10-2010

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Recommended Citation

Lizardo, Radhames A., and Andre Varella Mollick. “The Sustainability of the U.S. Current Account Deficit: Revisiting Mann’s Rule.” Global Economy Journal 9, no. 4 (October 2009): 1850181. https://doi.org/10.2202/1524-5861.1532.

Global Economy Journal

Volume 9, *Issue* 4 2009 *Article* 4

The Sustainability of the U.S. Current Account Deficit: Revisiting Mann's Rule

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The Sustainability of the U.S. Current Account Deficit: Revisiting Mann's Rule

Radhames A. Lizardo and Andre Varella Mollick

Abstract

Using quarterly data from 1973 to 2008, we provide evidence that current account (CA) deficits exceeding 4.2% of GDP ("Mann's rule") do have a significant lowering effect on the U.S. dollar value against major currencies. Controlling for inflation, public debt, and a broad trade weighted index, excessive CA deficits have a negative long-run impact on the USD. Along the transition path, much faster speeds of adjustment to long-run equilibrium are found when current account deficits in excess of Mann's rule are considered: 20% of the deviations from the long-run equilibrium are corrected in a month against 8% or 9% without Mann's rule. This suggests that excessive values of the CA deficit are "priced in" in international foreign exchange markets. Contrary to earlier evidence in favor of CA sustainability, we conjecture that economic conditions have made investors more sensitive to bad news for the U.S. dollar.

KEYWORDS: current account deficits, exchange rates, Mann's rule, U.S. dollar

1. Introduction

The United States dollar (USD) has served as the *numeráire* of the world payments system from 1944 to 1973, when most countries let their currencies float. More recently, even though the USD is still the world's reserve currency and the currency by which important commodities such as gold and oil are priced in international markets, some countries are calling for a change. For instance, China's Central Bank Governor released a paper calling for the IMF to create a super-sovereign reserve currency that is based on shares held by IMF members. These special drawing rights (SDR) would be used to effectively supplant the U.S. dollar as a major reserve currency. (See "China takes aim at Dollar" and "Beijing's call is just the latest to get away from the dollar" in the WSJ, March 24, 2009). In addition, one major factor has been contributing for some time to push the USD down in foreign exchange (FX) markets: due to the large U.S. current account deficits, one view based on the price system sustains that the U.S. dollar has to fall substantially for exports to go up, imports to go down, such that the disequilibrium in the balance of payments gets reduced.

Exporters of commodities priced in U.S. dollars, holders of U.S. financial assets, and trade surplus countries are concerned with the falling value of the U.S. dollar. The main reason is that the purchasing power provided by their exports and the value of their U.S. assets are declining. Prominent economists believe that the U.S. dollar supremacy may fade away unless drastic economic reforms are put in place. For example, Alan Greenspan suggested that the Euro could replace the USD as the world's primary reserve currency (International Herald Tribune, Sept. 17, 2007) and Paul Samuelson and Robert Mundell indicated that persistent trade deficits will precipitate a run against the USD with serious global financial consequences (People's Daily Online, May, 11, 2007).

As Figure 1 shows, the U.S. has run a current account deficit for a long time, and it has been growing lately. Even after the recent significant increase in the USD competitiveness, which has pushed U.S. exports upward about 12% in 2007, the current account deficit is still above Mann (1999)'s benchmark rule of 4.2% of GDP. In fact, the U.S. current account deficit has been above 4.2% of GDP since 2002 for the first time, passing the 6% mark in 2005 but retreating back to 4.7% in 2008. The implication is that the U.S. has been enjoying an ever-increasing standard of living by consuming way more than what it produces.

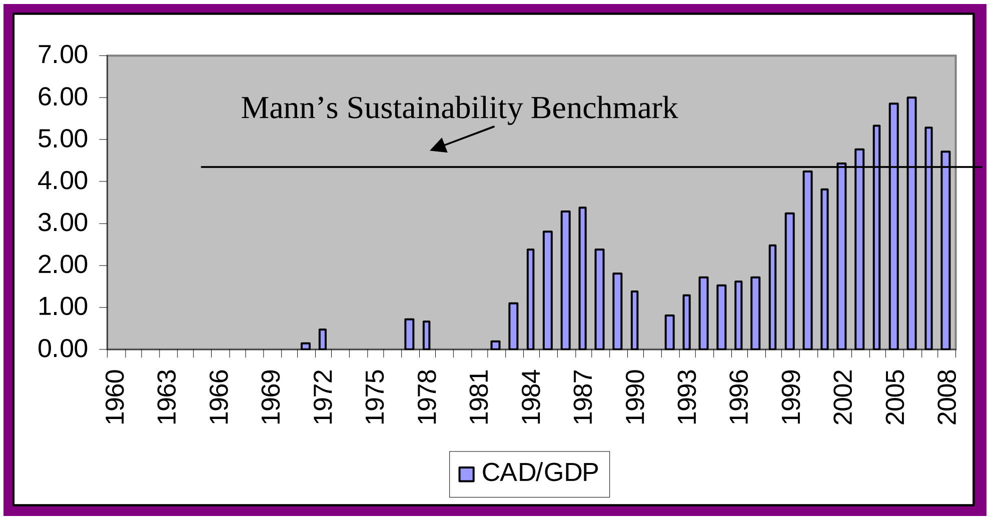
A significant fraction of the American's prosperity is based on borrowing (from abroad) rather than increased production.[1] Figure 2 links the value of the

[1] This view is best illustrated by Feldstein (2008), who believes that the large U.S. trade and current account deficits can not continue indefinitely because doing so would imply a "permanent gift" to the U.S. economy. The process that causes this gift to shrink, and eventually to reverse, is the fall in the USD. Simulations in Mann (2004), however, based on the model in Mann (1999),

USD (the trade weighted exchange rate index against major currencies, an increase means a U.S. dollar appreciation) to current account deficits exceeding 4.2% of GDP, a feature of more recent years.

Figure 1

U.S. current account deficits as a percentage of U.S. GDP.



Notes: Constructed by the authors, using data from International Financial Statistics (IFS) of the International Monetary Fund (IMF), downloaded from http://www.imfstatistics.org.

Former Fed Chairman Greenspan (2000) questioned the sustainability of the growing U.S. trade deficits: "Widening current account deficits require ever larger portfolio and direct foreign investments in the United States, an outcome that cannot continue without limit." Referring to the current account deficits incurred during the 1980s and 1990s and projections for up to 2002, Holman (2001) concluded that the U.S. current account deficits observed in the recent past are sustainable. Even though the deficit for 2000 and the forecasted deficits for 2001 and 2002 all exceeded Mann (1999)'s benchmark of 4.2% of GDP, Holman argued that the 4.2% ceiling is too low for the United States and therefore, current accounts deficits exceeding 4.2% of GDP should be sustainable given the prevailing conditions of the U.S. economy. Christopoulos and León-Ledesma

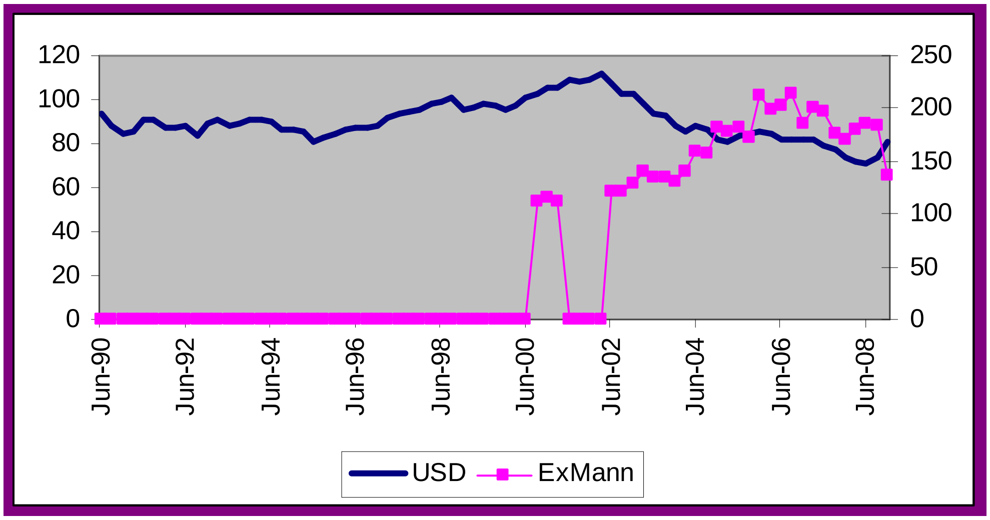
discuss three scenarios and are not very positive for the reversals of this trend. The first is one where the USD does not depreciate, resulting in a CA deficit of 13% of GDP by 2013. The second assumes some dollar depreciation for a sustained period with little improvement in CA. Only the third scenario with a steadily depreciating USD at 10% a year would keep the CA/GDP from widening.

DOI: 10.2202/1524-5861.1532

(2009) allow for nonlinearities on the U.S. current account and conclude in favor of sustainability. Feldstein (2008) has recently argued that the change in the way the current account deficit is being financed has important implications for its sustainability.[2]

Figure 2

Relationship between USD (left scale) and ExMann (right scale) in recent years.



Note. Constructed by the authors, using data from the Federal Reserve Bank of St. Louis, downloaded from http://www.frbstlouis.com

The idea of a threshold level in which effects can be felt (or the trend reversed) is grounded on empirical support. Freund (2005) identified 25 episodes in which there was a sustained improvement in the current account following a

[2] Holman (2001) defines a current account deficit as unsustainable when the deficit (by its own forces) triggers a sharp hike in domestic interest rates, a rapid depreciation of the domestic currency, or some other abrupt domestic or global economic disruption. This view that U.S. CA deficits are sustainable were put forward in the late 1990s when the surge in productivity attracted foreign capital to the U.S. as reviewed in Mann (2002). There are, however, very important changes more recently with the shift of the financing from equity investments to bond purchases. It is now different than in 2000, when the deficit could be deemed "sustainable" because it was being financed by private investors who were attracted by the productivity and profitability of the U.S. economy. The funds are coming into the U.S. now because *foreign governments* are willing to buy amounts of debt that can finance the U.S. current account deficit. Feldstein (2008, p. 115, our italics).

large deficit between 1980 and 1997 and found that a typical current account reversal begins when the current account deficit is about 5% of GDP. See also Obstfeld and Rogoff (2005) for detailed analysis of this view. Holman (2001)'s dismissal of Mann's benchmark applicability to the U.S. economy was not based on empirical evidence. Indeed, it could not have been because no actual current account deficit for the studied period exceeded Mann's benchmark, other than the observations for the year 2000. However, the U.S. current account deficit has consistently exceeded Mann's benchmark more recently. If Mann's rule is to be operative, we can observe at the FX market one of the symptoms coming to pass which can be clearly associated with such current account deficits: a rapid depreciation of the USD against its major trade partners. Figure 2 clearly shows a negative relationship between the value of the USD and current account deficits that exceeds 4.2% of GDP. Our conjecture in this paper is that, controlling for other factors that are known to affect the U.S. currency, the increase in the current account deficit as a percentage of GDP may be signaling to markets that the U.S. dollar will fall.

We find support for this hypothesis in this paper for the U.S. dollar against major currencies controlling for other macroeconomic factors over the 1973-2008 period. We also find that the amount of excessive deficits (defined by Mann's rule) has a stronger impact on the U.S. dollar than simply the current account deficit itself. Our results are very much robust to reverse causation exercises when we explore the possibility that the U.S. dollar does have an impact on the macroeconomic forces. Weak exogeneity tests in vector error-correction models (VECMs) support the notion that the macroeconomic forces in this paper, including excessive current account deficits, have a long-run impact on the U.S. dollar. Besides, the adjustment to equilibrium is relatively fast with about 20% of the deviations adjusted in the following quarter when excessive deficits are present.

2. Methodology

The monetary approach to exchange rates in Rapach and Wohar (2002) conceives the exchange rate as the relative price of two monies, where it becomes a function of the relative money supply and relative real income. No successful exchange rate model exists, however, and the empirical evidence concerning the flexible price model for exchange rate determination is mixed, at best. Several studies find that a naïve random walk model outperforms the flexible price model in predicting exchange rates, which cast further doubt on any particularly model.

As depicted in Figure 1, U.S. current account deficits started to widen to levels close to the Mann's sustainability benchmark in the late 1990s. Consumption in the United States has increased exponentially during the last two decades, arguably fueled by the wealth effect created by the "dot.com" boom of the 1990s and the real estate boom of the 2000s. If a country increases its demand for imports due to consumption boom, basic economic theory predicts that the country's current account deficit should widen and its currency depreciate. The present study applies these insights into the relationship between the U.S. trade deficits and the value of the U.S. dollar as represented by the Major Currencies Trade Weighted Index. Rather than testing the implications of a particular theoretical model of exchange rate behavior, we examine the dynamic relationship between the value of the U.S. dollar and the U.S. current account deficit after controlling for key determinants of currency values. The control variables were selected based on theories from macro and international economics.[3]

The research design herein relies on the fact that the series examined co-move in the long- run and, therefore, cointegrate. If the series have a unit root and are integrated of order one, Johansen (1988)'s cointegration procedure includes a VAR in levels of those time series.[4]

We start with a very simple model, in which information from the current account deficits should affect the value of the U.S. dollar. Of course, such a model is too simple and the following regression model is estimated as a first approach only:

$$\log(USD_t) = \beta_0 + \beta_1 \log(ExMann_t) + \varepsilon_t \qquad \text{(1a)},$$

$$\log(USD_t) = \beta_0 + \beta_1 CAD_t + \varepsilon_t \qquad \text{(1b)},$$

[3] The most widely accepted model of exchange rate determination is perhaps the monetary model, which would imply - under some assumptions - that differences in money supplies and output would determine the value of the currency. See Rapach and Wohar (2002) for recent developments over the very long-run. In this paper we have a multilateral index of the USD, which makes an implementation based on the monetary model not as straightforward as in the bilateral case: there is the aggregation problem associated with creating the composite of foreign money stocks and output levels.

[4] The test statistics for the null hypothesis of no long-run equilibrium relations against the alternative of long-run equilibrium relations or cointegration are the λ_{trace} and λ_{max} statistics as given by: $\lambda_{trace}(r/k) = -T\sum_{i=r+1}^{2}\log(1-\lambda_i)$ and $\lambda_{\max}(r/r+1) = -T\log(1-\lambda_{r+1})$,where: λ_i is an eigenvalue obtained from maximum likelihood estimation of the error correction model, the first-difference transformation of the VAR via reduced rank regression.

where: USD is the value of the U.S. dollar as proxied by the trade weighted exchange rate index of major currencies; ExMann represents the excess of the current account deficit over Mann's rule (4.2% of GDP) in billions of dollars; and CAD is the current account deficit. In (1b), there is no room for a threshold analysis as captured by the excess of current account over some critical level, such as 4.2% of GDP: in (1b) the deficit itself is assumed to impact the U.S. dollar index. We expect $\beta_1 < 0$ if excess of CA deficit over Mann's rule has any correctional impact on the value of the USD in (1a); we also expect $\beta_1 < 0$ in (1b) but it is an entirely empirical matter which of the two specifications provides a better fit. We proceed in several steps adding other macroeconomic factors gradually until estimating the more general specification below:

$$\log(USD_t) = \beta_0 + \beta_1 \log(ExMann_t) + \beta_2 FGD_t + \beta_3 INF_t + \beta_4 \log(TWEXB_t) + \varepsilon_t \qquad \text{(2a)},$$

$$\log(USD_t) = \beta_0 + \beta_1 CAD_t + \beta_2 FGD_t + \beta_3 INF_t + \beta_4 \log(TWEXB_t) + \varepsilon_t \qquad \text{(2b)},$$

where: FGD is the federal government debt as a percent of gross domestic product; INF is the inflation rate; and TWEXB is a broader trade weighted exchange rate index. For robustness purposes we start with (1a) and (1b) and gradually enlarge the model to (2). We therefore expand the simple model above to an augmented model with widely used control variables, such as the federal debt over GDP and inflation with expected negative effects on the USD: β_2, $\beta_3 < 0$. Both factors have been used before in related research by Evans (1986) and both could be capturing fluctuations in money stock as well. Theoretically, federal debt should have negative effects on the USD ($\beta_2 < 0$), as long as that would stimulate aggregate demand and cause interest rates to rise. By uncovered interest rate parity, the U.S. dollar is expected to depreciate further against other currencies to compensate investors for holding higher-paying currency assets. Earlier empirical work by Evans (1986), however, found no support for U.S. budget deficits having an impact on the U.S. dollar, which can be interpreted as Ricardian equivalence. Therefore, the sign on β_2 is in theory ambiguous depending on whether or not individuals are Ricardian. A higher U.S. inflation rate leads to lower demand for U.S. assets and should imply a negative relationship with the USD ($\beta_3 < 0$), although of course reverse causation may be present. Darrat et al. (2003), for example, find that the trade weighted dollar exchange rate is an important casual variable for U.S. inflation. The USD is for practical purposes a subset of the broader index TWEXB and pairwise Granger causality tests confirm bidirectional causality between TWEXB and USD.

Therefore, the broad and the major indices should move in the same direction ($\beta_4 > 0$), although of course both are jointly determined. The β_4-coefficient captures fluctuations of the value of the U.S. dollar against other currencies, whose currencies are not major players in the world financial system. Allowing for these controls, we conjecture that $\beta_1 < 0$ if excess of CA deficit over Mann's rule (or the CA deficit itself) should have any correctional impact on the value of the USD.

In order to further assess whether or not Mann's benchmark is applicable to the U.S. economy it would be helpful to use a semi-logarithmic regression model as given by:

$$\log(USD_t) = \beta_0 + \beta_1 D_t + \varepsilon_t \quad (3),$$

where: D = 1 if the current account deficit exceeds Mann's benchmark (4.2% of GDP) and 0 otherwise. The intercept β_0 gives the mean log value of the *USD* and β_1 gives the difference in the mean log value of the *USD* when the deficit exceeds Mann's benchmark.

We can also first-difference the models above and obtain equations to estimate only short-term variations (Δ is the first-difference operator):

$$\Delta(\log(USD_t)) = \beta_1 \, \Delta(\log(ExMann_t)) + \varepsilon_t \quad (4a),$$

$$\Delta(\log(USD_t)) = \beta_1 \, \Delta(CAD_t)) + \varepsilon_t \quad (4b),$$

The first-difference specifications stand as a robustness check since they are appropriate when the two series are non-stationary but not cointegrated; see Chen and Rogoff (2003). The models above are estimated by both ordinary least squares (OLS) and by the Johansen's multivariate maximum likelihood procedure. Since OLS estimations may be spurious due to heteroscedasticity and autocorrelation, the Newey-West variance-covariance estimator is employed. A battery of unit root tests is conducted to assess whether or not the series are *I*(1) at levels and turn *I*(0) when first differenced. Since the unit root null cannot be rejected in levels, the study proceeds with the Johansen (1988) trace and maximum eigenvalue tests. We wish to assess whether or not deviations of the dependent variable from a linear combination of the predictors are stationary.[5]

[5] One can object to the notion that the current account be non-stationary, on the basis that it should not follow a random-walk. As pointed out by a referee, this would run counter to the central hypothesis in this paper of sustainability caused by the current account deficit being corrected after some time. It may be that the sample period is simply too short to allow for mean reversion. However, if one accepts this standpoint none of the papers using cointegration techniques for the

If two variables are cointegrated, then there must be temporal causality in the Granger sense between them in at least one direction. The direction of Granger causality is confirmed by the sign and magnitude of the speed of adjustments in the VECM. If it is found that the speed of adjustment (represented by α_1) is negative and statistically significant, one would conclude that the direction of causality goes from the predictors to the dependent variable.[6]

3. The Data and Descriptive Statistics

The data are quarterly values of the U.S. dollar (USD) as proxied by the trade weighted exchange rate index of major currencies (TWEXM) from January 1, 1973 to December 31, 2008, which come from the Board of the Governor of the Federal Reserve System, downloaded from the U.S. Federal Reserve of Saint Louis (http://research.stlouisfed.org/fred2). The release is the G.5 "Foreign Exchange Rates." The trade weighted exchange rate index of broad currencies (TWEXB) is from the same release code and source as TWEXM. The federal government debt (FGD) is total public debt (Series ID: GFDEBTN, Release: Treasury Bulletin); the U.S. current account balance (Series ID: BOPBCA, Release: U.S. International Transactions); and the inflation rate (INF, Series ID: CPIAUCNS, Release: Index) are all downloaded from the same source. The ratio CA/GDP is downloaded from DATASTREAM.

Table 1 presents key descriptive statistics of the series used. The mean and median of the value of the USD for the examined period was about 97.7 while the maximum and minimum were 142 and 71 respectively with a standard deviation of about 13. The range (maximum and minimum values) and standard deviation of the predictors are approximately: FGD: 33.4% - 75.4% and 14%; INF: 1% - 14.6% and 3%; TWEXB: 31 – 129 and 32; CAD: 210.19 – 0 and 61.43; and ExMann: 1 – 75 and 16 respectively. It follows that ExMann contains more volatility than CAD since the mean for ExMann is 6.41 and its standard deviation is more than double at 15.82 and the mean for CAD is 51.38 and the standard deviation is only slightly higher at 61.43. Tests of the shape of the distributions indicate that all series are leptokurtic, which implies that these distributions are

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post-Bretton Woods era would be valid because the time span is short. An alternative interpretation is that an even longer period (than the 35 years used in this paper) is needed to yield stationary current account deficits.

[6] In order to gain insight into how the long-run equilibrium is restored, and to test for weak exogeneity of the predictors, VECMs are estimated. If the long-run impact matrix Π in the VECM is less than full rank, it can be decomposed in: $\Pi = \alpha\beta'$, where: α is an n x r matrix of speed of adjustments and β' is an r x n matrix of cointegrating coefficients.

DOI: 10.2202/1524-5861.1532

Table 1. Descriptive statistics.

	USD	FGD	INF	TWEXB	CAD	EXMANN
Mean	97.67	0.513	0.047	76.29	51.380	6.41
Median	96.04	0.567	0.037	72.46	27.990	0.01
Maximum	142.13	0.754	0.146	129.04	210.910	74.91
Minimum	70.88	0.334	0.01	30.90	0.000	0.01
Std. Dev.	13.28	0.136	0.03	31.90	61.432	15.82
Skewness	0.84	-0.29	1.38	0.05	1.225	2.65
Kurtosis	3.98	1.45	4.20	1.59	3.174	9.25
Jarque-Bera P-value	22.88 (0.00)	16.42 (0.00)	54.25 (0.00)	12.05 (0.00)	36.218 (0.00)	403.33 (0.00)

Notes: The total number of (quarterly) observations is 144 from 1973:1 to 2008:4. USD, FGD, INF, TWEXB, CAD and EXMANN denote, respectively, the value of the U.S. dollar as proxied by the trade weighted exchange rate index of major currencies, the federal gross debt as a percent of gross domestic product, inflation, the trade weighted exchange rate index of a broad set of currencies, the U.S. current account deficit, and the excess of the current account deficit over Mann's rule in billion of dollars. P-values for the Jarque-Bera tests are reported below the statistics.

higher or more peaked than the normal distribution. Some of the series are moderately skewed as well. The Jarque-Bera tests reject the null ($p < 0.10$) of underlying normal distribution of these series. Due to the sample size (144 observations) and the implications of the central limit theorem the series are adequate.

4. Empirical Results

Table 2 shows the unit root tests of USD, the U.S. dollar against major currencies, and the predictors. Since some tests are more robust than others, we include the traditional approach of the augmented Dickey and Fuller (1979) tests, the modified ADF test proposed by Elliott et al. (1996), and the KPSS method suggested by Kwiatkowski et al. (1992). Additional information concerning these tests has been included at the bottom of Table 2. As the Table 2 indicates, USD, FGD, INF, TWEXB, CAD and ExMann are clearly non-stationary series in levels. On the other hand, all series, except for FGD are clearly stationary when first differenced. The null that FGD is stationary when first differenced is only supported by KPSS. However, graphical inspection of the behavior of this series at levels and when first differenced reveals that the series is clearly I (1) in agreement with the result given by KPSS. As a result, we proceed with the assumption that all series are I (1). We also find strong support for the existence of a stable long-run relationship among USD, FGD, INF, TWEXB, and ExMann (or CAD) as given by the Johansen (1988) trace and maximum eigenvalue tests. The hypothesis of no cointegration is consistently rejected throughout at conventional significance levels.

Table 3 contains OLS estimations of (1a) and (1b), in which we change the regressor from ExMann to CAD when estimating the β_1-coefficient. When ExMann is used in the first four columns the β_1-coefficient is small (between -0.002 and -0.004) although always statistically significant. The control variables have all the expected signs: federal debt and inflation both have a negative sign and the broad index has a positive effect on USD. In the first four columns, the last two specifications have better properties as verified by the CUSUM and CUSUMSQ recursive estimates, which suggest these are good estimates for forecasting purposes since the coefficients do not vary over time. In the simplest specification (1a), the adjusted R^2 is 0.222; in the broadest one (2a) it is 0.852. There is, however, serial correlation as indicated by the DW statistics. In the next set of columns, CAD is used instead of ExMann and one again estimates a negative β_1-coefficient, although not always statistically significant. The coefficients associated with the macroeconomic control variables are about the same as with ExMann. Overall, one can conclude from Table 3 that ExMann has a stronger effect on the value of the U.S. dollar than simply the current account deficit as captured by CAD. The magnitude of the effect, however, seems to be very small.

Table 4 contains OLS estimations of (4a) and (4b), similar to Chen and Rogoff (2003). In these cases, the explanatory power of the empirical model gets substantially reduced while model specification (as measured by DW) improves. In all cases of Table 4, one can not find a statistically significant impact of either ExMann or CAD on the U.S. dollar. The control variables have their expected values in certain cases, and the value of the broad index tends to move with the major index in a one-to-one fashion.

The problem with the specifications (4a) and (4b) is that it only captures short-term effects as documented by Chen and Rogoff (2003) for commodity currencies. Other than occasional negative coefficients for federal debt and

Table 2. Unit Root Tests.

Series	Trend ?	ADF (k)	DF-GLS (k)	KPSS (4)	Determination
		H_0: Series has a unit root	H_0: Series has a unit root	H_0: Series is stationary	
USD	Yes	-2.40(1)	-2.31(1)	0.14(4)*	*I*(1)
FGD	Yes	-2.50(4)	-2.36(4)	0.44(4)***	*I*(1)
INF	Yes	-2.68(12)	-1.83(12)	0.22(4)***	*I*(1)
TWEXB	Yes	-1.47(1)	-1.54(1)	0.25(4)***	*I*(1)
CAD	Yes	-2.08(12)	0.24(0)	2.24(4)***	*I*(1)
ExMann	Yes	-2.11(1)	-2.03(1)	0.38(4)***	*I*(1)
Δ*(USD)*	No	-8.44(0)***	-2.67(2)***	0.12(4)	*I*(0)
Δ*(FGD)*	No	-1.51(4)	-0.10(4)	0.20(4)	*I*(0)
Δ*(INF)*	No	-4.36(11)***	-1.33(11)	0.06(4)	*I*(0)
Δ*(TWEXB)*	No	-7.49(0)***	-6.34(0)***	0.19(4)	*I*(0)
Δ*(CAD)*	No	-2.51(11)	-10.63(0)***	0.16(4)	*I*(0)
Δ*(ExMann)*	No	-15.65(0)***	-15.18(0)***	0.07(4)	*I*(0)

Notes: Data are of quarterly frequency from 1973:1 to 2008:4. The symbol Δ refers to the first-difference of the original series. We include the deterministic trend only when testing in levels as suggested from graph inspection. ADF(k) refers to the Augmented Dickey-Fuller t-tests for unit roots, in which the null is that the series contains a unit root. The lag length (k) for ADF tests is chosen by the Campbell-Perron data dependent procedure, whose method is usually superior to k chosen by the information criterion, according to Ng and Perron (1995). The method starts with an upper bound, k_{max}=13, on k. If the last included lag is significant, choose k = k_{max}. If not, reduce k by one until the last lag becomes significant (we use the 5% value of the asymptotic normal distribution to assess significance of the last lag). If no lags are significant, then set k = 0. Next to the reported calculated t-value, in parenthesis is the selected lag length. DF-GLS (k) refers to the modified ADF test proposed by Elliott et al. (1996), with the Schwarz Bayesian Information Criterion (BIC) used for lag-length selection. The KPSS test follows Kwiatkowski et al. (1992), in which the null is that the series is stationary and k=4 is the used lag truncation parameter. The symbols * [**] (***) indicate rejection of the null at the 10%, 5%, and 1% levels, respectively.

Table 3. OLS Estimations.

$$log(USD_t)= \beta_0 + \beta_1 ExMann_t + \varepsilon_{it} \quad \textbf{(1a)}$$
$$log(USD_t)= \beta_0 + \beta_1 ExMann_t + \beta_2 FGD_t + \varepsilon_{it} \quad \textbf{(1)}$$
$$log(USD_t)= \beta_0 + \beta_1 ExMann_t + \beta_2 FGD_t + \beta_3 INF_t + \varepsilon_{it} \quad \textbf{(1)}$$
$$log(USD_t)= \beta_0 + \beta_1 ExMann_t + \beta_2 FGD_t + \beta_3 INF_t + \beta_4 log(TWEXB_t)+ \varepsilon_{it} \quad \textbf{(2a)}$$
$$log(USD_t)= \beta_0 + \beta_1 D_t + \varepsilon_{it} \quad \textbf{(3)}$$

	EXMANN				**CAD**				
	(1a)	**(1)**	**(1)**	**(2a)**	**(1b)**	**(1)**	**(1)**	**(2a)**	**(3)**
β_0	4.600*** (0.023)	4.846*** (0.069)	5.311*** (0.104)	4.385*** (0.104)	4.625*** (0.027)	4.858*** (0.071)	5.335*** (0.105)	4.032*** (0.098)	4.602*** (0.024)
β_1	-0.004*** (0.001)	-0.002*** (0.0006)	-0.002*** (0.0004)	-0.002*** (0.0005)	-0.001*** (0.0003)	-0.0003 (0.0003)	-0.0003 (0.0002)	-0.001*** (0.0001)	-0.142*** (0.183)
β_2		-0.505*** (0.119)	-1.113*** (0.144)	-1.809*** (0.183)		-0.526*** (0.126)	-1.137*** (0.145)	-1.939*** (0.160)	
β_3			-3.365*** (0.571)	-2.259*** (0.294)			-3.529*** (0.592)	-2.104*** (0.256)	
β_4				0.292*** (0.043)				0.398*** (0.042)	
Adj.-R^2	0.222	0.452	0.712	0.852	0.218	0.398	0.691	0.889	0.188
D-W	0.111	0.120	0.290	0.366	0.074	0.095	0.268	0.374	0.093
CUSUM	Parameter constancy	Parameter constancy breaks down from mid-80s to 2000	Parameter constancy	Parameter constancy	Parameter constancy	Parameter constancy breaks down after 2003	Parameter constancy	Parameter constancy breaks down in late 1980s	Parameter constancy breaks down after 2006
CUSUMSQ	Parameter constancy breaks down from 2004 to 2007	Parameter constancy breaks down from mid-80s to 2000	Parameter constancy	Parameter constancy	Parameter constancy breaks down from 2004 to 2007	Parameter constancy breaks down in early 1980s and early 2000s	Parameter constancy	Parameter constancy	Parameter constancy

Notes: Data are of quarterly frequency from 1973:1 to 2008:4. Newey-West heteroscedasticity and autocorrelation consistent (HAC) standard errors are reported below the coefficients. The dependent variable is the value of the U.S. dollar as proxied by the trade weighted exchange rate index of major currencies (USD). The independent variables are the federal gross debt as a percent of gross domestic product (FGD), inflation (INF), a broader trade weighted exchange rate index (TWEXB), and the excess of the current account deficit over Mann's rule (ExMann), or the current account deficit (CAD). D is a dummy variable that takes the value of 1 if the deficit exceeds Mann's rule and zero otherwise. The method of estimation is Ordinary Least Squares (OLS). The symbols * [**] (***) attached to the figure indicate rejection of the null hypothesis of zero coefficients at the 10%, 5% and 1% levels respectively.

Table 4. OLS Estimations: First-Differenced Specifications.

$$\Delta(log(USD_t))= \beta_0 + \beta_1\Delta ExMann_t + \varepsilon_{it} \quad \textbf{(4a)}$$
$$\Delta(log(USD_t))= \beta_0 + \beta_1\Delta ExMann_t + \beta_2\Delta FGD_t + \varepsilon_{it} \quad \textbf{(4)}$$
$$\Delta(log(USD_t))= \beta_0 + \beta_1\Delta ExMann_t + \beta_2\Delta FGD_t + \beta_3\Delta INF_t + \varepsilon_{it} \quad \textbf{(4)}$$
$$\Delta(log(USD_t))= \beta_0 + \beta_1\Delta ExMann_t + \beta_2\Delta FGD_t + \beta_3\Delta INF_t + \beta_4\Delta(log(TWEXB_t))+ \varepsilon_{it} \quad \textbf{(4)}$$

	EXMANN				**CAD**			
	(4a)	**(4)**	**(4)**	**(4)**	**(4b)**	**(4)**	**(4)**	**(4)**
β_1	-0.0004 (0.0006)	-0.0004 (0.0006)	-0.0003 (0.0004)	-0.0001 (0.0002)	-0.0005 (0.0005)	-0.0005 (0.0005)	-0.0004 (0.0004)	-0.0002 (0.0002)
β_2		-0.177 (0.610)	-0.601 (0.507)	-0.823*** (0.277)		-0.237 (0.548)	-0.619 (0.487)	-0.837*** (0.265)
β_3			-0.970*** (0.304)	-0.240 (0.155)			-0.922*** (0.288)	-0.214 (0.157)
β_4				1.031*** (0.073)				1.029*** (0.071)
Adj.-R^2	0.002	-0.002	0.058	0.765	0.013	0.011	0.063	0.767
D-W	1.424	1.415	1.546	0.934	1.445	1.439	1.557	1.010
CUSUM	Parameter constancy	Parameter constancy	Parameter constancy breaks down after 1980	Parameter constancy	Parameter constancy	Parameter constancy	Parameter constancy	Parameter constancy breaks down after 1980
CUSUMSQ	Parameter constancy	Parameter constancy breaks down in 2006-2008	Parameter constancy breaks down in 2006-2008	Parameter constancy breaks down in 2005-2008	Parameter constancy	Parameter constancy	Parameter constancy	Parameter constancy breaks down in mid-1980s

Notes: Data are of quarterly frequency from 1973:1 to 2008:4. Newey-West heteroscedasticity and autocorrelation consistent (HAC) standard errors are reported below the coefficients. The dependent variable is the value of the U.S. dollar as proxied by the trade weighted exchange rate index of major currencies (USD). The independent variables are the federal gross debt as a percent of gross domestic product (FGD), inflation (INF), a broader trade weighted exchange rate index (TWEXB), and the excess of the current account deficit over Mann's rule (ExMann), or the current account deficit (CAD). D is a dummy variable that takes the value of 1 if the deficit exceeds Mann's rule and zero otherwise. The method of estimation is Ordinary Least Squares (OLS). The symbols * [**] (***) attached to the figure indicate rejection of the null hypothesis of zero coefficients at the 10%, 5% and 1% levels respectively.

inflation, the effect is about one-to-one between USD and the broader index. If one accepts the I (1) decision on the variables, however, Table 5 shows the cointegrating coefficient estimates for (1a) and some of its variants. In order to verify the effect of the gradual inclusion of (RHS) variables, we incorporate ExMann (or CAD) to the long-run broader vector in the pair of specifications (5d). As can be seen, the cointegrating coefficient estimates of FGD, INF, TWEXB, and ExMann (or CAD) are all in agreement with the theoretical propositions previously stated. They all have the expected signs and are statistically significant at conventional significance levels. The federal government public debt as a percentage of gross domestic product (FGD), inflation (INF), the trade weighted exchange index of broad currencies (TWEXB) and the excess of current account deficits over Mann's rule significantly explains variations in the value of the U.S. dollar.

Column (5d) of Table 5 (the most general model and the one with better diagnostics) suggests strong support for the hypothesis of the value-lowering effect that current account deficits over Mann's rule has on the U.S. dollar. Such finding clearly goes against Holman's proposition that Mann's rule does not apply to the United States based on the robust productivity growth of the U.S. economy in the late 1990s. Deficits in excess of the 4.2% rule suggest a lower USD in the long-run. It may well be that conditions have changed drastically since then, which made foreign investors very sensitive to any bad news for the U.S. dollar. As Feldstein (2008) notes, differently from 2000, the funds are now coming into the U.S. because foreign governments, not private investors, are willing to finance the U.S. current account deficit.

The speeds of adjustment, which are reported on the lower part of Table 5, are all negative and, except for the one reported on column (5b) of Table 5, are statistically significant throughout. The null hypothesis of these speeds of adjustment being zero can be rejected at conventional significance levels. This implies that when deviations from the long-run equilibrium occur it is primarily the value of the U.S. dollar that adjusts to restore long-run equilibrium, rather than the predictors. If the value of the U.S. dollar was higher than expected a priori in the last month, in the current month it would be decreased by 5 to 20 percent to restore the long-run relationship between the performance of the U.S. dollar and the included determinants. The included determinants are (*weakly*) exogenous in the sense of Engle et al. (1983).[7] The other implication is that Granger causality

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[7] Exploring this point in more detail, Table 5 also contains evidence on weak exogeneity based upon the bivariate VECMs as in Rapach and Wohar (2002). Usually 3 or 4 lags are used in these VECMs as determined by lag-exclusion tests on the last lag at the 5% level. At the bottom of Table 5 we report the coefficients on VECMs using USD as dependent variable first and then using each of the other series as dependent variable to check for reverse causation. In all cases the adjustment coefficient is negative and statistically significant when USD is the dependent variable.

DOI: 10.2202/1524-5861.1532

going from the predictors to the predicted variable is supported in two ways: First, in the long-run, the cointegrating coefficients are driving the performance of the U.S. dollar. Second, the temporal deviations from the long-run path are corrected by changes in the value of the U.S. dollar. In summary, this study finds long-run and short-run causation from the predictors to the value of the U.S. dollar.

When one concentrates on columns (5c) and (5d) of Table 5 for the VECM associated with the Johansen estimates, the error-correction term (speed of adjustment) increases in absolute value: from about 9% of the adjustment being corrected in the following month when ExMann is excluded from the model in column (5c), to about 20% of the adjustment being corrected in the following month when ExMann is included in column (5d). Thus, for situations away from the steady-state, a much faster speed of adjustment to long-run equilibrium when current account deficits in excess of Mann's rule are explicitly considered. The corresponding adjustment coefficient is about 17% when CA deficits are used in (5e), which is also higher than the values in (5a)-(5c). Combined, this suggests that excessive values of the CA deficit, as well as the current account deficit, are "priced in" in international FX markets relatively fast.

Tables 3 and 5 therefore provide support for the theoretical economic proposition that widening account deficits in the United States lead to U.S. dollar depreciations. This confirmation lead us to question whether or not Mann's benchmark application to the U.S. economy can be confirmed given the fact that we now have enough observations of current account deficits that exceeds that benchmark. Column (3) in Table 3 shows the estimation of (3). Taking the antilog of 4.602 (the intercept or β_0), we find 99.68, which is the median value of the U.S. dollar when the U.S. current account deficit does not exceed Mann's benchmark of 4.2% of GDP. Taking the antilog of $\beta_0 + \beta_1$ or 4.602 – 0.142 results in 86.48 which is the median value of the U.S. dollar when the U.S. current account deficit exceeds Mann's benchmark. Thus, the value of the U.S. dollar is lowered by about 13.24 percent [(99.68 – 86.48) / 99.68] when Mann's benchmark is exceeded. Consequently, contrary to Holman (2001) proposition that current account deficits in the U.S. above 4.2% of GDP has no significant consequences, this study finds that such levels of current account deficits exert a downward pressure on the value of the U.S. dollar. The policy implication is that in order to stop the declining of the U.S. dollar, policy makers should strive to keep the current account deficit under control.

When the other series are taken as dependent variable the error-correction term is weak and only significant at the 5% level for the equation for the broad index. While this suggests bidirectional effects between the two U.S. dollar indices, even so the coefficient for the equation corresponding to reverse causation is much smaller at -0.007. Overall, the bivariate ECMs are consistent with USD being affected by exogenous forces and it does not suggest strong movements from USD to each of these series separately.

Table 5. Vector ECM Estimations.

$$\log(USD_t)= \beta_0 + \beta_1 FGD_t + \varepsilon_{it} \quad \text{(5a)}$$
$$\log(USD_t)= \beta_0 + \beta_1 FGD_t + \beta_2 INF_t + \varepsilon_{it} \quad \text{(5b)}$$
$$\log(USD_t)= \beta_0 + \beta_1 FGD_t + \beta_2 INF_t + \beta_3 \log(TWEXB_t)+ \varepsilon_{it} \quad \text{(5c)}$$
$$\log(USD_t)= \beta_0 + \beta_1 FGD_t + \beta_2 INF_t + \beta_3 \log(TWEXB_t)+ \beta_4 \log(ExMann_t)+ \varepsilon_{it} \quad \text{(5d)}$$
$$\log(USD_t)= \beta_0 + \beta_1 FGD_t + \beta_2 INF_t + \beta_3 \log(TWEXB_t)+ \beta_4 \log(CAD_t)+ \varepsilon_{it} \quad \text{(5e)}$$

	(5a)	**(5b)**	**(5c)**	**(5d) ExMann**	**(5e) CAD**
β_1	-0.558***	-1.697***	-1.756***	-1.774***	-1.569***
	(0.226)	(0.196)	(0.202)	(0.162)	(0.192)
β_2		-6.483***	-4.533***	-3.740***	-3.946***
		(0.933)	(0.783)	(0.623)	(0.689)
β_3			0.137**	0.220***	0.184**
			(0.070)	(0.063)	(0.078)
β_4				-0.006***	-0.001***
				(0.002)	(0.0003)
Diagnostics					
Lag-Length	4	4	4	3	4
LM-test h = 6	4.48	5.24	6.11	13.99	22.52
[P-value]	[0.35]	[0.81]	[0.98]	[0.96]	[0.61]
Coint. tests vs. critical values	Trace Statistic/C.V	Trace Statistic/C.V	Trace Statistic/C.V	Trace Statistic/C.V	Trace Statistic/C.V
None	18.00<18.40	53.14>29.80**	69.49>47.86**	93.02>76.07**	98.82>69.82**
At most 1	5.27>3.84**	10.44<15.41	24.20<29.79	44.52<47.85	48.65>47.86**
At most 2		0.12<3.76	8.08<15.49	20.77<29.80	25.97<29.80
At most 3			0.10<3.84	8.71<15.50	11.37<15.49
At most 4				0.11<3.84	0.57<3.84
	Max-Eigen	Max.Eigen	Max.Eigen	Max. Eigen	Max. Eigen
None	12.64<17.15	42.71>21.13**	45.29>27.58**	48.49>33.88**	50.16>33.88**
At most 1	5.27>3.84**	10.32<14.26	16.13<21.13	23.80<27.58	22.68<27.58
At most 2		0.12<3.84	7.98<14.26	12.06<21.13	14.60<21.13
At most 3			0.10>3.84	8.69<14.26	10.79<14.26
At most 4				0.11>3.84	0.57>3.84
Speed of adjustment	-0.08***	-0.05	-0.09*	-0.20***	-0.17***
(std. error)	(0.027)	(0.039)	(0.054)	(0.064)	(0.053)
Adj. R^2 in VECM	0.14	0.12	0.13	0.15	0.17
Exogeneity: Speeds of adj. in bivariate VECMs (std. error)	USD↔FGD	USD↔INF	USD↔BROAD	USD↔EXMANN	USD↔CAD
	-0.078***	-0.050***	-0.053***	-0.063***	-0.065***
	(0.027)	(0.019)	(0.021)	(0.023)	(0.023)
	reverse:	reverse:	reverse:	reverse:	reverse:
	-0.005	-0.023	-0.007**	0.013	0.011
	(0.004)	(0.015)	(0.003)	(0.015)	(0.008)

Notes: Data are of quarterly from 1973:1 to 2008:4. Standard errors are reported below the coefficients. The method of estimation is the VECM with three seasonal dummies. In the first-stage the Johansen cointegration method is used and, in the second stage, residuals from the first stage are used in differenced form. The LM t-stat. is a standard Lagrange Multiplier test on the residuals of the regression, calculated under the null hypothesis of no serial correlation. The symbols * [**] (***) attached to the figure indicate rejection of the null hypothesis of zero coefficients at the 10%, 5% and 1% levels, respectively. Bivariate VECMs as in Rapach and Wohar (2002) yield error-correction coefficients upon which weak exogeneity can be inferred. The top coefficient is for USD as dependent variable and the bottom is for the variable listed as the dependent variable.

5. Concluding Remarks

This study finds that current account deficits exceeding 4.2% of GDP do have a significant lowering effect on the value of the U.S. dollar. Using quarterly data from 1973 to 2008, we include several observations of the more recent period in which "excessive" CA deficits were observed. Both long-run and short-run results indicate a very clear causal link: controlling for inflation, public debt, and fluctuations in a broad trade weighted index, excessive CA deficits have a negative long-run impact on the USD. Along the transition path, fast speeds of adjustment to long-run equilibrium are found when current account deficits in excess of Mann's rule are considered with up to 20% corrected in a month. In contrast to Holman (2001), we conjecture that economic conditions have changed drastically more recently, making foreign investors more sensitive to bad news for USD.

As Feldstein (2008) notes, differently from 2000, the funds are now coming into the U.S. because foreign governments, not private investors, are willing to buy amounts of debt that can finance the U.S. CA deficit. The policy implication is that in order to stop the declining of the U.S. dollar and to minimize or eliminate the call from other countries for the IMF to create a super-sovereign reserve currency, policy makers should push for reduction and stabilization of the U.S. current account deficit.

References

Chen, Y. C., and Rogoff, K. 2003. Commodity currencies. *Journal of International Economics* 60, 133-160.

Christopoulos, D., and M. León-Ledesma. 2009. Current account sustainability in the U.S.: What do we really know about it? *Journal of International Money and Finance,* forthcoming.

Darrat, A. F., M. C. Chopin, and C. Topuz, 2003. Is U.S. inflation low because the dollar value is high? Some short- and long run evidence. *Applied Financial Economics* 13, 237-243.

Dickey, D., and Fuller, W. 1979. Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association* 74, 427-431.

Elliot, G., Rothenberg, T.J., and Stock, J.H. 1996. Efficient tests for autoregressive unit root. *Econometrica* 64, 813-836.

Engle, R.F., Hendry, D.F., and Richard, J-F. 1983. Exogeneity. *Econometrica* 51, 277-304.

Evans, P. 1986. Is the Dollar high because of large budget deficits? *Journal of Monetary Economics* 18, 227-249.

Feldstein, M. 2008. Resolving the global imbalance: The dollar and the U.S. saving rate. *Journal of Economic Perspectives* 22 (3), 113-125.

Freund, C., 2005. Current account adjustment in industrial countries. *Journal of International Money and Finance* 24, 1278-1298.

Greenspan, Alan. 2000. The Federal Reserve's Semiannual Report on the economy and monetary policy: Testimony before the Committee on Banking and Financial Services, U.S. House of Rep., Feb 17.

Holman, J. 2001. Is the large U.S. current account deficit sustainable? *Federal Reserve Bank of Kansas City Economic Review*, First Quarter: 5-23.

International Herald Tribune, September 17, 2007. Retrieved on 8/12/2008 from: http://www.iht.com/articles/ap/2007/09/17/business/EU-FIN-MKT-Germany-Greenspan-Euro.php

Johansen, S., 1988. Statistical analysis of cointegrating vectors. *Journal of Economic Dynamics and Control* 12, 231-254.

Kwiatkowski, D., Phillips, P., Schmidt, P., and Shin, Y. 1992. Testing the null hypothesis of stationarity against the alternative of a unit root: How sure are we that economic series have a unit root? *Journal of Econometrics* 54, 159-178.

Mann, C. L. 2004. Managing exchange rates: Achievement of global re-balancing or evidence of global dependency? *Business Economics* July, 20-29.

Mann, C. L. 2002. Perspectives on the U.S. current account deficit and sustainability. *Journal of Economic Perspectives* 16 (3), 131-152.

Mann, C. L. 1999. Is the U.S. trade deficit sustainable? Washington: Institute for Int. Economics.

Obstfeld, M., and Rogoff, K. 2005. Global current account imbalances and exchange rate adjustments. *Brookings Papers on Economic Activity* 1:2005, 67-146.

People's Daily Online. Retrieved on 8/12/2008 from http://english.people.com.cn/

Rapach, D., and Wohar, M.E. 2002. Testing the monetary model of exchange rate determination: New evidence from a century of data. *Journal of International Economics* 58, 359-385.

The Wall Street Journal, various issues.