# THE CURRENT ACCOUNT AND THE REAL EXCHANGE RATE: A STRUCTURAL VAR ANALYSIS OF MAJOR CURRENCIES

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## ABSTRACT

A sticky-price model is used to motivate a structural VAR analysis of the current account and the real exchange rate for seven major industrialized countries (the US, Canada, the UK, Japan, Germany, France and Italy). The analysis is distinguished from previous work in that it adopts minimal assumptions for identification. The empirical results are consistent with the theoretical model, as well as the sticky price intertemporal model of Obstfeld and Rogoff (1995). Permanent shocks to productivity have large long term effects on the real exchange rate, but relatively small effects on the current account; money shocks have large effects on the current account and exchange rate in the short run, but not on either variable in the long run.

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# 1 Introduction

The determination of the real exchange rate and of the current account has been, and remains, a perennial topic of research in empirical open-economy macroeconomics. But, up until quite recently, the discussion of the two variables has remained largely separate. For instance, the typical examination of the real exchange rate relies upon either interest rate and purchasing power parity conditions (as in Edison and Pauls, 1993, and Baxter, 1994), or trends in productivity as in DeGregorio and Wolf (1994) or Chinn (1997). On the other hand, the econometric analysis of the current account has often been couched in terms of a composite good world (Sheffrin and Woo, 1990), at least when the framework is intertemporal in nature. Notable exceptions exist, as in Ahmed (1987), but by and large they constitute a minority.

This paper addresses this deficiency. Specifically, it applies a modified version of Clarida-Gali (1994) model to the simultaneous explanation of exchange rate and current account behavior for seven OECD countries. Although the model is essentially a reduced form, the implications for the behavior of the two key variables are consistent with most aspects of an optimizing intertemporal model of Obstfeld and Rogoff (1996) and others to be discussed later.

The specific econometric technique we adopt is the Blanchard-Quah (1989) decomposition. We assume that the exchange rate is nonstationary and that temporary shocks have no long-run effect upon it. This is a powerful identifying assumption, which, to our knowledge, has thus far remained unexploited in this bivariate context. We also make the assumption that global shocks have no effects on either of these variables; only country-specific ones. Under these assumptions which are consistent with broad spectrum of open-macro models, we can then test common predictions of the models, such as that temporary shocks are most important in causing movements in current account balances. Although it is possible to impose different, and more numerous identifying restrictions involving more variables, we believe that a bivariate model can be very useful in validating several presumptions in open economy macroeconomics, with a minimum of arbitrariness. Furthermore, other studies with more elaborate structural equations often fail to identify statistically significant impulse-response functions.[1] The conclusions one can then reach are correspondingly less persuasive.

To anticipate the results, the estimated impulse-response functions are much in line with the model's predictions. A permanent shock, which we interpret as a technology innovation, induces a permanent appreciation of the real exchange rate. There is some effect on the current account, although it is often statistically insignificant. A temporary shock, which we associate with a monetary innovation, induces a temporary depreciation of the real exchange rate and a concurrent improvement in the current account.

[1]For instance, Prasad and Kumar (1997) allow for a larger set of shocks; in particular they decompose real shocks into supply and demand shocks. But, they find that demand shocks have little independent effect on the exchange rate, except for the US, Canada and Italy. Even in these cases, the effects are in the same direction as the supply shocks, so it is not very likely that aggregating the two real shocks into one drives our results.

## 2 Theoretical Framework

We cxtend the model of Clarida and Gali (1994) to incorporate the effect of money and productivity shocks on the trade balance and real exchange rate. Incorporating at the same time a major insight of the intertemporal models, namely that trade balance is influenced not by common shocks but by idiosyncratic (country-specific) shocks, we define variables as log-differences between two countries, except for the exchange rate $s_t$.

$$y_t^d = \eta(s_t - p_t) - \sigma(i_t - E_t(p_{t+1} - p_t)) \tag{1}$$

$$p_t = (1-\theta)E_{t-1}p_t^e + \theta p_t^e \tag{2}$$

$$m_t - p_t = y_t - \lambda i_t \tag{3}$$

$$i_t = E_t(s_{t+1} - s_t) \tag{4}$$

These equations constitute the basic IS-LM model, recognizing in equation (2) that price level ($p_t$) adjusts towards the long-run equilibrium level ($p_t^e$) gradually. Equation (1) is an IS equation relating output demand ($y_t^d$) to the real exchange rate ($s_t - p_t$) and the expected real interest rate ($i_t - E_t(p_{t+1} - p_t)$). Equation (3) relates the demand for real balances ($m_t - p_t$) to output ($y_t$) and nominal interest rate ($i_t$). Equation (4) is the interest parity condition. The next three equations complete our model.

$$y_t^s = y_{t-1}^s + z_t \tag{5}$$

$$m_t = m_{t-1} + v_t \tag{6}$$

$$b_t = \xi(s_t - p_t) + \rho z_t \tag{7}$$

Equation (5) incorporates the productivity shock ($z_t$) to output supply ($y_t^s$). To be exact, a positive productivity shock is a shock that permanently increases the productive capacity of the domestic economy more than that of the foreign economy. Equation (6) describes the stochastic process of money supply. Although the money shock ($v_t$) brings about a permanent increase in the supply of money, the built-in neutrality annihilates its real effect in the long run. Finally, equation (7) explicitly introduces the trade balance ($b_t$) as dependent on the real exchange rate and the productivity shock.

If the prices are fully flexible ($\theta = 1$), the long-run equilibrium is attained instantly. Denoting the real exchange rate by $q_t = s_t - p_t$, we have the following long-run equilibrium.

$$y_t^l = y_t^s \tag{8}$$

$$q_t^l = y_t^l/\eta \tag{9}$$

$$p_t^l = m_t - y_t^l \tag{10}$$

When prices adjust slowly, the price level and output can deviate from long-run equilibrium values in the short run.

$$p_t = p_t^l - (1-\theta)(v_t - z_t) \tag{11}$$

$$q_t = q_t^l + \mu(1-\theta)(v_t - z_t) \tag{12}$$

$$y_t = y_t^s + (\eta + \sigma)\mu(1-\theta)(v_t - z_t) \tag{13}$$

where $\mu \equiv \frac{1+\lambda}{\lambda+\sigma+\eta}$.

Under sluggish price adjustment, a positive money shock depreciates the real exchange rate in the short run but has no effect on the real exchange rate in the long run. In the short run,

$$q_t = \frac{y^s}{\eta} + \mu(1-\theta)(v_t - z_t) \tag{14}$$

and

$$\frac{\partial q_t}{\partial v_t} > 0 \qquad \text{for} \quad \theta < 1. \tag{15}$$

Accordingly, the trade balance improves in the short run and is not affected in the long run.

A negative technology shock, or a positive technology shock to the foreign, has an ambiguous effect on exchange rate in the short run but appreciates the exchange rate in the long run. In the short run,

$$\frac{\partial q_t}{\partial(-z_t)} = -\frac{1}{\eta} + \mu(1-\theta) \tag{16}$$

and, in the long run,

$$\frac{\partial q_t^l}{\partial(-z_t)} = -\frac{1}{\eta}. \tag{17}$$

The effect on the trade balance is ambiguous in both the short run and the long run.

In terms of identification, as will be made clearer in the next section, we only require that temporary shocks have no long-run effect on the real exchange rate. This assumption is consistent not only with our model but with recent intertemporal models of open economy. It is consistent trivially with the original model of Obstfeld and Rogoff (1996) because the real exchange rate is constant in their model by the assumption of purchasing power parity. In the models by Betts and Devereux (1996) and Chari et. al (1998), the pricing-to-market effect causes monetary shock to fluctuate the real exchange rate in the short-run but not in the long-run. Therefore, our key identification is consistent with very broad class of open-macro models.

# 3 Empirical Approach

When we designate country-specific permanent shocks as $\epsilon_t^P$ and country-specific temporary shocks as $\epsilon_t^T$ and denote

$$\epsilon_t \equiv \begin{bmatrix} \epsilon_t^P \\ \epsilon_t^T \end{bmatrix}, \tag{18}$$

the current account and the first-differenced real exchange rate can be represented by the following MA process.

$$\begin{bmatrix} \Delta q_t \\ b_t \end{bmatrix} = \sum_{L=0}^{\infty} B(L) \begin{bmatrix} \epsilon_{t-L}^P \\ \epsilon_{t-L}^T \end{bmatrix} \tag{19}$$

with

$$E(\epsilon_t) = 0, \quad E(\epsilon_t \epsilon_t') = I, \quad \text{and} \quad E(\epsilon_t \epsilon_s') = 0 \quad t \neq s. \tag{20}$$

Since the temporary shock does not have a long-run effect on the real exchange rate,

$$\left[ \sum_{L=1}^{\infty} B(L) \right]_{(1,2)} = 0. \tag{21}$$

Since the current account is stationary and the real exchange rate is non-stationary, the following bi-variate VAR is estimated from the data.

$$\begin{bmatrix} \Delta q_t \\ b_t \end{bmatrix} = C(L) \begin{bmatrix} \Delta q_t \\ b_t \end{bmatrix} + \begin{bmatrix} \eta_t^{\Delta q} \\ \eta_t^b \end{bmatrix} \tag{22}$$

When we denote

$$\eta_t = \begin{bmatrix} \eta_t^q \\ \eta_t^b \end{bmatrix}, \tag{23}$$

the MA representation is

$$\begin{bmatrix} \Delta q_t \\ b_t \end{bmatrix} = \sum_{L=0}^{\infty} D(L) \eta_{t_L} \tag{24}$$

with

$$E(\eta_t) = 0, \quad E(\eta_t \eta_t') = V, \quad \text{and} \quad E(\eta_t \eta_s') = 0 \quad t \neq s. \tag{25}$$

$$V = B(0)(B(0))'. \tag{26}$$

Because $\eta_t = B(0)\epsilon_t$, using

$$B(L) = D(L)B(0)^{-1} \quad L = 1, 2, 3 \cdots, \tag{27}$$

equation (21) can be rewritten as

$$\left[ \sum_{L=1}^{\infty} D(L) B(0)^{-1} \right]_{(1,2)} = 0. \tag{28}$$

Then, equations (26) and (28) enable us to find the matrix $B(0)$, thereby uncovering the entire MA representation of the real exchange rate and current account in terms of permanent and temporary shocks.

# 4 Empirical Implementation

## 4.1 Data

We examine the behavior of the US, Canada, the UK, Japan, Germany, France, and Italy. We use the CPI-deflated real exchange rate series from the International Financial Statistics of IMF. This series is multilateral, trade-weighted against one another. The real exchange rate data are only available for the period after 1979:2, thus restricting the sample period from 1979:2 to 1994:4 or 1996:1 depending on the availability of the current account data for each country. The current account data and the GDP data are also from IFS. Obtaining the dollar-denominated current account numbers from IFS, we convert them to the national currencies by using the average bilateral exchange rate of each period. We then calculate the ratio of the current account to GDP, and seasonally adjust them using dummy variables. In actual estimations, we use the log of the real exchange rate and the ratio of the current account to GDP. The stationarity of the current account to GDP ratio is tested using the method of Kwiatkowski et al. (1992), often called the KPSS test. The results are reported in Table 1. For most countries, the stationarity of our current account series cannot be rejected at 5% level.[2]

## 4.2 Estimating the VAR

We use two lags for each country, striking a balance between the lag lengths chosen by Schwartz information criterion (SIC) and Akaike information criterion (AIC). The SIC typically chooses 1 or 2 lags, with 1 slightly preferred. The only exception is Japan where 1 and 2 are equally preferred. The AIC, on the other hand, selects 2 or 3 lags mostly, or longer lags in certain cases. When long lags such as 5 are used in the estimation, however, the coefficient estimates enter with very low statistical significance. Since the Schwartz criterion suggests using 1 or 2 lags in these cases, we did not use long lags suggested by AIC. We will focus on the key empirical results in the rest of the paper, and reserve the detailed results of VAR estimation for each country for Table 2.

## 4.3 Impulse Response Functions

Impulse-responses to temporary and permanent shocks are in Figures 1A-1B. The dotted lines are one standard deviation bands obtained by bootstrap of 1000 replications. Reassur-

[2]When the sample period is after 1975 and the lag length is kept at $l8$, stationarity is rejected at 5% only in the U.S. When the sample period is after 1979:2 and the lag length is kept at $l8$, stationarity is rejected at 5% fro Canada and UK, but not for the other countries including the U.S. The last column of Table 1 show the KPSS statistic calculated for the U.S. unemployment rate that is agreed to be stationary, for corresponding sample periods. The KPSS statistics for our CA variables are comparable to those for the unemployment rate, offering 'practical' evidence for their stationarity.

ingly, the results from the impulse response functions (IRFs) are broadly in line with most conventional models of the open economy. Consider first the United States results. The current account improves in response to a temporary as well as permanent shock. The level of the real exchange rate immediately depreciates in response to a temporary shock, then gradually tapers off to a zero effect. The permanent shock induces a gradual and continuous appreciation. These patterns validate the interpretation of the temporary shock as a money shock, and the permanent as a productivity shock. The money shock depreciates the currency so much that the current account improves over the short term (one to three quarters) and then deteriorates as the exchange rate change erodes.

The productivity shock also appreciates the currency in real terms. In all countries, permanent shocks improve the current account accompanied by the real appreciation. The response of the real exchange rate allows two interpretations which cannot be easily distinguished within the bivariate framework adopted in this paper. To stay strictly within the theoretical framework of this paper, the long-run response is consistent with the prediction of the model for a negative (positive) productivity shock to the domestic (foreign) economy. Alternatively, assuming the presence of nontradables, and hence going beyond the theoretical framework of this paper, and allowing for some degree of home bias in consumption patterns, a productivity shock can induce the observed impulse response function if the productivity growth is centered in the tradable sector. On the other hand, the improvement in the current account is somewhat difficult to explain in the context of an intertemporal model. The permanent positive productivity shock should induce no effect in the absence of rigidities.

A related anomaly is that the correlation between the responses of the current account and the real exchange rate to permanent shocks are of opposite signs to the correlation between the two responses to temporary shocks. Taken at face value, this result warns us against anticipating a specific correlation between the current account and the real exchange rate independent of the source of the shocks.

Most of the other countries fit into the same pattern of results: Canada, Japan, Italy, Germany and France. In fact, to the extent that the impulse response functions of the current account to the permanent shock are indistinguishably different from zero, the results for Canada, Italy and Germany are even more favorable to the standard model.

The United Kingdom provides some anomalous results. Once again the current account improves in response to a temporary shock; however, the level of the exchange rate also appreciates, rather than depreciates. The response of the current account and the exchange rate to the permanent shock is more in accord with theory – the exchange rate immediately appreciates, while the current account appears to deteriorate, although the impulse response function is within one standard error of no effect.

It is of interest to compare our results with those of previous studies. Using bilateral real exchange rates, Clarida and Gali (1994) obtain similar results for the US-German system; contrary to the model, the real exchange rate appreciates in response to a productivity shock.[3] On the other hand, the exchange rate depreciates in the US-Japan system. In a

[3] In their paper, the permanent shock reduces domestic prices, and thus cannot be the positive productive shock to the foreign. In contrast, appreciationary permanent shock in our paper is, in principle, consistent with the positive productive shock to the foreign.

study of multilateral real exchange rates, Prasad and Kumar (1997) find that both supply and demand shocks (which are permanent in nature) depreciate the currency in real terms. In our system with only a single temporary and a single permanent shock, we find that the permanent shock appreciates the currency.

While the Prasad and Kumar findings regarding the supply shock IRF for the real exchange rate, and the Clarida and Gali result for the US-Japan, are consistent with the basic Mundell- Fleming model augmented by stochastic supply shocks, our findings are actually more consistent with results from the regression and cointegration based literature on the real exchange rate/productivity link. One possible reconciliation of the disjuncture between our results and our theoretical model may be found in the fact that the theory assumes all goods in the CPI are tradable (see Chinn, 1997). However, the CPI is likely to contain a large nontradable component, so that productivity shocks will induce an appreciation of the observed CPI-deflated exchange rate, even though the (unobserved) tradable price deflated real exchange rate actually depreciates.

## 4.4 Decompositions

As the first attempt to compare the role of permanent vs. temporary shocks, we calculated variance decompositions based on the IRFs. The results for several horizons for each country are presented in Table 3. In all countries, the contribution of temporary shocks to the variation in the exchange rate declines over time. Also, except for the U.S., temporary shocks play a minor role in explaining the variation of the real exchange rate. In contrast, again with the primary exception of the U.S., temporary shocks play a larger role in explaining the variation in the current account. Thus, the absolute or relative, at least, prominence of the temporary shocks in explaining the current account is consistent with the basic theoretical predictions of the intertemporal approach to the current account.

Using the estimated VARs, we calculated the historical decompositions, as shown in Figure 2A-2C. For the United States the results are plausible. The deterioration in the current account over the mid-1980s is largely due to permanent factors, as is the improvement in the early 1990s due to the Gulf War transfers. The US real exchange rate changes are characterized by greater dominance in temporary shocks than would be expected from the time series literature on exchange rate behavior. In fact the United States case is somewhat different from the other countries'. These historical simulations indicate that for most other currencies, permanent shocks dominate in exchange rate changes. This asymmetry in findings suggests that the dollar's behavior differs from those of other G-7 currencies. One possibility is that the substantial swing in the dollar during the mid-1980s differentiates the US experience.

Different roles of temporary and permanent shocks offer some explanation for the difficulty in empirical attempts to uncover the relationship between the exchange rate and the current account. While many theories often suggest that the real depreciation should generate the improvement in current account, strong evidence for it has been rare. According to our results, a tight relationship would have been uncovered, had most of the exchange rate fluctuations been due to the temporary shocks. A recent example of this may be the

U.S. experience during the eighties, as discussed by Krugman (1991). In most countries and periods, however, we find that permanent shocks are prime causes for the movement of the real exchange rate. Their effects on the current account are small or in the opposite direction to that of temporary shocks. In other words, most of the fluctuations in the real exchange rate occur, affecting the current account little or in the direction opposite to the common prediction of theory. Hence, attempts to establish a tight evidence on the effect of the real exchange rate on the current account are bound to generate mixed results, as far as they do not successfully control for permanent shocks that drive the bulk of the movement in the real exchange rate. At the same time, weak evidence in such endeavor should not be viewed to be against the theories that the real depreciation caused by certain (temporary) shocks would improve the current account.

# 5 Conclusion

Working with the minimal identifying assumptions that apply to most intertemporal open-macro models, we find that the basic lessons of the literature are validated in the data. With the exception of the U.S., temporary shocks play a bigger role in explaining the variation in the current account, and permanent shocks play a bigger role in explaining the variation in the real exchange rate. Except for UK, the temporary shock depreciates the real exchange rate and improves the current account balance.

The evidence, however, are at variance with the finer implications of some of the literature. Permanent shocks do affect the current account, supporting the presence of nominal rigidities. The responses of the current account and the real exchange rate are correlated in opposite directions depending on the source of the shock. This outcome suggests that we investigate the nature of the shocks before interpreting the correlation between these two variables.

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Table 1: Stationarity of Current Account

| Sample | Lags | Canada | France | Germany | Italy | Japan | UK | US | US UR |
|---|---|---|---|---|---|---|---|---|---|
| 75.1 to | l4 | 0.736 | 0.212 | 0.347 | 0.131 | 0.718 | 0.745 | 0.898 | 0.541 |
| 96.1 | l8 | 0.419 | 0.146 | 0.197 | 0.090 | 0.040 | 0.419 | 0.499 | 0.323 |
| 79.2 to | l4 | 0.941 | 0.514 | 0.375 | 0.195 | 0.701 | 0.889 | 0.413 | 0.587 |
| 94.4/96.1 | l8 | 0.533 | 0.336 | 0.244 | 0.145 | 0.407 | 0.496 | 0.229 | 0.347 |

The statistics are those suggested by Kwiatkowski et al. (1992). The critical value for rejecting stationarity at 5% is 0.463. As in their paper, $ln$ = integer $[n(T/100)^{1/4}]$ where $T$ is the sample size.
The last column is the KPSS statistic calculated for the unemployment rate, which is widely viewed to be stationary, of the U.S. for the comparable sample period.

The upper panel is for the period from 1975 to 1996. The lower panel is for the sample period used in the actual estimation.

Table 2: Results of VAR

| | Canada | | France | | Germany | | Italy | |
|---|---|---|---|---|---|---|---|---|
| | $\Delta$ER | CA | $\Delta$ER | CA | $\Delta$ER | CA | $\Delta$ER | CA |
| $\Delta$ER(-1) | 0.334 | 0.003 | 0.146 | -0.082 | 0.298 | -0.177 | 0.299 | -0.086 |
| | (0.124) | (0.054) | (0.125) | (0.061) | (0.136) | (0.086) | (0.136) | (0.051) |
| $\Delta$ER(-2) | 0.069 | -0.046 | -0.185 | 0.074 | 0.046 | 0.075 | -0.211 | 0.032 |
| | (0.122) | (0.053) | (0.116) | (0.056) | (0.142) | (0.089) | (0.139) | (0.052) |
| CA(-1) | -0.015 | 0.692 | 0.836 | 0.363 | 0.167 | 0.749 | 0.294 | 0.640 |
| | (0.291) | (0.126) | (0.239) | (0.117) | (0.210) | (0.013) | (0.343) | (0.130) |
| CA(-2) | 0.146 | 0.194 | -0.179 | 0.413 | -0.099 | 0.203 | -0.142 | 0.125 |
| | (0.291) | (0.126) | (0.256) | (0.125) | (0.213) | (0.134) | (0.341) | (0.129) |
| constant | -0.001 | 0.000 | 0.001 | -0.000 | -0.000 | -0.000 | -0.001 | -0.000 |
| | (0.002) | (0.001) | (0.001) | (0.000) | (0.002) | (0.001) | (0.003) | (0.001) |
| $R^2$ | 0.158 | 0.734 | 0.239 | 0.477 | 0.135 | 0.836 | 0.097 | 0.560 |
| AIC | -7.69 | -9.36 | -8.36 | -9.79 | -8.11 | -9.04 | -7.11 | -9.05 |
| Nobs | 66 | | 65 | | 61 | | 64 | |

| | Japan | | UK | | USA | |
|---|---|---|---|---|---|---|
| | $\Delta$ER | CA | $\Delta$ER | CA | $\Delta$ER | CA |
| $\Delta$ER(-1) | 0.250 | 0.026 | 0.186 | 0.056 | 0.120 | -0.023 |
| | (0.128) | (0.014) | (0.125) | (0.035) | (0.126) | (0.020) |
| $\Delta$ER(-2) | -0.230 | 0.030 | -0.139 | -0.030 | -0.146 | -0.013 |
| | (0.137) | (0.015) | (0.119) | (0.034) | (0.128) | (0.021) |
| CA(-1) | 2.104 | 0.641 | -0.433 | 0.587 | 1.003 | 0.772 |
| | (1.096) | (0.121) | (0.433) | (0.124) | (0.770) | (0.126) |
| CA(-2) | -0.102 | 0.170 | 0.166 | 0.308 | 0.064 | 0.187 |
| | (1.029) | (0.113) | (0.437) | (0.125) | (0.078) | (0.128) |
| constant | 0.002 | 0.000 | -0.002 | -0.000 | 0.003 | -0.000 |
| | (0.006) | (0.000) | (0.005) | (0.001) | (0.003) | (0.000) |
| $R^2$ | 0.186 | 0.868 | 0.077 | 0.755 | 0.205 | 0.861 |
| AIC | -5.88 | -10.29 | -6.48 | -8.98 | -7.00 | -10.62 |
| Nobs | 65 | | 65 | | 66 | |

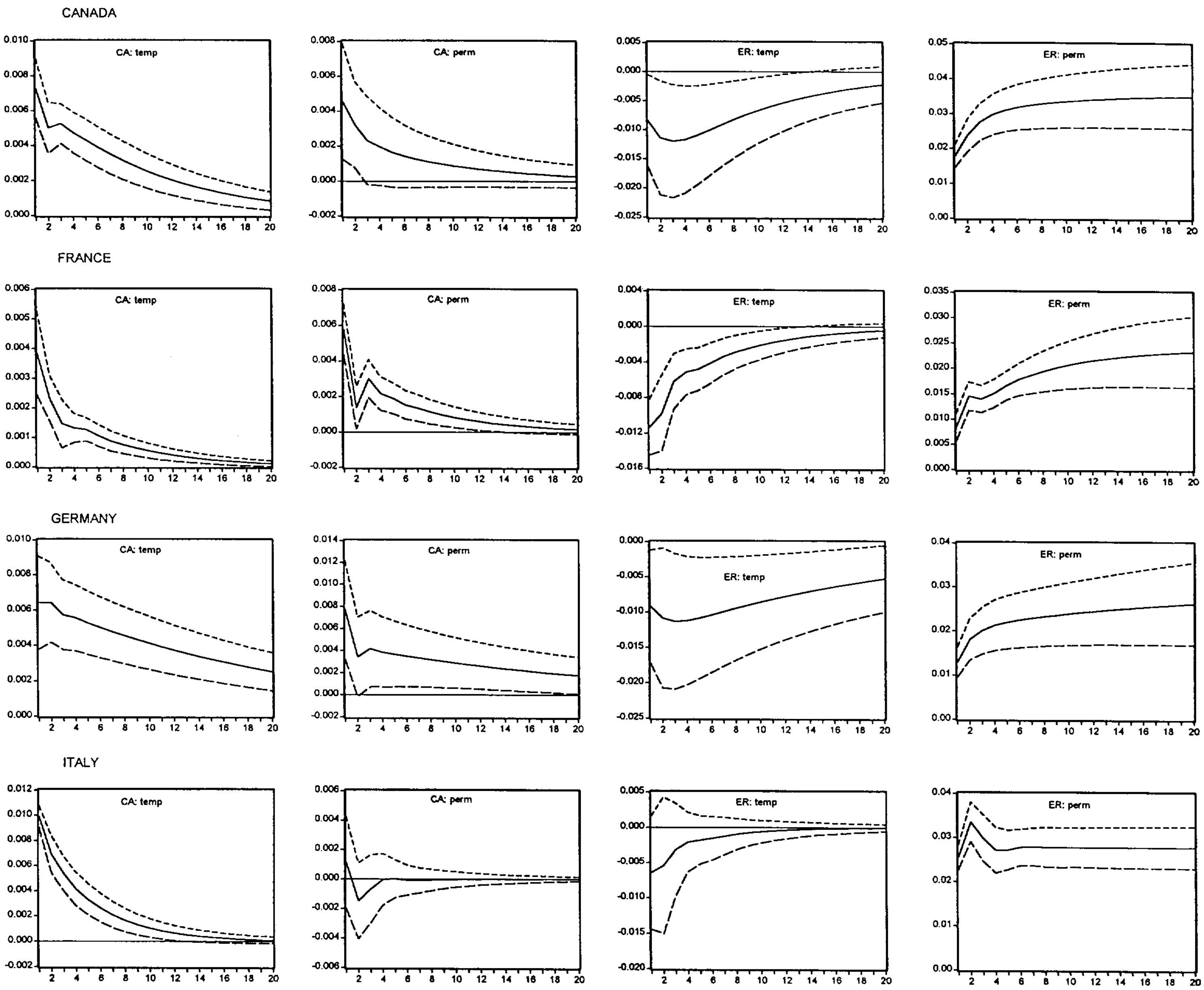
The table shows the coefficients for the VAR in the first-differenced log of the real exchange rate ($\Delta ER$) and the current account to GDP ratio ($CA$). Standard errors are in parentheses. AIC refers to Akaike Information Criterion.

Table 3: The Role of Temporary Shocks

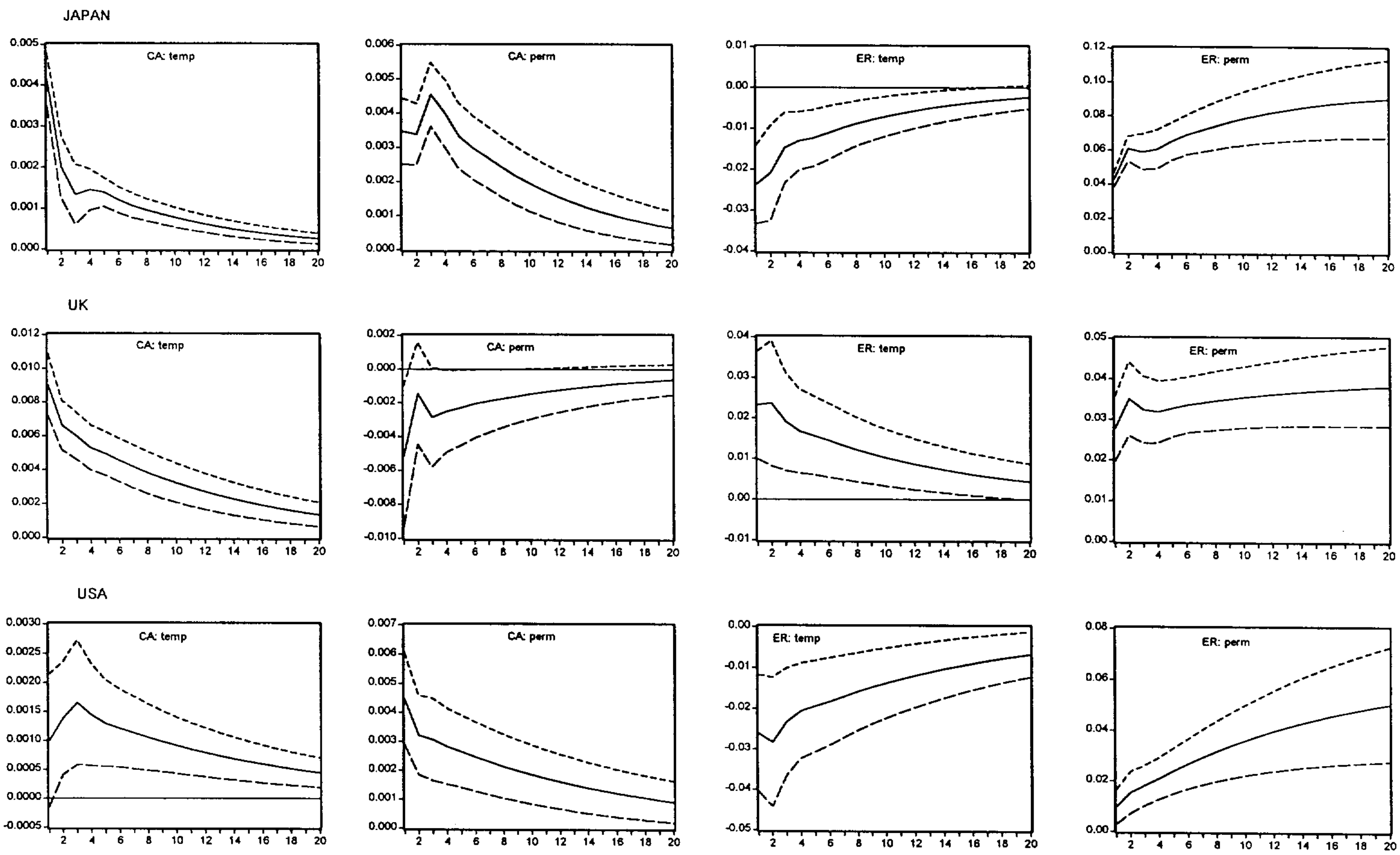
| Horizon | Canada | | | France | | | Germany | | |
|---|---|---|---|---|---|---|---|---|---|
| | CA | $\Delta$ ER | ER | CA | $\Delta$ ER | ER | CA | $\Delta$ ER | ER |
| 1 | 71 | 18 | 18 | 31 | 64 | 64 | 41 | 33 | 33 |
| 2 | 71 | 18 | 18 | 37 | 55 | 44 | 54 | 31 | 29 |
| 4 | 76 | 17 | 16 | 33 | 57 | 29 | 59 | 30 | 25 |
| 8 | 79 | 18 | 11 | 33 | 56 | 15 | 62 | 30 | 20 |
| 12 | 80 | 19 | 8 | 33 | 55 | 9 | 63 | 30 | 17 |
| 20 | 81 | 19 | 5 | 32 | 55 | 5 | 64 | 30 | 12 |
| | Italy | | | Japan | | | UK | | |
| | CA | $\Delta$ ER | ER | CA | $\Delta$ ER | ER | CA | $\Delta$ ER | ER |
| 1 | 99 | 6 | 6 | 58 | 23 | 23 | 75 | 41 | 41 |
| 2 | 98 | 6 | 3 | 47 | 21 | 15 | 81 | 40 | 35 |
| 4 | 98 | 6 | 2 | 29 | 22 | 10 | 81 | 40 | 30 |
| 8 | 98 | 6 | 1 | 25 | 22 | 5 | 82 | 41 | 23 |
| 12 | 98 | 6 | 1 | 23 | 22 | 3 | 82 | 41 | 18 |
| 20 | 98 | 6 | 1 | 23 | 22 | 2 | 82 | 41 | 11 |
| | United States | | | | | | | | |
| | CA | $\Delta$ ER | ER | | | | | | |
| 1 | 5 | 88 | 88 | | | | | | |
| 2 | 9 | 84 | 82 | | | | | | |
| 4 | 14 | 83 | 69 | | | | | | |
| 8 | 16 | 81 | 47 | | | | | | |
| 12 | 16 | 80 | 32 | | | | | | |
| 20 | 17 | 78 | 16 | | | | | | |

The numbers are the percentage contribution of temporary shocks for each horizon.

FIGURE1A

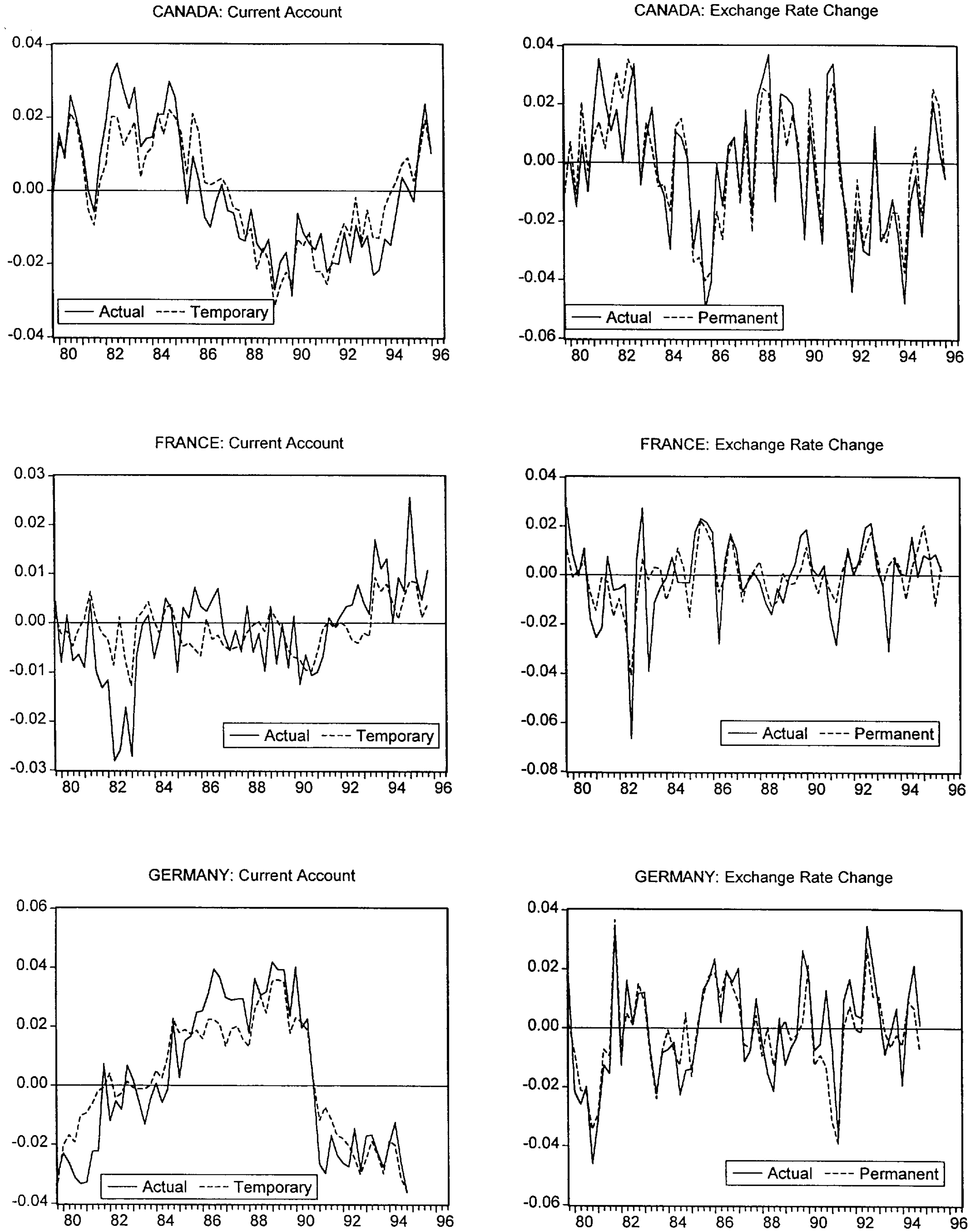

CANADA
CA: temp
CA: perm
ER: temp
ER: perm
FRANCE
CA: temp
CA: perm
ER: temp
ER: perm
GERMANY
CA: temp
CA: perm
ER: temp
ER: perm
ITALY
CA: temp
CA: perm
ER: temp
ER: perm

## FIGURE 1B

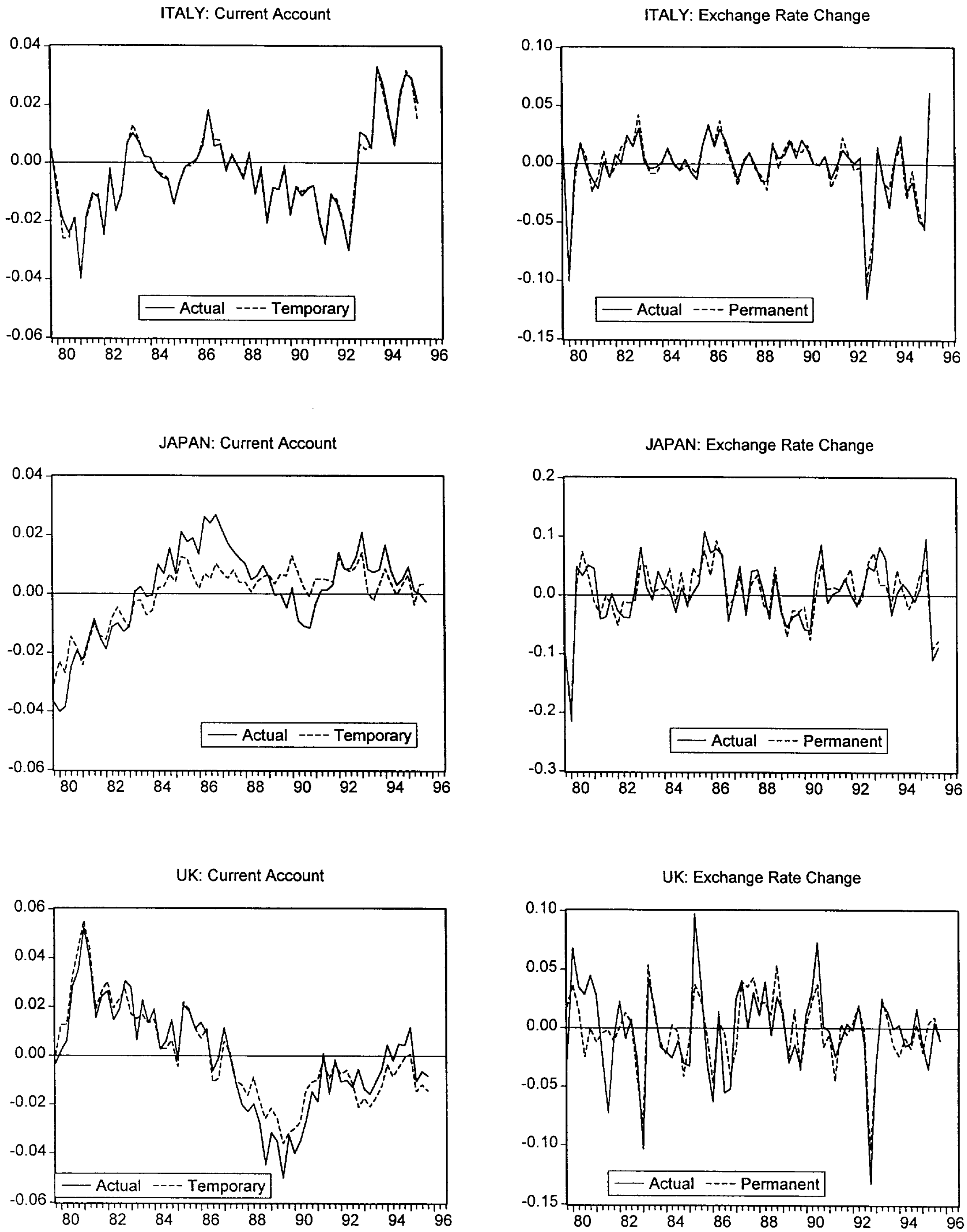


JAPAN
CA: temp
CA: perm
ER: temp
ER: perm
UK
CA: temp
CA: perm
ER: temp
ER: perm
USA
CA: temp
CA: perm
ER: temp
ER: perm

# FIGURE 2A

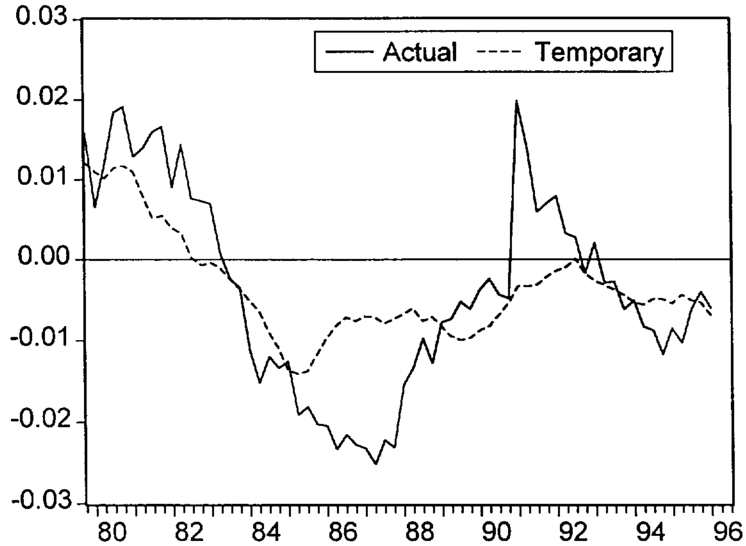

CANADA: Current Account
Actual ---- Temporary
CANADA: Exchange Rate Change
Actual ---- Permanent
FRANCE: Current Account
Actual ---- Temporary
FRANCE: Exchange Rate Change
Actual ---- Permanent
GERMANY: Current Account
Actual ---- Temporary
GERMANY: Exchange Rate Change
Actual ---- Permanent
80 82 84 86 88 90 92 94 96

# FIGURE 2B


ITALY: Current Account
0.04
0.02
0.00
-0.02
-0.04
-0.06
80 82 84 86 88 90 92 94 96
Actual ---- Temporary
ITALY: Exchange Rate Change
0.10
0.05
0.00
-0.05
-0.10
-0.15
80 82 84 86 88 90 92 94 96
Actual ---- Permanent
JAPAN: Current Account
0.04
0.02
0.00
-0.02
-0.04
-0.06
80 82 84 86 88 90 92 94 96
Actual ---- Temporary
JAPAN: Exchange Rate Change
0.2
0.1
0.0
-0.1
-0.2
-0.3
80 82 84 86 88 90 92 94 96
Actual ---- Permanent
UK: Current Account
0.06
0.04
0.02
0.00
-0.02
-0.04
-0.06
80 82 84 86 88 90 92 94 96
Actual ---- Temporary
UK: Exchange Rate Change
0.10
0.05
0.00
-0.05
-0.10
-0.15
80 82 84 86 88 90 92 94 96
Actual ---- Permanent

# FIGURE 2C

USA: Current Account




USA: Exchange Rate Change