A Model of US Import Flows (1974-1988)

Dominick Answini

Introduction

𝒯his paper will attempt to construct and explain a simple time series model of US import flows. The first section will deal with the theory behind the model and the historical circumstances in which the data were generated. The second section will entail an analysis of the data, using regression, correlation, and t-statistics to explain why the model behaves in a certain way when the raw data is manipulated.

The model itself is relatively simple, although some adjustment was needed to get the variables into a useable form. The raw data consisted of the value of dollars in terms of SDR, or 'Special Drawing Rights' of the 'currency' of the International Monetary Fund (IMF) used to help balance monetary exchanges between countries. Since this is a composite currency, it is less vulnerable to fluctuation. This variable was taken directly from the IMF's International Financial Statistics book from the years 1978, 1985 and 1991. That variable, however, was in the wrong form for this model, and had to be inverted to express SDRs in terms of dollars. This inverted variable became the first (X_1) independent

variable in the model.

The second independent variable (X_2), US GDP, also comes from the IMF book, but this was given in nominal billions of dollars. It was adjusted into real terms by using price level data from McConnell (1991).

The dependent Y variable also came from the IMF publication. It is the value of US imports in billions of dollars. This too was inflation adjusted using the McConnell data. A selection of these data is shown in table 1.

What the model ought to show, if we believe mainstream economic theory, is a positive relationship between real GDP and imports. The rationale for this follows.

Theory and the American Example

Mainstream international financial theory is quite straightforward with regard to the theory of how exchange rates affect the balance of payments. First, let's assume there is an exogenous appreciation of a country's exchange rate. In reality, the currency has become more expensive in terms of other currencies. Because one nation must pay for imports from another in the importer's currency, an appreciation of the importer's currency makes it more expensive and this also

Table 1

Year	$ per SDP exch. rate	nom. GDP in billions of $	price index (1983-85) =100	nom imports in billions of $
74	1.22435	1399.8	49.3	108.00
76	1.16183	1685.7	56.9	129.57
78	1.30279	2088.2	65.2	183.14
80	1.27541	2586.4	62.4	256.98
82	1.10311	3021.3	96.5	254.88
84	.98021	3724.8	103.9	302.37
86	1.22319	4205.4	109.6	352.46
88	1.34570	4847.3	118.3	424.44

(100/price index)* Nominal Imports = Y dependent variable
(1/exchange rate) = X_1 independant variable
(100/price index) * Nominal GDP = X_2 independant variable

Source: International Financial Statistics 1978, '85, '91

---

drives up the price of any goods purchased with that currency. The opposite will also hold: a depreciation of currency will make it cheaper to purchase the foreign goods. The price of currency also affects exports. The appreciation of the currency may make it cheaper to buy imports, but it makes exports more expensive and less attractive, (Grubel , 1977).

As Keynesian theory had a great laboratory in the Great Depression, so does the aforementioned theory have in the early 1980's. Circumstances fell into place that apparently illustrated the theory perfectly, though it was apparent by the late 1980's that the theory had lost some of its validity.

In 1981 the presidency of Ronald Reagan began a programme of deficit spending not witnessed in the United States since the second World War. A cut in taxes and an increase in military spending along with little or no cut in social programs caused the national deficit to grow to record levels and government borrowing to increase. This borrowing, along with the Federal Reserves Bank's 'tight monetary policy' to fight inflation, meant skyrocketing interest rates. It was not unusual for interest rates to hover over 20% (for borrowing) in the early 1980's. These high interest rates attracted a lot of portfolio investment from overseas, much of it from the newly oil-rich nations. Portfolio investment is similar to trade in that to invest in a country

(US), one must be able to turns one's currency into US currency. This caused an increase in the demand for dollars and an appreciation of their value relative to other currencies. In terms of international trade theory, we see that Americans now held dollars with inflated value and this made imports cheaper. (Of course it also made US exports more expensive in foreign countries but that is not the concern of this paper). This explains how - in theory - the exchange rate has an effect on the level of imports (McConnell, 1990).

A second reason why imports might be rising stems from the natural increase in GDP. It is reasonable to assume that as GDP rises so does disposable income and imports. This would occur regardless of the exchange rate (extreme circumstances excluded). Another reason for the American trade deficit in the 1980's was that the US economy was growing faster and increasing import demand faster than many of the US trading partners (including the EC). Although the trade deficit is not the subject matter of this paper, we should be aware of the explanatory power of increasing GDP on imports, which explains its inclusion as the second explanatory variable in the current model.

Regression Results

$R^2 = 0.78725$

Indept. Variable	Parameter Estimate	t- statistic $H_o: \beta = 0$
constant	26.159418	0.29310
x-rate	0.097344	6.21966
GDP	-79.867566	-1.07629

The raw data from the International Financial Statistics was used as previously explained and is reproduced in the table. Some of the results from the analysis using the 'Hummer' econometrics package are shown.

Estimated regression line

Using the information produced by Hummer, and in particular the parameter estimates, we can construct regression equations for the level of US import flows regressed on GDP and the exchange rate to yield the following

$Y=26.16-78.87X_1+.097X_2$

The most surprising fact that emanates from this analysis is the inverse relationship between the exhcange rate (X_1) and the level of imports (Y). Plainly said, this goes against all the theory that was explored previously. This can perhaps be best explained by a degree of multicollinearity between the two independent variables. The R^2 obtained is 0.76671 indicating that the model has good explanatory power though one that seems to dominated by GDP, whose parameter estimate is statistically significant at the 5% level.

What went wrong?

Although the entire model seems to have good predictive powers, the main independent variable, the exchange rate, seems to have little, if any, explanatory power. How then could this be true, given the generally accepted mainstream economic theory? There are several reasons.

It is widely recognised that at the same time as the US was experiencing higher exchange rates it was in a deep recession. A look at the raw data illustrates this clearly. When the exchange rate should have encouraged more imports the recession reversed this tendancy to some extent. This was the primary reason for choosing GDP as the second independent variable, to smooth the effect of this anomaly.

A second reason has already been explored. The US economy was simply growing too fast to let exchange rates stand in the way of its demand for foreign goods, many of which Americans had begun to prefer after exposure to them in the early 1980's. The declining exchange rate in the late 1980's would not have been enough to reverse this preference.

A related reason was that many US firms that were in competition with foreign firms found that after surviving the recession, they couldn't survive the high exchange rate foreign competition and went out of business. This caused some industries, like consumer electronics, to have no American suppliers, so regardless of the exchange rate, all goods bought from these industries would be foreign. Finally, many foreign suppliers simply lowered their prices to keep them the same as they were in the mid-1980's after the exchange rate fall in the late 1980's. The exchange rate effect was simply negated. That was, in particular, the experience with the Japanese car industry.

Conclusion

Although many of the conclusions from the statistical analysis seem quite evident and straightforward it should be pointed out that there is a lot of analysis that has not been included. The F-test, Chow test, and differencing the data are but three methods by which the data could be manipulated to give more insight. Without this additional analysis, however, we must accept that what we have is a very simple model with relatively good predictive powers.

References

Brown, W.S. (1991) *Introducing Econometrics.* New York: West Publishing.

Caves R.E.,Jeffrey A., Ronald W.,(1990) *World Trade and Payments* New York: Harper-Collins.

Gruebel, H. (1977) *International Economics.* Homewood Illinois:Irwin Inc.

Kenen, P. (1989) *The International Economy* Engelwood Cliffs N J USA: Prentice-Hall International.

Mc Connell, C. (1991) *Principles, Problems, Policies* New York: McGraw-Hill.