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How to cure the trade balance? Reducing budget deficits versus devaluations in the presence of J- and W-curves for Brazil

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Abstract. We analyze empirically for Brazil a hypothesis by Stiglitz (2002) saying that devaluations may be more effective in reducing trade deficits than cuts in budget deficits. We find that the Ricardian equivalence does not hold. Devaluations have a stronger impact on the trade deficit than budget deficits when doing the analysis with yearly or monthly data even when the effect from a risk variable obtained from a TARCH estimate is subtracted. Devaluations have an effect that lasts 25 months. A J-or W-curve can be obtained from a polynomial distributed lag estimate. Devaluations can explain almost 19% of consumer price inflation. However, if inflation control is a task assigned to monetary policy rather than exchange rate policy, devaluations are available as an instrument to stabilize the trade balance under shocks rather than keeping exchange rates fixed through sales of reserves. This may avoid overvaluations, speculative attacks and currency crises. The results for the trade balance hold for several updates except for the last one, where budget deficits and exchange rate changes change signs. This suggests a role for imported investments and elasticity pessimism and casts doubts on the role of cutting budget deficits and devaluations in regard to the trade balance. Stability tests suggest that structural change seems to play a role. The change in signs of our estimates may have been caused by a change of exchange rate policies leading to appreciations since June 2004 and by an extraordinarily strong industrial recession in 2003 in some countries. If Ricardian equivalence for the trade balance is imposed by assumption we find a weakly significant N-curve for exchange rate risk jointly with a J-curve for devaluations.

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Abstract. We analyze empirically for Brazil a hypothesis by Stiglitz (2002) saying that devaluations may be more effective in reducing trade deficits than cuts in budget deficits. We find that the Ricardian equivalence does not hold. Devaluations have a stronger impact on the trade deficit than budget deficits when doing the analysis with yearly or monthly data even when the effect from a risk variable obtained from a TARCH estimate is subtracted. Devaluations have an effect that lasts 25 months. A J-or W-curve can be obtained from a polynomial distributed lag estimate. Devaluations can explain almost 19% of consumer price inflation. However, if inflation control is a task assigned to monetary policy rather than exchange rate policy, devaluations are available as an instrument to stabilize the trade balance under shocks rather than keeping exchange rates fixed through sales of reserves. This may avoid overvaluations, speculative attacks and currency crises. The results for the trade balance hold for several updates except for the last one, where budget deficits and exchange rate changes change signs. This suggests a role for imported investments and elasticity pessimism and casts doubts on the role of cutting budget deficits and devaluations in regard to the trade balance. Stability tests suggest that structural change seems to play a role. The change in signs of our estimates may have been caused by a change of exchange rate policies leading to appreciations since June 2004 and by an extraordinarily strong industrial recession in 2003 in some countries. If Ricardian equivalence for the trade balance is imposed by assumption we find a weakly significant N-curve for exchange rate risk jointly with a J-curve for devaluations.

1. Motivation

It is a common property of many debt crises that the countries in trouble have a huge amount of foreign debt falling due within a short period (see Radelet and Sachs 1998). When countries have difficulties to repay debt, the natural way to increase the potential for repayment is to increase the trade surplus of goods and non-factor payments. In his recent book Stiglitz (2002) emphasizes that the IMF prefers to achieve this without devaluations and by a reduction of government deficits only. Stiglitz clearly indicates that he finds it preferable to support this process by devaluations. In the case of Brazil in 2002 the agreement with the IMF does not exclude devaluation policies as can be seen from the dropping of the exchange rate anchor in the vain of the switch to inflation targeting in 1999.[2] The IMF and Brazil did agree that Brazil should achieve an increasing budget surplus, but as a matter of fact the Real is falling in the first half of 2003. One may want to speculate that Brazil prefers Stiglitz' view

[2] See Amann and Baer (2003) for the recent development in Brazil and Mishkin and Schmidt-Hebbel (2001) for an introduction to inflation targeting.

and does not try to avoid due devaluations. Brazil as a big debtor is too powerful to allow for a one-sided imposition of a policy of budget deficit reductions only and the IMF has followed the introduction of inflation targeting in connection with dropping the idea of using the exchange rate as an anchor with great interest.[3] By implication, the case of Brazil, with its many devaluations, is a natural experiment to study the relative impact of budget deficits and devaluations on the trade balance, which is the purpose of this paper. Therefore we marry aspects from two strands of literature: The regressions of trade deficits on budget deficits and the regressions of trade balance on exchange rates yielding J-curves and related constructs. In particular, we want to know, which of these two variables has a stronger impact. We study this twice: once, in section 2, for the period 1980-1998 where hyperinflation ended in 1994 using yearly data and once, in section 3, for the period after hyperinflation, 1998 – 2005 (march) using monthly data with updates in several steps, where no earlier data are available for budget deficits. In section 4 we discuss the standard counter argument of imported inflation or inflation pass through. Section 5 concludes.

2. Some regressions for the trade balance with yearly data

The basic agreement between the IMF and Brazil is to reduce (increase) the central governments overall budget deficit (surplus) per unit of GDP. As this is a percentage rate, the natural variable to consider is the external balance of goods and services per unit of GDP. Data for the budget deficit are available in the World Development Indicators, from which we take all data used in this section, for the years 1980-1998 (with the exception of 1995 and 1996)[4]. This is mainly the high inflation period. As Brazil has undergone many reforms since the Latin American debt crisis, data for earlier periods may be of limited value anyway. For the years since 1980 the pure regression relation between the trade surplus and the budget

[3] See Bogdanski et al. (2000).
[4] WDI 2004 fills in a zero for these two years, which we do not take over but rather treat it as missing values. 1998 is the last value given in WDI 2004.

deficit both as percentage of the GDP is shown as regression 1 in Table 1. This preliminary estimate would suggest that a one percent reduction in the budget per unit of GDP increases the trade balance as a percentage of GDP by 0.27 percent. The budget deficit is a significant variable. The negative intercept suggests that there may be a trade deficit even if the budget deficit were zero. The budget deficit has no unit root according to the standard tests but this suffers from the low number of observations. The trade surplus has no unit root for the period from 1960-2001, but has a unit root if it is taken only from 1980 onwards. But again this suffers from the low number of observations. Therefore we consider unit root tests only for the longest possible period of each variable. As it remains unclear that this is also adequate for the short period available because of the limited data availability concerning budget deficits we will also estimate first differences of the basic equations with added lagged residuals of the level equations. Moreover, in regard to the specification we follow in the first instance our own economic intuition rather than relying on stationarity tests, which may be unreliable for a low number of variables. The residuals of the regression are stationary at the 1% level and therefore we may consider the equation as cointegrated. However, adding a quadratic time trend to the regression, which is significant for both, the time variable and its squared value, the budget deficit variable is significant and the coefficient drops to -.13 (not shown). Running the regression in first differences with the lagged residuals of Regression 1 as an additional regressor yields a coefficient of -.20 (see regression 2 in Table 1 with low explanatory power). This equation is robust against adding time variables, but the F-probability is much worse now. The effects of time variables will vanish in the more complex level regressions below. Due to the low number of observations we cannot use vector error correction methods. Therefore we first proceed by using level equations and then we will estimate in first differences.[5]

[5] What also considered using the methods discussed in Maddala and Kim (1998), which use level equations and add lagged error correction terms (Phillips-Loretan non-linear method) or leads and lags of first differences of

TABLE 1 OVER HERE

The natural next step now is to extend the regression by adding the exchange rate to it, because Stiglitz recommends this as a second instrument to increase the trade surplus. Exchange rae data in the WDI are corrected for the currency reforms. Because of the well-known J-curve effect we have included the percentage rate of devaluations of the official exchange rate without and with lags of one and two periods in all combinations. As exports in the trade surplus variable depend on world income we have added a world income variable. As imports and the denominator of the surplus and the budget deficit depend on the GDP of Brazil, we have also added the GDP of Brazil as a variable.[6] Moreover, as the trade and budget variables may be affected differently by inflation, we also add the percentage change of the GDP deflator.

There are five mechanisms by which the budget deficits may have an impact on the trade balance.[7]

First, the budget deficit has a negative impact on the trade balance probably because it raises the price level and therefore reduces the competitiveness of exports.

Second, deficits enhance imports directly or via the creation of income. Both effects may be mitigated by subsequent devaluations. This also allows for a distinction between percentage rates of inflation and price level effects, and other devaluation effects. Levels or lagged growth rates of the exchange rates give worse results than the growth rate of the current exchange rate. Seemingly there is little support for the J-curve effect when using

lagged regressors (Saikkonen's dynamic OLS) or lags of first differences of dependent and independent variables (Hendry's method). For the first two methods we have too low a number of observations and for the last method we did not get any good result probably for the same reason.

[6] Without doing so some regressions break down when adding a (quadratic) time trend and therefore we jump to the comprehensive regression rather than proceeding from simple to general following the argumentation in the debate. Adding a terms of trade variable leads to highly insignificant results. This result may be obtained because '... the nominal exchange rate accounts for most of the variation in the real exchange rate...' (Bahmani-Oskooee and Miteza 2002 and Joyce and Kamas 2003). Using logs of the GDP variables yields worse result in the Breusch-Godfrey serial correlation LM test.

[7] See Salman Saleh (2003) for more details of the arguments.

yearly data in this high-inflation period of Brazil where international contracts are written in dollar terms.

A third effect is that the financing of the deficit increases interest rates, which may reduce investment and therefore imported inputs. This direct effect is favorable for the trade balance.

Fourth, past values of variables induce expectations of deficits.[8]

Fifth, an increase in the interest rate attracts capital inflows, which in turn increase the exchange rate and reduces the trade balance unless private savings are increased sufficiently strongly to neutralize the effect of the deficit. This latter case is the Ricardian equivalence where the budget deficit has no impact on the trade deficit. The other case, where the trade balance is affected is usually called the Keynesian proposition or conventional view (see Vamvoukas (1997). Actually the view of the IMF, which is often held to have a neoclassical bias, then is a conventional Keynesian one and Stiglitz suggests letting the price mechanism work, which is normally expressing the neoclassical view. Thus, both borrow arguments in the other 'camp' and our research question can be read as asking 'Should they do this?'. Given the sign obtained so far in our regressions the reduction of imported inputs is dominated by the other four and there is no Ricardian equivalence.

With all the variables discussed above we get the result of regression 3 in Table 1. The Durbin-Watson statistic is close to two and also a Breusch-Godfrey test does not show any autocorrelation. The RESET test is quite good but non-suitable if we have I(1) variables. The GDP of Brazil is a doubtlessly stationary variable in this regression. The inflation rate is also

[8] See Kasa (1994) and Piersanti (2000). In both cases expected variables derived from forward-looking theoretical models are ultimately replaced by lagged ones. Both authors use the Yaari-Blanchard-Weil model. In that model the exchange-rate changes do not appear as a right-hand side variable in the regression. Therefore we cannot use that framework for our problem statement.

stationary at the 3.3% significance level. All other variables are I(1).[9] Therefore we estimate this equation also in first differences (see regression 4 in Table 1). The constant and the world income variable now have a very low significance. The absolute value of the coefficient of the budget deficit decreases drastically. It is half that of the level equation and close to the value of regression 2. However, if we add the lagged residuals of the level equation (see regression 5), that coefficient is back to .38.[10] The coefficient for the growth rate of the exchange rate is the same in all the regressions but those of the other variables change. The Breusch-Godfrey test again does not show serial correlation although the result is less strong now, and the RESET test has a weak result now. Adding lagged residuals seems to be slightly overdone as the RESET test gave much better results for regressions 3 and 4 in Table 1 before.

The preliminary interpretation of the regression in levels (first differences) is as follows. Any reduction in the budget deficit per unit of GDP increases the trade surplus per unit of GDP by about 0.44 (.21) times the change in the former. This supports to some extent the argument of the IMF to reduce budget deficits if the objective is to improve the trade balance. Any change in the percentage of devaluations changes the trade balance as percent of the GDP by 2.24 (2.62) times the change in the devaluations. This is an elasticity that also supports the standard assumption that the Marshall-Lerner stability condition is full-filled for the trade balance even without the restrictive assumptions of balanced trade.[11] The inflation rate and the exchange rate are 'monetary' variables, which enter the regression as growth rates because their real effect (at least in the inflationary phase) depends on the relative speed with which they move. Our result that the nominal devaluation has a real impact on the trade balance is in line with recent research showing that nominal devaluations lead to real

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[9] For the growth rate of the exchange rate with data for 1960-2001 the marginal significance levels according to the standard tests are as follows: ADF:.21; DF-GLS below 10%; Phillips-Perron .21; the KPSS hypothesis that dlne is stationary is rejected at the 5% level; ERS (and Ng-Perron slightly) higher than 10% level.

[10] This is done somewhat ad hoc in analogy to the procedure for the two variables case, because we do not have enough observations for the Johansen procedure.

[11] See Hooper and Marquez (1995) p.112.

devaluations (see Bahmani-Oskooee and Miteza 2002 and Joyce and Kamas 2003). When world income is replaced by a time variable, there are similar results (not shown). But time is less significant than world income, which proxies for the income of the countries to which Brazil exports. Inflation seems to have only a weak though significant impact.

In order to analyze the relative impact of the variables, we calculate the averages of the variables, insert them into the regression equation, and divide by the left-hand side. As a result we see, which regressor explains what percentage of the trade balance surplus. We do this for the level and the first difference versions (regressions 3, 4 and 5), because none of them seems to be clearly better than the other given the limits of unit root tests for low numbers of observations.

TABLE 2 OVER HERE

In each part of Table 2 we show the coefficients of the regression in the first line. The second line shows the average values of the variables. The third line shows the product of line one and line two, i.e. the product of regression coefficients and average values. The last line gives the result of dividing the regression by the average value of the (change of) the trade surplus, which is the percentage each variable explains of the dependent variable. The first block shows the result for the estimate in levels from regression 3. The GDP variables have by far the strongest impact; the budget deficits explain slightly less of the trade surplus than devaluations but more than inflation does.

In the second part of Table 2, belonging to regression 4, GDP movements have again the strongest impact. Devaluations have a slightly larger impact than inflation and budget deficits have the smallest impact.

The results for regression 5 show again that the impact of GDP variables is the strongest. The second strongest now is inflation, but devaluations are almost four times as strong as budget deficits are.

As GDP movements are not available as instruments of economic policy in regard to the trade balance, we can conclude that, for a given rate of inflation, the impact of devaluations is larger than that of reducing budget deficits for the period under consideration and estimates in first differences. This provides support for Stiglitz' argument and there is no Ricardian equivalence but rather the Keynesian proposition holds. Borrowing arguments in the other camp seems justified. By implication, both the budget deficits and devaluations can be used to reduce the trade deficit.

The critical question is whether or not this holds also for times of low inflation.

3. The trade balance in the period 1998 – 2005 with monthly data.

Data and econometric aspects

In the second but last stage of working with monthly data in summer 2004, we had data from the Central Bank of Brazil[12] all ending either in April or May 2004 (see Table 3), or, for industrial production indices between November 2003 and January 2004. In the second phase, one year later we had more observations.

There are some noteworthy problems here when going to an analysis with monthly data. First, in the possible presence of a J-curve effect using monthly data implies that about 24 lags have to be used. As exchange rates are available for three and a half more years than budget deficits this does not cause any loss of observations but it means that we estimate a large number of coefficients with still a low number of observations. Second, in regard to unit roots Table 3 reveals that the AIC selection criterion often tells that we have unit roots, whereas the SIC criterion does oppose this view. The Phillips-Perron test, which does not depend on these criteria does not reveal unit roots. Moreover, when we had data only until December 2003 all our variables were stationary. Third, the nominal exchange rate is stationary as found by

[12] See http://www.bcb.gov.br

Minella et al. (2003) if we use data only from July 1994 onwards, but are I(1) if we use only observations from 1998 onwards.[13] We use its growth rate and also the growth rate of the GDP, both of which are stationary. Our inflation variables are stationary. We conclude that the data are at least very close to being stationary.

TABLE 3 OVER HERE

Next, we do not have monthly GDP data for world income. Therefore we will approximate them by a time trend variable and industrial production indices for the USA, UK, Germany, France, Japan and Canada from the IMF-IFS also taken from the websites of the Central Bank of Brazil. The USA imports five times as much from Brazil as the second largest importer, the Netherlands. Many developing countries import about as much as the other OECD trading partners do, but we do not have their production indices. The most important data are then of course those of the USA. But we are lacking an important variable not knowing how good the proxies are.

In regard to exogeneity and causality we would imagine that budget deficits are policy variables, financial markets determine exchanges rates, and (the growth of) the stocks of capital and labour largely determined the GDP variable, where the investment rates are determined by long-run profitability expectations. In this sense we assume that right-hand side variables are exogenous except for the lagged dependent variable. Using vector autoregressive (VAR) models would be desirable in order to test for causality and endogeneity, but then we would have to estimate many parameters. In particular, in the presence of a J-curve we would need to allow for extremely many lags. Moreover, monthly investment data are not available and when we tried a VAR the equation for the GDP gives very bad results which may contaminate the other equations if we proceed in the seemingly unrelated regression mode. Therefore we proceed with the assumptions made above.

[13] This may point into the direction of a stochastic unit root problem found by Bleany and Leybourne (2003) or it appears because more random is coming in with flexible exchange rates.

With monthly data the difficulty is to find the appropriate number of lags. We proceeded in the following steps. First, we ran some regressions similar to those of the previous section trying to add some more lags in an intuitive manner. Here it turned out that the first lag of the dependent variable, the second lag of the budget deficit variable, the current growth rate of the GDP, the fifth lag of the industrial inflation index and most of about 26 lags of the exchange rate growth rate as well as the squared time variable were always significant. Some other lags of the industrial and agricultural inflation index, the second lag of the dependent variable, the time index and many of the lags of the industrial production indices were sometimes significant, but far from always. We did run 33.5 million regressions in which the first group of variables was always included and the second would be tried in all possible combinations. The program used would use the ordinary least squares method and select those regressions in which the second group variables are significant at the 10% level. These were 182 regressions. These 182 regressions then were tested according to the standard battery of tests: The Jarque-Bera test of normality, the Breusch-Godfrey test for serial correlation with two lagged residuals, the White heteroscedasticity test (if possible), the Ramsey RESET test[14], the CUSUM and CUSUM of squares test and the one and n-step forecast test. Among those of the 182 equations passing these tests, we did drop the non-significant (according to the Newey-West correction for heteroscedastivcity and autocorrelation) exchange rate growth rates and if necessary also other variables and ran again the whole test battery. From the remaining regressions we did select the regression with the highest adjusted R-squared, and the lowest Akaike, Schwarz and Hannan-Quinn criteria, standard error of regression and sum of squared residuals. Fortunately, it turned out that the best regression with deleted exchange rate terms is obtained from the best regression with

[14] We report the worst result from adding up to four fitted terms.

undeleted insignificant exchange rate variables. These regressions are presented in Table 4 and the trade balance accounting in Table 5.

TABLE 4 OVER HERE

Tables 4B and C (see Appendix, also for the corresponding accounting calculations) have similar regressions, but the selection has been made not using the above mentioned selection criteria but rather selecting those which perform best in the standard test battery, because some of the test results in Table 4 are a bit meager. Unfortunately, all of these regressions still estimate a large number of coefficients with a low number of variables. However, according to the Schwarz criterion mentioned above they are better then their alternatives (not shown) with a lower number of coefficients and variables. Regressions with lower number of variables are mainly those who drop the industrial production indices, when going through all combinations with significant variables only. In terms of results they have sums of exchange rate coefficients, which are half as large as the sum of the regressions in Table 4 and also the coefficient of the budget deficit variable is half as large as in Table 4. In both regressions of Table 4 the coefficients are about equally large although we have dropped four of the exchange rate lags.

Interpretation of the results

The budget deficit enhances the trade deficit with a lag of two months. The coefficient is about .11. This means that any change in the budget deficit as a percentage of GDP is translated by a factor 1/9 into the trade deficit. In all of the 182 regressions there was not anyone passing the standard test battery when this deficit variable was dropped. The Ricardian equivalence does not appear here. The growth rate of the GDP enhances the deficit with a coefficient of 5.5%. This means that one percent more growth results in .055% higher trade deficit as a percent of GDP, which is a combination of the effect that not only imports are increasing but also the denominator of the dependent variable. The squared time variable

has a significant but very small coefficient. Next, sixteen of the lagged growth rates of the industrial production index of the OECD countries have a significant impact with different signs though. The expected negative sign is present for all USA variables and one from France. Growth especially in the USA increases Brazil's exports and reduces its trade deficits. The positive sign of the other countries' growth of the industrial production index can be explained along the lines of Backus, Kehoe and Kydland (1994): The growth rate reflects not only demand but also productivity growth, which decreases the prices of OECD countries' goods and thereby enhances the trade deficit. As most of inflation may be captured in devaluations, we find a small impact of only four inflation rates, three of which have the expected sign and increase the deficit. Only the two months lagged agricultural inflation rate reduces the trade deficit. Perhaps this reflects an intertemporal substitution effect.

TABLE 5 OVER HERE

Now we can turn to the impact of devaluations and their strength relative to the other variables, especially the budget deficit reductions. The sum of the coefficients of all exchange rate variables, the long run coefficient, is about -1.97. The long-run coefficients are summarized in Table 5, panels (a) and (b), in the second column. The first column in this table has the average value of all these stationary variables. The third column contains the product of the coefficient and the average value for each variable. The fourth column is the value obtained when the third line is divided by the average value of the dependent variable. These numbers are percentages of the trade deficit explained by the corresponding variable. The interpretation is as follows. The constant and the growth rates of the industrial production indices each are about 55 or 45 times as large as the trade deficit as a percentage of GDP (plus the effect of the squared time variable, which is negligible though). These have by far the largest impact. The negative impact of devaluations is about 4.5 times as large as that of budget deficits. These results provide some support for Stiglitz' view that devaluations maybe

more important than changes of deficits. The effect of the lagged trade deficit is almost half that of budget deficits. The smallest effect comes from Brazil's GDP growth because its average value was a negative half percent during the period April 1998 through May 2003. This is the major difference with the section using yearly data. Industrial inflation has an impact that is smaller than that of devaluations, but larger than that of budget deficits, although we are in the low inflation period. Agricultural inflation has an impact that is as small as that of domestic growth.

FIGURE 1 OVER HERE

It may be interesting to look at the effect of the lagged devaluations. In figure 1 we plot the coefficients of all the devaluations of regression 2 in Table 4, which go up and down strongly. The positive immediate effects are on the left side. The lagged effects are more to the right and less frequently positive. Next, we regress these coefficients on a polynomial of time. We get three equations with significant terms. The within sample forecasts are plotted in Figure 2.

FIGURE 2 OVER HERE

We get a variant of the J-curve effect here.[15] The less time terms are in the regression, the less is the fluctuation reflected. The early effects are positive, but lagged effects reduce the trade deficits. This may be viewed as an example of the phenomenon that price changes and effects are small but may be important when cumulated over time, as expressed in the long-run coefficient of -1.97 in Table 5. The complete effect of devaluations is achieved only after 26 months, whereas that of reducing budget deficits is obtained after two months.

Table 7 again has similar results, but following Singh (2004) we have added a significant exchange rate risk variable, which is the standard error of a static forecast (see Figure 3) from a TARCH(1) regression (see Table 6) of the growth rate of the exchange rate on two of its lags. The TARCH regression uses exchange rate data only since October 1994, the last big

[15] The first two can also be read as a double W and the third as an inverted N-curve.

discreet jump in its value due to the end of hyperinflation. The estimate generates a stable difference equation in the exchange rate growth rate. The positive ARCH term indicates that errors increase volatility. The negative threshold effect in Tables 6 and 6b indicates that negative shocks to exchange rate growth reduce volatility. When our risk variable is added in Table 7 the risk reduces deficits.

TABLE 6 and 6b, TABLE 7, Table 8, FIGURE 3 OVER HERE

The impact of risk in Table 8, where the trade balance decomposition is repeated with the risk variable, is slightly larger than that of lagged trade deficits or budget deficits but only one fourth of the effect of exchange rate devaluations. The sum of coefficients of the devaluations has become larger now when risk is included. Even if this effect is subtracted from that of devaluations, devaluations affect trade deficits almost four times as strongly as budget deficits do. In sum, reduction in trade deficits is best achieved by growth in the USA and by devaluations under conditions of non-inflationary policies.

The previous regressions have a low number of observations relative to the number of parameters estimated. Therefore we replace the exchange rate variables by a polynomial distributed lag and get a figure that is comparable with a J- or W- curve. Sequential deletion of the then insignificant variables yields results presented in Table 9, which shows a J-curve pattern. In Table 10 we present the corresponding trade balance decomposition. Again changes of the exchange rate have a stronger effect of devaluations than those of budget deficits even after subtracting the effect of exchange rate risk, which is again persistent for about half a year. Inflation has a relatively stronger impact now. But of course the pdl method is fairly crude and serves mainly consuming less degrees of freedom and to show the J-curve pattern in a more stylized way. The latter can also be read as a W-curve found earlier for the USA in 1973-1985 (see Bahmani-Oskooee and Ratha 2004, p.1379).

TABLE 9, 10

In the above regressions we have presented the final results of several updates. In the meanwhile, more data have become available for about one year going until January to March 2005 for the industrial production indices and until April 2005 for all the other variables. For this last update we concentrate on the TARCH approach and the polynomial distributed lag.

FIGURE 4 ABOUT HERE

In the TARCH approach for the purpose of making the risk variable we use the Generalized Error Distribution now (see Table 6b), because this yields better forecast results (see Figure 4). The Root Mean Squared Forecast Error is again about 4% but its decomposition now has a higher percentage in the unexplained covariance proportion.

TABLE 11

We add the risk variable and one later as well as one earlier lag to those of the regression of Table 9[16] and then follow the stepwise regression procedure with some experiments of putting back eliminated variables. Table 11 summarizes the regression result. The sum of exchange rate change coefficients is now positive, indicating that the Marshall-Lerner condition is not fulfilled but rather elasticity pessimism is supported. The form of the curve is a mixture between J- and W-curve. The budget deficit variable – the first lag now - has a negative sign suggesting that the effect of interest rates on imported investments is dominating. Neither cuts of budget deficits nor devaluations are good for the trade balance although they may be good for other reasons. Another difference compared to Table 9 is that the industrial production indices matter much more and have a negative sign now, indicating higher demand reducing Brazil's trade deficit.

This is a dramatic shift in results indicating structural change. This suggestion is confirmed by the number of observations indicating non-constancy of parameters for the one-step and the n-step forecast test (not shown). These may be due to the consequences of many changes

[16] We do this instead of going through the procedure starting with 33.5 million regressions again which took 17 days of computer running time and would need an extension to include the risk variable, which enhances the number of regressions exponentially and also the time for the calculations.

since 1998: the Asian crisis in 1998, the move to inflation targeting in 1999, the onset of a recession in the industrial countries in 2000, and the Argentinean abandoning of the currency board. However, these phenomena were in the data at least partly also before the update. We speculate that the divergence of the growth rates of EU countries with those of the USA and Asian countries make the lack of a world income variable in our data more important.[17] Moreover, the natural log of the industrial production indices fell by about 20% in the single years of the second half of 2003 except in the USA and in Germany where it was smaller. This generates quite a different pattern of industrial production indices than in the period before the middle of 2003, where the regressions of Tables 7 and 9 stop. The Chow forecast test the industrial recession months August and September 2003 give a really strong indication for structural breaks.[18] There is also a dramatic change in the exchange rate development of Brazil. Since October 2002 and even more so since June 2004 there is a clear trend of appreciations (see Figure 5) whereas the country had incremental depreciations after each currency reform since 1990. The Chow tests for breakpoints and forecasts cannot be carried out for July 1999. The Chow breakpoint tests are not rejecting the null hypothesis of no structural change for 2000M10-12 whereas the forecast test does reject it. This is the well-known case of conflicting results from the Chow tests. For the later points of October 2002 and June 2004 (only forecast test) the forecast test indicates structural change. For the later periods of appreciation the result of structural change is more obvious. If this can be interpreted as a new policy, which has induced a change in signs of our estimates, it may be a case of the Lucas critique. But the industrial recession and the consequences of the other events mentioned above probably play a role too.

[17] It is not due to the change in the risk variable because we used the Gaussian risk variable with an update of Table 6 as well.

[18] We also tried quadratic terms of the industrial production indices, because we had the impression that in time of strong fluctuations non-linearities may be more important. This did not change the signs of the major results though. Similarly, estimation of the regression as a special case of one of the special cases of the TARCH-M family turned out to be in vain.

In Table 12 we show that the imposition of the Ricardian equivalence assumption by abandoning the budget deficit variable yields a J-curve for the exchange rate and an N-curve for the polynomial distributed lag of the exchange rate risk variable, the latter with low significance for the lags though. The overall effect of devaluations and of risk is to reduce the trade deficit. However, when we put back the deficit variable, the sum of the coefficients of the exchange rate growth lags changes to a positive sign.

TABLE 12 OVER

4. Arguments against devaluations

There are mainly two arguments against devaluations. First, devaluations can be induced by expansionary monetary policy at the cost of neighboring countries. It is clear from Stiglitz' text that this is not what he has in mind. It is clear that growth of the money supply should be directed at keeping inflation under control without too much over or undershooting (see Mishkin and Schmidt-Hebbel 2001). What Stiglitz has in mind is that shocks like world market interest rates and recessions as in the Latin American debt crisis of 1982 as well as contagion effects as those from the Asian debt crisis hitting Latin American countries require devaluations by letting the exchange rate go rather than selling foreign currency reserves. The question here is whether or not imported inflation is induced and sufficiently strongly so to deny the importance of devaluations as a means to cure the trade balance because of welfare reductions and redistributions through inflation.

Devaluations may have an impact on the consumer price index because of imported consumer goods and on the GDP deflator because of imported inputs. We look at both. Imports are not part of the GDP. By implication, a devaluation leading to higher import prices of dollar contracts in terms of local currency units has no direct impact on the GDP deflator. The crucial question, however, is whether or not the increase in local currency prices of imported investment goods leads to higher costs and therefore higher inflation in the periods after the

devaluation. Inflation is explained statistically by the following regressions using yearly data. First, the GDP deflator and the growth rate of M2 may be considered as stationary at the ten percent level. When we allow for five lags in the ADF, the growth rate of the exchange rate is also stationary. This would justify estimating the equation in levels. The result for yearly data is presented in column 1 of Table 13. It is clear from these regressions that lagged devaluations, money and quasi money supply growth with and without lags as well as lagged inflation have an impact on the rate of inflation but deficits, which we tried also, do not have an impact. For all variables we tried up to three lags. Adding a time trend gives a highly insignificant result for the latter but does not change the significance of the other variables. Lagged devaluations, however, reduce inflation according to this regression. Basic lessons on multi-collinearity tell us that the sign of the exchange rate variable could be wrong if it actually causes inflation in the next period. If so, the sign should change if we take out inflation with one lag, infl(-1). But if we do so (not shown) the sign remains negative. The adj.R^2 is lower. The intercept is much less significant now. We could find one way to get a positive sign of the devaluation: If M2gr(-2) causes the devaluation dlne(-2) we may have to take out the former. The intercept and the devaluation variable are getting highly insignificant. We cannot find support for imported GDP inflation through devaluation, but rather find stabilization. The critical question is what the share of lagged devaluations in explaining inflation is. The average GDP inflation is accounted for as follows (see Table 12, panel a). With a lag of two periods, devaluations have an impact on inflation. However, this effect is strongly negative. Devaluations do not reinforce GDP inflation by imported inflation in Brazil for this period. All positive impacts come from growth of money supply, which is also most strong with a two period lag. Imported inflation merely transfers inflation from the GDP to current imports with no further price effect on GDP inflation. The reason for this is that prices are already increased and firms have no need to increase prices again when imports have

prices, which are merely adjusted to inflation. Devaluations increase exports, allowing for more imported investment - if the latter are credit constrained and this dominates the higher costs for imported inputs - and therefore increases supply later, thus reducing inflation. As our variables are stationary only at the 10% significance level or with many lagged first differences it may be useful to confirm the regression in terms of first differences in all variables. The result is summarized in column 2 of Table 13, which is similar to the one in levels and a time variable is added. Again, lagged devaluations are stabilizing GDP inflation, not reinforcing it.

TABLE 13 OVER HERE

This result may be different for the consumer price index, or CPI inflation. In terms of levels the result for CPI inflation is summarized in column 3 of Table 13. Here the budget deficit does appear as a significant variable and so does the exchange rate with all three lags. The exchange rate increases inflation except for the third lag, which is negatively correlated and therefore reduces inflation. Moreover, as the accounting-for-inflation calculations (see Table 14, panel b) show, there seems to be a strong impact of devaluation on the CPI inflation. The regression result is supported also when the regression is done in first differences (see Table 13, column 4) although the budget deficit gets insignificant now. However, the CPI is only close to being integrated of order one. It passes the ADF test only as a series that is integrated of order two. In terms of second differences (see Table 13, column 4) only the third lagged growth rate of the exchange rate, which is stabilizing again, is significant. Imported inflation is absent. This latter equation also has no serial correlation according to the Breusch-Godfrey test. It is monetary growth that causes inflation and nothing else in this latter estimate.

Schmidt-Hebbel and Werner (2002) indicate the existence of imported inflation for the period 1991-1998 by using simple correlation coefficients for annual inflation and lagged

nominal exchange rate depreciation, and find imported inflation. Their results correspond to the coefficients of our level equation for the CPI when one or two lags are used. Their method does not control for other variables as we do and seemingly does not take unit roots into account. The inflation data used by Minella et al. (2003, p.121-24) are reported being integrated of order zero. They derive exchange rate pass through as an impulse response to exchange rate shocks in a VAR model for the period since 1994. Given their finding of imported inflation for the period after the hyperinflation we should note that according to all experience reported in the inflation targeting literature, the preference now has moved to have no exchange rate anchor anymore and to allow for flexible exchange rates, with some qualification for portfolio shocks and excessive fluctuations (see Mishkin and Schmidt-Hebbel 2001, p.24 and Schmidt and Werner 2002, 58-89, Minella et al. 2003, p.122).

4. Summary and conclusion

We have shown that devaluations contribute to trade surplus increases as much as budget deficit reductions do in the level estimate with yearly data and much more so in the estimate with first differences, but both do so much less than growth of the Brazilian economy and the World economy. This suggests that both variables can do little in the short run and have an impact mainly through cumulated effects on debt when policy starts using them as instruments early on. The Marshall-Lerner condition for stability is fulfilled but no J-curve is found.

Using monthly data until the beginning of 2004, however, the impact of domestic growth is much smaller when growth rates of GDP variables are used because it is too low in the time period considered. But again, the Ricardian equivalence does not hold and devaluations have a larger impact than reductions of budget deficits and so too does inflation. These results yield also J-, W- or inverted N-curves. These results also hold if a risk variable

is constructed from a TARCH model for the growth rate of the exchange rate. When the effect of devaluations is adjusted for that of risk, devaluations still have a stronger impact on the trade balance then reductions of deficits. US growth remains having the strongest impact.

As these results are based on too low a number of observations – although compatible with the results for yearly data – we use a polynomial distributed lag in order to estimate a lower number of parameters. We find J- or W-curves for Brazil, implying that the effect of devaluations is stretched out over more than two years, whereas that of budget deficit reductions vanishes after two month. This holds even if a measure of exchange rate risk is included in the regressions. The impact of devaluations on the trade balance is much stronger now than that of budget deficit reductions.

In the last update, though, using data also for the year 2005, the central variables in the discussion change there sign. Neither devaluations nor cuts in budget deficits would then have the desired impact on the trade balance. Cutting budget deficits would decrease interest rates, encourage investments, imports of investment goods and thereby increase the trade deficit. Devaluations would suffer from low elasticities of the trade balance. Both aspects have been discussed since long in the developing country literature. Since October 2002 and even more so since June 2004 Brazil has shifted to a policy leading to appreciations, which may have induced the shift in signs in our regressions, perhaps together with other events.

Moreover, we show that devaluations have no impact on GDP inflation in the period considered including a period of hyperinflation once the regressions are run for stationary variables. However, the literature for non-hyperinflation periods is clearly in favour of exchange rate pass through and we find it too for the consumer price inflation. Even though devaluations pass through to inflation, the recent inflation targeting literature is in favour of flexible exchange rates. Together with our major result obtained in several versions that devaluations have a stronger impact on the trade balance than budget deficit reductions, we

interpret these results as supportive for Stiglitz' view that devaluations should be allowed for rather than being avoided by selling foreign exchange reserves when debt payments require increased trade surpluses and the whole burden should not be shifted to budget deficits. However, if the change in results as obtained when adding data for the last year are correct, both these policies will not improve the trade balance. Therefore future research should focus on imported inputs, elasticities and stability tests.

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Table 1:

Regressions for the trade surplus as % of GDP

Regression Variable	1	2(b)	3	4(b)	5(b)
constant	-0.51	0.24	7.62	-0.34	-1.33
	-(0.47)	(0.59)	(1.96)	-(0.47)	-(2.05)
bdgdp	-0.27	-0.20	-0.44	-0.21	-0.39
	-(3.51)	-(2.90)	-(4.35)	-(1.93)	-(5.22)
D(lne)	-	-	2.61	2.24	2.62
			(4.23)	(1.32)	(2.08)
inflat. % ch.	-	-	-0.003	-0.002	-0.003
			-(4.83)	-(2.42)	-(4.27)
GDP Braz	-	-	-5E-11	-4E-11	-4E-11
			-(2.04)	-(1.91)	-(3.12)
GDP world	-	-	8.4E-13	1.4E-12	2.7E-12
			(1.66)	(0.72)	(1.99)
others	-	(a) -0.37	-	-	(c) -1.24
		-(1.64)			-(4.24)
Adjusted R-sq.	0.19	0.07	0.76	0.28	0.61
S.E. of regression	2.37	1.78	1.28	1.58	1.15
Sum sq. resid	84.4	38.1	18.1	22.4	10.7
Log likelihood	-37.7	-28.3	-24.7	-24.3	-18.7
Durbin-Watson stat	0.65	1.75	2.01	1.85	2.28
Akaike crit.	4.68	4.17	3.61	4.04	3.43
Schwarz crit	4.77	4.31	3.90	4.32	3.76
Prob(F-statistic)	0.05	0.25	0.00	0.16	0.02
BG F-Prob.(no.of lags)	-	-	0.625 (2)	0.74 (3)	0.5(1)
Reset F-Prob(no.fit it.)	-	-	0.63 (1)	0.73 (4)	0.16 (2)
Included obs.	17	15	17	15	15

t-values in parantheses

(a) RESIDregr1(-1)

(b) first differences of indicated variables

(c) Residregr4(-1)

Table 2 Accounting for the trade surplus

Regression 3

Variab.	tradsurp	C	BDGDP	dlne	Inflation	GDPBraz	GDPW
coefficient	1.00	7.6	-0.44	2.61	0.00	0.00	0.00
av. variable	1.47	1.0	-7.35	1.47	667.60	5.95E+11	2.46E+13
coeff*av.var	1.47	7.6	3.21	3.84	-1.96	-31.84	20.62
% of LHS	1.00	5.2	2.18	2.61	-1.33	-21.64	14.01

Regression 4

Variab.	d(tradsurp)	C	D(BDGDP)	D(d(lne))	D(INFLA)	D(GDPBRAZ)	D(GDPW)
coefficient	1.00	-0.3	-0.21	2.24	0.00	0.00	0.00
av. variable	0.11	1.0	-0.27	0.15	143.23	1.06E+10	6.47E+11
coeff*av.var	0.11	-0.3	0.06	0.35	-0.32	-0.47	0.91
% of LHS	1.00	-3.2	0.54	3.22	-2.98	-4.39	8.44

Regression 5

Variab.	d(tradsurp)	C	D(BDGDP)	D(d(lne))	D(INFLA)	D(GDPBRAZ)	D(GDPW),	RESE4(-1)
coefficient	1.00	-1.3	-0.39	2.62	0.00	0.00	0.00	-1.24
av. variable	0.11	1.0	-0.27	0.15	143.23	1.06E+10	6.47E+11,	1.4E-12
coeff*av.var	0.11	-1.3	0.10	0.40	-0.47	-0.38	1.77	0.00
% of LHS	1.00	-12.3	0.98	3.77	-4.35	-3.58	16.52	0.00

Table 3a

Variable	*Availability*	*Month. Data*	*Integration Order,b)*	
	from	*to*		
trade def/GDP	Jan 1990	Apr 2004	I(0)	
budgdef/GDP	Jan 1998	Apr 2004	I(0)	
dlne	Aug 1994	May 2004	I(0)	
inflat.%ch.(a)	Jan 1994	May 2004	I(0),0	
GDP Brazil, % change	Feb 1990	Apr 2004	I(0),0	
Indust. Product. Index,%change	Jan 1991	11/03-01/04	I(1)(d)	

Table 3b *marginal significance levels, (c)*

Variable	ADF	DF-GLS	PP	ERS-PO	Ng-Perron
trade def/GDP	0.135	<5%,c,	0.0842,c	>5%,c	<5%
budgdef/GDP	0.385, 0.0018, 0.086,c	>>10%, <1%, <5%,c	0, c (and c,t)	>>10%, <1%, <10%,c	>10%, <1%, <10%
dlne	0,c				
inflat.%ch.(a)	0	<1%,c	0,c	<1%, <5%,(d)	1%
GDP Brazil, % change	0.0071, 0,	>10%	0	>10%, <1%, >10%	>>10%, <1%, >>10%
Indust. Product. Index,%change	<5.5%, (e)				

(a) Whole Sale Price Index Global Supply Industry (WPIGSI) and Agriculture (WPIGSA)
(b) 'c' indicates a constant, 't' a time trend in some of the unit root tests.
(c) Several values are given if the selection of the number of lagged first differences differs depending on the use of the standard criteria AIC, SIC, HQ.
(d) if Spectral est.meth. is 'AR spectral, GLS detrended'; in other cases eviews' defaults are used.
(e) The log of the industrial production index has no unit root for France and Japan. As ADF gives clear results we did not use the other tests.

Table 4 **Trade deficit/GDP regression with monthly data**

Regression 1		*Regression 2*				
Variable	*Coefficient*	*t-Stat*	*t-Prob.*	*Coeff.*	*t-Statistic*	*t-Prob.*
C	0.34	2.15	0.05	0.42	1.18	0.26
DLNE	0.10	8.31	0.00	0.10	7.20	0.00
DLNE(-1)	-0.09	-6.95	0.00	-0.10	-7.27	0.00
DLNE(-2)	-0.03	-2.32	0.04	-0.04	-1.80	0.10
DLNE(-3)	0.23	10.70	0.00	0.24	9.48	0.00
DLNE(-4)	-0.12	-10.90	0.00	-0.13	-10.38	0.00
DLNE(-5)	-0.14	-6.32	0.00	-0.15	-5.64	0.00
D(LNE(-6)	-	-	-	0.01	0.28	0.78
DLNE(-7)	-0.36	-7.47	0.00	-0.37	-4.30	0.00
DLNE(-8)	0.09	3.45	0.00	0.10	1.15	0.27
DLNE(-9)	-0.32	-7.66	0.00	-0.33	-4.21	0.00
DLNE(-10)	0.12	4.16	0.00	0.14	2.26	0.05
DLNE(-11)	-0.27	-7.11	0.00	-0.30	-7.26	0.00
DLNE(-12)	0.18	5.45	0.00	0.25	4.42	0.00
DLNE(-13)	-0.26	-8.66	0.00	-0.33	-4.48	0.00
D(LNE(-14)	-	-	-	0.07	1.28	0.23
DLNE(-15)	-0.06	-2.48	0.03	-0.11	-2.25	0.05
DLNE(-16)	-0.08	-3.23	0.01	-0.04	-1.31	0.22
DLNE(-17)	-0.10	-2.86	0.01	-0.12	-3.24	0.01
DLNE(-18)	0.09	3.00	0.01	0.10	1.89	0.08
DLNE(-19)	-0.36	-9.78	0.00	-0.38	-6.96	0.00
DLNE(-20)	0.13	5.18	0.00	0.15	3.62	0.00
DLNE(-21)	-0.15	-9.01	0.00	-0.17	-5.17	0.00
DLNE(-22)	-0.21	-6.38	0.00	-0.19	-4.99	0.00
d(LNE(-23)	-	-	-	-0.04	-0.58	0.57
DLNE(-24)	-0.15	-6.14	0.00	-0.11	-2.12	0.06
DLNE(-25)	-0.22	-9.05	0.00	-0.26	-5.14	0.00
D(LNE(-26)	-	-	-	0.03	1.88	0.09
TDGDP(-1)	0.54	13.37	0.00	0.54	8.93	0.00
BDGDP(-2)	0.11	3.93	0.00	0.12	5.43	0.00
DLNGDP	0.06	6.86	0.00	0.06	5.13	0.00
TIMESQ	0.00	12.64	0.00	0.00	7.67	0.00
D(LNUSA(-4))	-1.71	-8.35	0.00	-1.84	-7.78	0.00
LNFRA(-3)	0.61	5.01	0.00	0.70	5.17	0.00
D(LNUSA(-3))	-0.30	-1.90	0.08	-0.38	-1.61	0.14
D(LNGER(-1))	0.47	5.01	0.00	0.48	4.72	0.00
D(LNUK(-3))	0.25	2.40	0.03	0.34	2.06	0.06
D(LNUSA(-1))	-0.81	-6.47	0.00	-0.90	-5.43	0.00
D(LNUK(-1))	-0.60	-7.48	0.00	-0.57	-3.86	0.00
D(LNJAP(-1))	0.35	8.26	0.00	0.40	6.80	0.00
D(LNGER(-2))	1.06	6.80	0.00	1.13	6.00	0.00
D(LNUSA(-2))	-1.09	-4.74	0.00	-1.23	-3.94	0.00
LNFRA(-2)	-0.69	-5.83	0.00	-0.80	-6.47	0.00

D(LNGER(-3))	0.52	5.10	0.00	0.52	4.49	0.00
D(LNJAP(-4))	0.31	5.08	0.00	0.31	4.89	0.00
D(LNCAN(-2))	0.29	2.79	0.01	0.36	3.06	0.01
D(LNCAN(-3))	0.65	7.15	0.00	0.72	4.97	0.00
D(LNCAN(-4))	1.02	9.22	0.00	1.07	11.37	0.00
WPIGSA(-2)	0.00	-3.34	0.00	0.00	-2.62	0.02
WPIGSA	0.00	3.51	0.00	0.00	2.71	0.02
WPIGSI(-5)	0.01	14.63	0.00	0.01	5.42	0.00
WPIGSI(-6)	0.00	2.95	0.01	0.00	1.80	0.10
Jarq.-Bera Prob.	0.55				0.19	
Breusch-Godfr. F-prob.	0.13				0.17	
Ramsey RESET	0.34				0.14	
One-Step Forc. Test(a)	2				1	
N-Step Forc. Test(a)	0				0	
R2 adj.	0.98				0.97	
AIC	-8.70				-8.76	
SIC	-7.07				-6.99	
HQ	-				-8.06	
DW	2.44				2.18	
see	0.00				0.00	
ssr	0.00				0.00	
No. of observations	63				63	

(a) number of observations which cast doubt on the assumption of parameter constancy

Table 5 Accounting for the trade deficit/GDP

(a) Regression 1 of Table 4

Variable	aver.	coeff	av.*coeff	percent
tdgdp	0.01	1.00	0.01	1.00
const	1.00	0.42	0.42	56.20
dlne	0.01	-1.97	-0.02	-3.30
bdgdp	0.05	0.12	0.01	0.78
tdgdp(-1)	0.01	0.54	0.00	0.47
dlngdp	-0.01	0.06	0.00	-0.04
wpigsi	1.15	0.01	0.02	2.20
wpigsa	1.59	0.00	0.00	-0.08
others(a)				-55.23

(b) Regression 2 of Table 4

Variable	aver.	coeff	av.*coeff	percent
tdgdp	0.01	1.00	0.01	1.00
const	1.00	0.34	0.34	45.25
dlne	0.01	-1.98	-0.02	-3.33
bdgdp	0.05	0.11	0.01	0.73
tdgdp(-1)	0.01	0.54	0.00	0.46
dlngdp	-0.01	0.06	0.00	-0.04
wpigsi	1.15	0.01	0.02	2.21
wpigsa	1.59	0.00	0.00	-0.05
others(a)				-44.23

(a) timesq and index of industrial production

Table 6 : TARCH(1) estimate of exchange rate risk

Dependent Variable: D(LNE)
Method: ML - ARCH (Marquardt) –Normal error distribution
Sample(adjusted): 1994:10 2003:12
Included observations: 111 after adjusting endpoints
Convergence achieved after 144 iterations
Bollerslev-Wooldrige robust standard errors & covariance
Variance backcast: ON

	Coefficient	Std. Error	z-Stat.	Prob.	
C	0.009	0.003	3.067	0.002	
D(LNE(-1))	0.540	0.093	5.820	0.000	
D(LNE(-2))	-0.251	0.090	-2.803	0.005	
Variance Equation					
C	0.001	0.001	1.534	0.125	
ARCH(1)	0.640	0.336	1.906	0.057	
(RESID<0)*ARCH(1)	-0.470	0.277	-1.697	0.090	
R-squared	0.231			Mean dependent var	0.011
Adjusted R-squared	0.194			S.D. dependent var	0.045
S.E. of regression	0.041			Akaike info criterion	-3.787
Sum squared resid	0.173			Schwarz criterion	-3.641
Log likelihood	216.193			F-statistic	6.297
Durbin-Watson stat	1.999			Prob(F-statistic)	0.000

Table 6b: TARCH(1) estimate of exchange rate risk

Dependent Variable: DLNE
Method: ML - ARCH (Marquardt) - Generalized error distribution (GED)
Sample (adjusted): 1994M10 2005M04
Included observations: 127 after adjustments
Convergence achieved after 26 iterations
Variance backcast: ON
GARCH = C(4) + C(5)*RESID(-1)^2 + C(6)*RESID(-1)^2*(RESID(-1)<0)

	Coefficient	Std. Error	z-Statistic	Prob.
C	0.003	0.000	36.863	0.000
DLNE(-1)	0.638	0.017	37.180	0.000
DLNE(-2)	-0.082	0.011	-7.351	0.000
Variance Equation				
C	1.4E-06	1.7E-06	8.3E-01	4.1E-01
RESID(-1)^2	1.8E+014.	9E+00	3.6E+00	3.0E-04
RESID(-1)^2*(RESID(-1)<0)	-1.2E+01	5.8E+00	-2.0E+00	4.5E-02
GED PARAMETER	5.8E-01	7.5E-02	7.7E+00	0.0E+00
R-squared	0.129		Mean dependent var	0.009
Adjusted R-squared	0.085		S.D. dependent var	0.044
S.E. of regression	0.042		Akaike info criterion	-5.093
Sum squared resid	0.212		Schwarz criterion	-4.936
Log likelihood	330.415		F-statistic	2.952
Durbin-Watson stat	2.151		Prob(F-statistic)	0.010

Table 7 Trade deficit/GDP regression with monthly data

Dependent Variable: TDGDP
Method: Least Squares
Sample(adjusted): 1998:03 2003:05
Included observations: 63 after adjusting endpoints
Newey-West HAC Standard Errors & Covariance (lag truncation=3)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.936	0.141	-6.653	0.000
DLNE	0.098	0.017	5.868	0.000
DLNE(-1)	-0.105	0.013	-7.891	0.000
DLNE(-3)	0.178	0.016	11.146	0.000
DLNE(-4)	-0.138	0.014	-10.119	0.000
DLNE(-7)	-0.399	0.031	-12.767	0.000
DLNE(-9)	-0.295	0.023	-12.653	0.000
DLNE(-11)	-0.219	0.021	-10.611	0.000
DLNE(-12)	0.103	0.026	3.931	0.001
DLNE(-13)	-0.329	0.028	-11.799	0.000
DLNE(-15)	-0.169	0.024	-7.096	0.000
DLNE(-16)	-0.045	0.014	-3.126	0.006
DLNE(-17)	-0.183	0.020	-9.145	0.000
DLNE(-19)	-0.249	0.015	-16.564	0.000
DLNE(-21)	-0.187	0.017	-10.944	0.000
DLNE(-22)	-0.102	0.018	-5.568	0.000
DLNE(-23)	-0.204	0.032	-6.415	0.000
DLNE(-24)	-0.065	0.022	-2.990	0.008
DLNE(-25)	-0.276	0.025	-11.184	0.000
DLNE(-26)	-0.033	0.016	-2.095	0.052
TDGDP(-1)	0.612	0.053	11.482	0.000
BDGDP(-2)	0.091	0.017	5.232	0.000
DLNGDP	0.041	0.011	3.836	0.001
WPIGSI(-5)	0.011	0.001	11.607	0.000
TIMESQ	0.000	0.000	12.110	0.000
D(LNUSA(-4))	-0.811	0.110	-7.382	0.000
LNFRA(-3)	1.035	0.154	6.745	0.000
WPIGSI(-6)	0.006	0.001	5.046	0.000
D(LNGER(-1))	0.480	0.058	8.242	0.000
D(LNUK(-3))	0.141	0.068	2.055	0.056
D(LNUSA(-1))	-0.580	0.089	-6.507	0.000
D(LNJAP(-1))	0.242	0.040	6.125	0.000
D(LNGER(-2))	1.014	0.086	11.814	0.000
D(LNUSA(-2))	-0.662	0.110	-6.032	0.000
LNFRA(-2)	-0.836	0.147	-5.696	0.000
D(LNGER(-3))	0.567	0.070	8.132	0.000
D(LNJAP(-4))	0.312	0.025	12.667	0.000
D(LNCAN(-2))	0.351	0.160	2.189	0.043
D(LNCAN(-3))	0.758	0.116	6.517	0.000
D(LNCAN(-4))	0.866	0.086	10.044	0.000
WPIGSA(-2)	-0.002	0.000	-9.655	0.000
DLNEFSIGMA	1.031	0.387	2.665	0.016
DLNEFSIGMA(-4)	-1.922	0.240	-8.000	0.000

DLNEFSIGMA(-5)	-2.974	0.326	-9.129	0.000
DLNEFSIGMA(-6)	0.812	0.345	2.354	0.031
DLNEFSIGMA(-7)	2.789	0.274	10.197	0.000
Jarq.-Bera Prob.	0.870			
Breusch-Godfr. F-prob.		.54 b)		
Ramsey RESET		.141 c)		
One-Step Forc. Test(a)		5.000		
N-Step Forc. Test(a)		9.000		
R2 adj.	0.982			
AIC	-8.946			
SIC	-7.381			
HQ	-			
DW	2.224			
see	0.003			
ssr	0.000			
No. of observations	63			

(a) number of observations which cast doubt on the assumption of parameter constancy
b) for one lag; it is larger when more lags are used
c) values get larger when more fitted terms are added

Table 8 Accounting for the trade deficit/GDP
(a) **Regression 1 of Table**

Variable	aver.	coeff	av.*coeff	percent
tdgdp	0.007	1.000	0.007	1.000
const	1.000	-0.936	-0.936	-125.095
dlne	0.013	-2.618	-0.033	-4.388
bdgdp(-2)	0.050	0.091	0.005	0.608
tdgdp(-1)	0.006	0.612	0.004	0.529
dlngdp	-0.006	0.041	0.000	-0.031
wpigsi	1.153	0.017	0.020	2.678
wpigsa	1.585	-0.002	-0.004	-0.524
risk(b)	0.002	-0.265	-0.001	-0.067
others(a)				127.290

(a) timesq and index of industrial production
(b) the average is taken over the regression period

Table 9

Dependent Variable: TDGDP
Method: Least Squares
Sample(adjusted): 1998:03 2003:06
Included observations: 64 after adjusting endpoints
Newey-West HAC Standard Errors & Covariance (lag truncation=3)

Variable	Coefficient	Std. Error	t-Stat.	Prob.
C	-0.811	0.199	-4.077	0.000
TDGDP(-1)	0.757	0.046	16.343	0.000
BDGDP(-2)	0.113	0.028	4.003	0.000
DLNGDP	0.024	0.009	2.526	0.016
WPIGSI(-5)	0.007	0.002	4.051	0.000
TIMESQ	0.000	0.000	3.726	0.001
LNFRA(-3)	0.170	0.042	4.073	0.000
D(LNCAN(-2))	0.266	0.115	2.322	0.025
DLNEFSIGMA	0.859	0.350	2.452	0.019
DLNEFSIGMA(-5)	0.753	0.365	2.066	0.045
DLNEFSIGMA(-6)	0.838	0.324	2.584	0.013
DLNEFSIGMA(-7)	1.238	0.332	3.733	0.001
PDL01	-0.036	0.014	-2.605	0.013
PDL02	0.000	0.004	0.009	0.993
PDL03	0.000	0.002	-0.250	0.804
PDL04	0.001	0.000	2.735	0.009
PDL05	-0.000102	9.26E-05	-1.106	0.275
PDL06	-3.17E-05	9.37E-06	-3.385	0.002
PDL07	3.40E-06	1.82E-06	1.870	0.069
PDL08	3.27E-07	9.21E-08	3.544	0.001
PDL09	-3.35E-08	1.47E-08	-2.278	0.028
PDL010	-1.06E-09	2.97E-10	-3.566	0.001
PDL011	1.04E-10	4.14E-11	2.521	0.016

R-squared	0.923	Mean dependent var	0.008
Adjusted R-squared	0.881	S.D. dependent var	0.020
S.E. of regression	0.007	Akaike info criterion	-6.864
Sum squared resid	0.002	Schwarz criterion	-6.089
Log likelihood	242.660	F-statistic	22.228
Durbin-Watson stat	2.367	Prob(F-statistic)	0

```
Lag Distribution of DLNE   i   Coefficient  Std. Error  T-Statistic

        .  *|              0   0.032        0.019       1.717
     *   .  |              1   -0.039       0.017       -2.333
        . * |              2   0.022        0.011       2.027
        . * |              3   0.027        0.011       2.491
       * .  |              4   -0.023       0.007       -3.340
   *     .  |              5   -0.080       0.016       -5.047
*        .  |              6   -0.111       0.022       -5.081
*        .  |              7   -0.111       0.022       -4.939
  *      .  |              8   -0.089       0.020       -4.497
```

* . |	9	-0.064	0.017	-3.860
* . |	10	-0.045	0.014	-3.304
* . |	11	-0.037	0.013	-2.859
* . |	12	-0.036	0.014	-2.605
* . |	13	-0.035	0.013	-2.659
* . |	14	-0.032	0.011	-2.955
* . |	15	-0.027	0.008	-3.237
*. |	16	-0.025	0.008	-3.114
* . |	17	-0.029	0.009	-3.282
* . |	18	-0.041	0.011	-3.844
* . |	19	-0.055	0.013	-4.369
* . |	20	-0.063	0.013	-4.874
* . |	21	-0.058	0.013	-4.590
* . |	22	-0.046	0.014	-3.356
* . |	23	-0.043	0.013	-3.330
* . |	24	-0.060	0.022	-2.722
* . |	25	-0.031	0.020	-1.542

Table 10 Accounting for the trade deficit/GDP
Regression 1 of pdl

Variable	aver.	coeff	av.*coeff	percent
tdgdp	0.007	1.000	0.007	1.000
const	1.000	-0.811	-0.811	-108.385
dlne	0.013	-1.098	-0.014	-1.840
bdgdp(-2)	0.050	0.113	0.006	0.754
tdgdp(-1)	0.006	0.757	0.005	0.655
dlngdp	-0.006	0.024	0.000	-0.018
wpigsi	1.153	0.007	0.009	1.144
wpigsa	1.585	0.000	0.000	0.000
risk (b)	0.002	3.688	0.007	0.928
others (a)				107.763

(a) timesq and index of industrial production
b) the average is taken over the regression period

Table 11

Dependent Variable: TDGDP,
Method: Least Squares
Sample(adjusted): 1998:02 2005:02
Included observations: 85 after adjusting endpoints
Newey-West HAC Standard Errors & Covariance (lag truncation=3)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.693	0.285	5.929	0.000
TDGDP(-1)	0.376	0.100	3.754	0.000
BDGDP(-1)	-0.133	0.028	-4.713	0.000
WPIGSI(-5)	0.005	0.001	3.911	0.000
TIMESQ	0.000	0.000	6.697	0.000
D(LNUSA(-1))	-0.659	0.133	-4.959	0.000
D(LNGER(-1))	0.124	0.059	2.110	0.039
D(LNUK(-3))	-0.155	0.057	-2.715	0.009
LNFRA(-2)	-0.067	0.017	-4.084	0.000
D(LNJAP(-5))	0.070	0.025	2.805	0.007
D(LNCAN(-4))	0.165	0.034	4.817	0.000
D(LNCAN(-5))	0.089	0.045	1.965	0.054
LNFRA(-1)	-0.177	0.030	-5.821	0.000
LNFRA(-4)	-0.136	0.029	-4.702	0.000
DLNEFSIGMA2(-1)	-0.017	0.007	-2.443	0.018
DLNEFSIGMA2(-5)	-0.017	0.009	-1.790	0.079
DLNEFSIGMA2(-8)	-0.019	0.008	-2.488	0.016
PDL01	0.030	0.011	2.835	0.006
PDL02	-0.006	0.004	-1.583	0.119
PDL03	-0.003	0.001	-2.985	0.004
PDL04	0.001	0.000	3.142	0.003
PDL05	0.000	0.000	2.702	0.009
PDL06	0.000	0.000	-3.406	0.001
PDL07	0.000	0.000	-2.305	0.025
PDL08	0.000	0.000	3.274	0.002
PDL09	0.000	0.000	1.994	0.051
PDL010	0.000	0.000	-3.067	0.003
R-squared	0.947	Mean dependent var		0.019
Adjusted R-squared	0.923	S.D. dependent var		0.027
S.E. of regr.	0.007	Akaike info crit.		-6.723
Sum squared resid	0.003	Schwarz criterion		-5.947
Log likelihood	312.709	F-statistic		39.907
Durbin-Watson stat	2.018	Prob(F-statistic)		0.000

Lag Distribution of DLNE	i	Coefficient	Std. Error	T-Statistic
. * |	0	0.009	0.021	0.408
. * |	1	0.018	0.014	1.286
. *|	2	0.050	0.013	3.963
. * |	3	0.047	0.011	4.186
. * |	4	0.020	0.008	2.459
*. |	5	-0.006	0.008	-0.840
* . |	6	-0.018	0.009	-1.851

```
    * .      |           7  -0.011    0.010    -1.073
      . *    |           8   0.006    0.010     0.575
      .   *  |           9   0.023    0.011     2.022
      .    * |          10   0.031    0.011     2.712
      .    * |          11   0.030    0.011     2.835
      .   *  |          12   0.022    0.009     2.442
      .  *   |          13   0.013    0.008     1.629
      . *    |          14   0.010    0.008     1.145
      .  *   |          15   0.012    0.009     1.404
      .   *  |          16   0.018    0.009     2.045
      .   *  |          17   0.020    0.009     2.321
      .  *   |          18   0.015    0.009     1.627
      .*     |          19   0.006    0.011     0.543
      .*     |          20   0.002    0.010     0.201
      .   *  |          21   0.017    0.015     1.087
      .     *|          22   0.036    0.025     1.464
*     .      |          23  -0.032    0.016    -2.014

Sum of Lags                  0.337    0.144     2.334
```

Table 12

Dependent Variable: TDGDP
Method: Least Squares
Sample(adjusted): 1995:10 2005:03
Included observations: 114 after adjusting endpoints
Newey-West HAC Standard Errors & Covariance (lag truncation=4)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8.51E-01	1.83E-01	4.645	0.000
TDGDP(-1)	2.70E-01	1.35E-01	2.006	0.048
WPIGSI(-5)	4.73E-03	1.24E-03	3.807	0.000
TIMESQ	2.90E-06	5.13E-07	5.648	0.000
LNFRA(-3)	-8.18E-02	2.61E-02	-3.130	0.002
D(LNUSA(-3))	-2.13E-01	1.27E-01	-1.673	0.098
D(LNGER(-1))	1.31E-01	7.70E-02	1.706	0.092
D(LNUK(-1))	-2.08E-01	4.49E-02	-4.641	0.000
D(LNGER(-2))	1.26E-01	7.01E-02	1.797	0.076
LNFRA(-2)	-1.15E-01	2.54E-02	-4.523	0.000
D(LNJAP(-4))	-9.11E-02	2.18E-02	-4.170	0.000
D(LNCAN(-4))	1.03E-01	3.09E-02	3.318	0.001
PDL01	6.15E-03	7.57E-03	0.812	0.419
PDL02	-2.93E-03	3.96E-03	-0.739	0.462
PDL03	-1.13E-03	6.12E-04	-1.842	0.069
PDL04	5.91E-04	2.27E-04	2.603	0.011
PDL05	-3.34E-05	3.38E-05	-0.986	0.327
PDL06	-1.42E-05	4.60E-06	-3.079	0.003
PDL07	1.71E-06	8.02E-07	2.131	0.036
PDL08	8.00E-08	3.63E-08	2.202	0.030
PDL09	-1.84E-08	7.38E-09	-2.487	0.015
PDL010	2.51E-10	2.74E-10	0.917	0.362

PDL011	5.90E-11	2.26E-11	2.610	0.011
PDL012	-2.21E-12	1.07E-12	-2.059	0.043
PDL013	1.19E-03	2.48E-03	0.480	0.632
PDL014	-2.54E-03	1.53E-03	-1.666	0.099
PDL015	-5.64E-06	1.31E-04	-0.043	0.966
PDL016	1.10E-04	6.33E-05	1.744	0.085

R-squared	0.908	Mean dependent var	0.013
Adjusted R-squared	0.879	S.D. dependent var	0.026
S.E. of regression	0.009	Akaike info criterion	-6.341
Sum squared resid	0.007	Schwarz criterion	-5.669
Log likelihood	389.441	F-statistic	31.392
Durbin-Watson stat	2.239	Prob(F-statistic)	0.000

```
     Lag Distribution of DLNE    i   Coefficient Std. Error   T-Statistic

         .    * |                0   0.039       0.019    1.994
         . *    |                1   0.013       0.014    0.949
         .     *|                2   0.049       0.020    2.409
         .    * |                3   0.042       0.019    2.154
         .*     |                4   0.004       0.012    0.294
     *   .      |                5   -0.033      0.012    -2.825
   *     .      |                6   -0.049      0.015    -3.311
    *    .      |                7   -0.044      0.016    -2.761
      *  .      |                8   -0.028      0.016    -1.693
        *.      |                9   -0.009      0.016    -0.595
         .*     |                10  0.003       0.014    0.194
         .*     |                11  0.007       0.011    0.650
         .*     |                12  0.006       0.008    0.812
         *      |                13  0.003       0.004    0.633
         *      |                14  0.000       0.002    -0.202
         *      |                15  -0.002      0.001    -2.363
         *      |                16  -0.002      0.001    -2.690
         *      |                17  -0.001      0.001    -2.204
         *      |                18  -0.001      0.001    -1.987
         *      |                19  -0.001      0.001    -2.330
         *      |                20  -0.002      0.001    -2.814
         *      |                21  -0.001      0.001    -2.162
         *      |                22  -0.001      0.000    -1.104
         *      |                23  0.000       0.001    -0.505
         *      |                24  0.000       0.000    -0.892
         *      |                25  -0.001      0.000    -3.431

                    Sum of Lags      -0.010      0.125    -0.083
     Lag Distribution of
DLNEFSIGMA2                      i   Coefficient Std. Error   T-Statistic

   *     .      |                0   -0.008      0.007    -1.050
        *       |                1   0.000       0.004    -0.008
        .  *    |                2   0.004       0.004    1.183
        .   *   |                3   0.006       0.004    1.515
```

```
   .   *   |          4  0.005     0.004    1.498
   .  *    |          5  0.004     0.003    1.222
   .*      |          6  0.001     0.002    0.480
  *.       |          7  -0.001    0.003    -0.475
 *  .      |          8  -0.003    0.003    -0.990
 *  .      |          9  -0.004    0.003    -1.126
  * .      |          10 -0.002    0.002    -0.828
   . *     |          11 0.002     0.002    0.958
   .      *|          12 0.010     0.006    1.672

          Sum of Lags    0.014     0.022    0.660
```

Table 13 **Regressions for inflation**

Regression	gr.GDP defl.	gr.GDPdefl. (a)	gr.CPI	gr.CPI (a)	gr.CPI(b)
constant	304.19	93.86	0.53	0.05	-0.05
	(2.54)	(1.98)	(5.03)	(1.30)	-(0.74)
INFL(-1)	-0.69	-0.63	-	-	-
	-(3.77)	-(6.43)			
M2GROWTH	0.45	0.86	0.0004	0.0005	0.0004
	(4.48)	(4.01)	(6.33)	(10.21)	(5.95)
M2GR(-1)	0.72	1.14	-	-	-
	(4.87)	(24.55)			
M2GR(-2)	1.53	1.65	-	-	-
	(4.78)	(8.63)			
dlne(-1)	-	-	0.18	0.10	-
			(2.77)	(2.20)	
dlne(-2)	-654.89	-279.27	0.22	0.20	-
	-(3.79)	-(2.25)	(3.13)	(3.82)	
dlne(-3)	-	-	-0.25	-0.42	-0.62
			-(5.39)	-(5.79)	-(8.39)
Bdgdp	-	-	-0.02	-	-
			-(2.08)		
time	-	-34.94	-	-	
-					
		-(5.92)			
Adjusted R-squared, 0.93	0.91	0.95	0.95	0.86	
S.E. of regr.	219.66	223.42	0.12	0.12	0.23
Sum squa. resid	482521.6	349430.6	0.13	0.14	0.52
Log likelihood	-105.22	-90.74	14.09	12.49	2.42
Durbin-Watson stat	1.80	2.89	2.07	2.57	1.71
Akaike ic	13.90	13.96	-1.08	-1.07	0.09
Schwarz c	14.19	14.28	-0.79	-0.84	0.22
F-statistic	42.56	24.06	52.70	60.62	36.58
No. of Obs.	16	14	15	14	13

t-values in parantheses

Table 14 Accounting for inflation

a) Level of GDP inflation

Variable	*coeff*	*var.aver.*	*coeff*aver.*	*% of infl*100*
infl	1.00	709.00	709.00	1.00
Intercept	304.19	1.00	304.19	0.43
M2growth	0.45	758.44	344.83	0.49
M2gr(-1)	0.72	686.87	492.52	0.69
M2gr(-2)	1.53	507.42	778.74	1.10
Infl(-1)	-0.69	573.17	-395.01	-0.56
d(lne(-2))	-654.9	1.31	-860.00	-1.21

b) level of CPI inflation

Variable	*coeff*	*var.aver.*	*coeff*aver.*	*%of infla*100*
CPIinfl	1.00	1.20	1.20	1.00
Intercept	0.53	1.00	0.53	0.44
M2growth	0.00	804.90	0.32	0.27
BDGDP	-0.02	-7.65	0.12	0.10
dlne(-1)	0.18	1.47	0.27	0.22
d(lne(-2))	0.22	1.31	0.29	0.24
d(lne(-3))	-0.25	1.34	-0.33	-0.28

Figure 1: Coefficients of the exchange rate variables

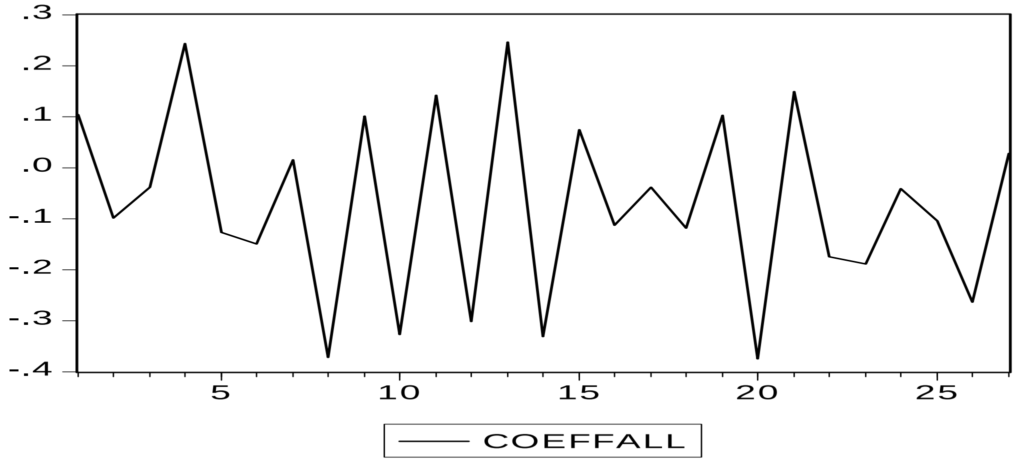


Figure 2: Variants of J-curves for monthly devaluations

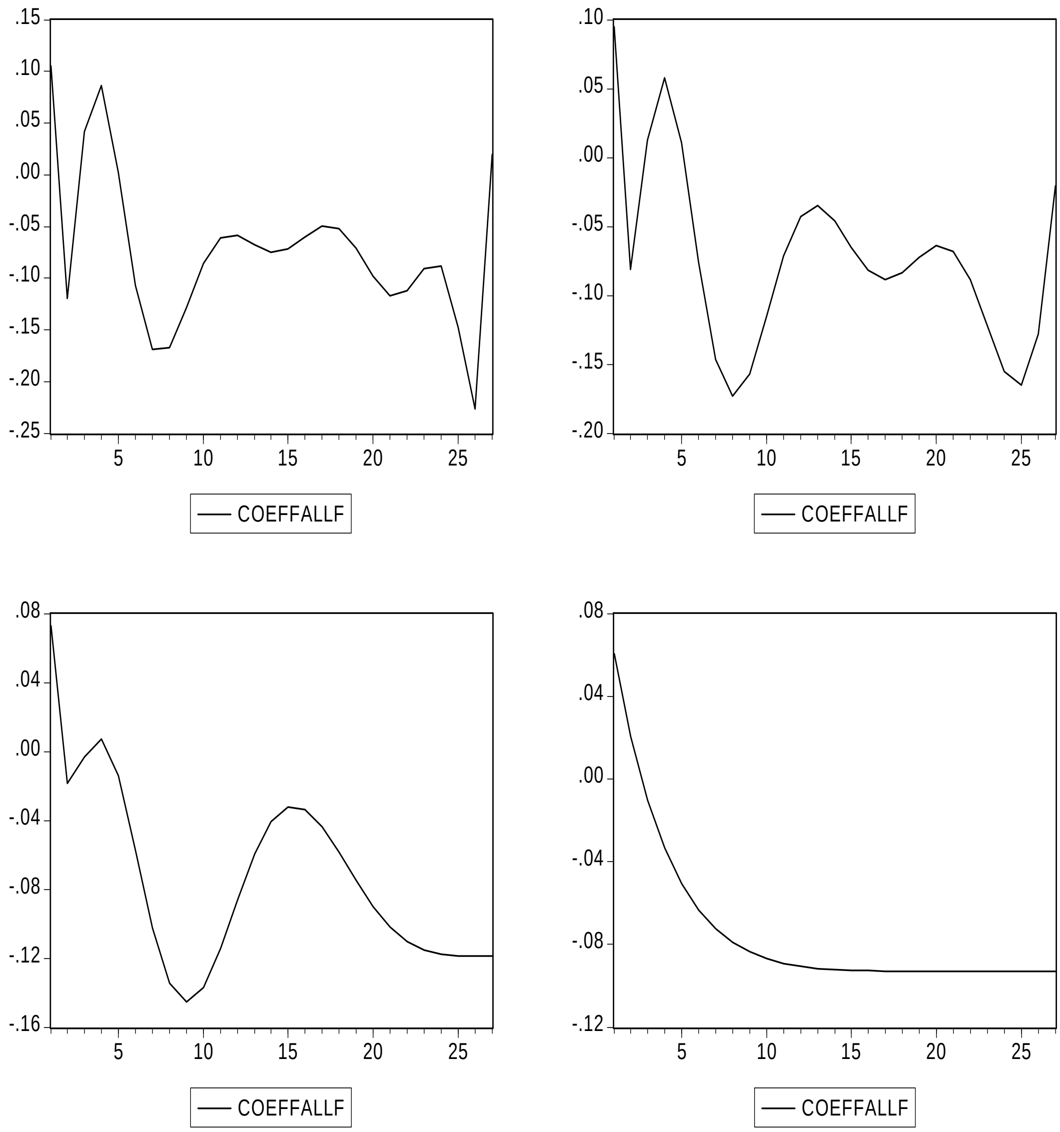
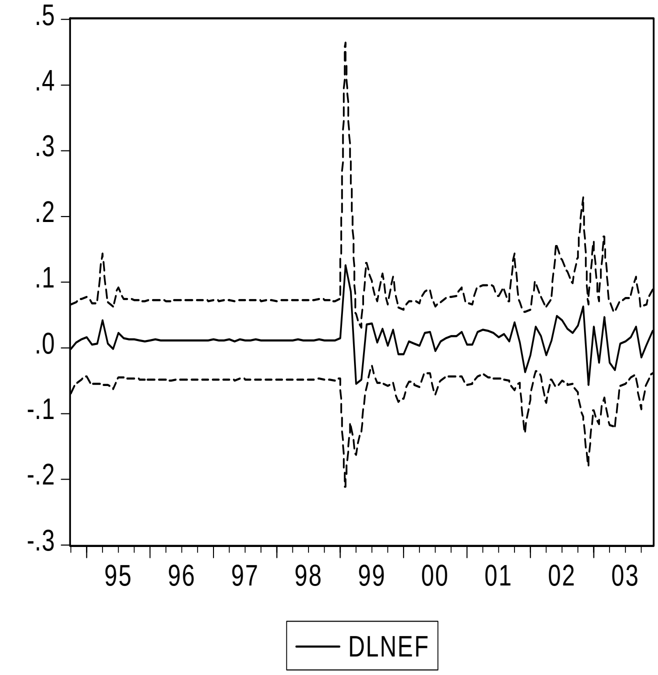


Figure 3: Forecast from the TARCH model with Gaussian Error Distribution



Forecast: DLNEF	
Actual: D(LNE)	
Forecast sample: 1990:01 2003:12	
Adjusted sample: 1994:10 2003:12	
Included observations: 111	
Root Mean Squared Error	0.039458
Mean Absolute Error	0.023879
Mean Abs. Percent Error	124.1069
Theil Inequality Coefficient	0.549396
Bias Proportion	0.001291
Variance Proportion	0.330694
Covariance Proportion	0.668014

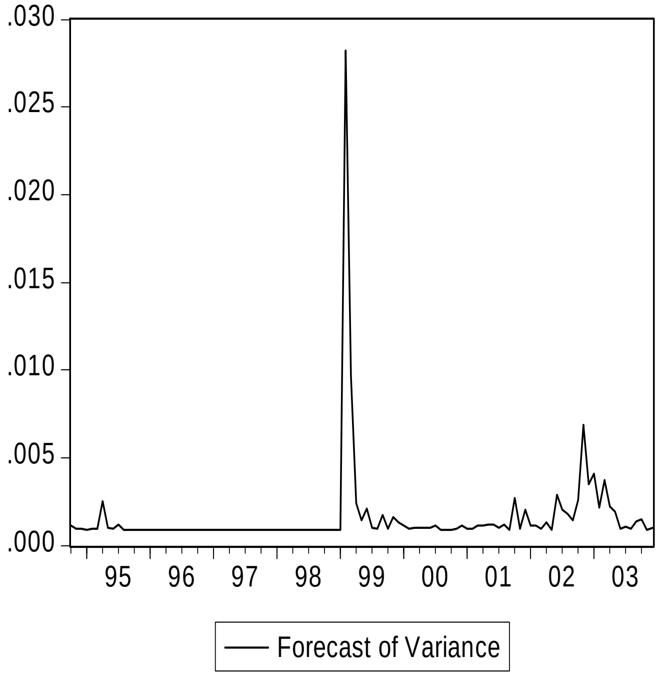
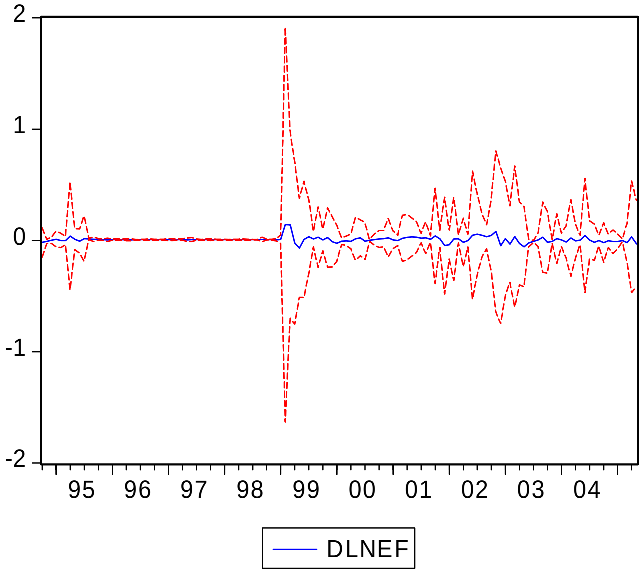


Figure 4:
Forecast from the updated TARCH model with Generalized Error Distribution



Forecast: DLNEF
Actual: DLNE
Forecast sample: 1990M01 2010M12
Adjusted sample: 1994M10 2005M05
Included observations: 127

Root Mean Squared Error	0.040869
Mean Absolute Error	0.023717
Mean Abs. Percent Error	128.5310
Theil Inequality Coefficient	0.564792
Bias Proportion	0.000463
Variance Proportion	0.175857
Covariance Proportion	0.823680

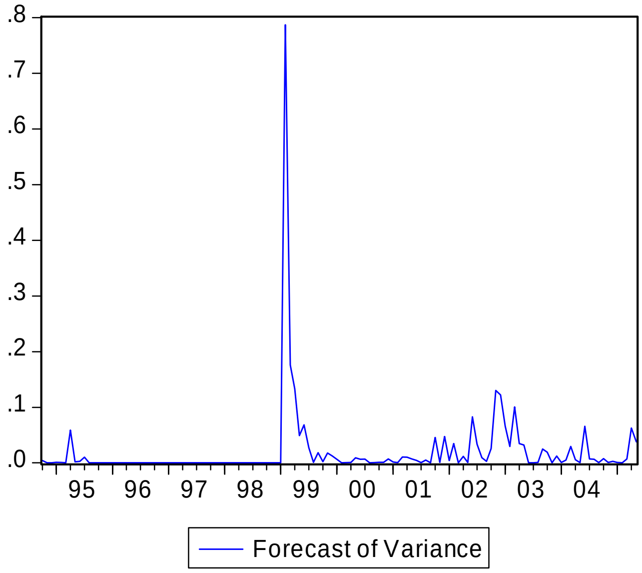
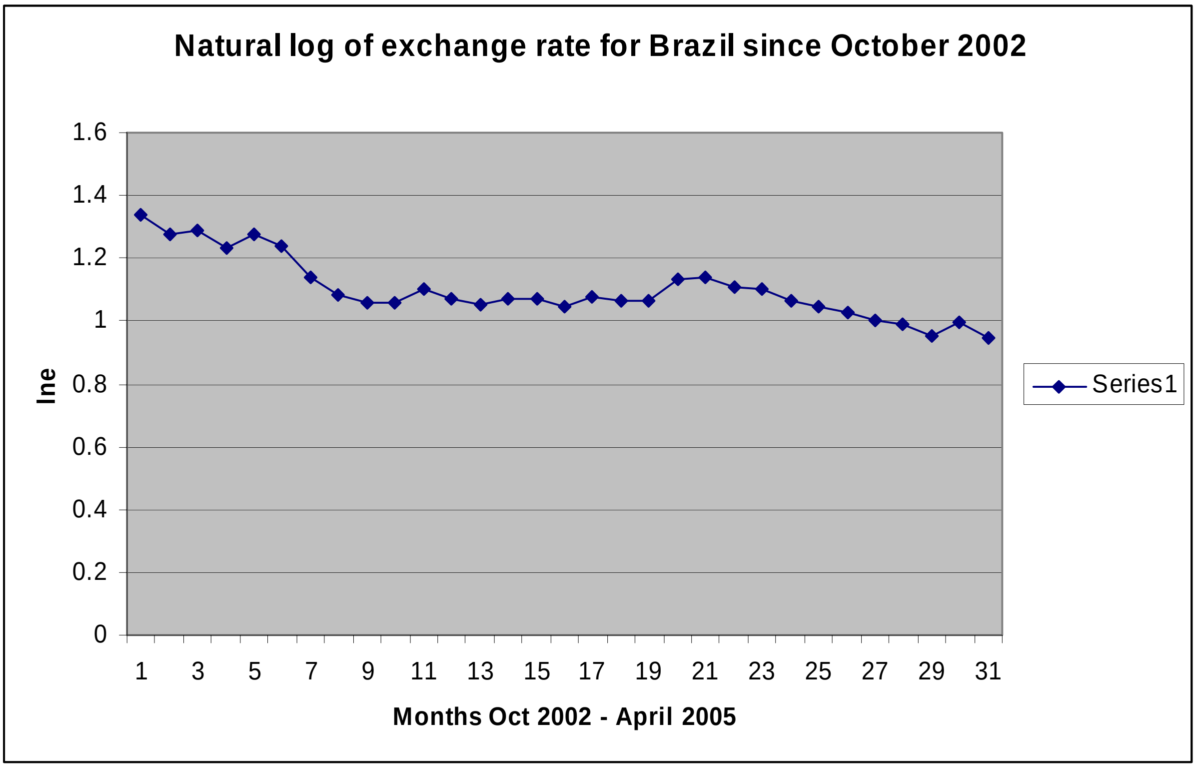


Figure 5



Natural log of exchange rate for Brazil since October 2002
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
lne
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31
Months Oct 2002 - April 2005
Series1

Appendix

Table 4B **Trade deficit/GDP regression with monthly data**

	Regression1			**Regression 2**		
Variable	Coeff.	t-Stat.	t-Prob.	Coeff.	t-Stat.	t-Prob.
C	1.845	2.903	0.012	1.630	3.806	0.001
DLNE	0.097	5.903	0.000	0.093	5.483	0.000
DLNE(-1)	-0.081	-3.529	0.004	-0.087	-4.778	0.000
DLNE(-2)	-0.028	-1.141	0.274	-	-	-
DLNE(-3)	0.217	5.828	0.000	0.188	8.140	0.000
DLNE(-4)	-0.091	-8.690	0.000	-0.081	-6.851	0.000
DLNE(-5)	-0.143	-4.743	0.000	-0.129	-5.516	0.000
DLNE(-6)	0.044	0.750	0.466	-	-	-
DLNE(-7)	-0.385	-4.452	0.001	-0.318	-12.479	0.000
DLNE(-8)	0.149	1.880	0.083	0.098	4.202	0.001
DLNE(-9)	-0.327	-4.856	0.000	-0.283	-8.457	0.000
DLNE(-10)	0.120	2.262	0.042	0.112	3.366	0.003
DLNE(-11)	-0.226	-3.230	0.007	-0.245	-4.250	0.000
DLNE(-12)	0.152	1.907	0.079	0.185	3.530	0.002
DLNE(-13)	-0.139	-1.731	0.107	-0.180	-4.043	0.001
DLNE(-14)	-0.045	-0.762	0.460	-	-	-
DLNE(-15)	0.030	0.630	0.540	-	-	-
DLNE(-16)	-0.100	-2.512	0.026	-0.077	-2.825	0.011
DLNE(-17)	-0.055	-1.752	0.103	-0.057	-4.084	0.001
DLNE(-18)	0.113	2.761	0.016	0.093	3.854	0.001
DLNE(-19)	-0.362	-7.283	0.000	-0.328	-9.531	0.000
DLNE(-20)	0.162	3.295	0.006	0.153	4.061	0.001
DLNE(-21)	-0.121	-3.712	0.003	-0.148	-6.479	0.000
DLNE(-22)	-0.221	-4.136	0.001	-0.150	-6.268	0.000
DLNE(-23)	0.086	1.266	0.228	-	-	-
DLNE(-24)	-0.189	-3.008	0.010	-0.121	-8.005	0.000
DLNE(-25)	-0.161	-4.348	0.001	-0.176	-7.892	0.000
DLNE(-26)	-0.007	-0.387	0.705	-	-	-
TDGDP(-1)	0.342	2.351	0.035	0.320	2.278	0.035
BDGDP(-2)	0.073	3.469	0.004	0.078	3.162	0.005
DLNGDP	0.063	5.941	0.000	0.060	5.734	0.000
WPIGSI(-5)	0.007	3.279	0.006	0.008	6.749	0.000
TIMESQ	0.000	6.762	0.000	0.000	8.457	0.000
D(LNUSA(-4))	-1.710	-4.448	0.001	-1.518	-4.033	0.001
WPIGSI(-6)	0.007	2.585	0.023	0.005	3.763	0.001
TIME	0.000	1.865	0.085	0.000	2.158	0.044
D(LNGER(-1))	0.425	4.817	0.000	0.379	5.777	0.000
D(LNUK(-3))	0.221	1.802	0.095	0.202	2.241	0.037
D(LNUSA(-1))	-0.821	-3.397	0.005	-0.738	-4.003	0.001
D(LNUK(-1))	-0.708	-5.743	0.000	-0.541	-9.989	0.000
D(LNJAP(-1))	0.266	4.622	0.001	0.251	4.989	0.000
D(LNGER(-2))	0.897	7.065	0.000	0.816	6.124	0.000
D(LNUSA(-2))	-1.005	-3.853	0.002	-0.864	-6.035	0.000
LNFRA(-2)	-0.405	-2.885	0.013	-0.360	-3.752	0.001
D(LNGER(-3))	0.469	3.437	0.004	0.377	3.487	0.003
D(LNJAP(-4))	0.327	3.397	0.005	0.273	4.115	0.001

D(LNCAN(-3))	0.305	2.273	0.041	0.254	1.839	0.082
D(LNCAN(-4))	0.792	3.633	0.003	0.706	3.323	0.004
WPIGSA(-2)	-0.001	-1.804	0.094	-0.001	-1.912	0.071
WPIGSA	0.001	4.113	0.001	0.001	3.586	0.002
Jarq.-Bera Prob.	0.386			0.3		
Breusch-Godfr. F-prob.	0.8			0.795		
Ramsey RESET	0.607			0.93		
One-Step Forc. Test(a)	1			4		
N-Step Forc. Test(a)	1			3		
R2 adj.	0.956			0.959		
AIC	-8.207			-8.094		
SIC	-6.506			-6.597		
HQ	-7.538			-		
DW	2.154			2.114		
see	0.004			0.004		
ssr	0.000			0.000		
No. of observations	63			63		

(a) number of observations which cast doubt on the assumption of parameter constancy

Table 5B Accounting for the trade deficit/GDP

(a) Regression 1 of Table 4B

Variable	aver.	coeff	av.*coeff	percent
tdgdp	0.01	1.00	0.01	1.00
const	1.00	1.84	1.84	246.49
dlne	0.01	-1.51	-0.02	-2.53
bdgdp(-2)	0.05	0.07	0.00	0.49
tdgdp(-1)	0.01	0.34	0.00	0.30
dlngdp	-0.01	0.06	0.00	-0.05
wpigsi	1.15	0.01	0.02	2.12
wpigsa	1.59	0.00	0.00	-0.03
others(a)				-245.79

(b) Regression 2 of Table 4 B

Variable	aver.	coeff	av.*coeff	percent
tdgdp	0.01	1.00	0.01	1.00
const	1.00	1.63	1.63	217.79
dlne	0.01	-1.46	-0.02	-2.46
bdgdp(-2)	0.05	0.08	0.00	0.52
tdgdp(-1)	0.01	0.32	0.00	0.28
dlngdp	-0.01	0.06	0.00	-0.05
wpigsi	1.15	0.01	0.02	2.07
wpigsa	1.59	0.00	0.00	0.03
others(a)				-217.17

(a) timesq and index of industrial production

Table 4C **Trade deficit/GDP regression with monthly data**

	Regression 1			**Regression 2**		
Variable	Coeff.	t-Stat.	t-Prob.	Coeff.	t-Stat.	t-Prob.
C	0.997	1.715	0.110	0.739	2.966	0.008
DLNE	0.126	5.136	0.000	0.120	7.092	0.000
DLNE(-1)	-0.097	-3.601	0.003	-0.097	-6.241	0.000
DLNE(-2)	-0.031	-1.646	0.124	-	-	-
DLNE(-3)	0.242	8.991	0.000	0.210	0.019	0.000
DLNE(-4)	-0.102	-7.924	0.000	-0.089	0.014	0.000
DLNE(-5)	-0.156	-6.169	0.000	-0.142	0.018	0.000
DLNE(-6)	0.034	0.431	0.673	-	-	-
DLNE(-7)	-0.386	-3.307	0.006	-0.305	-11.379	0.000
DLNE(-8)	0.134	1.141	0.274	0.088	4.828	0.000
DLNE(-9)	-0.310	-3.090	0.009	-0.262	-8.736	0.000
DLNE(-10)	0.109	1.237	0.238	0.114	3.059	0.007
DLNE(-11)	-0.242	-3.523	0.004	-0.260	-4.741	0.000
DLNE(-12)	0.167	2.082	0.058	0.213	4.192	0.001
DLNE(-13)	-0.171	-3.013	0.010	-0.205	-5.466	0.000
DLNE(-14)	-0.048	-0.875	0.397	-	-	-
DLNE(-15)	0.010	0.184	0.857	-	-	-
DLNE(-16)	-0.104	-2.329	0.037	-0.090	0.023	0.001
DLNE(-17)	-0.059	-1.204	0.250	-0.041	0.020	0.051
DLNE(-18)	0.108	1.469	0.166	0.080	0.025	0.004
DLNE(-19)	-0.367	-4.769	0.000	-0.321	0.030	0.000
DLNE(-20)	0.161	2.002	0.067	0.165	0.026	0.000
DLNE(-21)	-0.118	-2.791	0.015	-0.155	0.023	0.000
DLNE(-22)	-0.236	-3.608	0.003	-0.139	0.027	0.000
DLNE(-23)	0.093	1.217	0.245	-	-	-
DLNE(-24)	-0.193	-2.720	0.018	-0.111	-6.822	0.000
DLNE(-25)	-0.169	-4.027	0.001	-0.175	-7.985	0.000
DLNE(-26)	-0.005	-0.201	0.844	-	-	-
TDGDP(-1)	0.388	2.838	0.014	0.391	4.456	0.000
BDGDP(-2)	0.070	2.216	0.045	0.077	2.540	0.020
DLNGDP	0.071	4.553	0.001	0.070	6.057	0.000
WPIGSI(-5)	0.008	3.571	0.003	0.009	10.209	0.000
TIMESQ	0.000	6.943	0.000	0.000	11.036	0.000
TDGDP(-2)	0.205	1.644	0.124	0.218	2.137	0.046
D(LNUSA(-4))	-1.819	-6.082	0.000	-1.648	-7.494	0.000
WPIGSI(-6)	0.006	2.289	0.040	0.004	3.709	0.002
TIME	-	-	-			
D(LNGER(-1))	0.406	3.339	0.005	0.320	4.034	0.001
D(LNUK(-3))	-	-	-	-	-	-
D(LNUSA(-1))	-0.749	-4.351	0.001	-0.646	-4.117	0.001
D(LNUK(-1))	-0.892	-6.468	0.000	-0.655	-8.262	0.000
D(LNJAP(-1))	0.316	4.918	0.000	0.277	5.175	0.000
D(LNGER(-2))	0.925	5.931	0.000	0.769	5.626	0.000
D(LNUSA(-2))	-0.912	-2.300	0.039	-0.782	-2.794	0.012
D(LNUK(-2))	-0.247	-2.181	0.048	-0.196	-2.047	0.055
LNFRA(-2)	-0.213	-1.729	0.108	-0.158	-3.024	0.007
D(LNGER(-3))	0.436	3.557	0.004	0.302	2.789	0.012

D(LNJAP(-4))	0.330	3.121	0.008	0.280	4.593	0.000
D(LNCAN(-3))	0.450	4.350	0.001	0.367	3.355	0.003
D(LNCAN(-4))	0.883	5.129	0.000	0.782	5.455	0.000
WPIGSA(-2)	-0.002	-2.967	0.011	-0.002	-4.859	0.000
WPIGSA	0.001	2.548	0.024	0.001	3.275	0.004
Jarq.-Bera Prob.	0.56			0.37		
Breusch-Godfr. F-prob.	0.37			0.35		
Ramsey RESET	0.764			0.868		
One-Step Forc. Test(a)	1			0		
N-Step Forc. Test(a)	3			5		
R2 adj.	0.947			0.949		
AIC	-8.033			-7.865		
SIC	-6.333			-6.368		
HQ	-7.364			-		
DW	2.455			2.449		
see	0.004			0.004		
ssr	0.000			0.000		
No. of observations	63			63		

(a) number of observations which cast doubt on the assumption of parameter constancy

Table 5C Accounting for the trade deficit/GDP

(a) **Regression 1 of Table 4C**

Variable	aver.	coeff	av.*coeff	percent
tdgdp	0.01	1.00	0.01	1.00
const	1.00	1.00	1.00	133.24
dlne	0.01	**-1.61**	-0.02	-2.70
bdgdp(-2)	0.05	0.07	0.00	0.47
tdgdp	0.01	0.59	0.00	0.51
dlngdp	-0.01	0.07	0.00	-0.05
wpigsi	1.15	0.01	0.02	2.28
wpigsa	1.59	0.00	0.00	-0.09
others(a)				-132.65

(b) Regression 2 of Table 4C

Variable	aver.	coeff	av.*coeff	percent
tdgdp	0.01	1.00	0.01	1.00
const	1.00	0.74	0.74	98.72
dlne	0.01	-1.40	-0.02	-2.36
bdgdp(-2)	0.05	0.08	0.00	0.52
tdgdp	0.01	0.61	0.00	0.53
dlngdp	-0.01	0.07	0.00	-0.05
wpigsi	1.15	0.01	0.02	2.10
wpigsa	1.59	0.00	0.00	-0.07
others(a)				-98.38

(a) timesq and index of industrial production

List of abbreviations

(A)DF	(augmented) Dickey-Fuller
AIC	Akaike information criterion
ARCH(-x)	autoregressive conditional heteroscedasticity with x lagged squared residuals
av. or aver.	average of a variable
bdgdp	budget deficit as a share of GDP
BG	Breusch-Godfrey
c	constant
coeff	coefficient
CPI	consumer price index
D(LNCAN(-4))	growth rate of monthly industrial production index of Canada with four lags
dlne(-x)	growth rate of exchange rate with lag x
dlnef	forecast of growth of exchange rate
dlnefsigma	standard error of forecast from TARCH regression in Table 6
dlnefsigma2	standard error of forecast from TARCH regression in Table 6b
dlngdp	growth rate of the GDP of Brazil
DW	Durbin-Watson statistic
e	exchange rate (LCU per dollar)
ERS-PO	Elliot-Rottemberg-Stock Point Optimal
GDP	Gross domestic product
gr.	growth
HAC	Heteroscedasticity and autocorellation Corrected
HQ	Hannan-Quinn information criterion
I(x)	integration of order x
infl	inflation
LHS	left-hand side
ln	natural log
M2gr	growth of M2 (money and quasi money)
ML	maximum likelihood
pdl	polynomial distributed lag
PP	Phillips-Perron
RESE4	residual of equation 4
see	standard error of estimation
SIC	Schwarz information criterion
ssr	sum of squared residuals
tdgdp	trade deficit as a share of the GDP
TARCH	threshold autoregressive conditional heteroscedasticity
timesq	time index with exponent two
wpigsa	whole sale price index global supply agriculture
wpigsi	whole sale price index global supply industry