a general upward trend. Similarly, growth rates of credit in foreign currency started to slow down during this time and have only recently showed some signs of slow recovery in annual terms. Nonetheless, credit portfolio in foreign currency remains high and will probably continue to increase as banks recover and lending rates start to resume growth. Figure 1 in the appendix shows the development of the main indicators representing variables used in the study, from the start of 2001 to most recently.

The next section is an attempt to test and analyze all the above-mentioned theoretical determinants of financial euroization, with a focus on the deposit euroization ratio in Albania.

[10] See Broda and Yeyati (2003) on a panel of Latin American countries.

4. EMPIRICAL ANALYSIS

This section comprises two main parts. The first part provides a thorough discussion of the data and the methodology used to analyze the dynamic system of endogenous variables. The econometric framework employed aims at modeling the long-run and the short-run behavior of deposit euroization and its determinants. The second part consists of the presentation and analysis of the main findings, along with innovation accounting results.

A. Data and methodology

The data used in the deposit euroization model are of quarterly frequency, starting from 2001Q1 to 2014Q3. The proxy for deposit euroization is given by the share of foreign currency deposits to total deposits. Other variables include the exchange rate, both nominal (NEER) and real (REER), the volatility of the exchange rate, the consumer price index (CPI), the minimum variance portfolio index as suggested by Levy-Yeyati (2005), the interest rate differential of deposits and credit, the share of credit in foreign currency to the total credit of the banking system, remittances, the money multiplier as a proxy for financial development, and the openness of the external sector calculated as the trade volume share to GDP. All variables are in logarithms, except for the ones that represent ratios.

The following table shows all the endogenous variables and the expected signs of their impact on deposit euroization, as explained by theory and empirical findings in literature. A more detailed description of the variables and their notations is provided in table 1 of the appendix.

Table 1. List of the endogenous variables and their respective notations

Variables	**Notation**
Deposit euroization	y
Credit euroization	λ
CPI	π
Nominal effective exchange rate (NEER)	ε_n
Real effective exchange rate (REER)	ε_r
Exchange rate volatility	φ
Interest rate differential (credit and deposits)	$\acute{\imath}$
Minimum variance portfolio (MVP)	δ
Remittances	ρ
Financial development	γ
Trade openness	θ

In order to capture the dynamics of developments in deposit euroization and its determinants, a linear Johansen cointegration procedure and a reduced-form vector error correction model (VECM) is estimated. This framework is suitable when dealing with nonstationary variables, whose combination of stochastic trends gives an equilibrium relationship in the long run. In literature, this method is widely applied with financial data that exhibit these features.

As a first step, the procedure requires all series to be integrated of the same order, usually I(1). Various forms of Johansen tests can detect differing orders of integration of the series, but in practice mixing series with different orders of integration is not usually recommended (Enders, 2010). To check for unit roots, augmented Dickey-Fuller tests obtained through a modified test statistic using a generalized least squares rationale are applied. Elliot et al (1996) show this modified test has a better overall performance as compared to the usual Dickey-Fuller test, in terms of small sample size and power, especially when an unknown mean or trend is present. The test is also more powerful in controlling for autocorrelation and heteroskedasticity. Augmented Dickey-Fuller regressions are usually very sensitive to the lag length, so the number of lags specified through the Schwarz (1989) information criterion calculated from the sample size is taken into account. In order to cross-check the results, the Kwiatkowski–Phillips–Schmidt–Shin (KPSS) tests to check the null of stationarity of the series are also performed.

The second stage of the procedure requires cointegration among variables, which is a long-run equilibrium relationship that determines their dynamic paths and the current deviation from such equilibrium (Enders, 2010). The VECM restricts the long-run behavior of the endogenous variables to converge to their cointegrating (equilibrium) relationship by allowing for short-run adjustment. The following is a general specification of the VECM:

$$\Delta y_t = \alpha\beta' + \Gamma_1 \Delta y_{t-1} + \cdots + \Gamma_{p-1} \Delta\, y_{t-p+1} + e_t \qquad (1)$$

Where Δ is the first difference operator, y_t is a vector of endogenous variables, α is the coefficient vector measuring the speed of adjustment to equilibrium, β is the cointegrating vector of coefficients, Γs are coefficient matrices of lagged values of Δy_t, and e_t is a vector of white noise residuals. In the context of my empirical model, the vector y can be written as:

$$y_t = \{\varepsilon, \acute{\imath}, \pi, \lambda, \varphi, \delta, \rho, \gamma, \theta\}$$

following the notation introduced earlier.

The general-to-specific method is followed to test for the rank of cointegration: the model is estimated with the largest number of variables with combinations of one, three and four lags, as

suggested by different criteria of lag-order selection statistics[11]. More specifically, the Johansen trace cointegration test is performed using the decomposition of Hansen and Juselius (1995) of the deterministic components as shown in the following equation, with μ representing a vector of constants, and *t* a linear time trend:

$$\Delta y_t = (\gamma + \tau t) + \alpha(\beta' y_{t-1} + \mu + \eta t) + \sum_{i=1}^{p-1} \Gamma_i \, \Delta y_{t-1} + \varepsilon_t \qquad (2)$$

According to Hansen and Juselius (1995), the deterministic components of the above equation can be modeled in five ways, starting from the model with the highest number of restrictions to the one with the least restrictions[12].

1. *Not including a trend or a constant* ($\mu = \tau = \gamma = \eta = 0$)
2. *Including a constant only in the cointegrating equation* ($\tau = \gamma = \eta = 0$)
3. *Including an unrestricted constant* ($\tau = \eta = 0$)
4. *Including a trend in the cointegrating equation* ($\tau = 0$)
5. *Including a linear trend in the cointegrating equations and a trend in the differenced data*

Restrictions in case 1 do not allow any deterministic components in the data, suggesting the variables do not have a trend and their means revolve around zero. On the other hand, in case 5 there are no restrictions placed on the deterministic components, that is, allowing for linear trends in the differenced data (Δy_t), implying quadratic trends when expressed in levels (y_t). A quick eyeballing of the data plots in the appendix (figure 1) shows that none of the variables exhibit these characteristics[13]. So in order to determine the cointegration rank of the variables only cases 2, 3 and 4 are considered. The model in case 2 allows for constants in the cointegrating equation, but no linear trends in the data. Case 3, along with the constant in the cointegrating equation allows for linear trend in the data levels, while case 4 allows both for constant and linear trends in the cointegrating relationship. Both Hansen and Juselius (1995) and Johansen (1995) recommend including the minimum deterministic component. Hence, the exercise is performed by testing first the hypothesis of no cointegrating relationship for case 2, and upon rejection, proceeding with the hypothesis of one or more cointegration ranks. The exercise starts with the minimum number of deterministic components and continues until the hypothesis of one cointegrating relationship is not rejected.

[11] The final prediction error (FPE), Akaike's information criterion (AIC), Schwarz's Bayesian information criterion (SBIC), and the Hannan and Quinn information criterion (HQIC).

[12] See Ahking (2002) for a summarized discussion.

[13] Hansen and Juselius (1995) also consider these scenarios as unusual

B. Results

Following this order, Johansen's trace cointegration tests point towards accepting one cointegrating relationship allowing for a constant (case 2), at both three and four lags between the following variables: deposit euroization, NEER, interest rate differential of deposits, CPI and credit euroization[14]. The findings are also supported by Engel and Granger tests, rejecting the null that the residuals of the cointegrating vector have a unit root.

The vector error correction model including the abovementioned variables that exhibit one cointegrating relationship is estimated taking into account the different suggestions of the information criteria for the number of lags. The model with four lags, as recommended by the Akaike information criterion performs the best, fulfilling the diagnostics of stability and rejecting autocorrelation of up to 16 lags[15]. At the same time, robustness checks of the results by changing the significance level of cointegration rank suggest that cointegration holds even at 99% level.

Table 1. Long-run coefficients of cointegrating vector and short-run adjustment parameters of deposit euroization

Variables in the cointegrating vector	β	p-value	α	p-value
_ce1				
Deposit euroization	1		-0.14**	0.044
NEER	-1.23***	0.00	0.05	0.648
Interest rate differential of deposits	9.38***	0.00	-0.05*	0.059
CPI	-0.52***	0.00	0.09***	0.002
Credit euroization	-1.60***	0.00	0.17***	0.009
Constant	8.59***	0.00	.	.

The presence of cointegration suggests that there is an equilibrium relationship between these variables in the long run, as specified in the following equation (standard errors are displayed in parentheses):

$$\textit{deposit euroization} = 1.23\ \textit{NEER} - 9.38\ \textit{int.dif.deposits} + 0.52\ \textit{CPI} + 1.6\ \textit{cred.euro.} - 8.59 \quad (3)$$
$$(0.230) \qquad (1.371) \qquad (0.116) \qquad (0.255)$$

Table 1 provides in more details the normalized cointegrating vector and the speed of adjustment parameters. The ordering of the variables is not important at this stage. The variables are all

[14] Other specifications of the model including different combinations of variables that suggest two or more cointegrating relationships are attempted/ tested, but apart from the difficulty in interpreting the error correction terms economically, at the same time they do not satisfy most of the stability and other performance criteria.

[15] The hypothesis of autocorrelation is still rejected even with a higher number of lags

highly significant in the long run (beta coefficients of the cointegrating vector) and display the expected signs, in compliance with theory and most of them adjust normally in the short run. A simple Gregory and Hansen procedure is employed to test for cointegration in the case of level, trend and regime shifts. However, in all cases the hypothesis of no cointegration with regime shifts is not rejected[16].

Innovation accounting

Innovation accounting and causality tests are performed on the error correction model as a means of helping towards identifying a structural model –given that it is hard to interpret the magnitude of the coefficients in a reduced-form VECM– as well as checking whether the economic relationships hold. The ordering of the variables at this stage is important. As a general rule of thumb, variables are ordered from the most exogenous to the least exogenous. Granger causality tests are also used to support the ordering of the variables. Some of the variables exhibit feedback relationship, at which point economic theory is also considered. The test shows that as the most exogenous variable, exchange rate leads consumer prices and interest rate differentials (the results of the Granger causality tests are provided in the appendix). Economic theory for small open economies, as well as previous empirical work on Albania[17], suggest that foreign variables like the exchange rate be ordered first. Forward looking decision making under an Inflation Targeting regime, which has been the monetary policy regime followed by Bank of Albania in the recent years, provides ground for ordering interest rate second. Hence, the monetary authority anticipates in advance the expected changes in consumer prices and reacts proactively by changing the base rate, which in turn affects interest rate differentials. In the same vein, consumer price index is the variable ordered third, followed by deposit euroization and credit euroization. It is assumed that deposit euroization leads credit euroization, since the interest rate differential in the model represents the spread for deposits, and thus affects them first. As a robustness check, changing the ordering of the variables does not have a significant impact on the model.

Impulse responses

The orthogonalized impulse response functions using Cholesky decomposition show the effects of shocks on the adjustment path of the variables (figure 2 in the appendix). The magnitude of each shock is normalized to one standard deviation of the relevant variable. Given the series have unit roots, most of the shocks appear to have permanent effects, or their effects die out after a long time. In the short run, the ratio of credit in foreign currency and consumer price index are the

[16] Research has shown that as euroization increases during times of macroeconomic stability, it might continue to be persistent beyond a threshold level

[17] See Istrefi and Semi (2009), Exchange Rate Pass-Through in Albania

variables that appear to adjust faster, correcting by almost 21% and 12% respectively within one quarter.

Interest rate differential of deposits is a significant variable with the expected negative sign. Economic agents seem to be sensitive as interest rates in domestic currency grow in comparison to those in foreign currency, encouraging them to switch to the former and induce a reduction in the euroization rate. Hence, the direct impact of the positive interest rate differential between lek and euro deposits should be to encourage depositors to save in domestic currency. On the other hand, the continuous reduction of interest rate differentials in Albania might be an indication of the natural convergence process towards the interest rates in the euro area[18]. The narrowing gap between the two seems to provide the grounds for movements in the opposite direction, i.e an increase in the share of deposits in foreign currency. Kokenyne et al. (2010) find that despite interest rate parity holding in the medium to long-run, there is arbitrage in the short-run as interest rate differentials do not cover the fluctuations in the exchange rate, inducing economic agents as such to euroize their balance sheets.

Exchange rate is another determinant of deposit euroization, as also recognized by the market failure view (Levy-Yeyati, 2005). A positive shock of the exchange rate translates to a devaluation of the domestic currency. As expected, such shock encourages economic agents to switch to foreign currency, which in turn induces an increase in deposit euroization. Empirical results show that economic agents react more swiftly to changes in the nominal exchange rate, as compared to the real exchange rate. This reaction seems plausible for two reasons. First, the nominal exchange rate is more comprehensible and easily observed[19]. In addition, eyeballing the two exchange rate series one can see that the series tend to co-move closely[20]. This is consistent with the findings from Chari et al. (2002), who document that that most of the fluctuations of the REER come from fluctuations in the NEER.

Consumer price index is significant and exhibits the expected positive sign. A positive shock on the index suggests the following chain reaction: as consumer prices go up, purchasing power reduces in terms of consumption, inducing economic agents to switch to foreign currency as a better store of value. Theory suggests that market integration leads to price convergence and as prices in Albania follow the "catch-up" process, expectations of price level increases in the future might induce further euroization. The currency substitution view motivates such a reaction, highlighting the negative correlation between inflation and the demand for local currency[21]. The magnitude of the response to such shock is small.

[18] Xhepa (2002) in an early descriptive analysis of euroization patterns hints to similar behavior
[19] Ivanov et al. (2011) find similar results in a study on deposit eurozation in Croatia; they observe that the effect of nominal exchange rate is stronger compared to real exchange, while drawing similar conclusion.
[20] Their correlation coefficient is around 80%.
[21] See Savastano (1996)

Credit euroization also turns out to be a significant determinant of financial euroization. A positive shock in the share of credit in foreign currency to total credit increases deposit euroization. This result supports the feedback loop theory. Loans disbursed in foreign currency mean higher money creation in foreign currency through the money multiplier mechanism, feeding back into the system as deposits in foreign currency. In addition, a high stock of deposits in foreign currency serves as a good source of financing funds for the banks, and so forth. The finding on loan euroization being positively correlated with deposit euroization is supported by several other studies that justify the results in the light of banks' tendency of portfolio currency matching (Neanidis and Savva, 2009), the importance of the feedback loop mechanism consistent with banks' currency matching and risk-averse behavior (Luca and Petrova, 2008) or prudential regulations that limit banks net foreign currency positions (Levy-Yeyati 2006). These results are consistent with the widely followed practice in the literature of using deposit dollarization ratios as a proxy for credit dollarization as well as and findings of Shijaku (2013) for the case of Albania. The impulse response function shows an immediate and long-lived positive impact of such shock on deposit euroization, however with a small magnitude.

Variance decompositions

Forecast error variance decompositions measure the contribution of each type of shock to the forecast error variance (table 6 in the appendix). Most of the variation in euroization is explained through past rates of euroization. The high persistence of the euroization variable proves the existence of the hysteresis effect[22]. As the number of lags increases, its explanatory power reduces and other variables gain ground. Interest rate differential of deposits and the exchange rate explain on average around 25-30% and 3-5% of the variation in deposit euroization, respectively. Meanwhile credit euroization and the consumer price index share a modest explanatory power in the variance of deposit euroization.

[22] Shijaku (2013) also finds empirical evidence of high inertia in foreign currency lending in Albania.

5. CONCLUDING REMARKS

The main focus of this research was to explore the dynamics of deposit euroization and understand the factors behind it, using a Johansen cointegration approach and vector error correction model. Studies show that high levels of euroization have adverse effects on macroeconomic policies and financial stability such as loss of seignorage, reduced control of monetary policy and/ or exchange rate policy, liquidity and solvency risks, to mention only a few. In this context, an empirical assessment of euroization determinants is important. The empirical results presented here show that deposit euroization in Albania is the result of a combination of several factors such as the interest rate differentials, exchange rates, the price level, and credit euroization, similar to the results of other studies in literature. The developments in the spreads between interest rates in foreign and domestic currency have had an impact on euroization as well. Stable exchange rates and domestic prices turn out to be important in minimizing currency substitution and keeping euroization rate under control. Levy-Yeyati (2005) suggests that an inflation targeting regime, combined with flexible exchange rates[23] minimize dollarization incentives by increasing real exchange rate volatility relative to price volatility. Nonetheless, despite the floating exchange rate regime and inflation targeting being long prevalent, deposit euroization in Albania has been persistent. Fast exchange rate pass-through[24] is a possible explanation for this fact. In addition, empirical results also reflect some inertia in the behavior of economic agents.

Currency-blind regulations, such as deposit insurance schemes or central bank's role as a lender of last resort might further incentivize euroization, affecting both banks and economic agents' behavior. In terms of policy making, introducing currency-discriminating measures could prove useful in having the opposite effect, like central bank's decision of zero remuneration of foreign currency deposits after the financial crisis. Other measures could include currency discrimination practices such as increase of the reserve requirements of deposits in foreign currency, increasing banks' costs of operating in foreign currency; or measures aimed at providing some general awareness of economic agents about currency risks and balance sheet mismatches.

However, using regulation to curb euroization rates is not an easy and straightforward task. First and foremost, studies have shown that even a stable monetary policy might not be able to halt hysteresis of deposit euroization, as holding foreign currency deposits, among others, has become a habit in the eastern European region[25]. Second, the extent to which euroization is a serious concern should be evaluated in a broader context. Financial euroization focusing on the liabilities side of the banking system is one side of the story. Including measures of public debt issued in

[23] He highlights that in a high and volatile inflation environment, floating exchange rates could have the opposite effect

[24] Istrefi and Semi (2007) find that complete pass-through takes place within a year in the period1996-2006

[25] See Brown and Stix (2014)

foreign currency, known as “original sin” and estimates of cash and other liquidities in foreign currency would provide a more complete framework on euroization. As limited data on these indicators hampers the process for the moment, it should certainly remain an interesting area for further research in the future.

In spite of the relatively good performance of the model with respect to signs, long-run and short-run adjustments and the stability conditions being satisfied, several aspects of the analysis may be improved upon. For example, the relatively short span of the time series (almost 14 years of data) remains one of the main concerns within an autoregressive framework with a considerable number of lags. Bayesian estimation procedures to account for such problem could be employed in future work.

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Appendix

Table 1. Description of variables and their calculations

Variables	Notation	Description
Deposit euroization	y	Foreign currency deposits/total deposits
Credit euroization	λ	Foreign currency credit/total credit
CPI	π	Consumer Price Index (seasonally adjusted)
Exchange rate Nominal effective exchange rate (NEER) Real effective exchange rate (REER)	ε	Index calculated as weighted average of bilateral exchange rates of lek against euro (80%) and usd (20%) REER deflated by the inflation rate of respective countries (part of the exchange rate basket)
Exchange rate volatility	φ	Calculated as standard deviation of daily exchange rates within a month
Interest rate differential (credit and deposits)	ί	Difference between the interest rate of loans/ deposits in domestic currency with those in euro
Minimum variance portfolio (MVP)	δ	Calculated according to Yeyati (2005) definition: $\frac{var(\Delta \text{CPI})+cov(\Delta CPI,\Delta REER)}{var(\Delta CPI)+var(\Delta REER)+2cov(\Delta CPI,\Delta REER)}$
Remittances	ρ	Two different measures: quarterly inflows of remittances/GDP
Financial development	γ	Proxied with the money multiplier, given by the ratio of broad money to reserve money (M3/base money)
Trade openness	θ	The ratio of trade volume (import+export inflows) to GDP

Source: Bank of Albania, Institute of Statistics (INSTAT), author's own calculations

Figure 1. Plots of endogenous variables

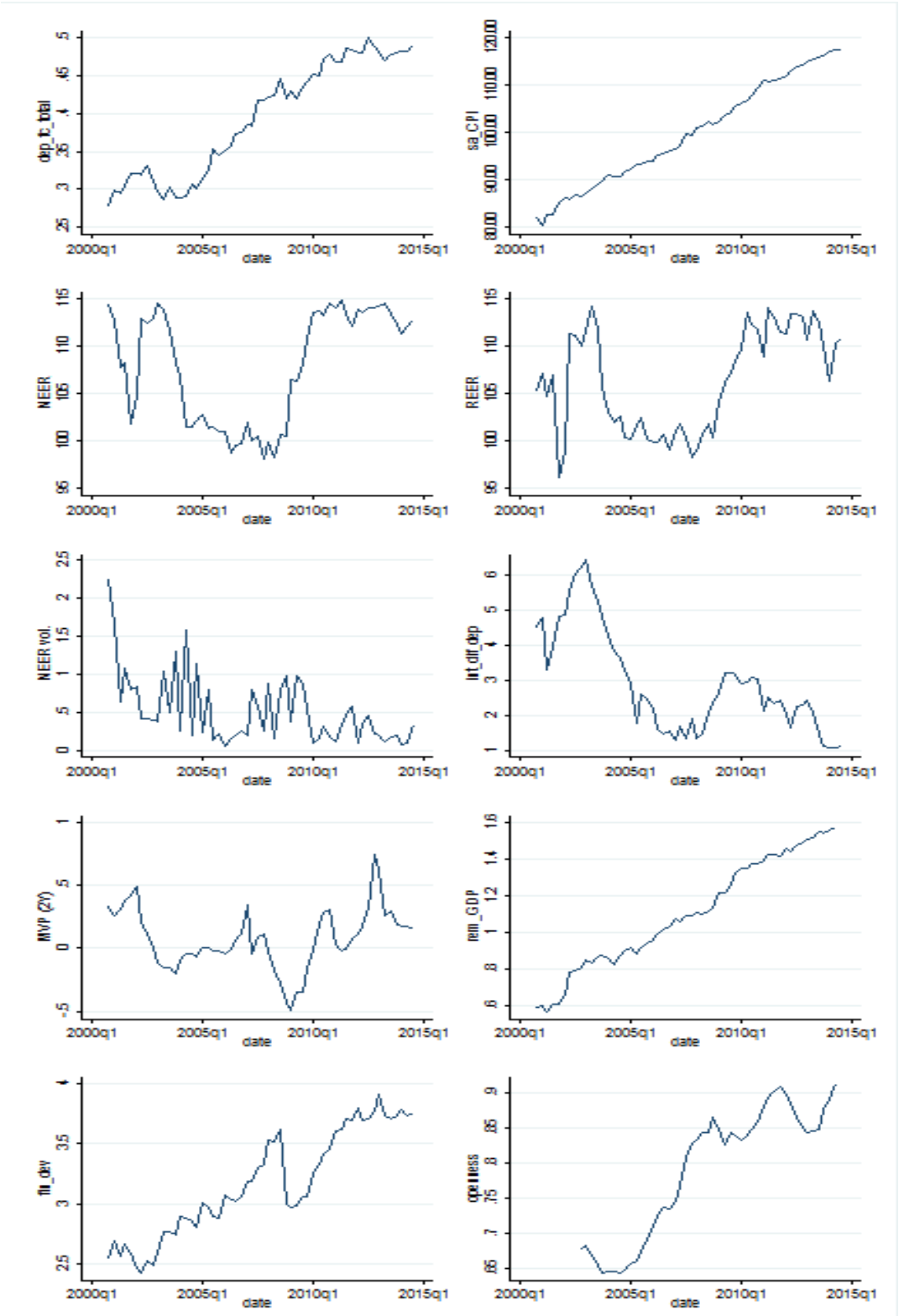

Table 2. Summary statistics of the variables used

Variable	Obs	Mean	Std. Dev.	Min	Max
dep_fc_total	56	.3939973	.0753172	.2779099	.5002498
Cr_fc_total	56	.7046482	.0691789	.5897641	.8427491
int_dif_dep	56	2.911575	1.456337	1.049787	6.41
NEER	56	107.894	5.947633	98.06993	114.8844
CPI	56	99.78303	11.1257	80.91422	119.3064

Table 3. Stochastic properties of the time series variables

variable	DFGLS test for one unit root			
	test statistic	critical value at 1%	critical value at 5%	critical value at 10%
deposit euroization (4)	-2.705	-3.747	-3.05	-2.758
interest rate differential of deposits (1)	-2.021	-3.751	-3.202	-2.898
exchange rate (2)	-1.404	-2.618	-2.248	-1.948
credit euroization (1)	-1.216	-3.747	-3.195	-2.892
consumer price index (1)	-2.219	-3.751	-3.202	-2.898
All variables are in logarithms, except for variables representing ratios (deposit euroization and credit euroization)				
(k) is the optimal lag length chosen by Schwert information criterion				

Table 4. Lag selection-order criteria

Selection-order criteria
Sample: 2002q1 - 2014q3 Number of obs = 51

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	590.053				7.5e-17	-22.9433	-22.8709	-22.7539
1	879.2	578.29	25	0.000	2.4e-21	-33.302	-32.8677	-32.1656*
2	914.026	69.652	25	0.000	1.7e-21	-33.6873	-32.8912	-31.604
3	951.357	74.662	25	0.000	1.1e-21	-34.1709	-33.0129*	-31.1406
4	982.295	61.875*	25	0.000	1.0e-21*	-34.4037*	-32.8839	-30.4264

Endogenous: dep_fc_total ln_NEER ln_intdif_dep sa_lnCPI Cr_fc_total
Exogenous: _cons

Table 5. Determining the number of cointegrating relationships

Johansen tests for cointegration

Trend: constant — Number of obs = 51
Sample: 2002q1 - 2014q3 — Lags = 4

maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value	1% critical value
0	80	934.598		95.3941	68.52	76.07
1	89	962.54522	0.66578	39.4997*1*5	47.21	54.46
2	96	973.91871	0.35983	16.7527	29.68	35.65
3	101	979.29787	0.19018	5.9944	15.41	20.04
4	104	981.66985	0.08882	1.2504	3.76	6.65
5	105	982.29506	0.02422			

Figure 2. Orthogonalized impulse response functions

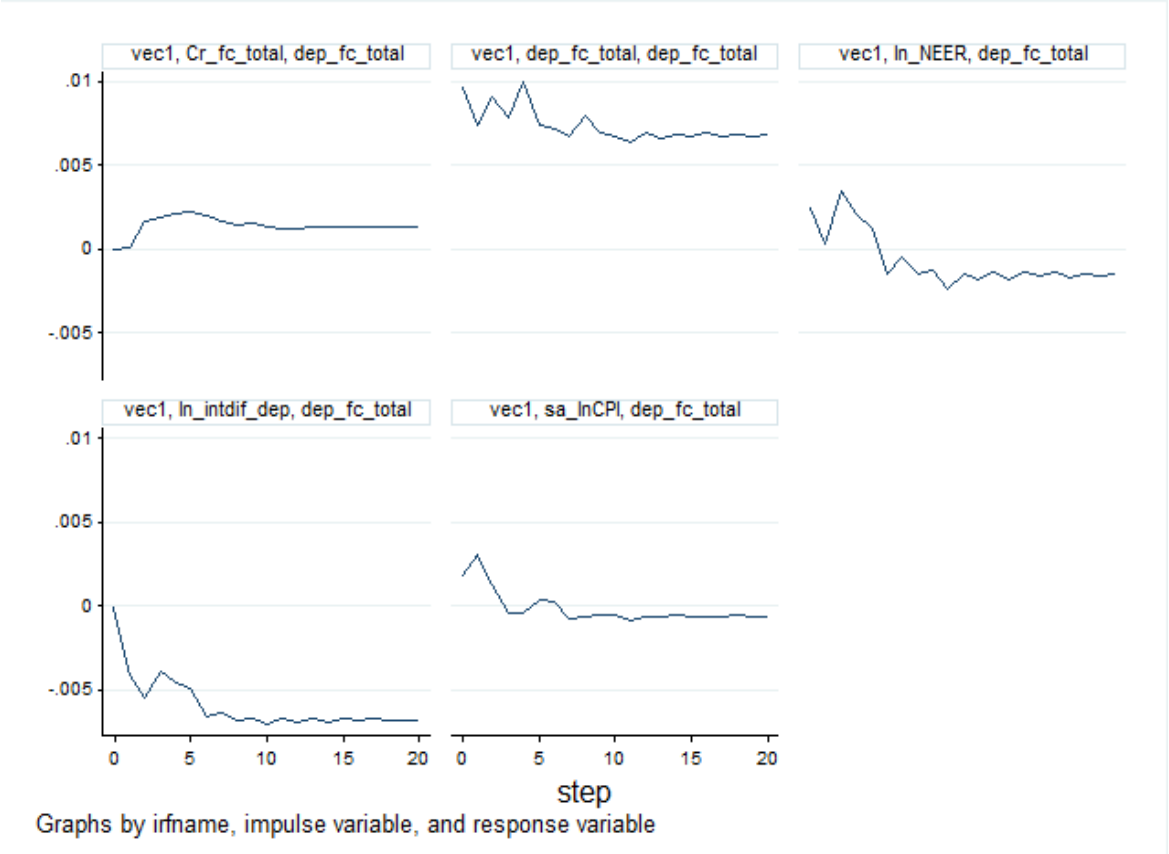

Table 6. Forecast error variance decomposition

step	(1) fevd	(2) fevd	(3) fevd	(4) fevd	(5) fevd
0	0	0	0	0	0
1	.060313	.000097	.032996	.906594	0
2	.034176	.092123	.067927	.80571	.000063
3	.059284	.151595	.044717	.735206	.009197
4	.058087	.158183	.035849	.731723	.016157
5	.046582	.160544	.027598	.744226	.02105
6	.04361	.178252	.023878	.728496	.025765
7	.037839	.214458	.0206	.6996	.027503
8	.036168	.240892	.018934	.676244	.027762
9	.033549	.26228	.017077	.660398	.026695
10	.035939	.280606	.015702	.641508	.026245
11	.034746	.3006	.01456	.624662	.025432
12	.034837	.315692	.014106	.610583	.024782
13	.033694	.32819	.013406	.600744	.023967
14	.033849	.338711	.012772	.591138	.023529
15	.032854	.34881	.012143	.58313	.023063
16	.032499	.356731	.011742	.576258	.02277
17	.031755	.363493	.011291	.571031	.02243
18	.031641	.369483	.010908	.565733	.022235
19	.031123	.375315	.010534	.561033	.021995
20	.030938	.380359	.010257	.556632	.021815

(1) irfname = vec1, impulse = ln_NEER, and response = dep_fc_total
(2) irfname = vec1, impulse = ln_intdif_dep, and response = dep_fc_total
(3) irfname = vec1, impulse = sa_lnCPI, and response = dep_fc_total
(4) irfname = vec1, impulse = dep_fc_total, and response = dep_fc_total
(5) irfname = vec1, impulse = Cr_fc_total, and response = dep_fc_total

Table 7. Pairwise granger causality tests

	F-test	**P-value**
NEER does not Granger-cause deposit euroization	2.92	0.032
Interest rate differential does not Granger-cause deposit euroization	5.18	0.002
CPI does not Granger-cause deposit euroization	7.41	0.000
Credit euroization does not Granger-cause deposit euroization	1.07	0.385
Credit euroization does not Granger-cause interest rate differential	2.02	0.1084
CPI does not Granger-cause interest rate differential	1.680	0.172
NEER does not Granger-cause CPI	0.61	0.6575
Interest rate differential does not Granger-cause NEER	5.700	0.001
Credit euroization does not Granger-cause CPI	5.67	0.0009
Credit euroization does not Granger-cause NEER	8.22	0.0001

Table 8. Lagrange multiplier test for autocorrelation

lag	chi2	df	Prob > chi2
1	32.1027	25	0.15506
2	22.5277	25	0.60512
3	24.5550	25	0.48752
4	33.2340	25	0.12532
5	30.4843	25	0.20667
6	20.4461	25	0.72305
7	15.0486	25	0.94024
8	15.4085	25	0.93131
9	31.2526	25	0.18079
10	18.8965	25	0.80206
11	15.5061	25	0.92874
12	24.8037	25	0.47342
13	10.6561	25	0.99447
14	16.0762	25	0.91254
15	16.4165	25	0.90186
16	33.0493	25	0.12984

H0: no autocorrelation at lag order

Table 9. Stability condition test of the vector error correction model

Eigenvalue	Modulus
1	1
1	1
1	1
1	1
-.8672165	.867216
-.00627316 + .789234*i*	.789259
-.00627316 - .789234*i*	.789259
.6213987 + .3597292*i*	.718012
.6213987 - .3597292*i*	.718012
.4004571 + .5572128*i*	.686187
.4004571 - .5572128*i*	.686187
-.6524082	.652408
-.4996241 + .2920844*i*	.578738
-.4996241 - .2920844*i*	.578738
-.04333243 + .5529574*i*	.554653
-.04333243 - .5529574*i*	.554653
.5394958	.539496
-.261849	.261849
.2167929	.216793
.02460775	.024608

The VECM specification imposes 4 unit moduli.