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IS STRONG DOLLAR ENHANCING US ECONOMIC GROWTH?

ABSTRACT

In this study, we measure the real output effect of the appreciation in the value of US dollar measured by US dollar index (USDI). Our dependent variable is percentage change in US real GDP and the independent variable is percentage change in US dollar index. We applied the vector error correction model on those variables using US data from 1974 to 2019. We found that any increase in US dollar index would negatively affect US real GDP with a one-period lag. So, we concluded that a strong dollar would have a negative impact on US economy.

JEL Classification: E01; E22; F31; F43
Key Words: US Dollar Index; US Real Output; Vector Error Correction

RIASSUNTO

Il dollaro forte favorisce la crescita economica degli USA?

In questo articolo si stima l'effetto dell'apprezzamento del dollaro USA sul PIL reale degli Stati Uniti tramite l'indice USDI (US dollar index). La variabile dipendente di questo studio è rappresentata dalla variazione di percentuale nella produzione reale degli USA, mentre la variabile indipendente è la variazione di percentuale nell'indice USDI. Il modello applicato alle due variabili è il vector error correction model, su un intervallo temporale compreso tra il 1974 e il 2019. I risultati indicano che qualunque aumento dell'indice USDI influenza negativamente il PIL reale con un ritardo pari ad una unità. La conclusione è che un dollaro forte avrebbe un'influenza negativa sull'economia USA.

1. Introduction

When a nation's currency appreciates, in other words, its exchange rate falls, domestic products become more expensive to foreigners and foreign products become cheaper to domestic consumers. This phenomenon causes a decline in nation's export and rise in its import causing a decline in the nation's next export, which in turn lowers the aggregate demand and thereby the nation's real output. But since US dollar is also a trading and investment currency, when US dollar appreciates the rate of return on US assets in terms of their own currency rises for foreign investors causing capital inflow into the US. This subsequently raises the investment in the US thereby raising US real output and compensating the loss in real output caused by the fall in net export. If the later effect is stronger than the former, an appreciation in US dollar will raise the real output in the US, otherwise it will lower the real output.

In this study, we attempt to measure the real output effect of the appreciation in US dollar measured by the rise in US dollar index (USDI).

A whole host of literature can be seen on this issue. For example, a study by Yue ad Lee (2017) examines the impact of USD exchange rate on economic growth and the environment in the US by using a Structural Vector Auto-regression model and finds USD exchange rate to be positively related to petroleum consumption, net imports in pollution intensive industries, real GDP and CO2 emissions. The study, however, does not explain the channel through which the impact occurs.

A study by Dvoskin *et al.* (2024) investigates the distributive effects of the external constraint on Argentina during 2004-2022 using the exogenous distribution model for a small open economy with technical and financial dependencies under foreign exchange controls by applying the vector error correction model. The study finds that the depreciation of the local currency to have a negative impact on the real wage in Argentina causing a redistribution of income against the labor.

Feijo (2024) examines the effect of exchange rate misalignment on Brazil's industry since 2000. He finds that while the Brazilian economy was in an expansionary phase in the 2000s due to the excellent performance of the external sector. However, the exchange rate misalignment and

overvaluation trend of the domestic currency together with the financial integration of a peripheral economy led to the country's deindustrialization.

Gong (2017) examines the factors that are influencing dollar exchange rate fluctuation after financial crisis and find US GDP, rate of inflation, fiscal balance, the current account balance, and the international price of gold to be the influencing factors with the GDP being the most important. This paper does not, however, examine the reverse relationships.

A study by Alvan and Sediqi (2022) examines the relationship between trade weighted dollar and the financial assets such as spot gold price, inflation rate, interest rate, 10-year US government bonds, treasury security, inflation-indexed security, treasury security, and S&P500 index and finds a negative relationship between the dollar index and the variables other than the inflation rate.

Park and Jeong (2010) examine the impact of won appreciation against the dollar on S. Korean economy and found a 10 percent decline in the won/dollar exchange rate to lower the economic growth by more than 1 percentage point.

A study by Long (2017) concludes that a rising U.S. dollar would not only hurt volatile and vulnerable economies by suppressing their purchasing power, worsening their dollar debt and triggering capital flight out of those countries, but given the current heavy fiscal deficit, it would also not necessarily benefit the U.S.

Rodrik (2008), in his study, has shown that undervaluation of the currency (a high real exchange rate) stimulates economic growth.

Similarly, a study by Rapeti *et al.* (2012) that uses alternative classification criteria and empirical strategies to evaluate the existence of asymmetries between groups of countries find that the effect of currency undervaluation on growth is indeed larger and more robust for developing economies.

Habit *et al.* (2017) investigate the impact of real exchange rate movements on economic growth based on five-year average data for a panel of over 150 countries in the post Bretton Woods period. They used country-specific instruments, such as global capital flows, financial openness and the growth rate of official reserves and find that a real appreciation (depreciation) reduces

(raises) annual real GDP growth. But their results confirm the effect only for developing countries and for pegs.

Our study is unique and will make a significant contribution to the literature in many ways. For example, first we develop a model based on the monetary equation to establish the relationship between the economic growth and the growth of US dollar index, which has not been done before at least to our knowledge. Second, we describe various channels, capital flows, investment, and net export through which change in dollar exchange rate can affect the US economic growth, which has also not been done before. Third, we use structural VECM model and examine both the short run and the long run effect of the change in US dollar index (US dollar trade weighted index) on US economic growth.

The organization of this study has been as following. We develop our model in section-2, describe the data sources in section-3, present empirical analyses in section-4, and conclude our findings, offer policy prescription, and express the limitation of this study in section-5.

2. The model

We develop a model based on the Absolute Purchasing Power (APP) theory and the Monetary Theory of Money Demand. The APP theory states that the exchange rate between the currencies of two nations equals the ratio of the price levels in the two nations, that is,

$$R = \frac{P}{P^*} \tag{1}$$

Where, R is the exchange rate between the currencies of two nations, P is the domestic price level, and P^* is the foreign price level. Further, the Monetary Theory of Money Demand states that the demand for money (M) in an economy equals the ratio of nominal GDP (i.e. price level, P, times the real GDP, Y) and the velocity of money (V) in that economy. That is,

$$M = \frac{PY}{V} \tag{2}$$

Equation 2 can be rearranged as,

$$P = \frac{MV}{Y} \tag{3}$$

For a foreign nation, equation 3 can be expressed as,

$$P^* = \frac{M^*V^*}{Y^*} \tag{4}$$

Where, * sign indicates any foreign nation. Combining equations 3 and 4 yields,

$$R = \frac{MVY^*}{M^*V^*Y} \tag{5}$$

Taking total differentiation of equation 5 yields,

$$dR = dM + dV + dY^* - dM^* - dV^* - dY \tag{6}$$

Since velocity of money depends on institutional arrangement, which does not change frequently, it is safe to assume V and V* to be constant. Therefore, equation 6 can be written as,

$$dR = dM + dY^* - dM^* - dY \tag{7}$$

After rearrangement, equation 7 can be written as,

$$dY = dM + dY^* - dM^* - dR \tag{8}$$

If we let the total of the mean effects of variables, $dM, dY^* and\ dM^*$ be measured by coefficient a, the total of their random effects be measured by the error term e, and that of -1 by coefficient b, then equation 8, in its stochastic form, can be written as,

$$dY_t = a + bdR_t + e_t \tag{9}$$

Replacing dY_t by RGDPGR (real GDP growth rate) and dR_t by DIGR (percentage change in US dollar index), equation-10 can be written as,

$$RGDPGR_t = a + bDIGR_t + e_t \tag{10}$$

If b turns out to be positive (negative) and statistically significant, it will imply that increase in dollar index (dollar's exchange rate or strength) will enhance (lower) the US real GDP growth.

3. The data

The data on RGDPGR (growth rate of US real GDP) has been obtained from Statista: Annual Growth of Real GDP in the USA from 1930 to 2021(https://www.statista.com/statistics/996758/rea-gdp-growth-united-states-1930-2019/) and that on DI (US dollar index) from Macrotrends: https://www.macrotrends.net/1329/us-dollar-index-historical-chart. Our data covers the period from 1974 to 2019.

4. Empirical analysis

In order to determine if any long-run relation exists between our two model variables, we first need to make sure they are integrated of the same order. To that end, we applied the augmented Dickey-Fuller test, which produced the following results:

Table 1 -

Variable	t-statistic	Critical Value at 5%	Stationary?
RGDPGR	-5.109225	-2.925169	Yes
DIGR	-4.875932	-2.928142	Yes

The above result indicates that both model variables are integrated of the same order, that is, 0. It means a long-run relation may exist between the two variables. To determine this, we conducted the Johansen cointegration test. But since the test is sensitive to lag length, we must first determine the appropriate lag length. So, we ran a vector autoregressive model, which produced the following results.

Table 2 -

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-210.5274	NA*	109.0115	10.36719	10.45078*	10.39763*
1	-206.2134	7.996632	107.4088	10.35187	10.60264	10.44319
2	-201.8971	7.579735	105.9774*	10.33645*	10.75439	10.48864

The results show that the appropriate lag length is 0-2. So, using a lag length of 1 we conducted the Johansen cointegration test that yielded the following results.

TABLE 3 -

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		**Trace**	**0.05**	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.348546	28.49672	15.49471	0.0003
At most 1	0.208751	10.06811	3.841465	0.0015
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		**Max-Eigen**	**0.05**	
No. of CE(s)	**Eigenvalue**	**Statistic**	**Critical Value**	**Prob.****
None *	0.348546	18.42761	14.26460	0.0104
At most 1	0.208751	10.06811	3.841465	0.0015

Both Rank Test and Maximum Eigenvalue tests indicate that there are two cointegrating vector among our model variables. Therefore, we ran a vector error correction model to determine a long-run and a short-run relationship between our model variables and obtained the following results.

Long-Run Equation:

$$RGDPGR_t = 2.793798 + \underset{(1.44741)}{0.119151} IDIGR_t \quad (11)$$

Short-Run Equation:

$$\Delta RGDPGR_t = \underset{(-4.1015)}{-0.767241} ECT + \underset{(1.0151)}{0.1581} \Delta RGDPGR_{t-1} + \underset{(1.2921)}{0.1766} \Delta RGDPGR_{t-2} - \underset{(-3.3990)}{0.1492} \Delta DIGR_{t-1}$$

$$\underset{(-0.8402)}{-0.0388} \Delta DIGR_{t-2} - \underset{(-0.3278)}{0.0838} \quad (12)$$

The figures in parentheses are corresponding t-values. The critical t-value for 37 (= n – k = 43 – 6) degrees of freedom is 2.021. The only coefficient that is statistically significant is that associated with the variable, $\Delta DIGR_{t-1}$, in the short-run equation, which is negative implying that any increase in US dollar index will negatively affect US real GDP with a one-period lag. The result is quite logical as a rise in US dollar's value makes US products more expensive to foreigners and foreign product cheaper to US consumers causing a fall in US export and a rise US import, thereby making US net export and eventually the US aggregate demand to fall causing a decline in US real output. However, since export and import deals are signed in advance and businesses are reluctant to immediately adjust the domestic prices in line with a change in exchange rates due to the fear of losing market share if prices are raised and falling into a price war if prices are lowered. Therefore, a resulting change in domestic prices in response to a change in the exchange rate only occurs with a time lag. Since price effect of an exchange rate change occurs with a time lag, its effect on net export thereby on real aggregate demand and ultimately on the real output also occurs with a time lag. So, our study finds that a strong dollar will have negative impact on US economy with a one-period lag. Our study also finds that the negative effect of US dollar appreciation on US real GDP through the resulting decline in net export is stronger than its positive effect on US real GDP through the resulting rise in gross private domestic investment resulting, thereby, in net negative effect on US real GDP.

5. Summary and conclusion

An appreciation of a nation's currency causes a decline in the nation's export and rise in its import causing a decline in the nation's net export and thereby the aggregate demand resulting in the decline in the nation's real output. However, since US dollar is also a trading and an investment currency, when US dollar appreciates the rate of return on US assets in terms of their own currency rises for foreign investors causing capital inflow into the US. This subsequently raises the investment in the US raising US real output compensating some of the loss in real output caused by the fall in net export. If the investment effect is stronger than the net export effect, an appreciation of US dollar will raise the real output in the US, otherwise just the opposite happens.

In this study, we measure the real GDP effect of the appreciation in the value of US dollar measured by US dollar index (USDI). Our dependent variable is percentage change in US real

GDP and the independent variable is percentage change in US dollar index – a composite measure of US dollar exchange rates. We applied the vector error correction model on those variables using US data from 1974 to 2019. The only coefficient that we found to be statistically significant was the one that was associated with the variable, $\triangle \mathrm{DIGR}_{t-1}$, which was negative and significant implying that any increase in US dollar index would negatively affect US real GDP with a one-period lag. So, we concluded that a strong dollar, in other words, any appreciation in US dollar index would have negative impact on US economy. Our result is quite logical. This is because, export and import deals are signed in advance and businesses are reluctant to immediately adjust the domestic prices in line with a change in exchange rates due to the fear of losing market share if prices are raised and falling into a price war if prices are lowered. As such, a resulting change in domestic prices in response to a change in the exchange rate only occurs with a time lag. This price effect of an exchange rate change then affects net export and thereby the real aggregate demand and ultimately the real output with a time lag. So, our study finds that a strong dollar will have negative impact on US economy with a one-period lag.

The findings of this study point to several policy implications. First, the Federal Reserve, in its attempt to clamp down inflation, uses a contractionary monetary policy, which raises the domestic rate of interest causing a capital inflow thereby making the US dollar stronger and causing a decline in US economy. So, the Federal Reserve should be careful about not using its contractionary policy to the extent that harms the economy, which it attempts to protect by clamping down the inflation. Second, the increasing amount of US national debt makes the United States increasingly rely upon foreign lenders as the domestic financial market alone cannot meet the scale of US government borrowing needs, which then forces the government to offer a higher interest rate to attract foreign capital thereby raising the capital inflow and thereby the US dollar index eventually affecting the US economy negatively. So, in an attempt to stimulate the economy through increased government spending, the US government may go too far to increase the interest rates on US Treasury securities that will eventually raise the dollar index and negatively affect the US economy it attempts to stimulate.

The limitation of this study is that it only covers the period from 1974 to 2019. Although the study period covers both the period of US economic boom of 1990s and the great recessionary period of 2008-2009, it would be interesting to see if the result could have been different if a longer time period had been covered. Also, the dollar index might have a threshold value above

which only its rise might negatively affect the US economy. So, one might be interested in using a threshold model to find the threshold value of US dollar index, if there was any.

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