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FISCAL STANCE AND THE REAL EXCHANGE: SOME EMPIRICAL ESTIMATES

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ABSTRACT

This paper presents some empirical results on the dynamic relationship between fiscal policy and the real exchange rate in the G3 countries since advent of floating exchange rates. This subject is of some interest given the recent shift to fiscal surpluses in the US, the annual announcement of yet another fiscal stimulus package in Japan, and Maastricht limits on fiscal deficits in Germany and the rest of Euroland. To the extent that the foreign exchange market anticipates that fiscal "contractions will follow expansions," as would be required by the government's intertemporal budget constraint when holding constant the present value of tax collections, it is possible that the exchange rate response to any contemporaneous index of fiscal stance will depend upon exactly what stage the government's "fiscal cycle" is (thought to be) in. We find a similarity across the G3 countries in their estimated dynamic responses to a fiscal shock. At first, and for several years thereafter, the real exchange rate appreciates in response to an expansionary fiscal shock. However, eventually, the process is reversed; the real exchange rate overshoots and actually depreciates relative to its initial prevailing before the fiscal shock.

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1. INTRODUCTION

This paper presents some empirical results on the dynamic relationship between fiscal policy and the real exchange rate in the G3 countries since advent of floating exchange rates. This subject is of some interest given the recent shift to fiscal surpluses in the US, the annual announcement of yet another fiscal stimulus package in Japan, and Maastricht limits on fiscal deficits in Germany and the rest of Euroland. Models of the Mundell-Fleming variety (see Clarida and Gali (1994) for a recent, rational expectations treatment) and more rigorously grounded versions of the Froot and Rogoff (1991) variety predict that, so long as the central bank is independent and deficits are not (expected to be) monetized, a fiscal package that results in an expansion of aggregate demand should appreciate the real exchange rate.[1] This occurs because the rise in aggregate demand that

[1] Of course, if Ricardian Equivalence applies, there is no impact of a temporary tax on aggregate demand or the real exchange rate. See Blanchard (1985) for open economy models in which Ricardian Equivalence breaks down.

follows from a fiscal expansion will tend to raise the price of home output relative to foreign output or push up the relative price of non-traded goods at home.

Absent from the theoretical discussion is any robust prediction about the dynamics of this response. This is not a defect of the theoretical models. Rather it reflect the fact that the dynamics of the exchange rate response depend upon the entire expected time path of government spending and taxes. In theoretical models this is recognized, but these models most often assume, for tracability, that the fiscal policy change is either *permanent* or, at the other extreme, completely transitory lasting just one 'period'. In practice, many fiscal expansions appear to be persistent but ultimately largely transitory (e.g. the "Reagan" budget deficits in 1980s and the "unification" deficits in Germany in the 1990s). To the extent that the foreign exchange market anticipates that fiscal "contractions will follow expansions", as would be required by the goverment's intertemporal budget constraint when holding constant the present value of tax collections, it is possible that the exchange rate response to any contemporaneous index of fiscal stance will depend upon exactly what stage the government's "fiscal cycle" is (though to be) in. For example, a large government deficit early in the fiscal cycle may produce a substantial real appreciation, while an equally large government deficit late in the fiscal cycle (the point at which future surpluses are on the immediate horizon) may be associated with a real deprecation of the exchange rate. This idea that macroeconomic outcomes may depend on the stage of the fiscal cycle is not a new one. For example, it figures prominently in the construction of Blanchard's (1985) intertemporal index of

fiscal stance. However, this is not an idea that has been widely studied in the context of estimating links between real exchange rates and fundamentals.

In this paper we use the 'exactly identified' structural VAR approach that has been featured in many recent empirical studies of monetary policy (Christiano, Eichenbaum, and Evans (1996); Bernanke and Blinder (1992)) to study the impact and dynamic effects of fiscal fiscal policy shocks on the real exchange rate. In particular we estimate for each G3 country a "typical dynamic response" of the real exchange rate to a fiscal shock, taking into account the induced dynamic response of fiscal and business cycle variables to the shock. We find a remarkable similarity across the G3 countries in their estimated dynamic responses to a fiscal shock. At first, and for several years thereafter, the real exchange rate appreciates in response to an expansionary fiscal shock. However, eventually, the process is reversed: the real exchange rate overshoots and actually depreciates relative to its initial level prevailing before the fiscal shock. We also provide some estimates the importance of fiscal shocks in accounting for G3 real exchange rate fluctuations in recent years. We find that that G3 fiscal cycles have played a not insignificant role in propelling real exchange rate swings in recent years. Before moving on, we should point out that ours is not the only paper to use 'exactly identified' structural VAR methods to study the dynamic effects of fiscal policy shocks. A recent working paper by Blanchard and Perotti (1998) also uses this approach to study a different set of issues. In particular, Blanchard and Perotti do not study the dynamic response of the real exchange rate to a fiscal shock which is the focus of the present paper.

The plan of the paper is as follows. In Section 2, we present the basic empirical model and motivate the assumption that we use to identify it. We also discuss the time series data that are used in the study which are OECD data for the G3 countries on structural budget positions, output gaps, and real exchange rates. In Section 3, we present the paper's basic results on the dynamic response of real exchange rate in each country to a shock in that country's structural budget balance. In Section 4, we provide decompositions of the realized history of each country's real exchange rate and assess the importance of fiscal shocks in accounting for observed real exchange rate fluctuations. Section 5 provides some brief concluding remarks.

2. THE MODEL

We consider, for each G3 country, a small four-equation macro model of the structural primary budget surplus, the output gap, the actual primary budget surplus, and the trade weighted real exchange rate. Let f_t denote the OECD's estimate of the *structural* primary budget surplus relative to *potential* GDP, y_t denote the output gap as estimated by the OECD, a_t denote the ratio of the *actual* primary budget surplus to *actual* GDP, and q_t denote the log of a multilateral index of the real exchange rate. Denote by $x_t = [f_t, y_t, a_t, q_t]'$ a four by one column vector of the system's variables. We assume that the system has a structural VAR representation of the form

$$Ax_t = Bx_{t-1} + e_t$$

where e_t is a four by 1 vector of mutually orthogonal and unit variance *structural* shocks to f_t, y_t, a_t, q_t respectively. The assumption that $E\, e_t\, e_{t'} = I$ is not enough to identify A; additional restrictions on A (in this case six) are required.

We assume that A is lower triangular. These restrictions on A can be motivated as follows.[2] We begin with assumption that the real exchange rate is ordered last. The reason for this is that the real exchange rate (which is the product of the nominal exchange rate and the ratio of the home price level to the foreign price level) is a forward looking asset price that jumps in reponse to new information about the demand or supply for national output (Obstfeld (1985); Clarida and Gali (1994)). Thus, by putting it last in the ordering, we allow the real exchange rate to respond to contemporaneous shocks in the fiscal and business cycle variables. We next discuss the assumption that f_t, the OECD's estimate of the structural primary budget surplus relative to potential GDP, is placed first in the causal ordering. This amounts to assuming that this ratio of the structural budget balance to potential GDP is contemporaneously exogenous (perhaps as the result of inertia in the legislative process). We finally discuss our assumption that y_t and a_t follow second and third in the causal ordering. Our identification scheme allows for the *actual* budget surplus (ordered third) to respond endogenously and contemporaneously to the output gap (ordered second) as well as to the structural budget

[2] The assumption that A is lower triangular means that the model is exactly identified. Thus, while we provide a motivation for these restrictions, we do not test them.

surplus (ordered first). We think of this identification assumption as a plausible way to decompose observed innovations in the *actual* budget surplus into three orthogonal components: a business cycle (output gap) component e^y_t, structural component e^f_t, and what is left over which we interpret as a contemporanous, discretionary component to fiscal policy e^a_t. Thus we our assumptions imply that our equation for a_t is written as

$$A_{33} a_t = -A_{31} f_t - A_{32} y_t + B_{3.} x_{t-1} + e^a_t$$

where $B_{3.}$ is a row vector comprised of the third row of the B matrix, and that our equation for y_t is written as

$$A_{22} y_t = -A_{21} f_t + B_{2.} x_{t-1} + e^y_t .$$

Thus, our identification strategy allows for a contemporaneous effect of the structural budget balance on the current output gap (perhaps through the former's effect on current expectations of future tax rates), but not for a contemporanous effect of the discretionary budget balance on the current output gap.[3]

Before moving on to the empirical results, we present simple plots of the data on f_t and q_t for each country. Figure 1.1 is a plot of the US real exchange rate (solid line; left- hand -scale) and the index of US fiscal stance (dashed line; right - hand - scale) which is computed from the OECD estimates of the structural primary budget surplus relative to potential GDP. A rise in *REALX* indicates a real appreciation of the dollar; a

[3] The OECD data on the structural budget position is only available annually; thus we estimate our model on annual data for f_t, y_t, a_t, q_t. A priority for future research is to construct a quarterly series for f_t for each G3 country so that the model can be re-estimated on quarterly data.

rise in *FISC_US* indicates rise in the structural budget deficit relative to potential GDP. As can be seen in the figure, there has been an apparent tendency for real depreciations to be associated with declines in *FISC_US* and, of course, for the large real appreciation of the dollar in the early 1980s to be associated with a rise in the structural budget deficit. Figure 1.2 plots Japan's real exchange rate (solid line; left- hand -scale) and the index of Japan's fiscal stance (dashed line; right - hand - scale). As can be seen in the figure, with the exception of the Plaza-Louvre period, major swings in Japan's real exchange rate tend to coincide with shifts in Japan's fiscal stance. Figure 1.3 plots Germany's real exchange rate (solid line; left- hand -scale) and the index of Germany's fiscal stance (dashed line; right - hand - scale). As can be seen in the figure, major swings in Germany's real exchange rate tend to coincide with shifts in Germany's fiscal stance. With these plots in mind, we now turn to the empirical findings.

3. ESTIMATED REAL EXCHANGE RATE RESPONSES TO FISCAL SHOCKS

With this just-identified VAR model, we can estimate the dynamic impulse response of the real exchange rate a structural fiscal shock (a shock to f_t). We expect an expansionary fiscal shock, one that increases the structural budget deficit, to appreciate the real exchange rate to increase the actual budget deficit. We are also interested in learning about the dynamic response to the shock and to determine if a "typical exchange rate cycle" in response to a fiscal impulse is evident in the data.

Results are presented in the top two panels of Figures 2.1, 2.2, and 2.3 The top two panels of Figure 2.1 depict the dynamic impulse responses to an expansionary US fiscal shock (a shock to f_t that raises the structural budget deficit). Over the first several years following a fiscal shock, the real exchange rate appreciates and the actual budget deficit widens. However, after three or four years, the exchange rate "gives back" all of its initial surge and actually begins to depreciate for several years thereafter. This occurs more or less in tandem with the eventual decline in the actual budget deficit (relative to GDP).

The top two panels of Figure 2.2 depict the dynamic impulse responses to an expansionary Japanese fiscal shock e^f_t. As in the US case, initially the real exchange rate appreciates as the actual budget deficit widens. Again, within a couple of years, the exchange rate "gives back" all of its initial surge and begins to depreciate for several years thereafter. In the Japanese case, this occurs in advance the eventual elimination of the deficit shock

Finally, the top two panel of Figure 2.3 depict the dynamic impulse responses to an expansionary German fiscal shock. As in the US case, initially the real exchange rate appreciates and the actual budget deficit widens. Also, as in the US case, after several years, the exchange rate "gives back" all of its initial surge and actually begins to depreciate for several years thereafter. This occurs more or less in tandem with the elimination of the deficit shock.

The botton panel in Figures 2.1, 2.2, amd 2.3 depicts the dynamic response of the output gap in each G3 country to a shock in the *discretionary* component of the budget position. Recall that the discretionary component of the actual budget position is that part that is orthogonal to the output gap and to the structural budget position. In all three countries, a surprise, discretionary fiscal expansion raises output for several years.

4. HISTORICAL DECOMPOSITIONS OF REAL EXCHANGE RATES

At any time t the estimated VAR can be used to construct a forecast of the most likely future path for the real exchange rate at $t+1, t+2, \ldots$ conditional on the history of the model's four variables up through t. Let $E[q_{t+n} \mid x_t]$ denote this conditional forecast of the real exchange rate n quarters in the future. The error associated with this forecast $q_{t+n} - E[q_{t+n} \mid x_t]$ can be written as a weighted sum of all the structural shocks to all the equations realized between $t + 1$ and $t + n$. A common technique for investigating the importance of different shocks in explaining the departures of a time series from the conditional forecast path is to compute a historical decomposition of the forecast errors. From such a decomposition of the recent history of the real exchange rate, we can estimate how important shocks to fiscal policy, output, and residual shocks to the real exchange rate were in pushing the real exchange rate away from its forecasted path.

Figure 3.1 presents an historical decomposition of the US real exchange rate since 1987. As is evident from Figure 3.1, fiscal shocks seem to be important in explaining the dollar's relative strength in 1988-1990 and relative weakness in 1993-1996. Figure

3.2 presents an historical decomposition of the Japanese real exchange rate, while Figure 3.3 presents an historical decomposition of the German real exchange rate. As for the US, fiscal shocks have accounted for a not insignificant fraction of the major swings in the in Japanese and German real exchange rates in recent years.

5. CONCLUDING REMARKS

This paper has used the 'exactly identified' structural VAR approach to estimate the impact and dynamic effects of fiscal fiscal policy shocks on the real exchange rate and the primary budget balance in the G3 countries using data for the floating exchange rate period. We estimate for each G3 country a "typical dynamic response" of the real exchange rate to a fiscal shock, taking into account the induced dynamic response of fiscal and business cycle variables to the shock, and found a remarkable similarity across the G3 countries in their estimated dynamic responses to a fiscal shock. At first, and for several years thereafter, the real exchange rate appreciates in response to an expansionary fiscal shock. However, eventually, the process is reversed: the real exchange rate overshoots and actually depreciates relative to its initial level prevailing before the fiscal shock. These adjustments track the 'fiscal cycle' that we document for the dynamic response of the primary budget balance to a structural fiscal shock.

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FIGURE 1.1

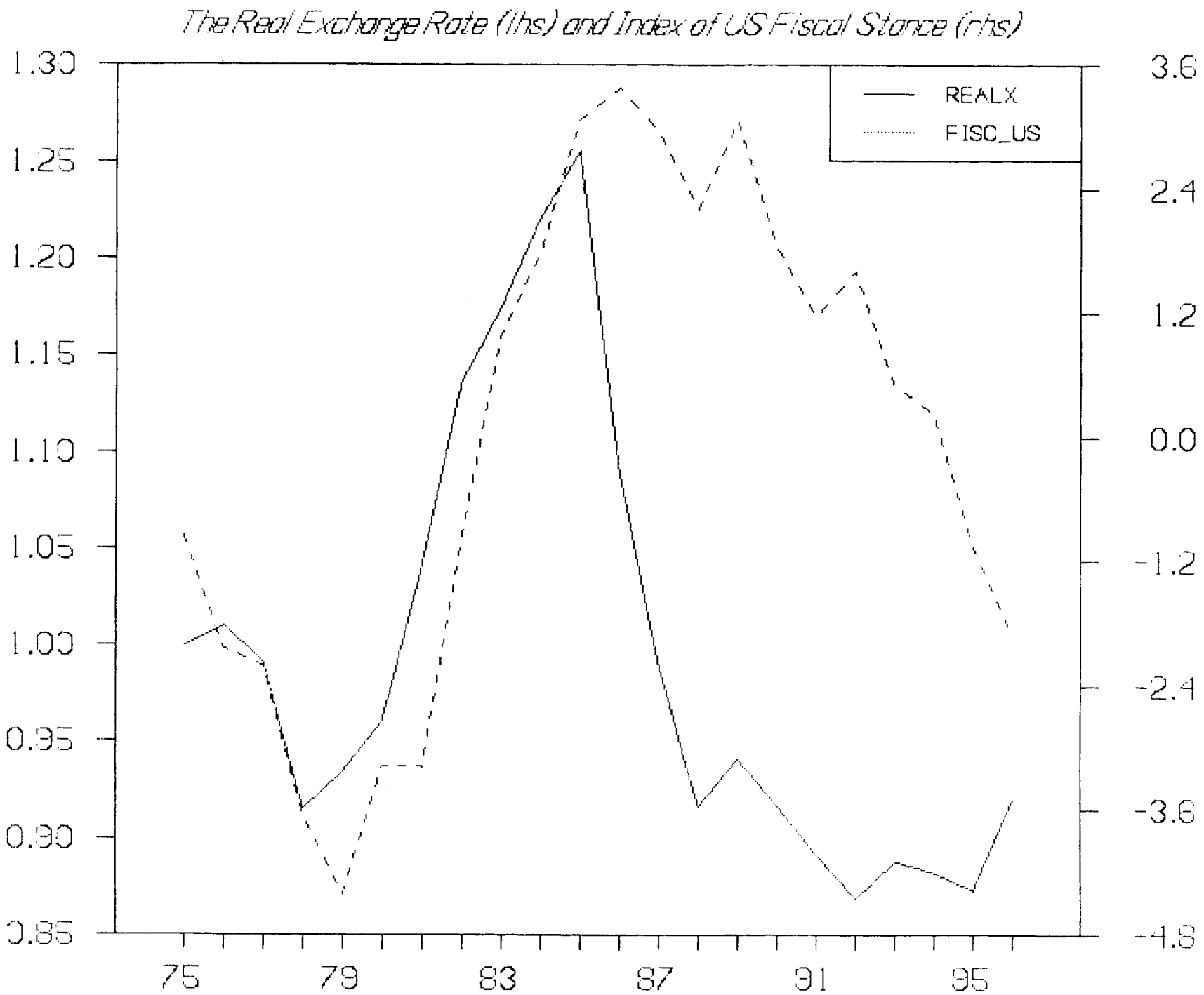

The Real Exchange Rate (lhs) and Index of US Fiscal Stance (rhs)
REALX
FISC_US
1.30
1.25
1.20
1.15
1.10
1.05
1.00
0.95
0.90
0.85
3.6
2.4
1.2
0.0
-1.2
-2.4
-3.6
-4.8
75
79
83
87
91
95

FIGURE 1.2

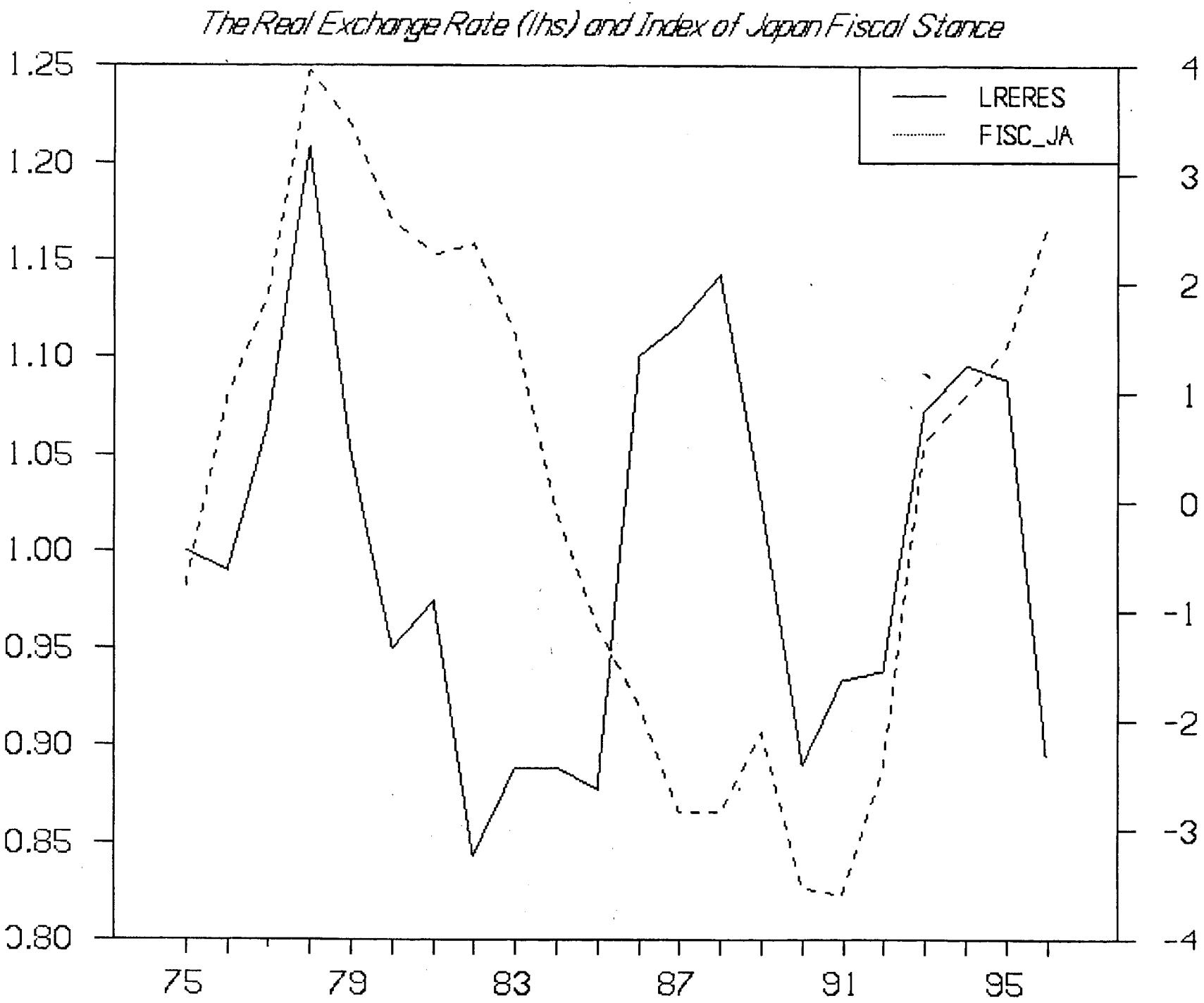

The Real Exchange Rate (lhs) and Index of Japan Fiscal Stance
LRERES
FISC_JA
1.25
1.20
1.15
1.10
1.05
1.00
0.95
0.90
0.85
0.80
4
3
2
1
0
-1
-2
-3
-4
75
79
83
87
91
95

FIGURE 1.3

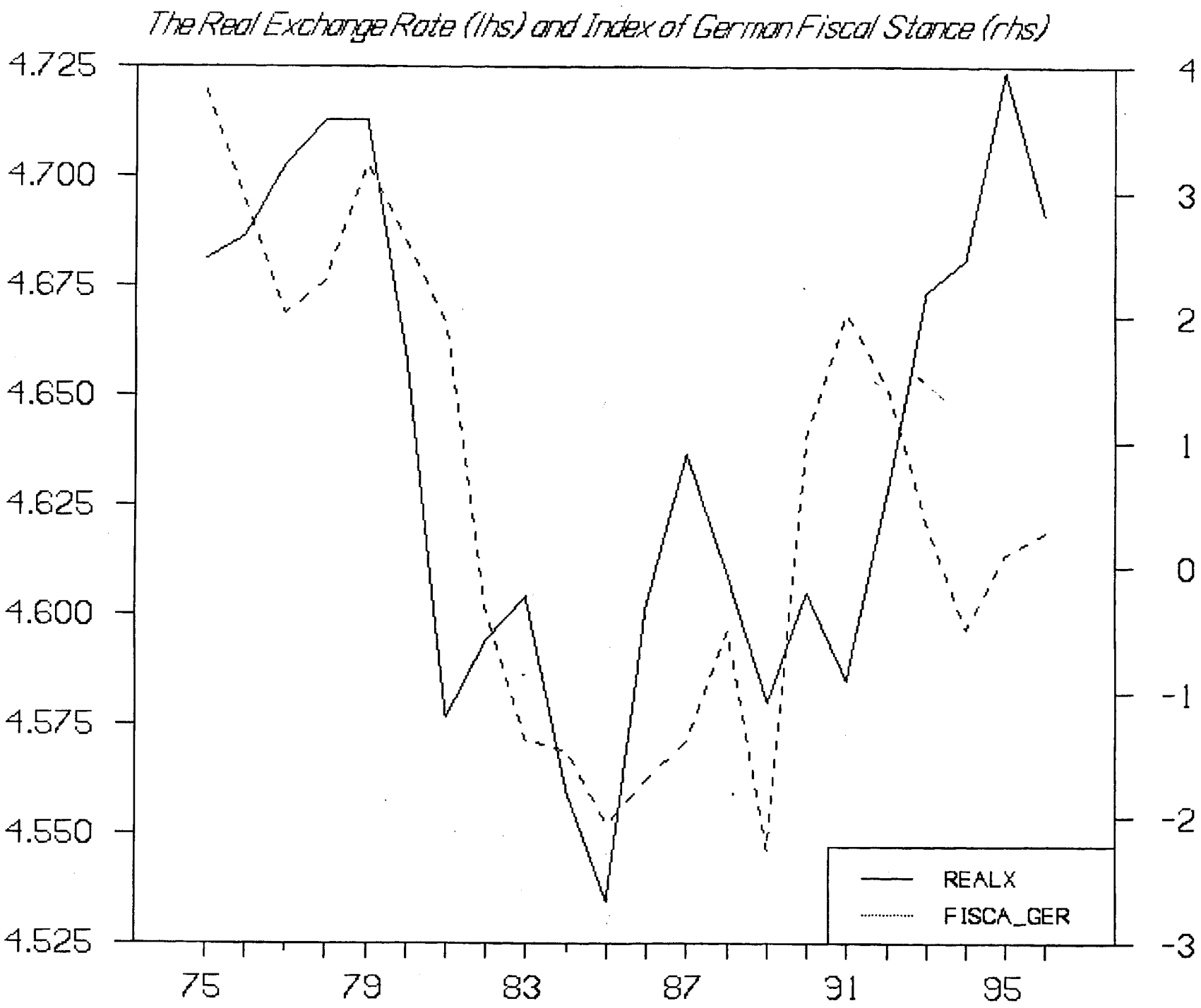

The Real Exchange Rate (lhs) and Index of German Fiscal Stance (rhs)
4.725
4.700
4.675
4.650
4.625
4.600
4.575
4.550
4.525
4
3
2
1
0
-1
-2
-3
75
79
83
87
91
95
REALX
FISCA_GER

FIGURE 2.1

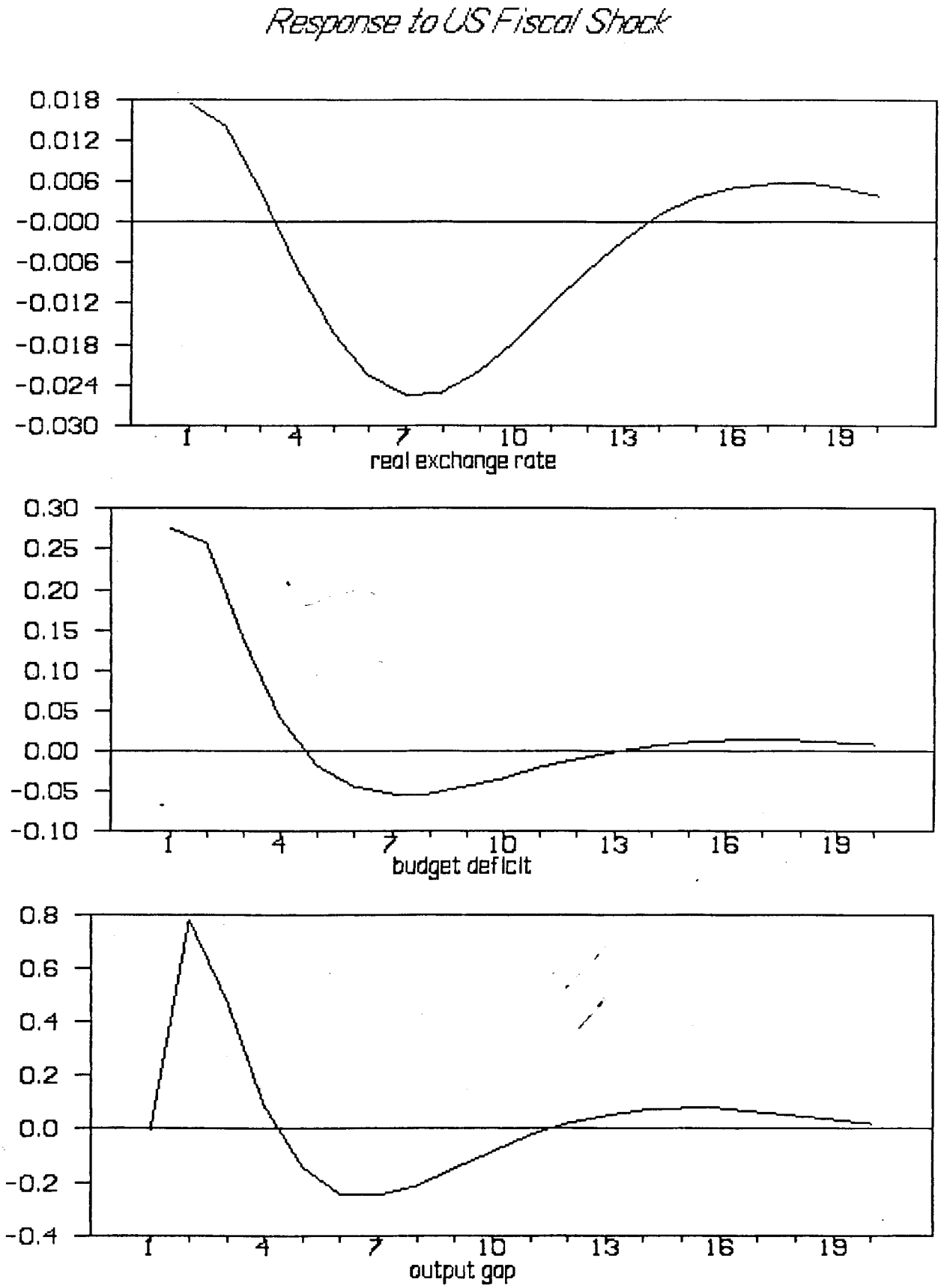

Response to US Fiscal Shock
0.018
0.012
0.006
-0.000
-0.006
-0.012
-0.018
-0.024
-0.030
1
4
7
10
13
16
19
real exchange rate
0.30
0.25
0.20
0.15
0.10
0.05
0.00
-0.05
-0.10
1
4
7
10
13
16
19
budget deficit
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
1
4
7
10
13
16
19
output gap

FIGURE 2.2

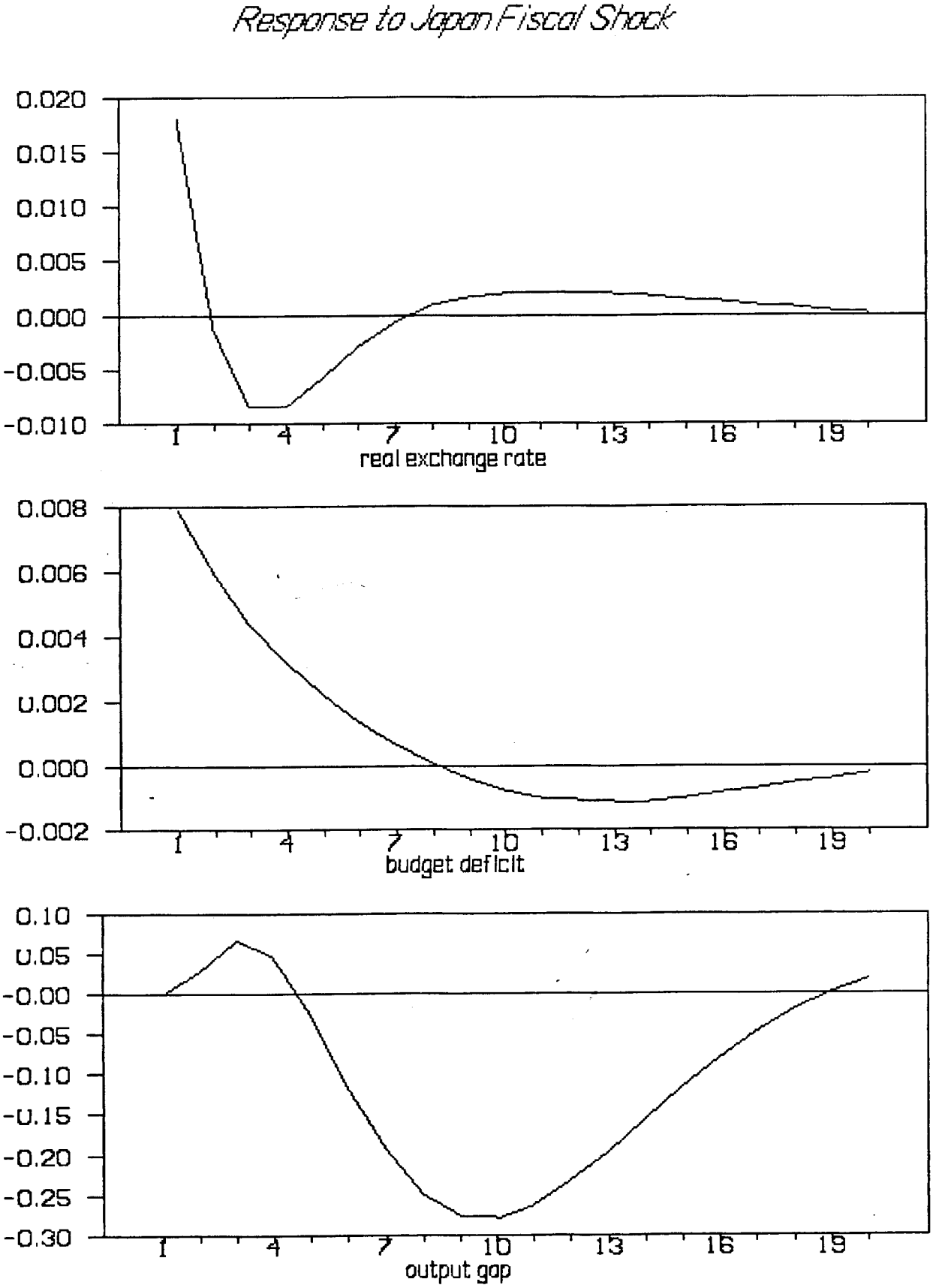

Response to Japan Fiscal Shock
0.020
0.015
0.010
0.005
0.000
-0.005
-0.010
1
4
7
10
13
16
19
real exchange rate
0.008
0.006
0.004
0.002
0.000
-0.002
1
4
7
10
13
16
19
budget deficit
0.10
0.05
-0.00
-0.05
-0.10
-0.15
-0.20
-0.25
-0.30
1
4
7
10
13
16
19
output gap

FIGURE 2.3

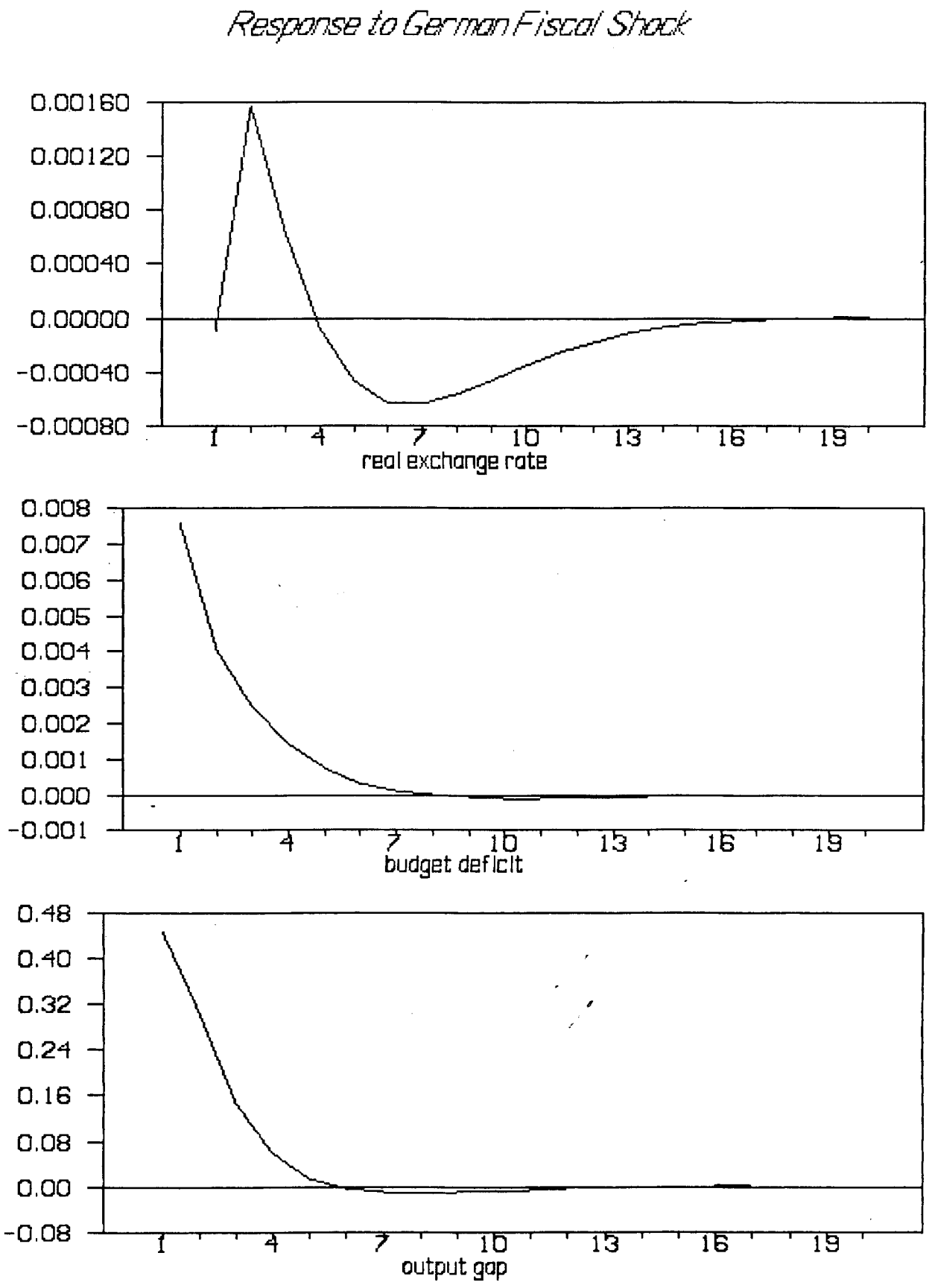

Response to German Fiscal Shock
0.00160
0.00120
0.00080
0.00040
0.00000
-0.00040
-0.00080
1
4
7
10
13
16
19
real exchange rate
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0.000
-0.001
1
4
7
10
13
16
19
budget deficit
0.48
0.40
0.32
0.24
0.16
0.08
0.00
-0.08
1
4
7
10
13
16
19
output gap

Figure 3.1

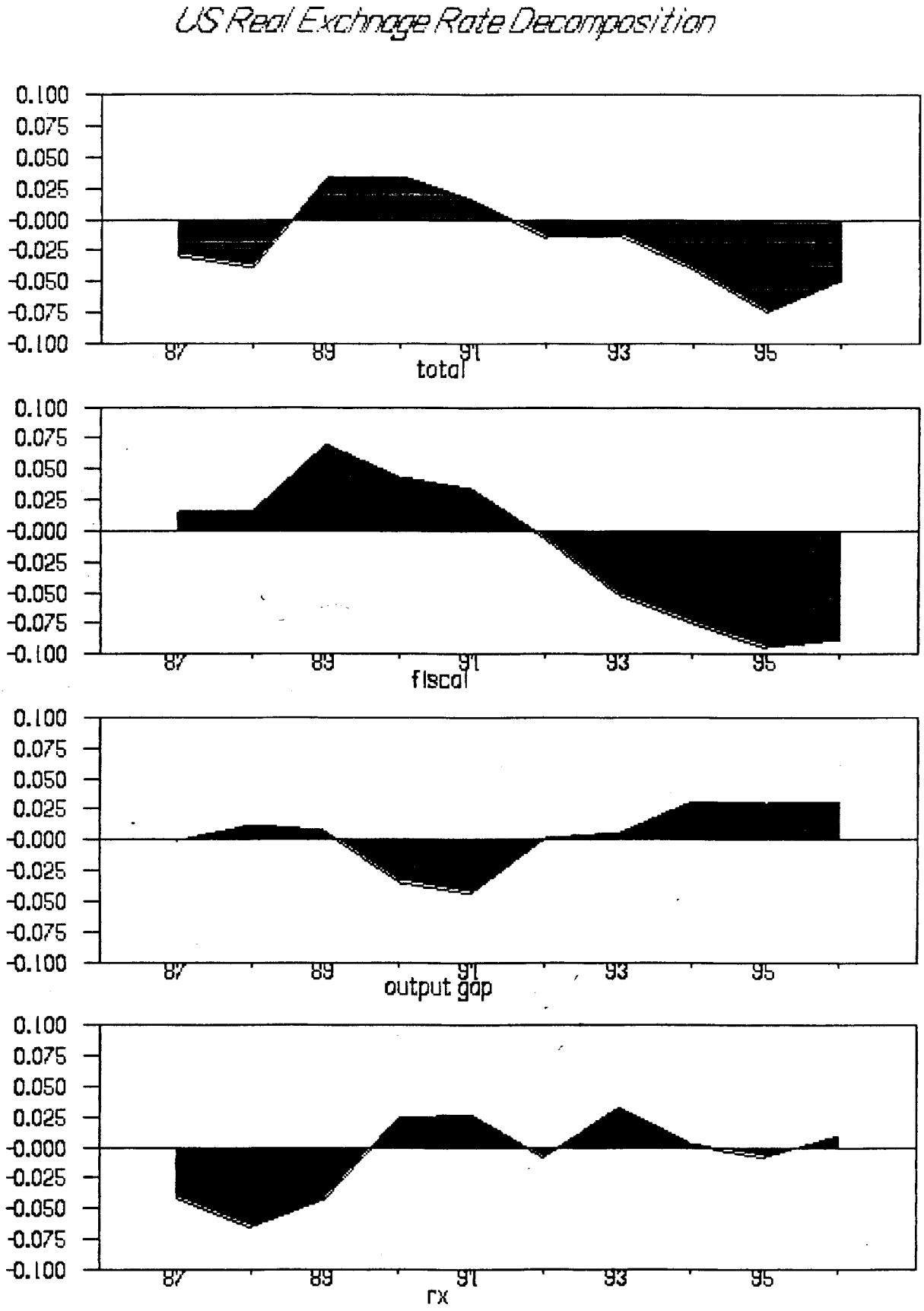

US Real Exchnage Rate Decomposition
0.100
0.075
0.050
0.025
-0.000
-0.025
-0.050
-0.075
-0.100
87
89
91
93
95
total
fiscal
output gap
rx

FIGURE 3.2

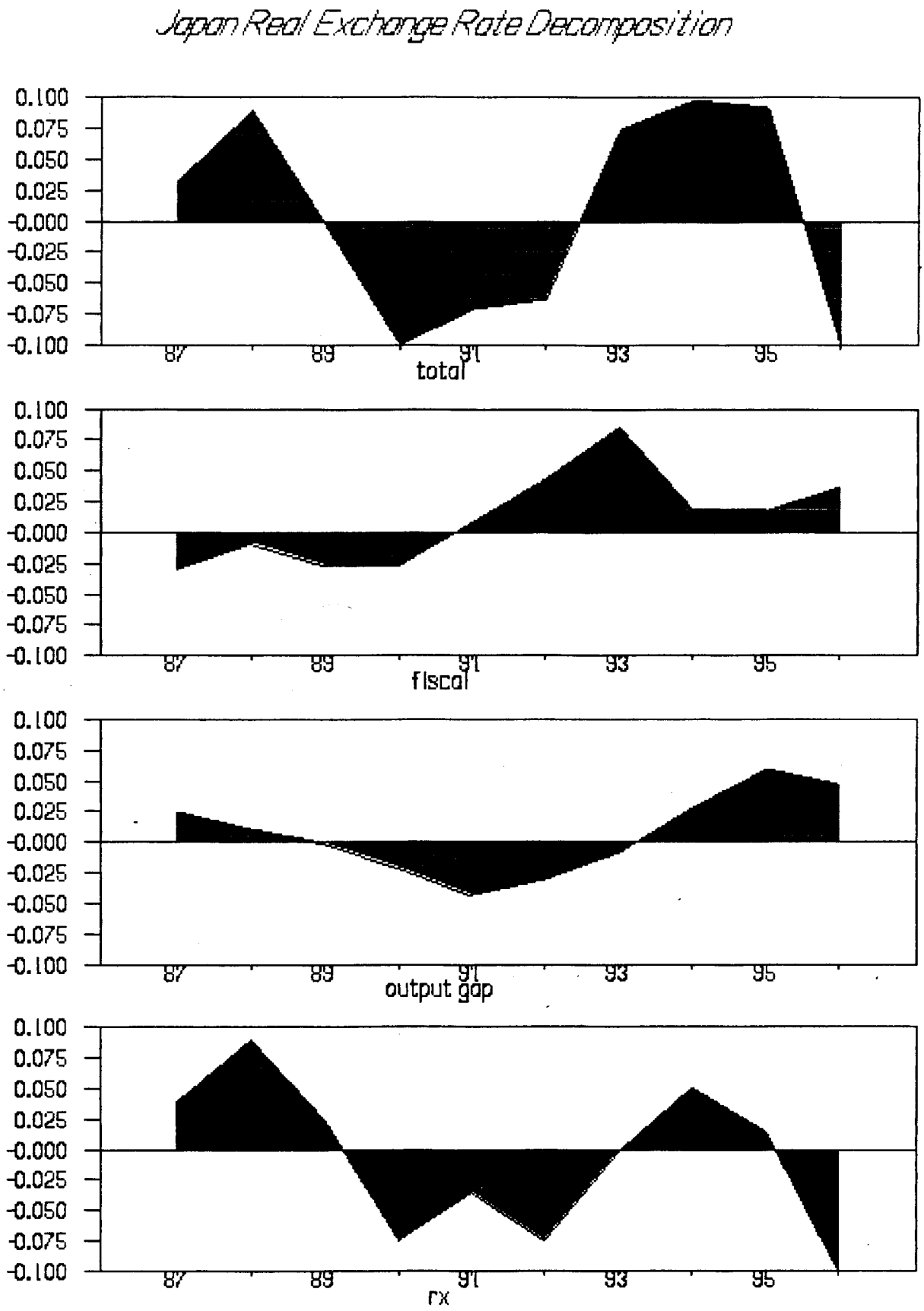
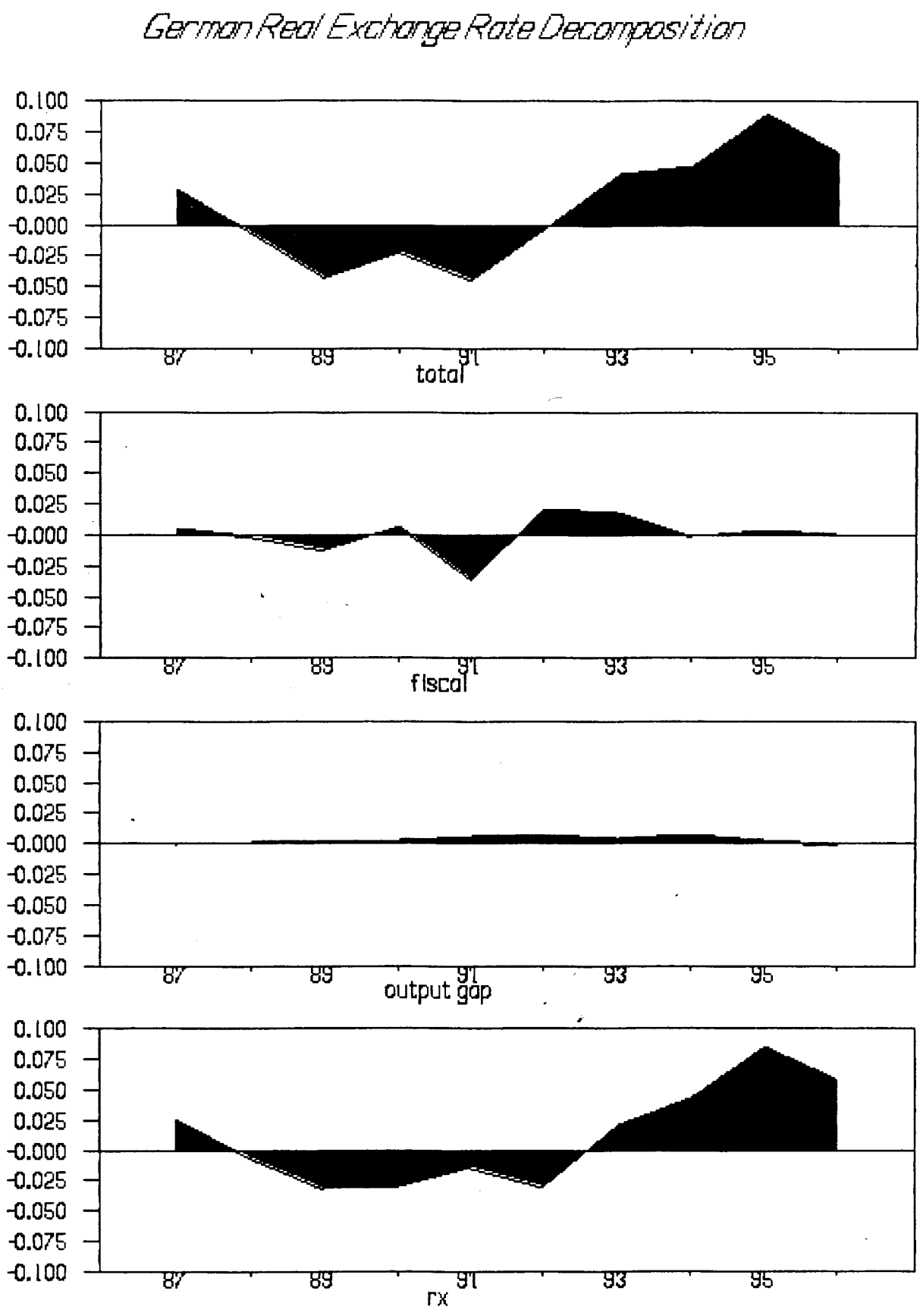

Japan Real Exchange Rate Decomposition
0.100
0.075
0.050
0.025
-0.000
-0.025
-0.050
-0.075
-0.100
87
89
91
93
95
total
fiscal
output gap
rx

FIGURE 3.3


German Real Exchange Rate Decomposition
0.100
0.075
0.050
0.025
-0.000
-0.025
-0.050
-0.075
-0.100
87
89
91
93
95
total
fiscal
output gap
rx