Accounting for U.S. Current Account Deficits: An Empirical Investigation

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Abstract: This paper investigates the relationship between the U.S. current account deficit and a number of macroeconomic variables including government spending, budget balance, productivity, domestic and foreign income, real interest rates, and terms of trade. Implications of the conventional "twin deficit" and the dynamic optimizing approaches are tested using a Vector Error Correction Model. Innovation accounting results indicate that macroeconomic variables explain the current account reasonably well, and the evidence seems to support the conventional approach where budget deficits and increases in the real interest rates are associated with curent account deficits.

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1. Introduction

The U.S. current account has witnessed unprecedented deficits in the past decade. While it was balanced on average for the 1970-80 period, the U.S. current account recorded an average deficit of 133 billion dollars in 1984-87, and 106 billion in 1988-90. The deficit receded steadily until 1992, when it began to increase again. The rise in the deficit incited a controversy among economists as well as policymakers as to what caused the deficit and the appropriate measures to reduce it. The traditional view holds that record federal government budget deficits are largely responsible for current account deficits. Accordingly, deficits financed through bond issuance alter the behavior of private agents and lead to increased consumption via the "wealth effect" and raises interest rates deterring domestic investment. Increased interest rates cause appreciation of domestic currency and reduce competitiveness leading to current account deficits. Adherents to the Ricardian Equivalence hypothesis (REH) challenge this view arguing that altering the means the government finances its expenditures does not affect private sector behavior since bonds "are not net wealth" and they merely represent future tax liabilities. Models consistent with the Ricardian Equivalence are based on intertemporal optimization and emphasize the effects on the current account balance of real factors such as productivity, terms of trade, government spending and taxes via intertemporal substitution in consumption, production and investment.

A number of papers have examined the sources of the U.S. current account deficit in general and the relationship between budget and trade deficits in particular[1] Although there is near unanimity among these studies that macroeconomic factors help explain the variation in the current account, the results on the relationship between the current account and budget deficits are mixed. Miller and Russek (1989), Abell (1990), Bachman (1992), Rosenweig and Tallman (1993) provide evidence that budget deficits are largely responsible for current account deficits while Evans (1989), Enders and Lee (1990), Dewald and Ulan (1990) find little evidence on the causal impact of budget deficits; Darrat (1988) reports bi-directional causality between budget and trade deficits.

This paper attempts to re-examine the relationship between the current account and a number of key macroeconomic variables using multivariate time series techniques. These variables include the federal budget deficit, government spending, income, all expressed in real terms; an index of foreign income, terms of trade, real interest rates, and productivity. The inclusion of government spending along with the budget deficit should shed some light on the effects of different types of fiscal shocks. Recall that according to REH, the level of government spending rather than the means of its finance may induce a current account deficit. Second, an explicit account of relative prices and relative incomes will be taken by the inclusion of domestic and foreign incomes and terms of trade. Also we will include the non-agricultural productivity index of labor as a supply side factor that might influence competitiveness, and the current account. We focus on the stochastic properties of the data, and then proceed to investigate cointegration between the current account and other variables in the system using the cointegration technique proposed by Johansen (1988) and Johansen and Juselius (1990). We then estimate the error correction representation and investigate key propositions of the traditional and the dynamic-optimizing approaches. To that end we use innovation accounting (impulse response and variance decompositions) based on the error correction representation. Recall that VAR in first differences is misspecified if the variables in the system are cointegrated. In order to investigate the robustness of the results, we will compare the results to those obtained from Vector Autoregression (VAR) in levels and first differences.

2. The Traditional and the Dynamic Optimizing approaches to the Current Account

The following National Income accounting identity indicates that a current account imbalance is reflective of an economy's saving investment imbalance:

X - M = (T - G) + (S - I)

where X is export of goods and services, M is import of goods and services, G is government expenditures, T is government revenue, S is domestic private saving, and I is domestic private investment. The response of private saving to a budget deficit provides the basis for the contrasting views on the impact on the current account.

The conventional income-expenditure approach applied to a small open economy with demand determined output and high capital mobility [e.g. Mundell-Fleming model] hypothesizes that an increase in budget deficit raises aggregate demand through the multiplier effect which exerts an upward pressure on domestic interest rates. Higher domestic interest rates induce an incipient capital inflow which appreciates the domestic currency. A higher value of domestic currency crowds out exports and increases imports leading to a current account deficit. In fixed exchange rate regimes interest arbitrage ensures the equality between domestic and foreign interest rates. In this case a fiscal expansion gains full potency in raising output and employment, since the exchange rate effect which would otherwise work to offset the fiscal expansion is absent. In this case too, the current account deteriorates due to the income effect. In the large country case, a similar result is obtained except for a dampened effect on the current account since the expansion raises the interest rates at home as well as abroad. This association between budget deficits and current account deficits in the conventional approach is hence referred to as "twin deficits". The conventional approach is also called "income-absorption" approach due to the fact that the current account reflects an excess spending (absorption) over output.

Another point which has drawn controversy is what is called the *"Laursen-Metzler effect"*. It refers to the current account effect of a terms-of-trade deterioration. Accordingly, a worsening terms-of-trade decreases real income, and the decrease in real income reduces savings out of any given income, both measured in terms of exportables. For a given level of investment and government budget deficit, a decrease in savings translates into a current account deficit [Laursen and Metzler (1950)].

The conventional static income-expenditure model has been challenged on the grounds that it is based on aggregate behavioral relationships, and paid little attention to capital and debt accumulations. Proponents of the dynamic optimizing approach [*e.g.,* Obtsfeld (1981), Frenkel and Razin (1986) Razin (1993)] view the current account as reflecting net national (private and government) saving, which involves intertemporal allocation of resources. Accordingly, secular deficits mean debt accumulations, and solvency requires that a country cannot run deficits indefinitely, since this would drive its wealth to zero. In the dynamic optimizing approach, an explicit account of the intertemporal budget constraint and optimization by firms and households enable us to derive key propositions on the factors reflecting intertemporal parameters and debt-income position.

A key proposition of the dynamic optimizing approach is that an economy's private real spending and the current account are invariant to the means the government finances its expenditures.

According to the Ricardian Equivalence hypothesists applied to an open economy, the level of government spending rather than the means of its finance can be expected to induce a current account deficit. If individuals (and the government) can freely borrow at the interest rate r, they would be invariant to the substitution of a current $1 tax cut with $1 bond paying the interest rate r, since for a given path of government spending, a current tax cut must be matched by an equal corresponding increase in the present value of future taxes. If the government runs a deficit, individuals respond by increasing their private saving by the same amount. In this framework, individuals are informed about current and future path of government spending, and have infinite horizons/intergenerational bequest motives, there is no uncertainty about future taxes and incomes, taxes are non-distortionary[2].

Another implication of the dynamic optimizing approach is that temporary rather than permanent income shocks affect the current account. This conclusion is a byproduct of the well-known Permanent Income hypothesis (PIH), and is an outcome of intertemporal smoothing in consumption. Consumption smoothing occurs when individuals wish to smooth the time profile of their consumption relative to fluctuating income over time. A given permanent income or endowment shock raises income and consumption in each period and does not create any incentive for saving or dissaving leaving the current account unaffected. A temporary increase in income/endowment which has the same present value as the permanent shock however, has the same effect on consumption, and depending on when the shock occurs, the individuals need to save (current account surplus) or borrow from abroad (deficit) in each period to finance their (optimal) consumption profile.

It should be noted that in the dynamic optimizing approach, government spending can have a nontrivial influence on the current account. First, government spending can influence private sector behavior through withdrawing resources that otherwise would be available to the private sector (reducing private sector wealth). Second, government spending can influence the marginal evaluation of private consumption across time periods (marginal rate of substitution of consumption across periods) depending on the characteristics of the utility function (i.e., depending on whether private consumption and consumption of the public good are substitutes or complements). Through resource withdrawal, government spending shocks are similar to endowment shocks, and only temporary (rather than permanent) government spending shocks have an effect (negative) on the current account. Working through the intertemporal rate of substitution channel, permanent government spending shocks do not influence the current account, since the induced substitution effects exactly offset each other in each period. In this case, too, temporary rather than permanent government spending affects the current account[3].

Proponents of the dynamic optimizing approach challenge the static Laursen-Metzler effect as well. Obstfeld (1982) argues that a deterioration of the terms-of-trade increases saving and leads to an improvement in the current account. Svensson and Razin (1983) shows that a temporary (future) terms-of-trade deterioration worsens (improves) the current account, whereas a permanent deterioration has an ambiguous effect depending on the rate of time preference.

This paper attempts to consolidate variables that are capable of distinguishing between the traditional and the dynamic optimizing approaches to the current account. The eight-variable system can provide additional evidence on the role of budget deficits vs government spending, and the roles of domestic and foreign incomes, productivity, real interest rates, and terms of trade shocks in current account adjustment.

3. Methodology and Data

Given the recent attention in applied macroeconomics literature on stochastic properties of time series and the problems of statistical inference inherent in nonstationary series, we pretest for unit roots. Augmented Dickey-Fuller tests are the most commonly used tests for detecting the possible existence of unit roots. It is known that integrated series might exhibit common trends in the long run, in which case the series are said to be cointegrated. The interpretation of a cointegration relationship as a "long run equilibrium" relationship and the embedded short run adjustment process to the long run equilibrium (error-correction representation) is due to the Granger Representation Theorem [see, Engle and Granger (1987)]. The appeal of cointegration methods stems from combining long properties with the short run adjustment process. The resulting error correction model can be used for statistical inference including Granger-causality and Innovation Accounting (impulse response functions and variance decompositions). In this study we will use the full information maximum likelihood method [Johansen (1988); Johansen and Juselius (1990)] which can detect multiple cointegrating vectors, and allows testing restrictions on these vectors. First, we will test for unit roots using Augmented Dickey-Fuller (ADF) tests. Using the maximum likelihood cointegration procedure, we will then test whether the current account, domestic income, foreign income, terms of trade, budget deficit, government spending, productivity, long term interest rates are cointegrated. Our choice of variables is motivated by factors typically emphasized in the traditional and the dynamic optimizing approaches to the current account. If data indicate one or more cointegrating vectors, then these variables share a long run equilibrium with he current account. To derive short run dynamics, we will use a Vector Error Correction Model (VECM) in which we combine these long run equilibrium relationship(s) with a VAR in first differences. Then the resulting variance decompositions and impulse response functions of the VECM can be used to check the conformity of the data with either of the theoretical frameworks outlined above.

Specifically in our eight variable system, the current account (CA) is measured by national-accounts-based export of goods and services minus imports of goods and services. This is the current account surplus short of net unilateral transfers. We measure the government budget balance (BD) by consolidated federal government revenues minus expenditures; government spending (G) by government consumption and investment; and domestic income (Y) by GDP. All of these variables are deflated by the GDP deflator to obtain real values. We also measure productivity (PR) by productivity index of labor excluding agriculture; foreign income index (YF) by a trade weighted index of GNP/GDP of 10 major trading partners of the U.S. (see Appendix for construction); terms of trade (TT) by export price index over import price index; and the real long term interest rate (RLR) is computed as $[(1+i)/(1+\pi)-1]$ where i is the 10 year government bond rate and π is the inflation rate as measured by the GDP deflator. All variables except the current account (CA), government budget balance (BD), and the real interest rate (RLR) are measured in logarithms. We use quarterly data running from 1957:I to 1992:II except estimations involving foreign income, where it is 1960:I to 1990:III. Given the extensive data period and theoretical considerations, we investigate the effects of real shocks on the current account and exclude nominal variables from the analysis. All data are taken from the CD-ROM edition of the *International Financial Statistics.*

4. Empirical Results

Before we employ the cointegration framework, it is instructive to pretest variables for unit roots. ADF test results for the levels and first differences are presented in Table 1. It is known that test results are sensitive to the inclusion of deterministic regressors as well as lag lengths. There is little theoretical ground for a trending current account or government budget balance; therefore we do not include a linear time trend in the ADF regression for these variables. Similarly, under a high degree of capital mobility real interest rates are not likely to exhibit deterministic trends. All other ADF regressions for levels include an intercept and a linear time trend. In determining lag lengths, we start from a maximum lag length of 12, then pair down the model by testing whether the coefficient on the last lag is significant at 10 % using standard t-tests. If the data generating process is pure autoregressive, then this method yields the true lag length with an asymptotic probability of unity provided that the initial choice of maximum lag includes the true lag length [Hall (1990)]. If the true data generating process is a mixed autoregressive moving average (ARMA) process with a sizable moving average component, no method is currently satisfactory in determining the lag length [Dahlberg and Jansson (1993)]. In determining lag lengths, we use additional diagnostics such as Box-Pierce Q-statistic for residual autocorrelation, and residual plots.

Table 1 indicates that the null hypothesis of a unit root cannot be rejected for all series in levels. However, the null of a unit root is rejected for all variables in the first difference, indicating that all the variables are integrated of order one. If the true data generating process is a unit root process, this implies that all shocks to the levels of the variables have permanent effects.

Cointegration and Error Correction

Although the variables in our system are integrated of order one, there can be linear combinations which are stationary (i.e., they are cointegrated). These linear combinations can be thought of as behavioral or reduced form relationships stemming from a structural model. Consider the dynamic specification:

$$(1) \quad \Delta X_t = A(L)\Delta X_{t-1} + \Pi X_{t-k} + \mu + \varepsilon_t$$

where X_t is an n x 1 vector of variables, A(L) is an n x n matrix with elements which are k-order polynomials in the lag operator L, μ is a column vector of constants, ε_t is a column vector of disturbances, and _ is the first difference operator. Other than the right-hand-side term ΠX_{t-k}, equation (2) is a VAR in the first differences. Cointegration places restrictions on the "long run matrix" Π, and if the variables in X are cointegrated, the rank of Π is $0 < r < n$. In that case the matrix Π is partitioned such that $\Pi = \alpha\beta'$ where β is n x r matrix of cointegration coefficients, and α is an n x r matrix of adjustment coefficients. The stationary r x 1 linear combinations $\beta' X_t$ are called error correction terms. Johansen (1988), Johansen and Juselius (1990) develop likelihood ratio test statistic on the proper determination of the cointegrating rank, r.

It is known that the cointegration matrix β is not uniquely identified, and the stationary linear combinations $\beta' X_t$ are unique up to a linear transformation. The common practice is to normalize each vector in β with respect to one element. To uniquely identify each vector in β, one must have at least r restrictions on each vector[4]. In practice, we will impose (r - 1) zero-restrictions on each cointegrating vector in addition to the normalization restriction for unique identification. In addition to interpreting each cointegrating relationship as a long run equilibrium relationship, the short run dynamics of the system can be derived from equation (1) with elements of $\beta' X_t$ substituted on the right hand side as explanatory variables. The resulting model is called a Vector Error Correction Model and statistical inference typical in a VAR (variance decompositions and impulse responses) apply in this case as well.

In our system, we let the vector X_t consist of CA, TT, RLR, Y, YF, PR, and BD. Table 2 shows Johansen's likelihood ratio test based on the trace of the stochastic matrix. The test uses 6 lags to whiten the residuals. Diagnostics such as residual plots, and Box-Pierce Q-statistic are used to determine lag length. Our test allows linear deterministic trends in the data, and an intercept in each cointegrating equation. The table indicates that the null hypothesis of at most 3 cointegrating vectors is rejected, but we fail to reject 4 cointegrating vectors at the 5 % significance level. It is known that the unrestricted cointegrating vectors are not identified, since any linear combination of the stationary vectors is also stationary. This makes direct interpretation uninteresting and necessitates the imposition of additional restrictions. In this paper we will impose zero restrictions on each of the cointegrating vectors to uniquely identify them. The bottom of Table 2 reports the 4 restricted cointegrating vectors.

The first cointegrating relation relates the current account to terms of trade, domestic real income, the real interest rate, and government spending:

(2) $$CA = 15347.8 + 3728.9\ TT + 10046.7\ Y - 14.67\ RLR - 9803.9\ G$$

Accordingly, increases in domestic real income and improvements in terms of trade are associated with an improvement in the current account, whereas higher real interest rates and government spending are associated with a deterioration in the current account in the long run[5].

Variance Decompositions and Impulse Response Functions

The interrelationships among variables and the dynamics of the system can be best understood by examining variance decompositions and the impulse response functions based on the error correction representation. Table 3 reports 16 quarter variance decompositions and the correlation matrix of the innovations. The innovations are orthogonalized using Choleski decomposition and the ordering is as reported in the Table: G BD PR Y RLR TT CA YF.

The Table reports the proportion of the 16-quarter forecast error variance explained by innovations in the column variables. Accordingly, the macroeconomic variables explain about 85 % of the variation in the current account balance. This is in line with the assertion that the current account is a macroeconomic phenomenon. Particularly, real interest rate innovations explain about 47 %, and government budget balance innovations explain about 16 % of the current account forecast error variance[6]. Government spending shocks, however, explain very negligible (less than 2 %) of the current account. These results contradict REH and are supportive of the conventional model which hypothesize that budget deficits through interest rate effects lead to current account deficits. Recall that the REH states that government spending, and not government balance should affect the current account. Other factor influencing the current account are, productivity (9.28 %), terms of trade (7.56 %), and foreign income (6.72 %). Variance decomposition of the real interest rate indicates that the most important factor influencing the real interest rate is government's budget balance, a result supportive of conventional wisdom. Government balance shocks explain about 22 % of the forecast error variance of real interest rates. In order to check the robustness of the results to the ordering in the Choleski decomposition, we reverse the order and report variance decompositions in the middle panel of Table 3. Note that reversing the order does not significantly change the results. Still variables in the system explain the preponderance of the forecast error variance in the current account. Although the effects of budget balance, terms of trade, and foreign income are slightly diminished, the effect of real interest rate and domestic income are increased. The correlation matrix at the bottom of Table 3 confirms these results. The Table indicates that correlations between innovations are relatively low. The highest correlations are between terms of trade and the current account balance (35.5 %), and terms of trade and the real interest rate (- 27.5 %) innovations. Given these correlations, reversing the order does not have a significant effect on variance decompositions, except for these highly correlated innovations.

The dynamic adjustment of the current account to various shocks in the system (impulse response functions) is presented in Figure 1. The impulse response functions give the response of the current account to one standard deviation shock in the respective error correction equation. Panels a) and b) give the response of the current account balance to fiscal policy shocks. In response to a government spending shock, the current account deteriorates, and then it improves for 4 quarters when it deteriorates again. Overall, the response indicates that government spending shocks have no permanent effect on the current account. A positive government budget balance shock, on the other hand, has a small effect until the fourth quarter when it improves the current account[7]. Productivity shocks (panel c) improve the current account for one quarter followed by deterioration and eventual improvement. As in the variance decompositions, domestic income does not have a significant impact on the current account (panel d). The most notable impact on the current account is caused by a real interest rate shock (panel e). Accordingly, in response to an real interst rate shock, the current account worsens, then it recovers slightly, and after seven quarters, it deteriorates permanently. The current account response to a terms of trade shock is also interesting. A positive terms of trade shock (improvement in the terms of trade) initially improves the current account for four quarters, then it worsens the current account. Finally, a positive foreign income shock improves the current account permanently (panel h).

The responses of domestic income to several shocks are given Figure 2. A productivity shock has positive permanent effects (panel a), whereas a real interest rate shock has negative effects (panel b). The effect of a terms of trade shock seem to conform to the traditional Laursen-Metzler hypothesis. A positive terms of trade shock starts to increase income significantly after the eighth quarter (panel c).

The dynamic responses of the current account and variance decompositions seem to conform to conventional wisdom: Budget deficits have negative effect on the current account via real interst rates and terms of trade. Government spending shocks have a negligible impact on the current account. The data seem to contradict the intertemporal approach to the current account. Recall that according to the intertemporal approach, temporary income and government spending shocks should have a positive and negative impact on the current account respectively. On the other hand, the intertemporal approach predicts that budget deficits don't alter the intertemporal budget constraint of individual agents hence should have no impact on the current account. It seems that the record budget deficits and interst rates of the past decade are largely responsible for current account deficits in the U.S.

Next we test the robustness of these results to alternative specifications of the VAR. As alternative specifications, we consider a VAR in levels, and first differences. The results of VAR in levels are very similar to the VECM results except that the effect of budget deficits are increased (21 %) and real interest rate effects are diminished (25 %). Variables in the system still explain 73 % of the 16-quarter forecast error variance of the current account. Results of a VAR in the first differences are somewhat different. Individual variables explain 5 % to 12 % of current account forecast variance with a combined effect of 57 %. These results are not reliable however, if the series are integrated processes and are cointegrated. Recall that a VAR in first differences is misspecified if the series are cointegrated.

5. Summary and Conclusions

The surge in both budget and current account deficits in the past decade led many to believe that there is a causal relationship whereby budget deficits lead to current account deficits, hence the twin deficit hypothesis. Adherents to the Ricardian Equivalence view dispute this reasoning. By invoking the governments and private agents' intertemporal budget constraint, they argue that deficits financed by bonds imply future tax liabilities, and hence do not alter the behavior of agents who "see through", and increase their savings to match their future taxes. Extensive empirical studies have not produced a consensus as the evidence is mixed. This study reconsiders sources of the current account deficits using an extensive set of macroeconomic variables and a Vector Error Correction Model. Our variable set includes two types of fiscal policy measures, government spending and federal government's budget balance, productivity, domestic and foreign real income, terms of trade, and real long term interest rates. The implications of both the traditional twin deficit and the intertemporal approach are tested using quarterly data spanning the past three decades. Macroeconomic factors seem to explain the current account reasonably well and the data seem to conform to the twin deficit hypothesis where budget deficits are not neutral and are associated with high interest rates and current account deficits. Overall, macroeconomic shocks including budget deficits seem to have played an important role in the recent U.S. current account adjustment process.

Appendix:

The Construction of Real Foreign Income, YF:

The trade weighted foreign income index (1985=100) was constructed for the major trading partners of the U.S. Each country is weighted by its average trade volume with the U.S. in 1984-86. Countries included in the index and their relative weight are Canada (31.4 %),

Japan (26.4 %), Mexico (8.5 %), Germany (8.3 %), United Kingdom (7.5 %), Korea (4.7 %), France (4.4 %), Italy (4.0 %), Belgium (2.4 %) and Australia (2.2 %). These countries accounted for approximately 65 % of the U.S. trade volume in 1984-86. Quarterly data were not available for Belgium, Korea, and Mexico. We used a linear regression of GDP on industrial production in deriving quarterly GDP figures for these countries.

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Table 1: Augmented Dickey Fuller Tests

Levels	Lags	ADF-t statistic
G	1	-2.07
BD	7	-.089
CA	0	-1.15
PR	10	-2.24
TT	7	-2.02
Y	12	-1.83
YF	1	-2.26
RLR	5	-1.41
First Differences		
D(G)	0	-8.92*
D(BD)	6	-7.11*
D(CA)	0	-9.95*
D(PR)	9	-3.51*
D(TT)	4	-5.91*
D(Y)	11	-3.36*
D(YF)	4	-4.68*
D(RLR)	4	-5.22*

Notes: (*) significant at the 5% level.

1. Sample period: 1960.I-1990.IV

2. ADF tests were conducted using an intercept and time trend for all data in levels except for BD, CA, and RLR. The remaining regressions were fit with an intercept only.

3. The Critical Value at the 5 % significance level for regressions with ternd is -3.44. The Critical Value for regressions without trend is -2.88.

Table 2. Cointegration Test

Likelihood Ratio (Trace)	5 % Critical Value	Hypothesized No. of Vectors
222.53	156.00	None **
164.09	124.24	At most 1 **
118.09	94.15	At most 2 **
77.978	68.52	At most 3 **
45.418	47.21	At most 4
25.752	29.68	At most 5
10.189	15.41	At most 6
0.0561	3.76	At most 7

Notes: (**) denotes rejection of the hypothesis at 5% significance level
1. Sample Period: 1960:I 1990:III, 116 included observations.
2. Test assumption: Linear deterministic trend in the data, intercept in cointegrating vectors.
3. No. of lags in VAR: 6

Normalized Cointegrating Coefficients: Cointegrating Equations

G	BD	PR	YF	RLR	Y	TT	CA	Intercept
9803.92	0	0	0	14.676	-10046.7	-3728.9	1	-15347.8
0	-0.014	0	0	0.063	-0.49	1	0.005	0.969
0	0	-2.081	0	0.019	1	0.25	0.001	0.049
0	0	0	301.29	1	-421.72	-66.65	0.015	-1650.10

TABLE 3: 16 Quarter Variance Decompositions and the Correlation Matrix

Innovation In

	G	BD	PR	Y	RLR	TT	CA	YF
G	13.58	6.82	13.51	10.26	1.40	44.51	5.58	4.30
BD	6.43	44.35	12.25	5.16	17.82	4.68	3.59	5.69
PR	2.33	3.17	57.22	7.73	18.57	6.00	3.14	1.80
Y	1.78	16.19	31.30	14.82	18.96	7.86	7.53	1.52
RLR	8.81	21.68	6.83	0.77	46.81	10.52	3.17	1.38
TT	17.10	1.70	1.97	2.07	5.76	65.47	4.58	1.30
CA	1.29	16.34	9.28	1.30	42.91	7.56	14.57	6.72
YF	6.12	13.34	19.59	7.03	22.70	9.55	6.29	15.34

Reverse Order

	G	BD	PR	Y	RLR	TT	CA	YF
G	12.74	0.98	8.13	28.14	0.87	35.51	0.69	12.92
BD	6.57	44.01	7.44	3.85	21.75	5.44	3.52	7.39
PR	2.14	2.40	35.86	14.78	27.14	5.88	4.58	7.19
Y	0.84	4.42	16.16	31.36	27.44	11.21	1.51	7.14
RLR	3.16	13.82	11.77	1.21	38.63	28.46	0.81	2.11
TT	20.12	3.81	1.16	5.37	7.01	53.54	2.53	6.42
CA	1.01	13.72	3.92	7.33	48.32	4.61	17.68	3.39
YF	4.06	5.13	12.77	13.22	33.98	16.74	2.51	11.55

Correlation Matrix of Innovations

	G	BD	PR	Y	RLR	TT	CA	YF
G	1.000	-0.064	-0.125	0.165	-0.096	-0.060	-0.118	0.012
BD		1.000	-0.023	-0.239	0.120	-0.099	-0.039	0.064
PR			1.000	0.197	-0.204	-0.035	0.142	-0.112

Y	1.000	-0.140	0.005	0.223	0.102
RLR		1.000	-0.275	-0.241	0.226
TT			1.000	0.355	-0.259
CA				1.000	-0.105
YF					1.000

Endnotes

1. For a summary of the empirical studies on the effects of U.S. budget deficits on interest rates, domestic investment, and trade deficits see, Arora and Dua (1993).

2. Barro (1974) formulates REH with inter-generational bequest motive. Examples to the controversies surrounding REH can be seen in Barro (1989), and Bernheim and Bagwell (1988). Seater (1993) is an extensive recent survey.

3. The foregoing analysis pertains to the small country case, where domestic allocation of resources does not influence intertemporal (interest rates) or intratemporal terms-of-trade (relative price of the export good in each period). The large country case is similar; see Frenkel and Razin (1992), pp 166-193.

4. Johansen and Juselius (1992) develops tests statistics for testing structural hypotheses within a multivariate cointegration frameork.

5. This result is conditional on the imposed (arbitrary) zero restrictions on the cointegrating vectors. In what follows these zero restrictions have no effect on the results of the error-correction model.

6. These results are invariant to different measures of interest rates; the real yield on 3-year government bond, and 3-month Treasury Bill rates gave similar results.

7. Since we measure budget balance as revenues minus expenditures, and current account as exports minus imports, the response implies that budget deficits cause current account deficits.