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Testing the J-Curve Hypothesis

Case Studies from Around the World

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OBSERVING THE J CURVE EFFECT

INTRODUCTION

The J Curve Effect is the term used to describe the impact of currency devaluation on a country's balance of trade. The theoretical basis of the J Curve Effect comes in part from Alfred Marshall and Abba Lerner, whose "Marshall-Lerner Condition" states that if initially the balance of trade is zero, and if supply elasticities are infinite, then the absolute values of export and import demand elasticities have to be at least large enough to add up to unity to have an exchange rate devaluation bring about the surplus in balance of payments. (Kulkarni, 2007) This theory can be proven by looking at the changes in elasticity over time. In the short run, elasticities are small, making the Marshall-Lerner Condition less likely to be satisfied. However, as time goes by, elasticities become larger, ultimately crossing the threshold point described by Marshall and Lerner, thus creating the condition for an improvement in BOP.

Applying this theory, and using simple observation of the effects of currency devaluations over time, economist have developed the J Curve Hypothesis, which says that in the short term period following a currency devaluation, the balance of trade for that country will decline, but then as elasticities grow, the balance of trade will begin to improve. The graph showing this trend often looks like a "J", thus prompting economists to refer to it as the "J Curve." This improvement in balance of trade of course occurs as a result of the competitiveness effects of currency devaluation, whereby the devalued currency's home country's products become cheaper in foreign markets

relative to foreign goods, and foreign goods become more expensive in domestic markets relative to domestically produced goods. This hypothesis became particularly relevant following the 1973 breakdown of exchange rate controls imposed by the Bretton-Woods System, and the introduction of a largely flexible, market-based pricing mechanism for currencies.

This paper hopes to observe two aspects of the J Curve Effect. The first is how well it actually characterizes the experiences of several specific cases we observe in this report. To do this, we will look at different countries that have experienced a significant devaluation or depreciation of domestic currency, chart the changes in trade balance, observe the extent to which it followed the course expected by the J Curve Hypothesis, and try to find explanations for any outliers in the data. The second aspect of the J Curve Effect we will examine is the extent to which there is any distinction between the long-run effects on trade balance in the cases of government controlled devaluation versus market-based depreciation. This will be done through case studies, primarily looking at a six to eight year time window.

Our hypothesis at the outset of this project was that the J Curve Effect would be more orderly in the case of devaluation because the currency value is more reliably set at a certain lower value, whereas in the case of depreciation, we expect to find a jagged J Curve, as currency volatility diminishes the trade effects. We further presume to find a decline in balance of trade and an appreciation of currency value in the out years in the case of currency depreciation. We will use case studies of four countries—Zambia, Nigeria, Latvia, and Thailand—in order to draw our conclusions.

LITERATURE REVIEW

THEORETICAL DESCRIPTION

In discussing the theoretical background for the J Curve Hypothesis, let us first define exchange rate. Exchange rate is the value of a given currency expressed as a proportion of another currency.

There are two ways to express exchange rate. One is as the number of foreign currency units per unit of domestic currency, for example, 105 ¥/$1. The other is the number of domestic currency units per unit of foreign currency, for example, $1.40/€1. The latter expression is the American style, and will be used for the purposes of this work.

When the exchange rate is changed (say, increased), the domestic currency loses value, causing exports to become cheaper for the rest of the world because foreign currency simultaneously gains value. Exports are therefore expected to go up. Likewise, imports are expected to decline as the rest of the world's goods and services become more expensive for domestic residents. Thus, the balance of trade (BOT) should increase.

However, Alfred Marshall and Abba Lerner argued that an increase in exchange rate can lead to a BOT surplus only if elasticity of demand for exports by the rest of the world, and similarly demand for imports by domestic residents, are strong enough. They created the following test to determine whether the elasticities are strong enough:

Define: elasticity of imports (with respect to exchange rate)=E_M^{ER}

Note that *elasticity* is the responsiveness of a dependent variable to the change in an independent variable. Thus:

$$E_M^{ER} = \frac{\%\ change\ in\ quantity\ of\ imports}{\%\ change\ in\ exchange\ rate} = \frac{\frac{\Delta M}{M}}{\frac{\Delta ER}{ER}} = \frac{\Delta M}{\Delta ER} \times \frac{ER}{M}$$

For example, if gasoline prices increase from $3 to $4, the percentage increase in price is 33%, which is determined by: $\frac{\Delta P}{P} \times 100 = \frac{1}{3} \times 100 = .33$

Thus, $E_M^{ER} = \frac{\Delta M}{\Delta ER} \times \frac{ER}{M}$

Define: elasticity of exports (with respect to exchange rate)=

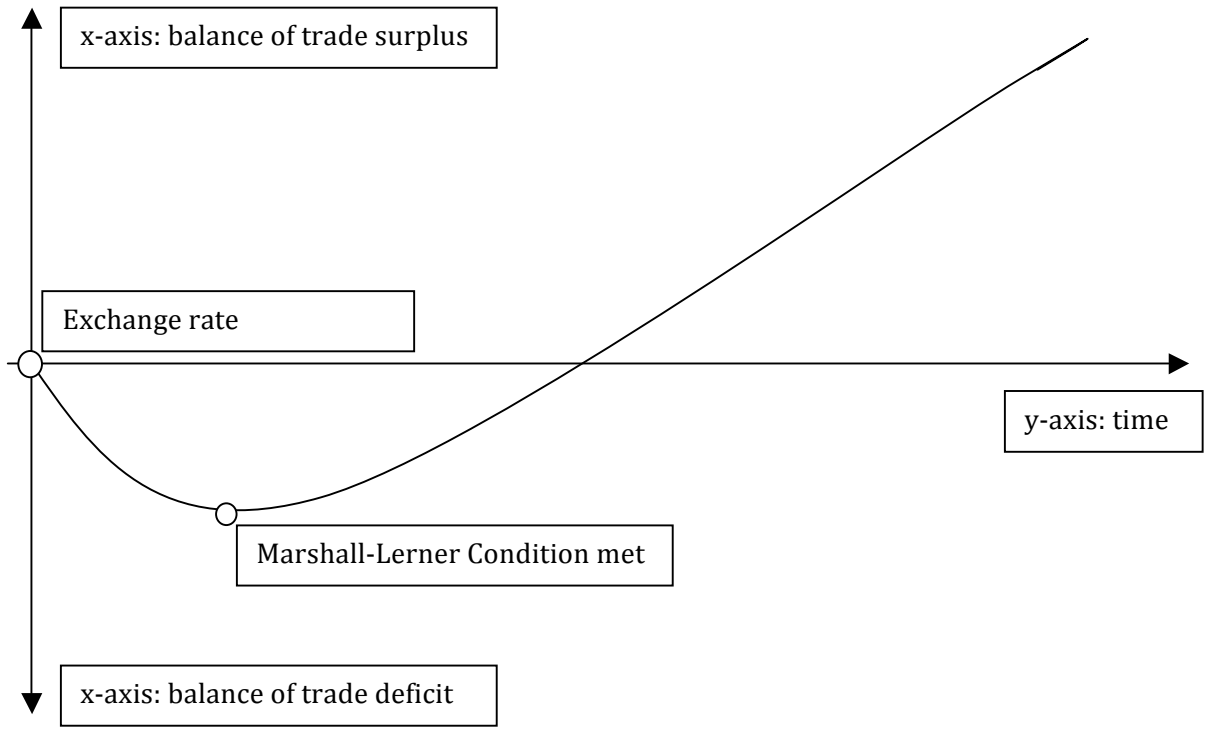
$$E_X^{ER} = \frac{\%\ change\ in\ exports}{\%\ change\ in\ exchange\ rate} = \frac{\frac{\Delta X}{X}}{\frac{\Delta ER}{ER}} = \frac{\Delta X}{\Delta ER} \times \frac{ER}{X} = E_X^{ER}$$

Thus, when elasticity is small, the quantity of exports increases by a small amount. Recall:

Export Revenue=Price of Exports × Quantity of Exports

Therefore if the quantity of exports increases only a little, and the price of exports decreases by more (as a result of the lower currency value), then the export revenue goes down. If the elasticity of imports is small, then a 10% increase in the exchange rate makes imports more expensive by 10%. However, if the elasticity of imports is very small, then an increase in exchange rate of 10% will reduce imports by *less than* 10%, causing the import bill to go up. Then, with small elasticity values, an increase in the exchange rate can lead to a balance of trade deficit.

Thus, for an increase in the exchange rate to lead to a balance of trade surplus, we must have strong enough elasticities with respect to imports and exports (E_M^{ER} *and* E_X^{ER}) that they add up to at least 1, or in equation form: $E_M^{ER} + E_X^{ER} \geq 1$. This is known as the Marshall-Lerner Condition.

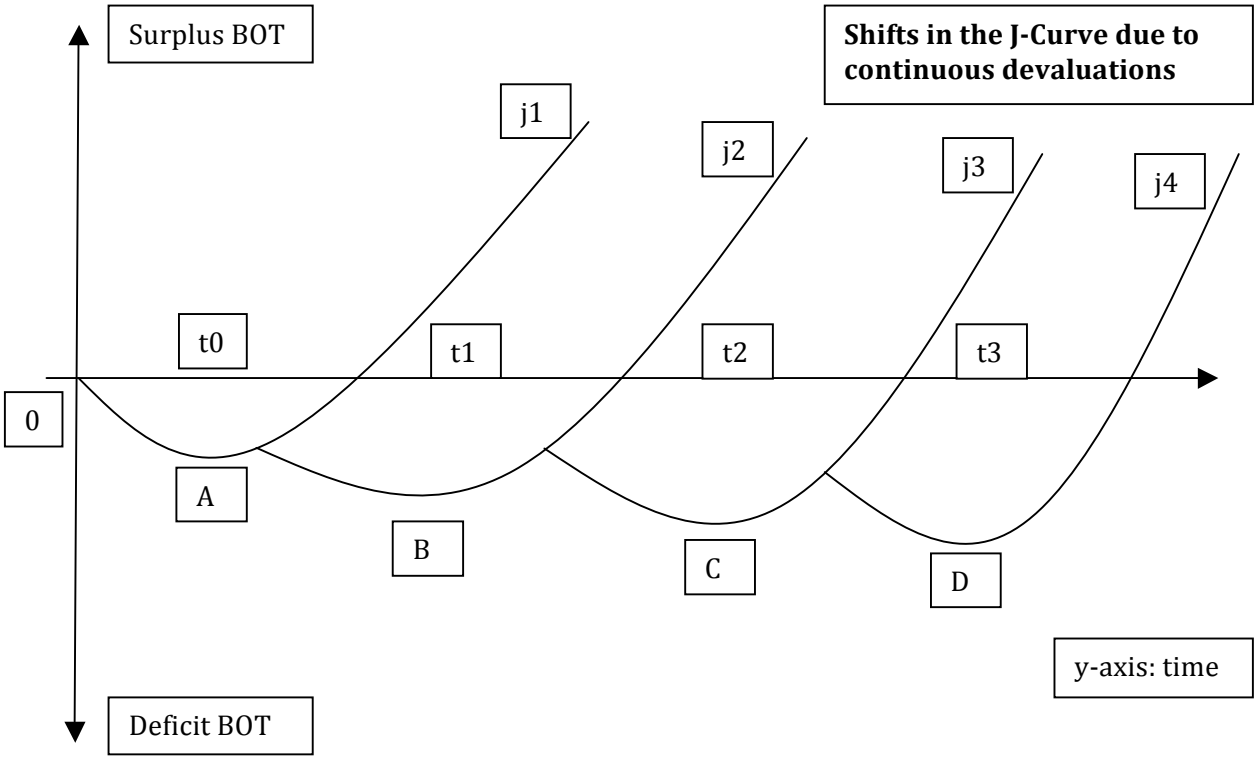


The two major determinants of elasticity values are:

1. The number of substitutes for the good. If there is a large number of substitutes available, the elasticity will be high, whereas the elasticity will be low if there is a small number of substitutes available.
2. Time passed after the change in exchange rate. The longer the time passed after the change in exchange rate, the higher the elasticity.

Consider the graphical representation of a balance of trade curve over time as hypothesized by the J-Curve Theory (see previous page). Notice that initially the elasticities don't satisfy the Marshall-Lerner Condition, and thus the balance of trade goes down. Over time, however, the elasticities increase, ultimately turning the balance of trade positive. The resulting balance of trade curve looks like a lopsided letter "J", hence the name "J-Curve."

The J-Curve Hypothesis was later expanded by Professor Kishore Kulkarni, who demonstrated in a 1994 article that in the case of a series of currency devaluations, the existence of "dynamic, persistent balance of trade deficits is a possibility." This phenomenon is known as the Kulkarni Hypothesis, and accounts for the real world possibility that currencies may be devalued multiple times over a relatively short time period.



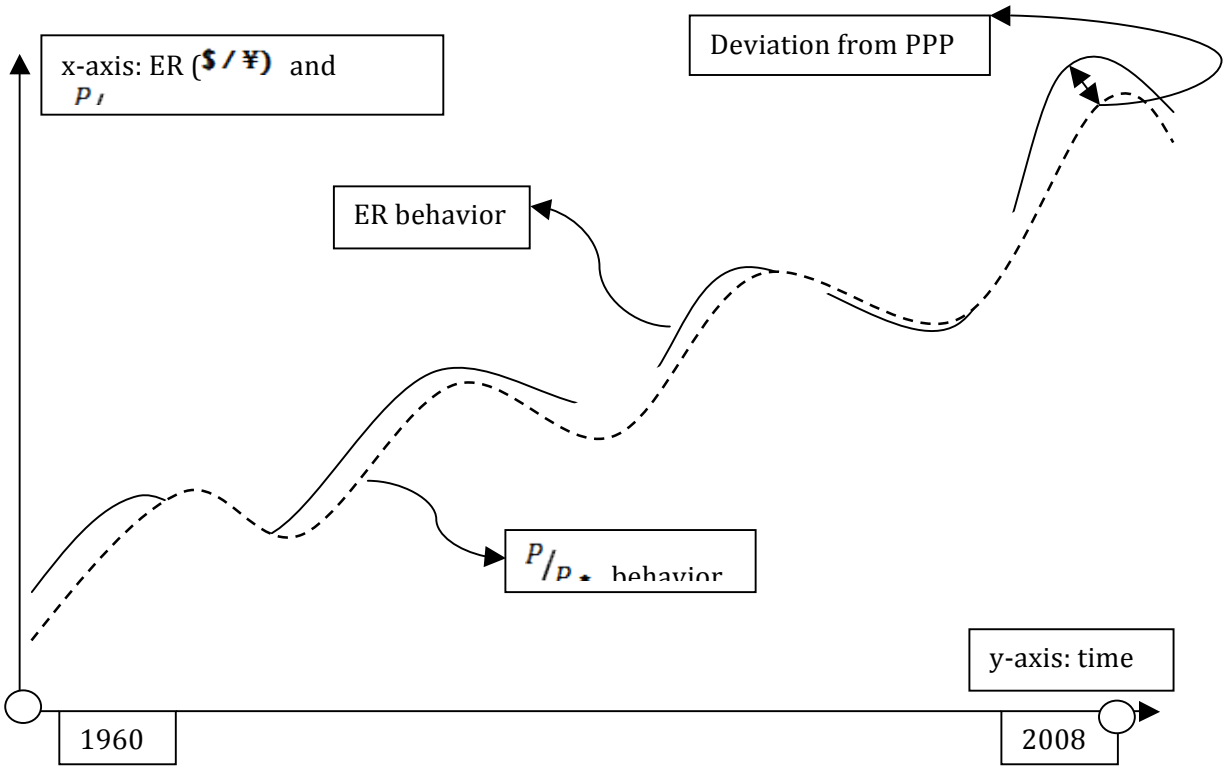
In the graph above, there are four devaluations at times t0, t1, t2, and t3, creating four consecutive J-Curves, with consecutively lower lows in balance of trade, as shown at points A, B, C, and D. This occurs because the J-Curve Hypothesis says, as mentioned above, that in the short run, elasticities of imports and exports are too small to meet the Marshall-Lerner Condition. Thus, if a second devaluation occurs before the Marshall-Lerner Condition is met, the J-Curve is shifted to the right as export/import elasticities again realign.

The J-Curve Hypothesis has gained relevance since the end of the Bretton Woods System in 1973. Prior to that, from 1944-1971, most of the world was under the BWS, in which the U.S. Dollar was the key currency, and all other currencies were pegged to it. This essentially forced all countries that participated in this monetary system, which was all but a few countries in the world, to keep their money supply consistent with U.S. money supply growth. This put the U.S. in what became known as the Triffin Dilemma, where on one hand the U.S. had to satisfy demand for the dollar, however on the other hand, if the supply of the dollar was raised to meet demand, its value relative to other currencies would decline. To avoid this outcome, the U.S. pressured other countries to

increase their money supplies. Ultimately, countries in Western Europe—like Germany, France, and Switzerland—refused to continue increasing their money supply, thus undermining the BWS and ushering in a new era of market-determined exchange rates and free monetary policy.

Now that exchange rates can be determined by market forces, we can consider their determination based on theory from Gustav Cassel (1918), who argued that exchange rates are a measure of relative purchasing power of the domestic currency and a foreign currency. Purchasing power is then determined by the price level (P) in the economy. Then if P is equal to the domestic price level, and P* is the foreign price level, $\frac{P}{P^*}$=ER. This is known as the Absolute Purchasing Power Parity statement.

Consider the graphical representation of Absolute PPP below:



Notice that $P/P*$ generally correlates with ER, though there are some deviations as labeled.

The other primary way of determining exchange rates is by considering relative changes in inflation rates.

$$\left(\frac{\Delta ER}{ER}\right) = \%\ change\ in\ domestic\ price\ level\ \left(\frac{\Delta P}{P}\right) - \%\ change\ in\ foreign\ price\ level\ \left(\frac{\Delta P*}{P*}\right)$$

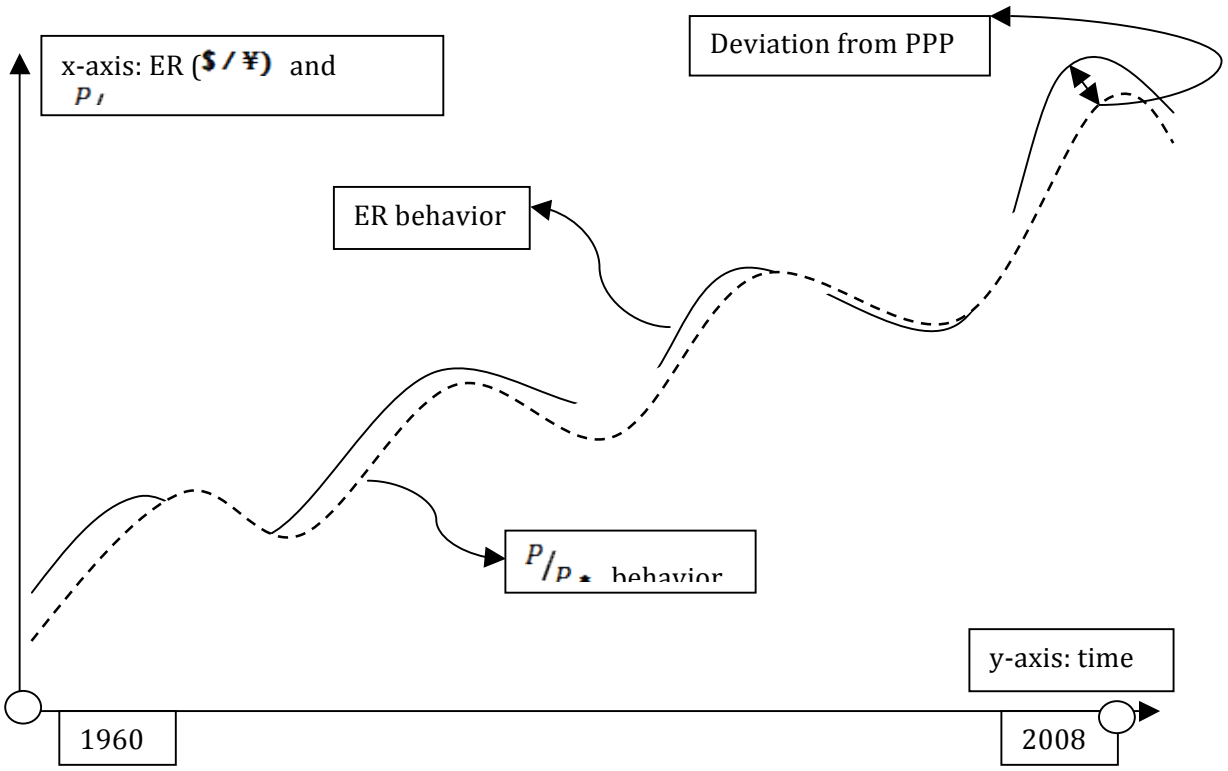
% change in ER

Or just: $\left(\frac{\Delta ER}{ER}\right) = \left(\frac{\Delta P}{P}\right) - \left(\frac{\Delta P*}{P*}\right)$

This is known as the Relative PPP statement, and is graphed in much the same way as the Absolute PPP statement (see next page).

Economists have reached three primary conclusions from studying PPP and its relevance to exchange rates. First, that long-term data show higher validity of both absolute and relative PPP statements than short-term data. Second, that the relative PPP statement has a higher reliability

than the absolute. And third, that periods of high inflation rates show smaller deviations and higher reliability of PPP statements than periods with low inflation.



This new era of floating exchange rates dictated by the free market using relationships like PPP to evaluate currency value has allowed governments to increase their money supplies at will, thus creating the opportunity for the tremendously profitable practice of seigniorage, where governments print money for their own use. This has led to currency crises and hyperinflation in some cases, particularly in Latin America and Africa. Perhaps as often, however, a country's money supply has increased as part of a financial sector liberalization package. As we shall see in the empirical section, this can sometimes lead to sharp declines in the value of that country's currency. We expect to then see a shift in the trade balance as predicted by the J-Curve Hypothesis, however we'll have to test it to find out.

A relatively early and oft-cited study comes from economist Anne O. Krueger's book Exchange Rate Determination (Krueger, 1983), where she argues that the J Curve occurs because at the time an exchange rate change occurs, goods already in transit and under contract have been purchased, causing a lag time in the effect of exchange rate changes. Once those transactions that had already been in progress prior to the rate adjustment are concluded, subsequent commercial activity reflects the new competition environment, allowing the balance of trade to begin to improve. Krueger specifically lists three such conditions that determine the extent to which there is a J Curve:

1. The extent to which trade takes place under pre-existing contracts (as contrasted with purchases made in spot markets);
2. The degree to which there may be asymmetric use of domestic currency and foreign currency in the making of contracts;
3. And the length of the lags in the execution of contracts.[1]

An earlier study by Stephen Magee (Magee, 1973) considers the period between the time of devaluation and the time after adjustment to the new currency value as well, what he terms the "pass-through period," though Magee concludes that "there is no logical necessity for a country's trade balance to deteriorate, any more than for it to improve or remain constant." Krueger seems to agree with Magee's conclusion in theory, but notes that the short-run decline in trade balance following a currency devaluation has become part of the J Curve Hypothesis more as a result of actual observation than theory.

Another 1973 study by Helen Junz and Rudolf Rhomberg theorized that the dip in trade balance following currency devaluation may be caused by five lags: 1. Lag in recognition of the new currency conditions by producers and consumers. 2. A lag in the decision by producers and consumers to change. 3. A lag in delivery time. 4. A lag in the replacement of inventory and material on the part of producers. 5. A lag in production due to the production cycle.

[1] Exchange Rate Determination, pg. 40

Regardless of why the J Curve Effect occurs, we can look to tests of the hypothesis to determine how robust it is in real world situations.

A 1985 test (Bahmani-Oskooee, 1985) of the J Curve Effect used a set of 12 possible lags that could cause a short-run decline in the trade balance following currency devaluation. The study looked at Thailand, Greece, Korea and India in the 1970s, and found that all the countries except Thailand followed the pattern predicted by the J Curve Hypothesis, with the only variation being the duration of decline before the trade balance began to increase. Greece took just two quarters, while India and Korea took three quarters, and Thailand took five quarters to begin improving its trade balance. Thus the paper concluded that for most of the cases studied, "the empirical evidence appeared to support the pattern of movement described by the J-curve."

A more recent study (Kulkarni, 2007) seeking to find empirical evidence of the existence of the J Curve examined seven case studies of countries that had experienced significant changes in their currency value. The effect on trade balance was analyzed in time spans ranging from five to ten years. The study concluded that in six of the seven countries—the Philippines, Kenya, Japan, Indonesia, Mexico, and Spain—"dramatic change in the exchange rate leads to a J Curve on the balance of payments." (pg. 62) This finding included an inverted J Curve in Japan, where a revaluation of the currency had taken place in 1985. The only outlier in the study was China, which was explained by the authors as possibly resulting from regulated import and export flows. Thus, the authors conclude that "if a country's currency is not valued according to market forces, the government is forced to readjust the currency value sooner or later." (pg. 63)

Some studies focused on exchange rates and trade on a bilateral basis, including a 2001 test (Wilson, 2001) of the J-Curve Hypothesis that examined the relationship between the real trade balance and the real exchange rate for bilateral trade in merchandise goods between Singapore, Korea, and Malaysia, and the USA and Japan on a quarterly basis from 1970 to 1996. This study found that real exchange rate does not have a significant impact on real trade balance. Korean trade

with the USA and Japan was the only exception, however the authors explained this by noting that for Korea, it is possible that the J-Curve effects were being muted by small country pricing of exports in foreign currency. This study is unique from the one being conducted by this paper, however, in that it examined the relationship between currency value and trade balance over a long period of time, regardless of what was occurring with the given currency. The study being attempted by this paper, however, attempts to look at specific currency events in order to determine whether they show evidence of the J-Curve Effect.

A 2008 test of the J-Curve Effect looked at bilateral trade effects between Turkey and its 13 biggest trading partners from 1985 to 2005. The author, Ferda Halicioglu, a professor of economics at Yeditepe University in Istanbul, applied a cointegration statistical model. Using six different lags to account for the pass-through period, Halicioglu tested to determine whether currency fluctuation was a statistically relevant causal variable for trade balance. It was determined that in all 13 cases, exchange rate had no effect on bilateral trade balance in the short run, and only some limited effect in the long run with two of the countries—the U.S. and UK.

Another study (Rose, 1990) from 1990 takes a similar approach of looking at the relationship of currency and trade balance over time. This study, by UC Berkeley Professor Andrew K. Rose, examined data from 30 developing countries over 18 years (1970-1988) to determine this relationship. Rose uses a statistical analysis to determine whether exchange rate has a statistically significant effect on trade balance at the .05 level, finding that for 28 of the 30 countries the hypothesis that it does not cannot be rejected. It should be noted that he used a 12-month lag period for trade balance to account for the decline during the pass-through period.

Another similar study (Hacker, 2003) looked at small northern European countries in order to determine if they experienced the J-Curve Effect. This test—which looked at Belgium, Denmark, the Netherlands, Norway, and Sweden—shows that after a depreciation there will be about a six-month period of decline in the trade balance, followed by an increase in the trade balance. The authors

further conclude that in these cases, sustainable higher long-term export-import equilibrium was achieved following currency depreciation.

The case of the U.S. seems a vexing one for several authors because of the stubbornness of trade deficits in the U.S. in several periods in spite of a declining currency. One notable study on this topic was done by Oregon State University Professor Michael H. Moffett in 1989 titled: The J-Curve Revisited: An Empirical Examination for the United States. (Moffett, 1989) Moffett finds that expenditures on imports have typically increased following dollar depreciations, which he explains results from the inelasticity of import volumes in the U.S. Export earnings, meanwhile, are shown to increase only modestly following these currency declines. Moffett concludes that the curve of U.S. trade balance with respect to currency value is better characterized as a sine wave than a J-Curve.

In my opinion, the reason behind the strange behavior of the U.S. trade balance is a result of the fact that essentially all global commodities are denominated in U.S. dollars. Thus, when the dollar declines, the price of imported commodities for U.S. consumers goes up. Moffett talks about the inelasticity of imports, which I agree with, though he simply fails to take the next step of noting that the imports that are inelastic tend to be commodities, and the price of those commodities has a special relationship with the U.S. dollar that could cause this unusual trade balance action.

Halicioglu characterizes the literature on the J-Curve Effect as coming in two basic varieties. The first, he says, employ an aggregate trade balance approach and compare two countries (home country and rest of world). The second group utilizes bilateral trade balance equations to analyze the exchange rate/trade balance dynamic. Based on my review of relevant literature related to the J-Curve Effect, I would add that the tests conducted seem to be able to be differentiated by the length of time observed. One type of test looks at some period (generally five to ten years) immediately following a significant change in a country's currency value, whereas other studies, often statistically oriented, look at a much longer time horizon that is often arbitrary in the sense

that the timing of the period observed is not anchored by the timing of a substantial change in currency value.

For the purposes of this paper, the timing of all case studies will be roughly five to eight years immediately following a dramatic change in currency value. This approach has been chosen primarily because it seems to be more in the spirit of the J-Curve Hypothesis, and also because it seems that any findings that come out of exceptional scenarios will be necessarily laden with caveats, whereas findings in a more idealized case study will be robust, particularly if it is determined that the J-Curve Effect is not observed.

EMPIRICAL SECTION

CASE STUDY: ZAMBIA

In 1991 Zambia held its first multiparty democratic elections. For 17 years prior to that, the Zambian government had been ruled by the United National Independence Party, who favored a largely state-run approach to economic development. Though a series of stability measures and structural adjustment programs had been put forward in Zambia between 1973 and 1990, in cooperation with the IMF and World Bank, these reforms found little success because they failed to address the underlying structural problems of the Zambian economy that centered around the large, wasteful state sector. Reforming that began in earnest following the 1991 election of the Movement for Multiparty Democracy (MMD), which was given a strong mandate for reform by the public.

Political reforms were relatively marginal during the period from 1991-1996, however economic reforms were profound. For one thing, the MMD launched an ambitious privatization program soon after taking office, which resulted in the 1992 Zambia Privatization Agency. The process began slowly, with only three companies privatized by early 1995. But by the end of 1995, 27 had been privatized, and by the end of 1997, that number jumped to 200. Importantly, however, the massive

Zambia Consolidated Copper Mines (ZCCM) company was delayed in its privatization for several years until 1999, as were some utility companies.

For this paper, however, the monetary reforms of the early 1990s are more germane. With inflation of 167% annually in 1992, the government of Zambia saw price stability as a primary precondition for economic growth. The government tightened monetary policy significantly, cutting deficits and restricting growth in the money supply. A key, yet controversial, step toward spending reduction was the step taken in 1991 to end subsidies on maize, a staple of the Zambian diet. A year later the price of maize had increased 700%. Still, the Zambian government pressed on with budgetary reform, instituting a cash budget system in 1993, which meant that government could not spend money it didn't have. This made it impossible for the government to monetize debt, in other words, to print money to pay for deficit spending. (Rakner, 2003)

The MMD also sought to improve the climate for foreign direct investment by beginning a process of lifting currency controls in 1992. By December of 1992, the official exchange rate was unified with the market rate, making the exchange rate fully market determined. By 1994 non-citizens were allowed to open foreign currency accounts in Zambia. The last big currency control was finally lifted in 1996, when the Bank of Zambia allowed Zambian Consolidated Copper Mines, which was by far the largest company in Zambia at the time though it was still largely state controlled, to retain 100 percent of its foreign exchange receipts to supply the market directly. Since the nationalization of the mines in the 1960s, ZCCM's lack of access to foreign exchange prevented it from significant reinvestment into its business. Another key reform occurred in 1993, when the Bank of Zambia (the Zambian Central Bank) removed all restrictions on bank lending and deposit rates. This opened the door for the entry of several new commercial banks and non-bank financial institutions. (Rakner, 2003)

Trade was also reformed in the early '90s, and by 1997 all licensing and quantitative restrictions on imports and exports were eliminated. The tariff structure was also streamlined and simplified,

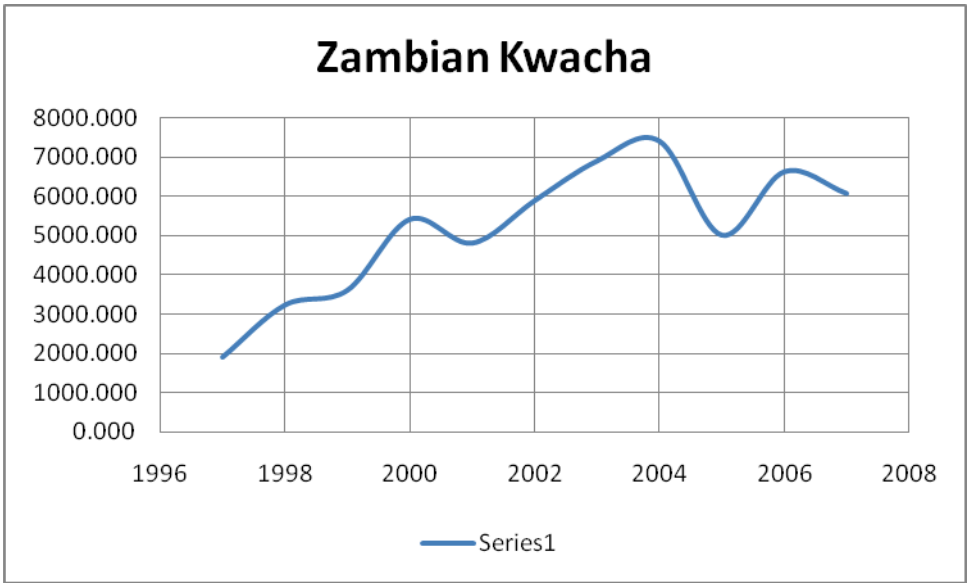
reducing the number of tariff bands from 11 to four, and lowering tariff rates from 0 to 100 percent to a lower range of 0 to 25 percent.

Following the 1996 elections, things began to change for the worse. Levy Mwanawasa, the previous vice president and a founding member of the MMD was sworn into office as president, though with only 29 percent of the vote. The vote was considered by many to be fraught with fairness violations as well, further undermining Mwanawasa's mandate. Early in the new administration, things began to change. Public sector reform efforts, which were key conditions of IMF funding, had been discontinued, causing the IMF to withdraw funding commitments. Also, the government's commitment to the cash budget system began to drift, as a loophole began to be exploited, allowing the government to run deficits of 14-18 percent of GDP from 1995 to 1997. (Taylor, 2002) Also, the privatization of ZCCM still lingered for the first three years of Mwanawasa's presidency, running up substantial additional government deficits to keep the company afloat until it could be sold. Years of mismanagement, lack of investment, and falling world copper prices caused ZCCM to lose $200-$300 million in 1998 alone, or between 6-9% of Zambian GDP.

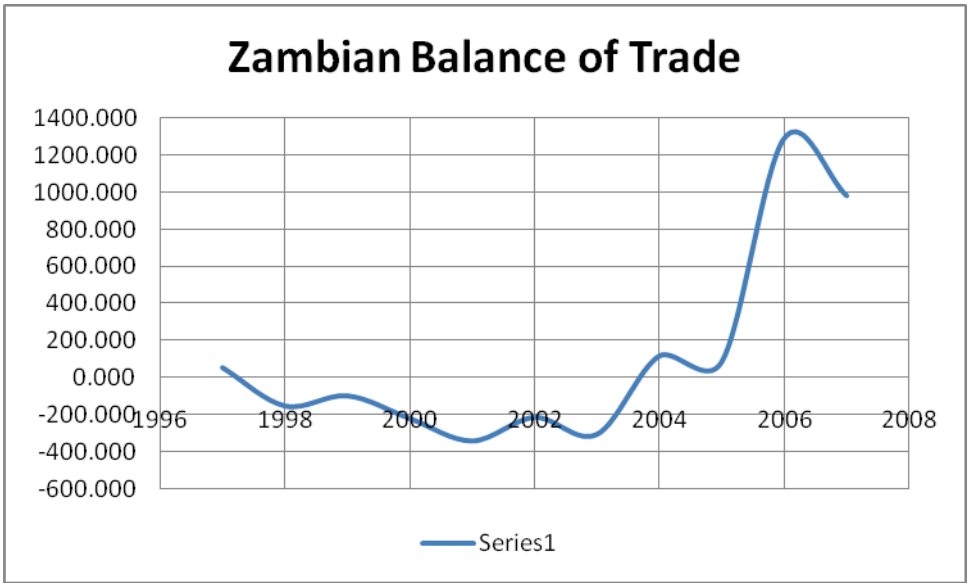
Taking growing debt and political instability together, the Zambian currency, the kwacha, began a series of steep declines in 1997, as evidenced by the graph below[2] [3].

[2] Source: IMF International Financial Statistics online.

[3] Exchange rate here expressed in terms of kwacha per IMF SDR.



The results on the Zambian balance of trade offer a further demonstration of the Kulkarni Hypothesis, as one can observe the series of mini J-Curves as the kwacha continued to lose value over a period of years from 1997 to 2003, and not actually leading to surplus in the balance of trade until 2004-2006, when the currency depreciation leveled off and then turned toward appreciation.



Year	BOT	% Change	Year	Kwacha/SDR	% Change
1997	54.4		1997	1908	
1998	-153	-381	1998	3236	70
1999	-98	36	1999	3612	12
2000	-220	-124	2000	5417	50
2001	-342	-55	2001	4813	-11

2002	-214	37	2002	5892	22
2003	-306	-43	2003	6903	17
2004	117	138	2004	7409	07
2005	86	-26	2005	5015	-32
2006	1293	1403	2006	6629	32
2007	983	-24	2007	6075	-8

From the data we see that in 1998, the kwacha depreciated 70% from the previous year, and in that same year the balance of trade declined 381%, but then in the following year the BOT began to pick up as one might expect from the J-Curve Hypothesis. Then in 2000 the kwacha depreciated sharply again, this time 50% year over year, causing the BOT to fall 124%. The pace of BOT decline lessened in 2001 as the kwacha appreciated 11%, and then turned up in 2002. But the 22% depreciation in 2002 and 17% depreciation in 2003 caused the BOT to dip 43% once again. Though volatile, the currency essentially leveled off by 2004, allowing elasticities of imports and exports to meet the Marshall-Lerner Condition and thus allowing the currency depreciation of 262% from 1997-2003 to effect the trade balance as predicted by the J-Curve Hypothesis.

CASE STUDY: NIGERIA

1986 was a watershed year for the Nigerian economy. Prior to that, Nigeria was seen as an exporter of primary agricultural commodities and oil, and it maintained a currency peg for the naira to either the U.S. dollar or the British pound (whichever was stronger). As world oil prices came down from highs in the 1970s[4], the Nigerian economy fell into recession, with GDP contracting 6.7% in 1983 alone, and interest rates hovering around 20%. (Onafowora, 2008) The IMF stepped in to Nigeria in 1986, however, pushing along structural adjustment measures including loosening currency controls. While the government did end direct rationing of foreign exchange in 1986 as part of the program, it instead set up a multiple exchange rate regime, giving preferred institutions access to more favorable exchange rates than everyone else. (Beck, 2005) This opened the door to

[4] Incidentally, oil accounted for roughly 80% of government revenues and 40% of GDP in the early '80s.

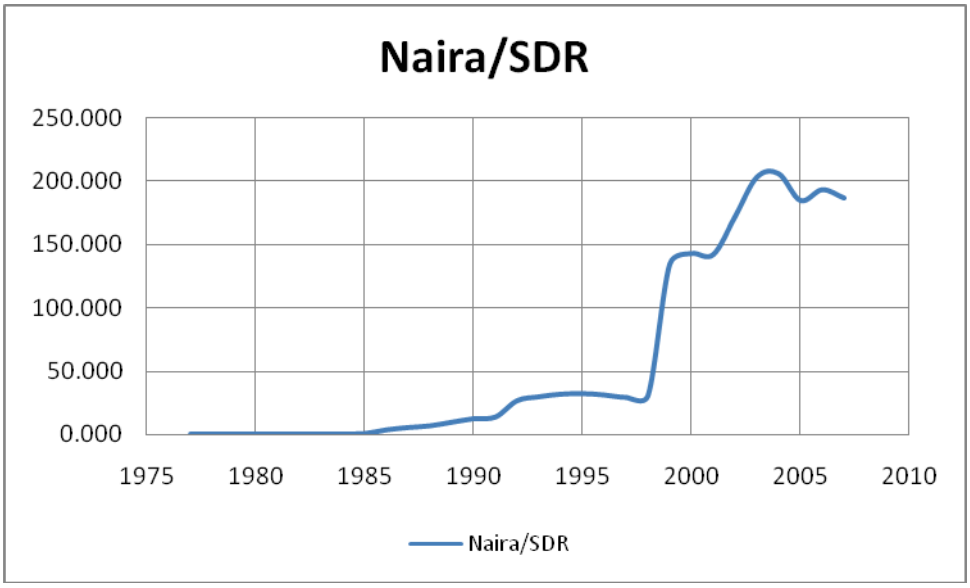
the incredibly lucrative practice of currency arbitrage by privileged financial institutions, and sparked a boom in the financial sector.

The number of banks tripled in the following six years, from 40 to 120, and the financial sector's contribution to GDP also tripled during that time, as banks were making 300% returns on investment. GDP increased an average of 5% per year during this period as well. Much of this was financial engineering, however, as evidenced by the declines in both deposits and lending to the private sector from 1986 to 1992. By 1990, the amount of non-performing loans began to increase sharply, and by 1991 the Nigerian Central Bank issued a moratorium on licenses for new banks. In 1993, political uncertainty triggered a run on the banks, paralyzing the financial system. By 1994 a military regime had taken power and re-instituted exchange rate controls on the naira.

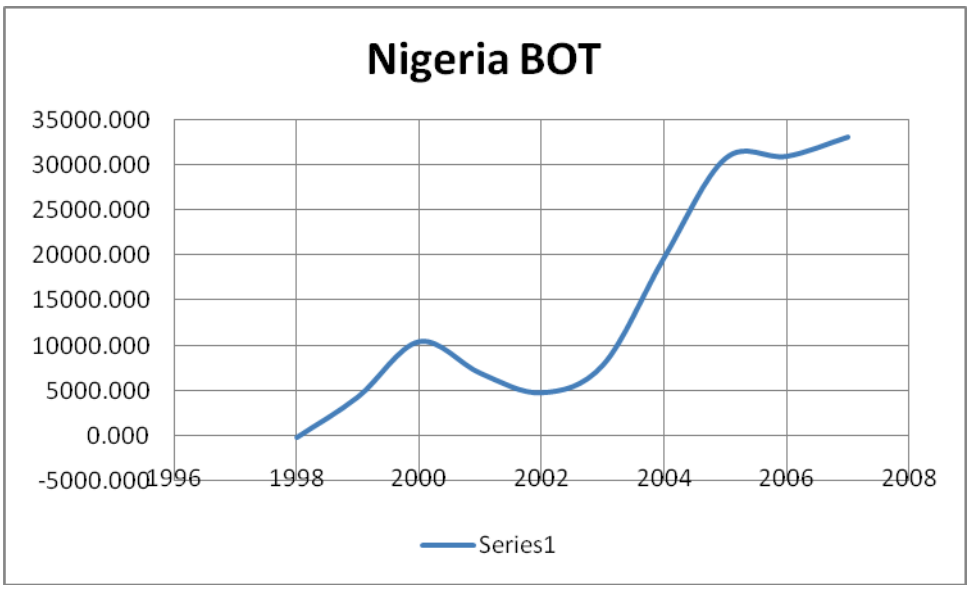
However by 1998, a civilian government had taken power again, and took several actions on the economy, including floating the naira. This step led to a sharp depreciation of the currency, which jumped from 30.8 naira/SDR in 1998 to 134.4 naira/SDR in 1999[5] [6], or 332%. Notice the leg up in the chart below.

[5] Source: IMF International Financial Statistics online.

[6] Note: SDR, or Special Drawing Rights, are a basket of currencies consisting of the US Dollar, British Pound, Japanese Yen, and Swiss Franc. The weighting of this basket is determined by the International Monetary Fund.



Nigeria's trade balance reacted to this sharp depreciation a bit strangely, however, given the J-Curve Hypothesis. While we would have expected the trade balance to go down in 1999, instead it soared 1800%, and continued its ascent in 2000, growing by 143%. In fact, it was not until the period from 2000-2005 that we saw the J-Curve Effect play out. Also, we don't see evidence of the Kulkarni Hypothesis as a result of the second wave of depreciation in 2002-2003, when the currency fell almost 43%. Notice in the chart on the following page how Nigeria's balance of trade goes up unimpeded during the period 2002-2007.



Year	BOT	% Change	Year	Naira/SDR	% Change
1998	-240		1998	31	
1999	4288	1887	1999	134	332
2000	10415	143	2000	142	6
2001	6895	-34	2001	141	-1
2002	4737	-31	2002	171	21
2003	7823	65	2003	202	18
2004	19757	153	2004	205	1
2005	30781	56	2005	184	-10
2006	31000	1	2006	192	4
2007	33137	7	2007	186	-3

This delayed J-Curve effect was likely due to more to political economy than economics itself. During the military regime, trade had been restricted and trade laws became much more protectionist. Thus, the surge in exports following the fall of the military leadership was a product more of pent up demand for Nigerian exports, particularly oil, than monetary policy. However it may be that following that initial surge due to the liberalization of the economy, then the elasticities of imports and exports began to draw the BOT lower initially, then up over time as the elasticities grew. As for why the Kulkarni Hypothesis didn't fit with this data, perhaps the depreciation (21% and 18% respectively) wasn't enough to move the needle on trade, or perhaps again, political issues trumped monetary policy on trade. Crude oil prices could also be behind these findings, considering that the price nearly tripled from January 2002 ($18.68/bbl.) to December 2005 ($51.66/bbl.)[7], and therefore allowing the Nigerian economy to shrug off the expected short-term dip in trade balance from the currency depreciation.

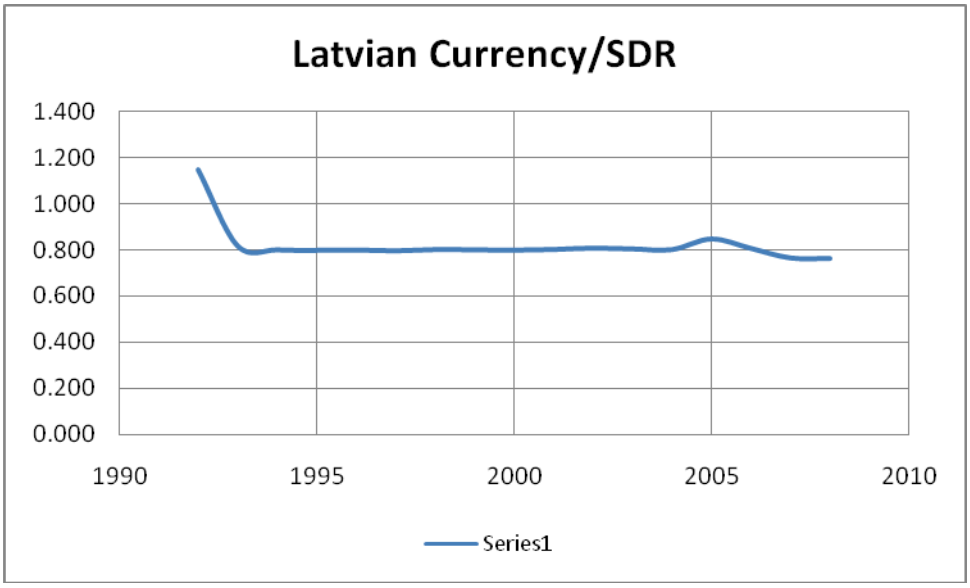
CASE STUDY: LATVIA

Latvia officially declared independence from the Soviet Union on May 4, 1990, and on September 3, 1991 the Latvian congress passed a resolution to restore the Bank of Latvia as the central bank of the country, giving it the right to issue national currency. After their independence from the Soviet

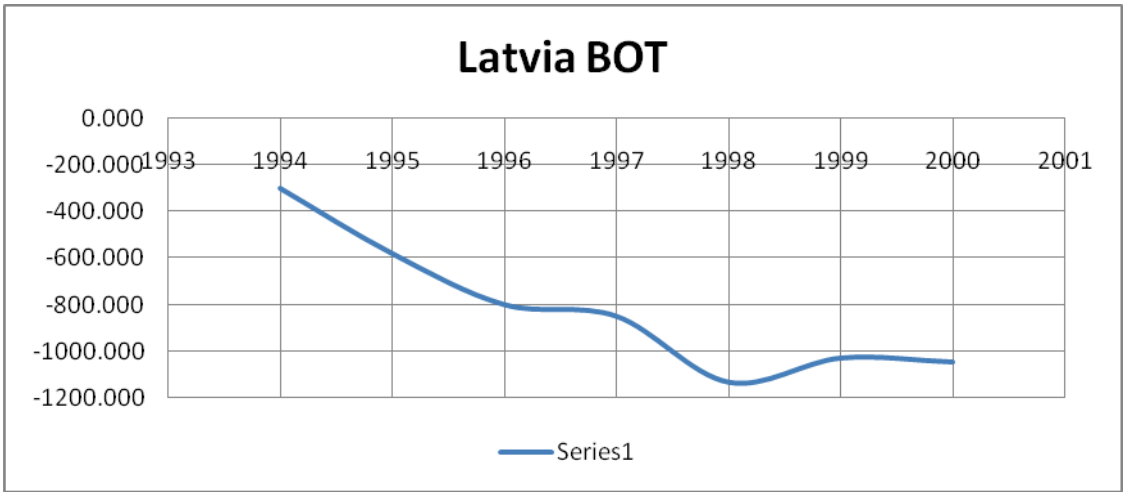
[7] Source: U.S. Energy Information Administration official statistics online. http://tonto.eia.doe.gov/dnav/pet/hist/wtotworldw.htm

Union in 1991, all three Baltic countries moved to a monetary policy framework within the context of a fixed exchange rate regime. This swift shift from a socialist monetary system allowed them to stabilize their economies much more quickly than other former Soviet republics. Estonia was the first former Soviet republic to issue its own currency, the kroon, in mid-1992, when they adopted a currency board style arrangement where the central bank is strictly prohibited from lending to government or state enterprises, and government reserves are backed by foreign reserves. This approach allowed the Estonian government to insulate monetary policy from political policy so the kroon could become a stable currency.

In early 1992, Latvia was still using the Russian ruble, which began to have adverse effects on its economy, as the ruble deteriorated, foreign imbalances grew, and the inability to issue cash domestically began to squeeze money supply. Because Latvia didn't have as much cash on reserve as Estonia, it initially adopted a money-based stabilization strategy, which involved the use of an interim currency—the Latvian ruble—that was circulated along with the Russian ruble until a national currency could be introduced in 1993. In mid-1993, the Latvian lat was introduced as the new national currency, and its value was pegged in early 1994 to the IMF's SDR. (Blejer, 1999) Based on IMF data, however, the lat was valued 29% higher than the previous currency regime in Latvia, and this data makes for an interesting case study because it is one of the few examples that could be found where a currency was revalued by a significant amount and then remained unchanged for a long period of time. Such data offers a fairly well controlled test for the J-Curve Hypothesis.



Notice the spike down from 1992 to 1993 in the chart above, which shows the period of introduction of the new currency, and subsequent revaluation. Notice too that the exchange rate remained constant for more than a decade following its introduction. Consider then the effects on balance of trade following the currency revaluation seen in the chart below.



We see that balance of trade continued a protracted slide for the seven years following the currency revaluation. These deficits would be predicted by a common understanding of currency valuations and trade, which, as described in the theory section of this paper, suggest that as currency value goes up exports become more expensive for the rest of world, and thus decline, while imports become cheaper in the domestic market, and thus increase. What is not evident from

the BOT chart is the inverse J-Curve Effect, however, where the BOT experiences a slight bump up following a revaluation before legging down in subsequent years.

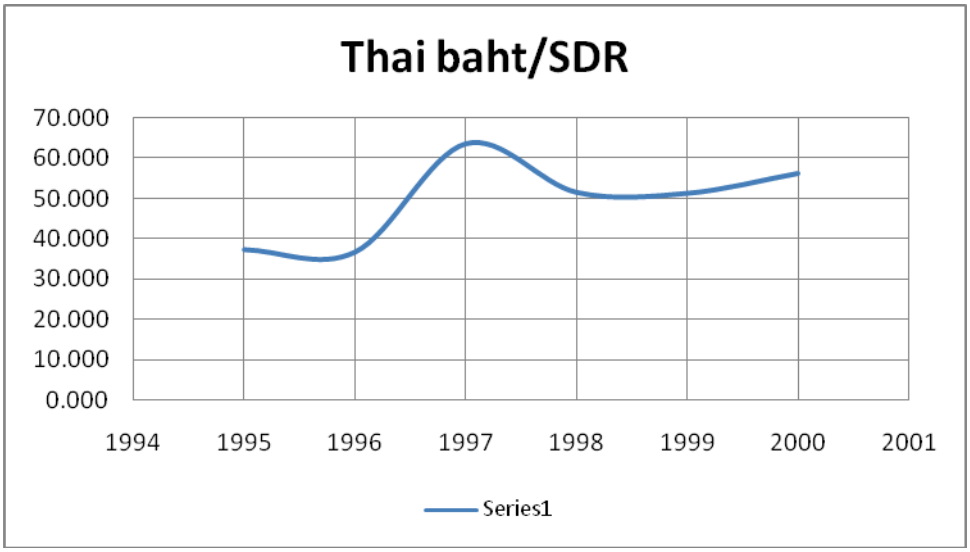
Latvia's trade deficits in the '90s may not be all currency driven, however. The other part of the BOT story is that Latvia is a relatively resource scarce country that has had to import primary materials from abroad to rebuild following independence. Also, with its manufacturing sector below Western standards and with new trade relations with the European Union in the mid-'90s, consumer demand for foreign goods was out of balance with foreign demand for Latvian goods. It will be interesting to see what happens with Latvia's trade balance following the switch to the Euro, which is currently scheduled for 2012.

CASE STUDY: THAILAND

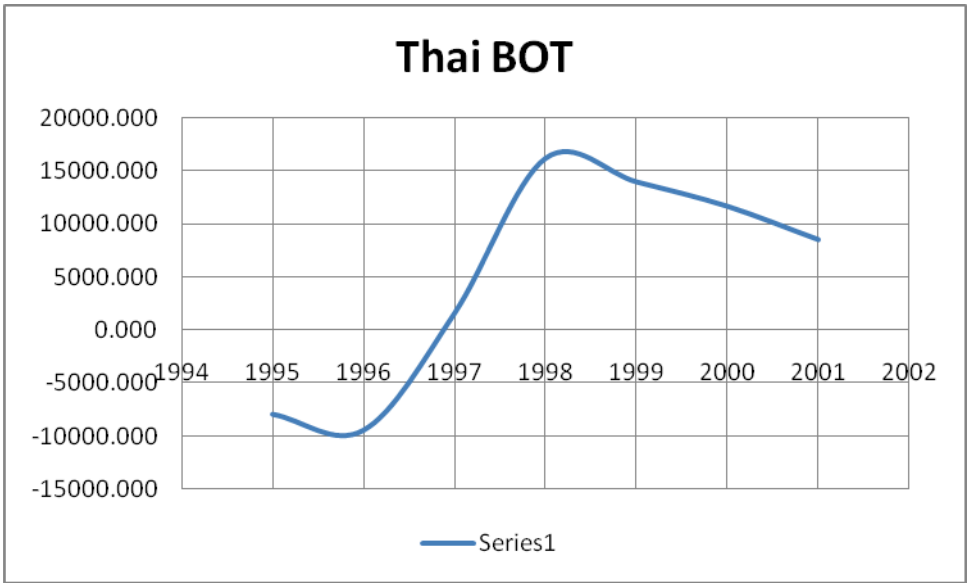
In 1992, Thailand completed IMF Article 8 obligations, opening up the foreign exchange market for current account transactions. This allowed Thai financial institutions to get more favorable lending terms from foreign and domestic sources, however financial regulatory bodies were not sophisticated enough to ensure prudential standards were met. This caused a drastic increase in foreign borrowing from 1992-1996 by Thai commercial banks, who borrowed large sums of short-term funds from abroad. (Charoenseang, 2007) What made this borrowing spree even more problematic was that almost none of the borrowing was hedge for currency fluctuation because the Thai baht was pegged to a basket of currencies heavily weighted to the dollar. Thai financial institutions were then taking these short-term loans from foreign lenders, and lending domestically in high concentrations to risky sectors like real estate or securities. This created two structural problems with the Thai financial institutions' scheme: that borrowing was done short-term, while lending was done long-term; and that foreign currency was being borrowed without hedging, while lending was done in baht. Also, a lot of the lending from Thai banks to Thai firms was based on connections, and thus had lower lending standards. (Kali, 2006)

On March 3, 1997, the Bank of Thailand and Thai Ministry of Finance announced that ten banks needed to raise capital due to liquidity and asset quality problems. The Bank of Thailand provided capital to the banks, and took over some of their troubled real estate assets through the newly established Property Loan Management Organization. These actions changed foreign perception of Thailand, and capital started flowing out as quickly as it had flowed in, putting pressure on the Bank of Thailand to defend the currency peg, particularly during the speculative attack in May 1997. The operations of 58 of the largest financial institutions were suspended from June to August, by the government who ordered them to restructure their balance sheets and management. By July 2, 1997, Thailand could no longer defend the currency peg, and allowed the baht to float, causing a sharp depreciation.

By the end of 1997, the baht had fallen 73% below its 1996 levels, as illustrated in the chart below.



The financial crisis that resulted, and ultimately spread to several other Asian countries, caused a severe recession, with GDP falling 1.5% in 1997 and 11% in 1998. The Thai trade balance reacted opposite of how the J-Curve Hypothesis would anticipate, as seen in the chart below.



Year	BOT	% Change	Year2	baht/SDR	% Change3
1995	-7968	-115	1995	38	2
1996	-9488	-19	1996	37	-1.6
1997	1571	117	1997	64	73
1998	16237	933	1998	51	-19
1999	14013	-14	1999	51	0.5
2000	11700	-17	2000	56	9.6
2001	8543	-27	2001	55	-1.4

Notice that in 1998, the year following the 73% devaluation of the baht, the Thai trade balance actually increased, contrary to what one would expect based on the J-Curve Hypothesis. Then in the following years, the trade balance proceeded to steadily decline by 14%, 17%, and 27% in 1999, 2000, and 2001 respectively. Notice too that, although there was a modest appreciation of the baht in 1998, it didn't come close to returning to its prior levels, which suggests that the trade balance should have increased in the out years.

One possible explanation for this phenomenon is that Thailand's key trading partners are other countries in Asia, and thus, although the SDR component currencies remained relatively stable throughout the Asian financial crisis, the currencies of Thailand's key trading partners may have depreciated even more than the baht, thus causing the decline in Thailand's trade balance.

CONCLUSION

This paper is designed to test the concepts of the J-Curve Hypothesis, the Kulkarni Hypothesis, and the Marshall-Lerner Condition. In the case of Zambia, we saw evidence of all three of these concepts, as the trade balance showed continued dips as a result of a series of large depreciations, followed ultimately by a marked increase once the currency was stabilized. In Nigeria, we saw a different result. A sharp devaluation of the currency was followed in the short run by a sharp increase in the balance of trade, which then dipped before rising again. We described this as a delayed J-Curve, and attributed it to factors exogenous from currency, particularly the changeover of government from a protectionist military leadership to a more open civilian government that coincided with the change in currency valuation. More testing would have to be done to determine whether there is such a phenomenon as a delayed J-Curve effect that can occur in such a case, or if the appearance of a J-Curve in the case of Nigeria was simply due to other unobserved factors unique to that case.

In the case of Latvia, the J-Curve Effect did not show up in the data. Though the currency was revalued, which we would predict would result in an inverted J-Curve based on the theory, the balance of trade went straight down following the revaluation. We may be able to attribute this several factors that make Latvia, and perhaps other post-Soviet economies during their transition, poor examples for testing the J-Curve Hypothesis. First, the currency that was shown as being revalued from the data was actually a new currency, so it may be presumptuous to compare the two currencies as if they were the same. Second, the Latvian economy as a whole underwent a complete transition from being centrally planned—both in terms of monetary policy and production—from Moscow to being market-based, with monetary policy coming from the new Latvian central bank. These fundamental economic changes are likely to cause all sorts of changes in trade policy, trade relations, and domestic demand that could have as much or more influence over trade flows as monetary policy, at least in the short-run during the transition, which was the period observed.

Finally, we looked at the case of Thailand, where a financial crisis caused a steep drop in the value of the domestic currency in 1997. Contrary to the J-Curve Hypothesis, however, what followed was a short-term rise in the balance of trade, followed by a decline in the out years, which looked like an inverted J-Curve. Further study could be done on this topic to determine whether this occurred, as theorized in the section above, as a result of steeper currency declines in other Asian countries at the same time, or due to some other unknown factor.

Nevertheless, while the results of these cases are mixed with respect to the J-Curve Hypothesis, we conclude that those cases that did not show evidence of the Marshall-Lerner Condition and the J-Curve Effect did so for external reasons, however in the one example where external factors did not impact the balance of trade—that is, the case of Zambia[8]—we did see clear evidence of the J-Curve Effect and the Kulkarni Hypothesis. Thus we conclude that the concept of the Marshall-Lerner Condition is a relevant one, and is applicable in real world cases. From this study, however, we recognize that the balance of trade is more than just a function of monetary policy, and in many cases external factors can have stronger effects than currency valuation.

[8] Note: Zambia also demonstrated the effect hypothesized in the introduction of this paper, that in the out years following a sharp depreciation, that currency would begin to appreciate and trade balance would begin to decline, as occurred in 2006-2007. This effect was not seen in the data from the three other cases, however.

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