Unraveling the Complex Interrelationships between Exchange Rates and Fundamentals

by Austin Murphy and Ellen Zhu*

*Professor of Finance and Assistant Professor of Finance, respectively, Oakland University, SBA, Rochester, MI 48309-4493 (Tel. 248-370-2125; Fax: 248-370-4275; email: jamurphy@oakland.edu)

ABSTRACT

By fundamentally decomposing investor expectations on fifteen exchange rates, this research investigates the intrinsic characteristics of currency values. Empirical support is provided for the hypothesis that forward rates often appear biased in finite samples because they incorporate a small probability of a large spot decline when a current account deficit exists. Investors are found to expect countries to be more likely to choose devaluation solutions to BOP problems when inflation is lower and when an alternative drop in real income growth is more "painful". Evidence is uncovered on the effect of currency unions and the U.S. Presidential election.

Keywords: currency, exchange rates, investor expectations, international current account, G15.

Unraveling the Complex Interrelationships between Exchange Rates and Fundamentals

Exchange rates between currencies have long baffled academicians (MacDonald, 1990) and traders alike (Simons, 2004). In particular, Frankel and Froot (1987), Fukuta and Saito (2002), Landon and Smith (2003), and many others have found empirical evidence of a forward bias in exchange rates that does not seem to be fully explainable by rational expectations. Moreover, both time-series and structural models have not been found to improve on pure random walk forecasts (Meese and Rogoff, 1983).

Structural models of exchange rate equilibrium have not been “very good at explaining exchange rates even ex-post” (Hairault, Patureau, and Sopraseuth, 2004) and seem to have been especially inconsistent with the currency crises of the 1990s (Berg and Pattillo, 1999). For instance, monetary models, such as that developed by Claessens (1991), provided few insights into the 1997 Asian currency crisis where currency values plummeted without any apparent monetary cause (Husted and MacDonald, 1999). As stated by Engel and West (2005), the inability to find empirical evidence of currency fundamentals like inflation affecting exchange rates has been particularly perplexing, although the latter authors have managed to find a statistically significant correlation between exchange rates and some future economic aggregates.

This research provides insights on some of the exchange rate puzzles by examining investor expectations implied by interest rate differentials for sixteen different currencies. The sample includes eight currencies that converted to the euro, three that were formerly part of the European Currency Unit (ECU) but chose not to convert into the common European currency, and five other major currencies (the yen, the Swiss franc, the Canadian dollar, the Australian dollar, and the U.S. dollar). Perhaps most importantly, long-term exchange rate expectations (as measured by interest rate differentials on long-term bonds) are found to be significantly related to both inflation and a fundamental model variable related to a country's international current account.

A particularly strong negative relationship between inflation and the expected real exchange rate change of a currency is discovered for all countries. This empirical result is consistent with investors predicting convergence in inflation rates across countries. This phenomenon may possibly help explain the inability of prior researchers to discover a significant relationship between nominal exchange rates and inflation.

Some evidence is also uncovered indicating that the expected value of short-term changes predicted for the value of a currency (as measured by interest rate differentials on short-term debt obligations) is positively and significantly related to the probability of a very large decline in that currency (as measured by a fundamental model of current account deficits). These findings provide empirical support for Krasker's (1980) hypothesis that the forward exchange rate will overestimate actual currency changes unless a sample includes a large outlier that does not happen within most empirical studies of major currencies because of a limited time horizon. Since these empirical results are consistent with unbiased forward exchange rates, it is not necessary to assume different pricing of risks in different currencies or the possibility of negative nominal interest rates that Backus, Foresi, and Telmer (2001) have indicated is necessary for forward exchange rate biases to exist in efficient markets. They also help explain Froot and Frankel's (1989) survey findings indicating that empirical findings of forward exchange rate biases are related to the single point exchange rate forecasts of professionals and not to a risk premium.

The overall results do not seem to vary systematically by the existence of fixed or flexible exchange rates. However, after controlling for fundamental factors, evidence is found that expectations for the strongest currencies that converted to the euro were higher before conversion than afterwards. Expectations independent of fundamentals were also discovered to deteriorate for the three ECU currencies that remained separate from the euro, although evidence is found that is consistent with a relative improvement in the fundamentals for these countries after they chose to retain their own currencies.

The model and its implications are described in Section I, the data and model estimation process are defined in Section II, the testing procedure is explained in Section III, and the results are reported in Section IV. The findings are summarized in Section V.

I. The Currency Model and Implications

In order to evaluate the relationship between exchange rates and currency fundamentals, a fundamental model of exchange rates is useful. Since traditional economic models of exchange rates, have not been very successful in explaining exchange rates (Hairault, Patureau, and Sopraseuth, 2004), Murphy’s (2003) financial theory of fundamental investor expectations is employed. In an initial limited study of one particular exchange rate (between the U.S. dollar and the yen), the model was discovered to be useful for uncovering some new insights on the empirical relationship between exchange rates, investor expectations, and currency fundamentals (Murphy, 2006).

The Murphy (2003) model is based on an assumption that exchange rates of convertible currencies are determined by investors who value currencies based on relative interest rates and expectations of future exchange rates. Expectations of future exchange rates are modeled to be a function of the international current account and the elasticity of inflation and exports relative to exchange rate changes.

According to the model, there is some probability that a country with a current account deficit will allow its currency to depreciate sufficiently to resolve this problem temporarily, although the subsequent imported inflation would lead to its future recurrence. The probability of both a large sudden devaluation and of a more gradual depreciation can be estimated from relative country interest rates. The model assumes that any currency devaluation/depreciation can only delay a real resolution of the Balance of Payments (BOP) problem, which has to be addressed with a real income decline (or other real methods) before all the capital in the deficit country is owned by foreign countries with current account surpluses that are financing the deficit.

The model implies that a country with a current account deficit has a rising (falling) currency value when investors perceive the probabilities of a devaluation solution are decreasing (increasing). A corresponding rise (fall) in the likelihood of the country using a reduction in real income growth to resolve its BOP problem is implied. The exact amount of needed real income/growth reduction that is required to resolve the BOP problem can be estimated by the model.

In an initial exploratory study, Murphy (2006) empirically applied the model to the yen/dollar exchange rate and found it yielded stable, rational investor expectations in the currency market. Relationships between expectations and fundamentals were also discovered that may explain numerous exchange rate puzzles. For instance, the forward bias found in prior empirical research as well as in surveys (Froot and Frankel, 1989) was discovered to be statistically related to a small probability of a large devaluation that is so small (and often is less than 1% per year) that it is generally not observed for major currencies over the typical empirical time horizon (such as less than 100 years). In addition, evidence was found of various political/government factors affecting currency values and expectations, including a Presidential election year effect, a reversal in the value of the dollar that might be caused by informal or formal target exchange rate bands, and a seemingly counterintuitive relationship between the dollar's value and fundamentals that might reflect politicians' and central bankers' aversion to high inflation and large reductions in economic growth needed to balance the U.S. current account.

Murphy's (2006) tests, however, employed Japan as a proxy for the rest of the world outside the U.S., and so the results may have been spurious or not universally applicable. This paper overcomes these limitations by testing the model on the major convertible currencies using a Seemingly Unrelated Regression (SUR) econometric procedure.

II. Data

The data requirements for the model are quarterly money market interest rates, long-term government bond rates, exchange rates versus the U.S. dollar, gross domestic product (GDP) deflator of all the countries.[1] In addition, for the assumed home country, the U.S. here, the quarterly current account position, exports, nominal GDP, and aggregate international asset and liability position are needed. Because of currency controls in some major countries prior to the 1980s that would invalidate the Murphy model (2006), the time interval for the study is restricted to the period 1981-2004.

The data are obtained from the International Monetary Fund's (IMF) *International Financial Statistics* electronic database. All members of the European Union's original exchange rate system that comprised the ECU and that have sufficient data in the IMF's database are included. Of the fifteen countries that fixed their exchange rates relative to each other within the ECU band (that was 2.25% for most of the time but permitted periodic devaluations and even changes to the band in the early 1990s), Germany, Austria, Italy, Spain, Belgium, France, Netherlands, and Portugal converted their currencies to the single European currency (the euro) in 1999. Denmark maintained its currency (the krone) but kept its exchange rate fixed within a 2.25% band around the euro. The United Kingdom and Sweden formally dropped out of the unified European exchange rate system altogether, but Sweden maintained an informal band target.

IMF data on short-term rates were unavailable for Belgium, France, the Netherlands, and Portugal after 1999, as was the long-term rate for Portugal after that year. However, the European Commission's *European Economy* indicates identical interest rates for all countries having adopted the euro beginning in 1999, and so it is possible to use the IMF data on the euro interest rates for the missing data. The countries Greece, Luxembourg, Finland, and Ireland were also part of the ECU, but they had many missing observations for interest rates prior to 1999, and so these countries could not be utilized.

Sweden had one missing data point for its long-term rate (for the fourth quarter of 2004), and Denmark was missing both interest rates for the first quarter of 2001. However, since both of these countries were still banded to the euro at least informally, these missing observations were interpolated by adding the prior quarter's interest rate spread with the euro rates to the actual euro rate for that quarter. Cross-checking these interpolated figures with data on interest rates reported elsewhere on the internet indicated the adjustment was reliably accurate.

The inclusion into the research of all the major currencies in the ECU also permits an evaluation of the effects of both fixed exchange rates and the conversion to a single currency via dummy variables. A further dummy variable will be utilized in the Germany regressions to determine if the unification with East Germany that encompassed a union of the West German currency with the East German one had any particular effect (with the discussion and implementation of the currency union occurring between the fourth quarter of 1989 and the third quarter of 1990).

Countries outside the U.S. and Europe found to have sufficient data were Japan, Canada, Australia, and Switzerland. These countries have the other major convertible currencies and are included in the empirical tests.

Before conducting the tests, it is necessary to estimate the elasticity of the U.S. current account with respect to changes in the real exchange rate as well as the number of years required for changes in the real exchange rate to affect U.S. inflation. These parameters are estimated utilizing annual data on U.S. exports, current account, GDP deflator, and exchange rates that were available from the electronic IMF database going back to 1977.

The elasticity parameter is estimated by conducting regressions of annual time-series data for the U.S current account as a percentage of U.S. exports on lagged changes in the real exchange rate (measured in dollars). Eleven regressions are run for each country with each having a different number of lagged years over which the past real exchange rate change is measured. The regression with the highest t-statistic for the regression coefficient is selected, and the actual regression coefficient in this chosen regression is specified to be the elasticity parameter estimate. For these regressions, Generalized Least Squares (GLS) is utilized, employing Harvey's (1981) two-step full transform method to adjust for the residual autocorrelation.

The duration parameter for inflation pass-through is estimated by regressing the U.S deflator inflation rate on lags in changes in the real exchange rate (measured in the foreign currency).[2] Eleven GLS regressions are again run for each currency, with each having a different number of lagged years (up to 11) for the independent variable. The parameter for the duration of inflation pass-through is estimated as the number of years of lagged real exchange rate changes in the regression that has the highest t-statistic for the regression coefficient.

III. The Empirical Testing Procedure

To test the hypothesis for the forward bias and to detect other systematic deviations from expectations, the following regression is run

$$c\$ - E(c\$) = B_0 + B_1D_1 + B_2D_2 + B_3D_3 + B_4D_4 + B_5LProbST\$Drop + e, \qquad (1)$$

where c$ is the percentage change in the value of the U.S. dollar (as measured in foreign currency units), E is the expected value operator (determined for c$ by one quarter of the lagged difference between the annualized short-term interest rates in the foreign country and the U.S.), LProbST$Drop is the lagged probability of a large short-term decline in the value of the dollar against the foreign currency (as estimated using the Murphy (2003) model) times the estimated decline in the U.S. dollar necessary to balance the U.S.

current account, the D Variables are dummy variables with values of 0 except that D_1 has values of 1 for U.S. Presidential election year quarters, D_2 has values of 1 for the year (between the fourth quarters of 1989 and 1990) of German political and currency unification (but only for Germany), D_3 has values of 1 for the two quarters 1998-1999 surrounding the adoption of the euro (but only for countries that adopted the euro), and D_4 has values of 1 after adoption of the euro in 1999 (but only for those countries that did replace their domestic currency with the common European currency), the B terms are parameters to be estimated, and e is the regression error term. Including the dummy variables in the regression permits factoring out any market inefficiency in anticipating the effects of the currency unions and U.S. Presidential elections. Since dummy variable effects should have been anticipated in advance, especially in the case of the euro that was planned long in advance of the actual union, inclusion of the dummy variables also permits some testing of efficiency in the currency markets.

Separate regressions are run for each country, and an iterative SUR procedure is utilized to adjust for the cross-sectional correlation of errors (Woolridge, 2002) that would be expected to be especially prevalent for the ECU/euro countries. The SUR process permits the entire system of 15 countries to be used as a more general proxy for the rest of the world outside the U.S. A GLS adjustment for the particular autocorrelation of each country's time-series data can also be made within the iterated SUR framework (Greene, 1997).

To test for hypothesized political effects on investor expectations incorporated into interest rate differentials, the following regression is run for each country using the same SUR GLS procedure

$$E(\text{real } c\$_{LT}) = B_0 + B_1 L3c\$ + B_2 D_2 + B_3 D_3 + B_4 D_4 + B_5 IncDec + B_6 Inf + e, \quad (2)$$

where E(real $c\$_{LT}$) is the expected annual long-term percentage change in the real value of the U.S. dollar (estimated by subtracting the current geometric difference between the inflation rates in the U.S. and the foreign country from the geometric difference between the interest rates on long-term government bonds in the foreign country and the U.S.), L3c$ is the actual percentage change in the value of the dollar over the prior 3 quarters, IncDec is the lagged expected annual percentage reduction in real income growth needed to balance the current account, Inf equals one less than the ratio of one plus the inflation rate in the U.S. over the prior year and one plus the inflation rate in the foreign country over the prior year, and the currency union dummy variables are the same as before. Inclusion of the dummy variables in regression (2) permits an evaluation of the effect of the currency unions on investor expectations.

IV. Empirical Results

The statistical characteristics of exchange rate changes, expectations, and fundamentals are provided in Table 1. All of the exchange rate elasticity coefficient estimates for the current account deficit are statistically significant from 0 at the .10 level, ranging in value between .29 and .52. The regression coefficients for estimating the duration of inflation pass-through were statistically significant for ten of the fifteen countries, with estimates for this parameter ranging between 5 and 10 years for those countries.

A. Empirical Results for the U.S Current Account Deficit and Exchange Rates Against 15 Foreign Currencies

The Murphy (2003) model indicated that the U.S. could balance the current account by reducing annual real income growth by an average of 2.11% per year for an average of 46 years. As shown in Table 1, the alternative of a slow long-term real decline in the U.S. dollar has an average probability of occurrence that ranges from a high of 29.31% against the Portuguese currency to a low of 3.27% for Canada. The chance of a large immediate real drop in the dollar (sufficient to balance the U.S. current account) averages a high of 8.91% against the Portuguese currency to a low of 2.78% for the Canadian dollar. The high probabilities for the Portuguese currency may at least partially reflect years when the volatile Portuguese inflation rate exceeded interest rates in Portugal (leading to measured expectations of a large probability of a real decline in the dollar against that currency).

A.1. Factors Influencing Deviations from Exchange Expected Values

The results of regression equation (1) are reported in Table 2. For five of the countries (Germany, the Netherlands, Portugal, Denmark, and Japan), the unexpected change in the value of the dollar demonstrates a significantly positive relationship with LST$DevalProb, the probability of a large short-term decline in the dollar sufficient to immediately correct that country's current account deficit. These nations include the two biggest economies outside the U.S. (Japan and Germany) that directly and indirectly have among the most important impact on the U.S. current account.

However, for the other ten countries, there is no significant correlation between the unexpected dollar returns and the probability of a large immediate decline in the currency value. Of these ten countries without a significant B_5 coefficient, over half had current account deficits on average, as shown in column (10) of Table 1. Such deficits carry with them the possibility of large declines in their own currency value to solve their own BOP problems that would be incorporated into implied forward rates. The resulting existence of a small probability of a large decline in their own currency values (that is not observed over the finite sample interval) might partially or fully offset the effect of the small possibility a U.S. dollar decline in the formation of expected future currency values. This possibility may have created enough noise to mask any significant relationship (although it apparently did not for Portugal, which also had a current account deficit, on average, but a significantly positive relationship between unexpected returns and the LST$DevalProb variable).[4]

Even for the four countries with an average current account surplus but without a significant relationship between unexpected returns and the probability of a large decline in the dollar, the existence of current account deficits in those particular countries at various points in the sample could also create enough noise to explain the lack of significance. In fact, three of these four countries (Belgium, France, and Sweden) had, despite an average current account surplus over the entire sample, at least one current account deficit that was, as a percentage of GDP, far in excess of any of the U.S., as shown in column (11) of Table 1. Since the largest current account deficit of these nations are much higher than even those of the U.S. at any time, it would, according to the Murphy (2003) model, theoretically create the possibility of their currencies suffering a very large short-term decline against even the dollar (as with the other foregoing six). Because such a possibility is not incorporated into the Murphy (2006) empirical testing model that employs each foreign country as a proxy for the rest of the world (including those that also have current account deficits), regression (1) may be unable to pick up the possibility of such a large drop against the dollar in periods when the U.S. current account deficit is also high. While Switzerland never had a current account deficit in any quarter over the sample, this small country is not a significant trading partner of the U.S. (directly or indirectly), and so the possibility of a large drop in the dollar against the Swiss franc may be masked by other factors.[3]

Regardless, the overall findings of one third of the sample countries having a significant parameter estimate for LST$DevalProb provide some evidence in favor of the hypothesis that the possibility of a large decline in the dollar needed to balance the U.S. current account was priced into the implied forward exchange rates but did not occur over the sample interval. A joint hypothesis that all coefficients for LST$DevalProb equal zero was rejected by a chi-squared test statistic of 33.73 (not shown in the table).

However, all of the parameter coefficients for LST$DevalProb except for Japan are significantly less than one, and a chi-squared statistic of 888.48 leads to a rejection of the joint hypothesis that all these parameters equal 1.00. This finding could be due to the model overestimating the probability and/or size of the potential decline forecast by investors. Alternatively, it could be caused by a portion, but not all, of the needed currency decline being realized over the sample interval for many of the currencies. In other words, there may be one or more large declines in the dollar in the observed time periods, but they were not enough to balance the current account. Such declines, which exceed (are less than) the annual ones needed for a gradual (immediate) devaluation solution to a current account deficit, are smoothed for mathematical tractability out of the Murphy (2003) model.

Investigation into the possibility of a dollar decline that is large but insufficient to balance the U.S. current account provided evidence consistent with the latter hypothesis. In particular, it was found (not shown in the tables) that the largest quarterly drop of the dollar against any of the currencies was 16.42% (against the Swiss franc), with the maximum decline in the dollar against the other currencies being of similar magnitudes above 10% for all but the Canadian and Australian dollars, whose currencies also rose by nearly 10% in at least one quarter. However, the decline in the dollar needed to balance the current account exceeded the actual currency drop in every case. Thus, the possibility of an extremely large drop in the dollar needed to balance the current account was not observed over the sample interval, but the actual double-digit dollar declines over the sample far exceeded the more gradual declines needed to balance the current account long-term in all cases.[5]

Table 2 also indicates that fifteen of the sixteen parameter estimates for the various dummy variables for the euro were insignificantly different from zero. Given that at least one of sixteen parameter estimates would be expected to be significant from zero even by random chance, this result is consistent with any currency merging effects having already been incorporated into investor expectations and existing currency values. Thus, this finding is consistent with markets efficiently incorporating such information into market prices (Fama, 1970).

Nevertheless, the positive significant coefficient for the German currency union does indicate a negative effect on the value of the West German currency that was not initially anticipated by investors. This result is consistent with a hypothesis that investors correctly recognized the merger with the weaker East Germany currency to have a negative effect and bid down the value of the currency as the likelihood of the merger increased over the 1989-90 time interval. The finding is also consistent with investors only slowly predicting the economic disaster that later resulted from the particular method selected for the economic and currency union of East and West Germany (Murphy, 2000) and its long-term effect on the German currency's value.

In addition, Table 2 indicates the U.S. Presidential election dummy variable is positively significant for thirteen of the fifteen countries (all but Australia and Canada[6]). These findings are consistent with a hypothesis that, over the sample interval, markets did not anticipate this political effect, which increased the return on the dollar by over 9% in each U.S. Presidential election year for those thirteen countries. This result could be proxying for some political risk in the U.S. Presidential election years that might cause an extremely large decline in the value of the dollar (such as the election of an "easy money" politician) but that was not realized over the empirical sample interval.[7]

A.2. Variables Affecting Long-Term Expectations of Future Real Currency Changes

The results of regression equation (2) are listed in Table 3. For most countries, the expected long-term change in real currency values implied in relative interest rates and current inflation rates is found to be strongly related to both relative current inflation and the size of an annual reduction in real U.S. income growth needed to balance that country's current account.

As hypothesized, a higher annual income reduction results in a falling dollar against eleven of the currencies, as investors may be speculating that the political will to take on such a bitter pill (as opposed to devalue) is reduced the more bitter the medicine.[8] The only four exceptions are Spain, Portugal, Australia, and Japan, the former three of which themselves had average current account deficits in excess of those of the U.S., as shown in column (11) of Table 1. The noise caused by these extreme current account situations (with those of Portugal being the most extreme of the entire sample) may have caused the lack of a significant relationship for these countries.

On the other hand, investors appear to forecast for all fifteen currencies that the U.S. is more likely to take the medicine of declining real growth when inflation and the corresponding costs/risks of excessive inflation are relatively high. The extremely high level of significance for the parameter estimates for the relative inflation variable stems at least in part from the fact that it has essentially been added to the expected nominal exchange rate change in order to compute the real change. The finding that nine of the parameter coefficients are insignificantly different from one implies independence between investors' long-term exchange rate forecasts and current relative inflation rates, as is consistent with a hypothesis that inflation differentials between countries will disappear long-term. Such an expectation seems rational if investors predict that countries will use monetary and fiscal policy to hit a similar long-term inflation target that is considered economically and politically optimal.[9]

The inflation convergence criteria required for the eleven countries that either joined or considered converting their currencies to the euro (Westbrook, 1998) probably also contributed to the negative relationship between real exchange rate expectations and inflation in the sample. However, the overwhelming significance levels for all countries imply that it is not a phenomena restricted to just those nations. It is possible that similar economic philosophies among central bankers and governments with respect to inflation, as well as explicit cooperation to achieve worldwide price stability through meetings of the Group of 7 (or 8 more recently with the adding of a non-sample country, Russia) and the IMF, is an important factor in these results, as may be the existence of fixed exchange rates for those countries over most of the sample.

However, the joint hypothesis of all fifteen B_6 parameters equaling one is rejected by a chi-squared statistic of 44.20, as six of the coefficients for Inf are significantly different from 1.0. This finding implies that investors do not just simply assume currencies harden or loosen sufficiently to equalize inflation rates across countries. For instance, for the four countries with parameter coefficients for the inflation variable that are significantly less than one (Belgium, France, Portugal, and Denmark), the results are consistent with an expectation of a hardening of the currency with the higher inflation rate in real terms but by an amount less than that needed to completely eliminate the current inflation differential. For the two nations with a parameter coefficient significantly greater than one (Sweden and Switzerland), there appears to be an expectation of a sufficient relative hardening of the currency with the higher inflation rate to actually reverse the existing inflation differential between the U.S. and those two countries. Thus, nominal exchange rate expectations of investors seem to be dependent on existing relative inflation for some currencies but not in a universal direction.

It is also interesting to observe from Table 3 that long-term expectations for the dollar were significantly impacted by the existence of a unified currency for five of the eight countries converting to the euro. As indicated by the negative coefficients for Spain and Portugal, expectations of a dollar decline were higher when they had the euro than when they had their own currencies for the same fundamentals. In contrast, the positive coefficients for Germany, Austria, and the Netherlands indicate that the currencies of those countries, for the same relative inflation and other fundamentals incorporated into the Murphy (2003) model, would have been expected to go higher against the dollar without conversion to the euro. These results are consistent with a hypothesis that Portugal and Spain benefited from the relative strength of the euro (in the form of lower real interest rates) because their own semi-independent monetary discipline had been perceived to be less than for the unified currency under centralized European control. On the other hand, the results imply that the fundamentals for Germany, Austria, and the Netherlands after 1998 would have resulted in their currencies being expected to be stronger if they hadn't converted to the euro as confidence in their own country's former monetary discipline exceeded that for the unified currency. These results are consistent with column (5) of Table 1 that indicates the former two countries had the weakest, and the latter three the strongest, of the eight sample currencies that converted to the euro.

As also reported in Table 3, far different results were obtained for expectations about long-term real exchange rate expectations in the two quarters around the currency union. In particular, the actual event of the conversion to the euro did not significantly affect any of the eight currencies that converted to the euro. Given the conversion to the euro was easily anticipated long in advance by investors, this result is consistent with market efficiency.

The dummy variable for German unification indicates that long-term investor expectations on the German currency were not significantly affected by this particular merging of a strong currency (the West German mark) with a weaker currency (the East German mark). This result is consistent with a hypothesis that investors did not appear to have anticipated the economic disaster that resulted from the method selected for the economic and currency union of East and West Germany. Instead, the unexpected lower return for the West German mark around the currency union reported in Table 2 appears to have represented strictly short-term fundamentals and weakness related to the merging with the weaker East Germany currency.

Table 3 provides conflicting evidence across currencies on the relationship between expectations and past returns. For one country (Italy), there is significant evidence of a tendency for investors to expect an exchange rate trend over three quarters to persist into the future. For another country (Australia), there is significant evidence that investors expect trends to reverse themselves. For the other thirteen countries (all European ones), there is no evidence of an expectation of any trend or reversal at all.

Thus, investor expectations about the strength or weakness of a currency to persist or reverse seem to vary depending on the country and situation, as would seem rational. For instance, a currency trend might be expected to continue for one country because of the reputation of the country's central bank for maintaining a hard or soft currency, while another currency might be predicted to reverse direction because of a belief that the country will act to keep a currency within a targeted exchange rate band. As shown by column (5) of Table 1, an example of a weak currency might be Italy, thus possibly explaining the significant persistence of expectations for that currency. For the Australian dollar, the significant evidence of investor expectations of a reversal is consistent with that country following a path of targeting an exchange rate band to maintain trade/economic stability. However, given the number of significant parameter coefficient estimates for the variable are scarcely different than the number that would occur with pure noise, the results are far from conclusive.[10]

The insignificance of a trend or reversal for thirteen countries is consistent with a hypothesis that the two foregoing effects are offsetting for those nations. The latter results, which hold for the three European nations that chose not to convert to the euro (Britain, Sweden, and Denmark) and for seven of the eight that chose to do so, do not provide much of a pattern in terms of evaluating the effect of fixed exchange rates (relative to the ECU or euro) on investor expectations with respect to a persistence or reversal of a trend.[11]

B. Summary Results for the Current Account Deficit and Exchange Rates of the Other Nations as Home Countries

A further set of regressions was conducted using each of the countries treated as "foreign" in Section A (in Tables 2 and 3) as the home country (instead of the U.S.).[12] However, because three of these fifteen countries (the Netherlands, Japan, and Switzerland) consistently had such relatively low real interest rates (and/or consistent current account surpluses) that only 0% estimates of a large short-term decline in the currency value against at least one foreign country existed across the entire sample, thereby making a complete set of SUR regressions impossible. As a result, these countries are purged from the list of home countries with current account deficit problems that might possibly be resolved with a short-term large devaluation.

Tables 4A and 4B summarize the most important findings for each of the twelve "home" countries that have varying parameter estimates against all fifteen of the other "foreign" countries (including the three countries not usable as home countries as well as the U.S.). The tables show that the parameter coefficients for the LST$DevalProb variable from regression (1) were significantly greater than zero in 33.89% of the 180 cases tested.[13] These findings are similar to those found for the U.S. as the home country. In addition, the Chi-squared tests indicated the parameter estimates across all fifteen foreign countries were significantly different from zero for nine of the twelve new home countries (thus, for, ten of thirteen home countries tested in all that includes the U.S. previously).

Chi-squared test statistics reported in Table 5b indicated acceptance of the null hypothesis of all the B_2 and B_3 coefficients equaling zero, and so the parameter estimates for D_2 and D_3 (corresponding to the quarters surrounding the German and euro currency unions, respectively) are not shown. However, the findings for the other two dummy variables provide some potentially revealing insights into currency behavior. As a result, the parameter estimates and significance for these variables are listed in Tables 4c and 4d.

The Presidential election year (as picked up by D_1) is significant in 42 of the 180 exchange rates in the sample. However, only four of those significant B_1 estimates (for

Germany, Austria, Belgium, and Canada as home countries) are in the regressions using the U.S as the foreign country. While that minority of B_1 values have the hypothesized negative sign that is consistent with the Table 2 results where the U.S. was the home country, the other eight coefficients for D_1 are statistically insignificant from zero for the case of the U.S. as the foreign country, compared to only two insignificant B1 estimates out of fifteen when the U.S. was the home country (as reported in Table 2).

It can be revealing to speculate on why the Presidential election year effect is less prevalent when the effects of the non-U.S. foreign current account deficits are factored in via the LST$DevalProb variable. In particular, the rise of the U.S. dollar in Presidential election years may have more to do with U.S. trade policy (such as greater protectionism to win votes) that negatively impacts the current accounts of non-U.S. countries.[14] The existence of larger current account deficits at non-U.S. nations during U.S. Presidential election years would result in a larger decline in the non-U.S. currency needed in order to balance that current account. The resulting larger LST$DevalProb in for the non-U.S. home countries thereby picks up the higher dollar returns in U.S. Presidential election years and thereby effectively factors out the correlation of exchange rates with the D_1 variable.

Excluding the 12 significant B_1 values for Canada, the other 26 significant coefficients for the D_1 variable are not much more than the 15 that would be expected in a random sample. However, 18 of these are positive and only 8 are negative, providing some evidence that a few currencies are positively impacted by the U.S. Presidential election effect. Australia and Portugal (having 5 and 3 significantly positive coefficients, respectively) are the most positively affected, although the impact was insignificantly different from zero against the U.S. for these two countries. The cause may be related to indirect trade effects that could be investigated in future research.

Canada has 9 significantly negative parameter estimates for the D_1 variable and 3 positive ones, implying expectations for the Canadian dollar deteriorate on average during the U.S. Presidential election year after adjusting for Canadian fundamentals through the LST$DevalProb variable. The fact that there was no significant rise in the U.S. dollar against the Canadian dollar after adjusting for U.S. or Canadian fundamentals (as reported in Table 2 and 4d, respectively) is consistent with a hypothesis that the fall in the Canadian currency represents some kind of indirect effect (e.g., a booming U.S. economy in a Presidential election year could help Canadian exports enough for Canada, which is a major U.S. trading partner, to experience a large temporary reduction in its own current account deficit, thereby reducing the size of the LST$DevalProb effect that increases measured unexpected returns in many finite samples).

The parameter estimates for the post-euro D_4 dummy variable were statistically significant in 52.08% of the 96 cases and of varying signs. Nine coefficients (4 for Germany and 5 for Austria) were statistically significant and positive for the two strongest currencies (as indicated by Table 1) that converted to the euro in the sample. Since none were negatively significant for these two hard-currency nations, the evidence implies that returns were higher than expected after the currency union. For Portugal, Spain, and Italy, returns were generally lower than expected after the currency union, with significantly positive-negative coefficients in 0-5, 1-5, and 1-4 cases, respectively. The latter three countries had the weakest currencies prior to the currency union (see Table 1 again). The findings for the new regressions indicate that those the currencies of those three nations performed worse than investors had expected before the conversion to the euro. These combined findings imply that investor expectations of currency changes were lower (higher) than actual returns for the weaker (stronger) currencies before the currency union, as is consistent with a hypothesis that the currency union helped expectations for the weaker currencies and negatively impacted the stronger ones.

For the three European countries that were originally part of the European monetary system but chose not to convert to the euro (Britain, Sweden, and Denmark), there was also evidence of a negative impact on unexpected changes in their currency values (with 0-1, 1-4, and 0-4 of the coefficients being significantly positive-negative). These results are consistent with investors also raising their expectations of currency returns relative to actual returns (in comparison to the relationship before the currency union) for the three European countries that eventually decided not to convert to the euro. Since all nine of their significantly negative coefficients were against the four strongest currencies (Germany, Austria, Belgium, and the Netherlands) that converted to the euro, it is possible that investor expectations of strength in these three currencies that remained independent was only relative to the weakness in expectations resulting from the conversion of the strongest currencies to the unified currency.

Tables 5a and 5b summarize the most important results for the set of 12 equation (2) regressions, indicating parameter estimates and significance for all but two of the variables. The parameter coefficients for the D_2 and D_3 variables were almost universally statistically insignificant from 0 in the 12 sets of equation (2) regressions for the non-U.S. countries. Since a Chi-squared test for each of the 12 regressions indicated acceptance of the hypothesis of all the coefficients for these variables being equal to zero, they are therefore not listed

As with the U.S., the B_6 parameter estimates for the inflation variable are highly significant in all 180 regressions, but Chi-squared tests (shown in column 10 of Table 5b) indicated that they were statistically significant from 1.0 for all but one country (Canada). However, only 11 of the 180 B_6 coefficients were more than 10% away from the value of 1.0, and no meaningful pattern in investor expectations of deviations from complete inflation convergence could be ascertained. Although the B_6 parameter estimate for one major exchange rate (for Germany-U.S.) was below 0.90 (at 0.87), Table 3 had indicated this same coefficient to equal 1.00 for the same exchange rate (except inverted) when that regression factored out the effects of the fundamentals incorporated into the IncDec variable for the U.S. (as opposed to factoring out those fundamentals for Germany in Table 5b).

The B_5 coefficients for the IncDec variable were statistically negative in 67 of the 180 regressions and positively significant in only two cases. Combined with the universal significance of the inflation variable, these results provide further support for the hypothesis that investors often expect countries with lower inflation and a higher annual required income decline to use the devaluation solution to a current account deficit problem.[15]

The B_1 parameter estimates for the past 3-quarter change in a currency value were significant in 52 regressions, in which 23 were positive and 29 were negative. Five of the negative coefficients implying expectations of a reversal were for ECU countries against the U.S. dollar. Since the results against the dollar for the country in the European Union with the largest economy (Germany) were statistically insignificant from zero, and since none of the exchange rates between the dollar and the 11 ECU currencies reported for the earlier regression (2) reported in Table 3 with the U.S. as the home country were significantly negative, these results may represent indirect evidence of a tendency for investors to expect exchange rates to reverse within an informal band that is related to the fundamentals of major economic powers like the U.S. and Germany. In particular, the fundamentals for Germany and for the U.S. are not in the regressions for the smaller ECU countries acting as home countries, and the significant reversals against the U.S. dollar displayed in those regressions may only reflect reversals in fundamentals in the U.S. and Germany, to whose currency the other ECU currencies are tied and on whose economy the other ECU economies and their currencies are heavily dependent.

For the exchange rates between the eleven ECU countries themselves, the results are more revealing. The majority (twelve) of the 19 cases of B_1 significance for the exchange rates of the eight sample countries that converted to the euro were positive. However, five of the 6 significant coefficients for the three ECU countries that did not join the union are negative. Thus, for countries that try to fix their exchange rates, there is some evidence of investors expecting a continuation of a trend in 13 cases and of a reversal in 12 others. Eleven of the 12 cases for which a reversal was expected were concentrated in the five weakest of the ECU currencies (Italy, Spain, Portugal, Britain, and Sweden), as shown in column (5) of Table 1. These findings are consistent with a hypothesis of investors having a tendency to expect some weaker currencies to stay within fixed exchange rate bands but harder currencies to continue their strong trend.

The D_4 dummy variable for the existence of the euro yielded further evidence on the effect of a currency union on investor expectations. The results for the B_4 parameter vary widely, but there appears to be a rather widespread tendency for weak (strong) currencies to be expected to perform worse (better) against the stronger (weaker) currencies before the conversion to the euro fixed the exchange rate permanently. In particular, a significantly negative impact on expectations for the two strongest currencies in this sample (for Germany and Austria) is apparent against the three weakest currencies (for Italy, Spain, and Portugal), with long-term expected returns on these strong currencies reduced by an amount in excess of 1% per year. In addition, those three weakest currencies experienced a positive impact in eight of the nine cases against the three strongest (including not only the German and Austrian ones but also that for the Netherlands which couldn't be included as a home country). Because these results occur within the context of regression (2) that controls for the fundamental factors incorporated into the inflation and IncDec variables, the findings are consistent with a hypothesis of the currency union enhancing (detracting from) investor expectations for the weaker (stronger) currencies, even after at least partially controlling for the union's formal convergence criteria on inflation and economic stimulus (such as via capping price increases and government deficit spending in each country).

For the three ECU countries that did not join the currency union, there is evidence of stronger expectations in only 5 of 24 cases after 1998 when the effect of the fundamental factors incorporated into regression (2) are factored out. These findings imply that the strength in expectations evidenced in Table 4c for these three currencies against the four strongest currencies that converted to the euro were largely related to fundamentals that may have improved relatively for the three former ECU currencies that remained independent after 1998. Ten significantly negative coefficients for the D_4 variable imply that the failure to join the currency union had an overall negative effect on investor expectations for the independent currencies after adjusting for changes in the fundamentals.

V. Conclusion

This research provides further empirical evidence and insights on the behavior of exchange rates. For instance, more empirical support is provided for the hypothesis that at least a portion of the forward bias may be related to a small possibility of a large decline in spot exchange rates that is not observed over most empirical samples for many currencies.

Stronger empirical evidence is found that investors expect currencies to move in accordance with “pain” indexes. In particular, relatively higher inflation in a country is expected to lead to a rising real value for that country’s currency, probably because of government efforts to slow down the high inflation. On the other hand, higher future income costs associated with balancing a current account deficit are associated with investors expecting a real resolution of the problem to be postponed with currency depreciation. These findings supply some insights into the puzzle of a currency value rising on news of higher inflation and economic growth, which classical economists, without considering the effect of investor expectations of government reactions to the news, might predict would lead to a depreciating currency because of the adverse effect on purchasing power and the current account.

The European currency union was found to affect investor expectations in different ways cross-sectionally. The evidence is consistent with investors systematically perceiving the union to decrease the strength of the formerly stronger currencies of the union and enhance the value of the formerly weaker currencies.

Regressions using the non-U.S. countries as the home countries provided results that were consistent with the findings for the regressions that treated the U.S. current account deficit as the determinant of investor expectations. More significant evidence is found that investors do factor into their expectations some slight probability of a large immediate currency decline to resolve a current account deficit, and that they also expect countries with lower inflation and a larger cost associated with a real resolution of the problem to be more likely to allow their currencies to fall. Some new evidence and insights on the effects of the Presidential election on currency values are also uncovered that indicate a complex interdependent phenomenon at least partially caused by changes in fundamentals in U.S. Presidential election years. The three ECU countries that chose to have their currencies remain independent were discovered to experience weakness in investor expectations as a result, just as did the strongest currencies that did join the union.

References

Backus, D., S. Foresi, and Telmer, 2001, Affine term structure models and the forward premium anomaly, Journal of Finance, 56, 279-304.

Berg, A. and C. Pattillo, 1999, Are currency crises predictable? A test, IMF Staff Papers, 107-138.

Berub, Gerard, 2004, And now the Presidential election, CA Magazine, 137, 6.

S. Claessens, 1991, Balance of Payments Crises in an Optimal Portfolio Model, European Economic Review 35, 81-101.

Danthine, J., 2005, Distribution risk and equity returns. FAME Research Paper 161 (at the International Center for Financial Asset Management and Engineering in Geneva, Switzerland).

Engel, Charles and Kenneth West, 2005, Exchange rates and fundamentals. Journal of Political Economy, 113, 485-518.

Fama, Eugene, 1970, Efficient capital markets: a review of theory and empirical work, Journal of Finance 25, 383-417.

Fukuta, Y. and M. Saito, 2002, Forward discount puzzle and liquidity effects: some evidence from exchange rates among the United States, Canada, and Japan, Journal of Money, Credit & Banking, 34, 1014-1033.

Frankel, J. and K. Froot, 1987, Using survey data to test standard propositions regarding exchange rate expectations, American Economic Review 77, 133-153.

Froot, K. and J. Frankel, 1989, Forward discount bias: is it an exchange risk premium? Quarterly Journal of Economics, 104, 139-161.

Greene, W., 1997, *Econometric Analysis.* Prentice-Hall: Upper Saddle, Third Edition.

Hairault, J., L. Patureau, and T. Sopraseuth, 2004, Overshooting and the exchange rate disconnect puzzle: a reappraisal, Journal of International Money and Finance, 23, 615-643.

Harvey, A., 1981, The econometric analysis of time series (John Wiley: New York).

S. Husted and R. MacDonald, 1999, The Asian currency crash: were badly driven fundamentals to blame? Journal of Asian Economcs 10, 537-550.

Judge, G., C. Hill, W. Griffiths, H. Luetkepohl, and T. Lee. Introduction to the Theory and Practice of Econometrics (John Wiley: New York).

Korhonen, I. and P. Wachtel, 2006, A note on exchange-rate pass-through in CIS countries, Research in International Business and Finance, 20, 215-226.

Krasker, W., 1980, The 'peso problem' in testing the efficiency of forward exchange rate markets, Journal of Monetary Economics, 6, 269-276.

Landon, S. and C. Smith, 2003, The risk premium, exchange rate expectations, and the forward exchange rate: estimates for the Yen-Dollar rate, Review of International Economics 11, 144-158.

MacDonald, R., 1990, Empirical studies of exchange rate determination, in Current issues in monetary economics (ed. by D. Lewellyn and C. Milner), Macmillan, London.

Meese, R. and K. Rogoff, 1983, Empirical exchange rate models of the seventies: Do they fit out of sample?, Journal of International Economics, 14, 3-24.

Murphy, A., 2000, The Triumph of Evil (European Press Academic Publishing: Florence).

Murphy, A., 2003, A financial analysis of the effects of having to reverse current account deficits in: Practical Financial Economics (Praeger, Westport), 177-223.

Murphy, A., 2006, An empirical investigation of investor expectations in the currency market, International Review of Financial Analysis (forthcoming).

Simons, H., 2004, Taking the commodity out of currencies, Futures, August, 42-45.

Westbrook, J., 1998, Monetary integration, inflation convergence, and output shocks in the European Monetary System, Economic Inquiry, 36, 183-145.

Woolridge, J., 2002, Econometric analysis of cross section and panel data, MIT, Cambridge.

Footnotes

1. The electronic data were appropriately adjusted for changes in the index values for the deflator that, in some cases, had not been corrected in the IMF database.
2. Note that it is a real exchange rate change that would tend to affect the current account and inflation, as an exchange rate change that merely reflects the inflation rate differential will not impact relative competitiveness in international trade nor the existing inflation rate, which are, all else being equal, perpetuated by a zero change in the real exchange rate.
3. Also potentially contributing to the insignificance of 2/3 of the parameter estimates is the fact that the independent variable LST$DevalProb is an expectation measured with error, thereby leading to the statistical problem of error in variables that biases estimates toward zero (Judge, Hill, Griffiths, Luetkepohl, and Lee, 1982). To test this hypothesis, three-stage least squares, which solves for the problem of parameter estimates being biased toward zero but does not correct for the residual correlation between regressions (Woolridge, 2002), were employed by setting LST$DevalProb as both an independent variable in regression equation (1) and as a dependent variable in a linear regression on the variables of which the Murphy (2003) model sets it as a complex nonlinear function (the U.S. current account deficit, long-term interest rate, inflation rate, real GDP growth rate, international assets and liabilities, and foreign inflation rate) as well as the long-term interest rate and current account deficit of the foreign country. This new regression framework increased the number of

significant parameters for the LST$DevalProb variable to 8 (over half) from just 5.

4. The fact that Switzerland may represent a special case given its insignificance with respect to world trade and GDP, its huge current account surpluses (as shown in Table 1), and its enormous importance as a financial center, especially for illegal money flows that have been found to significantly affect exchange rates (Murphy, 2000), might help clarify the lack of significance for this particular country.

5. More evidence on this issue is provided by rerunning regression equation (1) with the specification of LST$DevalProb as the simple probability of a large drop in the U.S. dollar (i.e., not multiplied by the percentage decline needed to balance the current account). This new set of GLS SUR regressions yielded (not shown) the same number of parameter coefficients for the LST$DevalProb variable as before (and a test again rejected a joint null hypothesis that all the parameter estimates for this variable equaled zero, with a Chi-squared statistic of 164.60). In a further test, the non-U.S. data were weighted by their GDP (as possibly the best indicator of their long-term future effect in global trade and the U.S. current account situation) and combined into weighted global variables (for short-term and long-term interest rates, inflation, and exchange rates). Rerunning equation (1) with just one GLS regression utilizing these global variables (with an adjustment for first order autocorrelation but without the specific country dummy variables) yielded (not shown) a statistically significant value for the coefficient for the modified LST$DevalProb variable (t-statistic=3.19), although the identical

regression that employed the unmodified LST$DevalProb variable yielded an insignificant parameter estimate with a t-statistic of 0.69 (the election year dummy variable remained statistically significant in both regressions).

6. It is interesting to note that the two exceptions are similar in terms of being heavy producers of raw materials like oil and gold (as is the U.S. itself). However, testing whether the election-year effect is related to a boom in raw materials is beyond the scope of this study. It should be mentioned that the systematically significant results for the election dummy variables were not robust to different statistical procedures. For instance, OLS parameter estimates for this variable were significantly different from zero in only four (compared to thirteen reported in Table 2) of the fifteen regressions (in contrast, the results for the LST$DevalProb were only moderately affected by different regression procedures, with four OLS parameter estimates significantly positive, compared to the five reported in Table 2).

7. The latter hypothesis might fit within the context of Danthine, Donaldson, and Siconolfi's (2005) hypothesis that premium returns on assets represent required compensation for the risks associated with changes in the balance of power between investors and workers that can lead to lower returns to investors. For currency investors, compensation in U.S. Presidential election years might be required for the political risks related to those perceiving a benefit from easy money (such as workers who might enjoy higher employment and income growth with a devaluation) gaining more political power through the Presidential election

process that would include the primaries and thus the entire Presidential election year.

8. Adding the U.S. current account deficit as a percent of U.S. GDP to regression (2) reduced (not shown) the number of parameter estimates for IncDec to seven, all but one of which was positive. Only two of the coefficients for the U.S. current account variable had a significantly positive sign, while four of the parameter estimates for the U.S. current account were significantly negative, indicating investor expectations of the dollar to rise more often than fall when the U.S. current account deficit widens (as is consistent with prior research unable to find a meaningful relationship between exchange rates and currency fundamentals). Since the reduced number of significantly negative coefficients for IncDec in this regression probably results from multicollinearity (Judge et al., 1982), these results seem to indicate that investors do incorporate more complex models into their expectations than simple raw data. Replacement of the IncDec variable with the simple U.S. current account deficit as a percent of GDP in regression (2) provided further evidence of this hypothesis, as it yielded (not shown) only six significant parameter estimates for the U.S. current account. All six had the theoretically correct positive sign, indicating investor expectations of a future dollar value that rises with the U.S. current account but only for a minority of cases. A further regression that replaced IncDec with the current account deficit of the foreign country (also not shown) yielded only two significant parameter estimates, including one with a positive sign that counter-intuitively indicated a falling foreign currency value with a rising foreign current account. The latter

results indicate no meaningful linear relationship whatsoever between the value of the dollar and foreign current accounts. These additional findings are more consistent with investors intuitively or otherwise employing a complex forecasting model, as has been described by Murphy (2003) for instance, as opposed to just simple economic data and linear regressions.

9. For example, if inflation in the U.S. is higher than some universal target while Japanese inflation is lower than that, investors may predict that the U.S. will adopt a hard currency strategy at the same time that Japan is adopting a soft currency strategy. Since tight monetary policy often implies rising interest rates that raise currency values, exchange rates themselves would contribute to the effect insofar as a rising real currency value (such as for the U.S. dollar when interest rates rise to slow inflation to some targeted rate) would lead to an importation of lower prices long-term.

10. Moreover, the reversal in the Australian currency could also be caused by a mere spurious cycle that might relate to some particular aspect of Australia's economy, such as a cycle in the commodities that it heavily exports.

11. It should be mentioned that twelve of the parameter estimates for the l3c$ variable were significantly negative in OLS regressions, implying that there may be some form of reversal that the GLS adjustment for autocorrelation masks (the coefficients were statistically insignificant from zero only for Italy, Portugal, and Sweden). In contrast, the sign and significance of the coefficients for the Inf variables were not affected by use of different estimation procedure (although OLS t-statistics were far lower), and the sign and significance of the parameter

estimates for the IncDec variable were only moderately affected by use of different regression procedures (e.g., thirteen, as opposed to eleven, coefficients for the IncDec variables were significantly negative in OLS regressions).

12. For consistency purposes, the same exchange rate elasticity of the current account and inflation-pass-through duration are used as were estimated for the set of regressions that employed the U.S. as the home country. Initial attempts with annual data to estimate these parameters independently for two countries with chronic current account deficits (Britain and Australia) yielded too many parameter coefficients that were statistically insignificant from zero or consistently of the wrong sign and, hence, meaningless. Since an attempt to estimate these parameters using other econometric procedures would have led to inconsistencies in methodology across countries (and detracted from the focus of this research), such an attempt is left to future research. One reason for the insignificance of the elasticity parameter estimates in the annual regressions may be due to the effect of exchange rate changes being felt in periods less than a year, as Korhonen and Wachtel (2006) found for some countries with more open economies. It is also possible that monetary policy was too quickly adapted to exchange rate changes (especially large ones) for the effect to be measured. In particular, given standard prescriptions across much of the world outside the U.S. of following up a large devaluation with a large rise in interest rates that itself slows imports rather rapidly and minimizes any inflation pass-through effect, the true parameter values that would exist without this intervening policy may be quite difficult to estimate econometrically.

13. Thirteen of the 180 new parameter estimates for this variable, or less than 10%, were significantly less than zero. However, since this figure is less than the number (18) that would exist by random chance at the .10 level, these results with a sign inconsistent with the model can safely be assumed to be spurious. A further test that combined all 12 sets of different home country regressions with the U.S. also as home country for a total of 195 GLS SUR regressions initially indicated 63 coefficients for LST$DevalProb were significantly greater than zero (many closer to the hypothesized value of 1.0 than reported in Tables 2 and 4a) and 29 were negatively significant, but the iterative SUR estimation process failed to even come close to converging after over 100 iterations, and so the results are not tabulated.

14. It is well recognized that U.S. trade policy is strongly influenced by the political pressures of the Presidential election, and attempts to negotiate better trade terms for the U.S. (and/or pressure foreign countries to have their currencies appreciate) take place well in advance of the actual election year due to the well-understood lag in the effect on the economy and hence voters (Berub, 2004). The empirical evidence of this study implies that at least part of the rise in the dollar in the Presidential election years over the sample interval may have been caused by deteriorating fundamentals in countries that had been pressured by U.S. Presidential politics to make trade concessions. While investors perhaps should have anticipated such effects over the sample, it’s also possible that the pressure put on the foreign countries to have their currencies appreciate before the election year inhibited any such expectations from being reflected in market prices (as is

feasible given the enormous power of determined governments and central banks), as may have the risk of an easy-money politician coming to power in the U.S.

15. A further test that combined all 12 sets of different home country regressions with the U.S. also as home country for a total of 195 GLS SUR regressions resulted in 61 coefficients for IncDec being significantly less than zero, 25 being positively significant, and 3 being statistically insignificant. A total of 106 regressions did not run because of collinearity (as the l3c$ variable was the inverted form of another country's l3c$ variable in most cases). However, the results that were produced, combined with a finding that all 89 regressions that did run had positive significant coefficients for the inflation variable, provides further support for the hypothesis that investors expect currency weakness for countries with higher inflation and lower declines in real income growth needed to balance the current account.

Table 1
Summary Characteristics of Exchange Rate Changes, Expectations, and Fundamentals[a]
(1982-2004)

(1) Country	(2) Avg. Inflat. Rate	(3) Years Inflat. Pass-Thru	(4) Avg. Needed Currency Rise In %	(5) Avg. c$	(6) ST E(c$)	(7) LT E(c$)	(8) Avg. Prob. LT $ Drop	(9) Avg. Prob Large ST $ Drop	(10) Avg. Curr. Acc. % of GDP	(11) Max. Curr. Acc. Deficit
				Mean						
U.S.: Avg.	2.71%	-	-	0%	0%	0%	0%	0%	-2.46%	6.36%
Euro Countries										
Germany Avg.	2.25	10*	47%*	-0.31	-0.22	-1.12	14.09	6.43	4.24	12.39
Austria Avg.	2.65	5	52%*	-0.31	-0.17	-0.86	13.17	4.91	-3.21	25.72
Belgium Avg.	2.90	10*	44%*	-0.09	0.01	0.21	4.51	3.89	10.18	29.82
France Avg.	3.32	5*	49%*	-0.02	0.27	0.47	8.32	3.73	1.78	13.96
Italy Avg.	6.02	5	29%*	0.35	0.98	2.34	11.92	2.85	-0.52	18.83
Nether. Avg.	2.10	5*	47%*	-0.28	-0.18	-0.69	7.41	4.27	15.13	9.67
Spain Avg.	6.09	5*	33%*	0.41	0.90	2.25	13.92	3.36	-7.09	22.27
Portugal Avg.	11.17	10*	29%*	1.07	1.12	3.92	29.31	8.91	-16.67	89.77
European Union Countries w/o euro										
Britain Avg.	4.10	5*	40%*	0.12	0.55	0.61	13.01	2.66	-5.56	23.99
Sweden Avg.	4.26	5*	37%*	0.36	0.63	1.22	12.42	4.61	3.23	24.31
Denmrk Avg.	3.48	5*	37%*	-0.15	0.45	0.91	4.16	3.11	0.17	3.16
Other Countries with Convertible Currencies										
Australi Avg.	4.17	5	46%*	0.55	0.72	2.08	6.84	3.57	-4.39	7.00
Japan Avg.	0.47	8	48%*	-0.61	-0.70	-3.30	17.47	4.28	2.47	0.34
Canada Avg.	2.88	1	38%*	0.05	0.28	1.02	3.27	2.78	-1.10	5.61
Switz. Avg.	2.14	5*	39%*	-0.29	-0.68	-2.90	25.15	8.43	27.12	-

*Parameter significantly different from 0 at the .10 level in the regressions using annual data (1977-2004) utilized to estimate the parameter.

[a]Inflat. Rate is the inflation rate in the country (as measured by the GDP deflator), Years Inflat. Pass-Thru is the number of years for the effects of a devaluation to be passed through into U.S. inflation (estimated with GLS regressions, adjusted for autocorrelation, of U.S. inflation lags of the real exchange rate change over a number of years that

maximizes the t-statistic of the regression coefficient), needed Currency Rise in % is the rise of the country's currency against the dollar needed to balance the U.S. current account (estimated with GLS regressions, adjusted for autocorrelation, of the U.S. current account on lags of the real exchange rate change over a number of years that maximizes the t-statistic of the regression coefficient), c$ is the percentage change in the value of the U.S. dollar (as measured in foreign currency units), E is the expected value operator (determined for ST c$ by one quarter of the lagged difference between the annualized short-term interest rates in the foreign country and the U.S., and determined for LT c$ by one quarter of the lagged difference between the long-term interest rates on government bonds in the foreign country and the U.S.), Prob. LT $ Drop is the percentage probability of a small annual decline in the value of the dollar against the foreign currency spread necessary to postpone a real income decline long-term as estimated using the Murphy (2003) model, Prob. Large ST$ Drop is the percentage probability of a large short-term decline in the value of the dollar against the foreign currency large enough to temporarily balance the U.S. current account as estimated using the Murphy (2003) model, Curr. Acc. % of GDP is the annualized current account of the country as a percentage of GDP, and the Max. Curr. Acc. Deficit is the absolute value of the largest annual current account deficit for the country over the sample.

Table 2
Causes of Exchange Rate Deviations from Expectations[a]
(Quarterly Data, 1982-2004)

$$c\$ - E(c\$) = B_0 + B_1D_1 + B_2D_2 + B_3D_3 + B_4D_4 + B_5 LST\$DevalProb + e$$

(1) Country	(2) B_0	(3) B_1	(4) B_2	(5) B_3	(6) B_4	(7) B_5
Euro Countries						
Germany	-1.02	3.65*	0.34*	0.13	-0.31	0.17*
(t-statistic)	(-1.44)	(3.05)	(1.81)	(0.15)	(-1.06)	(2.93)
Austria	-0.92	3.50*		0.27	-0.36	0.04
(t-statistic)	(-1.32)	(2.97)		(0.31)	(-1.20)	(0.92)
Belgium	-0.79	3.28*		-0.17	-0.57*	0.13
(t-statistic)	(-1.04)	(2.60)		(-0.22)	(-2.16)	(0.85)
France	-0.94	3.11*		0.23	-0.07	-0.02
(t-statistic)	(-1.31)	(2.59)		(0.23)	(-0.22)	(-0.11)
Italy	-1.45*	2.93*		1.31	0.49	-0.01
(t-statistic)	(-2.03)	(2.41)		(0.65)	(0.73)	(-0.02)
Netherlands	-0.96	2.85*		-0.32	-0.44	0.23*
(t-statistic)	(-1.46)	(1.94)		(-0.38)	(-1.61)	(3.46)
Spain	-1.36*	2.60*		0.93	0.18	0.34
(t-statistic)	(-1.79)	(2.10)		(0.51)	(0.28)	(1.48)
Portugal	-0.99	2.40*		1.37	0.09	0.14*
(t-statistic)	(-1.05)	(1.68)		(0.70)	(0.11)	(2.27)
European Union Countries w/o euro						
Britain	-0.96	2.60*				0.19
(t-statistic)	(-1.42)	(2.13)				(0.27)
Sweden	-0.79	3.03*				-0.22
(t-statistic)	(-0.93)	(2.19)				(-0.49)
Denmark	-1.45*	3.15*				0.33*
(t-statistic)	(-2.16)	(2.76)				(2.09)
Other Countries with Convertible Currencies						
Australia	-0.24	0.08				0.26
(t-statistic)	(-0.34)	(0.06)				(0.44)
Japan	-1.33*	2.91*				0.94*
(t-statistic)	(-1.66)	(2.13)				(1.84)
Canada	-0.30	0.54				-0.41
(t-statistic)	(-0.83)	(0.79)				(-0.94)
Switzerland	-0.84	4.16*				0.11
(t-statistic)	(-1.13)	(3.26)				(0.88)

*Significantly different from 0 at the .10 level.

[a]c$ is the percentage change in the value of the U.S. dollar (as measured in foreign currency units), E is the expected value operator (determined for c$ by one quarter of the lagged difference between the annualized short-term interest rates in the foreign country and the U.S.), LST$DevalProb is the lagged probability of a large short-term decline in the value of the dollar against the foreign currency as estimated using the Murphy (2003) model (whose averages are given in column 9 of Table 1) times the estimated decline in the U.S. dollar necessary to balance the U.S. current account, the D Variables are dummy variables, with D_1 having values of 1 for U.S. Presidential election year quarters, D_2 having values of 1 for the year (1989-1990) of German political and currency unification (but only for Germany), D_3 having values of 1 for the 2 quarters 1998-1999 surrounding the adoption of the euro (but only for countries that adopted the euro), and D_4 having values of 1 after adoption of the euro in 1999 (but only for those countries that did replace their domestic currency with the common European currency). Parameters are estimated utilizing an iterative SUR procedure that makes a separate GLS adjustment for the autocorrelation in each country's time series.

Table 3
Factors Affecting Investor Expectations about Future Exchange Rates[a]
(Quarterly Data, 1982-2004)
$E(\text{real } c\$_{LT}) = B_0 + B_1 L3c\$ + B_2 D_2 + B_3 D_3 + B_4 D_4 + B_5 IncDec + B_6 Inf + e,$

(1) Country	(2) B_0	(3) B_1	(4) B_2	(5) B_3	(6) B_4	(7) B_5	(8) B_6
Euro Countries							
Germany	-1.16*	-0.00	0.07	0.08	0.57*	-0.15*	1.00*
(t-statistic)	(-4.68)	(-0.55)	(0.85)	(0.35)	(2.75)	(-1.96)	(72.21)
Austria	-0.85*	-0.01		0.14	0.84*	-0.20*	0.96*
(t-statistic)	(-3.69)	(-1.26)		(0.22)	(4.47)	(-2.48)	(47.80)
Belgium	0.73*	-0.00		-0.32	0.20	-0.31*	0.92*
(t-statistic)	(4.81)	(-0.79)		(-1.36)	(1.26)	(-4.89)	(25.51)
France	0.88*	-0.00		-0.29	0.15	-0.26*	0.89*
(t-statistic)	(4.58)	(-0.70)		(-1.48)	(0.87)	(-3.78)	(35.30)
Italy	3.20*	0.01*		-0.59	-0.76	-0.39*	0.92*
(t-statistic)	(6.27)	(1.81)		(-1.29)	(-1.64)	(-3.29)	(15.08)
Netherlands	-0.66*	-0.00		0.12	0.70*	-0.19*	1.01*
(t-statistic)	(-2.95)	(0.83)		(0.47)	(3.21)	(-2.44)	(68.66)
Spain	2.50*	-0.00		-0.38	-1.27*	-0.13	0.92*
(t-statistic)	(4.92)	(-0.44)		(-0.76)	(-2.53)	(-1.12)	(13.80)
Portugal	4.50*	-0.00		-0.33	-1.25*	-0.10	0.97*
(t-statistic)	(4.56)	(-0.05)		(-0.68)	(-2.05)	(-0.77)	(67.00)
European Union Countries w/o euro							
Britain	1.11*	0.01				-0.25*	1.01*
(t-statistic)	(4.31)	(1.20)				(-3.73)	(45.97)
Sweden	2.19*	-0.00				-0.36*	1.16*
(t-statistic)	(3.57)	(-0.11)				(-1.74)	(14.30)
Denmark	1.69*	0.01				-0.36*	0.90*
(t-statistic)	(4.64)	(1.03)				(-3.09)	(19.32)
Other Countries with Convertible Currencies							
Australia	2.22*	-0.01*				-0.13	1.00*
(t-statistic)	(5.63)	(-1.71)				(-1.31)	(17.85)
Japan	-3.13*	0.00				-0.12	0.96*
(t-statistic)	(-8.74)	(0.30)				(-1.51)	(20.48)
Canada	1.17*	-0.00				-0.10*	1.00*
(t-statistic)	(5.63)	(-0.61)				(-2.39)	(39.61)
Switzerland	-2.95*	-0.00				-0.13*	1.09*
(t-statistic)	(-6.08)	(-0.23)				(1.83)	(34.07)

*Significantly different from 0 at the .10 level.

[a]E(real $c\$_{LT}$) is the expected annual long-term change in the value of the U.S. dollar (estimated by subtracting the current geometric difference between the inflation rates in the U.S. and the foreign country from the geometric difference between the interest rates on long-term government bonds in the foreign country and the U.S.), L3c$ is the changed in the dollar over the prior 3 quarters, IncDec is the lagged annual expected annual reduction in real income growth needed to balance the current account, and Inf equals one less than the ratio of one plus the inflation rate in the U.S. over the prior year and one plus the inflation rate in the foreign country over the prior year. The D dummy variables are the same as in Table 2, D_2 having values of 1 for the year (1989-1990) of German political and currency unification (but only for Germany), D_3 having values of 1 for the 2 quarters 1998-1999 surrounding the adoption of the euro (but only for countries that adopted the euro), and D_4 having values of 1 after adoption of the euro in 1999 (but only for those countries that did replace their domestic currency with the common European currency). Parameters are estimated utilizing an iterative SUR procedure that makes a separate GLS adjustment for the autocorrelation in each country's time series.

Table 4a
Causes of Exchange Rate Deviations from Expectations[a]
(Quarterly Data, 1982-2004, Euro home countries[b])

$$c\$ - E(c\$) = B_0 + B_1D_1 + B_2D_2 + B_3D_3 + B_4D_4 + B_5LST\$DevalProb + e$$

	Parameter Estimates for B_5 against the below foreign country:							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Home Country	Germ.	Austria	Belg.	France	Italy	Neth.	Spain	Portugal
Euro Countries								
Germany	-	0.07	0.08	0.22	0.18	0.02	-0.34	0.07
(t-statistic)	-	(-0.90)	(1.45)	(0.63)	(0.27)	(0.39)	(-1.08)	(0.56)
Austria	0.01	-	0.06	0.38	-0.37	0.02	-0.20	-0.06
(t-statistic)	(0.19)	-	(0.17)	(0.89)	(-0.62)	(0.47)	(-0.60)	(-0.81)
Belgium	0.92*	0.46*	-	-2.00*	(-0.10)	1.02*	1.18*	-0.54*
(t-statistic)	(6.31)	(3.73)	-	(-4.47)	(-0.10)	(8.40)	(2.20)	(-5.36)
France	0.04	-0.00	0.15*	-	0.52	0.25*	0.22	0.03
(t-statistic)	(0.99)	(-0.01)	(6.32)	-	(1.63)	(3.89)	(0.65)	(0.36)
Italy	0.04	-0.03	0.11*	0.19	-	-0.00	0.20	0.09
(t-statistic)	(1.38)	(-0.87)	(3.99)	(0.58)	-	-0.07	(0.98)	(1.19)
Spain	0.02	0.10*	0.08*	0.16*	0.48*	-0.05	-	-0.04*
(t-statistic)	(0.48)	(2.71)	(3.15)	(2.31)	(1.69)	(-1.23)	-	(-2.07)
Portugal	-0.03	0.02	0.15*	0.25*	0.27	-0.18*	-0.52	-
(t-statistic)	(-0.79)	(0.25)	(2.80)	(2.51)	(0.34)	(-2.18)	(-0.94)	-
European Union Countries w/o euro								
Britain	0.02	0.02	0.04	0.08	0.08	-0.02	0.02	-0.04
(t-statistic)	(0.60)	(0.65)	(0.31)	(0.58)	(0.22)	(-0.40)	(0.09)	(-0.47)
Sweden	0.02	0.05	0.24*	0.37*	-0.09	0.10*	-0.01	-0.15*
(t-statistic)	(0.54)	(1.34)	(19.27)	(5.97)	(-0.66)	(2.71)	(-0.15)	(-2.11)
Denmark	0.16*	0.08*	0.14*	0.43*	0.07	0.20*	-0.08	0.14*
(t-statistic)	(4.08)	(1.92)	(5.45)	(5.06)	(0.22)	(4.39)	(-0.44)	(2.56)
Other Countries with Convertible Currencies								
Australia	0.04*	0.00	0.03	0.11	0.03	0.01	0.07	0.09*
(t-statistic)	(2.24)	(0.08)	(0.43)	(1.41)	(0.13)	(0.46)	(0.65)	(1.74)
Canada	0.06*	0.01	0.13*	0.37*	0.06	0.08*	0.15	-0.17*
(t-statistic)	(2.19)	(0.40)	(5.67)	(2.87)	(0.27)	(2.29)	(0.98)	(-3.43)

*Significantly different from 0 at the .10 level.

[a]c$ is the percentage change in the value of the U.S. dollar (as measured in foreign currency units), E is the expected value operator (determined for c$ by one quarter of the lagged difference between the annualized short-term interest rates in the foreign country and the U.S.), LST$DevalProb is the lagged probability of a large short-term decline in the value of the dollar against the foreign currency as estimated using the Murphy (2003) model (whose averages are given in column 9 of Table 1) times the estimated decline in the U.S. dollar necessary to balance the U.S. current account, the D Variables are dummy variables, with D_1 having values of 1 for U.S. Presidential election year quarters, D_2 having values of 1 for the year (1989-1990) of German political and currency unification (but only for Germany), D_3 having values of 1 for the 2 quarters 1998-1999 surrounding the adoption of the euro (but only for countries that adopted the euro), and D_4 having values of 1 after adoption of the euro in 1999 (but only for those countries that did replace their domestic currency with the common European currency). Parameters are estimated utilizing an iterative SUR procedure that makes a separate GLS adjustment for the autocorrelation in each country's time series.

[b]The home country is the one for which the probability of a large short-term decline in the currency (necessary to balance the current account) is computed. For three of the countries (the Netherlands, Japan, and Switzerland), extremely low interest rates (or consistent current account surpluses) provided consistent 0% estimates of a large short-term decline in the currency value against at least one foreign country, thereby making a complete set of SUR regressions impossible. As a result, these countries are only listed as foreign countries in the Table.

Table 4b
Causes of Exchange Rate Deviations from Expectations[a]
(Quarterly Data, 1982-2004, non-Euro home countries[b])
$c\$ - E(c\$) = B_0 + B_1D_1 + B_2D_2 + B_3D_3 + B_4D_4 + B_5LST\$DevalProb + e$

	Parameter Estimates for B_5 against the below foreign country:								
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Home Country	UK.	Swed.	Denm.	Austla.	Japan	Cana.	Switz.	U.S.	Chi-Squared[c]
Euro Countries									
Germany	-0.65	-1.44*	0.39*	-0.80	1.00*	-0.81	0.69*	0.56*	49.19*
(t-statistic)	(-0.59)	(-1.83)	(1.70)	(-1.06)	(1.68)	(-2.01)	(4.52)	(1.75)	
Austria	0.46	0.43	0.64*	1.14	0.73	0.60	0.10	0.14	16.74
(t-statistic)	(0.48)	(0.61)	(2.81)	(0.98)	(1.30)	(1.11)	(0.70)	(0.47)	
Belgium	2.03	-0.24	1.55*	-0.16	1.81*	3.67	0.26*	0.36	153.09*
(t-statistic)	(1.25)	(-0.23)	(2.09)	(-0.16)	2.44	(0.52)	(2.01)	(0.18)	
France	-0.59	0.31	0.12	0.18	0.52	0.77*	0.28*	0.30	60.72*
(t-statistic)	(-1.10)	(0.86)	(0.79)	(0.29)	(1.31)	(1.84)	(2.41)	(1.07)	
Italy	0.85*	-0.03	0.17	0.82	0.57	0.72*	-0.08	0.20	37.17*
(t-statistic)	(2.74)	(-0.11)	(1.18)	(1.15)	(1.29)	(2.28)	(-0.49)	(0.58)	
Spain	0.74*	0.50*	0.58*	0.70*	0.71*	0.64*	-0.04*	-0.00	62.32*
(t-statistic)	(2.27)	(1.94)	(3.93)	(1.96)	(2.26)	(2.32)	(-1.75)	(-0.00)	
Portugal	-0.31	-0.75	0.51*	1.04	0.19	0.35	0.52*	-0.10	40.03*
(t-statistic)	(-0.54)	(-0.78)	(1.67)	(0.98)	(0.37)	(0.77)	(2.33)	(-0.15)	
European Union Countries w/o euro									
Britain	-	0.03	0.03	(0.99)	0.70	-0.65*	0.04	-0.02	9.67
(t-statistic)	-	(0.10)	(0.22)	(1.30)	(1.57)	(-2.04)	(0.25)	(-0.06)	
Sweden	1.07*	-	0.42*	0.93*	0.03	1.06*	0.13*	-0.35*	577.98*
(t-statistic)	(5.65)	-	(6.80)	(4.71)	(0.19)	(5.95)	(1.65)	(-2.14)	
Denmark	0.26	0.88*	-	0.43	0.78*	1.21*	0.23*	-0.17	96.96*
(t-statistic)	(0.61)	(2.48)	-	(1.05)	(2.15)	(2.80)	(2.74)	(-0.65)	
Other Countries with Convertible Currencies									
Australia	-0.06	0.08	0.12	-	0.64*	-0.02	0.34*	0.41*	31.53*
(t-statistic)	(-0.19)	(0.42)	(1.58)	-	(2.05)	(-0.09)	(3.13)	(2.18)	
Canada	0.68*	0.14	0.34*	0.75*	0.74*	-	0.04	-0.41	76.06*
(t-statistic)	(2.00)	(0.53)	(2.68)	(1.97)	(2.68)	-	(0.39)	(-0.61)	

*Significantly different from 0 at the .10 level.

[a]c$ is the percentage change in the value of the U.S. dollar (as measured in foreign currency units), E is the expected value operator (determined for c$ by one quarter of the lagged difference between the annualized short-term interest rates in the foreign country and the U.S.), LST$DevalProb is the lagged probability of a large short-term decline in the value of the dollar against the foreign currency as estimated using the Murphy (2003) model (whose averages are given in column 9 of Table 1) times the estimated decline in the U.S. dollar necessary to balance the U.S. current account, the D Variables are dummy variables, with D_1 having values of 1 for U.S. Presidential election year quarters, D_2 having values of 1 for the year (1989-1990) of German political and currency unification (but only for Germany), D_3 having values of 1 for the 2 quarters 1998-1999 surrounding the adoption of the euro (but only for countries that adopted the euro), and D_4 having values of 1 after adoption of the euro in 1999 (but only for those countries that did replace their domestic currency with the common European currency). Parameters are estimated utilizing an iterative SUR procedure that makes a separate GLS adjustment for the autocorrelation in each country's time series.

[b]The home country is the one for which the probability of a large short-term decline in the currency (necessary to balance the current account) is computed. For three of the countries (the Netherlands, Japan, and Switzerland), extremely low interest rates (or consistent current account surpluses) provided consistent 0% estimates of a large short-term decline in the currency value against at least one foreign country, thereby making a complete set of SUR regressions impossible. As a result, these countries are only listed as foreign countries in the Table.

[c]Test for null hypothesis of all parameter coefficients being statistically insignificant from 0 for the LST$DevalProb variable (for all foreign countries in both Tables 4a and 4b) using for the country on that line as the home country.

Table 4c
Causes of Exchange Rate Deviations from Expectations[a]
(Quarterly Data, 1982-2004, non-Euro home countries[b])
$c\$ - E(c\$) = B_0 + B_1D_1 + B_2D_2 + B_3D_3 + B_4D_4 + B_5LST\$DevalProb + e$

(1) Home Country	Parameter	Parameter Estimates for B_1 and B_4 against the below foreign country: (2) Germ.	(3) Austria	(4) Belg.	(5) France	(6) Italy	(7) Neth.	(8) Spain	(9) Portugal
Euro Countries									
Germany	B_1	-	0.02	-0.08	0.15	0.26	-0.03	0.90	0.33
	B_4	-	-0.02	0.04	0.86*	1.35*	-0.03	1.43*	2.04*
Austria	B_1	-0.04	-	0.17	0.07	0.11	-0.06	0.80	0.14
	B_4	-0.01	-	0.81*	0.92*	2.01*	-0.04	1.65*	2.48*
Belgium	B_1	-0.56*	-0.50	-	0.11	0.18	-0.46	0.70	0.38
	B_4	-0.04	-0.04	-	0.34	1.40*	-0.09	1.38*	2.13*
France	B_1	-0.41	-0.26	-0.00	-	-0.03	-0.43	0.56	0.16
	B_4	-0.59	-0.61	-0.30*	-	1.12*	-0.61*	0.87	2.13*
Italy	B_1	-1.08	-1.00	-0.17*	0.20	-	-1.07	-0.04	-0.35
	B_4	-0.68*	-0.68*	-0.42*	-0.19	-	-0.68*	0.54	2.17*
Spain	B_1	-0.70	-0.56	-0.27	0.12	-0.65	-0.66	-	-0.30
	B_4	-1.51*	-1.40*	-0.89*	-0.78*	0.44	-1.55*	-	1.09*
Portugal	B_1	-0.65	0.69	0.14	0.90*	-0.30	-0.64	0.27	-
	B_4	-2.10*	-2.09*	-0.83*	-0.53*	-0.47	-2.18*	-0.29	-
European Union Countries w/o euro									
Britain	B_1	0.87	0.70	0.47	0.30	0.18	0.83	-0.18	-0.87
	B_4	-0.35	-0.32	-0.57*	-0.08	0.39	-0.32	0.34	-0.16
Sweden	B_1	-0.12	-0.20	0.09	-0.07	0.34	-0.30	1.18	1.12
	B_4	-1.18*	-1.17*	-0.56*	-0.23	0.65	-1.15*	0.46	1.50*
Denmark	B_1	-0.47	-0.36	-0.14	-0.45*	-0.11	-0.51	0.57	1.49
	B_4	-0.73*	-0.77*	-0.47*	-0.07	0.87	-0.78*	0.74	-0.22
Other Countries with Convertible Currencies									
Australia	B_1	2.59*	2.43*	2.21	2.02	2.00	2.55*	1.44	-0.34
	B_4	-0.48*	-0.51*	-0.64*	-0.09	0.54	-0.51*	0.52	1.13
Canada	B_1	-2.98*	-2.95*	-0.22*	2.22	-2.67*	-3.02*	-2.18*	-2.99*
	B_4	-0.45	-0.49	-0.39*	-0.36	1.36*	-0.45	1.26*	2.01*

*Significantly different from 0 at the .10 level.

[a]c$ is the percentage change in the value of the U.S. dollar (as measured in foreign currency units), E is the expected value operator (determined for c$ by one quarter of the lagged difference between the annualized short-term interest rates in the foreign country and the U.S.), LST$DevalProb is the lagged probability of a large short-term decline in the value of the dollar against the foreign currency as estimated using the Murphy (2003) model (whose averages are given in column 9 of Table 1) times the estimated decline in the U.S. dollar necessary to balance the U.S. current account, the D Variables are dummy variables, with *D_1 having values of 1 for U.S. Presidential election year quarters,* D_2 having values of 1 for the year (1989-1990) of German political and currency unification (but only for Germany), D_3 having values of 1 for the 2 quarters 1998-1999 surrounding the adoption of the euro (but only for countries that adopted the euro), and *D_4 having values of 1 after adoption of the euro in 1999 (but only for those countries that did replace their domestic currency with the common European currency)*. Parameters are estimated utilizing an iterative SUR procedure that makes a separate GLS adjustment for the autocorrelation in each country's time series.

[b]The home country is the one for which the probability of a large short-term decline in the currency (necessary to balance the current account) is computed. For three of the countries (the Netherlands, Japan, and Switzerland), extremely low interest rates (or consistent current account surpluses) provided consistent 0% estimates of a large short-term decline in the currency value against at least one foreign country, thereby making a complete set of SUR regressions impossible. As a result, these countries are only listed as foreign countries in the Table.

Table 4d
Causes of Exchange Rate Deviations from Expectations[a]
(Quarterly Data, 1982-2004, non-Euro home countries[b])
$c\$ - E(c\$) = B_0 + B_1D_1 + B_2D_2 + B_3D_3 + B_4D_4 + B_5LST\$DevalProb + e$

		Parameter Estimates for B_1 against the below foreign country:								$B_2,B_3=0$
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Home Country	Parameter	UK.	Swed.	Denm.	Austla.	Japan	Cana.	Switz.	U.S.	Chi-Squared[c]
Euro Countries										
Germany	B_1	2.11	0.22	-0.43	2.72	-0.29	2.69*	0.69*	-3.06*	1.19
Austria	B_1	2.18	0.04	-0.15	2.57	0.06	2.40*	-0.84	-2.72*	2.93
Belgium	B_1	2.22*	-0.00	0.17	3.13*	0.78	2.55*	-1.35*	-2.72*	1.71
France	B_1	2.17	-0.09	0.24	2.40	0.50	2.06	-1.14	-2.27	1.10
Italy	B_1	1.75	-0.04	0.17	0.82	1.09	1.26	-1.97*	-2.04	2.20
Spain	B_1	1.81	-0.64	0.26	1.47	0.59	1.34	-1.59	-1.76	3.23
Portugal	B_1	2.57*	-0.91	0.98*	2.09	1.46	1.85	-1.29	-1.25	3.27
European Union Countries w/o euro										
Britain	B_1	-	-0.00	0.48	1.55	0.84	-1.13	1.43	-1.77	1.08
Sweden	B_1	0.79	-	-0.13	1.41	0.44	1.25	-1.18	-1.57	3.69
Denmark	B_1	2.14*	-0.49	-	2.52	0.15	1.99	-1.32*	-2.78*	2.68
Other Countries with Convertible Currencies										
Australia	B_1	1.87	1.77	2.25	-	3.12*	0.23	3.60*	0.07	1.36
Canada	B_1	2.36*	-2.73*	2.49*	-0.14	3.09*	-	-3.89*	-0.41	1.53

*Significantly different from 0 at the .10 level.

[a]c$ is the percentage change in the value of the U.S. dollar (as measured in foreign currency units), E is the expected value operator (determined for c$ by one quarter of the lagged difference between the annualized short-term interest rates in the foreign country and the U.S.), LST$DevalProb is the lagged probability of a large short-term decline in the value of the dollar against the foreign currency as estimated using the Murphy (2003) model (whose averages are given in column 9 of Table 1) times the estimated decline in the U.S. dollar necessary to balance the U.S. current account, the D Variables are dummy

variables, with *D_1 having values of 1 for U.S. Presidential election year quarters*, D_2 having values of 1 for the year (1989-1990) of German political and currency unification (but only for Germany), D_3 having values of 1 for the 2 quarters 1998-1999 surrounding the adoption of the euro (but only for countries that adopted the euro), and *D_4 having values of 1 after adoption of the euro in 1999 (but only for those countries that did replace their domestic currency with the common European currency)*. Parameters are estimated utilizing an iterative SUR procedure that makes a separate GLS adjustment for the autocorrelation in each country's time series.

[b]The home country is the one for which the probability of a large short-term decline in the currency (necessary to balance the current account) is computed. For three of the countries (the Netherlands, Japan, and Switzerland), extremely low interest rates (or consistent current account surpluses) provided consistent 0% estimates of a large short-term decline in the currency value against at least one foreign country, thereby making a complete set of SUR regressions impossible. As a result, these countries are only listed as foreign countries in the Table.

[c]Test for the null hypothesis of all parameter estimates for B_2 and B_3 being statistically insignificant from 0 (for all foreign countries in both Tables 4c and 4d) using the country on that line as the home country.

Table 5a
Factors Affecting Investor Expectations about Future Exchange Rates[a]
(Quarterly Data, 1982-2004, Euro home countries[b])
$E(\text{real } c\$_{LT}) = B_0 + B_1 L3c\$ + B_2 D_2 + B_3 D_3 + B_4 D_4 + B_5 IncDec + B_6 Inf + e,$

Parameter Estimates B_1, B_4, B_5, and B_6 against the below foreign country:

(1) Home Country	Parameter	(2) Germ.	(3) Austria	(4) Belg.	(5) France	(6) Italy	(7) Neth.	(8) Spain	(9) Portugal
Euro Countries									
Germany	B_1	-	0.03	0.00	-0.01	-0.03*	0.09*	0.02	0.01
	B_4	-	0.12	-0.03	-0.18	-1.91*	0.02	-1.78*	-1.72*
	B_5	-	-0.10	-0.03	-0.12	0.54	-0.15*	0.04	0.49
	B_6	-	1.00*	0.97*	0.89*	0.96*	1.00*	0.91*	1.00*
Austria	B_1	0.07*	-	0.02*	0.02	-0.02	0.05*	0.01	-0.01
	B_4	-0.10	-	-0.03	0.00	-1.48*	-0.03	-1.33*	-1.40*
	B_5	-0.17*	-	-0.21	0.11	0.44	-0.11	0.07	0.72*
	B_6	1.00*	-	0.99*	0.93*	0.91*	0.99*	0.93*	0.99*
Belgium	B_1	0.03*	0.03*	-	0.02*	-0.01	0.05*	-0.01	-0.02
	B_4	0.15	0.18	-	0.15	-1.07*	0.47*	-1.41*	-1.71*
	B_5	-0.23	-0.24	-	-0.14	-0.01	-0.39*	-0.61*	-0.84*
	B_6	1.00*	0.99*	-	0.90*	0.94*	0.99*	0.93*	0.98*
France	B_1	0.02*	0.03*	0.00	-	-0.02	0.01	0.01	-0.00
	B_4	-0.18	-0.09	-0.38*	-	-0.91*	0.11	-2.10*	-1.94*
	B_5	-0.76*	-0.64*	-0.12	-	-0.05	-0.87*	-0.47*	-0.69*
	B_6	0.99*	0.98*	0.98*	-	1.05*	0.98*	0.85*	1.00*
Italy	B_1	0.00	0.01	0.00	-0.01*	-	-0.02*	0.00	0.02
	B_4	0.73*	0.96*	0.20	0.21	-	1.02*	-2.03*	-1.95*
	B_5	-0.02	-0.11	-0.07	-0.12	-	-0.15	0.44*	0.27
	B_6	0.99*	1.00*	0.96*	0.92*	-	0.98*	0.91*	0.99*
Spain	B_1	-0.01	-0.01*	0.00	0.01*	0.01	-0.01*	-	0.04*
	B_4	0.85*	0.19	0.18*	0.92*	0.12	0.77*	-	-1.04*
	B_5	-0.19*	-0.20*	-0.16*	-0.50*	-0.25*	-0.15*	-	-0.33*
	B_6	0.99*	1.00*	0.98*	0.90*	0.98*	0.95*	-	0.99*
Portugal	B_1	-0.02*	-0.01	0.00	0.01	-0.01	-0.01*	0.02	-
	B_4	0.47*	0.64*	0.21	0.10	-1.52	0.66*	-0.44	-
	B_5	-0.28*	-0.25*	-0.16*	-0.10	-0.02	-0.26*	-0.08	-
	B_6	0.98*	0.99*	0.99*	0.99*	1.01*	0.98*	0.99*	-
European Union Countries w/o euro									
Britain	B_1	0.00	0.00	0.00	0.00	-0.01	0.01	-0.03*	-0.01
	B_4	0.98*	0.95*	0.22	0.24	-1.09*	1.06*	-2.17*	-1.69*

	B_5	0.10	-0.01	-0.05	-0.13	-0.17	-0.02	0.40	0.20
	B_6	0.99*	1.00*	0.96*	0.91*	0.77*	0.98*	0.91*	.98*
Sweden	B_1	-0.02*	-0.01*	0.00	-0.01*	-0.00	-0.02*	0.02*	0.02
	B_4	0.07	0.30*	-0.26*	0.14	-1.44*	0.09	-2.49*	-3.46*
	B_5	-0.07	-0.06	-0.01	0.08	0.10	-.11	0.09	0.10
	B_6	1.01*	0.99*	0.91*	.87*	0.73*	0.98*	0.95*	0.98*
Denmark	B_1	0.02	0.01	0.00	-0.01	-0.02	0.02	0.02	0.00
	B_4	0.11	0.15	-0.21	0.26*	-1.14*	0.13	-1.86*	-1.51*
	B_5	-3.25*	-2.76*	-1.73*	-1.27*	-0.91*	-3.00*	-1.37*	-1.47*
	B_6	1.00*	0.97*	0.98*	0.94*	0.82*	0.99*	0.95*	0.99*
Other Countries with Convertible Currencies									
Australia	B_1	-0.00	-0.01*	-0.00	-0.01*	-0.00	0.00	-0.00	-0.00
	B_4	0.10	0.49*	-0.06	0.08	-0.49	0.19	-1.99*	-2.01*
	B_5	-1.81*	-1.77	-0.98*	-0.81*	-0.50*	-1.81*	-0.50*	-0.25
	B_6	0.98*	0.95*	0.93*	1.00*	0.94*	0.96*	0.99*	0.99*
Canada	B_1	0.00	0.00	0.00	-0.00	-0.01	0.00	0.00	0.00
	B_4	0.26	0.34*	-0.08	-0.17	-1.37*	0.31*	-1.98*	-2.73
	B_5	-0.12	-0.16	-0.08	-0.24	-0.20	-0.25	0.24	0.36
	B_6	1.00*	0.99*	0.93*	0.95*	1.00*	1.00*	0.95*	0.98*

*Significantly different from 0 at the .10 level.

[a]E(real $c\$_{LT}$) is the expected annual long-term change in the value of the U.S. dollar (estimated by subtracting the current geometric difference between the inflation rates in the U.S. and the foreign country from the geometric difference between the interest rates on long-term government bonds in the foreign country and the U.S.), L3c$ is the changed in the dollar over the prior 3 quarters, IncDec is the lagged annual expected annual reduction in real income growth needed to balance the current account, and Inf equals one less than the ratio of one plus the inflation rate in the U.S. over the prior year and one plus the inflation rate in the foreign country over the prior year. The D dummy variables are the same as in Table 2, D_2 having values of 1 for the year (1989-1990) of German political and currency unification (but only for Germany), D_3 having values of 1 for the 2 quarters 1998-1999 surrounding the adoption of the euro (but only for countries that adopted the euro), and D_4 having values of 1 after adoption of the euro in 1999 (but only

for those countries that did replace their domestic currency with the common European currency). Parameters are estimated utilizing an iterative SUR procedure that makes a separate GLS adjustment for the autocorrelation in each country's time series.

[b]The home country is the one for which the probability of a large short-term decline in the currency (necessary to balance the current account) is computed. For three of the countries (the Netherlands, Japan, and Switzerland), extremely low interest rates (or consistent current account surpluses) provided consistent 0% estimates of a large short-term decline in the currency value against at least one foreign country, thereby making a complete set of SUR regressions impossible. As a result, these countries are only listed as foreign countries in the Table.

Table 5b

Factors Affecting Investor Expectations about Future Exchange Rates[a]

(Quarterly Data, 1982-2004, non-Euro home countries[b])

$E(\text{real } c\$_{LT}) = B_0 + B_1 L3c\$ + B_2 D_2 + B_3 D_3 + B_4 D_4 + B_5 IncDec + B_6 Inf + e,$

		Parameter Estimates B_1,B_5, and B_6 against the below foreign country:								
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Home Country	Parameter	UK.	Swed.	Denm.	Austla.	Japan	Cana.	Switz.	U.S.	Ho:B_6=1 Chi-Squared[c]
Euro Countries										
Germany	B_1	0.01*	0.02	-0.03	0.01	-0.00	0.00	-0.02*	-0.02	
	B_5	-0.13	0.55	0.31	0.15	0.08	0.03	-0.15	-0.10	
	B_6	1.01*	1.03*	0.91*	0.95*	0.99*	0.97*	1.03*	0.87*	41.50*
Austria	B_1	0.01*	0.01	-0.01	0.00	-0.00	0.01	-0.01*	-0.01*	
	B_5	0.00	1.20	0.14	0.27	-0.23	-0.11	-0.19	0.13	
	B_6	0.99*	1.06*	0.92*	1.06*	0.91*	1.01*	1.05*	1.04*	31.77*
Belgium	B_1	0.01*	0.01	-0.17*	0.00	-0.00	0.01	-0.02*	-0.01*	
	B_5	0.36	-0.85	-0.27	-0.91*	-0.57*	-0.06	-0.36*	-0.05	
	B_6	1.00*	1.02*	0.95*	0.96*	0.95*	0.98*	1.04*	1.00*	26.36*
France	B_1	0.01*	0.00	-0.09*	0.01	-0.01	0.00	-0.02*	-0.02*	
	B_5	-0.24	-0.72	-0.17	0.51*	-0.43*	-0.26*	-0.94*	-0.55*	
	B_6	0.98*	0.81*	1.04*	0.95*	0.96*	0.98*	1.01*	1.11*	43.41*
Italy	B_1	0.01*	0.03	-0.01	-0.00	0.00	0.00	-0.01*	-0.02*	
	B_5	-0.01	0.50	-0.09	0.31	0.03	0.07	0.06	-0.14	
	B_6	1.02*	1.09*	0.92*	1.01*	0.99*	0.99*	1.00*	0.76*	55.23*
Spain	B_1	0.01	-0.03	0.00	0.00	-0.00	-0.00	-0.01*	0.00	
	B_5	-0.22*	-0.21	-0.10	-0.39*	-0.36*	-0.38*	-0.13	-0.15*	
	B_6	1.02*	0.81*	0.97*	0.92*	0.96*	0.97*	1.03*	0.95*	38.16*
Portugal	B_1	0.01*	-0.02	0.01	-0.00	-0.00	-0.00	-0.02*	0.00	
	B_5	-0.18*	0.07	-0.07	-0.12	-0.18*	-0.11*	-0.21*	-0.12*	
	B_6	1.01*	0.77*	0.99*	1.00*	1.00*	1.00*	0.99*	1.00*	97.23*
European Union Countries w/o euro										
Britain	B_1	-	0.00	-0.02	0.00	0.00	0.00	0.01*	-0.00	
	B_5	-	0.44	-0.16	0.25	0.07	0.08	0.14	0.00	
	B_6	-	1.08*	0.92*	1.00*	0.99*	0.98*	1.01*	1.01*	53.34*
Sweden	B_1	0.01	-	-0.01	-0.00	0.00	0.00	-0.02	-0.01	
	B_5	-0.01	-	0.23	0.02	0.11	0.01	-0.25	-0.09	
	B_6	1.00*	-	0.88*	0.98*	0.96*	0.98*	1.01*	0.91*	127.91*
Denmark	B_1	0.01*	-0.00	-	0.00	-0.00	0.00	-0.02	-0.01*	
	B_5	-1.90*	-2.71*	-	-1.46*	-2.25*	-1.62*	-3.24*	-1.46*	
	B_6	0.98*	0.93*	-	0.98*	0.96*	0.98*	1.03*	0.98*	31.87*

Other Countries with Convertible Currencies										
Australia	B_1	0.00	-0.00	-0.02*	-	0.00	-0.00	0.01*	-0.00	
	B_5	-0.90*	-0.73*	-0.36	-	-0.94*	-0.75*	-2.13*	-0.84*	
	B_6	0.96*	0.97*	1.01*	-	0.99*	1.02*	1.02*	0.99*	69.21*
Canada	B_1	0.01*	-0.02	0.00	0.01	0.00	-	-0.00	-0.01	
	B_5	0.11	-0.22	-0.36	0.16	-0.13	-	-0.08	-0.19*	
	B_6	1.00*	1.04*	0.92*	0.98*	0.97*	-	1.01*	1.01*	19.35

*Significantly different from 0 at the .10 level.

[a]E(real $c\$_{LT}$) is the expected annual long-term change in the value of the U.S. dollar (estimated by subtracting the current geometric difference between the inflation rates in the U.S. and the foreign country from the geometric difference between the interest rates on long-term government bonds in the foreign country and the U.S.), L3c$ is the changed in the dollar over the prior 3 quarters, IncDec is the lagged annual expected annual reduction in real income growth needed to balance the current account, and Inf equals one less than the ratio of one plus the inflation rate in the U.S. over the prior year and one plus the inflation rate in the foreign country over the prior year. The D dummy variables are the same as in Table 2, D_2 having values of 1 for the year (1989-1990) of German political and currency unification (but only for Germany), D_3 having values of 1 for the 2 quarters 1998-1999 surrounding the adoption of the euro (but only for countries that adopted the euro), and D_4 having values of 1 after adoption of the euro in 1999 (but only for those countries that did replace their domestic currency with the common European currency). Parameters are estimated utilizing an iterative SUR procedure that makes a separate GLS adjustment for the autocorrelation in each country's time series.

[b]The home country is the one for which the probability of a large short-term decline in the currency (necessary to balance the current account) is computed. For three of the countries (the Netherlands, Japan, and Switzerland), extremely low interest rates (or

consistent current account surpluses) provided consistent 0% estimates of a large short-term decline in the currency value against at least one foreign country, thereby making a complete set of SUR regressions impossible. As a result, these countries are only listed as foreign countries in the Table.

[c]Test for the null hypothesis of all parameter estimates being statistically insignificant from 1 for the variable Inf (for all foreign countries in both Tables 5a and 5b) using the country on that line as the home country.