Differential Output Growth, Money Supply, and Interest Rate between the Philippines and its Major Trading Partners: Analyzing the Impact on the Spot Peso Exchange Rates

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ABSTRACT

The lack of consensus on factors that significantly influence exchange rate movements heightens country exposure to foreign exchange risks. Focused on understanding exchange rates, this research aims to test the validity of the Monetary Approach to Exchange Rate (MAER) in the Philippines in relation with Japan, the United States, and the European Union. Based on the results of the economic procedures, the MAER is not valid but the regression analysis proved the importance of output on exchange rate movements for all the three models. Interest rate differential changes were also found to affect the dollar-peso and euro-peso spot rates.

Key Words: Monetary Approach, Purchasing Power Parity, Uncovered Interest Parity, Cointegration

JEL Classification Numbers: C32, F31

1. INTRODUCTION

To live in an open and global-oriented economy means that one must be especially concerned about the cost of dealing with foreign goods and services; hence, the rate at which currencies are exchanged. The behavior of the exchange rate or the value at which one currency is exchanged to obtain another has different effects, depending on the position of the stakeholder. In the Philippines and other economies that largely depend on exports of services, exchange rate movements may also affect the volume and value of overseas workers' remittances. Since the exchange rate links the country to the global economy, any country would aim to achieve exchange rate equilibrium or at least seek to bring it to a level that is aligned with policy objectives (Giannellis & Koukouritakis, 2013).

To provide an understanding of exchange rates, it is imperative to identify factors that significantly affect its behavior. According to Nicita (2013), short term and long term currency fluctuations are sources of concern for developing nations. The lack of financial instruments that can be used to hedge against foreign exchange risks shows the significance of exchange rate stability for developing countries. For the past decade, the average annual growth of Philippine merchandise exports and imports has been dismal at

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4.57 percent and 4.88 percent, respectively. However, the freight on board (F.O.B.) value of Philippine exports have increased from US$41,255 million in 2005 to US$58,827 million in 2015 while imports went up from US$47,418 million in 2005 to US$71,067 million. The country's merchandise trade activities have been largely affected by weak global demand during the 2008 to 2009 financial crisis. In 2009, the country's exports of goods decreased by 21.68 percent while imports contracted by 24.06 percent. The Philippines largely depends on electronic products for its exports. As of August 2016, the Philippine Statistics Office (PSA) estimated that electronic products accounted for 53.7 percent of the country's total export revenues. Among electronic products, components/devices (semiconductors) held the biggest share of 39 percent of total electronic products shipped abroad. Japan remained as the country's top export market, with a share of 20.4 percent of the total Philippine merchandise exports as of August 2016. This was followed by the United States (15.1 percent), Hong Kong (13 percent), People's Republic of China (11.4 percent), and Singapore (7.1 percent). More than half of Philippine export products are shipped to other countries in East Asia in August 2016 while exports to ASEAN member countries and European Union (EU) member countries comprised 14.8 percent and 11.6 percent, respectively.

Given the importance of analyzing exchange rate behavior, this research hopes to shed light on the potential influence of economic indicators on the Philippine peso based on the monetary approach to exchange rate (MAER) determination. An examination of this traditional exchange rate approach can provide insights on the relevance of aggregate output, money supply, and interest rates on the movements of the Philippine peso vis-à-vis the currency values of some of its major trading partners namely Japan, the United States, and the European Union. While the Bangko Sentral ng Pilipinas (Philippine central bank) does not actively and directly manage exchange rate changes as the country observes a flexible exchange rate regime, it can effectively affect other economic indicators which may have an indirect influence on the path of the Philippine peso.

The primary objective of this research is to analyze the potential influence of output differential, money supply differential, and short-term interest rate differential between the Philippines and each of the following countries or economic bloc: Japan, the United States and the European Union, to spot peso exchange rates (SR^{PH}). More specifically, it has the following objectives:

(1) To describe the historical trend of the variables included in the model namely, the spot peso exchange rates (SR^{PH}), Japan-Philippines national real output differential (y^{JP}-y^{PH}), Japan-Philippines money supply differential (m^{JP}-m^{PH}), and Japan-Philippines interest rate differential (r^{JP}-r^{PH}); U.S.-Philippines national output differential (y^{US}-y^{PH}), U.S.-Philippines money supply differential (m^{US}-m^{PH}), and U.S.-Philippines interest rate differential (r^{US}-r^{PH}); and EU-Philippines national output differential (y^{EU}-y^{PH}), EU-Philippines money supply differential (m^{EU}-m^{PH}), and EU-Philippines interest rate differential (r^{EU}-r^{PH}).

(2) To examine whether or not differentials in real output, money supply, and interest rates between the Philippines and the cited foreign countries

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(Japan and the U.S.) as well as the EU have significant effects on the spot peso exchange rates

(3) To determine if there is a long-term equilibrium relationship between the Philippines spot exchange rate and the given independent variables

(4) To investigate whether or not there is structural stability in the relationship between the spot exchange rate of the Philippines, output differential, money supply differential, and interest rate differential of the abovementioned foreign countries and the EU.

The remainder of this study is organized as follows: Section 2 discusses briefly the literature review, Section 3 covers the data and theory, Section 4 describes the methodology applied in the study, Section 5 provides the empirical results and discussions, and Section 6 concludes.

2. LITERATURE REVIEW

It is widely accepted that exchange rates affect economic conditions, especially with the rapidly increasing integration of markets. Theoretically, economies benefit from trade openness as it provides greater market reach and more alternative sources of inputs and final products. However, trade openness also heightens the vulnerability of countries to external shocks such as in the findings of Bodart et al. (2015). Meanwhile, Montalbano (2011) expressed that there is no absolute theoretical or empirical evidence that specifies a clear-cut linkage between trade openness of a country and its vulnerability to external shocks, especially since the term vulnerability remains a vague concept in international economics.

In a study conducted by Mariano et al. (2016), they found out that among several factors considered, GDP is the primary contributor to exchange rate movements, accounting for 29.22 percent of the variation. Gervais et al. (2016) mentioned that some industries such as mining and manufacturing are more sensitive to currency movements while An & Park (2016) stressed the significance of using free-float currencies. Papadopoulos & Papanikos (2001) concluded that money supply tend to have a larger impact on output under flexible exchange rates. More importantly, Giannellis & Koukouritakis (2013) and Jiang & Kim (2013) discussed the role of exchange rate stability in maintaining steady price levels. In relation to inflation, Thornton (2014) showed that monetary aggregates significantly matter in terms of U.S. Federal Reserve (Fed) policies, although more emphasis was given on interest rates as an actual monetary policy tool. A number of studies further stressed the connection between exchange rates and the price level, including those by Huang & Yang (2014), Delatte & Lopez-Villavicencio (2012), and Aleem & Lahiani (2014).

On the contrary, Robertson et al. (2014) as well as Beckmann (2012) found out that PPP does not always hold. Under panel GMM estimation, Nguyen (2015) concluded that monetary aggregate is no longer an important inflation determinant. Sabade (2014), meanwhile, refuted the validity of Irving's quantity theory of money, stating that money

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supply changes do not necessarily have a significant impact on inflation as countries do not operate in full employment. Dumrongrittikul & Anderson (2016) observed that for developing countries, monetary policy has no long-run effect on real exchange rates.

A number of studies also explored the potential influence of interest rates on exchange rates based on the uncovered interest parity (UIP). The parity states that in the long run, risk-neutral investors would be indifferent to their foreign investments since the exchange rate would seal any gap between the domestic interest rate and the foreign interest rate. Studies conducted by Hoffman & Macdonald (2009), Hunter & Ali (2014), Hnatkovska et al. (2013), Kim (2007), Hacker et al. (2014), Kanas (2005), and Byrne & Nagayasu (2010) attempted to explain how interest rates and exchange rates are related, albeit with differences on methodology, countries, and focus. As described by Cuestas et al. (2016) in their analysis, UIP appears to be a useful information provider for foreign exchange forecasters.

Quite contrary, in the analysis by Bekaert et al. (2007), they concluded that there is mixed evidence against UIRP. Bhatti (2014) found evidences that support UIP among six countries of the Commonwealth of Independent States (CIS). However, such evidence were said to be sensitive to model specifications, interest rate horizons, and volatilities of both exchange rates and interest rates, as well as the sample, estimation techniques, and countries considered. Chaboud & Wright (2004) also found statistical evidence supportive of UIRP using short frequency data. But, such findings became rather inconclusive over time, even with just an addition of few hours. Meanwhile, according to Kitamura & Akiba (2004), exogenous shocks of short-term interest rate differential influence the exchange rate via two channels: one through the UIP and second through the expectations of market participants since interest rates are seen as informative variables that reflect the future economic conditions.

3. DATA AND THEORY

The empirical model in this study is comprised of four variables – the spot exchange rate between the domestic currency which is the peso and that of a given foreign trading partner which can be Japan, the United States, and the European Union; the real output differential which refers to the difference between the real gross domestic product (GDP) of the foreign trading partner and the Philippines; the money supply differential or the difference between the M1 money stock of the foreign trading partner and the Philippines; and finally, the interest rate differential or the difference between the 3-month Treasury bill rate between the foreign trading partner and the Philippines.

The researcher recognizes the fact that other factors may have considerable influence on exchange rate movements such as business confidence index, government spending and revenues. However, these will not be included as variables in the study due to data limitations, subjectivity (such as in the case of confidence indexes), and its minimal role in monetary policies. Moreover, several studies already explored these variables in relation to exchange rate movements. The study uses the data covering the quarters within the period 1994 to 2015. However, in the case of the European Union, the data begins from the first quarter of 1999 up to the fourth quarter of 2015 since the euro, as a common

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currency, was only adopted in 1999. The choice of countries was primarily based on the Philippines' major trading partners. The People's Republic of China, despite being a primary trading partner of the Philippines, was excluded in the country since the renminbi (RMB) was pegged to the U.S. dollar until 2005 when it shifted to a managed floating exchange rate regime. Therefore, for comparability purposes, the trading partners considered are those which also follow a floating exchange rate regime during the covered period, similar with the Philippines.

3.1. The Monetary Approach to Exchange Rate Determination

Given a clear emphasis on the significance of analyzing exchange rate variability, we use the Monetary Approach to Exchange Rate (MAER) determination in this study. The MAER is associated with the University of Chicago and represented earlier in the works of Dornbusch and Frenkel in 1976. It is largely based on a strand of exchange rate theory, the PPP hypothesis[1] and the UIP (sometimes termed as UIRP). According to Dornbusch and Branson (1978) in a Boston Fed discussion paper, the PPP can be viewed as the "open economy extension of the quantity theory of money" since it is one of those theories which would normally hold in the long run but deviations from which are sufficient to have an impact in the short term. An understanding of the MAER would necessitate a discussion of the PPP hypothesis and the monetarist theory of price determination.

The PPP theory primarily claims that exchange rate changes over time to balance the deviations in national price levels i.e., a country with very low inflation levels would, at the same time, experience a corresponding currency appreciation. Divergent changes in the national price levels (which also bring about a currency appreciation or depreciation) stem from the existence of non-traded goods and current account imbalance. Empirically, the PPP theory can be stated as:

$$E_{DOM/FOR} = P_{DOM}/P_{FOR,} \qquad (1)$$

where $E_{DOM/FOR}$ is the exchange rate between the domestic currency vis-à-vis a given foreign currency, P_{DOM} is the general price level in the given domestic country, P_{FOR} is the general price level in the given foreign country.

Aside from the PPP theory, the development of the MAER model also requires the quantity theory of money which states the monetary equilibrium must be:

$$V(r,Y)\ \frac{M}{P} = Y, \qquad (2)$$

where M is the nominal quantity of money, P is the price level, V is the velocity of money, and Y is the real income. To solve for the price level P, the above equation can be rewritten as:

$$P = V\ \frac{M}{Y} \qquad (3)$$

Equation (3) indicates that for a given velocity, a rise in the nominal quantity of money would result to a proportional increase in the general price level. The absolute PPP, which

[1] Aside from the PPP, another major strand of exchange rate theory is the balance of payments theory.

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is based on the Law of One Price (LOOP)[2], states that the general price level is equal to the foreign general price level multiplied or converted by the exchange rate. Simply, the cost of a basket of commodities in a home country should be equal to the cost of the same basket of commodities in a foreign country, taking into account the exchange rate. A deviation from this would mean that the prices of commodities and the exchange rate must adjust until they reach a point of equilibrium.

$$P = (P^{*}) \, X \, (E) \qquad (4)$$

where P is the domestic price level, P* is the foreign price level, E is the exchange rate or the local currency price of the foreign exchange. By substituting equation *(3)* in equation *(4)*, the equilibrium exchange rate may be derived as:

$$E = (1/P^{*}) \, V \, \frac{M}{Y} \qquad (5)$$

Equation (5) translates to the dependence of the equilibrium exchange rate on the nominal quantity of money (M), real output (Y), and velocity (V). This implies that a rise in M or in V will lead to proportional currency depreciation. Meanwhile, an increase in Y will result to a currency appreciation in the same proportion. The MAER emphasizes that domestic prices are fully flexible but related to global prices in terms of the PPP. By viewing money as a good with exchange rate as its price, any changes in the demand for money must be supported by a compensating change in the exchange rate. Therefore, given the nominal quantity of money, a rise in real money demand will normally bring about a corresponding decrease in the price level to increase the money stock. However, since the price level would be at a disequilibrium at international level, an appreciation of the currency would be required to bring the price level back to equilibrium. Since the theory deals with exchange rates, it necessarily involves the foreign price level P* which is determined by foreign money demand and supply which is written as:

$$E = \left(\frac{M}{M^{*}}\right)\left(\frac{V}{V^{*}}\right)\left(\frac{Y^{*}}{Y}\right) \qquad (6)$$

If the domestic nominal money stock increases relative to the money stock abroad, the exchange rate of the home country will depreciate, ceteris paribus. To explain the interest rate component in relation to exchange rate determination, the velocity function must be specified:

$$V = Y^{\lambda-1} \exp(\theta r) \qquad (7)$$

This means that V depends on real income Y and alternative cost of holding money that is represented by the nominal interest rate r.

Through substitution: $e = m\text{-}m^{*} + \lambda \, (y\text{-}y^{*}) + \theta(r\text{-}r^{*}) \qquad (8)$

[2] Krugman and Obstfeld (1996) differentiated LOOP with PPP, with LOOP applying to the price of individual commodity while PPP is used for the reference basket of commodities; hence, the general price level.

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Note that in equation (8), a rise in the relative interest rate would result to depreciation, under the MAER. This stands contrary to the conventional idea that an interest rate increase would bring about currency appreciation. In MAER, the increase in the domestic interest rate will reduce real money demand. Similar with the discussion on nominal money stock and income in relation to the exchange rate, any changes in money demand would be offset by a proportional change in the exchange rate. In this scenario, the lower real money demand would lead to a rise in the price level to increase the money stock. However, the price level would be at disequilibrium at the international level. This would require an exchange rate depreciation to lead the price level back to its equilibrium, as described under PPP.

Since the study is concerned with the relevance of the MAER to the Philippine exchange rate while taking into account some of its major trading partners, we adopt the MAER equation in equation (8) and substitute with:

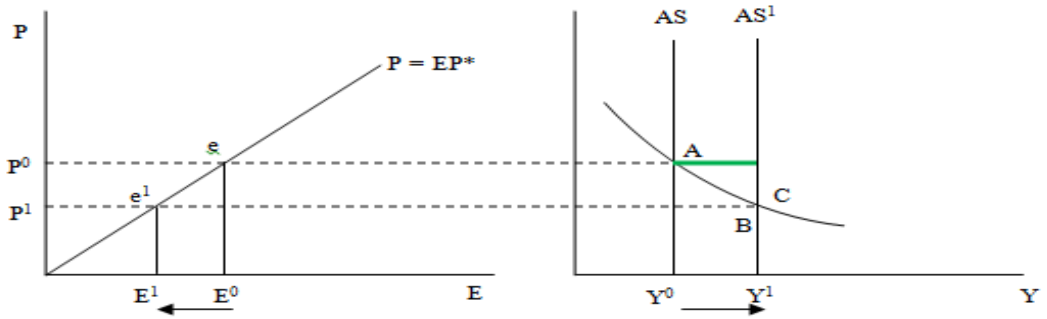
$$SR^{JPY/PHP} = m^{JP} - m^{PH} + \lambda (y^{JP} - y^{PH}) + \theta(r^{JP} - r^{PH}), \qquad (9)$$

where $SR^{JPY/PHP}$ is the spot exchange rate between the Japanese yen and the Philippine peso, y^{JP} is the real GDP of Japan, y^{PH} is the real GDP of the Philippines, m^{JP} is the M1 monetary aggregate of Japan, m^{PH} is the M1 monetary aggregate of the Philippines, r^{JP} is the 3-month average T-bill rate of Japan, and r^{PH} is the 3-month average T-bill rate of the Philippines. The same equation is replicated with the U.S.-Philippines model and the EU-Philippines model by replacing Japan variables with the U.S. and EU data, respectively.

3.1.1. Influence of output on exchange rates

Based on the MAER, an increase in output will lead to a currency appreciation, for the PPP to hold. To illustrate, a rise in output (Y) will lead to a movement in Y from Y^0 to Y^1. This will induce the aggregate supply (AS) curve, the long run level of real output to shift from AS to AS^1. At the same price P^0, there will be an excess demand for money, which implies an excess supply of goods and services (denoted by the green horizontal line). This will lead to a fall in the domestic price level from P^0 to P^1. For the PPP to hold, the exchange rate must adjust to the decline in the domestic currency, requiring an appreciation (E^0 to E^1).

Fig. 1. Influence of increase in output on exchange rates



3.1.2. Influence of money supply on exchange rates

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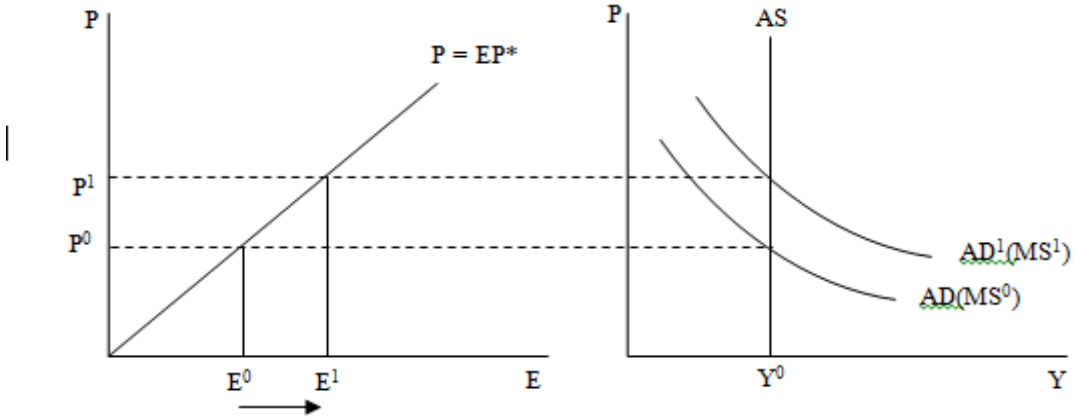
Aside from output, the MAER is also used to explain how money supply changes can affect the exchange rate. Specifically, an increase in the money supply will lead to a depreciation of the domestic currency. An increase in the money supply, ceteris paribus, will drive the aggregate demand (AD) curve to the right from AD to AD^1. The rise in aggregate demand will lead to an increase in domestic prices from P^0 to P^1. For the PPP hypothesis to hold, the increase in domestic prices must be followed by a movement in the value of the domestic currency from E^0 to E^1, equivalent to depreciation (more domestic currency needed per unit of foreign currency).

Fig. 2. Influence of increase in money supply on exchange rates



3.1.3. Influence of interest rates on exchange rates

Aside from the PPP, one of the main assumptions of the MAER approach is the UIP, which maintains that the interest rate differential between one country and another has to equal the expected exchange rate change[3] (Jiang and Kim, 2013). For the UIP to hold, domestic and foreign currencies must be perfect substitutes. The concept also states that the currency of a high interest rate country will have to depreciate. Conversely, the currency of a low interest rate country will have to appreciate. To explain further:

$$r_{PHP} = r_{JPY} + \frac{E^e_{PHP/JPY} - E_{PHP/JPY}}{E_{PHP/JPY}} \quad (10)$$

Equation (10) shows that for an investor, he can either place his money in a peso security with an interest rate of r_{PHY} or a foreign Japanese security with an interest rate upon maturity of r_{JPY}. However, the expected return on the Japanese security must take into account the exchange rate between the Philippine peso and the yen, both at today's value ($E_{PHP/JPY}$) and the expected value upon maturity of the security ($E^e_{PHP/JPY}$). Today's exchange rate must be taken into account since the Philippine peso must be exchanged for Japanese yen if the investor wants to invest in a Japanese security. Meanwhile, the expected exchange rate must also be considered since the investor must revert to the Philippine peso upon maturity of the Japanese security where he placed his investment. If the expected return on the Japanese security is higher than the Philippine peso-denominated security, the investor will opt to favor the Japanese security, thus increasing

[3] Originally based on the definition by Krugman and Obstfeld in 2003

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the demand for Japanese yen. This will increase the current value of the Japanese yen. The appreciation of the Japanese yen will continue until UIP holds up to a point when the expected appreciation of the yen diminishes. At this point, the two sides of the UIP equation are the same and there will be no incentive for the investor to adjust his investment portfolio.

4. METHODOLOGY

The study is primarily based on a quantitative research design as we perform a number of statistical analyses on the time series variables. For the explanatory variables, we use real GDP, nominal M1 money stock, and the 3-month T-bill rates. Except for T-bill rates, we transform all the variables into logarithmic (log) form for easier interpretation and to reduce the possibility of skewness. In the case of interest rates, log transformation is not applicable as some of the data are negative. The occurrence of negative data for interest rates has become more evident in the recent years as Japan, the United States, and the European Union experienced near zero policy rates. Note that although we are not using the key policy rates of the central banks as explanatory variables, the predictor T-bill rates in this research are closely aligned with the policy rates; hence, also negative in some quarters. After the log transformation of the real GDP and M1 money stock, we compute for the differentials. For the Japan-Philippines model, we derive the differentials by taking the difference between the real GDP of Japan and the Philippines, M1 money stock of Japan and the Philippines, and the average T-bill rate of Japan and the Philippines. We repeat the same computations for the United States-Philippines model and the European Union-Philippines model by replacing the real GDP, M1 money stock, and average T-bill rates of Japan with data for the United States and the European Union, respectively.

To analyze the possible existence of a long-run relationship among the variables and the potential influence of real GDP, M1 money stock, and 3-month T-bill rates on the value of the Philippine peso vis-à-vis the Japanese yen, U.S. dollar, and the euro, we utilize a number of relevant statistical and econometric tools. First, the stationarity of the time series are checked using the Augmented Dickey-Fuller (ADF) test with lag length selection based on Akaike Information Criterion (AIC).

We then proceed with Multiple Regression (Ordinary Least Squares) to estimate the unknown parameters of the regression equation that is central to analyzing the relationship between the spot exchange rates and the predictor variables. We test the robustness of the regression model using the assumptions of the classical normal linear regression model (CNLRM). To check the normality of the residuals, which is one of the assumptions of the CNLRM, we apply the Jarque-Bera Test for Normality. We also use the pairwise correlation Test and Variance Inflation Factor (VIF) test to check for a possible multicollinearity problem while we apply the Breusch-Godfrey Serial Correlation Test to detect the presence of a possible higher-order serial correlation. Moreover, we employ the White-Autoregressive Heteroskedasticity (ARCH) Test to find out if there is heteroskedasticity and the Ramsey Regression Specification Error Test (ReSET) to check for a specification error problem. As a final test for robustness of the

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model, specifically for the structural stability of the parameters, we use the Chow Breakpoint Test.

As discussed earlier, the study is also intended to determine if there is a long-term equilibrium relationship between the spot exchange rates and the explanatory variables. We use the Johansen Cointegration Test for this purpose. With the assumption that the variables are cointegrated, we perform an ex-post forecast for all the three country models. We analyze the accuracy of the model by referring to the Theil Inequality Coefficient and its components.

5. DISCUSSION OF THE RESULTS

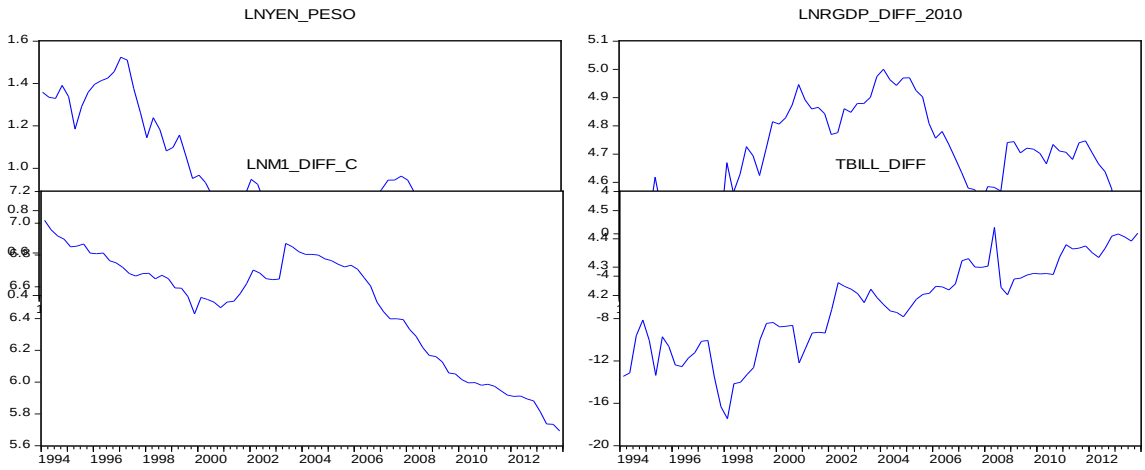
In this section, we discuss the results of the ADF Test for stationarity and the regression analysis. Moreover, we assess the robustness of the model by showing the outcome of the Jarque-Bera Test, Ramsey ReSET, and ARCH-White Test. We also discuss the results of the VIF Test and the Chow Breakpoint Test. Finally, we present the findings derived from the Johansen Cointegration Test and Ex-post forecasts for each of the three country models.

3.1. Tests for stationarity

Based on the outcome of the ADF Test, the variables were nonstationary in their levels form but stationary at first differences. Since the variables are stationary at the same order, at I(1), these were no long transformed to first differences.

Fig 3. Results of the ADF Tests

Model 1: Japan - Philippines Model
(data in logarithmic form)



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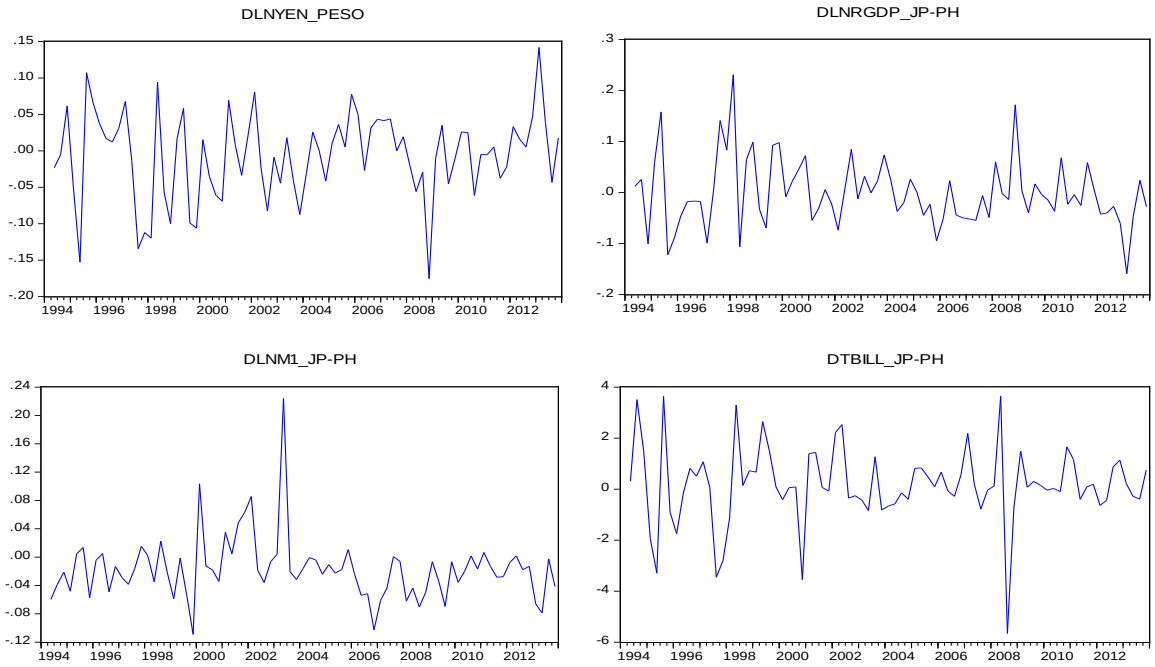
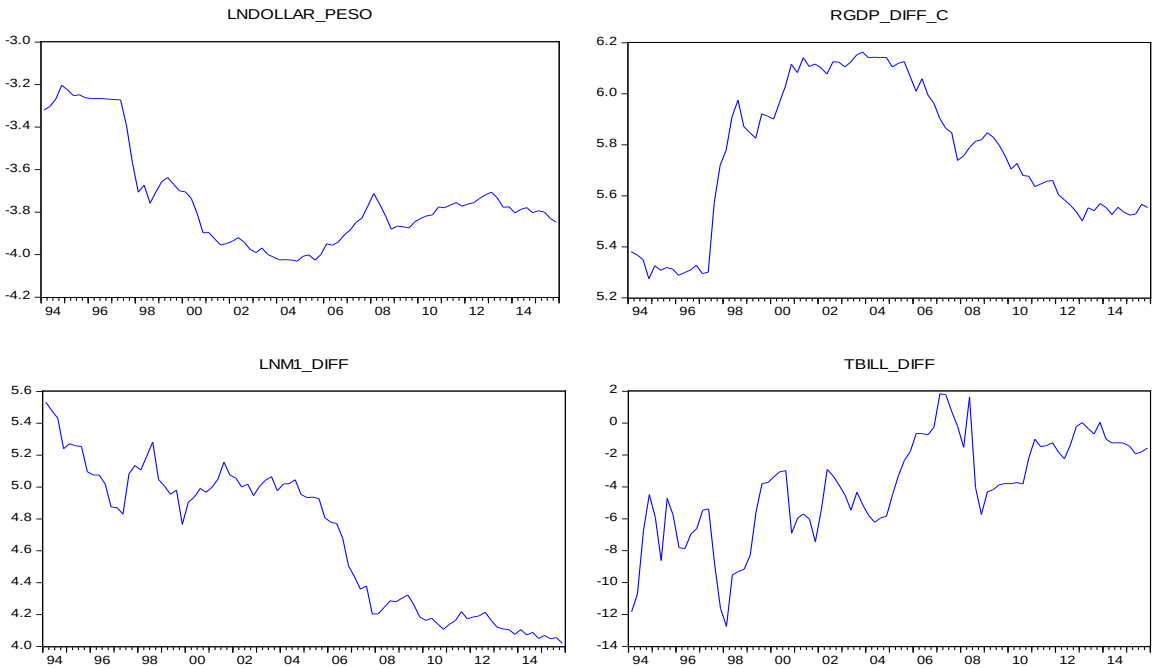
Japan – Philippines Model
(data in first-difference)



Model 2: United States - Philippines Model
(data in logarithmic form)



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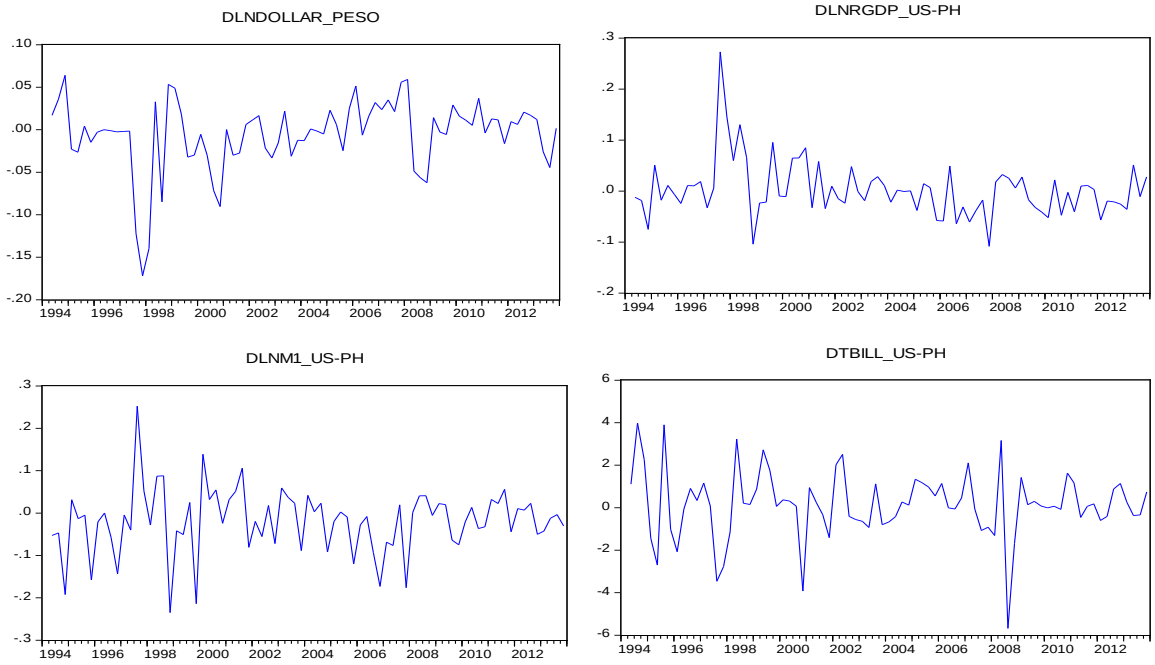
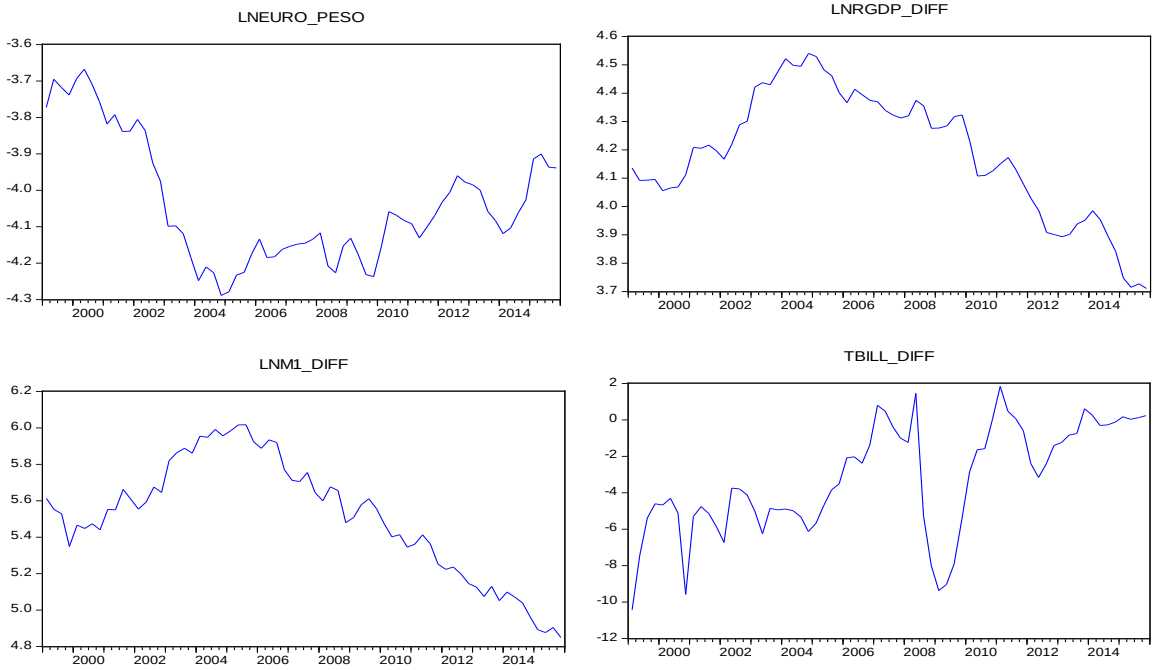
United States – Philippines Model
(data in first-difference)



Model 3: European Union - Philippines Model
(data in logarithmic form)



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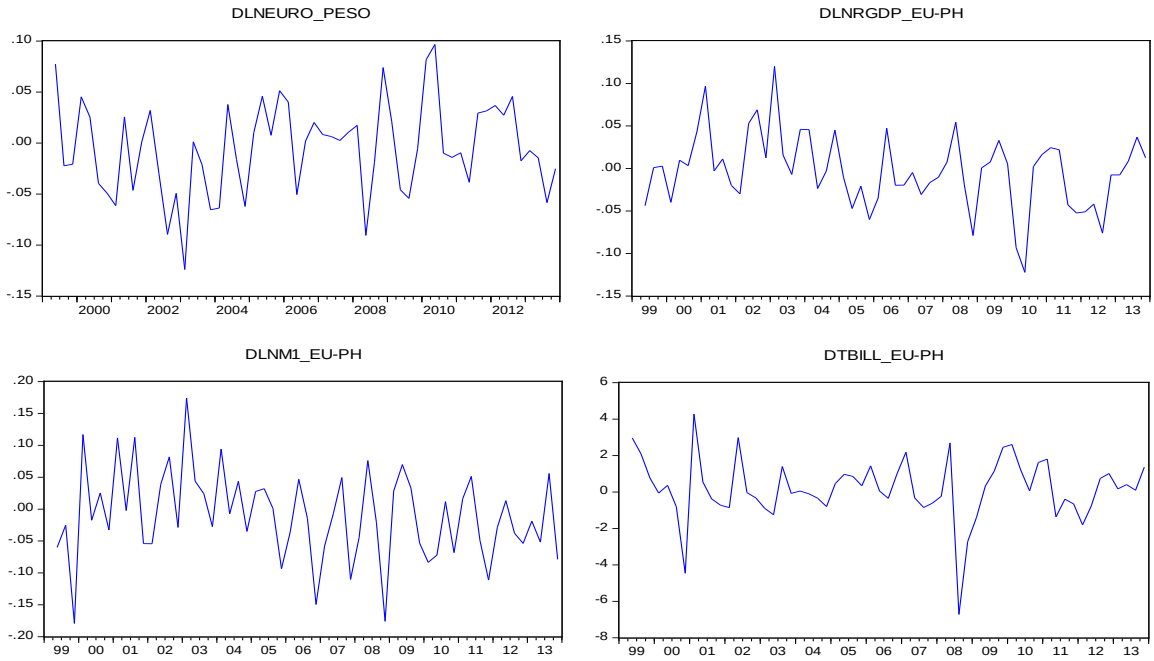
European Union - Philippines Model
(data in first-difference)



3.2. Results of the Regression Analysis

With regards to the primary objective of this paper, which is to analyze the potential impact of RGDP differential, M1 money supply differential, and T-bill rate differential on the spot exchange rates of the peso relative to the yen, U.S. dollar, and the euro, the regression analysis show that RGDP differential exert a significant influence on the spot exchange rates. Under the Japan-Philippines model, RGDP differential has a coefficient of -0.847954 whereas under the U.S.-Philippines and EU-Philippines model, the coefficients were estimated at -0.607742 and -0.928282, respectively.

Table 1. Coefficients of the Explanatory Variables

Model	Variables	Coefficients	p-values
Model 1: Japan-Philippines	**LNRGDP_DIFFERENTIAL**	**-0.847954**	**0.0000**
	LNM1_DIFFERENTIAL	0.081353	0.0692
	TBILL_DIFFERENTIAL	0.002033	0.1876
Model 2: U.S.-Philippines	**LNRGDP_DIFFERENTIAL**	**-0.607742**	**0.0000**
	LNM1_DIFFERENTIAL	-0.035203	0.4984
	TBILL_DIFFERENTIAL	**0.007674**	**0.0001**
Model 3: EU-Philippines	**LNRGDP_DIFFERENTIAL**	**-0.928282**	**0.0000**
	LNM1_DIFFERENTIAL	-0.033702	0.4021
	TBILL_DIFFERENTIAL	**0.003052**	**0.0174**

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Meanwhile, across all the three country models, M1 money supply does not have a significant impact on the spot exchange rates based on the results of the regression. Similarly, T-bill differential does not have an effect on the spot exchange rates under the Japan-Philippines model. However, the particular predictor variable was found to carry an impact on the spot exchange rates between the U.S. dollar-peso and the euro-peso with statistically significant coefficients of 0.007674 and 0.003052, respectively. The regression analysis also generated the following R-squared values: 99.58% for the Japan-Philippines model, 98.94% for the U.S.-Philippines model, and 98.94 % for the EU-Philippines model.

Table 2. Results of the Regression Analysis

	Model 1 Japan - Philippines	**Model 2 U.S. - Philippines**	**Model 3 EU - Philippines**
R^2	0.995843	0.989363	0.989385
Adjusted R^2	0.995554	0.988452	0.988599
DW statistic	2.025664	2.072314	2.018465
F-statistic	3449.327	1085.166	1258.319

3.3. Robustness checks

The regression model used in this study followed all the assumptions of the classical normal linear regression model; hence, the parameters are considered as the best linear unbiased estimators. One of the assumptions, the normality of the residuals, was checked using the Jarque-Bera Test. In all the three country cases, the JB statistics were insignificant; hence the residuals are normally distributed.

Table 3. Results of the Jarque-Bera Test

	Model		
	Japan-Philippines	**US - Philippines**	**EU - Philippines**
JB-stat	1.569255	4.459693	2.128152
p-value	0.456290	0.107545	0.345047

To investigate whether there is collinearity among the regressors, the pairwise correlation and variance inflation factor test were applied. Both diagnostic tests ruled out the possible presence of a multicollinearity problem. To examine if there is specification error in the model, the Ramsey Regression Specification Error Test (ReSET) was used. Since the computed F-statistics for this test did not exceed the critical values of F for all the three country cases, the null hypothesis of no specification error was accepted.

Table 4. Results of the Ramsey ReSET

	Japan-PH		**US - PH**		**EU - PH**	
	F-stat	p-value	F-stat	p-value	F-stat	p-value
$\gamma_1 = 0$	3.969818	0.0502	1.424109	0.2368	0.907336	0.3451
$\gamma_1 = \gamma_2 = 0$	6.425427	0.0027	2.146504	0.1247	1.404534	0.2546
$\gamma_1 = \gamma_2 = \gamma_3 = 0$	7.767066	0.0002	2.294226	0.0858	0.933936	0.4311

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Given the tendency of economic and financial time series data to exhibit volatility clustering (values are characterized by wide swings for an extended time period, followed by period of relative calmness), the ARCH-White Test was applied. Estimation of the ARCH Model showed that volatility clustering is not present given statistically insignificant coefficients. To test for the structural stability of the model which is crucial in the purpose of making policy analysis and forecast, the Chow Breakpoint Test was used. Since the p-values for the F-statistics are greater than the 5% level of significance, the null hypothesis of no structural instability was accepted.

Table 5. Results of the ARCH-White Test

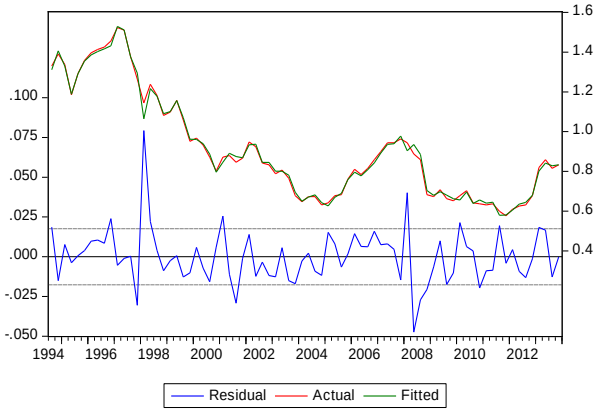
	Japan - PH	**US - PH**	**EU - PH**
F-stat	3.404713	0.62386	N.A.*
Prob. F(1,75)	0.0690	0.4321	
Obs* R-squared	3.343713	0.635365	
Prob. Chi-Square(1)	0.0675	0.4254	

** HAC (Newey-West) was used in the estimation*

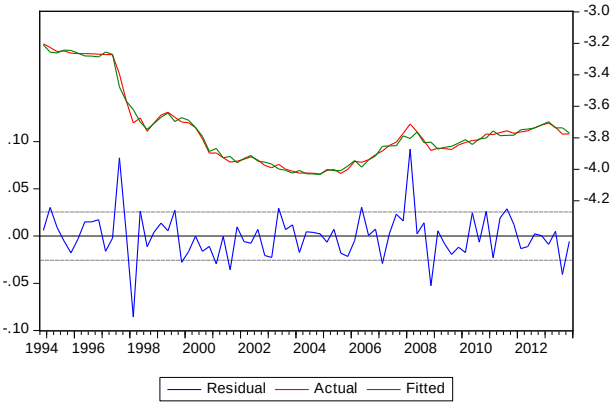
Furthermore, the model for all the country pairs appeared to be accurate based on the plot between the actual and fitted values. On the following graphs, the actual values fitted the data line very well.

Fig. 4. Plots of the Actual, Fitted, and Residual values

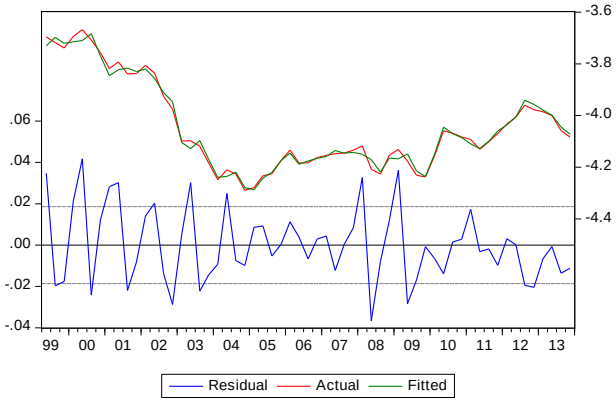
Japan – Philippines Model



U.S. – Philippines Model



EU – Philippines Model



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3.4. Tests for Cointegration

Another objective of the research is to analyze if there is a long-term equilibrium relationship between the spot exchange rates and the predictor variables (RGDP differentials, M1 money stock differentials, and T-bill rate differentials for each country/economic bloc pair (Japan-Philippines, U.S.-Philippines, and EU-Philippines). The results of the Johansen Cointegration Test showed the presence of cointegrating vectors. This indicates a long term equilibrium relationship between the following: (1) the spot JPY/PHP exchange rates vis-a-vis RGDP differentials between Japan and the Philippines, M1 money stock differentials between Japan and the Philippines, and 3-month T-bill rate differentials between the same two countries; (2) the spot USD/PHP exchange rates vis-à-vis RGDP differentials, M1 money stock differentials, and (3) T-bill rate differentials between the U.S. and the Philippines; and finally (3) the spot EUR/PHP exchange rates vis-à-vis the RGDP differentials, M1 money stock differentials, and the T-bill rate differentials between the EU and the Philippines.

Table 6. Cointegration Test Results

Model 1: Japan – Philippines

Ho	**Option 2**		**Option 3**		**Option 4**	
	Trace	5% CV	Trace	5% CV	Trace	5% CV
r = 0	79.89574	54.07904	53.95712	47.85613	68.91186	63.87610
r = 1	39.70782	35.19275	21.50770	29.79707	34.16280	42.91525
r = 2	20.47340	20.26184	7.704394	15.49471	19.74687	25.87211
r = 3	6.749958	9.164546	0.685629	3.841466	6.696127	12.51798

Model 2: U.S. – Philippines

Ho	**Option 2**		**Option 3**		**Option 4**	
	Trace	5% CV	Trace	5% CV	Trace	5% CV
r = 0	68.44220	54.07904	55.86858	47.85613	75.72408	63.87610
r = 1	42.60642	35.19275	32.56736	29.79707	49.75674	42.91525
r = 2	19.93380	20.26184	10.05798	15.49471	26.52776	25.87211
r = 3	9.162481	9.164546	0.612630	3.841466	7.896051	12.51798

Model 3: EU – Philippines

Ho	**Option 2**		**Option 3**		**Option 4**	
	Trace	5% CV	Trace	5% CV	Trace	5% CV
r = 0	170.4660	54.07904	153.6354	47.85613	199.4334	63.87610
r = 1	78.58811	35.19275	61.78075	29.79707	107.5732	42.91525
r = 2	36.31687	20.26184	21.98321	15.49471	51.61620	25.87211
r = 3	14.29331	9.164546	2.367508	3.841466	18.58060	12.51798

3.5. Ex-Post Forecasts

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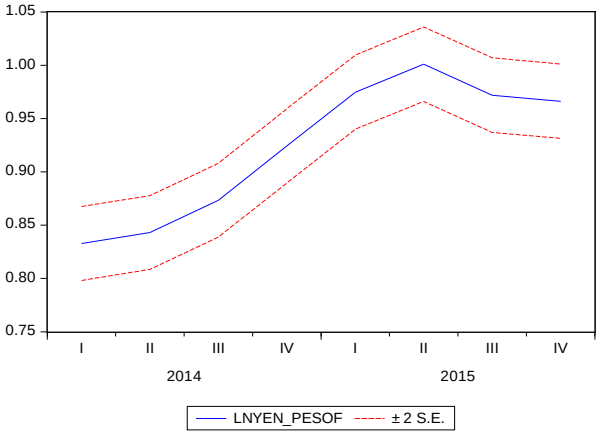
Since the results of the tests showed that the model can be used for forecasting, an ex-post forecast was conducted for each of the three country pairs. Based on the Theil Inequality Coefficient and its components namely, Bias Proportion, Variance Proportion, and Covariance Proportion, the ex-post forecasts are very good or accurate. Theil Inequality Coefficient for Japan-Philippines Model was 0.004719 while the figure for the U.S.-Philippines Model and EU-Philippines Model were 0.002270 and 0.001736, respectively.

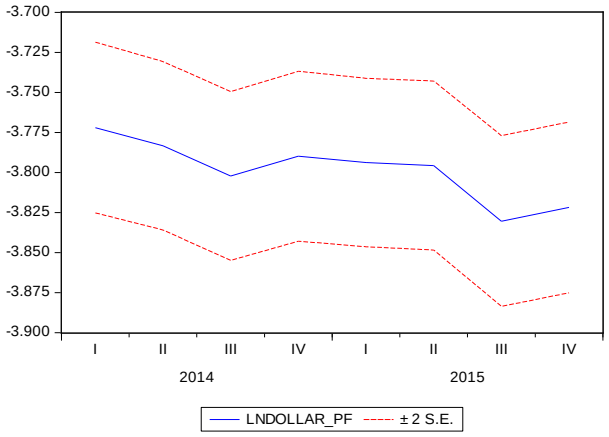
Fig. 5. Ex-post Forecasts

Japan - Philippines Model



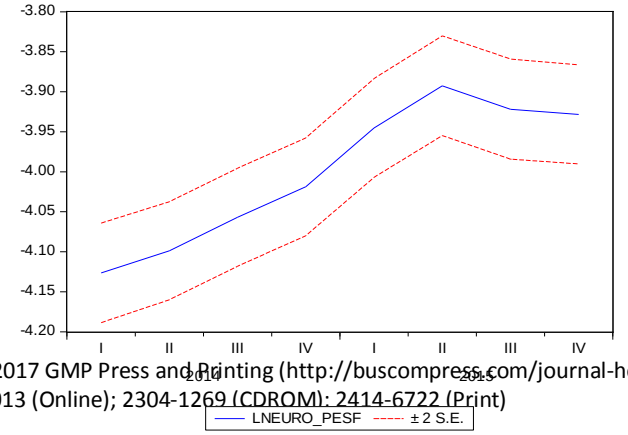
Forecast: LNYEN_PESOF	
Actual: LNYEN_PESO	
Forecast sample: 2014Q1 2015Q4	
Included observations: 8	
Root Mean Squared Error	0.008731
Mean Absolute Error	0.007073
Mean Abs. Percent Error	0.764595
Theil Inequality Coefficient	0.004719
Bias Proportion	0.006326
Variance Proportion	0.100386
Covariance Proportion	0.893288

U.S. - Philippines Model



Forecast: LNDOLLAR_PF	
Actual: LNDOLLAR_PESO	
Forecast sample: 2014Q1 2015Q4	
Included observations: 8	
Root Mean Squared Error	0.017262
Mean Absolute Error	0.012626
Mean Abs. Percent Error	0.331553
Theil Inequality Coefficient	0.002270
Bias Proportion	0.147288
Variance Proportion	0.031313
Covariance Proportion	0.821400

EU - Philippines Model



Forecast: LNEURO_PESF	
Actual: LNEURO_PESO	
Forecast sample: 2014Q1 2015Q4	
Included observations: 8	
Root Mean Squared Error	0.013889
Mean Absolute Error	0.011219
Mean Abs. Percent Error	0.283091
Theil Inequality Coefficient	0.001736
Bias Proportion	0.012103
Variance Proportion	0.001802
Covariance Proportion	0.986095

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6. CONCLUSIONS

This research disproved the absolute validity of the MAER, specifically the PPP and the UIP. However, the regression analysis emphasized the influence of RGDP differential on the spot exchange rates between the Philippines and three of its major trade partners namely, Japan, the United States, and the European Union. Moreover, the sign of the coefficients for RGDP is positive which is consistent with the theoretical expectations based on PPP. Simply, this means that an increase (or widening) of the RGDP differential between the Philippines and the foreign trade partner that is brought about by a rise in the Philippine RGDP would lead to the appreciation of the peso. Another plausible interpretation is that an increase in the RGDP of the foreign trading partner would lead to the appreciation of its currency (or a depreciation of the peso, in this case). However, M1 money stock differential failed to have a significant impact on the spot exchange rates between the Philippines and the major trade partners. This conclusion does not entirely ignore the importance of monetary policy on the stability of exchange rates. It is possible that the impact of monetary policy does not have an instantaneous impact on exchange rate movements. Note also that other measures of money other than M1 money stock may yield results that are closer to what is being described by the PPP hypothesis.

Finally, the analysis showed that T-bill rate differentials have a significant impact on the USD/PHP and EUR/PHP spot exchange rates but not for the JPY/PHP spot exchange rates. Note that despite the influence of the T-bill rate differentials on the spot rates in the two country models, the signs of the coefficients contradict the theoretical expectations under the UIP hypothesis. In this study, an increase in the T-bill rate differential arising from the rise in the 3-month T-bill rate in the Philippines would lead to a depreciation of the spot peso exchange rate vis-à-vis the U.S. dollar or the euro. Similarly, an increase in the T-bill rate differential due to an uptick in the T-bill rate in the U.S. (or EU) would lead to a depreciation of the U.S. dollar (or euro) relative to the Philippine peso. One of the assumptions of the UIP, the perfect substitutability of the investment instruments, may be violated, thus leading to results that contradict the parity condition. Securities from the Philippines, a developing market, may not be generally regarded as a perfect alternative to “safe haven” instruments from advanced economies like Japan, the United States, and the European Union. Despite higher yields from Philippine government securities, particularly 3-month T-bills, investors may opt to purchase the low return but low risk investments from developed markets.

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APPENDIX

Appendix 1. Data Table for Japan - Philippines Model

PERIOD		LNYEN-PESO DIFFERENTIAL	LNRGDP DIFFERENTIAL	LNM1 DIFFERENTIAL	TBILL DIFFERENTIAL
1994	Q1	1.358409158	4.464120071	7.018541629	-13.451
	Q2	1.335001067	4.476563753	6.958930241	-13.131
	Q3	1.32972401	4.502054794	6.920314912	-9.621

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	Q4	1.391281903	4.40126781	6.899165794	-8.131
1995	Q1	1.337629189	4.460493922	6.851123823	-10.071
	Q2	1.184789985	4.618557545	6.855849249	-13.364
	Q3	1.291983682	4.496289053	6.869487766	-9.726
	Q4	1.358409158	4.40654725	6.812051342	-10.636
1996	Q1	1.396244692	4.360278251	6.807636345	-12.386
	Q2	1.413423029	4.342698779	6.812682906	-12.536
	Q3	1.425515074	4.325913126	6.763590329	-11.726
	Q4	1.456286733	4.308490068	6.750418818	-11.216
1997	Q1	1.523880024	4.209404605	6.721591442	-10.146
	Q2	1.510721939	4.214374908	6.683267583	-10.076
	Q3	1.376244025	4.355546487	6.667476589	-13.526
	Q4	1.264126727	4.438636343	6.682844464	-16.326
1998	Q1	1.1442228	4.669763152	6.68474478	-17.456
	Q2	1.238374231	4.563236454	6.649937278	-14.156
	Q3	1.181727195	4.627865669	6.672535269	-14.015
	Q4	1.08180517	4.726620955	6.651324742	-13.295
1999	Q1	1.098612289	4.693999817	6.592440008	-12.626
	Q2	1.156881197	4.624538104	6.59104073	-9.978
	Q3	1.057790294	4.717014482	6.538673689	-8.459
	Q4	0.951657876	4.814862477	6.42964294	-8.37
2000	Q1	0.966983846	4.806469924	6.533105506	-8.785
	Q2	0.932164081	4.828502891	6.520559968	-8.728
	Q3	0.871293366	4.874224554	6.502478127	-8.644
	Q4	0.802001585	4.946432504	6.468270374	-12.193
2001	Q1	0.871293366	4.891909726	6.50341629	-10.8
	Q2	0.879626748	4.859956596	6.508071982	-9.36
	Q3	0.845868268	4.865658371	6.556715868	-9.292
	Q4	0.867100488	4.843195711	6.619865257	-9.367
2002	Q1	0.947789399	4.769357258	6.705414792	-7.148
	Q2	0.924258902	4.776180044	6.686854341	-4.618
	Q3	0.841567186	4.86071032	6.650920004	-4.968
	Q4	0.832909123	4.847992555	6.644418786	-5.225

PERIOD		**LNYEN-PESO DIFFERENTIAL**	**LNRGDP DIFFERENTIAL**	**LNM1 DIFFERENTIAL**	**TBILL DIFFERENTIAL**
2003	Q1	0.78845736	4.879582169	6.648338532	-5.654
	Q2	0.806475866	4.878869019	6.872342068	-6.493
	Q3	0.765467842	4.901124173	6.851777698	-5.226
	Q4	0.678033543	4.974937598	6.820191673	-6.047
2004	Q1	0.647103242	5.00026832	6.804097007	-6.708
	Q2	0.672944473	4.963167733	6.803567569	-7.285
	Q3	0.672944473	4.943308481	6.799534483	-7.432
	Q4	0.631271777	4.96963298	6.775473205	-7.827

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2005	Q1	0.641853886	4.970467299	6.764810479	-7.012
	Q2	0.678033543	4.925652732	6.742189264	-6.18
	Q3	0.683096845	4.902587851	6.72473092	-5.71
	Q4	0.760805829	4.807998239	6.735415145	-5.617
2006	Q1	0.810930216	4.756712737	6.71117051	-4.951
	Q2	0.783901544	4.780041412	6.657208413	-5.02
	Q3	0.815364813	4.735927696	6.60550394	-5.302
	Q4	0.858661619	4.686225543	6.502857095	-4.731
2007	Q1	0.90016135	4.634470455	6.441785443	-2.544
	Q2	0.943905899	4.579869981	6.398363228	-2.347
	Q3	0.943905899	4.574193718	6.399085703	-3.131
	Q4	0.963174318	4.525007003	6.393133757	-3.167
2008	Q1	0.943905899	4.58499971	6.33125946	-3.047
	Q2	0.887891257	4.58258172	6.287673967	0.597
	Q3	0.858661619	4.568874198	6.217220666	-5.061
	Q4	0.683096845	4.741018245	6.16763921	-5.763
2009	Q1	0.672944473	4.744296416	6.16100994	-4.268
	Q2	0.708035793	4.704470569	6.127020093	-4.192
	Q3	0.662687973	4.721242693	6.057548998	-3.889
	Q4	0.652325186	4.717446602	6.050934095	-3.739
2010	Q1	0.678033543	4.702499061	6.015522244	-3.781
	Q2	0.703097511	4.665792659	5.995230237	-3.754
	Q3	0.641853886	4.733913602	5.997059184	-3.85
	Q4	0.636576829	4.710813638	5.98041997	-2.19
2011	Q1	0.631271777	4.706575786	5.986939983	-1.026
	Q2	0.636576829	4.681261477	5.973680293	-1.428
	Q3	0.598836501	4.740091544	5.945262079	-1.346
	Q4	0.576613364	4.746981514	5.917792059	-1.15
2012	Q1	0.609765572	4.704724895	5.910366273	-1.788
	Q2	0.625938431	4.664777482	5.912130718	-2.231
	Q3	0.631271777	4.637812829	5.894409656	-1.362
	Q4	0.678033543	4.577249743	5.881425754	-0.226
2013	Q1	0.819779831	4.417983018	5.815591551	-0.018
	Q2	0.858661619	4.371774459	5.736672288	-0.296
	Q3	0.815364813	4.395967346	5.734084123	-0.687
	Q4	0.832909123	4.368257881	5.692611769	0.057

PERIOD		**LNYEN-PESO DIFFERENTIAL**	**LNRGDP DIFFERENTIAL**	**LNM1 DIFFERENTIAL**	**TBILL DIFFERENTIAL**
2014	Q1	0.828551818	4.355185268	5.662237154	-1.017
	Q2	0.841567186	4.328369811	5.633231904	-1.246
	Q3	0.862889955	4.282906446	5.624509771	-1.257
	Q4	0.936093359	4.204229434	5.607502848	-1.296
2015	Q1	0.985816795	4.146960272	5.592206265	-1.454
	Q2	1.00063188	4.116410352	5.566672424	-1.951
	Q3	0.97455964	4.139284413	5.533040642	-1.895
	Q4	0.951657876	4.138838562	5.511272379	-1.721

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Appendix 2. Data Table for United States - Philippines Model

PERIOD		LNDOLLAR-PESO DIFFERENTIAL	LNRGDP DIFFERENTIAL	LNM1 DIFFERENTIAL	TBILL DIFFERENTIAL
1994	Q1	-3.319722156	5.381070919	5.532296666	-11.83
	Q2	-3.302707046	5.368783696	5.479556317	-10.72
	Q3	-3.266844074	5.35021796	5.432661954	-6.74
	Q4	-3.20280471	5.275212254	5.240353688	-4.48
1995	Q1	-3.225646192	5.326091322	5.271766796	-5.92
	Q2	-3.252068145	5.308352616	5.258751323	-8.62
	Q3	-3.247710734	5.319204348	5.253850816	-4.72
	Q4	-3.262426905	5.312657186	5.096173132	-5.74
1996	Q1	-3.265328014	5.288344942	5.075357045	-7.81
	Q2	-3.265250368	5.299000554	5.075437572	-7.87
	Q3	-3.26619825	5.309125892	5.018322841	-6.96
	Q4	-3.268650904	5.327791286	4.874953226	-6.62
1997	Q1	-3.270712767	5.294969478	4.870316321	-5.46
	Q2	-3.272257324	5.300879598	4.830168478	-5.38
	Q3	-3.394428979	5.573710037	5.082380964	-8.84
	Q4	-3.566262574	5.719027532	5.13485302	-11.61
1998	Q1	-3.706058533	5.778663699	5.106709208	-12.75
	Q2	-3.673244519	5.908866242	5.193794726	-9.52
	Q3	-3.758047084	5.97503583	5.281771581	-9.31
	Q4	-3.704629762	5.871092129	5.047045963	-9.16
1999	Q1	-3.655796539	5.847624063	5.005286799	-8.28
	Q2	-3.637406302	5.826096055	4.954666119	-5.56
	Q3	-3.669650756	5.921652169	4.979720324	-3.79
	Q4	-3.699482225	5.912025056	4.765951583	-3.73
2000	Q1	-3.704887299	5.900987473	4.904653923	-3.36
	Q2	-3.73483703	5.965746624	4.936822157	-3.05
	Q3	-3.806589152	6.030628227	4.991433792	-2.98
	Q4	-3.896949976	6.115584745	4.967253063	-6.9
2001	Q1	-3.89674895	6.08302434	4.999019404	-5.96
	Q2	-3.926664623	6.141121836	5.050224684	-5.7
	Q3	-3.954199615	6.106861599	5.156588973	-6.03
	Q4	-3.948111274	6.1164194	5.075708694	-7.44
2002	Q1	-3.936764415	6.101238435	5.056120885	-5.42
	Q2	-3.920202769	6.077396808	5.000565094	-2.91
	Q3	-3.941702208	6.125228137	5.01829636	-3.32
	Q4	-3.974902051	6.124130295	4.946220886	-3.88
2003	Q1	-3.990397876	6.105371821	5.005342765	-4.52
	Q2	-3.968486537	6.12401721	5.042383297	-5.45
	Q3	-3.999598505	6.152315506	5.065586655	-4.33

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	Q4	-4.011982356	6.16318674	4.977118426	-5.13
2004	Q1	-4.024747961	6.141352499	5.019043053	-5.8
	Q2	-4.023767075	6.143316899	5.022098913	-6.22
	Q3	-4.025352299	6.14234123	5.045407701	-5.95
	Q4	-4.030376566	6.142817221	4.953526359	-5.83
PERIOD		**LNDOLLAR-PESO DIFFERENTIAL**	**LNRGDP DIFFERENTIAL**	**LNM1 DIFFERENTIAL**	**TBILL DIFFERENTIAL**
2005	Q1	-4.007449527	6.104837237	4.93399645	-4.49
	Q2	-4.00132668	6.119301081	4.936444492	-3.31
	Q3	-4.02603422	6.125972314	4.927150147	-2.34
	Q4	-4.000522799	6.068294414	4.807397934	-1.79
2006	Q1	-3.949015623	6.009475449	4.779350614	-0.65
	Q2	-3.955361497	6.058701926	4.771209439	-0.66
	Q3	-3.93938264	5.994629489	4.678002163	-0.72
	Q4	-3.907440521	5.963399256	4.505019048	-0.26
2007	Q1	-3.88371202	5.902702171	4.436385306	1.85
	Q2	-3.848704697	5.864579244	4.360124751	1.78
	Q3	-3.827410938	5.846861683	4.379376293	0.71
	Q4	-3.771540279	5.738505041	4.203432665	-0.21
2008	Q1	-3.712446222	5.756334076	4.204855123	-1.52
	Q2	-3.761217185	5.788842481	4.245438402	1.64
	Q3	-3.817898392	5.813765588	4.286431437	-4.04
	Q4	-3.880226805	5.819703001	4.281048139	-5.73
2009	Q1	-3.865977652	5.847152086	4.303315543	-4.31
	Q2	-3.868739643	5.830047277	4.323115759	-4.17
	Q3	-3.874294126	5.798245424	4.259520253	-3.87
	Q4	-3.845204897	5.756944774	4.18456072	-3.79
2010	Q1	-3.829233244	5.70476982	4.163628786	-3.8
	Q2	-3.817905719	5.726684881	4.176983202	-3.73
	Q3	-3.812692418	5.679345615	4.140381516	-3.81
	Q4	-3.775756426	5.676762918	4.107905752	-2.18
2011	Q1	-3.779567604	5.636310997	4.139869027	-1.01
	Q2	-3.76689397	5.646115942	4.16238742	-1.47
	Q3	-3.75541053	5.657099499	4.218342071	-1.41
	Q4	-3.771798779	5.660218672	4.174114788	-1.23
2012	Q1	-3.762263897	5.603513197	4.184728235	-1.83
	Q2	-3.755975654	5.583950999	4.191649545	-2.24
	Q3	-3.735282661	5.562870317	4.214557692	-1.36
	Q4	-3.718284537	5.53737778	4.164475505	-0.22
2013	Q1	-3.706346845	5.501553352	4.122005857	0.03
	Q2	-3.732471198	5.552718631	4.109726754	-0.34
	Q3	-3.77697887	5.541775412	4.1060358	-0.68
	Q4	-3.775373598	5.569579822	4.075677077	0.06
2014	Q1	-3.80379319	5.553992012	4.106347169	-1
	Q2	-3.787084697	5.526689372	4.072157933	-1.24
	Q3	-3.778940276	5.554901538	4.08851043	-1.23
	Q4	-3.802484126	5.536403673	4.050557565	-1.26
2015	Q1	-3.793776122	5.524546389	4.06902878	-1.45

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	Q2	-3.799281993	5.52888235	4.048601016	-1.93
	Q3	-3.829780611	5.566544947	4.055205665	-1.8
	Q4	-3.847291768	5.554104478	4.018940249	-1.57

Appendix 3. Data Table for European Union - Philippines Model

PERIOD		LNEURO-PESO DIFFERENTIAL	LNRGDP DIFFERENTIAL	LNM1 DIFFERENTIAL	TBILL DIFFERENTIAL
1999	Q1	-3.77269594	4.135837602	5.61301614	-10.43
	Q2	-3.695300022	4.092080873	5.553009619	-7.47
	Q3	-3.717690536	4.093046006	5.527799334	-5.38
	Q4	-3.738489955	4.095773724	5.34855188	-4.61
2000	Q1	-3.693289163	4.055926146	5.46558103	-4.67
	Q2	-3.667901048	4.065618597	5.448098237	-4.31
	Q3	-3.70745084	4.068884456	5.473432752	-5.12
	Q4	-3.756730121	4.11188755	5.440545397	-9.58
2001	Q1	-3.818077393	4.208609815	5.552111942	-5.31
	Q2	-3.79246377	4.205697966	5.549879126	-4.76
	Q3	-3.838772544	4.216830378	5.662395393	-5.14
	Q4	-3.837843607	4.196843526	5.608306716	-5.87
2002	Q1	-3.80586281	4.166919344	5.553975889	-6.73
	Q2	-3.835988319	4.219835603	5.592838959	-3.75
	Q3	-3.925614959	4.2887109	5.674697703	-3.79
	Q4	-3.974962805	4.30116006	5.646044927	-4.12
2003	Q1	-4.098955175	4.421191095	5.820325428	-5.01
	Q2	-4.097750355	4.43695399	5.864100303	-6.26
	Q3	-4.119047175	4.429930572	5.88821102	-4.86
	Q4	-4.184488112	4.475961582	5.860774222	-4.94
2004	Q1	-4.248195287	4.52159349	5.954972683	-4.89
	Q2	-4.210429041	4.498060195	5.947672498	-4.99
	Q3	-4.22673375	4.495094118	5.991236862	-5.33
	Q4	-4.288900657	4.540278594	5.956295105	-6.13
2005	Q1	-4.278748285	4.529380026	5.984007012	-5.67
	Q2	-4.232917212	4.482266246	6.016004341	-4.7
	Q3	-4.225364825	4.461432174	6.017112292	-3.85
	Q4	-4.174037331	4.401336765	5.923679609	-3.51
2006	Q1	-4.133917337	4.366526924	5.887626294	-2.08
	Q2	-4.184488112	4.413825564	5.934479166	-2.03
	Q3	-4.182520253	4.394133552	5.919508604	-2.38
	Q4	-4.162409293	4.37460708	5.770021035	-1.38
2007	Q1	-4.154094567	4.369867818	5.712227162	0.8
	Q2	-4.147745339	4.339252132	5.705044792	0.47
	Q3	-4.145216893	4.322586883	5.754625754	-0.38
	Q4	-4.134541752	4.312326078	5.644450432	-1
2008	Q1	-4.117203856	4.319950133	5.599941275	-1.24
	Q2	-4.20773725	4.374390031	5.676006007	1.45
	Q3	-4.22673375	4.355120857	5.655359977	-5.27
	Q4	-4.152821492	4.276214354	5.479529245	-7.99

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2009	Q1	-4.13142357	4.276888742	5.507776339	-9.37
	Q2	-4.177291483	4.28454988	5.577542524	-9.04
	Q3	-4.231539801	4.317566613	5.610580721	-7.9
	Q4	-4.237060864	4.322976113	5.557115989	-5.45
PERIOD		**LNEURO-PESO DIFFERENTIAL**	**LNRGDP DIFFERENTIAL**	**LNM1 DIFFERENTIAL**	**TBILL DIFFERENTIAL**
2010	Q1	-4.155369264	4.229832614	5.473695998	-2.85
	Q2	-4.058784387	4.10774313	5.401443006	-1.64
	Q3	-4.068676815	4.110058607	5.41323557	-1.58
	Q4	-4.082811326	4.12640307	5.345009903	0.04
2011	Q1	-4.09234656	4.15092979	5.361540652	1.84
	Q2	-4.130801099	4.172823185	5.412789439	0.47
	Q3	-4.101369177	4.129937122	5.363227819	0.07
	Q4	-4.069847091	4.077525624	5.252074908	-0.59
2012	Q1	-4.033061334	4.026611258	5.22312831	-2.4
	Q2	-4.005784385	3.984670357	5.2364357	-3.16
	Q3	-3.960163381	3.908668871	5.198551379	-2.42
	Q4	-3.977628763	3.901050734	5.144915263	-1.41
2013	Q1	-3.985131477	3.893469687	5.126039208	-1.24
	Q2	-3.99976192	3.901921177	5.074291512	-0.84
	Q3	-4.058205516	3.9387907	5.130153213	-0.75
	Q4	-4.083404622	3.951414144	5.051508023	0.61
2014	Q1	-4.119047175	3.985280197	5.099099197	0.26
	Q2	-4.103183511	3.952832664	5.070572364	-0.31
	Q3	-4.06168378	3.894427765	5.039845763	-0.27
	Q4	-4.026872847	3.841668299	4.963965107	-0.13
2015	Q1	-3.914025008	3.747639589	4.891850707	0.17
	Q2	-3.900588628	3.714846084	4.876181563	0.03
	Q3	-3.936828124	3.727272642	4.903878335	0.12
	Q4	-3.93888046	3.710743629	4.84938039	0.23

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