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THE JAPANESE TRADE BALANCE:  
RECENT HISTORY AND FUTURE  
PROSPECTS

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ABSTRACT

I examine the evolution of the Japanese trade balance and its relation to the terms of trade and the value of the yen. Using a vector time series model, I predict that the trade surplus will fall from a high of 3.7 percent of GNP in late 1992 to about 2.6 percent in 1995. This relatively modest decline is an indication that relative prices are not the dominant factor influencing the Japanese trade balance.

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# 1 Introduction

The Japanese trade surplus has garnered increasing attention over the last decade in American political circles. Probably the most important aspect of this attention is its impact on bilateral and world trade negotiations. This paper, however, is concerned with a side issue: the impact of the dramatic rise in the yen over the last year on the balance of Japanese trade. The two issues were connected explicitly last spring, when President Clinton remarked that the US would not look unfavorably on further appreciation of the yen. This was promptly delivered by financial markets, as the yen 'rose' in value from 124 per dollar in December of 1992 to 110 in early May. For the last few months the yen has flirted with 100 per dollar, and currently trades at about 106. The logic behind Clinton's strategy was apparently that a rise in the yen would put pressure on Japanese exporters and thus reduce the Japanese surplus. Certainly we have seen such reactions by exporters, with Honda recently announcing shifts in production from Japan to the US, and American exporters ranging from computer manufacturers to L.L. Bean increasing their share of the Japanese market. The question is how large an impact we might expect these developments to have in the aggregate over the next five years.

This paper is concerned, then, with the impact of the strong yen on the

Japanese balance of trade. Can we expect the strong yen to be followed by a substantially smaller trade surplus? Forecasting is not something that an academic economist does without apprehension, but the widely documented correlation between fluctuations in the trade balance and relative prices of Japanese and foreign goods gives us some hope that we can predict future movements in the former from past movements in the latter. After reviewing the relation between these variables in the data, I extrapolate past patterns to form a forecast of the evolution of the trade balance over the next five years. A catalog of caveats serves as protection against the inevitability that the forecasts prove to be wrong.

## 2 Recent History

Let me start by reviewing the behavior of the Japanese trade balance and terms of trade over the postwar period. I measure the trade balance (denoted  $tb$  in the figures) as the ratio of net exports to GNP, with both valued at current prices. The data are reported in the OECD's *Quarterly National Accounts*. We see in Panel A of Figure 1 that the Japanese trade balance has alternated between surplus and deficit over the last forty years, with no particular tendency toward

either.

Japan departed from this path of roughly balanced trade in the last twelve years, the longest period of continuous surplus in the postwar period. If we were to graph only these years, we would be struck by a pattern of large and persistent surpluses. Stated somewhat differently, the surplus averaged 0.4 percent of GNP between 1955 and 1981, but 2.7 percent since then. This is generally what we see in newspaper accounts of trade issues, for which a decade is a lifetime. But viewed against the postwar period as a whole, the recent period of large surpluses has been unusual.

In Panel B of Figure 1 I look at two aggregate measures of the relative price of foreign to Japanese goods: the terms of trade (denoted  $p$ , solid line) and the real exchange rate (denoted  $e$ , dashed line). The real exchange rate (the IMF's real effective exchange rate, line *reu* of *International Financial Statistics*) is a trade-weighted ratio of foreign wages to Japanese wages; it tells us how Japanese labor costs vary relative to those of its trading partners. Its movements, for the most part, reflect those in the value of the yen vs. other currencies, including the dollar. The yen's recent appreciation appears in the figure as a sharp drop in the real exchange rate toward the end of the period.

The terms of trade follows a similar pattern. I define the terms of trade (with

apologies to trade theorists) as the ratio of the import deflator to the export deflator, so it concerns only goods that are traded. This data, too, comes from the OECD's *Quarterly National Accounts*. We see that the terms of trade has fallen in the recent past, but by substantially less than the real exchange rate. We also see a gradual increase in the relative price of imported goods, dating back to the late 1960s, which contrasts with the average decline in the real exchange rate.

A close look at Figure 1 indicates that fluctuations in the trade balance and relative prices have been closely related. We see in Figure 2, Panel A, that the cross-correlation function for short-run fluctuations in the trade balance and the terms of trade exhibits a horizontal S shape: correlations of the trade balance with present and future movements in the terms of trade are negative, while those of the trade balance and past price movements are positive. These correlations were computed from data covering the period 1955:2 to 1993:2 using series filtered by the method of Hodrick and Prescott. The S-shaped cross-correlation function is a familiar pattern in the data, applying to many countries and over different time periods; see, for example, Backus, Kehoe, and Kydland (1994, Figure 1) for evidence on other countries and Meade (1988) for a review of earlier work. We find a similar pattern if we focus on more recent data or use the real exchange rate as our relative price variable. For Japan the

peak in the cross-correlation function occurs at 6 quarters, indicating that the maximal correlation concerns the trade balance and the relative price of foreign goods lagged six quarters.

The standard interpretation of the asymmetric cross-correlation function, which appears routinely in textbooks under the name 'J-curve,' is that increases in the relative price of foreign goods initially reduce the trade balance, by raising the value of imported goods, but once importers and exporters adjust to the new prices the trade balance turns to surplus. The current situation in Japan is the reverse of this, with a strong yen reducing the price of imported goods, so many economists predict an eventual decline in the Japanese surplus. My paper with Kehoe and Kydland suggests a somewhat different interpretation: that terms of trade increases resulting from increases in domestic productivity lead to inflows of physical capital to fuel an investment boom. When the boom dissipates, the trade balance turns to surplus. The Japanese experience is, again, the opposite, with a sharp rise in the relative price of Japanese goods associated with a decline in investment and an increase in the trade surplus. Our theory also suggests that changes in relative prices arising from other sources (government spending, for example) may be associated with different behavior of the balance of trade. The key is investment: shocks that do not have strong investment responses tend not to have strong responses in the balance of trade.

Another factor influencing the current Japanese surplus is the recession. We know that in most countries the trade balance is countercyclical: we tend to see deficits in booms and surpluses in recessions. This fact is documented in Backus, Kehoe, and Kydland (1994, Table 1), and many other places as well. Panel B of Figure 2 illustrates this for Japan. The relation is weaker, however, than that between trade and relative prices. Panel C completes the picture of bivariate relations between the three variables, and shows that there has been a modest tendency for the terms of trade to rise in recessions.

These features of the data suggest, then, that there are two factors that exaggerate the current Japanese surplus, and might be expected to reduce it in the near future. The first is the recent increase in the value of the yen, which has made Japanese goods more expensive. Past experience suggests that one or two years from now the trade balance will fall. The second factor is the Japanese recession: since surpluses generally rise in recessions, we might expect the inevitable Japanese recovery to be associated with a decline in the surplus. In the next section, I use a vector time series model to generate a forecast of the Japanese trade balance that incorporates these effects and provides an estimate of their magnitude. I go on to consider factors that might temper our confidence in the forecast.



### 3 Future Prospects

We have seen that the correlation between the trade balance and the terms of trade suggests that a decline in the relative price of foreign goods will be followed by a decline in the trade surplus. In this section I summarize the interrelations of these two variables and real output in a vector autoregression, or VAR. The VAR is then used to forecast the trade balance. Various details of this procedure are outlined in Ooms (1992) and Sims (1980). For now it's sufficient to note that the VAR is a black-box time series model. Its strength and weakness, depending on one's perspective, is that it makes little use of economic theory in describing and extrapolating the patterns we see in the data.

To be specific, I summarize the patterns in the data in a three-variable vector autoregression for the terms of trade, real output, and the trade balance. In what follows, I use parameters estimated with data for the period 1975:1 to 1993:2, which I think is more likely to be similar to the present than data from earlier years, but little would change in anything that follows if I used data back to 1955:2, the sample period used in computing cross-correlation functions in the previous section. The vector autoregression is first order, meaning that one lag of each variable enters each equation.

A useful way of reporting the dynamics implied by the estimated VAR is with

the impulse response functions: the dynamic responses of the three variables to a one-time “impulse”, or innovation, in one of the three equations. In Figure 3 I report the responses of the terms of trade, real output, and the trade balance to a one-standard deviation increase in the terms of trade. Panel A of the figure shows that effect of the shock is highly persistent: after two years we expect the terms of trade to remain fifty percent above its initial value of zero. There is nothing new or unusual about this: many studies have documented the high degree of persistence in international relative prices. In Panel B we see that this rise in the relative price of foreign goods is accompanied initially by a decline in the balance of trade. The decline is reversed several quarters later, reaching a maximum three to four years after the shock. This pattern resembles the right side of the cross-correlation function of Figure 2, and suggests that the VAR is capturing the same dynamic relation between trade and relative prices we saw there. In Panel C we see that the increase in the terms of trade is associated with a decline in real output.

Now that we have some feeling for the dynamics of the statistical model, we can go on to use it to forecast the balance of trade. The forecast reported in Figure 4 is a mechanical extrapolation of the VAR's equations, starting from the values of output, the terms of trade, and the trade balance in the second quarter of 1993, our most recent data point. For better or worse, it uses none

of the judgmental adjustments commonly applied to professional forecasts. In the figure the vertical bar indicates the start of the forecast: lines to the left of the bar represent data, lines to the right the forecast. We see in Panel B that over the next four years the trade balance is predicted to fall from its current (1993:2) value of 3.1 percent of GNP to about 2.6 percent in 1995. This decline would bring the trade balance back to its value of 1991, but nowhere near its 1990 trough of 1 percent or its pre-1981 mean of 0.4 percent.

The surprising feature of this forecast is, of course, that the impact on the trade balance of the decline in relative prices and projected increase in output is so small: the predicted decline in the balance of trade still leaves us with a surplus of 2.6 percent of GNP. Given the observed relations between trade and prices, and between trade and output, I expected the rise in the yen and the predicted Japanese recovery to produce a smaller surplus. The model incorporates both of these features, but suggests that their magnitudes are small. Put somewhat differently, both the terms of trade and real output influence the balance of trade in the VAR, but more than half of the variance in the trade balance can be attributed to factors that are uncorrelated with either one. (Details of this decomposition are provided in Table 1.) That leaves us with two choices: either we follow the VAR and predict that the rise in the yen will have little impact on the Japanese trade surplus, or we argue that the VAR

has omitted some additional factors that we think are important to the current situation. I consider the second possibility in the next section.

## 4 Other Considerations

We economists pride ourselves on knowing more than the empiricists, who built models from data with no theoretical framework to guide them. A favorite example of our time is the prediction in the mid-1970s, by professionals too numerous to list, that the price of oil would reach 100 dollars a barrel by the end of the century. They may still turn out to be right, but the odds are much worse now than they were in 1980. Their method, if we can call it that, was to extrapolate the upward trend we saw in the data. Some economists of the time (William Nordhaus comes to mind) argued against this forecast, suggesting that such price increases would engender moderating market responses: cars would become more fuel efficient and geologists and engineers would find it cost-effective to find and pump oil in out of the way places. The VAR is a more sophisticated version of this method, but it still amounts to extrapolation of past trends in the data. If we think the present is different from the past, we may be able to do better.

In this case several factors might lead to lead us qualify our forecast of the trade balance. One qualification is uncertainty: users of VARs (and other models, too) typically find that their mean forecasts come with a high degree of uncertainty. If we were to report the degree of uncertainty with the forecast, one suspects that users would show less interest in them. In the VAR I have used, the standard deviation of the two-year forecast of the trade balance is about 1.5 percent. We should not be surprised, in other words, if the trade surplus falls to 1.2 percent of GNP or rises to 4.1 percent: neither is very unlikely given past experience. This is not a very sophisticated line of argument, but it's sufficient to protect me against the likelihood that my forecast turns out to be wrong.

A qualification with more economic content concerns the recent behavior of the terms of trade: we saw in Figure 1 that the recent decline in the real exchange rate (i.e., the rise in the value of the yen) was larger than the decline in the terms of trade (the relative price of imports to exports). Apparently the rise in the yen has not translated – yet anyway – into a comparable rise in the relative price of Japanese exports. This observation might lead us in several different directions. One follows from the trend in relative wages: Japanese wages have generally increased faster than those in other countries, a reflection of higher rates of labor productivity growth. De Gregorio, Giovannini, and Wolf (1993) and Yoshikawa (1990) are among those to relate relative wage and price

movements to productivity differentials; they also provide a guide to earlier work. If we expect this trend to continue in Japan, then we would not expect the relative price of Japanese goods to rise as much, on average, as the real exchange rate.

Alternatively, we might guess that the terms of trade will follow the real exchange rate and fall further in the near future. The lag of import and export prices behind exchange rate movements is, in fact, one of the key ingredients of the J-curves generated by macroeconomic models (Meade 1988). In our data, however, there is no obvious tendency for movements in the terms of trade to lag behind those in the real exchange rate. Nevertheless, we can get some idea of the impact of further declines in the terms of trade with a conditional forecasting exercise in which we lower (arbitrarily) the terms of trade by 2.5 percent per quarter for each of the next four quarters. We see the result in Figure 5: the trade balance declines somewhat more, bottoming out at 1.9 percent of GNP in early 1996. This is a substantial drop from the value of 3.1 percent in late 1992, but remains a long way from the typical value of the trade balance two decades ago.

Yet another interpretation of the difference between movements in the real exchange rate and the terms of trade comes from the 'pass-through' literature (Knetter 1993, for example): that traded goods prices may move systematically

less than exchange rates. Certainly that's what we see in Figure 1. Since the fourth quarter of 1990, the real exchange rate has fallen 26 percent and the terms of trade 9 percent, and since 1992:4 by 15 and 1 percent, respectively. In Japan the price deflators for imports and exports over the last two years indicate that the decline in the real exchange rate since 1992:4 has appeared as a decline of 8 percent in the price of imports. But since the (yen) price of exports declined by 7 percent, the terms of trade has fallen only slightly.

Taken as a whole, our uncertainty about the likely changes in relative prices may lead us to forecast a larger reduction in the trade surplus. A third qualification may move us in either direction: that with the yen at unprecedented heights, we might see a change in the statistical relation between trade and relative prices. This argument was applied by Richard Baldwin (1987) to the US trade deficit in the 1980s to account for the apparent intransigence of the deficit to movements in the value of the dollar. In the US we saw a marked change in the relation between the trade balance and the terms of trade sometime in the last twenty years (see, for example, Figure 2 of Backus 1994). In Japan a similar argument could go either way. The theory underlying Baldwin's argument suggests that a small or temporary shock has little effect on trade flows, but that a large persistent shock can have a large effect. The question for Japan is whether the shock is large and persistent enough. If it is, then we might antic-

ipate larger responses of trade flows than we would expect from past patterns in the data.

Taken together, these additional considerations provide little reasons to suppose that the strong yen will result in a large decline in the balance of trade over the next few years. A dynamic perspective reinforces this conclusion. We know, as a matter of accounting, that the trade balance is the difference between saving and investment:

$$tb = s - i.$$

In the national income and product accounts a useful operational version of this identity follows from the definition of saving as  $s \equiv y - c - g$ . This concept of saving is based on flows of goods, and avoids some of the measurement problems associated with estimating flows of assets. The identity tells us that factors influencing saving and investment also influence the balance of trade. Without saying what these factors might be, we have no reason *a priori* to expect that they will be associated in any particular way with relative prices. We get a hint of these other factors from the VAR. The variance decomposition reported in Table 1 attributes variation in the balance of trade over various time horizons to three factors: movements in the terms of trade, in real output, and in factors uncorrelated with either. We see that at any forecast horizon, more than 60



percent of the variation is attributable to these other factors.

The suggestion that relative prices are not the primary influence on the trade balance should come as no surprise to students of history, who have noted long periods of trade 'imbalance' in a wide range of countries. The UK, for example, ran surpluses during much of the nineteenth century, as they financed capital formation (largely transportation) throughout the world. The US, conversely, ran persistent deficits over the same period. In more recent times, Korea ran deficits averaging 7 percent of GNP between the end of the Korean War and 1980. In short, there is no lack of evidence for persistent trade deficits or surpluses. With this as background, the Japanese surpluses of the last decade seem less surprising, recent movements in relative prices notwithstanding. For this reason, we might feel more comfortable with the forecast of the previous section.

The questions, in the Japanese case, are why saving and investment rates are so high relative to other countries, and why the saving rate over the last twelve years has exceeded the investment rate. We see both in Figure 6, together with the balance of trade. Our track record, as economists, hasn't been great on either front. The continued high saving rates, in particular, have proved hard to explain. Given a choice between the two, I'd guess that a large rise in investment is more likely than a decline in saving, because investment historically has been

more volatile than saving. But I wouldn't bet my own money on either one.

## 5 Final Remarks

We have seen that a mechanical forecast with a time series model indicates that the Japanese trade surplus is likely to fall by only a modest amount over the next few years, despite the new heights reached by the yen. Despite the widely documented relation between trade and relative prices, it appears that prices are not the only, or even the most important, factor governing the level and fluctuations of the balance of trade. Put somewhat differently: the trade balance is the difference between saving and investment, and both move for many reasons besides changes in international relative prices. A number of considerations might lead us to modify this forecast of the trade balance, but on the whole I see little reason to predict a decline below 2 percent of GNP in the near future. Probably the best reason to predict a greater decline in the trade surplus is the political pressure put on the Japanese by other countries, most notably the US. If this continues, then we might expect to see further strengthening of the yen or increases in government purchases, either of which could reduce the surplus.

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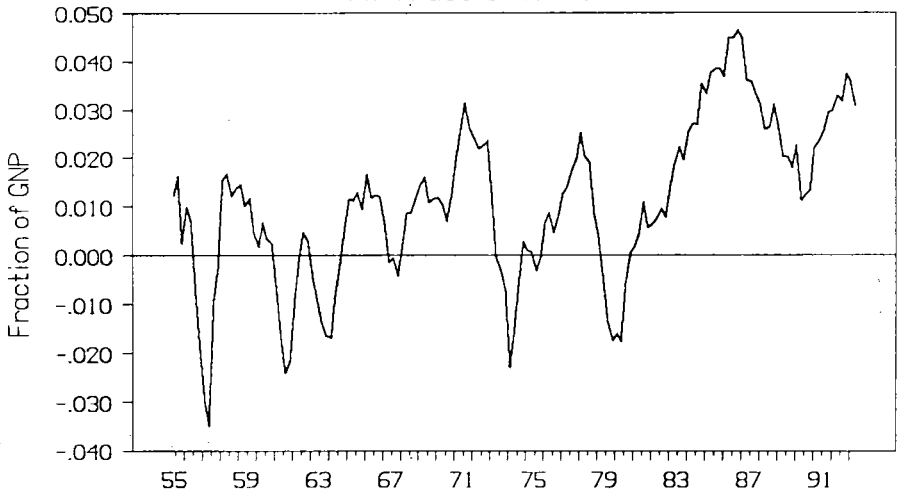
**Table 1**  
**Sources of Trade Balance Variation**

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Time Horizon	Percent of Variance Due to		
	Terms of Trade	Output	Trade Balance
1 Quarter	25	5	69
2 Quarters	22	5	73
4 Quarters	16	6	79
8 Quarters	13	6	82
12 Quarters	21	5	74
24 Quarters	36	4	61

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Figure 1. The Data  
A. Trade Balance



B. Relative Prices

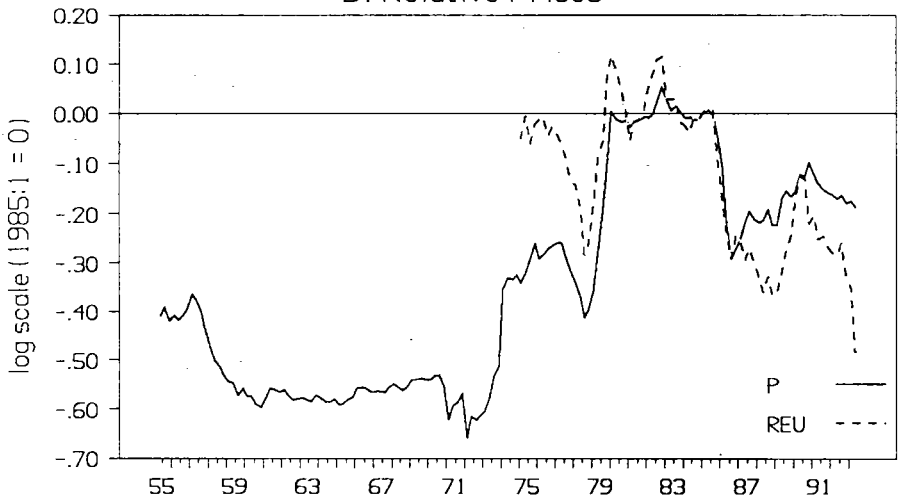
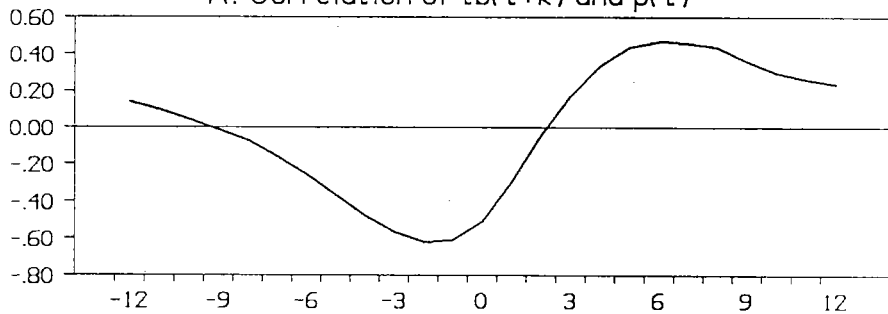
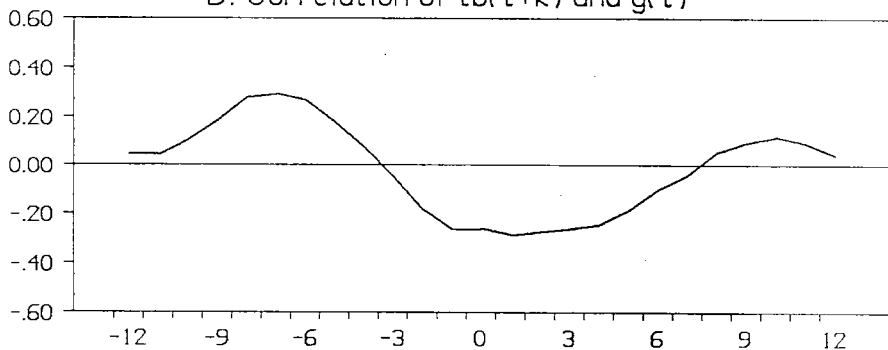


Figure 2. Cross Correlation Functions

A. Correlation of  $tb(t+k)$  and  $p(t)$



B. Correlation of  $tb(t+k)$  and  $y(t)$



C. Correlation of  $y(t+k)$  and  $p(t)$

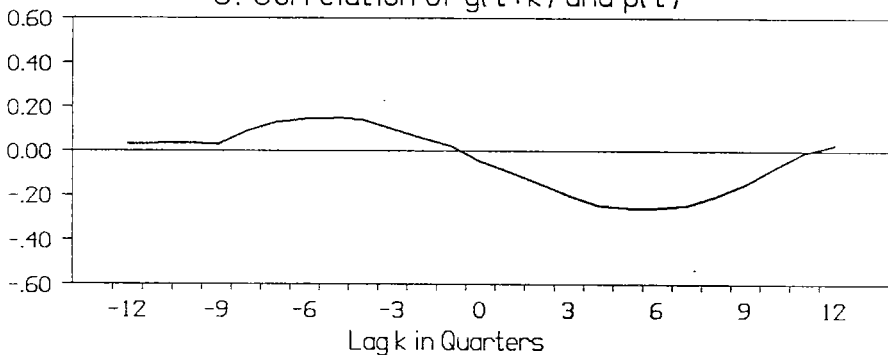
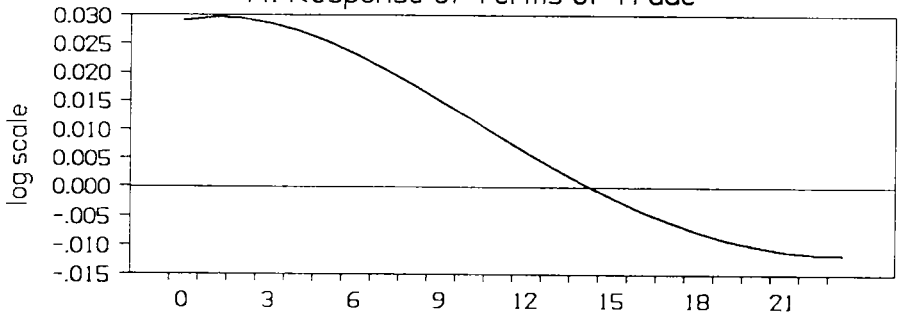
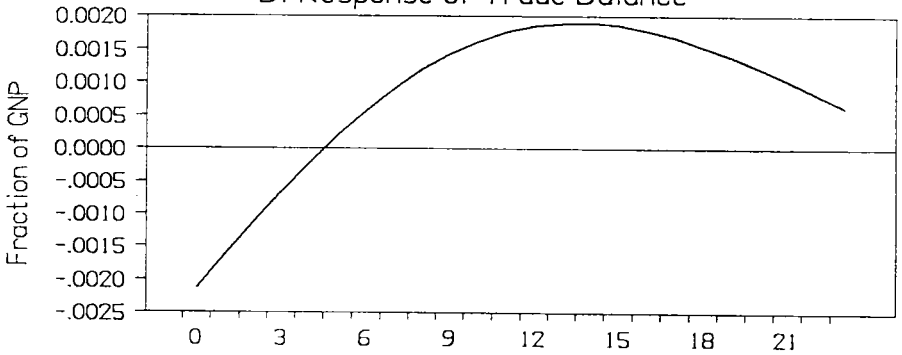


Figure 3. Responses to Shock in Terms of Trade

A. Response of Terms of Trade



B. Response of Trade Balance



C. Response of Real Output

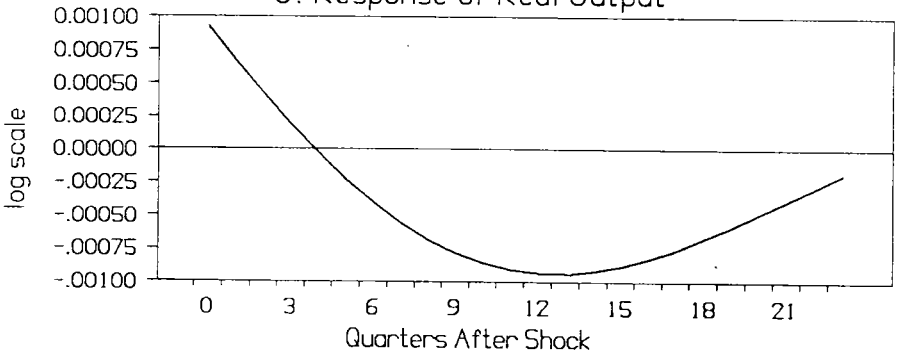
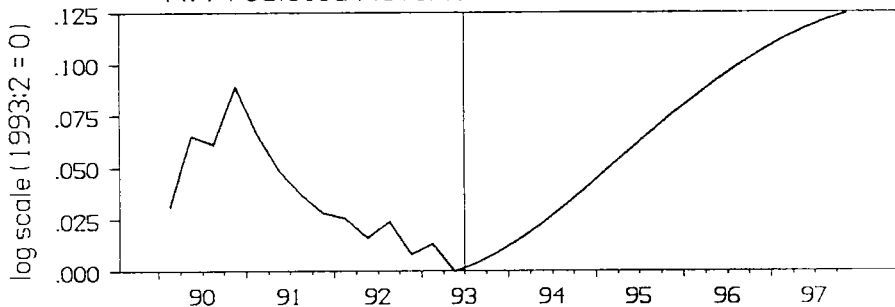
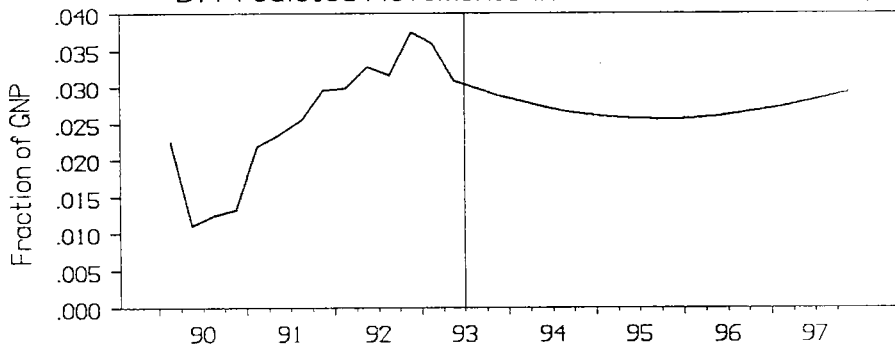


Figure 4. Forecasts

A. Predicted Movements in Terms of Trade



B. Predicted Movements in Trade Balance



C. Predicted Movements in Output

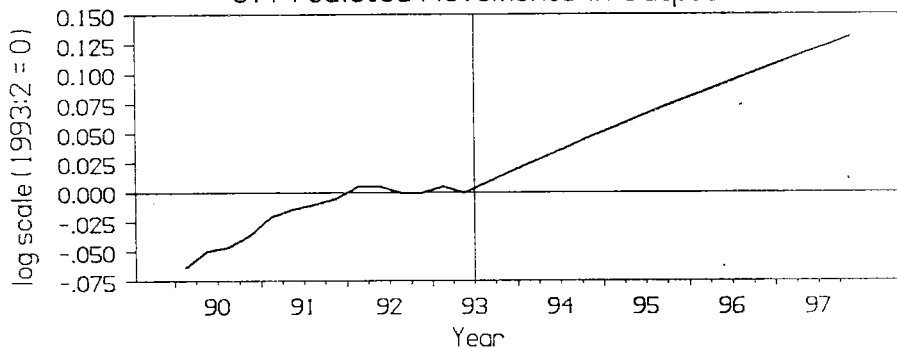
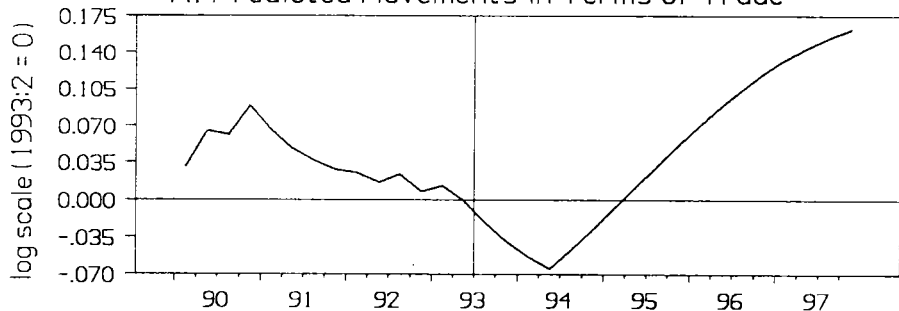


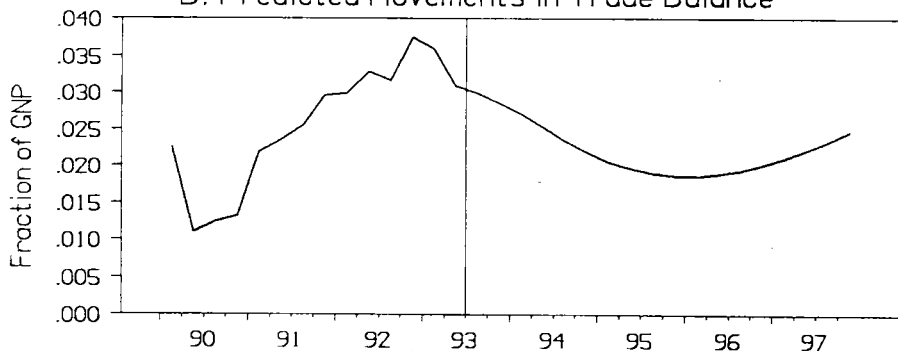


Figure 5. Forecasts with Further Price Declines

A. Predicted Movements in Terms of Trade



B. Predicted Movements in Trade Balance



C. Predicted Movements in Output

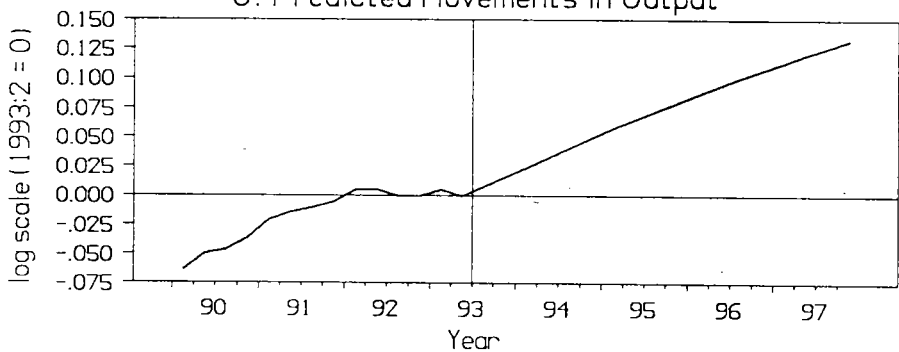


Figure 6. Saving and Investment Rates

