Journal of Applied Economics, Vol. VII, No. 2 (Nov 2004), 249-269

SUSTAINABILITY OF THE US CURRENT ACCOUNT DEFICIT: AN ECONOMETRIC ANALYSIS OF THE IMPACT OF CAPITAL INFLOW ON DOMESTIC ECONOMY

MOHAMMED I. ANSARI*
Albany State University

Submitted September 2003; accepted February 2004

The purpose of this paper is to estimate, by using the recent econometric techniques of unit root testing and Johansen-Juselius cointegration technique (1990), the impact of foreign capital inflow on the volume and efficiency of domestic investment in the United States during the period, 1973-1999. A battery of diagnostic tests is employed to check the validity and robustness of the estimated results. Evidence suggests that capital inflows have had a significant positive effect on the volume of US investment, but the effect on the efficiency of investment has been minimal. These findings imply that, while achieving current account balance is important, it is equally important to sustain and augment the beneficial impact of capital inflow by creating a more conducive investment climate. Given our limited ability to influence current account balance, this seems to be a more pragmatic policy option for dealing with the US current account imbalance.

JEL classification codes: F21, F41, O51
Key words: current account, capital inflow

I. Introduction

The persistently growing US current account deficit has attracted a good

* The author is grateful to the Faculty Research Committee, Albany State University, for providing funding for this project under its Title III Programs for Fall 2002. A preliminary draft of this paper was presented in the 29th Annual Conference of the Academy of Economics and Finance, and a revised version was presented in the 5th Annual International Business and Economics Conference. The author likes to express his gratitude to the two referees and the editor of this journal for making valuable comments and suggestions. The usual disclaimer applies.

deal of attention from researchers and policy makers alike. Many view the situation as unsustainable and even downright calamitous.[1] There are many reasons why a rapidly rising current account deficit is looked at with such a disdain. First, current account deficit complicates domestic demand management policy. The concomitant rise in capital account surplus can feed into booming equity market creating wealth effect. Further, pursuing a tight monetary policy to dampen demand pressures, can create supply bottlenecks by discouraging investment and exacerbate inflationary pressures. Thus, current account imbalance can potentially confound and complicate macroeconomic policy, making it harder to maintain price stability and achieve long term economic growth. Second, many studies have shown that a nation's unfavorable balance of payment has the potential to constrain its long term economic growth.[2] Third, there is always a danger of a sudden and a large scale withdrawal of foreign capital, creating, what Peter Drucker calls, the looming transfer crisis (1988).

But a more realistic approach to the sustainability issue must take into account the impact of foreign capital inflow on the national economy. Just as a large and persistently growing current account deficit can have a detrimental effect, a large and persistently growing capital account surplus, which mirrors the current account balance, can have a beneficial effect on the economy. The

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[1] Lester Thurow says, "...to run a trade deficit, a country must borrow from the rest of the world...as debts grow, interest payments grow...as time passes, the rate of debt accumulation speeds up...compound interest eventually insures that the remained annual borrowings become so large that the rest of the world will be unable to lend the necessary sums... when that happens, dramatic changes occur," (1992, pp. 236-237). Paul Krugman goes one step further and maintains that "the (U.S.) trade deficit remains huge; meanwhile foreigners have bought up a large quantities of U.S. assets at bargain prices, thanks to a weaker dollar...a financial squeeze to the U.S. due to a cutoff of foreign capital is not only a live possibility, it is arguably already in process," (1995, p. 36).

[2] "In the long run, no country can grow faster than at the rate consistent with balance of payments equilibrium on current account, and if the real terms of trade do not change much, this rate is determined by the rate of growth of export volume divided by the income elasticity of demand for imports. Attempts to grow faster than this rate mean that exports cannot pay for imports, and the economy comes against a balance of payments constraint on demand, which affects the industrial sector's ability to grow as fast as labor productivity," (Thirlwall, 1982, p. 33).

balance sheets of many highly successful corporations show an extremely high debt to equity ratio. But, so long as these corporations have a good cash flow and earn a high rate of return on their investment, heavy debt burden does not mire their future growth potential. To a large extent, the analogy may apply to a country's balance sheet. It is conceivable that the United States has done well in recent years because of and not despite rising foreign debt. Preliminary calculations show that the US economy has grown at an annual average rate in excess of 3 percent over 1970 and 1999, considered to be the country's long term secular growth rate. This is also the period which marked a rising trend in the current account deficit. It is noteworthy that the rate of growth excluding 1991, the year of the previous recession, has been about 3.6 percent. During the same period, the US has experienced the fastest rate of deterioration in the country's current account balance. Are these just coincidences and statistical artifacts or there is more to them than meets the eye? The purpose of this study is to find some answers. More specifically, we estimate econometric models to determine the impact of foreign capital inflow on the volume and the efficiency of domestic investment. To avoid spurious results, we employ recently developed and widely used time series methodologies for establishing the statistical properties of the data set. A battery of diagnostic tests is employed to verify the validity and robustness of these results. These findings suggest that, while reducing the current account deficit is important, it is equally important to augment the beneficial impact of capital inflow. Given the limited ability to influence current account balance, this seems to be a more pragmatic policy option for dealing with the US current account imbalance.

The rest of the paper is organized as follows. Section II presents a synopsis of the US current and capital account balance. Section III explains the literature, the model, and the methodology. Empirical results are analyzed in section IV. Section V consists of a few concluding remarks.

II. The US Current and Capital Account Balance: A Synopsis

The United States has seen significant structural changes in its external economy over the past 50 years. It enjoyed the status of a creditor nation

during the 1950's, 1960's and a balanced status during much of the 1970's.[3] But it has gradually earned the status of the largest debtor nation in recent years. To obtain a visual impression of the magnitude of these changes, we have shown the time series behavior of current account (CA) and capital account (KA) balance in Figure 1. The figure clearly shows the transition as the country moved from the position of equilibrium during much of the 1970's to a position of deficit, especially following a large appreciation of the dollar in the first half of the 1980s. This trend is seen to have reversed itself in the second half of the 1980s following an equally large depreciation of the dollar. The 1991 recession further helped improve the balance. However, the declining trend resumed and even accelerated thereafter. The longest peace time expansion, coupled with the strengthening dollar, has caused the current account deficit to reach an all time high in the 1990's.[4]

It has often been pointed out that the dollar value of the deficit presents an exaggerated picture as it does not account for the size of the economy. To redress this, we computed the ratio of current account balance to total GDP. This ratio has ranged from a high of about 1 percent in 1975 to a low of about -3.6 percent in 1999, with an average of an about -1 percent over the sample period. The years of external deficit has caused our foreign indebtedness to swell. What is the critical level of foreign indebtedness for a country like the USA? There is no clear cut answer to this question. Evidence shows that many nations in the past, including Canada and Australia, have carried several times higher debt burden than the US. At the risk of simplification, one might say that external debt is limited only by total foreign wealth and the foreigner's ability and willingness to continue lending.

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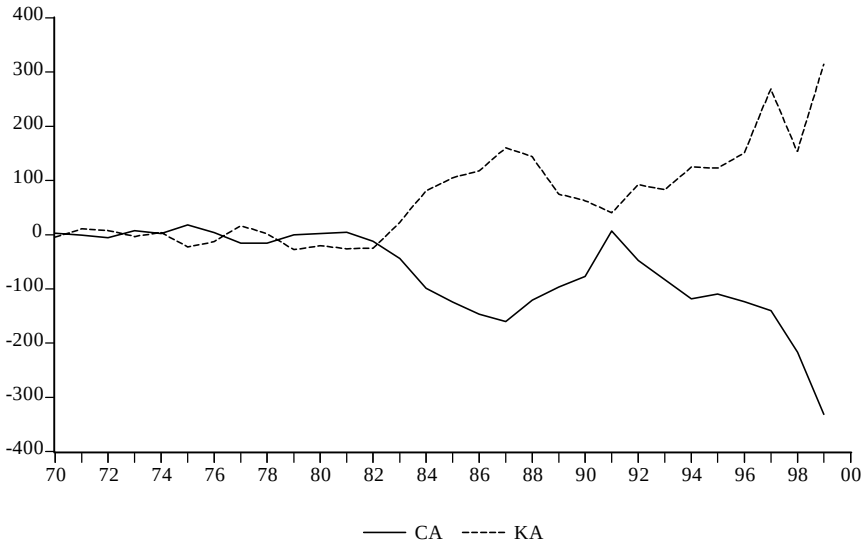
[3] The large current account surplus of the 1950's and 1960's was made possible mainly because the country enjoyed a unique and enviable trade competitiveness position which led to an unprecedented export boom. Faced with a growing challenge by major economies like Japan and Germany, coupled with unfavorable exchange rate changes and the impact of large energy imports, the country began to see a deterioration in its external balance in the 1970's.

[4] The gradual improvement in the US service account balance over the sample period provides one bright spot in this otherwise dismal scenario. See Ansari and Ojemakinde (2003) for a detailed discussion of the asymmetric behavior of the merchandise and service account balance.

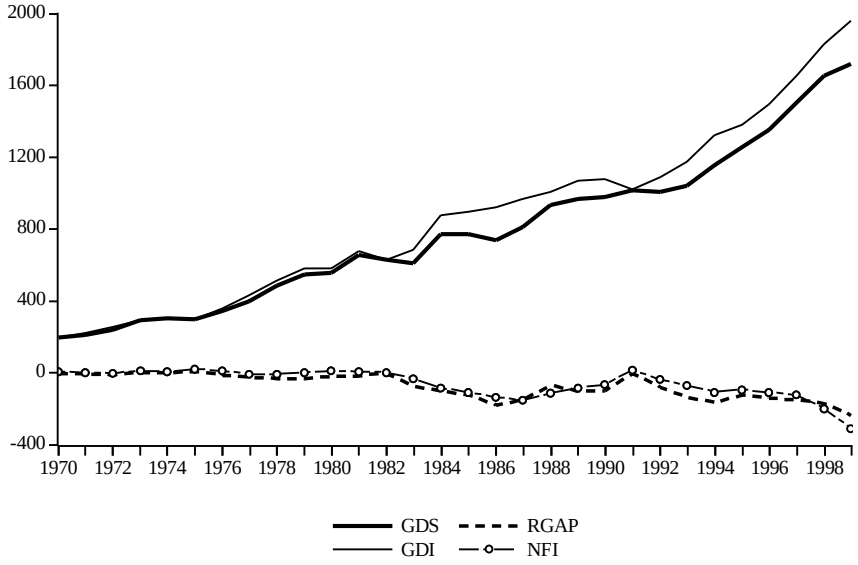
Figure 1. The US Current and Capital Account Balance



As one would expect, Figure 1 also shows capital account as being the mirror image of the current account balance. This is because, in the national accounting system, any excess of imports over exports translates into accumulation of foreign debt. In most cases, the money that is owed to foreign residents does not leave the country. Instead, it gets invested in the US domestic economy, and shows up as surplus in the capital account balance. In this traditional view, the current account balance can be seen to cause capital account balance. But there is an alternate way of looking at the national accounting system. If the nation invests more than it saves, the difference must be made up by net foreign capital inflow. A rising capital account surplus can cause the domestic currency to appreciate, depressing exports and inducing imports. The excess of imports over exports, would then, show up as current account deficit. Thus, capital account balance can be seen to cause current account balance. We have plotted gross domestic saving (GDS), gross domestic investment (GDI), resource gap (RGAP), defined as the difference between gross domestic saving and gross domestic investment, and net foreign investment (NFI) in Figure 2. The figure shows the growing gap between domestic saving and investment. Contrary to the national accounting

framework in which resource gap and net foreign capital inflow should be identical, Figure 2 shows some discrepancy. Statistical discrepancy in the balance of payment account explains the observed difference between the two. Here, resource gap (RGAP) reflects the amount of net foreign capital inflow (NFI) that the country needs to restore equilibrium in the economy. This discussion makes it clear that there is no *a priori* basis for assuming the direction of causation one way or the other. However, since causality between the two accounts is not the main focus of this paper, we abstain from any further discussion of the subject.[5]

Figure 2. Saving, Investment, and Resource Gap



III. Literature, Model, and Methodology

Most of the literature on the subject, both theoretical and empirical, has evolved in the context of the developing countries. In the 1950's and 1960's foreign capital, by and large, was seen to augment growth in the developing

[5] Results from a preliminary causality test for the US, not reported here, indicate that capital account balance has caused current account balance in the Granger sense.

countries both through its resource augmentation effect, and with certain assumptions regarding capacity utilization, gestation period, and composition of output, through favorable effect on the efficiency of domestic investment.

The resource augmentation effect is believed to take two forms. There is a direct effect, which stems from the fact that foreign capital provides additional investible funds, adding directly to total volume of domestic investment. But foreign capital can also affect volume of domestic investment in another and indirect way. To the extent foreign capital augments national income, it can help generate additional domestic saving, which in turn, can cause domestic investment to rise. The impact of foreign capital on the efficiency of domestic investment can take many forms and can flow from many channels. For instance, it can raise incremental output-capital ratio (IOCR), total factor productivity (TFP), and labor productivity (LP). It has been argued that, by helping reduce price distortions, foreign capital can facilitate pricing of inputs and outputs to reflect relative scarcities, and thereby, enhance efficiency.

By the 1970's the once one-sided view of foreign capital began to change. It was, for instance, recognized that much of the benefits will be lost if foreign capital is used to finance consumption. There is always a possibility that foreign capital may cause governments to lax their tax efforts, increase consumption, and induce the country to import more. It is also argued that foreign capital may pre-empt private investment opportunities, crowding-out domestic investment. Further, accompanied by wrong technology and inefficient management, foreign capital can actually have adverse effect on the efficiency of investment. It is easy to see that, given many and sometimes conflicting possibilities, the impact of foreign capital on domestic economy becomes an empirical issue.

In the past investigators have adopted several routes while trying to assess the impact of foreign capital on domestic economy. Many researchers have focused on the relationship between foreign capital and domestic saving, i.e., the resource effect. Others have tried to study the relationship between foreign capital and output-capital ratio, i.e., the efficiency effect. Yet others have focused on the relationship between foreign capital and economic growth through capital formation. These studies seem to have produced mixed results. Rahman (1968), Griffin and Enos (1970), and Areskoug (1973) are some of the earlier studies falling into the first category. With some minor differences,

these studies found that foreign capital substituted for domestic saving only partly, implying that foreign capital had a positive effect on domestic saving. Weisskopf (1972), using both cross-section and time series data from less developed countries, also reached a similar conclusion. However, Papanek (1972), using pooled data in a disaggregated study, found that foreign capital had a negative effect on domestic saving. Similarly, Fry (1984) using time-series data from 1960 to 1980 for Bangladesh, Korea, Nepal and Thailand, found that foreign capital had a net negative effect on domestic saving only in Bangladesh. In another study, Gupta and Islam (1983), using cross-section data for eighteen Asian countries, found a positive effect of foreign capital on domestic saving with no substitution effect. Stoneman (1975), Papanek (1973), Dowling and Hiemenz (1983), and Gupta and Islam (1985), using pooled cross-section time series data, estimated a neoclassical production function and found that foreign capital had a positive effect on capital formation and hence on economic growth in many developing countries. Voivodas (1974) and Go (1985) also found a positive effect of foreign capital on investment and economic growth when they estimated an investment function using foreign capital as an independent variable. Voivodas (1973), on the other hand, using incremental output-capital ratio as a proxy for efficiency of investment and pooled data from twenty developing countries, found that foreign capital had a negative effect on the efficiency of investment.

Despite their contribution to the existing knowledge on the subject, most of these studies suffered from two serious problems. First, invariably, all these studies depended on a single equation model. It is well known fact that single equation specifications suffer from a simultaneity problem. And second, none of these studies paid sufficient attention to the issue of stationarity in the data set. It is commonly agreed fact that most of the macroeconomic time series data are non-stationary, which can render the estimated results invalid and unreliable.

This study differs from the earlier studies in that we explicitly deal with the issue of stationary. All data series are pre-tested to establish their time series characteristics. Also, consistent with the objective of this paper, we estimate vector autoregressive models. The resource effect of foreign capital, for instance, is studied by estimating a three-variable VAR model with domestic saving, domestic income, and foreign capital. Of course, the

specification of the VAR model depends on the actual time series characteristics of the data set. If, for instance, the variables are integrated but not cointegrated, a VAR in difference may provide an appropriate specification. But if the variables are integrated and also cointegrated, then a vector error-correction model (VECM) provides a more efficient specification. We estimate a bivariate model with incremental output-capital ratio and foreign capital to test for the efficiency effect of foreign capital.

The VAR methodology is so commonly used that only a brief discussion is warranted here. A vector error-correction model retains all other benefits of an unrestricted VAR. Like VAR, it is also a generalized reduced form which helps detect the statistical relationship among the variables in the system. It allows all variables to interact with itself and with each other, without having to impose a theoretical structure on the estimates. Moreover, it provides a convenient method of analyzing the impact of a given variable on itself and on all others by using variance decompositions (VDCs) and impulse response functions (IRFs). In estimating VECM, the residuals from the cointegrating equations are included as error-correction terms. If the coefficients of the error-correction terms are found to be statistically significant, it implies that any deviation from long run equilibrium is corrected by short-run adjustment process. Thus, the error-correction terms provide additional channels for capturing causality.

It is widely known that many time series data suffer from non-stationarity problem which may undermine the validity of the estimated parameters. For these and other reasons, it is important to conduct a unit root test on the data set. Since the idea is not new and the techniques are widely used, only a brief description is presented here. A series is considered stationary if its mean, variance and covariances are time-independent. The two most frequently used unit root tests are the Dickey-Fuller (DF) and the Augmented Dickey-Fuller (ADF) tests. The ADF test uses an equation of the following form:

$$dx_t = \alpha_0 + \alpha_1 x_{t-1} + \sum_{i=1}^{p} \alpha_{2i} dx_{t-i} + e_t \qquad (1)$$

where d is the first difference operator and e_t is a zero mean white noise error-term. The null hypothesis that x_t contains a unit root (is non-stationary) amounts

to testing H_0: $\alpha_1 = 0$. The null hypothesis is rejected if α_1 takes a negative value and is significantly different from zero, in which case the series is considered stationary. The lag structure is chosen such that the error-term, e_t becomes white noise. The test statistic has a special distribution (Fuller, 1976). The DF test is used by omitting the summation term in equation (1). In case a given series turns out to be non-stationary (contains a unit root), these tests are repeated using the series in its first difference. If the null hypothesis of unit root is rejected, then the series is said to be integrated of order one, or I(1).

Next, we employ the Johansen-Juselius cointegration method to test for the existence of a long run equilibrium economic relationships among the variables in the model, namely, sr, yr, and kr in the United States, during the period 1973Q1-1999Q4. In a bivariate case, each of the two series, x_t and y_t can individually be non-stationary, I(1), but a linear combination of the two, say, $z_t = x_t - \sigma y_t$, can either be non-stationary, I(1) or stationary, I(0). In general, two variables are said to be cointegrated if both are integrated of order k, but a linear combination of the two is integrated of order less than k. As a general rule, for cointegration all variables should have the same order of integration. The rejection of the null hypothesis of no cointegration establishes the existence of a long-run equilibrium relationship between variables in the system. This methodology is essentially the one proposed by Johansen (1988) and Johansen and Juselius (1990), and is the most commonly used for this kind of problems.[6]

IV. Empirical Results

All estimations have been carried out using quarterly data covering the period 1973Q1 to 1999Q4. The sample period is justified by data availability. All data series used in estimating the resource effect (sr, yr, kr) are in real terms. Real domestic saving (sr) has been obtained by deflating nominal gross domestic saving, taken from Bureau of Economic Analysis, Department of Commerce, by the GDP deflator, 1995 = 100, from International Financial Statistics. The real GDP data (yr) is in 1996 prices and was obtained from IFS, CD-ROM. Similarly, real capital flow data (kr) was obtained by deflating nominal capital flow data from IFS, CD-ROM, using the GDP deflator

[6] The use of two-step Engle and Granger methodology for testing cointegration has been criticized on several grounds. For a detailed discussion of this issue, see Murthy and Phillips (1996).

1995 = 100. Consistent with the preceding discussion, we first run the unit root and cointegration tests to determine the degree of integration of each variable in the system. Results of the Dickey-Fuller and Augmented Dickey-Fuller tests with and without time trend are presented in Tables 1 and 2. As the DF and ADF tests are known to suffer from power limitations, we have also reported the results from the Dickey-Fuller test with GLS detrending (DF-GLS) and the Kwiatkowski, Phillips, Schmidt, and Shin test (KPSS). We have employed the automatic lag selection in the DF, ADF, and the DF-GLS tests using the Schwarz Information Criterion (SIC) and a maximum lag length of 12. Numbers in the parentheses are the actual lag selection used in the estimation process. In case of the KPSS test, we have employed the automatic bandwidth selection procedure based on the Newey-West using Bartlett kernel, with the actual bandwidth shown in the parentheses. It is important to point out that unlike other tests, KPSS assumes trend stationarity under the null hypothesis. As Tables 1 and 2 show, all variables are I(1), except kr. This variable appears to be I(0) at the one percent level according to the DF test with no trend and DF and ADF test with trend. However, the null hypothesis of unit root is uniformally rejected in all tests when they are repeated in first difference. Hence, we have concluded that all variables are I(1).

Table 1. Unit Root Test Results with Drift but no Time Trend

Variables	DF	ADF	DF-GLS	KPSS
sr	-0.83	-0.67 (6)	1.01 (1)	1.11 (9)
yr	3.88	2.74 (1)	4.19 (1)	1.17 (9)
kr	-3.74	-0.55 (3)	-0.00 (3)	1.04 (8)
iocr	-8.61	-7.29 (0)	-8.02 (0)	0.09 (6)
krp	-4.68	-1.28 (0)	-0.81 (3)	1.00 (8)
dsr	-8.81	-6.05 (5)	-5.06 (3)	0.04 (3)
dyr	-6.59	-6.59 (0)	-4.40 (1)	0.54 (6)
dkr	-16.89	-10.71 (2)	-14.65 (0)	0.06 (5)

Notes: The MacKinnon critical values for rejection of hypothesis of a unit root at the 1, 5, and 10 percent levels are, respectively, -3.49, -2.88, and -2.58. The critical values for DF-GLS are -2.58, -1.94, and -1.61, and for KPSS the asymptotic critical vales are 0.74, 0.46, and 0.35.

Table 2. Unit Root Test Results with Drift and a Time Trend

Variables	DF	ADF
sr	-2.30	-2.74 (3)
yr	0.57	-0.14 (1)
kr	-7.01	-4.56 (0)
iocr	-8.61	-7.26 (0)
krp	-7.81	-7.81 (0)
dsr	-8.77	-6.02 (5)
dyr	-7.34	-6.59 (0)
dkr	-16.82	-10.71 (2)

Notes: The MacKinnon critical values for rejection of hypothesis of a unit root for test with drift and a time trend, at the 1, 5, and 10 percent levels are, respectively, -4.04, -3.45, and -3.15.

Next, we have used the Johansen and Juselius method to test for the existence of a long run equilibrium relationships among the three variables used in the model testing the resource effect, namely, sr, yr, and kr. The estimation was carried out using one-period lag based on the Schwarz (SIC) and Akaike (AIC) information criteria, with no deterministic trend and restricted intercept. To enhance the robustness of the results, we have employed both the trace and the maximum eigenvalue tests statistics. The critical values are taken from Osterwald-Lenum (1992). The results of this test are shown in Table 3. Looking at the table, we find that both the trace and eigenvalue statistics exceed the critical values up to one cointegrating vector, implying rejection of the null hypothesis and allowing us to conclude the existence of two cointegrating vectors. This establishes the existence of a long run equilibrium relationship among the three variables. It means that short term deviations from this long run equilibrium will have an impact on the changes in the dependent variable in a way which will bring the relationship back to equilibrium once again. As Engle and Granger (1987) have shown, since variables in the model are cointegrated, an error-correction model provides a more efficient choice of methodology for testing the resource effect.

Table 3. Johansen and Juselius Cointegration Tests

Trace test		Maximum eigenvalue test	
Null	Trace statistic	Null	Max. eigenvalue
r = 0	65.06	r = 0	36.65
	(41.07)		(26.81)
r ≤ 1	28.40	r = 1	20.97
	(24.60)		(20.20)
r ≤ 2	7.43	r = 2	7.43
	(12.97)		(12.97)

Note: Numbers in the parentheses are the one percent critical values.

A. Resource Effect of Foreign Capital

Engle and Granger (1987) have shown that if variables are integrated and also cointegrated, they have a valid error-correction representation. In estimating a vector error-correction model, cointegration approach helps capture the dynamics of the short run relationships. Accordingly, we have estimated a three-variable (sr, yr, kr) vector error-correction model using two cointegrating vectors and an optimal lag structure of five periods, as determined by the Akaike information criterion (AIC) and Schwarz information criterion (SIC). The results of this estimation are presented in Table 4. As is the case with unrestricted VAR, individual coefficients from the VECM model are also hard to interpret. We have, therefore, analyzed the dynamic properties of the model with the help of the impulse response functions and the variance decompositions analysis. Consistent with the main thrust of the paper and to capture the maximum impact of kr_t, on sr_t, we have placed kr_t first followed by yr_t and sr_t the last. Since the results from VAR models are known to be sensitive to the ordering of the variables, we have tried different ordering, but this did not alter the results in any significant ways. The impulse response functions, not shown here to conserve space, indicate that a one-time one standard deviation shock applied to yr_t produced a positive impact on sr_t in both short and long run. More importantly, a one-time one standard deviation

shock applied to kr_t produced a positive impact on sr_t, with the impact magnifying over time. They also show a significant positive impact of kr_t on yr_t. This may be viewed as an evidence in support of our earlier contention that foreign capital may augment domestic saving by augmenting domestic income. It is important to point out that this indirect effect of kr_t on sr_t via yr_t is not captured in a single equation model.

Table 4. Vector Error-correction Results with dsr_t as the Dependent Variable

	Independent variables		
Lag	dyr_t	dkr_t	dsr_t
1	0.017	-0.09	0.39
	(0.28)	(-0.72)	(3.70)*
2	0.06	-0.11	-0.20
	(0.86)	(-0.81)	(-1.98)***
3	0.00	-0.01	0.43
	(0.00)	(-0.07)	(4.64)*
4	0.02	-0.36	-0.31
	(0.32)	(-2.95)*	(-3.08)*
5	-0.05	0.11	0.01
	(-0.80)	(1.00)	(0.15)
EC terms:	v_{1t-1} = 0.006	v_{2t-1} = 0.23	AIC = 30.5 SC = 32.0 R^2 = 0.45
	(1.96)***	(2.26)**	

Notes: Numbers in the parentheses are the t-values. * significant at the one percent level. ** significant at the five percent level. *** significant at the ten percent level.

Impulse response functions show the signs of the dynamic multipliers, but they do not give any indication of their size and magnitude. For this, we must rely on variance decompositions, as presented in Table 5. The table shows that foreign capital inflow have had a delayed, but sharply rising impact on sr_t, the proportion of variance explained by kr_t reaching over 28 percent

Table 5. Decomposition of Variance Error from VECM

Dependent variable	Period	S.E.	Explained by innovation in:		
			yr_t	kr_t	sr_t
sr_t	1	25	6.12	0.30	93.56
	2	42	7.12	0.38	92.50
	3	51	9.84	0.98	89.18
	4	63	12.55	2.17	85.28
	8	84	19.68	11.74	68.58
	12	100	21.88	28.15	49.97
	16	120	23.88	40.34	35.78
	20	140	24.90	49.08	26.02
yr_t	1	45	98.88	1.12	0.00
	2	71	99.51	0.48	0.01
	3	96	97.92	1.50	0.58
	4	118	95.96	2.68	1.36
	8	206	79.78	13.36	6.86
	12	293	69.67	23.90	6.43
	16	388	62.58	33.04	4.38
	20	495	55.92	41.22	2.86
kr_t	1	30	0.00	100.00	0.00
	2	32	0.42	99.58	0.00
	3	33	2.40	97.60	0.00
	4	34	4.78	95.14	0.08
	8	40	7.66	90.78	1.56
	12	45	9.76	88.80	1.44
	16	50	11.53	87.21	1.26
	20	55	12.80	85.98	1.22

Ordering: kr_t, yr_t, sr_t

within three years and over 49 percent within five years. The impact of yr_t on sr_t, on the other hand, has been relatively modest in the beginning, reaching a maximum of about 25 percent. Thus, both the impulse response functions and the variance decompositions show a large and positive impact of kr_t on sr_t. The table also shows, a large and a growing impact of kr_t on yr_t, the proportion of explained variance error approaching over 40 percent. This is in line with our earlier statement about the indirect effect of foreign capital on domestic saving.

The coefficients of the two error-correction terms deserve a special mention. As seen in Table 4, both coefficients of error-correction terms (EC) are statistically significant. It means that the two independent variables (yr_t, kr_t) are related with the dependent variable (sr_t) in the Granger sense through the error-correction terms. Whenever the actual value of sr_t deviates from its long run equilibrium value, a change in yr_t and kr_t helps bring it back to the long term equilibrium value, other things being equal. It is in this sense that error-correction terms provide additional channels of causation. It is worth noting that both coefficients are positive. In a two-variable case, the sign of the EC term is negative for bringing the system back to its long run equilibrium whenever there is a short term deviation from the long run path. However in a three or more variable model, the signs of the EC terms are indeterminate and the feed back effects among the variables ensure the stability of the model (Enders, 1995, p. 380, Rousseau and Wachtel, 1998). To sum, the results from vector error-correction model are strong and consistent, implying a fair degree of robustness.[7]

B. Efficiency Effect of Foreign Capital

As pointed out earlier in the paper, with certain assumptions, foreign capital inflow is expected to generate significant efficiency effect on domestic investment. This efficiency effect can take many forms, a change in incremental output-capital ratio(IOCR) is one of them. For the purpose of this study, we

[7] A pairwise Granger causality test based on the results from the vector-error-correction model, not reported here to conserve space, also indicated a strong uni-directional causation from kr_t to sr_t, further enforcing the robustness of these results.

have defined this variable as the ratio of change in output (dy/y) to investment rate (I/y), where y is real income, dy is change in real income, and I is investment. We have used gross fixed capital formation, taken from International Financial Statistics (IFS), CD-ROM and deflated by the implicit price index, 1995 = 100, as the proxy for real investment. The following equation has been estimated to test the efficiency effect.

$$iocr_t = \beta_0 + \beta_1 krp_t + e_t \qquad (2)$$

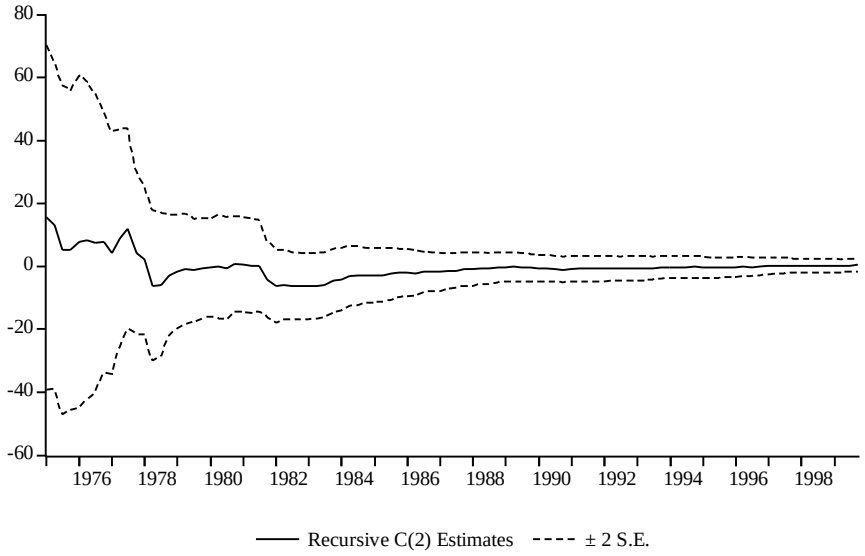
where krp_t is the ratio of total foreign capital inflow to total GDP, both in real terms, and $iocr_t$ is incremental output-capital ratio, as defined above. As shown in Tables 1 and 2, both variables are stationary I(0) according to various unit root tests applied. Accordingly, we estimated equation (2) employing standard regression techniques, without having to worry about the results being spurious. It produced the following results,

$$iocr_t = \underset{(0.85)}{0.05} + \underset{(0.92)}{0.11}\, krp_t, \qquad R^2 = 0.08, \qquad DW = 2.04,$$

with the numbers in the parentheses being the t-values. Judging by the size of the adjusted R^2, the model did not perform well. Also, the coefficient of krp_t, although has the expected sign, it is not found to be statistically significant. From this one can deduce that the impact of foreign capital on the efficiency of investment is not significant. To check the stability of the coefficient, we employed the recursive least squares method. The plot of the coefficient is produced in Figure 3. Looking at the picture, it appears that the coefficient has experienced some improvement, implying that the impact of foreign capital on efficiency of investment has been increasing over time. This equation was also estimated with Almon distributed lag method to capture both the short and the long term impact.

The results not produced here to conserve space, showed that ten out of twelve short run coefficients had a positive sign, but none were statistically significant. Similarly, the long run coefficient had the expected sign, but was not found to be statistically significant. There are several plausible explanations for somewhat muted efficiency effect of foreign capital. First, the impact of

Figure 3. Recursive Behavior of the Coefficient of Foreign Capital



foreign capital on the efficiency of investment is contingent upon certain assumptions about capacity utilization rate, gestation period, and composition of output. A violation of any or all of these assumptions can compromise the expected results. Before drawing any definitive conclusions, therefore, one has to do a thorough study of whether, in fact, some or all of these assumptions were violated. Second, a non-violation of these assumptions does not guarantee a positive efficiency effect of foreign capital inflow. Much will also depend on the quality of management and the kind of technology which accompanies foreign capital. The US being a highly developed country, it is quite likely that foreign capital inflow did not bring any noticeable improvement in either the quality of management or in the level and sophistication of technology.

V. Concluding Remarks

In this paper we set out to investigate the sustainability of the US current account deficit by assessing the impact of capital inflow on the US economy. The results seem to suggest that capital inflow have had a positive effect on the economy both directly by increasing the availability of investible resources

and indirectly by augmenting domestic income and saving. A battery of diagnostic tests was employed to check the validity and robustness of these results. The test on the efficiency effect of foreign capital, though produced positive coefficient, was not found to be statistically significant. There are several plausible explanations, as explained previously. The main implication is that, while achieving current account balance is important, it is equally important to sustain and augment the beneficial impact of capital inflow by creating conducive investment climate. Given our limited ability to influence current account balance, this seems to be a more pragmatic policy option for dealing with the US current account imbalance.

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