The Effects of Budget Deficit Reduction on the Exchange Rate

By Craig S. Hakkio

Public sector debt in the industrialized world has increased dramatically over the last 15 years. From 1980 to 1994, government debt rose from 37 percent of GDP to 63 percent in the United States, and from 41 percent to 70 percent in the major industrialized countries. At the June 1996 Economic Summit in Lyon, France, leaders of the seven major industrialized democracies discussed the problems posed by large budget deficits and debt, as well as the potential benefits of regaining fiscal balance. The G-7 leaders agreed that while economic fundamentals in their countries are sound, investment growth, income growth, and job creation all depend on enacting credible fiscal consolidation programs and successful anti-inflationary policies.

While there is general agreement that cutting budget deficits and debt will lower interest rates, debate persists over the effects on a country's exchange rate. At the August 1995 Jackson Hole symposium on "Budget Deficits and Debt: Issues and Options" sponsored by the Federal Reserve Bank of Kansas City, some participants argued the exchange rate would be strengthened by deficit reduction, while others argued it would be weakened. Unfortunately, the evidence on the relationship between budget deficits and the exchange rate does not readily resolve the debate. In the early 1980s, the rising U.S. budget deficit was associated with dollar appreciation, while in the 1990s rising deficits in Finland, Italy, and Sweden were associated with currency depreciation.

This article analyzes the effects of budget deficit reduction on a country's exchange rate. The first section shows the evidence on the relationship between budget deficits and exchange rates is not clear-cut and explains why the theory that underlies the relationship is ambiguous. To sort out the ambiguity, the second section provides new empirical results indicating that deficit reduction through tax increases tends to weaken the exchange rate of countries with good records on inflation and debt, while deficit reduction through spending cuts tends to strengthen the exchange rate of countries with poor records on inflation and debt.

DEFICIT REDUCTION AND EXCHANGE RATES: EVIDENCE AND THEORY

The relationship between deficit reduction and exchange rates has caused a debate among the

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world's most respected monetary policymakers and analysts. Federal Reserve Board Chairman Greenspan and Governor Thiessen of the Bank of Canada have argued that deficit reduction could lead to currency appreciation, while professors Martin Feldstein and Paul Krugman contend that deficit reduction would lead to currency depreciation.[1] This debate over the relationship between deficit reduction and exchange rates arises both because the evidence is not clear-cut and the theory is ambiguous. The evidence shows that deficit reduction has sometimes been associated with a stronger exchange rate and sometimes with a weaker exchange rate. The theory is ambiguous because deficit reduction has several different effects on the exchange rate. Some effects tend to increase the exchange rate, while other effects tend to decrease the exchange rate.

The evidence

The evidence shows the empirical relationship between deficit reduction and exchange rates is not clear-cut. Charts 1 and 2 show that deficit reduction leads to a weaker exchange rate in some countries and a stronger exchange rate in other countries. Chart 1 plots the government budget deficit as a share of GDP and the real trade-weighted exchange rate index for the United States and Germany from 1979 to 1995. The solid line shows the regression line relating the exchange rate to the budget deficit. While the relationship is not perfect, the upward sloping regression line suggests that both the dollar and the mark generally rise with an increase in the budget deficit. The slope of the regression lines is 3.6 for the United States and 0.5 for Germany.[2] Thus, the evidence from both the United States and Germany suggests that a positive relationship exists between budget deficits and exchange rates.

In contrast, the downward sloping regression line in Chart 2 shows that the Finnish markka and Swedish krona generally fall with increases in the budget deficit. The slope of the regression line is -2.4 for Finland and -0.8 for Sweden.[3] Thus, the evidence from Finland and Sweden suggests that a negative relationship exists between budget deficits and exchange rates.

The evidence on the relationship between budget deficits and exchange rates also gives mixed signals when looking at a single country over time. Chart 3 plots the U.S. budget deficit as a share of GDP and the real trade-weighted dollar exchange rate index from 1973 to 1995. During the early 1980s, the dollar rose with the budget deficit. From 1989 to 1993, however, the dollar and budget deficit moved in opposite directions. Since 1993, the dollar and budget deficit have once again moved in the same direction.

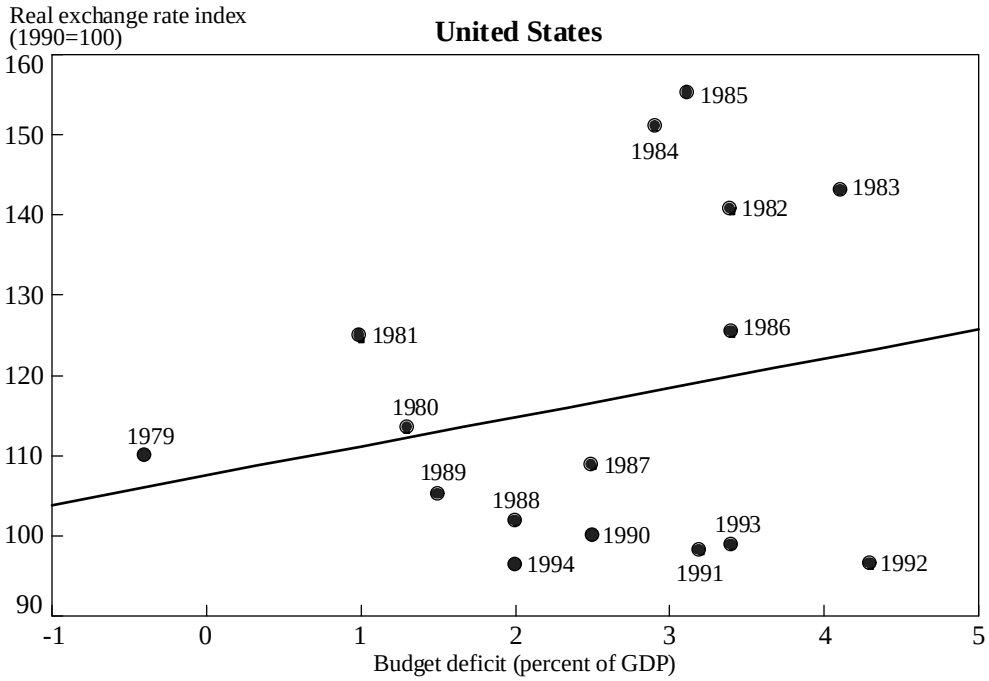
The theory

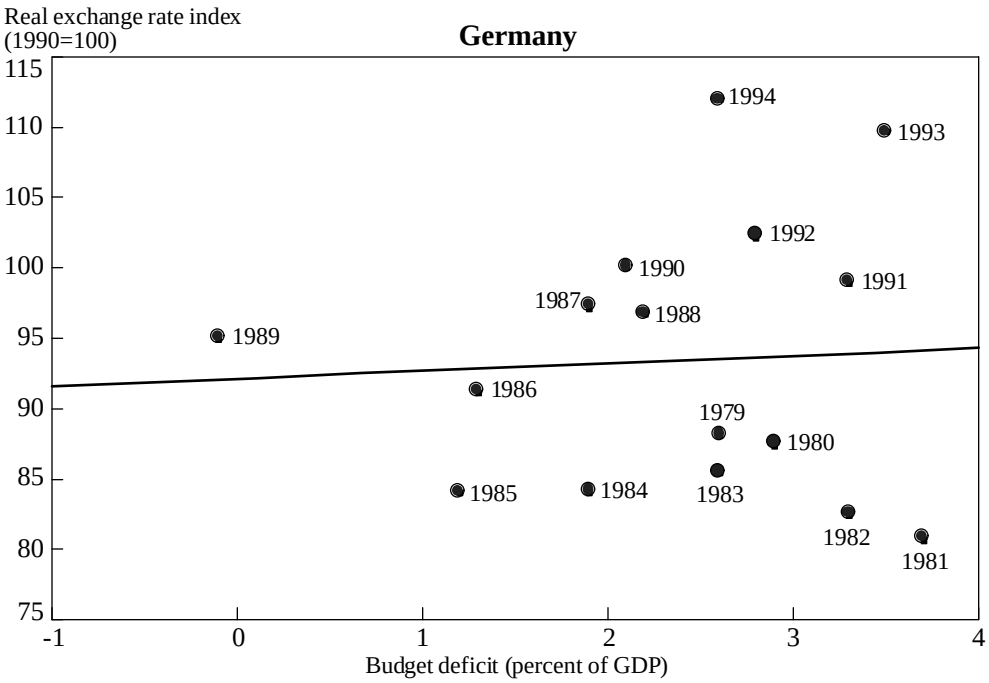
It is not surprising that the empirical relationship between deficit reduction and the exchange rate is unclear because the theoretical relationship is ambiguous. Deficit reduction has several different effects on the exchange rate, with some effects leading to a stronger exchange rate and other effects leading to a weaker exchange rate. This section examines the direct and indirect effects of deficit reduction on the demand for loanable funds which, in turn, can lead to different effects on the exchange rate.

Deficit reduction can lead to a weaker exchange rate. Deficit reduction *directly* affects interest rates and exchange rates because it reduces the demand for loanable funds. When the government runs a budget deficit, it generally enters financial markets and borrows funds to pay for the excess of spending over taxes. If the budget deficit falls, therefore, the government needs to borrow less, causing the demand for funds and thus domestic interest rates to decline.[4]

Chart 1

A POSITIVE RELATIONSHIP BETWEEN BUDGET DEFICITS AND THE REAL EXCHANGE RATE

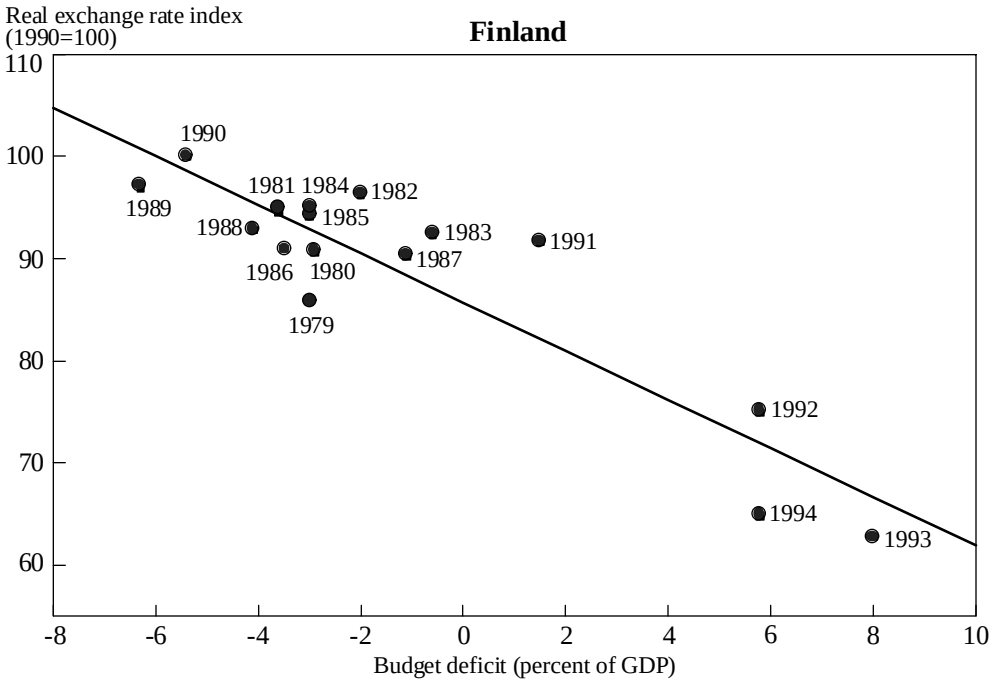


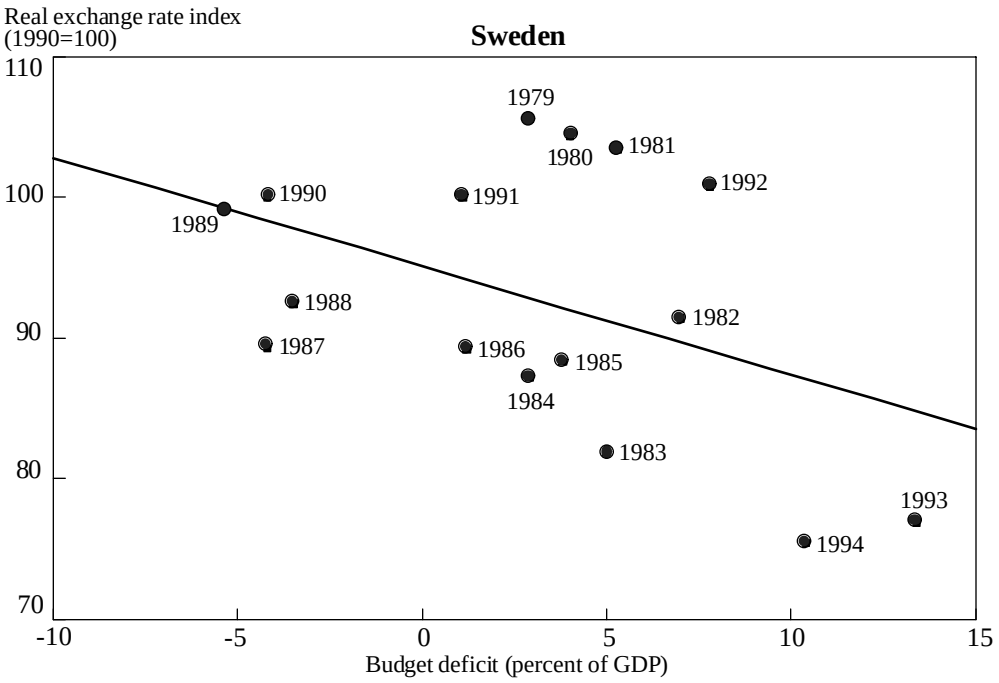


Source: *OECD Economic Outlook* (budget deficit) and *International Financial Statistics* (real exchange rate).

Chart 2

A NEGATIVE RELATIONSHIP BETWEEN BUDGET DEFICITS AND THE REAL EXCHANGE RATE

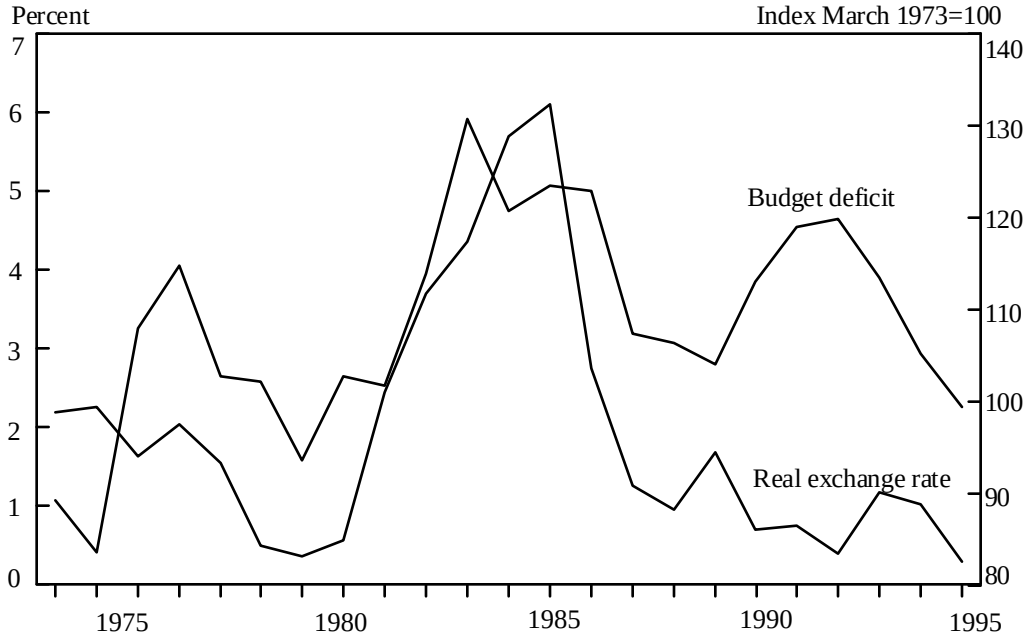




Source: *OECD Economic Outlook* (budget deficit) and *International Financial Statistics* (real exchange rate).

Chart 3

A POSITIVE AND NEGATIVE RELATIONSHIP BETWEEN THE U.S. BUDGET DEFICIT AND THE REAL EXCHANGE RATE



Source: *International Financial Statistics.*

As interest rates decline, so does the exchange rate. When domestic assets pay lower returns, investors tend to sell lower yielding domestic securities and buy higher yielding foreign securities. The decreased demand for domestic assets and increased demand for foreign assets both affect the market for foreign currency. When an investor wants to sell a domestic security and buy a foreign security, he does not actually exchange a domestic security for a foreign security. Rather, the investor sells the domestic security for domestic currency, uses the domestic currency to buy foreign currency, and finally uses the foreign currency to buy the foreign security. The middle transaction—selling domestic currency and buying foreign currency—causes the exchange rate to depreciate. In other words, a fall in interest rates reduces the demand for the domestic currency in the market for foreign exchange, causing the exchange rate to depreciate.

Deficit reduction can lead to a stronger exchange rate. While deficit reduction leads directly to a decrease in the demand for funds by the government, it may also *indirectly* lead to an increase in the demand for funds by private investors. The increase in the demand for funds may be brought about by one of three effects, (1) lower expected inflation, (2) lower foreign exchange risk premium, and (3) greater expected rate of return on domestic securities. These indirect effects induce private investors to increase their demand for domestic securities

relative to foreign securities. As investors switch from foreign to domestic securities, the exchange rate would tend to rise.

First, deficit reduction might reduce expected inflation. Since some governments finance their budget deficits simply by printing money, or having the deficit "monetized" by the monetary authority, many analysts believe that a projected string of budget deficits eventually leads to higher inflation. Therefore, if a country reduces its budget deficit, long-term inflation expectations could decline. As Chairman Greenspan (1995, p. 141) put it, "Many of us who are central bankers expect that a substantial reduction in the long-term prospective deficit of the United States will significantly lower very long-term inflation expectations vis-a-vis other countries." In other words, reducing future budget deficits may reduce investor fears that the deficit will eventually be monetized.

A fall in long-term inflation expectations could have different effects on the exchange rate. A fall in expected inflation could reduce the inflation premium in long-term interest rates, thereby reducing long-term rates. And since a fall in long-term interest rates would reduce the attractiveness of U.S. securities, the exchange rate would tend to fall. But the tendency for the exchange rate to fall may be partly offset. Typically, long-term interest rates do not fall one-for-one with decreases in expected inflation. For example, if expected inflation falls 100 basis points, the nominal long-term interest rate may fall only 80 basis points. In such a case, the real, or inflation adjusted, interest rate would rise by 20 basis points. Therefore, since the real interest rate typically rises when expected inflation falls, the increased attractiveness of U.S. securities could cause the exchange rate to rise. Which of these two offsetting effects of falling long-term inflation expectations has a greater effect on the exchange rate is an empirical question. Most analysts believe lower expected inflation causes the exchange rate to rise (Mishkin, p. 487). Simply put, they believe that reducing expected inflation increases investor confidence in monetary policy, which ultimately leads to a stronger exchange rate.

Second, deficit reduction might reduce the riskiness of domestic securities relative to foreign securities. Just as interest rates contain an inflation premium to compensate for expected inflation, domestic interest rates also contain a foreign exchange risk premium to compensate for the riskiness of domestic securities relative to foreign securities. According to one theory of the determinants of exchange rates, the foreign exchange risk premium depends on the relative stock of domestically issued debt (Melvin, pp. 166-67). When the budget deficit falls, government borrowing falls, reducing the stock of domestic government securities, which in turn causes the foreign exchange risk premium to fall. When the foreign exchange risk premium falls, the demand for domestic securities rises and the currency strengthens. Simply put, as long as investors want to hold a diversified portfolio of domestic and foreign securities, a reduction in the stock of domestically issued debt causes investors to rebalance their portfolio by bidding for domestic securities, thereby bidding up the exchange rate.

Deficit reduction could also lower the foreign exchange risk premium by diminishing the probability of default. While default is unlikely for most industrial countries, even a remote chance of a default could still affect the demand for domestic securities. Moreover, even if a country does not default literally, it could impose restrictions on capital mobility by preventing capital outflows, or it could impose taxes on interest income or financial wealth. By reducing such deterrents to investment, deficit reduction increases the demand for domestic securities, leading to an appreciation of the exchange rate.

Third, deficit reduction may increase the expected return on domestic assets. Deficit reduction can be achieved by cutting government spending or increasing tax rates. The way the government chooses to use these tools may have important effects on the expected rate of return of domestic assets, thereby leading to changes in the demand for domestic assets and in turn to changes in the exchange rate.

By cutting government spending, deficit reduction shifts resources from the government sector to the private sector. Consequently, productivity and long-run potential economic growth could increase. In addition, if deficit reduction is accompanied by a shift in spending from public and private consumption to investment, productivity and long-run potential economic growth could again increase. The U.S. Congressional Budget Office (August 1995) estimates that balancing the budget by 2002 could increase growth 0.1 percentage point per year. While this increase may seem small, it would amount to about a 0.5 percentage point increase in GDP by 2002. As a result of faster long-run potential growth and productivity, the expected return on domestic assets could also increase, thereby leading to greater demand for U.S. assets and hence a stronger exchange rate.

The expected return on domestic assets could increase for yet another reason. All government spending must be paid for—either by raising taxes today or by running a budget deficit and borrowing the money from the public. However, by running a budget deficit, the government must eventually raise taxes to make interest payments in the future. That is, more government spending today means higher taxes—either today or in the future.

Accordingly, deficit reduction could lead to lower taxes—either today or in the future. Feldstein (1995a, p. 407) estimates that if the United States had run a balanced budget since 1980, marginal tax rates could have been reduced from the current 31 percent to 22 percent. And with lower marginal tax rates, the after-tax rate of return on domestic assets would increase, leading to a stronger exchange rate.[5] Moreover, since marginal tax rates distort incentives, reducing marginal tax rates would also reduce inefficiencies.[6] Again, with a more efficient economy, the expected return to domestic assets could increase, thereby leading to an increased demand for U.S. assets and hence a stronger exchange rate.

What determines the relative size of the effects?

Since policymakers want to know whether deficit reduction will cause their currency to rise or fall, it is necessary to know the relative size of these different effects. In other words, when do the indirect effects, which increase the exchange rate, dominate the direct effect, which decreases the exchange rate?

The indirect effects are more likely to dominate the direct effect if deficit reduction is credible, long term, and sustainable. Only in this case is deficit reduction likely to have an important effect on expected inflation, the risk premium, and the expected rate of return on domestic securities. Thus, deficit reduction that is credible, long term, and sustainable will lead private investors to increase their holding of domestic securities, thereby leading to a stronger exchange rate.

The indirect effects are also likely to dominate the direct effect when the risk of monetization is large, the risk of default is large, or the expected return on domestic assets increases significantly. These conditions are likely to hold for three reasons. The risk of monetization is greater for a country with a high rate of inflation because the country has shown a willingness to

tolerate a high rate of inflation. The risk of default rises with the level of debt. The expected return on domestic assets increases when the deficit is cut significantly by reducing a high level of government spending. Unfortunately, it is not easy to determine when these effects are large.

So, which effects dominate? No answer is possible without first defining such terms such as "credible," "long term," "sustainable," and "large." Empirical analysis is needed to give policymakers some practical definitions.

DEFICIT REDUCTION AND EXCHANGE RATES: SORTING OUT THE RELATIONSHIP

A systematic study of the data can help determine when deficit reduction leads to a stronger exchange rate and when it leads to a weaker exchange rate. This section discusses an International Monetary Fund (IMF) study of episodes of deficit reduction, which focused on the success or failure of such episodes. The results suggest that large reductions in the budget deficit, coming through spending cuts, are associated with stronger exchange rates.

This section also presents a new empirical model developed to isolate the contributions of the direct and indirect effects of deficit reduction. The results of the model suggest that a country can increase its exchange rate by reducing its budget deficit through spending cuts when inflation is high and government debt is large because deficit reduction reduces the risk of monetization and default.

The IMF study

The IMF recently studied 62 episodes of "fiscal consolidation" by industrial countries over the last 25 years.[7] Rather than study the effects on the exchange rate, the IMF study focused on the factors that led to significant falls in gross public debt as a share of GDP. If gross public debt as a share of GDP fell by at least three percentage points by the second year after the end of a fiscal tightening, the IMF said the episode was "successful." The authors found that the real exchange rate rose 5.4 percent on average in the 14 successful episodes of fiscal consolidation, while the real exchange rate fell 0.8 percent in the 48 unsuccessful cases. Therefore, by studying the determinants of successful episodes of fiscal consolidation, some clues can be gleaned about when deficit reduction leads to a stronger exchange rate.

The IMF study noted that the average size of the two-year fiscal contraction was larger in successful episodes than in unsuccessful episodes—4.0 percent of potential GDP versus 3.2 percent. According to the authors,

> A more timid commitment to fiscal consolidation may be more likely to fail than a strong one. This may be partly due to a nonlinear relationship between fiscal policy and output growth, whereby small reductions in budget deficits may reduce aggregate demand, while large adjustments may revive confidence and expectations so that growth is given a boost (IMF, p. 59).

In other words, if large fiscal contractions are viewed as credible, long term, and sustainable, the increase in demand by private investors dominates the decrease in demand by the government, so the exchange rate appreciates.

The IMF study also found that reducing the budget deficit by cutting spending was typically associated with successful episodes of fiscal consolidation. The study divided the episodes of fiscal contraction into cases in which at least 60 percent of the deficit reduction came from revenue increases and cases in which at least 60

Table 1

THE SUCCESS OR FAILURE OF FISCAL CONSOLIDATION

(Percent)

	Revenue increases	Expenditure cuts
Successful	16	41
Unsuccessful	84	59
Total	100	100

Note: There were 37 episodes where revenues increased and 17 episodes where expenditures decreased. For eight of the 62 episodes of fiscal contraction, the reduction in the budget deficit was split about equally between revenue increases and expenditure cuts.

Source: *World Economic Outlook*, IMF, Table 13, p. 61.

percent came from expenditure cuts. Table 1 shows that of the cases where the fiscal contraction came primarily from expenditure cuts, 41 percent were successful and 59 percent were unsuccessful. In contrast, of the cases that came primarily from revenue increases, 16 percent were successful and 84 percent were unsuccessful. One can conclude that the success or failure of the fiscal package depends on whether deficit reduction came primarily from reducing spending or raising taxes.[8]

In addition, the IMF study found that average expenditure cuts were 3-3/4 percent of GDP for the successful episodes versus only 2 percent for the unsuccessful episodes. This finding is consistent with the fact that fiscal consolidation that occurs through significant cuts in spending, rather than increases in taxes, leads to greater productivity, higher long-run potential growth, and lower marginal tax rates. All three of these effects, in turn, lead to an increase in the after-tax real rate of return and an appreciating exchange rate.

The empirical model

An empirical model can be developed to more systematically study the effects of deficit reduction and to separate the direct from the indirect effects. The following equation relates the real exchange rate to the budget deficit:

$$\begin{aligned} \textit{real exchange rate} &= \alpha + \\ &\beta\,[\textit{budget deficit as a share of GDP}] \\ &+ \textit{error term.} \end{aligned} \tag{1}$$

The sign and magnitude of β show whether the exchange rate increases or decreases following a change in the budget deficit. If β is positive, then an increase in the budget deficit leads to currency appreciation, and a decrease in the deficit leads to currency depreciation. Similarly, if β is negative, an increase in the budget deficit leads to currency depreciation, and a decrease in the deficit leads to currency appreciation. In other words, a positive β means deficit reduction weakens the currency,

while a negative β means deficit reduction strengthens the currency.

The actual estimated model differs from equation 1 in three ways. First, other variables are included that capture the dynamic effects of time and interest rate differentials. A time trend is included to capture any long-run movements in the real exchange rate. The long-term interest rate differential is included because it is an important determinant of exchange rate movements. And, a lagged value of the real exchange rate is included to capture short-run dynamics in the adjustment process. Second, the model is estimated using annual data for 18 OECD countries from 1979 to 1994 (Appendix B). By using data from many countries over many years, the model can yield more precise estimates of the direct and indirect effects of deficit reduction.

The third, and most important, modification involves redefining β in equation 1 to separate the direct and indirect effects of deficit reduction. The indirect effects of deficit reduction are captured by including proxies that measure the expected inflation, risk premium, and expected rate of return effects.

Incorporating these three modifications leads to the following equation (Appendix A):

$$\begin{aligned} \textit{real exchange rate} = \alpha &+ \beta_{0i}\,[\textit{direct effect}] \\ &+ \beta_1\,[\textit{expected inflation effect}] \\ &+ \beta_2\,[\textit{risk premium effect}] \\ &+ \beta_3[\textit{expected rate or return effect}] \\ &+ \textit{other variables} \\ &+ \textit{error term} \qquad (2) \end{aligned}$$

As shown in the equation, four different β's are estimated for each country. The specific proxies used to measure the direct and indirect effects are discussed with the results.

Results

Model estimates can be used to answer two questions. Are the direct and indirect effects significant in explaining how deficit reduction affects the exchange rate? And, for each country in the sample, how much would the exchange rate change if the country reduced its budget deficit?

The results in Table 2 can be used to answer both questions. The answer to the first question depends on the sign and statistical significance of the parameter estimates.

The direct effect of deficit reduction is estimated by the coefficient β_0. Since the direct effect of deficit reduction leads to a weaker exchange rate, economic theory suggests that β_0 should be positive. The direct effect is estimated as the coefficient on the difference between the budget deficit as a share of GDP and the OECD average budget deficit as a share of GDP. The reason for using the difference between the budget deficit and the OECD average is that theory suggests the direct effect of deficit reduction for a single country leads to a weaker exchange rate. But, if all countries cut their budget deficits, it is not possible for all exchange rates to fall. Thus, the model imposes the restriction that if all countries cut their budget deficits, there is no effect on the exchange rate.

In Table 2, a separate β_0 is estimated for each country. The results provide mixed evidence on the theory since 13 of the estimates are negative and five are positive. However, only seven of the estimates are *significantly* negative. While these results are troubling, they are not sufficient to totally reject the model. The result may simply reflect the fact that some important determinants of the exchange rate were excluded from the model. If true, then the direct effect may be picking up the influence of these excluded variables.[9]

Table 2

PARAMETER ESTIMATES OF β

Variable	Coefficient
Indirect effects	
Expected inflation effect	**-.064**
Risk premium effect	**-.018**
Expected rate of return effect	**.326**

Variable	Coefficient	Variable	Coefficient
Direct effect			
United States	-.653	**Belgium**	**-.474**
Japan	**2.787**	**Sweden**	**-.912**
Germany	**-1.608**	**Austria**	**.905**
France	-.306	Denmark	-.076
Italy	**1.169**	**Finland**	**-2.815**
United Kingdom	.232	Greece	-.006
Canada	-.344	**Portugal**	**.326**
Spain	**-1.714**	**Norway**	**-.445**
Netherlands	**-.580**	Australia	-2.224

Note: Variables and coefficients in bold are significant at the 10 percent level.

The expected inflation effect is estimated by the coefficient β_1. In the model, if country i's inflation rate is high, investors may believe that country *i's* monetary authority is more likely to monetize its budget deficit than if the inflation rate were low. Accordingly, by reducing its budget deficit, and thus the risk of monetization, country *i's* exchange rate may appreciate. For this reason, the proxy used to measure the expected inflation effect is country i's inflation rate relative to the average OECD inflation rate. Since deficit reduction—operating through the expected inflation effect—leads to a stronger exchange rate, economic theory suggests β_1 should be negative. Although β_1 is constrained to be equal for all currencies, the expected inflation effect is allowed to be different for each country because the inflation rate differential is different for each country.

As predicted, the expected inflation effect is negative and significant. The coefficient, however, is small. For example, suppose a country's inflation rate is ten percentage points greater than the average OECD rate. Then, a one percentage point fall in the budget deficit as a share of GDP would cause the real exchange rate index to rise 0.64 points—or about two-thirds of 1 percent.

The risk premium effect is estimated by the coefficient β_2. The proxy used to measure the risk premium effect is the stock of government debt (as a percent of GDP) relative to the OECD average. That is, if debt is high, then the risk of default is greater. Consequently, by reducing its budget deficit, the risk of default—or the risk premium—falls, causing the exchange rate to rise. Since deficit reduction—operating through

the risk premium effect—leads to an increase in the exchange rate, economic theory suggests β_2 should be negative. Although β_2 is constrained to be equal for all currencies, the risk premium effect is allowed to be different for each country because the risk premium is different for each country.

As predicted, the risk premium effect is negative and significant. However, again the effect is small. If a country's ratio of debt to GDP is ten percentage points greater than the OECD average—that is, if the risk premium is large—then reducing the budget deficit by one percentage point of GDP would increase the exchange rate by 0.18 point, or about one-fifth of 1 percent.

The expected rate of return effect is estimated by the coefficient β_3. Governments can cut their budget deficit by cutting government spending or by raising taxes. The previous theory suggests that cutting the budget deficit by cutting government spending would tend to increase the expected rate of return and lead to a stronger exchange rate. For this reason, the proxy used to measure the expected rate of return effect is the change in government spending (as a share of GDP). Since a reduction in the budget deficit accompanied by a reduction in government spending leads to a stronger exchange rate, β_3 should be positive.

As predicted, the expected rate of return effect is positive and significant. Moreover, the effect appears to be similar in size to the expected inflation and risk premium effect. If a country cuts its budget deficit by one percentage point of GDP through reducing government spending by one percentage point of GDP, the model predicts the exchange rate would rise by 0.33 point, or about one-third of 1 percent.

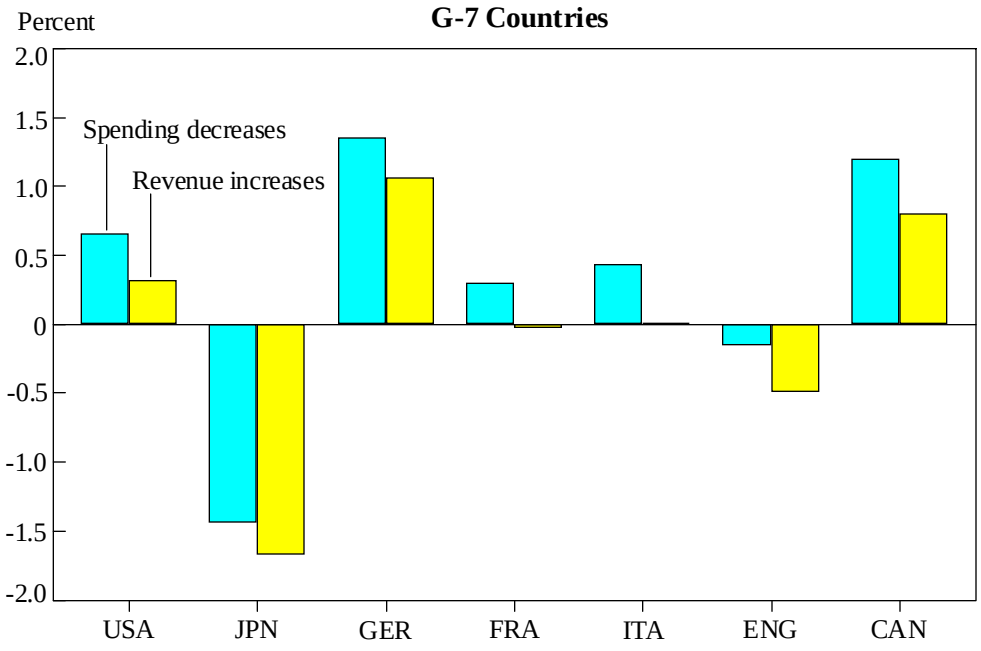
The model also provides answers to the second question: For each country in the sample, how much would the exchange rate change if the country reduced its budget deficit? The answer to this question is given in Chart 4, which shows the effect of deficit reduction on each country's exchange rate. The top panel shows the results for the G7 countries and the bottom panel shows the results for the other countries. The bars show the percent change in the real exchange rate from reducing the budget deficit as a share of GDP by one percentage point. The left bar assumes government spending is cut by one percentage point of GDP; the right bar assumes government revenue is increased by one percentage point of GDP.[10] To calculate the expected inflation and risk premium effects, data on inflation and debt from 1994 were used.[11]

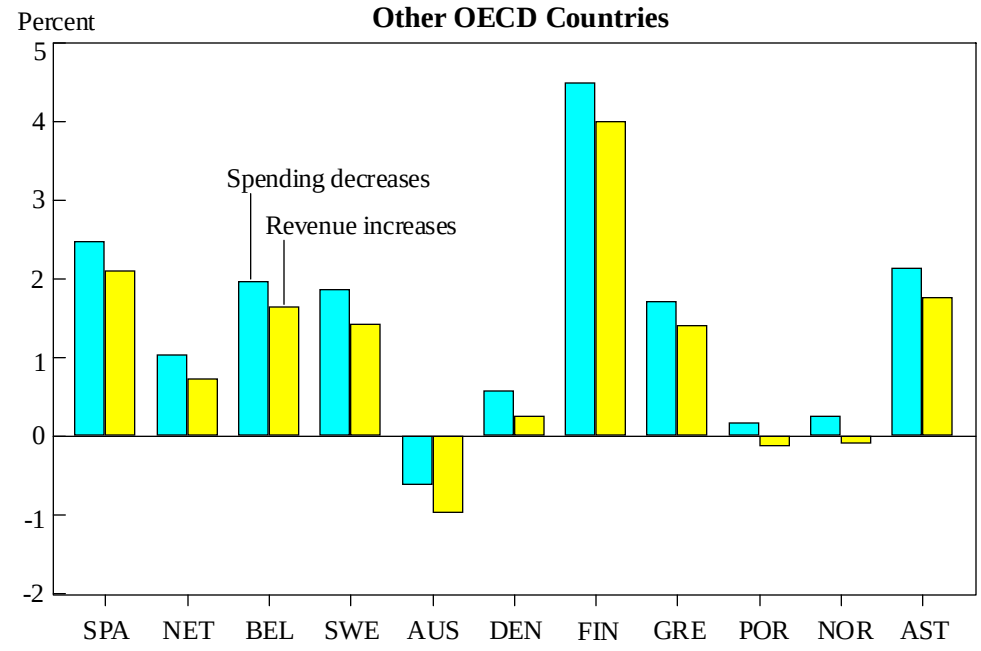
For the G7 countries, deficit reduction leads to a stronger exchange rate in the United States, Germany, France, Italy, and Canada, and leads to a weaker exchange rate in Japan and England.[12] In each case, the model predicts that the exchange rate strengthens more—or weakens less—when deficit reduction occurs by reducing spending than by raising taxes. For example, if the U.S. budget deficit is reduced by cutting spending, the dollar exchange rate rises by 0.7 percent; however, if it occurs by raising taxes, the dollar rises just 0.3 percent. In France, reducing the budget deficit by cutting spending strengthens the franc, while cutting the deficit by raising taxes weakens the franc. Since Italian inflation and gross debt as a share of GDP are both greater than the OECD average, it seems reasonable that deficit reduction will strengthen the Italian lira. In all cases, the effect of deficit reduction on the exchange rate is small—less than 1.5 percent. The small effect of deficit reduction on the exchange rate is not surprising since it is unlikely that investors fear the central banks in the G7 countries will monetize the budget deficit or that the government's will default or impose capital controls.[13]

The bottom panel of Chart 4 shows that deficit reduction is also predicted to lead to a stronger

Chart 4

EFFECT OF DEFICIT REDUCTION ON THE REAL EXCHANGE RATE





Note: AUS denotes Austria and AST denotes Australia.

exchange rate in many of the other OECD countries. Many of these results are not surprising. Greek inflation and gross debt are both greater than the OECD average, so it is not surprising that deficit reduction is predicted to strengthen the Greek drachma. In fact, of the five cases in which inflation and gross debt are greater than the OECD average (Netherlands, Portugal, Italy, Greece, and Belgium), deficit reduction is predicted to lead to a stronger exchange rate in each case. In addition, for each of the seven countries with the largest ratios of debt to GDP, deficit reduction is predicted to lead to a stronger exchange rate. Finally, the results are consistent with Chart 2, which showed the Finnish markka and Swedish krona rise when the budget deficit falls. The effect of deficit reduction on the exchange rate in both Portugal and Norway depends on whether the budget deficit is cut by cutting spending or by raising taxes. The currency is predicted to rise if spending is cut and fall if taxes are raised. Deficit reduction is predicted to weaken the Austrian schilling because the direct effect of deficit reduction dominates the indirect effects.

CONCLUSION

Budget deficit reduction has both direct and indirect effects on the demand for funds, which lead to different effects on the exchange rate. Deficit reduction can lead to a weaker exchange rate by reducing the demand for funds by the government, or it can lead to a stronger exchange rate either by reducing expected inflation, reducing the foreign exchange risk premium, or increasing the expected after-tax rate of return on domestic assets. Because of these different effects, it is not surprising that deficit reduction leads to a weaker exchange rate for some countries and to a stronger exchange rate for other countries.

The article provides policymakers several key insights into when budget deficit reduction leads to a stronger exchange rate. First, deficit reduction must convince private investors to increase their demand for domestic securities. Second, according to the IMF study and the empirical model, deficit reduction tends to lead to a stronger exchange rate if the reduction is large, if it occurs through cutting government spending, if a country's inflation rate is high (so the chance of monetization is high), or if a country's ratio of gross debt to GDP is high (so the chance of default is high). Of course, none of these factors, by themselves, will guarantee that budget deficit reduction will lead to a stronger exchange rate. Hence, the third key insight is that budget deficit reduction must be viewed by private investors as credible, long term, and sustainable.

While fiscal credibility is difficult to achieve, the Canadian experience in reducing its budget deficit offers useful guidance. Particularly relevant to the Canadian experience—and to the achievement of fiscal credibility—is the following statement by Finance Minister Paul Martin made at the August 1995 Jackson Hole symposium sponsored by the Federal Reserve Bank of Kansas City (1995, p. 216):

> We have also decided to adopt a two-year budget horizon—rolling the second year's target forward one year at a time. This is central to our overall strategy. We have rejected the traditional approach where typically a balanced budget would be projected five or more years down the line. Frankly, that is political never-never land for the simple reason that elections intervene before the magic date arrives. Political accountability is lost and the bureaucracy can safely put off the day when they really have to buckle down and find the savings. The result, as we saw in Canada during at least the last ten years, is a progression of missed targets, looming fiscal crisis, and growing public cynicism.

APPENDIX A

MODEL DESCRIPTION

The model relates the real exchange rate to the budget deficit. To control for factors that affect the exchange rate other than the budget deficit, a linear time trend, long-term interest rate differential, and a lagged real exchange rate are included. More specifically, the model can be written as:

$$q_{it} = \alpha_i + \beta_{it} BD_{it} + \gamma_{1i}\, trend_t + \gamma_{2i}[i_{it}^{LT} - i_{OECDt}^{LT}] + \rho_i q_{it} + \varepsilon_{it}$$

$$\beta_{it} = \beta_{0i} + \beta_1[infla_{it} - infla_{OECDt}] + \beta_2 [\left(\frac{D}{Y}\right)_{it} - \left(\frac{D}{Y}\right)_{OECDt}] + \beta_3[\left(\frac{G}{Y}\right)_{it} - \left(\frac{G}{Y}\right)_{it-1}],$$

where q_{it} = real exchange rate, BD_{it} = budget deficit relative to GDP of country i, $infla_{it}$ = CPI inflation rate, i^{LT} = long-term interest rate, D/Y = gross debt as a percent of GDP, and G/Y_{it} = government consumption as a percent of GDP.

This is a time-series cross-section model. It is estimated using fixed effects, so that a separate constant term is estimated for each country. A seemingly unrelated regression procedure is used, so that the error terms are correlated across exchange rate equations. The covariance matrix across exchange rate equations is estimated in a preliminary regression and then applied in generalized least squares in a second round.

The model was also estimated including the growth rate of real GDP relative to the average OECD growth rate. However, the procedure did not converge because the covariance matrix was nearly singular.

APPENDIX B

DESCRIPTION OF DATA

Most of the data were obtained from the Organization for Economic Cooperation and Development (OECD) and the International Monetary Fund (IMF). The following is a brief description of the variables.

Budget deficit. The general government financial balance as a percent of nominal GDP. Organization for Economic Cooperation and Development, OECD Economic Outlook, Annex Table 30, December 1995.

GDP. Nominal gross domestic product, in local currency units. Organization for Economic Cooperation and Development, *OECD Economic Outlook* database, Board of Governors of the Federal Reserve System.

Debt. Government gross debt, in local currency units. Organization for Economic Cooperation and Development, *OECD Economic Outlook* database, Board of Governors of the Federal Reserve System.

Inflation. Percent change in consumer prices. Consumer prices are an index, with 1990 = 100. International Monetary Fund, *International Financial Statistics* database, Board of Governors of the Federal Reserve System.

Real exchange rate. Real effective exchange rate index, 1990 = 100. The index equals the nominal effective exchange rate, weighted by trade in manufactures, deflated by relative normalized unit labor costs in manufacturing. International Monetary Fund, *International Financial Statistics* database, Board of Governors of the Federal Reserve System.

Government spending. Government consumption, in local currency units. Organization for Economic Cooperation and Development, *OECD Economic Outlook* database, Board of Governors of the Federal Reserve System.

ENDNOTES

[1] For example, Chairman Greenspan (1995, p. 141) stated: "I think the point that central bankers are making is that lower long-term inflation expectations can significantly overwhelm the short-term interest rate effects, and through arbitrage back to the spot rate, firm it." Similarly, Governor Thiessen (1995, p. 139) stated: "I must say, in more open economies we certainly worry about the net accumulation of foreign liabilities that comes from running an ongoing public deficit and public debt.... And, what that leads to, of course, is a depreciating exchange rate to generate the trade surplus that you need. So, in the long run, you expect an accumulation of public debt to lead to an accumulation of net foreign liabilities and a weaker currency." In contrast, Krugman (1995) and Feldstein (1995b) argue that reducing the budget deficit would lead to a weaker currency.

[2] The relation is statistically insignificant. The t-statistic is 0.84 for the United States and 0.21 for Germany.

[3] The relation is statistically significant. The t-statistic is -8.1 for Finland and -1.8 for Sweden.

[4] Some economists argue that deficit reduction has no effect on interest rates. They believe that while deficit reduction leads to a decrease in the demand for funds, it also leads to an equal decrease in the supply of funds. Because future taxes will be less, consumers need to save less so the supply of funds falls. While the evidence is mixed, most economists believe that deficit reduction leads to a lower interest rate.

[5] Actually, the after-tax rate of return on domestic assets and foreign assets, held by domestic investors, would increase. However, since domestic investors tend to hold more domestic securities than foreign securities, the exchange rate would still rise.

[6] Feldstein (1995a, p. 407) states, "If we didn't have to pay interest on the deficits accumulated since 1980, the deadweight loss of the personal income tax would be cut in half. . . . The taxes that are required to pay the resulting interest to ourselves distorts incentives and causes a massive deadweight loss, probably more than $100 billion a year at current levels."

[7] The IMF defines fiscal impulse as the change in the primary structural balance relative to potential GDP. Then, an episode of fiscal consolidation occurs when the fiscal impulse shows tightening in two successive years, amounting to at least 1-1/2 percentage points of GDP in total. Successful fiscal consolidation occurs when the ratio of gross public debt to GDP falls at least three percentage points by the second year after the end of a two-year fiscal tightening.

[8] One can test the null hypothesis that success or failure is independent of whether deficit reduction comes from reducing spending or raising taxes. The $X^2(1)$ statistic was 3.94; the 5 percent critical value is 3.84. Therefore, one can reject the null hypothesis of independence at the 5 percent level.

[9] One bit of evidence supports this interpretation. Different specifications of the model lead to different estimates of β_0.

[10] Technically, the left bar assumes the change in government spending (as a percent of GDP) equals -1 and the right bar assumes the change in government spending (as a percent of GDP) equals 0.

[11] In order to estimate the direct effect, one must make an assumption about how a change in the budget deficit affects the OECD average. Since the OECD average budget deficit is a weighted average of individual country budget deficits, it can be written as BD[OECD] = w(1)*BD[1] + w(2)*BD[2] + ... + w(18)*BD[18]. The model assumes that the change in BD[OECD] due to a change in BD[i] equals w(i).

[12] Standard errors for the change in the exchange rate can be calculated as follows. The change in the exchange rate from a one percentage point change in the budget deficit is given by the second equation in the Model Description Appendix. The calculation assumes that parameter uncertainty is the only source of uncertainty. Thus, using the variance-covariance matrix of the parameters, and the actual values of the variables in 1994, one can calculate the standard deviation of β_{it}. Significant effects are found for Japan, Germany, Canada, Austria, Belgium, Denmark, Finland, Greece, the Netherlands, Spain, and Sweden.

[13] Much of the predicted effect of deficit reduction comes from the β_0 parameter. As discussed in the text, this parameter measures the direct effect of deficit reduction and is predicted to be positive. In many cases, however, the parameter is negative. Moreover, the parameter is often a "large" negative number and often is larger than the negative indirect effects. Nonetheless, the indirect effects are negative, as predicted by the theory.

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