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Is Real Appreciation or More Government Debt Contractionary? The Case of the Philippines

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Abstract

This paper has studied the impacts of the exchange rate, government debt as a percent of GDP and other relevant macroeconomic variables on aggregate output in the Philippines. A simultaneous-equation model consisting of aggregate demand and short-run aggregate supply is applied. The dummy variable technique is employed to detect whether the slope and intercept of the real effective exchange rate may have changed. Real depreciation during 1998.Q1 - 2006.Q3, real appreciation during 2006.Q4 - 2016.Q1, a lower domestic debt as a percent of GDP, a lower real interest rate, a higher stock price or a higher lagged real oil price would raise aggregate output.
Recent trends of real peso appreciation, declining domestic debt as a percent of GDP, lower real interest rates, and rising stock prices are in line with the empirical results and would promote economic growth. The authorities may need to continue to pursue fiscal prudence and maintain a stronger peso as the positive effect of real appreciation dominates its negative effect in recent years.

Keywords: Exchange Rates, Government Debt, Oil Prices, Stock Prices, Interest Rates.

1. Introduction

Economic performance in the Philippines was robust in 2015. Real GDP grew 5.9%. Consumption and investment expenditures showed rapid growth. Strong job creation in the labor market led to a 6.3% unemployment rate. The inflation rate of 1.4% fell into the inflation target range of 2% - 4% set by the Bangko Sentral ng Pilipinas (BSP) mainly due to lower commodity prices. Its fiscal standing was strong as evidenced by a relatively small government deficit of 1.4% of GDP. Its external position was represented by a current account surplus of 2.9% of GDP and international reserves of US$81 billion, which was equivalent to eleven months of imports (International Monetary Fund, 2016).
Since 1984, the Philippines has adopted a freely floating exchange rate regime. The central bank may intervene in the foreign exchange market in order to maintain stable and orderly market conditions. The Philippine peso has been fluctuating over the years. Before the Asian financial crisis, the PHP/USD exchange rate was relatively stable and stayed at 26.37 pesos per U.S. dollar in 2007.Q2. Due to the Asian financial crisis, it depreciated as much as 62.53% and reached 42.86 in 1998.Q3. After the Asian financial crisis, the freely floating exchange rate system caused the exchange rate to continue rising to a high of 56.28 in 2004.Q4. Since then, it appreciated 27.24% and reached 40.95 in 2008.Q1. The global financial crisis caused the peso to depreciate as much as 17.58%, and the exchange rate reached 48.15 by 2009.Q3. In recent years, the peso depreciated from 40.7 in 2013.Q1 to 46.52 in

2016.Q2. Whether recent peso depreciation would increase or reduce aggregate output remains to be addressed. In fiscal policy, its domestic debt was 30.38% of GDP in 2016.Q1. Its external debt was pretty small. Whether more government debt as a percent of GDP may raise aggregate output needs to be examined.
This paper focuses on the impacts of the PHP/USD exchange rate and government debt as a percent of GDP on aggregate output. This study applies the AD/AS model and a simultaneous-equation system in formulating a theoretical framework. Other potential relevant economic variables will be considered. Potential supply shocks due to change in oil prices will be incorporated in the model.

2. The Model

Suppose that aggregate demand is determined by the inflation rate, government spending, government revenue, the real interest rate, the stock price, and the real effective exchange rate and that short-run aggregate supply is a function of the inflation rate, the real effective exchange rate, the real oil price, and the expected inflation rate. We can express aggregate demand and short-run aggregate supply as:

$$AD = f(\pi, G, T, R, S, \varepsilon) \tag{1}$$

$$AS = g(\pi, \varepsilon, E, \pi^e) \tag{2}$$

where
AD = aggregate demand or real GDP demanded,
π = the inflation rate,
G = government spending,
T = government revenue,
R = the real interest rate,
S = the stock price,
ε = the real effective exchange rate (An increase means real appreciation.),
AS = short-run aggregate supply or real GDP supplied,
E = the real oil price per barrel, and
π^e = the expected inflation rate.
Solving for the two endogenous variables, real GDP and the inflation rate, we can find equilibrium real GDP as:

$$Y^* = h(\varepsilon, G - T, R, S, E, \pi^e) \tag{3}$$

To measure the impact of fiscal policy, we replace G – T with government debt as a percent of GDP (D):

$$Y^* = v(\varepsilon, D, R, S, E, \pi^e) \tag{4}$$
$$? \quad ? \quad -+ \quad ? \quad -$$

Real appreciation may be expansionary or contractionary. Real appreciation tends to make Philippine-made goods more expensive and reduce exports but tends to reduce import costs and reduce domestic inflation. In addition, real appreciation is expected to cause capital inflows and increase domestic investment spending as it would cost less to convert the Philippine peso into a foreign currency. Several studies have examined the impact of the exchange rate on aggregate output based on samples including the Philippines. Gylfsaon and Risager (1984), Bahmani-Oskooee and Miteza (2006), Kim and Ying (2007), An, Kim and Ren (2014), and Kim, An and Kim (2015) find that real depreciation is contractionary whereas Nunnenkamp and Schweickert (1990) cannot find support for the contractionary devaluation hypothesis. Bahmani-Oskooee, Chomsisengphet, and Kandil (2002) indicate that real depreciation is expansionary. Edwards (1986) reveals that real depreciation is contractionary in the first year, expansionary in the second year and neutral in the long run.
The impact of more government debt/deficit as a percent of GDP on aggregate output remains inconclusive, depending upon whether the positive effect of increased government spending on aggregate demand and the negative effect such as decreased private spending and exports due to crowding-out and a stronger peso caused by a higher interest rate. Several studies including the Philippines in the sample have examined the impact of government debt on economic growth. Reinhart and Rogoff (2010) maintain that government debt as a percent of GDP greater

than 90% would dampen economic growth. Kumar and Wu (2010) reveal that there is a nonlinear negative relationship between initial debt and growth and that a 10 percentage-point increase in the initial debt as a percent of GDP would lead to a 0.2 percentage-point decrease in per capita real GDP growth. Égert (2012) shows that there is a nonlinear negative relationship between government debt and growth and that the threshold of government debt as a percent of GDP is much lower and between 20% and 60%. Swamy (2015) reports that the debt threshold for developing countries is estimated to be 84.17% and that a 10 percentage-point increase in the debt/GDP ratio beyond the debt threshold would reduce the growth rate of real GDP by 10 to 30 base points.

In studying the impact of fiscal policy, Feldstein (1982), Aisen and Hauner (2013), Cebula (2014a, 2014b), Cebula, Angjellari-Dajci, and Foley (2014) show that more government deficit as a percent of GDP raises the real interest rate whereas Barro (1974, 1989), McMillin (1986), Gupta (1989), Darrat (1989, 1990), Findlay (1990), Ostrosky (1990) argue that more government deficit has a neutral impact or does not affect the real interest rate.

A higher real oil price causes a negative supply shock and shifts short-run aggregate supply to the left. On the other hand, when a higher real oil price is driven by aggregate demand, its impact may be positive in the short run (Hamilton, 1996; Kilian, 2008a, 2008b).

An analysis of the scatter diagram (Figure 1) shows that the relationship between real GDP and the real effective exchange rate seem to have a negative relationship during 1998.Q1 – 2006.Q3 and a positive relationship during 2006.Q4 – 2016.Q1. Thus, a slope dummy variable and an intercept dummy variable are included in the estimated equation:

$$Y^* = \omega(\varepsilon, \varepsilon \times B, B, D, R, S, E, \pi^e) \qquad (5)$$
$$\quad - \quad + \quad - \; ? \; - \; + \; ? \; -$$

3. Empirical Results

The data were collected from IMF's *International Financial Statistics* and the Bangko Sentral ng Pilipinas (BSP). Real GDP is measured in million pesos. The real effective exchange rate is an index with weights based on trade with other countries. The real exchange rate defined as units of the peso per U.S. dollar times relative prices in the U.S. and the Philippines is not used because the Bangko Sentral ng Pilipinas (BSP) is using the real effective exchange rate in the analysis of exchange rate policy. An increase means an appreciation of the peso. Due to lack of the data for external debt after 2015.Q2, domestic debt as a percent of GDP is selected to represent fiscal policy.

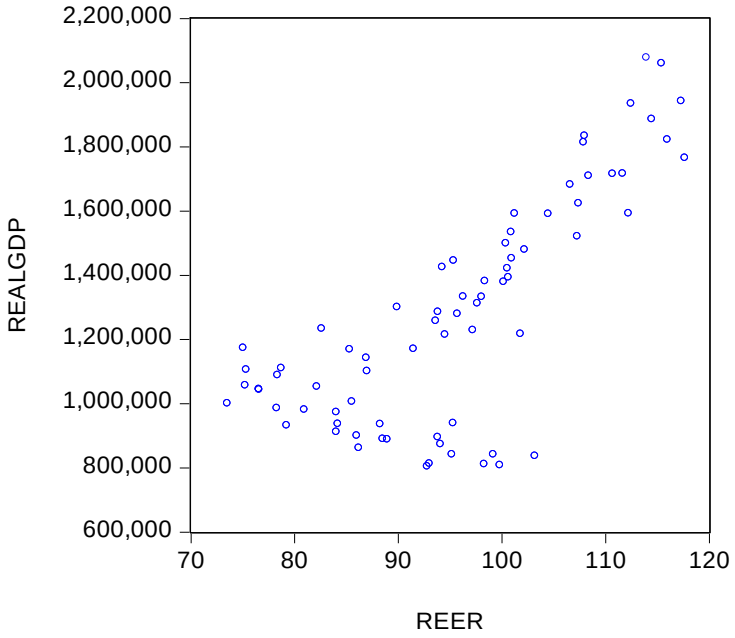

Figure 1: Scatter Diagram between Real GDP (REALGDP) and the Real Effective Exchange Rate (REER)

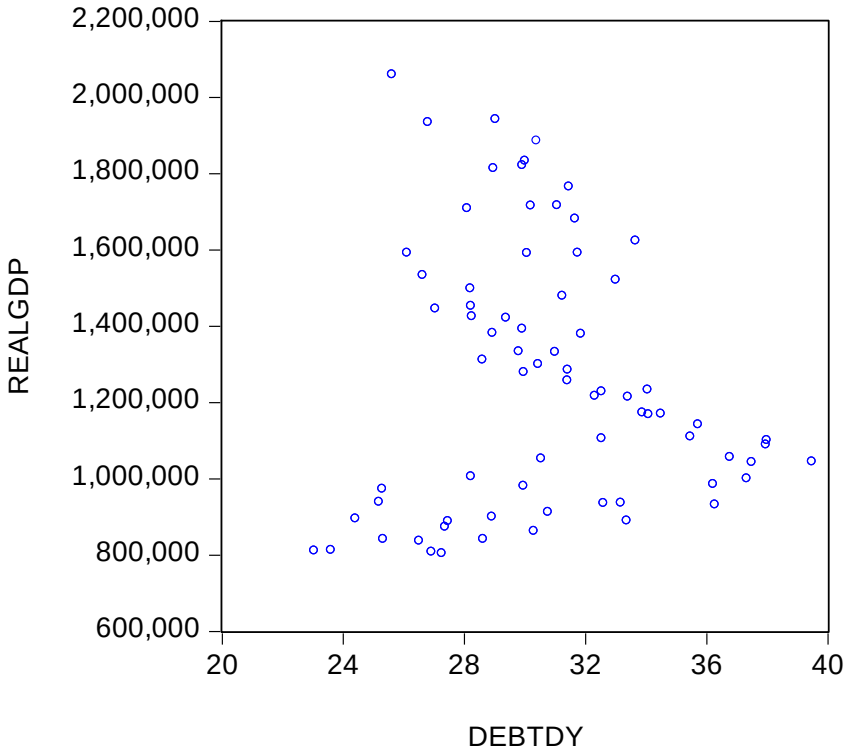

Figure 2: Scatter Diagram between real GDP and government debt as a percent of GDP (DEBTDY)

The real interest rate is represented by the lending rate minus the inflation rate. The stock price is represented by the equity index. Lagged real oil price per barrel measured in the peso is used to represent the real energy cost. The expected inflation rate is represented by the lagged inflation rate. The sample ranges from 1998.Q1 to 2016.Q and has a total of 73 observations.

The ADF test on the residuals shows that the test statistic of -3.8012 is greater than the critical value of -3.5300 in absolute values at the 1% level. Hence, these time series variables have a long-term stable relationship.

Table 1 presents the estimated regression. Approximately 95.04% of the variation in real GDP can be explained by the right-hand side variables with significant coefficients. Except for the expected inflation rate, all other coefficients are significant at the 1% or 10% level. Real GDP has a negative relationship with the real effective exchange rate during 1998.Q1 – 2006.Q3, domestic debt as a percent of GDP, and the real interest rate and a positive relationship with the real effective exchange rate during 2006.Q4 – 2016.Q1, the stock price and the real oil price. The slope of the real effective exchange rate changed to 1.3454 during 2006.Q4 – 2016.Q1, and the intercept declined by 10.6775 during 2006.Q4 – 2016.Q1. In other words, a 1% real appreciation of the peso would reduce real GDP by 1.0584% during 1998.Q1 – 2006.Q3 but raise real GDP by 1.3454% during 2006.Q4 – 2016.Q1. A 1% increase in domestic debt as a percent of GDP would reduce real GDP by 0.2409%. A higher stock price raises household wealth, consumption spending, and real GDP. The mean absolute percent error (MAPE) is estimated to be 4.5703%, suggesting that the forecast error is relatively small and the model can capture most of the variation in real GDP.

When total debt as a percent of GDP is used to represent fiscal policy, the sample ranges from 1998.Q1 to 2005.Q2 due to lack of data after 2005.Q2 and has 70 observations. Its coefficient is estimated to be -0.2238 and significant at the 1% level. The estimated coefficient is pretty close to the value when domestic debt as a percent of GDP is used in Table 1. Other results are similar. When the lagged dependent variable is included as an explanatory variable to test the partial adjustment model, its positive coefficient is insignificant at the 10% level. If U.S. real GDP is included to represent world income, its positive coefficient is significant at the 1% level. However, due to a high

degree of multicollinearity, the coefficient of the real oil price changes the sign and becomes insignificant, and the positive coefficient of the stock price becomes insignificant at the 10% level.

Table 1: Estimated Regression of Log(Real GDP) for the Philippines

Variable	Coefficient	z-Statistics
Intercept	18.55708	15.18869
Log(real effective exchange rate)	-1.058440	-4.312646
Log(real effective exchange rate)*Dummy variable	2.403846	9.970928
Dummy variable	-10.67750	-9.743633
Log(debt as a percent of GDP)	-0.240919	-2.238943
Real interest rate	-0.014505	-2.607723
Log(stock price)	0.091672	2.292844
Log(lagged real oil price)	0.067923	2.202983
Expected inflation rate	-0.004093	-0.742599
R-squared	0.950416	
Adjusted R-squared	0.942419	
Akaike info criterion	-2.582270	
Schwarz criterion	-2.237133	
Methodology	EGARCH	
Sample period	1998Q1 2016Q1	
Number of observations	73	

4. Summary and Conclusions

This paper has studied the impacts of the exchange rate, government debt as a percent of GDP and other relevant macroeconomic variables on aggregate output in the Philippines. A simultaneous-equation model consisting of aggregate demand and short-run aggregate supply is applied. The dummy variable technique is employed to detect whether the slope and intercept of the real effective exchange rate may have changed. Real depreciation during 1998.Q1 - 2006.Q3, real appreciation during 2006.Q4 - 2016.Q1, a lower domestic debt as a percent of GDP, a lower real interest rate, a higher stock price or a higher lagged real oil price would raise aggregate output.

Recent trends of real peso appreciation, declining domestic debt as a percent of GDP, lower real interest rates, and rising stock prices are in line with the empirical results and would promote economic growth. The authorities may need to continue to pursue fiscal prudence and maintain a stronger peso as the positive effect of real appreciation dominates its negative effect in recent years.

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