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TRADE BALANCE AND EXCHANGE RATE DEPRECIATION - A STUDY OF STRONG AND WEAK CURRENCIES

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Abstract

In the short run, exchange rates are volatile, mainly caused by capital flows. However, in the long run, trade balance is a key determinant of the exchange rate. Graphical presentations show that counties such as Switzerland, Germany, Norway, Denmark and Netherlands, with persistent trade surpluses, experience strong currency. The effects of exchange rate changes on the trade balance are analysed in the context of Marshall – Lerner condition and the J curve effect. The empirical results of this study based on annual data over a 50 year period, provide support for long run J curve in three out of ten counties. In the short run, the J curve is supported by data for Greece, Norway and Denmark.

Keywords: Exchange rate, Trade balance, J curve, Marshall-Lerner condition, cointegration, VAR

INTRODUCTION

In the short run, exchange rate fluctuations are rapid and mainly a result of capital flows. However, in the long run, the trade balance and exchange rate move in the same direction. That is, over long periods of time countries with persistent trade deficits, experience depreciating currencies. Countries such as Australia, UK, France, Spain, Greece, and Portugal with

continuous trade balance deficits have had weak currencies. On the other hand, Germany, Netherlands (before introduction of Euro), Switzerland, Norway and Denmark have experienced persistent trade surpluses and strong currencies.

According to purchasing power parity (PPP), in the long run, exchange rates follow the countries' inflation rates. Those countries with high inflation experience a weak currency and those with low rates of inflation maintain a strong currency. For example, Germany, Switzerland and Netherlands, historically have had strong currencies. On the other hand, currencies of most of the Latin American counties with high inflation, have depreciated over a long period.

The purpose of this study is to examine the long-run relationship between trade balances and exchange rates. In particular, the existence of a J curve is examined. To this end, net trade balances of five trade surplus countries and five trade deficit countries and their relationship with their respective exchange rates are investigated.

The review of literatures on this and related topic is discussed in Section 1. Some graphical presentations regarding the relationship between trade balances and exchange rates are shown in section 2. A theoretical model and corresponding empirical results are discussed in Section 3. Summary and concluding remarks are offered in Section 4.

REVIEW OF LITERATURE

Most of the literature in this area is dominated by testing the validity of the Marshall – Lerner (ML) condition and the J curve effect. Details pertaining to the ML condition are presented in the appendix. Briefly, the ML condition argues that for depreciation to improve the trade balance, elasticities of export and import together must be greater than unity.

Sofia Styf (2010) and several other studies have discussed how currency depreciation affects the trade balance. Studies in this area have used different approaches to assess the impacts of currency depreciations. Some studies such as Bahmani-Oskooee and Niroomand (1998), Bahmani-Oskooee (1986) and Houthakker examined the validity of the ML condition for a sample of selected countries.

Other studies mainly tested for the existence of a J curve effect. The J curve argues that in the short run, as currency depreciates, the trade balance deteriorates because the value of imports in domestic currency rises and the value of exports in domestic currency remain unchanged. However, in the long run, the trade balance improves as quantity of imports fall and the quantity of exports rises. The J-curve is concerned with the length of deterioration of the trade balance caused by depreciation and its improvement in the long run, relative to the initial value. The existence of a J-curve effect has been examined by several studies. Magee (1973) supported the existence of J curve for the US economy caused by a 15 percent depreciation of

the US dollar. Other studies such as Wilson (1993), Bahmani-Oskooee and Alse (1994), Demirden and Pastine (1995), Hacker and Hatemi-J (2003), and Narayan and Narayan (2004) have also demonstrated favourable support for the existence of a J curve. However, there are studies such as Bahmani-Oskooee and Ratha (2004), Rose (1991), and Rose and Yellen (1989), that did not find empirical support for the J curve.

The J Curve operates under the assumption that the volumes of imports and exports change slowly as prices adjust before quantities. Then, as time progresses, export volumes begin to increase, due to lower prices to foreign buyers. At the same time, domestic consumers purchase less quantity of imported goods, because of their higher prices. The lag between the devaluation and the response on the curve is mainly due to the effect that even after a nation's currency experiences a depreciation, the total value of imports will likely increase. However, the country's exports remain static until the pre-existing trade contracts play out. In the long run, more foreign consumers increase their purchases of foreign produced goods from the nation with the devalued currency because their prices are lower.

In this study, a different approach is used for testing the existence of the J curve effect. A theoretical model is developed in the next section. The impulse response function (IRF) derived from the vector auto regressive (VAR) are suitable for the examination of the validity of J curve effect. The IRF shows the overtime response of a variable in the model to two standard deviation shock of another variable. Specifically, what is the responsive path of the net trade balance when a currency depreciates by two standard deviations? The results of IRFs over the 20-years horizon for ten selected counties are presented in Figures 5 to 15. The first five graphs are responses of surplus countries, and the next five graphs show responses of deficit countries.

SOME TIME-SERIES OBSERVATIONS

In this section, annual data on trade balance surplus counties and trade deficit countries and their respective exchange rates are presented in Figures 1 to 4.

In Figure 1, all five counties had surplus trade balances for the past 50 years, except Germany in the decade of 1970s. In Figure 2, exchange rates of Switzerland, Germany and Netherlands appreciated during the past five decades. Germany and Netherland started using the same currency, euro, from the beginning of 1990. Denmark's and Norway's currencies fluctuated but overall, remained relatively stable during the past five decades. On the other hand, currencies of trade deficit countries, UK, France, Spain, Portugal, and Greece, generally depreciated over the past 50 years. These four figures indicate that over a long time, trade

balance is related to the value of currencies in the international market. Currencies of those countries that experience persistent trade surpluses appreciate.

Figure 1 Five Trade Surplus Countries Percentage of GDP

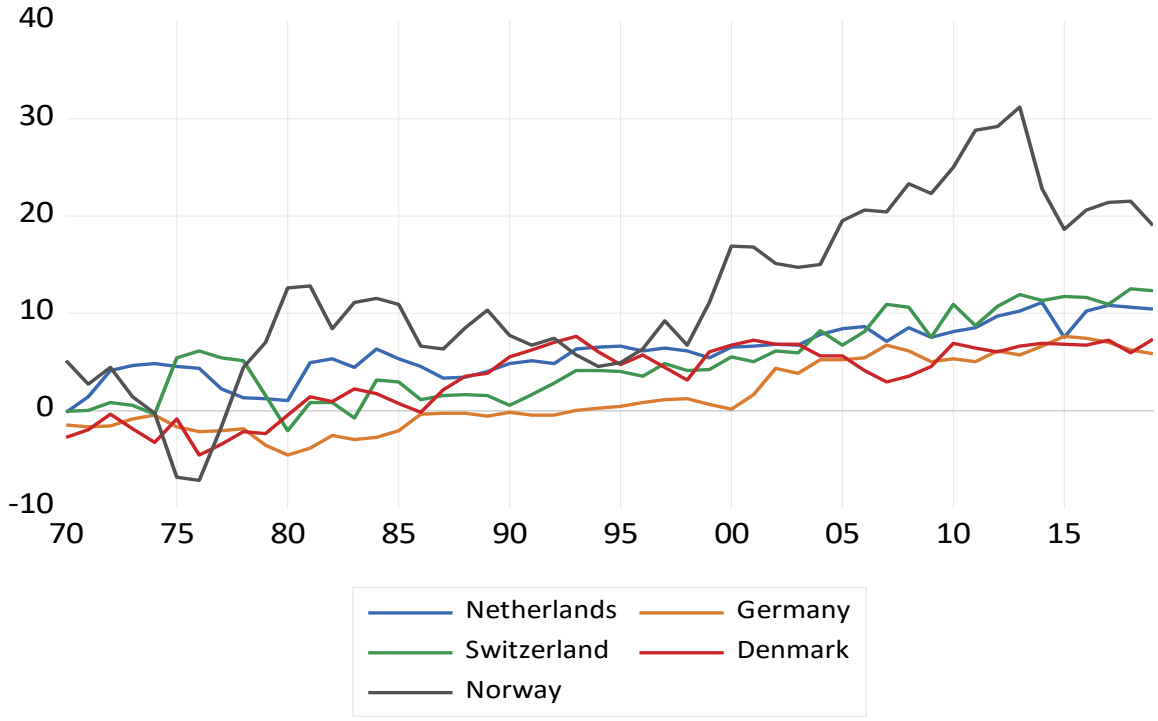


Figure 2 Five Trade Deficit Countries Percentage of GDP

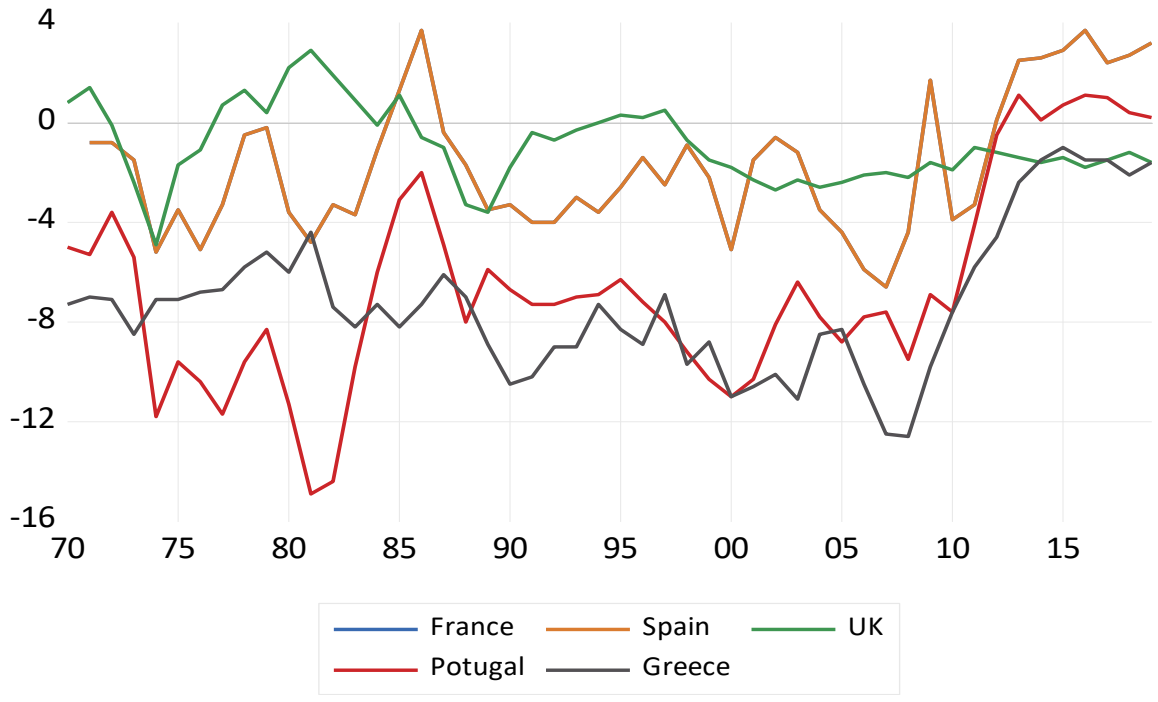


Figure 3 Five Trade Surplus Countries Exchange Rates

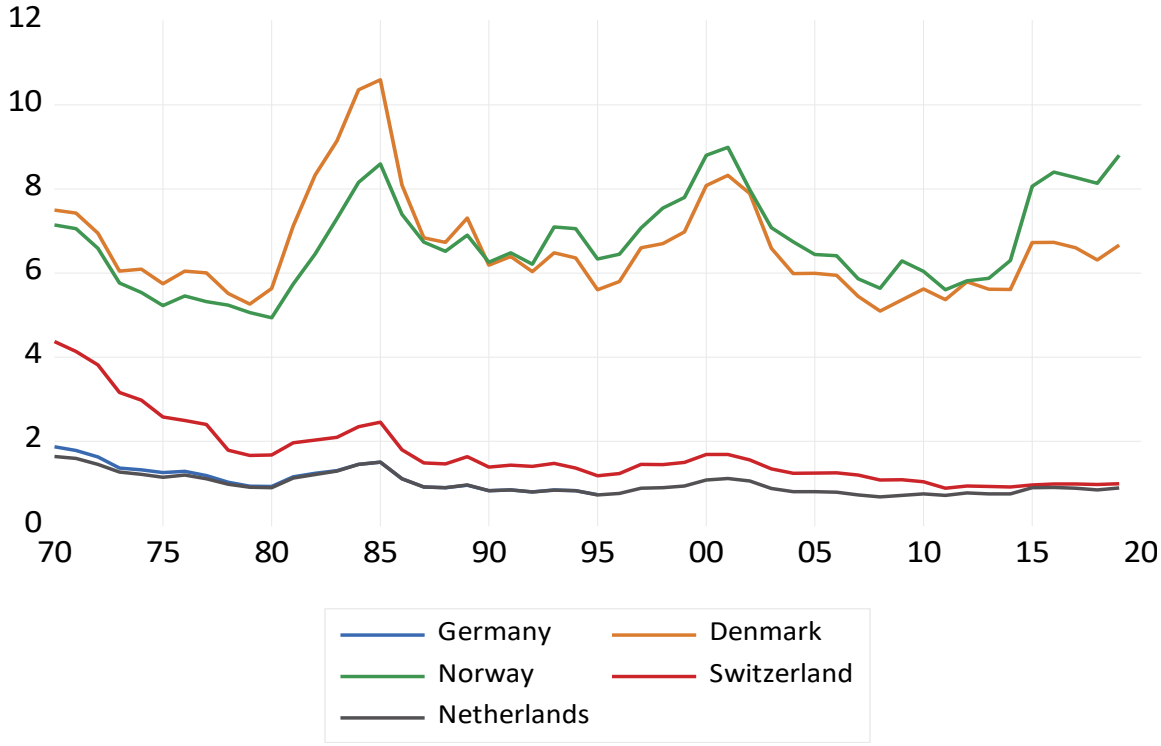
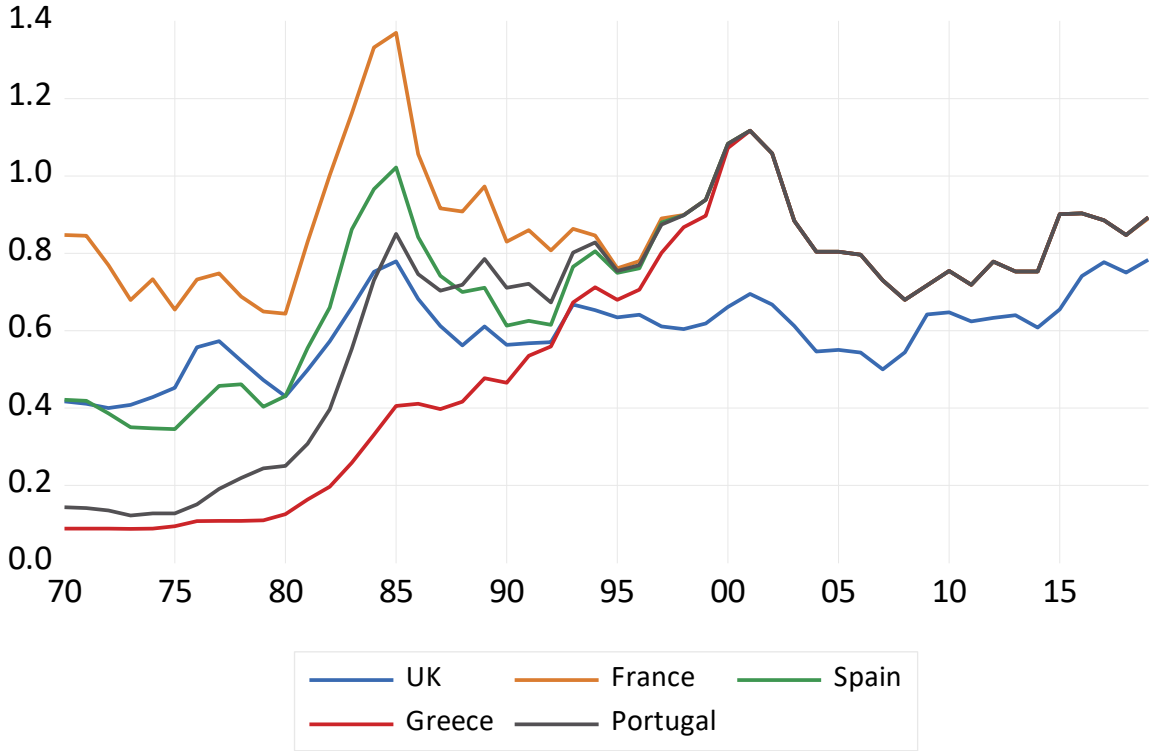


Figure 4 Five Trade Deficit Countries Exchange Rates



Source: https://data.oecd.org/trade/trade-in-goods-and-services.htm#indicator-chart

THEORETICAL DISCUSSION

The balance of trade affects the exchange rates through supply and demand for a currency leading to an appreciation or depreciation. A country with a high demand for its goods tends to export more, as a consequence the positive effect on the trade balance causes an appreciation of its currency. A country that imports more than its exports, will experience a depreciation of its currency. Trade balance changes, under a floating exchange rate system, cause the exchange rate to fluctuate rapidly. Based on the above analysis, changes in exports and imports affect the trade balance, and as demand and supply for currency change, the exchange rate fluctuates.

Equations 1 and 2 present demand for and supply of a currency. The demand for a currency is a function of exchange rate and foreign income, which affects exports. The supply of a currency depends on exchange rate and domestic national income, as the latter influence's imports.

$D_t = f(e_t \; Y*)$ (1)

$S_t = \; g\;(e_t \;\; Y)$ (2)

Where;

D_t, S_t , e_t, Y and Y* are demand, supply, nominal exchange rate, domestic output and foreign output respectively.

The equilibrium exchange rate is determined when Dt = St.

$TB_t = D_t - S_t$ or

TB_t = h (e_t Y Y*) (3)

Equation 3 is used for testing the relationship between the trade balance and the exchange rate for five countries with trade surpluses and five countries with trade deficits included in Figures 1 and 2. A VAR model based on variables in equation 3 is estimated, and the IRFs of the estimated VAR model will be reported. The IRFs trace the effects of change in the exchange rate in the long and short run. As, such, they are suitable for examining the validity of a J curve.

METHODOLOGY

Equation 3 is used to examine the short run and long run effects of change in exchange rates on net trade balances of five trade surplus and five trade deficit countries. The sample period is 1970-2019. All of the series are collected from the OECD website; links are given in the references. IRFs for 10 countries are presented in Figures 5 – 14. Figures 5- 9 are for surplus countries and 10 – 14 are for deficit countries. The IRFs are the responds of net trade balances to change in exchange rates for 20 years.

EMPIRICAL RESULTS

Among surplus countries, the J curve effect is rejected for Switzerland, Germany and Netherlands and accepted for Norway and Denmark. In latter two cases, the net trade balance initially declines in the first two years and then improves during the next 18 years. In the case of deficit countries, the J curve is validated only for Greece. Overall, the J curve is supported for 3 out of 10 cases.

Response to Cholesky One S.D. (d.f. adjusted) Innovations ± 2 S.E.

Figure 5 Response of Swiss Net Trade Ratio

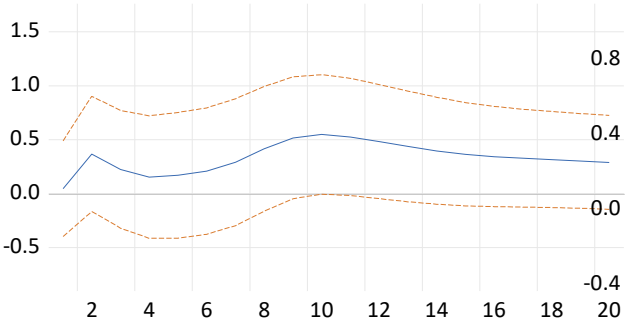


Figure 6 Response of Germany Net Trade Ratio

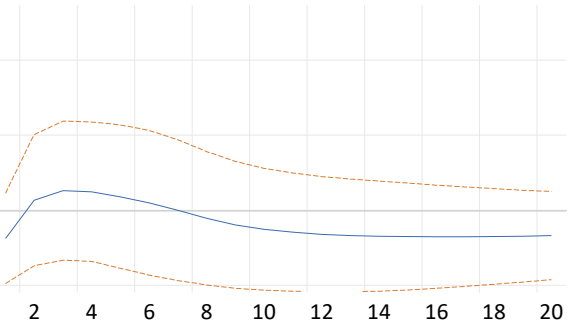


Figure7 Response of Norway Net Trade Ratio

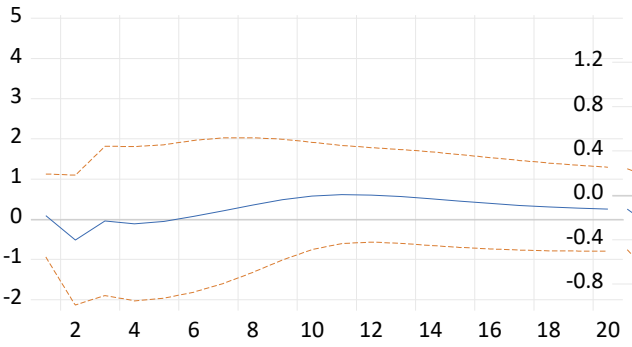


Figure 8 Response of Denmark Net Trade Ratio

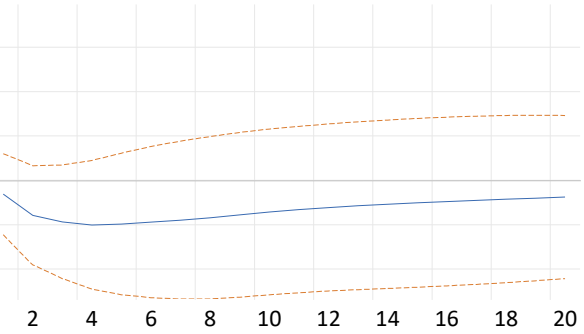


Figure 9 Response of Netherlands Net Trade Ratio

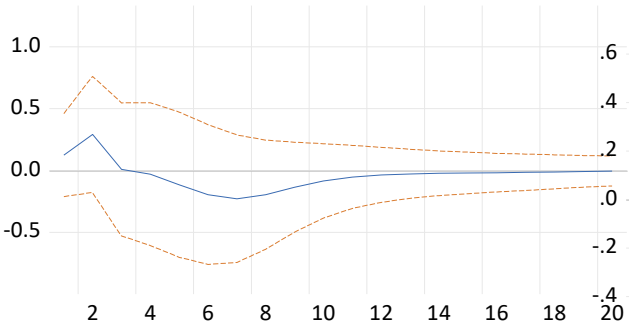


Figure 10 Response of France Net Trade Ratio

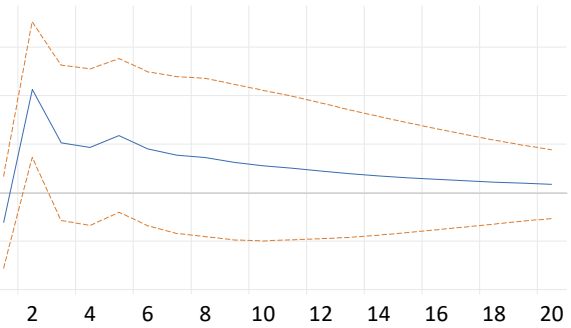


Figure 11 Response of UK Net Trade Ratio

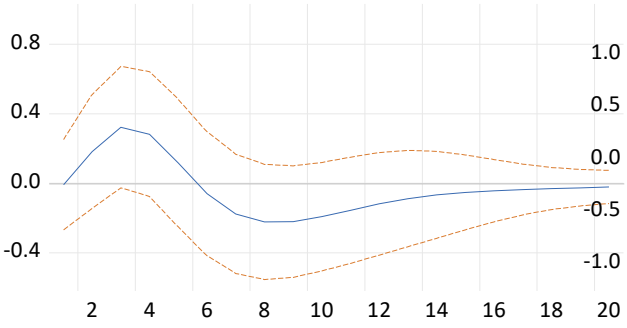


Figure 12 Response of Spain Net Trade Ratio

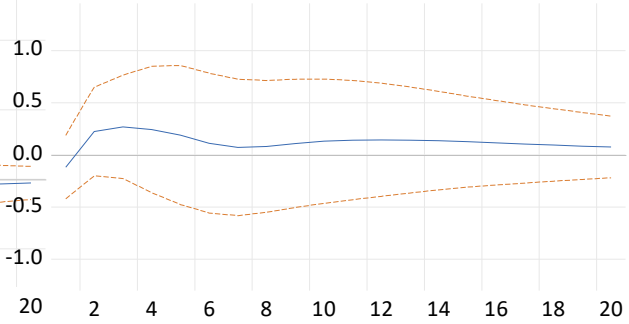


Figure 13 Response of Portugal Net Trade Ratio

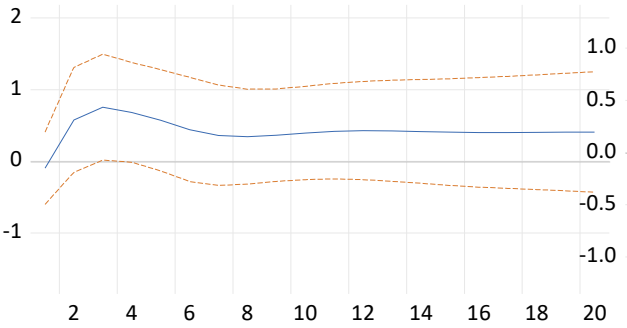
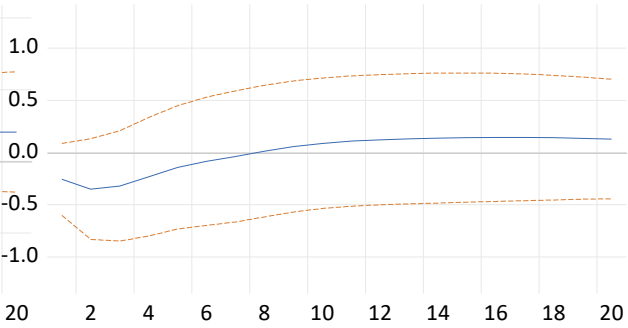


Figure 14 Response of Greece Net Trade Ratio



Further Statistical Evidence on J Curve

The J curve effect of a depreciation argues that in the short run the trade balance worsens, but in the long run it improves, and it returns to its initial position, if the ML condition holds. The ML condition assumes that the initially, before depreciation, the trade balance is zero. This implies that in the long run there is an equilibrium between the trade balance and the exchange rate. Cointegration can be used to determine the existence of an equilibrium between exchange rates and trade balances of 10 selected countries. The long run of ML condition is valid if there is a cointegrating vector between exchange rates and the trade balance.

Most of time series data are non-stationary. This means that their variances become larger and larger over time. As such the OLS estimates of series are not BLUE and standard t statistics, based on constant variance are not valid. However, Granger and Engel (1987) showed that there exists an equilibrium between two series if a linear combination of their residuals is stationary.

Granger and Engle published a paper in 1987, in which they formalized the cointegrating vector approach. Their concept established that two or more non-stationary times series data are integrated together in a way that they cannot move away from some equilibrium in the long term. Johansen (1988 and 1991) suggested tests for determining the number of cointegrating vectors among several time series variables. The long run relationship between variable is

determined by the rank of matrix Π[1]. The two economists argued against the use of linear regression analysis.

Table 1 Johansen's Cointegration Results

Country	Trace Test	λ Max	Cointegrating Vector
UK	19.33**	7.88*	2
France	12.22	8.77	None
Spain	11.59*	7.60*	1
Norway	11.37	6.71	1
Denmark	12.35	10.04	None
Germany	12.00	11.56	None
Netherlands	15.65*	11.46*	2
Greece	5.11	4.29	None
Portugal	10.66	6.22	None
Switzerland	6.08	5.33	None

*and ** show significant 10% and 5% levels

Comparing cointegration results presented in Table 1 and Figures 5 to 19 both suggest that a J curve effect is valid for UK, Norway, Netherlands, and Spain but not for the other six countries. It is interesting to note that results of IRFs and cointegration tests are consistent.

SUMMARY AND CONCLUDING REMARKS

This study attempted to investigate the relationship between exchange rate changes and the trade balance. In particular, the validity of a J curve effect was examined. Eight countries were selected, and it was shown that counties that experience a continuous trade surplus had strong and stable currencies, and those with persistent deficits experienced weak currencies. The data set was annual data 1970 – 2019. The IRFs derived from VAR model are suitable for examining the J curve effect. The results for eight selected countries showed that the J curve effect is not uniformly validated. The IRFs supported the J curve for Norway, Denmark and Greece. A second approach based on Johansen's cointegration test also supported the IRFs results. It is comforting to find that alternative testing procedures produced uniform results as this adds credibility to our findings.

[1] $0 < \text{Rank } \Pi = r < p$ where r is the number of cointegrating vectors. Johansen (1991) uses likelihood ratio statistics and tests two hypotheses. The first tests the hypothesis that number of cointegrating vectors r = 0, no cointegrating vector is (trace test). The second tests the hypothesis that the number of cointegrating vectors is equal to r (λ Max test). The hypotheses are rejected if values of trace and λMax tests are greater than critical values of 5% and 10% levels. Critical values are compiled by Osterwald-Lenum (1992).

A word of caution is also prudent here. 'Weak' and 'strong' currencies do not necessary involve a judgment that a weak currency is in some sense 'bad' or 'detrimental' and 'strong' does not mean that a currency is 'favourable' or 'desirable' in any normative sense. A currency reflects the underlying economic fundamentals of a country. A country, like Australia, has always been a net capital importer as it is a desirable location for foreign investment. The capital and financial account surplus by definition implies a current account deficit (and a probable trade deficit). There is nothing detrimental about that as we get to use a foreign saving to supplement domestic saving. Hopefully, the outcome is greater national output and long - run growth. The second point relates to the impact of capital flows on a currency. The capital inflow may be stabilizing or destabilizing. It may be that long term investment that raises the productive capacity of an economy or it may be volatile short term capital flows are primarily driven by speculative urges. In the latter case, the currency may for considerable periods deviate from long run equilibrium levels.

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APPENDIX

Marshall-Lerner Condition

$$N_x = X - Qe \quad (1)$$

N_x, *Q*, X, *and we* are net export (the trade balance), imports, exports and the exchange rate (price of foreign currency) respectively. *Qe* is imports in domestic currency.

Differentiating 1 with respect to e yields:

$$\frac{\partial N_x}{\partial e} = \frac{\partial X}{\partial e} - e\frac{\partial Q}{\partial e} - Q$$

Dividing through by *X*:

$$\frac{\partial N_x}{\partial e}\frac{1}{X} = \frac{\partial X}{\partial e}\frac{1}{X} - \frac{e}{X}\frac{\partial Q}{\partial e} - \frac{Q}{X}$$

At equilibrium, $X = eQ$. Therefore:

$$\frac{\partial N_x}{\partial e}\frac{1}{X} = \frac{\partial X}{\partial e}\frac{1}{X} - \frac{1}{Q}\frac{\partial Q}{\partial e} - \frac{1}{e}$$

Multiplying through by *e*:

$$\frac{\partial N_x}{\partial e}\frac{e}{X} = \frac{\partial X}{\partial e}\frac{e}{X} - \frac{\partial Q}{\partial e}\frac{e}{Q} - 1$$

Which can be expressed as $\frac{\partial N_x}{\partial e}\frac{e}{X} = \eta_{Xe} - \eta_{Qe} - 1$

X and e are positive. η *Qe* is negative. For the left hand side to be positive, $|\eta Xe + \eta Qe| > 1$