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USING SURVEY DATA TO TEST SOME STANDARD PROPOSITIONS REGARDING EXCHANGE RATE EXPECTATIONS

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ABSTRACT

Survey data provide a measure of exchange rate expectations that is superior to the commonly-used forward exchange rate in the respect that it does not include a risk premium. We use survey data and the technique of bootstrapping to test a number of propositions of interest. We are able to reject static or "random walk" expectations for both nominal and real exchange rates. Expected depreciation is large in magnitude. There is even statistically significant unconditional bias; during the 1981-85 "strong dollar period" the market persistently overestimated depreciation of the dollar. Expected depreciation is also variable, contrary to some recent claims. The expected future spot rate can be viewed as inelastic with respect to the contemporaneous spot rate, in that it also puts weight on other variables: the lagged expected spot rate (as in adaptive expectations), the lagged actual spot rate (distributed lag expectations), or a long-run equilibrium rate (regressive expectations). In one important case, the relatively low weight that investors' expectations put on the contemporaneous spot rate constitutes a statistical rejection of rational expectations: we find that prediction errors are correlated with expected depreciation, so that investors would do better if they always reduced fractionally the magnitude of expected depreciation. This is the same result found by Bilson, Fama, and many others, except that it can no longer be attributed to a risk premium.

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Using Survey Data to Test Some Standard Propositions Regarding Exchange Rate Expectations

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No variable is as ubiquitous in international finance and yet as elusive empirically as exchange rate expectations. In this paper we adopt a new data set (two, in fact) to measure expectations: a survey that the Economist has been conducting six times a year since 1981, and a less frequent one that American Express began conducting in 1976.

1. THE LITERATURE ON EXCHANGE RATE EXPECTATIONS

We begin with brief descriptions of some simple models of exchange rate expectations that have been prominent in the past theoretical literature, to be followed by a discussion of how they relate to the standard empirical tests in the more recent literature on forward market efficiency. Later sections will present our attempts to apply the survey data to test standard propositions regarding exchange rate expectations.

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1.1. ALTERNATIVE MODELS OF EXPECTATIONS

1.1.1. Static Expectations (Random Walk)

The simplest hypothesis would be that the expected rate of depreciation is always zero. Expectations are "static" if

$$E_t[\ \Delta s_{t+1}] = 0 \tag{1}$$

where $E_t[\ \Delta s_{t+1}]$ is the rate of depreciation of the domestic currency that is expected by investors (not the mathematical expectation). Models of exchange rate determination often assume static expectations for lack of a better alternative. For example, Branson, Halttunen and Masson (1977) did so, giving as a reason that "we have very little empirical evidence on alternative, more complicated expectations formation mechanisms" (p. 308). The immortal Mundell-Fleming model of exchange rates under conditions of perfect capital mobility can be interpreted as having assumed static expectations, so that international arbitrage equated domestic and foreign interest rates.

More recently, Meese and Rogoff (1983) have found statistically that the lagged spot exchange rate is a better predictor of the future rate than are standard monetary models, time series models, or the lagged forward exchange rate, that is, the exchange rate seems to follow a random walk.[1] This finding suggests that static expectations may be the rational specification, though this is not the same as saying that it accurately characterizes the expectations that investors actually hold.

1.1.2. Bandwagon (Extrapolative) and Distributed Lag Expectations

One characterization of expectations formation often claimed by market participants themselves is that the most recent trend is extrapolated: if the

[1] Other empirical papers exploring the random walk hypothesis include Poole (1967), Giddy and Duffy (1975), Mussa (1979), and Meese and Singleton (1982).

currency has been depreciating, then investors expect that it will continue to depreciate.[2] Such extrapolative or "bandwagon" expectations are represented:

$$E_t[\,\Delta s_{t+1}] = g\,\Delta s_t \tag{2}$$

where Δs_t is the most recent observed change in the log of the exchange rate, and g is hypothesized to be positive. (Static expectations would be the special case where $g = 0$.)

It has long been a concern of critics of floating exchange rates that bandwagon expectations would render the system unstable. For example, Nurkse (1944, p. 118):

> [Speculative] anticipations are apt to bring about their own realization. Anticipatory purchases of foreign exchange tend to produce or at any rate to hasten the anticipated fall in the exchange value of the national currency, and the actual fall may set up or strengthen expectations of a further fall.... Exchange rates under such circumstances are bound to become highly unstable, and the influence of psychological factors may at times be overwhelming.

Nurkse's view was challenged by Friedman (1953), who argued that speculation would be stabilizing. "Speculation" can be defined as buying and selling of currency in response to expectations of exchange rate changes, as compared to the counterfactual case of static expectations. This is the definition used, for example, by Kohlhagen (1979) to evaluate whether or not speculation is destabilizing. A property of bandwagon or extrapolative expectations is that the expected future spot rate as a function of the observed current spot rate has an elasticity that exceeds unity, as contrasted to static expectations, which has an elasticity equal to unity. It follows that speculation based on bandwagon expectations is destabilizing because speculators sell currencies that are appreciating.

[2] See, for example, the discussion in Dooley and Shafer (1983, pp. 47-8).

The next several models to be discussed go the opposite direction. They can all be subsumed under the label **Inelastic Expectations**: a change in the current spot rate induces a revision in the expected future level of the spot rate that, though it may be positive, is less than proportionate. An observed appreciation of the currency generates an anticipation of a future depreciation of the currency back, at least partway, toward its previously expected level. It then follows that speculation is stabilizing, because speculators sell currencies that are appreciating. Argy and Porter (1972), Niehans (1975) and Dornbusch (1976a) pointed out the implications of inelastic expectations for stability in macroeconomic models of the Mundell-Fleming type. Under static expectations, perfect capital mobility would tie the domestic interest rate immovably to the world interest rate. As a consequence a monetary expansion, for example, would have to induce a very large depreciation of the currency, large enough so that the excess supply of money could be absorbed without a decline in the domestic interest rate. (The depreciation would normally work to increase the demand for money by stimulating output.) Under inelastic expectations, on the other hand, a depreciation would generate expectations of future appreciation; as a consequence, investors would be willing to hold domestic bonds when the domestic interest rate falls short of the world interest rate, so that the depreciation of the currency need not be large enough to accomplish in itself the entire equilibration of the domestic money market. In other words, the exchange rate need not be as variable under inelastic expectations as it would be under static expectations (let alone under bandwagon expectations).

One case of inelastic expectations is equation (2) with g less than zero. An equivalent representation would be

$$E_t[s_{t+1}] = (1+g)s_t - gs_{t-1} \tag{2'}$$

where s_t is the logarithm of the current spot rate and g is hypothesized to be negative. The hypothesis is a simple form of **Distributed Lag Expectations.** (Obviously we could have longer lags.) However there are several other examples of inelastic expectations that are more prominent in exchange rate theory.

1.1.3. Adaptive Expectations

The form specified by Argy and Porter (1972) and Dornbusch (1976a) was an old standby in the economist's traditional arsenal of expectations models: the expected future spot rate is formed adaptively, as a weighted average of the current observed spot rate and the lagged expected rate:

$$E_t[\, s_{t+1}] = (1-\gamma_1)s_t + \gamma_1 E_{t-1}[s_t] \tag{3}$$

where γ_1 is hypothesized between 0 and 1 for expectations to be inelastic. Adaptive expectations have also been considered by Kouri (1976), as a third alternative after static and rational expectations, as well as by many other authors.[3]

1.1.4. Regressive Expectations

Dornbusch (1976b) followed with a more elegant specification, consistent with dynamic models in which variables such as goods prices converge toward their long-run equilibrium values over time in accordance with differential equations (or, in discrete time, in accordance with difference equations):

$$E_t[\, s_{t+1}] = (1 - \vartheta)s_t + \vartheta\bar{s}_t \ . \tag{4}$$

Here $\bar{s}_t$ is the long-run equilibrium exchange rate, and ϑ (a number between 0 and 1 in this discrete-time version) is the speed at which s_t is expected to regress toward $\bar{s}_t$, as can perhaps be seen more clearly in the equivalent

[3] See Kohlhagen (1978, pp. 9-17) for a survey of adaptive and other models of expectations appearing in the earlier exchange rate literature.

representation,

$$E_t[\Delta s_{t+1}] = -\vartheta(s_t - \bar{s}_t) \qquad (4')$$

The long-run equilibrium, $\bar{s}_t$, can itself change. It is normally assumed to obey Purchasing Power Parity, increasing proportionately in response to a change in the domestic money supply and price level.

1.1.5. PPP Expectations

The hypothesis of *ex ante* Purchasing Power Parity (PPP) suggests an alternative specification for expected depreciation, that it is given by the expected inflation differential:

$$E_t[\Delta s_{t+1}] = E_t[\pi_{t+1} - \pi^*_{t+1}] \qquad (5)$$

where $E_t[\pi_{t+1} - \pi^*_{t+1}]$ is defined as expected inflation at home minus abroad. One can think of this equation as having been derived by taking first differences on PPP in its level form. If PPP actually held in level form, it would simply be the special case of regressive expectations, which we just considered, where ϑ, the speed of adjustment to PPP, is equal to 1. But deviations from absolute PPP are observed to have been extremely large. Indeed it is often impossible to reject statistically the hypothesis that the speed of adjustment to PPP is zero. Such empirical findings have led some economists to swing from the one extreme, the hypothesis that the real exchange rate is constant, to the opposite extreme, that the real exchange rate follows a random walk, in other words that PPP holds <u>only</u> in expected rate of change form. This alternative way of deriving equation (5) is said to have a basis in efficient markets theory, as an arbitrage condition so that agents considering buying goods in one country and shipping them to another cannot expect to make excess profits. (See Roll (1979).) This argument seems to ignore that, to the extent that international goods arbitrage is possible in rate-of-change form, it should in theory be even more powerful in level form. When one country's goods have become more expensive relative to other countries, as in the recent very large real appreciation of the dollar, goods arbitragers should buy goods in the country where they expect prices to be the lowest, not in the country where they expect the lowest inflation rate. Thus arbitrage should work to push the real exchange rate back toward the equilibrium level, not to enforce a zero expectation of future changes in the real exchange rate. Nevertheless PPP in expected rate-of-change form warrants testing. Theoretical arguments aside, there are enough empirical studies supporting the random walk hypothesis for the actual real exchange rate process to make it a serious hypothesis for describing the expected process. In any case, it is certainly true that those countries that experience chronically high inflation rates, for example Italy, have currencies that tend to depreciate against those of countries with low inflation rates, for example Switzerland, and investors can be expected to incorporate this tendency.[4]

1.1.6. Inflation-Adjusted Regressive Expectations

Our last form of expectations combines the tendency for the exchange rate to regress toward an equilibrium value, represented by equation (4), with the tendency for the equilibrium value itself to change over time with secular inflation, represented by equation (5),

$$E_t[\,\Delta s_{t+1}] = \vartheta(\bar{s}_t - s_t) + E_t[\,\pi_{t+1} - \pi^*_{t+1}] \qquad (6)$$

The augmentation of regressive expectations with the secular term is necessary in models with steady state rates of money growth. These are useful for study-

[4] While Krugman (1978) and many others documented the slow tendency to adjust toward PPP, Frenkel (1981) was clearly the most influential in eradicating support for it as a literal statement about the levels of exchange rates and prices in the short run. Roll (1979) makes the "market efficiency" argument for PPP in rate-of-change form. Roll (1979) and Darby (1981) offer empirical support for the hypothesis.

ing, for example, the overshooting resulting from recent disinflations in the United Kingdom, the United States, and other countries.[5]

In equation (6) we test $\vartheta = 0$ to test the null hypothesis of equation (5) -- *ex ante* PPP expectations in the Roll (1979) sense that the real exchange rate follows a random walk -- against the meaningful alternative that the exchange rate is expected to regress toward its historic PPP level. As in the case of simple regressive expectations, the closer ϑ is to unity, the more rapidly is the exchange rate expected to adjust to PPP.

So far we have not paid much attention to the idea of **Rational Expectations**, or its analog in deterministic models, perfect foresight. Making the assumption of rational expectations is the *sine qua non* of modern macroeconomic model-building; but what it actually entails is entirely dependent on the rest of the model. For example, regressive expectations are rational within the context of the Dornbusch model (with a particular value imposed on the parameter ϑ, closely related to the speed of adjustment in goods markets). Similarly, static expectations are rational if the true spot exchange rate process is a random walk. Adaptive expectations can be rational in other models (as Mussa (1976) has shown in the context of expected money growth rates). Even the sort of exchange rate instability associated with bandwagon expectations is consistent with rational expectations in models of speculative bubbles.[6] Thus rational expectations cannot be listed as a well-defined alternative specification of expectations formation on a par with the six

[5] Frankel (1979), Buiter and Miller (1982), and others have proposed equations like (6) in order to introduce secular expected inflation into the Dornbusch overshooting model. In theory, the secular term can be defined variously as the expected money growth differential, the expected short-term rate of change of relative price levels, or the rate of change of a longer-term equilibrium target $\bar{s}_t$. But, as Obstfeld and Rogoff (1984) have shown, the various alternatives are equivalent in the type of models generally used; all that changes is the precise nature of the dependence of the rational value of ϑ on the other parameters in the system.

[6] Papers exploring models of stochastic bubbles include Blanchard (1979), Dornbusch (1982), and Meese (1985).

enumerated above. But the rational expectations hypothesis is integral to the largest existing empirical body of literature relevant to the subject of exchange rate expectations, tests of efficiency in the forward exchange market, to which we now turn.

1.2. FORWARD MARKET EFFICIENCY TESTS

Most empirical work on exchange rate expectations uses the forward rate as the measure of investors' expectations. If one were interested only in choosing the most realistic specification for the formation of expectations, one might simply regress the measure of expectations directly against some of the variables that appear in the foregoing equations: the current and lagged spot rate, lagged expectations, and so forth. Such "direct" regressions are tried out below. But a major drawback with this approach, which applies here and in much of macro-econometrics, is that there is no good reason to think that the error term in such a regression would be independent of the righthand-side variables. This may explain why there have not been many direct regressions of the forward rate.

Instead, most empirical work features the forward rate prediction error, that is, the *ex post* realized future spot rate less the current forward rate, as the dependent variable. Under the assumption that the forward rate indeed accurately reflects investors' expectations, a regression against any variables available to investors at the time that expectations are formed is a test of rational expectations. Under the null hypothesis, the error term should be uncorrelated with the righthand-side variables and serially uncorrelated, and all coefficient estimates should be zero. Most tests of rational expectations do not consider what the alternative hypothesis is. But we shall see that in some of the tests, the alternative hypothesis does have a natural interpretation in terms of the models discussed above.

The majority of existing rational expectations tests fall into two categories. In the first, the prediction error is regressed against its own lagged values; in the second, the righthand-side variable is the forward discount.

1.2.1. Tests of Serial Correlation

A simple univariate test of serial correlation in the prediction errors made by the forward rate, or by any other measure of the expected future spot rate $E_t[\Delta s_{t+1}]$,[7] is the following regression:

$$E_t[s_{t+1}] - s_{t+1} = \gamma(E_{t-1}[s_t] - s_t) + \varepsilon_{t+1} \tag{7}$$

where γ is the autocorrelation coefficient. In the early years after exchange rates began to float in 1973, it was possible to use univariate tests to find statistically significant serial correlation.[8] A more sophisticated test is to regress the prediction error in a given country's exchange rate against the previous prediction errors in other exchange rates. In later years it may have become more difficult to reject the null hypothesis without the more sophisticated techniques.[9]

The null hypothesis, rational expectations, is zero coefficients on all lagged prediction errors. What is the alternative hypothesis? It is that investors' expectations are insufficiently, or overly, adaptive. Assume that the true best predictor of the future spot rate is a weighted average of the current spot rate and the lagged expectation:

$$s_{t+1} = (1-\gamma_2)s_t + \gamma_2 E_{t-1}[s_t] + \varepsilon_{2,t+1} \tag{8}$$

Then investors' expectations would be rational if and only if γ_1 from equation

[7] When speaking of the forward rate as an accurate measure of expectations, we are implicitly assuming that there is no risk premium.

[8] See for example, Dooley and Shafer (1976, 1983), Cornell (1977) and Frankel (1980).

[9] See Hansen and Hodrick (1980), Cumby and Obstfeld (1981), and Frankel (1985).

(3) were equal to γ_2 from equation (8). If we take the difference of equations (3) and (8),

$$E_t[\, s_{t+1}] - s_{t+1} = \Big[(1-\gamma_1) - (1-\gamma_2)\Big]s_t + (\gamma_1-\gamma_2)E_{t-1}[s_t] + \varepsilon_{t+1} \tag{9}$$

we get an equation precisely equivalent to (7), with $\gamma = \gamma_1 - \gamma_2$. Thus we see that a positive autocorrelation coefficient γ means that expectations are insufficiently adaptive, and a negative autocorrelation coefficient means that they are overly adaptive.

1.2.2. Tests of 'Excessive Speculation'

A large number of studies of forward market efficiency feature as the right-hand side variable the expected rate of depreciation rather than the lagged prediction error or other variables:

$$E_t[\, s_{t+1}] - s_{t+1} = \alpha + dE_t[\, \Delta s_{t+1}] + \varepsilon_{t+1} \tag{10}$$

If investors' expectations are measured by the forward rate, then $E_t[\, \Delta s_{t+1}]$ is the forward discount. The null hypothesis is that the prediction errors are random $\alpha = d = 0$. A more common representation of the equation can be derived in terms of changes, by noting that the lefthand expression is equal to $E_t[\, \Delta s_{t+1}] - \Delta s_{t+1}$. The equivalent test is to regress the *ex post* realized rate of depreciation against the forward discount, with a hypothesized coefficient of 1:

$$\Delta s_{t+1} = -\alpha + (1-d)E_t[\, \Delta s_{t+1}] - \varepsilon_{t+1}. \tag{10'}$$

Regression equations like (10') evolved from earlier regressions of the simple level of s_{t+1} against the level of the current forward rate (by Frenkel (1976) and others), after it was realized that the levels were likely to be nonstationary. Tests in either the form of (10) or (10') have been performed by, among many others, Tryon (1979), Levich (1980), Bilson (1981a), Longworth (1981), Fama (1984) and Huang (1984). If the rational expectations null hypothesis is $d = 0$, what interpretation can we give the alternative hypothesis? Bilson (1981b) proposed that the alternative of d greater than 0 be termed "excessive speculation", because it would imply that investors could do better if they were always to reduce fractionally the magnitude of their forecasts of exchange rate changes, and that the alternative of d less than 0 be termed "insufficient speculation", because it would imply that investors could do better if they were always to raise multiplicatively the magnitude of their forecasts of exchange rate changes . The usual finding has been the former: a coefficient $(1\text{-}d)$ in equation (10') significantly less than 1, i.e. a positive value of d. Indeed, the coefficient $(1\text{-}d)$ has often appeared much closer to 0, which is the random walk hypothesis, than to 1: the current spot rate is a better predictor of the future spot rate than is the current forward rate.[10] Occasionally $(1\text{-}d)$ has even appeared to be significantly less than 0, suggesting that the exchange rate tends to move in the opposite direction from that expected by investors! More often, the optimal predictor has appeared to be a convex combination of the spot and forward rates.

1.2.3. Systematic Expectational Errors or Risk Premium?

The most popular alternative hypothesis in regressions of equations like (10) is that domestic and foreign securities are imperfect substitutes because of risk. The forward rate does not accurately reflect investors' expectations in the first place; the two differ by a risk premium, defined as follows:

$$rp_t = f_t - E_t[\, s_{t+1}] \qquad (11)$$

where f_t is the log of the forward exchange rate used in the regressions described above. Equivalently, the risk premium can be defined in terms of rates of change:

[10] This finding appears in Frankel (1980), Bilson (1981a, 1985), Meese and Rogoff (1983), and Huang (1984), among others.

$$rp_t = fd_t - E_t[\Delta s_{t+1}], \tag{11'}$$

where fd_t is the forward discount, defined as $f_t - s_t$.[11]

The crucial impediment, when systematic prediction errors (separating the forward rate from the optimal predictor) are detected empirically, lies in distinguishing whether they are due to a failure of rational expectations (separating investors' expectations from the optimal predictor), or to the existence of a risk premium (separating the forward rate from investors' expectations). Most of the literature arbitrarily assumes away one of the two, in order to concentrate on the other. For example, in interpreting their tests of equations (10) and (10'), Fama (1984), Hodrick and Srivastava (1985) and Bilson (1985) explicitly assume that expectations are rational, in order to learn about the behavior of the risk premium. Bilson (1981a, 1981b), Longworth (1981) and others, on the other hand, explicitly assume away the risk premium, in order to learn about expectations.

In his provocative paper, Fama proposes a decomposition of the forward discount into the risk premium and the expected rate of depreciation, as in equation (11') above:

$$fd_t = rp_t + E_t[\Delta s_{t+1}]. \tag{11''}$$

His finding is that the variance of the risk premium is larger than the variance of expected depreciation, though it is not entirely meaningful to speak of how much of the variance of the forward discount is attributable to the variance of the risk premium and how much to the variance of expected depreciation (because of a large negative covariance). Hodrick and Srivastava (1985) report the same finding (p. 18). Bilson (1985 p. 63) speaks of a new "empirical paradigm that most of the variation in the [forward] premium reflects variation in

[11] Some of the tests described above use the domestic-foreign interest differential in place of the forward discount; the two are normally equal, by covered interest parity.

the risk premium rather than variation in the expected rate of appreciation." He takes the argument a step further, and suggests that possibly <u>none</u> of the forward discount is attributable to expected depreciation on the part of the market: "It is consequently not possible to reject the view that the forward premium, and hence international differences in short-term interest rates, are unrelated to either actual or market forecasts of exchange rates." In other words, Bilson (1985) concludes, from estimates close to $d = 1$ in equations like (10) and (10'), that the random walk holds not only as a description of the actual spot rate process but also as a description of expectations formation.[12]

2. THE SURVEY DATA

Without a measure of exchange rate expectations that is more direct than the forward rate, any conclusions regarding the nature of either the risk premium or expectations formation can be no more than assertions.

This paper uses survey data of exchange rate expectations compiled from two separate sources. The Amex Bank Review (AMEX) publishes surveys taken once or twice annually from early 1976 to the present.[13] For each survey, 250-300 central and private bankers, corporate treasurers and finance directors and economists were asked to record their expectations of the level of five major currencies against the dollar, six months into the future. The second survey was conducted by the the Economist Financial Report (ECON). Beginning in June 1981, the Economist polled a sample of 13 leading international banks six times annually, asking for their expectations at three and six month

[12] Earlier papers finding that the rational expectation is closer to zero depreciation than to the forward discount, such as Bilson (1981a), Meese and Rogoff (1983) and Huang (1984), did not explicitly conclude that the same is necessarily true of investors' expectations; these authors supported the random walk model of the spot rate, but were relatively agnostic on investors' expectations.

[13] Amex Bank approximate survey dates were January 76, July 76, January 77, June 77, November 77, June 78, November 78, June 81, June 82, June 83, and June 84.

horizons. Both surveys record expectations of the same five major currencies against the dollar: the pound, French franc, mark, Swiss franc, and yen.

Economists generally distrust survey data. It is a cornerstone of "positive economics" that we learn more by observing what people do (in the marketplace) than what they say. Nevertheless, alternative measures of expectations all have their own drawbacks. For this reason, closed-economy macro and finance economists have found survey data useful, in studies of expected inflation (where the Livingston survey has been the most popular), expected announcements of the money stock and other macroeconomic variables (where Money Market Services, Inc. is the source), and even expectations of interest rates. To our knowledge, there have been no studies of exchange rate expectations using survey data. This might be considered surprising in light of the great interest in the subject evident in the large literature on the forward market discussed in the preceding section. One could even argue that the case for using survey data on exchange rate expectations is on firmer ground than the case for using survey data on inflation expectations: the respondents to the AMEX and Economist surveys are probably more direct participants in the spot and forward exchange markets than the respondents to the Livingston survey are in the various financial and goods markets of interest. In any case, the exchange rate survey data surely contain at least some useful information that warrants study. It seems likely that the failure of economists in the past to use the data is attributable only to lack of awareness of its existence.

One serious limitation to the AMEX and Economist data should be registered from the start, the very small number of observations that are available as of 1985: only 11 dates for the AMEX data and 24 for the Economist data.[14] We alleviate this problem by pooling the cross-section of five currencies,

[14] The largest sample of non-overlapping observations for the Economist data is only 14. If overlapping observations are used, e.g. 6-month forward expectations observed

and we use Zellner's Seemingly Unrelated Regressions to correct for the obvious existence of contemporaneous correlation of error terms across currencies. Furthermore, because it has been claimed that exchange rates may have non-normal distributions,[15] which would render regular test statistics particularly unreliable in small samples, we adopt the technique of bootstrapping to get better estimates of the standard errors.

3. PRELIMINARY RESULTS

Before we set out to test the hypotheses of interest, some descriptive statistics and preliminary tests are in order.

3.1. EXPECTED DEPRECIATION VERSUS THE RISK PREMIUM

First and perhaps foremost, by using survey data some light can be shed on questions concerning the relative size and volatility of exchange rate expectations. As we have already noted, recent papers by Fama (1984), Hodrick and Srivastava (1985), and Bilson (1985) argue that their apparent rejections of simple forward market efficiency can be viewed as evidence of a risk premium that is more variable than expectations. To see this argument, note that the slope coefficient $(1-d)$ in equation (10') can be rewritten as,

$$1-d = \frac{cov[\Delta s_{t+1}, fd_t]}{var[fd_t]} = \frac{cov[E_t[\Delta s_{t+1}], fd_t]}{var[E_t[\Delta s_{t+1}]]+var[rp_t]+2cov[E_t[\Delta s_{t+1}], rp_t]} \quad (12)$$

$$= \frac{var[E_t[\Delta s_{t+1}]] + cov[E_t[\Delta s_{t+1}], rp_t]}{var[E_t[\Delta s_{t+1}]] + var[rp_t] + 2cov[E_t[\Delta s_{t+1}], rp_t]}$$

where the second equality follows from assuming rational expectations. If

every 3 months, the prediction errors are serially correlated even under the null hypothesis of rational expectations. See for example Hansen and Hodrick (1980) or Frankel (1980, appendix).

[15] See for example, Westerfield (1977)

$d > \frac{1}{2}$ it follows that $var(rp_t) > var(E_t[\Delta s_{t+1}])$. We have already mentioned that since the exchange rate is approximately a random walk, rationally expected depreciation would be small in magnitude. Equation (12) and the empirical finding that $1-d$ is relatively close to zero seem to confirm that investor-expected depreciation is relatively static as well.

Both our sets of survey data, however, indicate that expected depreciation does exhibit considerable variation, often more in fact than does the implied risk premium. Table 1 shows the variance of expected changes in the spot rate and of risk premia for each data set, individually and averaged across currencies.[16] Note to begin with that the magnitude of the *ex post* exchange rate changes (first column) dwarfs the forward discount (second column), an empirical regularity noted by Mussa (1979) and many others. For example, a variance of .04 is a standard deviation of .20 and implies that roughly 95 percent of quarterly exchange rate changes lie in a band of plus or minus 40 percent on an annualized basis (or 10 percent in a quarter).

Of greater interest, the variance of expected depreciation is comparable in size to (or slightly larger than) the variance of the risk premium, and is also several times larger than the variance of the forward discount. The relative stability of the forward discount masks considerable variation in its components, corroborating Fama's (1984) finding that the risk premium is negatively correlated with the change in the spot rate.

To give an idea of the relative importance of expected spot rate changes and the risk premium as components of the forward discount, mean squared values (MSV) are compared in Table 1a. An implication of static expectations is that the MSV should be zero. The table shows this is clearly not the case. Not

[16] Averaging the variance across currencies is equivalent to computing the variance of the entire sample when allowing countries to have different means.

only is the MSV of expectations greater than that of the risk premium, but it is surprisingly large in comparison with the MSV of the forward discount.

These measures of variability suggest that survey expectations do not merely mimic the forward discount. The same conclusion follows from the first moments.[17] Table 2 shows the averages of alternative measures of expected depreciation. The most striking fact is that the survey numbers show considerably greater expected depreciation of the dollar against other currencies than do the forward market numbers. For purposes of comparison,the nominal interest differential on Eurocurrency deposits is also shown. The interest differential is much closer to the forward discount, confirming past evidence that covered interest parity holds, and foreign exchange markets today can be treated as essentially frictionless.

3.2. UNCONDITIONAL BIAS

The simplest possible test of market efficiency is to see if expectations are unconditionally biased, if investors systematically overpredict or underpredict the future spot rate. Tests performed in the 1970s clearly failed to find any unconditional bias.[18] But in the 1980s the dollar has consistently sold at a discount in the forward exchange market against most other major currencies, as is shown in Table 2, and yet the great long-anticipated dollar depreciation has failed to materialize. Could there be unconditional bias in the more recent data?

Table 3 reports formal tests of unconditional bias. In the case of each of the five currencies, the 3 and 6 month forward discounts have indeed systematically underpredicted the value of the dollar (overpredicted its depreciation)

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[17] The *Amex Bank Survey of Expectations: Summary of Results 1976-1978* also reports finding considerable differences between survey data and the forward discount.

[18] See Cornell (1977), Stockman (1978) and Frankel (1980).

during the period June 1981 to March 1985. The bias is highly significant statistically.

There are four possible explanations for this finding. The first is a risk premium separating the observed forward discount from investors' true expectations. But in Table 3 we also use our Economist survey data for the period June 1981 to March 1985, and we find unconditional bias even larger in magnitude and in level of statistical significance (as one would expect from observing in Table 2 that the survey data shows an even greater rate of expected dollar depreciation in the 1980s than the forward discount). If the survey numbers are to be believed at all, the unconditional bias is present in actual investor expectations, and cannot be attributed to a risk premium.

The second possible explanation is a convexity or Jensen's inequality term that enters into the mathematical expectation of the log of an uncertain exchange rate even when risk-aversion is not a concern. However, the convexity term is bounded above by the conditional variance of the exchange rate; with an unconditional variance of depreciation on the order of 0.0428 (3 month annualized annualized rates) and conditional variances on the order of 0.0424 or 0.0370 (conditional on tbe forward discount and survey numbers, respectively), the convexity term is necessarily too small to explain the bias that shows up in Table 3.[19]

The third explanation is that there is indeed a gross failure of rational expectations, unattractive as such a conclusion would be on theoretical grounds. The fourth, which is the one to which we tentatively incline, is that the rational expectation for the value of the dollar in recent years has been the weighted average of a small probability of a large decline coupled with a large

[19] In Frankel (1985), footnote 13, the upper bound for the convexity term under risk neutrality is shown to be the conditional variance of the spot rate. More generally, McCulloch (1975) discuss the convexity term and its small size given actual variances.

probability of continued strength. This could be the case if the 1980-85 appreciation of the dollar were due either to a speculative bubble as mentioned above (in which case the small-probability event would be the bursting of the bubble) or to fundamentals (in which case the small-probability event would be a large change in fundamentals such as the monetary/fiscal policy mix). Either way, the distribution of the exchange rate would be non-normal and the reported test statistics would be untrustworthy.[20]

It requires emphasis that this new finding of unconditional bias is an artifact of the strong-dollar period, and not of our survey data. The Economist survey data is not available before 1981, but the AMEX data is, and it shows no statistically significant unconditional bias when the pre-1980 years are included, even though -- like the Economist data -- it shows a statistically significant tendency to overpredict the value of foreign currencies against the dollar during the post-1980 period. The unconditional bias is uniquely a phenomenon of the "overvalued dollar" period.

Whichever of the explanations for the unconditional bias during the 1980s is the correct one, we think it desirable to separate it out from conditional biasedness and other hypotheses to be tested. We would like to know if prediction errors in one period are associated with prediction errors in the following period even taking the unconditional bias as given. So that the unconditional bias would not dominate the results, in most of the test results reported in the following section we included constant terms for each currency and a dummy variable for the 1981-1984 period.

[20] This econometric difficulty is often known as the "peso problem;" Krasker (1980) offers a technique for dealing with it.

4. TESTS WHETHER EXPECTATIONS PUT THE CORRECT WEIGHT ON THE CONTEMPORANEOUS SPOT RATE AS OPPOSED TO SEVERAL OTHER CANDIDATES IN THE INFORMATION SET

In this section we investigate alternative specifications of expectations mentioned above and test whether the results are consistent with rational expectations. A general framework for expressing equations (1) through (10') would be to write the expected future spot rate as a weighted average of the current spot rate with weight $1-\beta_1$, and some other element, x_t, with weight β_1:

$$E_t[\Delta s_{t+1}] = \alpha_1 + \beta_1(x_t - s_t) + \varepsilon_{1,t} \quad (13)$$

A regression of equation (13) is the direct test of whether the other element x_t is important in the formation of expectations. A finding that x_t is not important, or that $\beta_1 = 0$, would be interesting in itself since it would be consistent with the case of static expectations.

Then, once we have a sense of the weight placed on x_t in equation (13), it would be helpful to know if the spot rate follows a process which gives comparable weight to x_t

$$\Delta s_{t+1} = \alpha_2 + \beta_2(x_t - s_t) + \varepsilon_{2,t+1} \quad (14)$$

The hypothesis that expectations are rational is simply that $\alpha_1 = \alpha_2$ and $\beta_1 = \beta_2$. This hypothesis can be tested formally by subtracting equation (14) from equation (13),

$$E_t[\Delta s_{t+1}] - \Delta s_{t+1} = \alpha + \beta(x_t - s_t) + \varepsilon_{t+1} \quad (15)$$

and testing $\alpha = 0$, $\beta = 0$, where $\alpha = \alpha_1 - \alpha_2$ and $\beta = \beta_1 - \beta_2$. We refer to this as an indirect test of expectations formation. A reason for preferring an indirect test of expectations, equation (15), is that it is hard to think of stories for equations (13) and (14) in which the error term is uncorrelated with the righthand-side variables. But under the null hypothesis of rational expectations the error term in (15) does satisfy the Gauss-Markov assumptions.[21] By testing $\beta = 0$ it is possible to determine if expectations put too much or too little weight on the contemporaneous spot rate as opposed to x_t, relative to what is rational. In addition, by examining β_1 and β_2 in the direct equations (13) and (14) separately, we can determine whether x_t is in fact a meaningful input into the formation of expectations and whether it describes the actual spot rate process. If not, then a test of $\beta = 0$ in the indirect equation (15) is not a powerful test of rational expectations: a finding that investors put the correct weight on x_t is a less interesting finding if that weight is zero. Finally, by running each of these regressions once using the survey data <u>and</u> once using the forward discount, we can highlight the extent to which a risk premium in the forward discount makes fd_t an unreliable proxy for expected depreciation.

In light of the relatively small number of data points, for each regression we conserve degrees of freedom by constraining slope parameters to be equal across currencies. The coefficients can then estimated using OLS. A problem with such aggregation is that the nominal degrees of freedom are overstated due to highly significant contemporaneous correlation across currencies. This difficulty is to be expected since all cross rates are expressed in terms of the dollar (and also since the EMS restricts the relative variability of the DM the French Franc, and to a limited extent the Pound). To exploit the correlation we use Seemingly Unrelated Regressions on the largest data set, the Economist survey 3 month data.[22]

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[21] Throughout the paper we assume conditional homoscedasticity.

[22] Frankel (1980), Bilson (1981a) and Fama (1984) are forward market studies which discuss the use of the SUR technique.

Although SUR offers some improvement in efficiency, it comes at a high cost in small samples. The estimates become nonlinear functions of the residuals so that, even under normality, it is necessary to appeal to asymptotic distribution theory for standard errors. With only 12 or 13 data points per currency, such practice warrants more than the usual healthy skepticism of reported confidence regions. In support of the asymptotic standard errors, bootstrap regressions are performed. Bootstrapping is a nonparametric way of estimating standard errors by resampling the data.[23] We draw random samples with replacement from the initial pool of residuals. With these samples and the initial parameter estimates, artificial observations of the dependent variables are formed. Using the constructed data, new regressions are then run. An empirical distribution of the parameters is then formed by repeating this procedure many times.[24]

More specifically, bootstrapping attempts to estimate the true distribution of the parameters from the empirical distribution of the residuals. The procedure, however, is only valid if the assumption that the true errors are iid holds. Moreover, the validity of inferences based on bootstrapping remains sensitive to the particular sample chosen. If the sample distribution of the residuals is very far from the true distribution, then the bootstrap may contain little additional information. This would be the case if, for example, there was a small probability of a large dollar depreciation that we know *ex post* did not occur in the sample.

4.1. BANDWAGON EXPECTATIONS

Here we consider the hypothesis obtained when x_t in equations (13), (14),

[23] See for example, Freedman and Peters (1984).

[24] In this paper, bootstrap repetitions are performed 1000 times.

and (15) is replaced by the past value of the spot rate. In equation (13) for expected depreciation, this would give us equation (2), in which the bandwagon parameter was called g (the equivalent of $-\beta_1$ in the general case). Negative weight on past values of the spot rate implies extrapolative or "bandwagon" expectations, while a positive weight implies that expectations are stable and conform to a distributed lag formulation. Table 4a presents the direct and indirect regression results using the forward discount, the traditional measure of expected depreciation.

To begin, we look for bandwagon effects by regressing the forward discount and the *ex post* change in the spot rate directly on the lagged change in the spot rate, comparable to equations (13) and (14). The results are presented in the first two panels of Table 4a. The top panel shows the results of regressing the forward discount on current and past levels of the spot rate. Here $\beta_1 > 0$, indicating that the forward discount puts positive weight on past levels of the spot rate. Since the data are irregularly spaced and thus are not true time series, values of Durbin-Watson d test must be interpreted with caution. Nevertheless, the null hypothesis of no "serial" correlation is still appropriate, and the low reported values of d suggest that we could reject such a hypothesis. We attempt to minimize the serial correlation problem by allowing each country's residuals in the SUR regression to follow an AR(1) process. While we do find borderline evidence of serial correlation, the coefficients are similar in size and significance to the uncorrected SUR regression, and so the results are not reported here. Thus, after taking account of the unconditional bias reflected in the highly significant αs, the forward discount is closer to a distributed lag than to a bandwagon. The finding is that, in this context, expectations are inelastic.

In the middle panel of Table 4a, we regress the actual change in the spot rate on the current and lagged level of the spot rate. We cannot reject $\beta_2 = 0$, i.e., the random walk hypothesis. As we have mentioned, this is a common result. Within the framework of equations (13)-(15), the finding that the forward discount puts more weight on the past level of the spot rate than the spot rate process itself, seems to be *prima facie* evidence that the forward rate puts "too much" weight on s_{t-1} to be a rational expectation.

Whether rational expectations holds is precisely the question the indirect regression in the bottom panel is intended to answer. In none of these regressions, which are comparable to equation (15) above, can we reject the hypothesis that $\beta = 0$. At first glance this seems inconsistent with finding $\beta_1 > 0$, and $\beta_2 = 0$. But the tendency of the forward discount to follow a significant though slight distributed lag is overwhelmed by the much greater volatility of the spot rate. Thus although the forward discount follows a distributed lag, it still places enough weight on the current spot rate to avoid a statistical rejection of rational expectations.

One might reasonably ask whether this is a very powerful test of rational expectations. Since there is only slight evidence that s_{t-1} is an important factor in determining either expectations or the future spot rate, a finding of $\beta = 0$ in the indirect regression may not tell us much about the rationality of expectations. But in any case, the failure to reject does not imply that expectations as given by the forward discount are rational since the constant term is significantly different from zero, as one would expect from the finding of unconditional bias reported in the previous section.

Table 4b reports corresponding sets of regressions using the survey data for expected depreciation. In the top panel we again find evidence of distributed lag effects in the formation of expectations i.e., $\beta_1 > 0$ (though only in the AMEX data). As before, we cannot reject the hypothesis that $\beta_2 = 0$ in the direct tests of the spot process itself. Similarly, we cannot reject the rational expectations constraint $\beta = 0$ in the indirect tests.

Taking the results of Tables 4a and 4b together, there is nothing to show that expectations are systematically extrapolative. To the contrary, expectations as measured by the forward discount or the survey data seem to exhibit more significant stability than does the actual spot rate. But it may still be true that psychological factors are important. While apparent bandwagon effects could be the result of speculative bubbles in the data, the absence of such effects does not rule out bubbles. Speculative bubbles which are constantly forming and popping would not yield systematic bandwagon effects in the spot rate. And stochastic bubbles can even be consistent with a constant rate of expected depreciation, as pointed out by Dornbusch (1982).

4.2. ADAPTIVE EXPECTATIONS

A second potential candidate to replace x_t in equation (13) is the previous period's expected depreciation, which would give us equation (3). Now β_1 becomes γ_1. In Tables 5a and 5b this alternative specification is tested using the forward discount and survey data, respectively, as proxies for expectations. Regressions using AMEX data are omitted because gaps in the survey dates do not permit the construction of enough observations with lagged expectations.

Turning first to the direct regressions, there is evidence that the forward discount (Table 5a) can be viewed as placing weight on lagged forward rates. The survey data (Table 5b), however, seem to put little weight on prior predictions. Because serial correlation is likely to be a problem, we correct the SUR estimates for first order serial correlation. This procedure yields a significantly positive coefficient in the forward discount regression. From the middle panels of Tables 5a and 5b, we can see that the optimal predictor of the future spot rate also gives weight to past expectations. The evidence is, however, not very compelling since the random walk hypothesis can be rejected in only one of the 3 data sets.

In the indirect regressions of Tables 5a and 5b, there is no evidence that expectations are insufficiently adaptive, i.e. that $\gamma > 0$. For one data set (ECONII 6 Month) expectations actually appear to be <u>overly</u> adaptive, to place too much weight on the current spot rate to be rational. Once again the constant terms, particularly in the survey data regressions, are significantly positive, indicating a failure of rational expectations.[25]

4.3. REGRESSIVE EXPECTATIONS

We next consider the possibility that expectations are determined by the current deviation from long-run equilibrium. Thus x_t in equations (13), (14), and (15) now becomes $\bar{s}_t$, the long-run equilibrium value of the spot rate, as in equation (4), with $\vartheta = 1 - \beta_1$. A complete consideration of what determines $\bar{s}_t$ is beyond the scope of a paper on exchange rate expectations. Here we interpret the long-run value in two separate ways.

The simplest possible description of the long-run equilibrium is that it is constant over our sample. Thus we regress the left hand side variables in equations (13), (14), and (15) on the current spot rate and a constant term. The results are presented in Tables 6a and 6b. A second specification for the long-run value of the exchange rate is purchasing power parity. In this case, $\bar{s}_t$ is not constant but rather moves with relative inflation differentials. More importantly, when the regressions are run without a constant term, such a measure of $\bar{s}_t$ based on a reference period like the 1970's, implies that throughout the

[25] Serial correlation appears less prevalent in the indirect regressions than in the direct regressions. If it were present, it would in itself constitute a rejection of the null hypothesis of rational expectations, and no correction would be needed.

1981-84 in-sample period the dollar would be expected to depreciate, not just in those months when the dollar happens to have been above its 1981-84 average. These regressions are reported in Tables 7a and 7b.

The general conclusions that come out of Tables 6 and 7 are the same. First, expectations as measured by the surveys are strongly regressive in the Economist data. The estimates of ϑ are not significant in the AMEX survey data and are even of incorrect sign. However, this is partly an artifact of including the 1981-1984 dummy variables, which in both tables show large, positive shifts in the long-run value of the dollar. When the dummies are removed, and $\bar{s}_t$ is forced to remain constant (or evolve slowly with inflation differentials), the coefficients become significantly positive (results not reported). The direct regressions of the Economist survey data in Tables 6b and 7b show that the spot rate is expected to eliminate 20 to 30 percent of the deviation from PPP within a year.[26] Second, the forward discount is not significantly regressive, and the point estimates are decidedly smaller in magnitude than those for the survey data. Third, looking at the indirect equations in the bottom panels, there is evidence that survey expectations are overly-regressive, tending to predict a more rapid return to long-run equilibrium than is rational, beyond that implied by the significantly positive constant terms. The forward rate does not appear to have this element of irrationality since $\beta = 0$ cannot be rejected in the indirect regressions in Tables 6a and 7a.

The finding of regressive expectations, like the findings of distributed-lag or adaptive (as opposed to bandwagon or static) expectations in the preceding two sections, says that the expected future spot rate is relatively inelastic with respect to the contemporaneous spot rate. Because a current increase in the

[26] For example, in Table 6b, the case of a constant long-run equilibrium exchange rate, the SUR regression on the 3 month data set shows deviations from PPP are expected to decay at an annual rate of $(1 - 0.9487^4) = 19$ percent, and the ECONII data shows an expected annual rate of decay of $(1 - 0.8559^2) = 27$ percent.

value of a currency generates expectations of future depreciation, speculators will tend to dampen the original increase. Speculation is stabilizing. Our finding is that if expectations were rational, they would be more elastic, put more weight on the contemporaneous spot rate, which has the implication that overshooting would be greater than it is.[27]

4.4. PPP EXPECTATIONS

It is also possible to think of x_t in equations (13)-(15) as the level of the future spot rate which first differences of PPP would predict, $s_t + E_t[\pi_{t+1} - \pi^*_{t+1}]$. If *ex ante* PPP held, expectations would give zero weight to the contemporaneous spot rate alone ($\beta_1 = 1$) and a weight of one to $s_t + E_t[\pi_{t+1} - \pi^*_{t+1}]$. Similarly, if expectations follow a random walk, i.e. are perfectly inelastic with respect to changes in relative inflation rates, then the contemporaneous spot rate would get full weight and no importance would be attached to an inflation-adjusted prediction of the future spot rate. Equation (13) can therefore be rewritten with the expected inflation differential[28] as the sole regressor:

$$E_t[\Delta s_{t+1}] = \alpha_1 + \beta_1(E_t[\pi_{t+1} - \pi^*_{t+1}]) + \varepsilon_{1,t} \quad (13')$$

Tables 8a and 8b report tests of PPP expectations.[29] Looking at the direct regressions of expected spot rate changes, it is clear that, in forming their

[27] Frankel (1983) shows theoretically that if expectations were more elastic with respect to the contemporaneous spot rate and less elastic with respect to other factors, as would be the case under rational expectations according to Tables 6b and 7b, the degree of overshooting in the Dornbusch model would be increased. Findings of "excessive speculation" in the sense of Bilson, as in the statistically more significant results reported in the next section, have the same implication (p. 43): the nature of observed failure of rational expectations is to reduce overshooting not to increase it.

[28] See the Data Appendix for a description of the estimates of expected inflation we use in this paper.

[29] Unlike in the preceding regressions we constrain the intercepts to be equal across currencies in the equations with expected inflation, for three reasons: (1) the paucity of data points makes it desirable to conserve degrees of freedom; (2) Expected inflation differentials tend to vary more across countries than across time; (3) The data are more amenable to the constraint that the constant terms are equal across countries here than for the other equations.

expectations, investors put a large and significant weight on the PPP predictor of the future spot rate. Using either the forward discount or the survey data, in seven regressions it is not possible to reject $\beta_1 = 1$, the PPP expectations hypothesis. The AMEX data regressions, however, show a clear rejection of both the static expectations and the PPP expectations hypotheses.[30] In the middle panels of Tables 8a and 8b we cannot reject the hypothesis that the actual spot process conforms to PPP.

In the indirect regressions there is no statistically significant potential for using the published survey numbers to improve on exchange rate forecasts, i.e., we are again unable to reject rational expectations but for the constant term.

4.5. INFLATION-ADJUSTED REGRESSIVE EXPECTATIONS

In Tables 9a and 9b we again consider regressive expectations, this time in the context of a secular inflation differential that causes $\bar{s}_t$ to change over time. In models with non-zero steady state growth of nominal prices and money, it is the real exchange rate as in equation (6) that should exhibit a tendency to regress to the long-run equilibrium, $\bar{s}_t$. A test of inflation-adjusted regressive expectations can be interpreted in terms of the general equations (13)-(15) as a test of whether investors' expectations of the future <u>real</u> exchange rate puts the correct weight, if any, on the long-run equilibrium.

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[30] Notice that, under the assumption of covered interest parity, the direct regressions of the forward discount in Table 8a also can be interpreted as tests of real interest rate parity. In all the forward discount regressions the hypothesis $\alpha_1 = 0$, $\beta_1 = 1$, and dummy=0 can be rejected, indicating that real interest parity fails. The Economist regressions indicate that the real interest differential 1981-85 is significantly positive, approximately 1.5 percent per annum.

Such a test also provides a meaningful alternative to the *ex ante* PPP hypothesis, the proposition that investors expect the real exchange rate to follow a random walk. In the direct regressions of expectations using the forward rate in Table 9a there is no evidence that expectations, measured by the inflation-adjusted forward discount are regressive.[31] Survey data expectations (Tables 9b), however, demonstrate a tendency for expectations to predict a return to the long-run equilibrium. The estimates of ϑ are significant for the 1981-85 Economist data set. They are not significant for the AMEX data set, but are somewhat better than under the tests of simple regressive expectations without any secular inflation term.

4.6. TESTS OF EXCESSIVE SPECULATION

Another possible replacement for x_t in equations (13)-(15) is the expected future spot rate itself, giving us equations (10) and (10'), with $d = \beta$. We are thus asking whether investors put the correct weight on the contemporaneous spot rate versus all other factors that enter their expectations, whatever they may be. Equation (13) now becomes an algebraic identity, with $\beta_1 = 1$. Furthermore, equations (14) and (15) have identical statistical properties, with $\alpha = -\alpha_2$ and $\beta = 1-\beta_2$.

Table 10a uses the forward discount as the expectational variable. The results are similar to the many already published. In three of the five equations, we can reject the null hypothesis of simple forward market efficiency. In the top panel of Table 10b we regress the survey expectational error on the survey expected depreciation. Here we can reject the null hypothesis even more strongly than in the previous table, 10a. All five data sets yield significantly positive slope parameters. The optimal predictor would place less

[31] Because of the low value of the Durbin-Watson d statistics, the forward discount results should be interpreted with caution.

than full weight on the survey expectation and would place some weight instead on the contemporaneous spot rate.

Recall that a rejection of $d = 0$ in equation (10), which is the common finding if the forward discount is used as a proxy for expectations, can be explained by two alternative hypotheses. One is that investors should fractionally reduce their expectations in order that they be rational: in Bilson's (1981b) terminology, there is excessive speculation. The other is that there is a time-varying risk premium which allows the variance of expectations rationally to exceed the variance of the forward discount. If, however, the survey data are used as expectations, the alternative of a time-varying risk premium is eliminated, and we are left with a single, unambiguous alternative hypothesis: a failure of rational expectations in the form of excessive speculation.

5. CONCLUSIONS

To summarize our findings:

(1) Exchange rate expectations are not static. The observed nonzero forward discount numbers, far from being attributable to a risk premium, have understated the degree of expected dollar depreciation during the recent period. Our results tend to undermine the claims of Fama, Hodrick and Srivastava, and Bilson (1985) that the variance in the risk premium exceeds the variance in expected depreciation.

(2) Exchange rate expectations are also not extrapolative. We find that the elasticity of the expected future spot rate with respect to the current spot rate is significantly less than unity; expectations put positive weight on the "other factor", regardless whether it is the lagged spot rate (distributed lag expectations), lagged expected rate (adaptive expectations), the forward rate, the long-run equilibrium rate (regressive expectations) or the predictions of *ex ante* PPP. The general finding of inelastic expectations is important because it implies that a current increase in the spot exchange rate itself generates anticipations of a future decrease, as in the overshooting model, which tends to moderate the extent of the original increase. Speculation is stabilizing.

(3) Often the actual spot exchange rate process is close to a random walk. Combined with point (1), this would suggest that expectations are excessively speculative in the sense of Bilson (1981b). Indeed the common finding that prediction errors are significantly correlated with the expected rate of depreciation is upheld even more strongly when we measure expectations with the survey data than with the traditional forward discount. Thus we are able to reject rational expectations, a finding that holds also when we use the bootstrapping

technique to estimate the standard errors. When forming their expectations, investors would do better to put more weight on the contemporaneous spot rate. This is the same result that Bilson and many others have found with forward market data; but now that we have found it in the expectational survey data, it cannot be attributed to a risk premium.

6. DATA APPENDIX

In this appendix we briefly describe the construction of the AMEX and Economist data sets more specifically.

The Economist Financial Review has conducted 24 surveys beginning in June, 1981. Surveys took place on a specific day on which the foreign exchange markets were open. Respondents were asked for their expectations of the value of five currencies (the pound, French franc, mark, Swiss franc, and yen) against the dollar in 3 months and 6 months time. We matched a given day's survey results with that day's actual rates, and with actual rates as close to 90 and 180 days later as possible. Data points which did not overlap by more than a few days were grouped into separate data sets. Survey dates, the horizon dates, and the data set separation scheme are all reported in Table A1.

The Amex Bank Review has conducted 11 surveys beginning in January, 1976. Respondents were asked for their expectations of the value of the same five currencies in 6 months time. The first 3 surveys, however, included only the pound and the mark. Future foreign exchange market realizations were matched in a manner similar to that used for the Economist data. Amex Bank surveys were conducted by mail, and hence it was impossible to pick specific days which were used by all respondents as reference points with any degree of certainty. Since exchange rates vary so much within a month, two methods of choosing the contemporaneous spot rate were employed. First, single days within the survey period were selected (AMEX DAY data set). Second, 30 day averages of daily rates were constructed to encompass the entire survey period (AMEX MONTH data set). The days and averages used are reported in Table A2. Since both methods gave very similar quantitative results in the body of the paper, the lack of a precise reference point should not arouse much concern.

Actual market spot and forward rates were taken from DRI. They represent the average of the morning bid and ask rates from New York. Interest rates are calculated as the average of the bid and ask rates for Eurocurrency deposits. Interest differentials are defined as:

$$\ln\left(\frac{1+i_{t,t+k}}{1+i^*_{t,t+k}}\right)$$

where $i_{t,t+k}$ is the Euro-bill rate on dollars at time t to mature at time $t+k$, and $i^*_{t,t+k}$ is the corresponding rate for a foreign currency.

The purchasing power parity level of any foreign currency against the dollar (used as an approximation to the long-run equilibrium level of the dollar, $\bar{s}_t$) is calculated as

$$s_0 + \ln\left(\frac{P_t \,/\, P_0}{P^*_t \,/\, P^*_0}\right)$$

where s_0 is the log of the average nominal value of that currency in terms of dollars, 1973-1979, P_t and P^*_t are the current monthly levels of the US and foreign CPIs respectively, and P_0 and P^*_0 are the average levels of the US and foreign CPIs, 1973-1979.

Lagged exchange rates (used for "bandwagon" expectations) are market rates approximately 90 days before survey dates. These dates are reported in the last columns of Table A1 and Table A2.

Relative inflation differentials were taken from two separate sources. In addition to expected depreciation, AMEX surveys also reported respondents' estimates of expected inflation for the U.S., U. K., West Germany, and, in several surveys, France. These observations match precisely the date and horizon (6 months) of the AMEX exchange rate expectations. The Economist survey does not include respondents' expectations of inflation. Instead DRI forecasts of inflation for the U. S., U. K., France, West Germany, and Japan were used. Forecasts were performed at approximately the same time as the surveys were taken (the dates are given in the second-to-last column of Table A1). DRI inflation forecasts are reported at 3 year horizons, and have a slightly different interpretation than the AMEX expected inflation: expected inflation can be thought of as representing the longer-run secular trend in relative price levels.

7. REFERENCES

Amex Bank, Ltd., Survey Unit, "*The Amex Bank Survey of Expectations on Interest Rates, Exchange Rates and Inflation: Summary of Results 1976-1978*," 120 Morgate, London.

Argy, Victor and Michael Porter, "*Forward Exchange Market and the Effects of Domestic and External Disturbances under Alternative Exchange Rate Systems*," IMF Staff Papers, 1972, 503-28.

Bilson, John, "*The Speculative Efficiency Hypothesis*," Journal of Business, July 1981, 54, 435-51 (1981a).

__________, "*Profitability and Stability in International Currency Markets*," NBER Working Paper no. 664, April 1981 (1981b).

__________, "*Macroeconomic Stability and Flexible Exchange Rates*", American Economic Review, Papers and Proceedings, May 1985, 75, no. 2, 62-67.

Blanchard, Olivier, "*Speculative Bubbles, Crashes and Rational Expectations*," Economic Letters, 1979, 387-89.

Branson, William, Hannu Halttunen and Paul Masson, "*Exchange Rates in the Short Run: The Dollar-Deutschemark Rate*," European Economic Review 10 (1977) 303-324.

Buiter, Willem and Marcus Miller, "*Real Exchange Rate Over-shooting and the Output Cost of Bringing Down Inflation*," European Economic Review, May/June 1982, 18, 85-123.

Cornell, Bradford, "*Spot Rates, Forward Rates, and Exchange Market Efficiency*," Journal of Financial Economics, 1977, 5, 55-65.

Cumby, Robert, and Maurice Obstfeld, "*Exchange Rate Expectations and Nominal Interest Differentials: A Test of the Fisher Hypothesis*," Journal of Finance, 1981, 36, 697-703.

Darby, Michael, "*Does Purchasing Power Parity Work*?" Proceedings of Fifth West Coast Academic/Federal Reserve Economic Research Seminar, Federal Reserve Bank of San Francisco, December 1981, 136-167.

Dooley, Michael and Jeffrey Shafer, "*Analysis of Short-Run Exchange Rate Behavior: March 1973 to September 1975*." Federal Reserve Board International Finance Discussion Paper 123, 1976.

____________________, "*Analysis of Short-Run Exchange Rate Behavior: March 1973 to November 1981*," in Exchange Rate and Trade Instability: Causes, Consequences, and Remedies, D. Bigman and T. Taya, eds., 1983.

Dornbusch, Rudiger, "*The Theory of Flexible Exchange Rate Regimes and Macroeconomic Policy*," Scandinavian Journal of Economics, May 1976, 78, no. 2, 255-79.

_______________, "*Expectations and Exchange Rate Dynamics*," Journal of Political Economy, December 1976, 84, 1161-76.

_______________, "*Equilibrium and Disequilibrium Exchange Rates*," Zeitschrift fur Wirtschafts-und Sozialwissenshaften, 1982, 102, no. 6, 573-599.

Fama, Eugene, "*Forward and Spot Exchange Rates*," Journal of Monetary Economics, 1984.

Frankel, Jeffrey, "*On the Mark: A Theory of Floating Exchange Rates Based on Real Interest Differentials*," American Economic Review, Sept. 1979, 69, no. 4, 610-622.

_______________, "*Tests of Rational Expectations in the Forward Exchange Market*," Southern Economic Journal, April, 1980, 46, 1083-1101.

_______________, "*The Effect of Excessively Elastic Expectations on Exchange-Rate Volatility in the Dornbusch Overshooting Model*," Journal of International Money and Finance, 1983, vol. 2, 39-46.

_______________, "*The Implications of Mean-Variance Optimization for Four Questions in International Macroeconomics*," Journal of International Money and Finance, 1985 (forthcoming).

Freedman, David A. and Stephen C. Peters, "*Bootstrapping an Econometric Model: Some Empirical Results*," Journal of Business and Economic Statistics, vol. 2, no. 2, April, 1984.

Friedman, Milton, "*The Case of Flexible Exchange Rates*," in M. Friedman, *Essays in Positive Economics*, Chicago, University of Chicago Press, 1953, 157-203.

Frenkel, Jacob, "*A Monetary Approach to the Exchange Rate: Doctrinal Aspects and Empirical Evidence*," Scandinavian Journal of Economics, May 1976, 78, 200-24.

_______________, "*The Collapse of Purchasing Power Parities During the 1970's*," European Economic Review, 1981, 16, 145-165.

Giddy, Ian and Gunter Duffy, "*The Random Behavior of Flexible Exchange Rates*," Journal of International Business Studies 6 (Spring 1975), 1-32.

Hansen, Lars and Robert Hodrick, "*Forward Rates as Optimal Predictors of Future Spot Rates: An Econometric Analysis*," Journal of Political Economy, October 1980, 88, 829-53.

Hodrick, Robert, and Sanjay Srivastava, "*An Investigation of Risk and Return in Forward Foreign Exchange*," Journal of International Money and Finance, April 1984, 3, no. 1, 5-30.

______________________, "*The Covariation of Risk Premiums and Expected Future Spot Rates*," Goldwater Conference, Arizona State University, March 1985. Forthcoming, Journal of International Money and Finance.

Huang, Roger, "*Some Alternative Tests of Forward Exchange Rates as Predictors of Future Spot Rates*," Journal of International Money and Finance 3, no. 2 (August 1984), 157-67.

Kohlhagen, Steven, "*The Behavior of Foreign Exchange Markets -- A Critical Survey of the Empirical Literature*," N.Y.U. Monograph Series in Finance and Economics (1978).

______________, "*On the Identification of Destabilizing Speculation*," Journal of International Economics, August 1979, vol. 9, 321-340.

Krasker, William, "*The 'Peso Problem' in Testing the Efficiency of Forward Exchange Markets*," Journal of Monetary Economics, April 1980, 6, 269-76.

Krugman, Paul "*Purchasing Power Parity and Exchange Rates: Another Look at the Evidence*," Journal of International Economics, August 1978, 8, no. 3, 397-407.

Longworth, David, "*Testing the Efficiency of the Canadian-U.S. Exchange Market Under the Assumption of No Risk Premium*," Journal of Finance, March 1981, 36, 43-49.

McCulloch, J. H. "*Operational Aspects of the Siegal Paradox*," Quarterly Journal of Economics, Vol. 89, no. 1, February, 1975, 170-172.

Meese, Richard, "*Testing for Bubbles in Exchange Markets: The Case of Sparkling Rates*," Journal of Political Economy, 1986, forthcoming.

Meese, Richard and Kenneth Rogoff, "*Empirical Exchange Rate Models of the Seventies: Do They Fit Out of Sample*?", Journal of International Economics, February 1983, 14, 3-24.

Meese, Richard and Kenneth Singleton, "*On Unit Roots and the Empirical Modeling of Exchange Rates*," Journal of Finance, vol. 37, 1029-35.

Mussa, Michael, "*The Exchange Rate, the Balance of Payments and Monetary and Fiscal Policy under a Regime of Controlled Floating*," Scandinavian Journal of Economics, May 1976, 78, 229-48.

______________, "*Empirical Regularities in the Behavior of Exchange Rates and Theories of the Foreign Exchange Market*," Carnegie-Rochester Series on Public Policy, Autumn 1979, 11, 9-57.

Niehans, Jurg, "*Some Doubts about the Efficacy of Monetary Policy under Flexible Exchange Rates*," Journal of International Economics, August 1975, 5, 275-81.

Nurkse, Ragnar, *International Currency Experience*, League of Nations, 1944.

Obstfeld, Maurice and Kenneth Rogoff, "*Exchange Rate Dynamics with Sluggish Prices under Alternative Price-Adjustment Rules*," International Economic Review, February 1984, 25, no. 1, 159-174.

Poole, William, "*Speculative Prices as Random Walks: An Analysis of Ten Time Series of Flexible Exchange Rates*," Southern Economic Journal, 33 (April 1967), 468-78.

Roll, Richard, "*Violations of Purchasing Power Parity and Their Implications for Efficient International Commodity Markets*," International Finance and Trade, M. Sarnat and G. Szego, eds., Cambridge, Ma.: Ballinger, 1979, vol. 1, 133-176.

Stockman, Alan C., "*Risk, Information and Forward Exchange Rates*," in J.A. Frenkel and H. G. Johnson, eds., The Economics of Exchange Rates, Reading, Ma.: Addison Wesley, 1978.

Tryon, Ralph, "*Testing for Rational Expectations in Foreign Exchange Markets*," Federal Reserve Board International Finance Discussion Paper no. 139, 1979.

Westerfield, J. M., "*An Examination of Foreign Exchange Risk under Fixed and Floating Rate Regimes*," Journal of International Economics, vol. 7, no. 2, 1977.

Table A1

DATES USED TO CONSTRUCT ECONOMIST DATA SETS

Approximate Survey Date *	3-Month Forward Date	6-Month Forward Date	DRI Inflation Forecast Date
23-Jun-81 # ##	21-Sep-81	18-Dec-81	Jun-81
03-Aug-81	30-Oct-81	29-Jan-82	Jul-81
15-Sep-81 # ###	14-Dec-81	12-Mar-82	Sep-81
27-Oct-81	25-Jan-82	23-Apr-82	NA
08-Dec-81 # ##	08-Mar-82	04-Jun-82	Jan-82
19-Apr-82 # ###	19-Jul-82	15-Oct-82	Apr-82
01-Jun-82 ##	31-Aug-82	29-Nov-82	Jul-82
23-Aug-82 #	22-Nov-82	22-Mar-83	Aug-82
16-Nov-82 # ###	14-Feb-83	13-May-83	Nov-82
03-Jan-83 ##	01-Apr-83	01-Jul-83	Dec-82
14-Feb-83 #	13-May-83	12-Aug-83	Mar-83
28-Mar-83	24-Jun-83	23-Sep-83	NA
09-May-83 ###	05-Aug-83	04-Nov-83	NA
21-Jun-83 # ##	19-Sep-83	16-Dec-83	NA
01-Aug-83	28-Oct-83	27-Jan-84	NA
24-Oct-83 # ###	20-Jan-84	20-Apr-84	Oct-83
06-Dec-83	05-Mar-84	01-Jun-84	Dec-83
24-Jan-84 # ##	23-Apr-84	20-Jul-84	Jan-84
05-Mar-84	01-Jun-84	31-Aug-84	NA
29-May-84 # ###	27-Aug-84	23-Nov-84	May-84
21-Aug-84 # ##	19-Nov-84	05-Mar-85	Sep-84
14-Dec-84 # ###	14-Mar-85	12-Jun-85	Dec-84
05-Feb-85	06-May-85	04-Aug-85	Feb-85
19-Mar-85 # ##	17-Jun-85	15-Sep-85	Mar-85

* The day on which the Economist Financial Review conducted their survey.

\# Indicates that the 3 month horizon survey observation was used in the ECON 3 Month data set.

\## Indicates that the 6 month horizon survey observation was used in the ECON 6 Month data set.

\### Indicates that the 6 month horizon survey observation was used in the ECONII 6 Month data set.

Table A2
DATES USED TO CONSTRUCT AMEX DATA SETS

Approximate Survey Date *	6-Month Forward Date	3-Month Lag Date
	AMEX DAY DATES *	
30-Jan-76 **	30-Jul-76	31-Oct-75
30-Jul-76 **	31-Jan-77	30-Apr-76
31-Jan-77 **	29-Jul-77	01-Nov-76
30-Jun-77	01-Dec-77	01-Apr-77
01-Dec-77	01-Jun-78	02-Sep-77
30-Jun-78	29-Dec-78	31-Mar-78
01-Dec-78	01-Jun-79	01-Sep-78
30-Jun-81	31-Dec-81	01-Apr-81
30-Jun-82	31-Dec-82	01-Apr-82
30-Jun-83	30-Dec-83	01-Apr-83
29-Jun-84	31-Dec-84	30-Mar-84

Approximate Survey Date *		6-Month Forward Date		3-Month Lag Date	
		AMEX MONTH DATES *			
From	To	From	To	From	To
01-Jan-76	31-Jan-76 **	01-Jul-76	31-Jul-76	01-Nov-75	30-Nov-75
01-Jul-76	31-Jul-76 **	01-Jan-77	31-Jan-77	30-Apr-76	30-May-76
01-Jan-77	31-Jan-77 **	01-Jul-77	31-Jul-77	31-Oct-76	29-Nov-76
16-Jun-77	15-Jul-77	16-Dec-77	15-Jan-78	18-Mar-77	16-Apr-77
16-Nov-77	15-Dec-77	16-May-78	15-Jun-78	17-Aug-77	16-Sep-77
01-Jun-78	30-Jun-78	01-Dec-78	31-Dec-78	01-Apr-78	01-May-78
16-Nov-78	15-Dec-78	16-May-79	15-Jun-79	17-Aug-78	16-Sep-78
16-Jun-81	15-Jul-81	16-Dec-81	15-Jan-82	18-Mar-81	16-Apr-81
16-Jun-82	15-Jul-82	16-Dec-82	15-Jan-83	18-Mar-82	16-Apr-82
16-Jun-83	15-Jul-83	16-Dec-83	15-Jan-84	18-Mar-83	16-Apr-83
16-Jun-84	15-Jul-84	16-Dec-84	15-Jan-85	18-Mar-84	16-Apr-84

* Because each AMEX survey took place over 2 to 4 weeks, two different sets of market reference dates were used. The first is a single day approximating the survey date, and the second uses averages over corresponding 30 day periods.

** Suveys included only the pound and the mark.

TABLE 1
COMPARISON OF VARIANCES OF E[ds(t+1)] AND RP(t)
(in percent per annum)

Data Set	Approximate Dates	N	Var(ds(t+1))	Var(fd(t))	Var(E[ds(t+1)])	Var(rp(t))	Var(E[ds(t+1)]) - Var(rp(t))
ECON 3 MONTH *	1981-85	70	4.230	0.060	0.458	0.448	0.009
UK		14	2.703	0.051	0.965	0.987	-0.022
FR	-	14	4.792	0.117	0.382	0.297	0.085
WG		14	4.083	0.020	0.371	0.366	0.005
SW		14	6.053	0.040	0.352	0.363	-0.011
JA		14	3.517	0.074	0.219	0.229	-0.010
ECON 6 MONTH**	1981-85	40	1.170	0.066	0.234	0.185	0.048
UK		8	0.713	0.036	0.168	0.188	-0.019
FR		8	0.932	0.199	0.390	0.207	0.183
WG		8	0.998	0.013	0.238	0.212	0.025
SW		8	2.442	0.034	0.220	0.230	-0.010
JA		8	0.764	0.047	0.152	0.091	0.061
ECONII 6 MONTH	1981-85	30	1.536	0.042	0.128	0.136	-0.008
UK		6	0.584	0.017	0.132	0.141	-0.009
FR		6	0.804	0.051	0.230	0.199	0.031
WG		6	1.250	0.016	0.064	0.106	-0.042
SW		6	2.484	0.035	0.179	0.205	-0.026
JA		6	2.559	0.092	0.035	0.031	0.005
AMEX DAY	1976-84	46	2.635	0.094	0.313	0.164	0.148
UK		11	2.894	0.145	0.227	0.050	0.176
FR		8	1.873	0.085	0.117	0.031	0.086
WG		11	2.120	0.052	0.273	0.164	0.110
SW		8	4.267	0.077	0.513	0.335	0.177
JA		8	2.020	0.109	0.434	0.242	0.192
AMEX MONTH	1976-84	46	2.563	0.094	0.273	0.133	0.140
UK		11	2.631	0.157	0.270	0.073	0.197
FR		8	1.693	0.076	0.155	0.075	0.080
WG		11	1.894	0.052	0.329	0.207	0.121
SW		8	4.173	0.077	0.412	0.247	0.165
JA		8	2.423	0.108	0.199	0.064	0.135

* For var(ds), N=65 ** For var(ds), N=35

ds(t+1) - log percentage depreciation of the dollar over following period.

ECON 3 Month data are expected spot rates at three month horizons. The survey dates are: 6/23/81, 9/15/81, 12/8/81, 4/19/82, 8/23/82, 11/16/82, 2/14/83, 6/21/83, 10/24/83, 1/24/84, 5/29/84, 8/21/84, 12/14/84, 3/19/85.

ECON 6 Month data are at 6 month horizons after the following survey dates: 6/23/81, 12/8/81, 6/1/82, 1/3/83, 6/21/83, 1/24/84, 8/21/84, 3/19/85.

ECONII 6 survey dates comprise a second grouping of 6 month non-overlapping responses: 9/15/81, 4/19/82, 11/16/82, 5/9/83, 10/24/83, 5/29/84, 12/14/84, 3/19/85.

AMEX DAY data are at 6 month horizons after the following approximate survey dates: 1/30/76, 7/30/76, 1/31/77, 6/30/77, 12/1/77, 6/30/78, 12/1/78, 6/30/81, 6/30/82, 6/30/83, 6/29/84.

AMEX MONTH data are at 6 month horizons after the following approximate averaged survey dates: 1/1/76-1/31/76, 7/1/76-7/31/76, 1/1/77-1/31/77, 6/16/77-7/15/77, 11/16/77-12/15/77, 6/1/78-6/30/78, 11/16/78-12/15/78, 6/16/81-7/15/81, 6/15/82- 7/15/82, 6/16/83-7/15/83, 6/16/84-7/15/84.

TABLE 1a
COMPARISON OF MEAN SQUARED ABSOLUTE VALUE OF E[ds(t+1)] AND RP(t)
(in percent per annum)

Data Set	Approximate Dates	N	MSAV(ds(t+1))	MSAV(fd(t))	MSAV(E[ds(t+1)])	MSAV(rp(t))
ECON 3 MONTH*	1981-85	70	4.930	0.263	1.452	0.965
ECON 6 MONTH**	1981-85	40	2.762	0.276	1.235	0.732
ECONII 6 MONTH	1981-85	30	2.109	0.265	1.105	0.561
AMEX DAY	1976-84	46	2.754	0.278	0.422	0.222
AMEX MONTH	1976-84	46	2.648	0.280	0.451	0.216
AMEX DAY LATE	1981-84	20	2.444	0.333	0.623	0.198
AMEX MONTH LATE	1981-84	20	2.537	0.324	0.808	0.269

* For MSAV(ds(t+1)), N=65
** For MSAV(ds(t+1)), N=35

AMEX DAY LATE survey dates are: 6/30/81, 6/30/82, 6/30/83, 6/30/84.

AMEX MONTH LATE survey dates are: 6/16/81-7/15/81, 6/16/82-7/15/82, 6/16/83-7/15/83, 6/16/84-7/15/84.

Table 2
VARIOUS MEASURES OF EXPECTED DEPRECIATION
OVER THE FOLLOWING MONTHS
(% percent per annum)

Data Set	Approximate dates	N	SURVEY DATA E[s(t+1)]-s(t)	FORWARD DISCOUNT f(t)-s(t)	INTEREST PARITY i-i*	ACTUAL CHANGE s(t+1)-s(t) ***
ECON 3 MONTH *	1981-85	70	9.55	2.28	2.10	-8.64
UK		14	6.30	0.58	0.43	-16.19
FR		14	4.72	-4.65	-3.99	-12.85
WG		14	12.49	4.28	3.89	-6.76
SW		14	12.12	6.14	5.61	-5.69
JA		14	12.14	5.03	4.56	-1.71
ECON 6 MONTH**	1981-85	40	9.29	2.05	1.94	-12.61
UK		8	3.92	0.39	0.28	-17.46
FR		8	4.60	-5.44	-4.93	-17.28
WG		8	12.81	4.28	4.00	-10.37
SW		8	12.35	5.87	5.55	-10.91
JA		8	12.71	5.16	4.78	-7.05
ECONII 6 MONTH	1981-85	30	9.04	2.51	2.35	-7.91
UK		6	5.59	1.19	1.11	-10.78
FR		6	2.42	-5.52	-5.09	-14.76
WG		6	12.83	4.69	4.39	-7.23
SW		6	12.00	6.70	6.22	-4.97
JA		6	12.36	5.49	5.12	-1.81
AMEX DAY 6 MONTH	1976-84	46	3.57	2.45	2.59	3.98
UK		11	1.39	-1.52	-1.50	-3.40
FR		8	2.13	-2.72	-2.37	-0.56
WG		11	4.85	4.07	3.82	5.81
SW		8	3.54	6.92	6.50	12.00
JA		8	5.94	5.50	6.50	6.03
AMEX MONTH 6 MONTH	1976-84	46	4.26	2.45	2.54	3.31
UK		11	1.83	-1.68	-1.67	-4.53
FR		8	2.90	-2.61	-2.39	-1.54
WG		11	5.27	4.10	3.84	5.00
SW		8	4.62	6.86	6.47	11.23
JA		8	6.69	5.59	6.47	6.38
AMEX DAY LATE	1981-84	20	6.74	3.80	3.55	-5.06
UK		4	6.11	2.56	2.24	-15.14
FR		4	2.25	-3.36	-2.81	-10.07
WG		4	10.30	5.46	5.07	-5.18
SW		4	6.31	7.56	7.00	0.90
JA		4	8.73	6.77	6.25	4.18
AMEX MONTH LATE	1981-84	20	8.03	3.89	3.61	-4.98
UK		4	7.20	2.45	2.18	-15.98
FR		4	3.68	-2.84	-2.57	-9.86
WG		4	11.77	5.57	5.15	-4.99
SW		4	8.25	7.44	6.92	1.72
JA		4	9.25	6.84	6.37	4.19

* For s(t+12)-s(t), N=65 ** For s(t+12)-s(t), N=35
*** s(t+12)-s(t) does not include final survey obeservation.

Table 3
UNCONDITIONAL BIAS OF VARIOUS MEASURES OF EXPECTED CHANGES IN THE SPOT RATE
(in percent per annum)

Data Set	Approximate Dates	N	SURVEY ERROR MEAN	SURVEY ERROR SD of MEAN	SURVEY ERROR t stat	FORWARD DISCOUNT ERROR MEAN	FORWARD DISCOUNT ERROR SD of MEAN	FORWARD DISCOUNT ERROR t stat	INTEREST PARITY ERROR MEAN	INTEREST PARITY ERROR SD of MEAN	INTEREST PARITY ERROR t stat
ECON 3 MONTH	1981-85	65	19.3	2.8	6.86	11.0	2.5	4.36	10.9	2.5	4.29
UK		13	24.0	5.9	4.09	17.1	4.7	3.67	16.9	4.6	3.65
FR		13	18.3	6.4	2.87	8.0	6.1	1.31	8.7	6.1	1.43
WG		13	20.5	6.2	3.30	11.1	5.6	1.98	10.7	5.6	1.91
SW		13	19.1	7.5	2.55	12.0	6.8	1.77	11.5	6.8	1.69
JA		13	21.2	6.1	3.48	6.9	5.4	1.28	6.4	5.4	1.19
ECON 6 MONTH	1981-85	35	22.6	2.0	11.11	14.8	1.8	8.29	14.6	1.8	8.26
UK		7	22.1	3.9	5.61	18.2	3.4	5.29	18.1	3.4	5.26
FR		7	22.2	3.9	5.68	11.3	3.3	3.47	11.9	3.3	3.63
WG		7	24.3	4.5	5.34	14.8	4.0	3.71	14.5	3.9	3.67
SW		7	24.1	7.1	3.37	17.1	5.8	2.94	16.7	5.8	2.86
JA		7	20.6	3.7	5.58	12.4	3.4	3.61	12.1	3.4	3.53
ECONII 6 MONTH	1981-85	30	17.0	2.4	7.20	10.4	2.3	4.51	10.3	2.3	4.46
UK		6	16.4	4.3	3.78	12.0	3.2	3.79	11.9	3.1	3.82
FR		6	17.2	3.8	4.54	9.2	4.1	2.26	9.7	4.1	2.35
WG		6	20.1	4.7	4.28	11.9	4.8	2.47	11.6	4.8	2.41
SW		6	17.0	7.1	2.39	11.7	6.7	1.73	11.2	6.7	1.66
JA		6	14.2	7.2	1.97	7.3	7.5	0.98	6.9	7.4	0.94
AMEX DAY	1976-84	46	-0.1	2.8	-0.04	-1.3	2.5	-0.53	-1.2	2.4	-0.49
UK		11	4.8	5.7	0.85	1.9	5.6	0.33	1.9	5.6	0.34
FR		8	2.7	4.9	0.55	-2.2	4.9	-0.44	-1.8	4.9	-0.37
WG		11	-1.0	5.3	-0.18	-1.7	4.7	-0.37	-2.0	4.6	-0.43
SW		8	-8.5	9.3	-0.91	-5.1	7.9	-0.65	-5.5	7.8	-0.70
JA		8	-0.1	6.7	-0.01	-0.5	5.8	-0.09	0.5	5.2	0.09
AMEX MONTH	1976-84	46	1.3	2.7	0.46	-0.6	2.4	-0.25	-0.6	2.4	-0.23
UK		11	6.4	5.5	1.15	2.8	5.4	0.53	2.9	5.4	0.53
FR		8	4.4	4.7	0.95	-1.1	4.7	-0.23	-0.9	4.7	-0.18
WG		11	0.3	5.2	0.05	-0.9	4.5	-0.20	-1.2	4.4	-0.26
SW		8	-6.6	9.0	-0.74	-4.4	7.7	-0.56	-4.8	7.7	-0.62
JA		8	0.3	6.4	0.05	-0.8	6.2	-0.13	0.1	5.7	0.01
AMEX DAY LATE	1981-84	20	11.8	3.4	3.42	8.9	3.2	2.77	8.6	3.2	2.69
AMEX MONTH LATE	1981-84	20	13.0	3.4	3.79	8.9	3.2	2.77	8.6	3.2	2.67

TABLE 4a
BANDWAGON EXPECTATIONS / Independent variable: s(t-1) - s(t)
FORWARD DISCOUNT REGRESSIONS

Direct Regression of Expected Change: f(t) - s(t) = a + b1(s(t-1) - s(t))

	a(uk)	a(fr)	a(wg)	a(sw)	a(ja)	Dummy 81-84	b1	DW	DF	t:b1=0	r2
SUR Regression	-0.0003	-0.0147	0.0093	0.0151	0.0126	—	0.0557		59	5.77 **	0.37 #
Asymptotic se's	0.0011	0.0025	0.0009	0.0011	0.0018		0.0097				
OLS Regressions											
ECON 3 Month	.0000	-0.0144	0.0095	0.0152	0.0126		0.0492	0.99	59	3.88 **	0.83
	0.0016	0.0016	0.0016	0.0015	0.0015		0.0127				
ECON 6 Month	0.0013	-0.0333	0.0199	0.0303	0.0282		0.0984	1.12	29	3.75 **	0.85
	0.0041	0.0042	0.0041	0.0041	0.0041		0.0262				
ECONII 6 Month	-0.0014	-0.0341	0.0199	0.0299	0.0253		0.1455	1.18	24	2.72 **	0.89
	0.0046	0.0045	0.0040	0.0040	0.0038		0.0534				
AMEX 6 Month (Day)	-0.0107	-0.0200	0.0166	0.0304	0.0250	0.0053	0.0932	1.70	39	1.90	0.74
	0.0045	0.0053	0.0044	0.0054	0.0056	0.0055	0.0489				
AMEX 6 Month (Month)	-0.0118	-0.0197	0.0168	0.0296	0.024622	0.0060	0.0886	1.68	39	1.55	0.73
	0.0045	0.0053	0.0045	0.0054	0.005687	0.0061	0.0573				

Direct Regression of Actual Change: s(t+1) - s(t) = a + b2(s(t-1) - s(t))

	a(uk)	a(fr)	a(wg)	a(sw)	a(ja)	Dummy 81-84	b2	DW	DF	t:b2=0	r2
SUR Regression	-0.0414	-0.0331	-0.0175	-0.0145	-0.0044		0.0215		59	0.17	.00 #
Asymptotic se's	0.0132	0.0152	0.0143	0.0179	0.0136		0.1241				
OLS Regressions											
ECON 3 Month	-0.0473	-0.0390	-0.0213	-0.0162	-0.0054		0.1500	1.98	59	1.26	0.16
	0.0152	0.0152	0.0146	0.0143	0.0142		0.1192				
ECON 6 Month	-0.0924	-0.0935	-0.0562	-0.0555	-0.0327		0.2071	2.22	29	1.61	0.61
	0.0202	0.0204	0.0201	0.0199	0.0200		0.1288				
ECONII 6 Month	-0.0294	-0.0519	-0.0243	-0.0126	-0.0017		-0.4857	2.63	24	-1.37	0.32
	0.0306	0.0295	0.0263	0.0264	0.0254		0.3539				
AMEX 6 Month (Day)	0.0085	0.0391	0.0567	0.0951	0.0600	-0.0605	-0.2859	1.75	39	-1.15	0.31
	0.0226	0.0267	0.0223	0.0271	0.0283	0.0277	0.2477				
AMEX 6 Month (Month)	0.0024	0.0300	0.0506	0.0907	0.0644	-0.0638	-0.1385	1.94	39	-0.47	0.26
	0.0231	0.0272	0.0229	0.0278	0.0291	0.0314	0.2930				

Indirect Regression: f(t) - s(t+1) = a + b(s(t-1) - s(t))

	a(uk)	a(fr)	a(wg)	a(sw)	a(ja)	Dummy 81-84	b	DW	DF	t:b=0	r2
SUR Regression	0.0426	0.0199	0.0278	0.0301	0.0173		0.0019		59	0.02	0.00 #
Asymptotic se's	0.0134	0.0155	0.0144	0.0177	0.0141		0.1238				
Bootstrap se's	0.0128	0.0161	0.0143	0.0164	0.0134		0.1435			0.01	
OLS Regressions											
ECON 3 Month	0.0473	0.0246	0.0308	0.0314	0.0180		-0.1008	1.97	59	-0.83	0.20
	0.0154	0.0154	0.0148	0.0145	0.0144		0.1210				
ECON 6 Month	0.0937	0.0602	0.0761	0.0858	0.0609		-0.1087	2.30	29	-0.82	0.65
	0.0209	0.0211	0.0208	0.0206	0.0207		0.1332				
ECONII 6 Month	0.0281	0.0178	0.0442	0.0425	0.0270		0.6312	2.54	24	1.67	0.38
	0.0327	0.0316	0.0281	0.0282	0.0272		0.3783				
AMEX 6 Month (Day)	-0.0191	-0.0591	-0.0401	-0.0647	-0.0351	0.0658	0.3791	1.92	39	1.47	0.26
	0.0235	0.0279	0.0233	0.0283	0.0295	0.0289	0.2585				
AMEX 6 Month (Month)	-0.0142	-0.0497	-0.0338	-0.0611	-0.0398	0.0698	0.2270	2.08	39	0.74	0.20
	0.0243	0.0286	0.0241	0.0292	0.0306	0.0330	0.3081				

*, ** indicate significance at 5% and 1% levels # [illegible]

TABLE 4b
BANDWAGON EXPECTATIONS / Independent variable: s(t-1) - s(t)
SURVEY DATA REGRESSIONS

Direct Regression of Expected Change: E [s(t+1)] - s(t) = a + b1(s(t-1) - s(t))

	a(uk)	a(fr)	a(wg)	a(sw)	a(ja)	Dummy 81-84	b1	DW	DF	t:b1=0	r2
SUR Regression	0.0208	0.0150	0.0353	0.0338	0.0320		-0.0300		59	-1.07	0.02 $
Asymptotic se's	0.0061	0.0044	0.0026	0.0028	0.0031		0.0280				
OLS Regressions											
ECON 3 Month	0.0213	0.0154	0.0356	0.0340	0.0321		-0.0400	1.79	59	-1.24	0.80
	0.0041	0.0041	0.0040	0.0039	0.0038		0.0322				
ECON 6 Month	0.0211	0.0216	0.0677	0.0654	0.0685		0.0840	2.09	29	1.51	0.85
	0.0087	0.0088	0.0090	0.0086	0.0086		0.0557				
ECONII 6 Month	0.0179	0.0031	0.0593	0.0550	0.0588		0.2002	1.36	24	2.04	0.90
	0.0085	0.0082	0.0073	0.0073	0.0070		0.0980				
AMEX 6 Month (Day)	-0.0003	-0.0045	0.0153	0.0076	0.0235	0.0128	0.2140	2.86	39	2.76 **	0.56
	0.0071	0.0084	0.0070	0.0085	0.0089	0.0087	0.0776				
AMEX 6 Month (Month)	-0.0003	-0.0029	0.0163	0.0100	0.0233	0.0189	0.1912	2.48	39	2.49 **	0.70
	0.0061	0.0071	0.0060	0.0073	0.0076	0.0082	0.0769				

Direct Regression of Actual Change: s(t+1) - s(t) = a + b2(s(t-1) - s(t))

	a(uk)	a(fr)	a(wg)	a(sw)	a(ja)	Dummy 81-84	b2	DW	DF	t:b2=0	r2
SUR Regression	-0.0414	-0.0331	-0.0175	-0.0145	-0.0044		0.0215		59	0.17	.00 $
Asymptotic se's	0.0132	0.0152	0.0143	0.0179	0.0136		0.1241				
OLS Regressions											
ECON 3 Month	-0.0473	-0.0390	-0.0213	-0.0162	-0.0054		0.1500	1.98	59	1.26	0.16
	0.0152	0.0152	0.0146	0.0143	0.0142		0.1192				
ECON 6 Month	-0.0924	-0.0935	-0.0562	-0.0555	-0.0327		0.2071	2.22	29	1.61	0.61
	0.0202	0.0204	0.0201	0.0199	0.0200		0.1288				
ECONII 6 Month	-0.0294	-0.0519	-0.0243	-0.0126	-0.0017		-0.4857	2.63	24	-1.37	0.32
	0.0306	0.0295	0.0263	0.0264	0.0254		0.3539				
AMEX 6 Month (Day)	0.0085	0.0391	0.0567	0.0951	0.0600	-0.0605	-0.2859	1.75	39	-1.15	0.31
	0.0226	0.0267	0.0223	0.0271	0.0283	0.0277	0.2477				
AMEX 6 Month (Month)	0.0024	0.0300	0.0506	0.0907	0.0644	-0.0638	-0.1385	1.94	39	-0.47	0.26
	0.0231	0.0272	0.0229	0.0278	0.0291	0.0314	0.2930				

Indirect Regression: E [s(t+1)] - s(t+1) = a + b(s(t-1) - s(t))

	a(uk)	a(fr)	a(wg)	a(sw)	a(ja)	Dummy 81-84	b	DW	DF	t:b=0	r2
SUR Regression	0.0675	0.0533	0.0562	0.0499	0.0373		-0.1657		59	-1.29	0.03 $
Asymptotic se's	0.0163	0.0163	0.0154	0.0196	0.0158		0.1281				
Bootstrap se's	0.0155	0.0163	0.0151	0.0184	0.0144		0.1474			-1.12	
OLS Regressions											
ECON 3 Month	0.0686	0.0544	0.0569	0.0502	0.0375		-0.1900	1.78	59	-1.42	0.41
	0.0170	0.0171	0.0164	0.0160	0.0160		0.1336				
ECON 6 Month	0.1136	0.1151	0.1239	0.1208	0.1013		-0.1231	2.51	29	-0.79	0.76
	0.0245	0.0248	0.0245	0.0242	0.0243		0.1567				
ECONII 6 Month	0.0473	0.0551	0.0835	0.0676	0.0061		0.6859	2.37	24	1.79	0.63
	0.0331	0.0319	0.0285	0.0286	0.0275		0.3827				
AMEX 6 Month (Day)	-0.0088	-0.0436	-0.0414	-0.0875	-0.0365	0.0733	0.4999	2.10	39	1.82	0.35
	0.0250	0.0295	0.0247	0.0300	0.0313	0.0306	0.2740				
AMEX 6 Month (Month)	-0.0027	-0.0329	-0.0343	-0.0807	-0.0411	0.0827	0.3296	2.07	39	1.06	0.33
	0.0246	0.0289	0.0244	0.0296	0.0310	0.0334	0.3117				

*, ** indicate significance at 5% and 1% levels. $ r2 corresponds to approximate F test on all [illegible]

TABLE 5a
ADAPTIVE EXPECTATIONS / Indeoendent variable: f(t-1) - s(t)
FORWARD DISCOUNT REGRESSIONS

Direct Regression of Expected Change f(t) - s(t) = a + b1(f(t-1) - s(t))

	a(uk)	a(fr)	a(wg)	a(sw)	a(ja)	b1	DW	DF	t:b1=0	r2
SUR Regression	0.0004	-0.0126	0.0102	0.0150	0.0116	0.0217		54	2.46 **	0.10 $
Asymptotic se's	0.0011	0.0026	0.0011	0.0015	0.0016	0.0088				
SUR Regression with AR(1) Correction	0.0001	-0.0124	0.0101	0.0151	0.0119	0.0344		54	4.98 **	
Asymptotic se's	0.0007	0.0038	0.0008	0.0009	0.0019	0.0069				
AR(1) coefficient	-0.33	0.63	-0.28	-0.48	0.27					
OLS Regressions										
ECON 3 Month	0.0002	-0.0127	0.0101	0.0149	0.0116	0.0266	1.35	54	1.73	0.80
	0.0017	0.0017	0.0017	0.0017	0.0017	0.0154				
ECON 6 Month	0.0013	-0.0318	0.0220	0.0301	0.0243	-0.0017	1.42	24	-0.03	0.77
	0.0069	0.0060	0.0064	0.0067	0.0063	0.0574				
ECONII 6 Month	0.0042	-0.0285	0.0228	0.0329	0.0230	0.0037	1.74	19	0.11	0.85
	0.0048	0.0047	0.0048	0.0048	0.0046	0.0343				

Direct Regression of Actual Change: s(t+1) - s(t) = a + b2(f(t-1) - s(t))

	a(uk)	a(fr)	a(wg)	a(sw)	a(ja)	b2	DW	DF	t:b2=0	r2
SUR Regression	-0.0350	-0.0391	-0.0214	-0.0193	-0.0028	-0.0506		54	-0.43	.00 $
Asymptotic se's	0.0127	0.0147	0.0149	0.0183	0.0149	0.1181				
OLS Regressions										
ECON 3 Month	-0.0401	-0.0411	-0.0244	-0.0222	-0.0046	0.0827	2.17	54	0.61	0.19
	0.0154	0.0146	0.0148	0.0148	0.0146	0.1356				
ECON 6 Month	-0.1077	-0.1065	-0.0787	-0.0970	-0.0561	0.2317	1.96	24	1.28	0.77
	0.0219	0.0189	0.0202	0.0212	0.0200	0.1815				
ECONII 6 Month	-0.0823	-0.0899	-0.0618	-0.0614	-0.0115	0.4593	2.51	19	2.36 *	0.45
	0.0271	0.0267	0.0272	0.0269	0.0262	0.1942				

Indirect Regression: f(t) - s(t+1) = a + b(f(t-1) - s(t))

	a(uk)	a(fr)	a(wg)	a(sw)	a(ja)	b	DW	DF	t:b=0	r2
SUR Regression	0.0377	0.0273	0.0329	0.0356	0.0153	0.0129		54	0.11	.00 $
Asymptotic se's	0.0126	0.0145	0.0149	0.0183	0.0153	0.1187				
Bootstrap se's	0.0124	0.0145	0.0143	0.0175	0.0143	0.1635			0.08	
OLS Regressions										
ECON 3 Month	0.0403	0.0284	0.0344	0.0371	0.0162	-0.0561	2.07	54	-0.41	0.23
	0.0155	0.0148	0.0149	0.0149	0.0147	0.1370				
ECON 6 Month	0.1090	0.0748	0.1007	0.1271	0.0803	-0.2334	2.04	24	-1.21	0.79
	0.0232	0.0201	0.0214	0.0225	0.0212	0.1926				
ECONII 6 Month	0.0866	0.0614	0.0846	0.0944	0.0345	-0.4556	2.56	19	-2.10 *	0.45
	0.0303	0.0299	0.0304	0.0301	0.0293	0.2171				

TABLE 5b
ADAPTIVE EXPECTATIONS / Indeoendent variable: E[t-1][s(t)] - s(t)
SURVEY DATA REGRESSIONS

Direct Regression of Expected Change: E [s(t+1)] - s(t) = a + b1(E(t-1) [s(t)] - s(t))

	a(uk)	a(fr)	a(wg)	a(sw)	a(ja)	b1	DW	DF	t:b1=0	r2
SUR Regression	0.0204	0.0138	0.0347	0.0335	0.0313	0.0178		54	0.65	0.01 $
Asymptotic se's	0.0065	0.0042	0.0031	0.0031	0.0333	0.0273				
SUR Regression with AR(1) Correction	0.0202	0.0139	0.0338	0.0329	0.0306	0.0406		54	1.80	
Asymptotic se's	0.0066	0.0052	0.0026	0.0024	0.0027	0.0226				
AR(1) coefficient	0.13	0.26	-0.13	-0.18	-0.18					
OLS Regressions ECON 3 Month	0.0215	0.0147	0.0356	0.0343	0.0319	-0.0031	2.05	54	-0.09	0.81
	0.0044	0.0043	0.0044	0.0043	0.0042	0.0349				
ECON 6 Month	0.0295	0.0298	0.0760	0.0740	0.0687	-0.0216	1.85	24	-0.27	0.86
	0.0120	0.0123	0.0128	0.0125	0.0124	0.0810				
ECONII 6 Month	0.0286	0.0150	0.0641	0.0636	0.0574	0.0533	2.27	19	1.08	0.94
	0.0070	0.0073	0.0076	0.0071	0.0070	0.0495				

Direct Regression of Actual Change: s(t+1) - s(t) = a + b2(E(t-1) [s(t)] - s(t))

	a(uk)	a(fr)	a(wg)	a(sw)	a(ja)	b2	DW	DF	t:b2=0	r2
SUR Regression	-0.0333	-0.0370	-0.0193	-0.0176	-0.0012	-0.0713		54	-0.63	0.01 $
Asymptotic se's	0.0134	0.0154	0.0156	0.0185	0.0152	0.1133				
OLS Regressions ECON 3 Month	-0.0387	-0.0412	-0.0241	-0.0217	-0.0046	0.0341	2.24	54	0.27	0.19
	0.0159	0.0153	0.0156	0.0153	0.0151	0.1250				
ECON 6 Month	-0.1031	-0.1098	-0.0799	-0.9532	-0.0567	0.1396	1.99	24	0.94	0.77
	0.0222	0.0227	0.0236	0.0231	0.0228	0.1492				
ECONII 6 Month	-0.0913	-0.1074	-0.0814	-0.0729	-0.0277	0.4714	2.28	19	2.34 *	0.45
	0.0287	0.0298	0.0311	0.0289	0.0286	0.2019				

Indirect Regression: E [s(t+1)] - s(t+1) = a + b(E(t-1) [s(t)] - s(t))

	a(uk)	a(fr)	a(wg)	a(sw)	a(ja)	b	DW	DF	t:b=0	r2
SUR Regression	0.0596	0.0555	0.0592	0.0556	0.0362	-0.0276		54	-0.23	.00 $
Asymptotic se's	0.0174	0.0160	0.0169	0.0202	0.0176	0.1195				
Bootstrap se's	0.0173	0.0154	0.0163	0.0192	0.0169	0.2449			-0.11	
OLS Regressions ECON 3 Month	0.0601	0.0558	0.0597	0.0560	0.0366	-0.0372	2.20	54	-0.26	0.44
	0.0179	0.0173	0.0176	0.0173	0.0170	0.1413				
ECON 6 Month	0.1326	0.1395	0.1558	0.1693	0.1253	-0.1612	2.00	24	-0.98	0.89
	0.0244	0.0250	0.0260	0.0254	0.0251	0.1642				
ECONII 6 Month	0.1198	0.1224	0.1455	0.1365	0.0806	-0.4181	2.24	19	-1.91	0.70
	0.0311	0.0323	0.0337	0.0314	0.0310	0.2191				

* ** indicate significance at 5% and 1% levels $ r2 corresponds to appropriate F test on all nonintercept parameters

TABLE 6a
REGRESSIVE EXPECTATIONS I / Independent variable:-s(t)
Long Run Equilibrium Constant
FORWARD RATE REGRESSIONS

Direct Regression of Expected Change: f(t) - s(t) = a - b1(s(t))

	a(uk)	a(fr)	a(wg)	a(sw)	a(ja)	Dummy 81-84	b1	DW	DF	t:b1=0	r2
SUR Regression	0.0053	-0.0253	0.0046	0.0108	-0.0235		+0.0067		59	+1.09	0.01 $
Asymptotic se's	0.0031	0.0124	0.0059	0.0048	0.0337		0.0061				
OLS Regressions											
ECON 3 Month	0.0037	-0.0183	0.0080	0.0135	-0.0041		+0.0031	1.26	59	+0.49	0.79
	0.0034	0.0126	0.0062	0.0051	0.0347		0.0063				
ECON 6 Month	0.0140	-0.0702	0.0029	0.0155	-0.0862		+0.0208	1.56	29	+1.13	0.79
	0.0103	0.0360	0.0176	0.0144	0.1005		0.0184				
ECONII 6 Month	0.0027	-0.0139	0.0299	0.0387	0.0655		-0.0069	1.24	24	-0.31	0.85
	0.0115	0.0446	0.0213	0.0173	0.1241		0.0227				
AMEX 6 Month (Day)	-0.0484	0.0796	0.0640	0.0676	0.3396	0.0207	-0.0591	1.92	39	-3.76 **	0.79
	0.0104	0.0268	0.0134	0.0114	0.0846	0.0043	0.0157				
AMEX 6 Month (Month)	-0.0495	0.0797	0.0638	0.0670	0.3395	0.0218	-0.0591	1.80	39	-3.84 **	0.79
	0.0102	0.0263	0.0131	0.0112	0.0829	0.0043	0.0154				

Direct Regression of Actual Change: s(t+1) - s(t) = a - b2(s(t))

	a(uk)	a(fr)	a(wg)	a(sw)	a(ja)	Dummy 81-84	b2	DW	DF	t:b2=0	r2
SUR Regression	-0.0262	-0.0941	-0.0464	-0.0379	-0.1758		+0.0314		59	+1.35	0.02 $
Asymptotic se's	0.0160	0.0487	0.0261	0.0244	0.1280		0.0233				
OLS Regressions											
ECON 3 Month	-0.0602	0.0531	0.0238	0.0184	0.2317		-0.0431	2.28	59	-0.80	0.15
	0.0284	0.1071	0.0526	0.0430	0.2942		0.0537				
ECON 6 Month	-0.1262	0.0665	0.0206	0.0033	0.3948		-0.0789	3.05	29	-1.01	0.59
	0.0434	0.1520	0.0742	0.0606	0.4242		0.0777				
ECONII 6 Month	-0.0428	-0.1198	-0.0579	-0.0422	-0.1377		+0.0235	2.83	24	+0.17	0.27
	0.0694	0.2684	0.1285	0.1041	0.7474		0.1364				
AMEX 6 Month (Day)	-0.0077	0.0934	0.0855	0.1226	0.2485	-0.0767	-0.0330	1.80	39	-0.37	0.29
	0.0599	0.1538	0.0768	0.0655	0.4858	0.0248	0.0902				
AMEX 6 Month (Month)	0.0052	0.0285	0.0516	0.0931	0.0654	-0.0749	+0.0007	1.916	39	+0.01	0.26
	0.0598	0.1535	0.0766	0.0656	0.4847	0.0252	0.0899				

Indirect Regression: f(t) - s(t+1) = a - b(s(t))

	a(uk)	a(fr)	a(wg)	a(sw)	a(ja)	Dummy 81-84	b	DW	DF	t:b=0	r2
SUR Regression	0.0441	0.0140	0.0250	0.0278	0.0007		+0.0030		59	+0.15	.00 $
Asymptotic se's	0.0151	0.0421	0.0233	0.0225	0.1088		0.0198				
Bootstrap se's	0.0178	0.0627	0.0320	0.0283	0.1695		0.0307			+0.10	
OLS Regressions											
ECON 3 Month	0.0638	-0.0715	-0.0158	-0.0049	-0.2358		+0.0463	2.20	59	+0.86	0.20
	0.0286	0.1078	0.0530	0.0433	0.2962		0.0541				
ECON 6 Month	0.1401	-0.1367	-0.0176	0.0122	-0.4810		+0.0997	2.87	29	+1.29	0.66
	0.0430	0.1507	0.0736	0.0601	0.4206		0.0771				
ECONII 6 Month	0.0455	0.1059	0.0878	0.0809	0.2032		-0.0304	2.72	24	-0.21	0.31
	0.0755	0.2917	0.1396	0.1131	0.8124		0.1483				
AMEX 6 Month (Day)	-0.0408	-0.0137	-0.0215	-0.0550	0.0911	0.0974	-0.0261	1.88	39	-0.27	0.23
	0.0632	0.1622	0.0810	0.0691	0.5125	0.0262	0.0951				
AMEX 6 Month (Month)	-0.0545	0.0513	0.0122	-0.0260	0.2741	0.0967	-0.0598	1.96	39	-0.63	0.20
	0.0628	0.1612	0.0805	0.0689	0.5089	0.0264	0.0944				

*, ** indicate significance at 5% and 1% levels. $ r2 corresponds to [illegible]

TABLE 6b
REGRESSIVE EXPECTATIONS I / Independent variable: s(t)
Long Run Equilibrium Constant
SURVEY DATA REGRESSIONS

Direct Regression of Expected Change: E [s(t+1)] - s(t) = a - b1(s(t))

	a(uk)	a(fr)	a(wg)	a(sw)	a(ja)	Dummy 81-84	b1	DW	DF	t:b1=0	r2
SUR Regression	0.0429	-0.0877	-0.0138	-0.0053	-0.0249		+0.0513		59	+4.13 **	0.20 $
Asymptotic se's	0.0068	0.0247	0.0120	0.0098	0.0679		0.0124				
OLS Regressions											
ECON 3 Month	0.0467	-0.1042	-0.0217	-0.0116	-0.2942		+0.0596	1.60	59	+4.82 **	0.85
	0.0065	0.0246	0.0121	0.0099	0.0677		0.0124				
ECON 6 Month	0.0751	-0.1794	-0.0272	-0.0114	-0.5061		+0.1052	1.53	29	+3.77 **	0.89
	0.0156	0.0545	0.0266	0.0217	0.1522		0.0279				
ECONII 6 Month	0.0960	-0.2701	-0.0688	-0.0465	-0.0727		+0.1441	2.71	24	+5.49 **	0.95
	0.0134	0.0516	0.0247	0.0200	0.1438		0.0262				
AMEX 6 Month (Day)	-0.0444	0.1081	0.0680	0.0474	0.3734	0.0381	-0.0665	3.14	39	-2.34 *	0.54
	0.0189	0.0486	0.0243	0.0207	0.1535	0.0078	0.0285				
AMEX 6 Month (Month)	-0.0414	0.1018	0.0645	0.0474	0.3506	0.0432	-0.0621	2.79	39	-2.67 **	0.71
	0.0155	0.0398	0.0198	0.0170	0.1255	0.0065	0.0233				

Direct Regression of Actual Change: s(t+1) - s(t) = a - b2(s(t))

	a(uk)	a(fr)	a(wg)	a(sw)	a(ja)	Dummy 81-84	b2	DW	DF	t:b2=0	r2
SUR Regression	-0.0262	-0.0941	-0.0464	-0.0379	-0.1758		+0.0314		59	+1.35	0.02 $
Asymptotic se's	0.0160	0.0487	0.0261	0.0244	0.1280		0.0233				
OLS Regressions											
ECON 3 Month	-0.0602	0.0531	0.0238	0.0184	0.2317		-0.0431	2.28	59	-0.80	0.15
	0.0284	0.1071	0.0526	0.0430	0.2942		0.0537				
ECON 6 Month	-0.1262	0.0665	0.0206	0.0033	0.3948		-0.0789	3.05	29	-1.01	0.59
	0.0434	0.1520	0.0742	0.0606	0.4242		0.0777				
ECONII 6 Month	-0.0428	-0.1198	-0.0579	-0.0422	-0.1377		+0.0235	2.83	24	+0.17	0.27
	0.0694	0.2684	0.1285	0.1041	0.7474		0.1364				
AMEX 6 Month (Day)	-0.0077	0.0934	0.0855	0.1226	0.2485	-0.0767	-0.0330	1.80	39	-0.37	0.29
	0.0599	0.1538	0.0768	0.0655	0.4858	0.0248	0.0902				
AMEX 6 Month (Month)	0.0052	0.0285	0.0516	0.0931	0.0654	-0.0749	+0.0007	1.92	39	+0.01	0.26
	0.0598	0.1535	0.0766	0.0656	0.4847	0.0252	0.0899				

Indirect Regression: E [s(t+1)] - s(t+1) = a - b(s(t))

	a(uk)	a(fr)	a(wg)	a(sw)	a(ja)	Dummy 81-84	b	DW	DF	t:b=0	r2
SUR Regression	0.1048	-0.1487	-0.0413	-0.0267	-0.5021		+0.0984		59	+5.84 **	0.18 $
Asymptotic se's	0.0162	0.0369	0.0223	0.0223	0.0932		0.0168				
Bootstrap se's	0.0206	0.0706	0.0359	0.0313	0.1923		0.0350			+2.81 **	
OLS Regressions											
ECON 3 Month	0.1069	-0.1573	-0.0455	-0.0300	-0.5259		+0.1027	2.24	59	+1.73	0.42
	0.0313	0.1182	0.0580	0.0475	0.3246		0.0593				
ECON 6 Month	0.2013	-0.2459	-0.0477	-0.0148	-0.9009		+0.1841	3.52	29	+2.12 *	0.78
	0.0484	0.1695	0.0828	0.0676	0.4731		0.0867				
ECONII 6 Month	0.1388	-0.1503	-0.0109	-0.0043	-0.5895		+0.1206	2.92	24	+0.81	0.59
	0.0760	0.2938	0.1406	0.1139	0.8181		0.1493				
AMEX 6 Month (Day)	-0.0367	0.0147	-0.0176	-0.0752	0.1248	0.1149	-0.0335	2.08	39	-0.33	0.29
	0.0680	0.1743	0.0870	0.0743	0.5509	0.0281	0.1022				
AMEX 6 Month (Month)	-0.0465	0.0734	0.0129	-0.0457	0.2852	0.1181	-0.0628	1.96	39	-0.65	0.32
	0.0640	0.1642	0.0820	0.0702	0.5186	0.0269	0.0962				

*, ** indicate significance at 5% and 1% levels. $ r2 corresponds to [illegible]

TABLE 7a
REGRESSIVE EXPECTATIONS II / Independent variable: $\bar{s}(t) - s(t)$
Long Run Equilibrium PPP
FORWARD DISCOUNT REGRESSIONS

Direct Regression of Expected Change: $f(t) - s(t) = a + b1(\bar{s}(t) - s(t))$

	a(uk)	a(fr)	a(wg)	a(sw)	a(ja)	Dummy 81-84	b1	DW	DF	t:b1=0	r2
SUR Regression	0.0021	-0.0147	0.0102	0.0155	0.0128		0.0019		59	0.30	.00 $
Asymptotic se's	0.0015	0.0089	0.0026	0.0019	0.0017		0.0066				
OLS Regressions											
ECON 3 Month	0.0053	-0.0209	0.0055	0.0112	-0.0133		0.0046	1.43	59	0.72	0.79
	0.0046	0.0123	0.0078	0.0068	0.0367		0.0065				
ECON 6 Month	0.0179	-0.0665	-0.0016	0.0100	-0.0880		0.0204	1.68	29	0.99	0.79
	0.0152	0.0374	0.0244	0.0216	0.1168		0.0207				
ECONII 6 Month	-0.0062	0.0048	0.0443	0.0518	0.1297		-0.0179	1.17	24	-0.66	0.86
	0.0188	0.0491	0.0317	0.0279	0.1531		0.0271				
AMEX 6 Month (Day)	-0.0742	0.1062	0.0874	0.0928	0.4618	0.0306	-0.0814	2.33 -	39	-5.04 **	0.82
	0.0128	0.0253	0.0146	0.0134	0.0874	0.0050	0.0161				
AMEX 6 Month (Month)	-0.0774	0.1107	0.0897	0.0945	0.4771	0.0325	-0.0842	2.28	39	-5.47 **	0.84
	0.0122	0.0242	0.0140	0.0129	0.0835	0.0048	0.0154				

Direct Regression of Actual Change: $s(t+1) - s(t) = a + b2(\bar{s}(t) - s(t))$

	a(uk)	a(fr)	a(wg)	a(sw)	a(ja)	Dummy 81-84	b2	DW	DF	t:b2=0	r2
SUR Regression	-0.0479	-0.1636	-0.0529	-0.0346	-0.0144		0.1001		59	2.54 **	0.07 $
Asymptotic se's	0.0122	0.0541	0.0200	0.0184	0.0132		0.0394				
OLS Regressions											
ECON 3 Month	-0.0464	-0.0153	-0.0063	-0.0051	0.0465		-0.0090	2.21	59	-0.16	0.14
	0.0393	0.1046	0.0669	0.0579	0.3135		0.0554				
ECON 6 Month	-0.1594	0.0994	0.0680	0.0507	0.5491		-0.1037	3.08	29	-1.20	0.59
	0.0634	0.1561	0.1019	0.0900	0.4871		0.0863				
ECONII 6 Month	-0.0252	-0.1502	-0.0854	-0.0680	-0.2474		0.0423	2.79	24	0.26	0.27
	0.1141	0.2974	0.1924	0.1693	0.9280		0.1640				
AMEX 6 Month (Day)	-0.0443	0.1532	0.1241	0.1596	0.4745	-0.0646	-0.0746	1.84	39	-0.74	0.30
	0.0806	0.1591	0.0918	0.0845	0.5494	0.0311	0.1014				
AMEX 6 Month (Month)	-0.0178	0.0750	0.0779	0.1168	0.2279	-0.0680	-0.0293	1.96	39	-0.29	0.26
	0.0810	0.1598	0.0922	0.0851	0.5517	0.0318	0.1018				

Indirect Regression: $f(t) - s(t+1) = a + b(\bar{s}(t) - s(t))$

	a(uk)	a(fr)	a(wg)	a(sw)	a(ja)	Dummy 81-84	b	DW	DF	t:b=0	r2
SUR Regression	0.0461	0.0804	0.0444	0.0394	0.0219		-0.0460		59	-1.24	0.02 $
Asymptotic se's	0.0125	0.0512	0.0193	0.0182	0.0131		0.0371				
Bootstrap se's	0.0117	0.0621	0.0217	0.0195	0.0137		0.0458			-1.00	
OLS Regressions											
ECON 3 Month	0.0517	-0.0055	0.0118	0.0163	-0.0597		0.0136	2.14	59	0.24	0.19
	0.0396	0.1053	0.0674	0.0583	0.3157		0.0558				
ECON 6 Month	0.1773	-0.1659	-0.0696	-0.0407	-0.6371		0.1241	2.90	29	1.45	0.66
	0.0628	0.1547	0.1010	0.0892	0.4829		0.0856				
ECONII 6 Month	0.0190	0.1550	0.1297	0.1198	0.3771		-0.0602	2.67	24	-0.34	0.31
	0.1239	0.3230	0.2090	0.1839	1.0079		0.1781				
AMEX 6 Month (Day)	-0.0299	-0.0471	-0.0368	-0.0669	-0.0127	0.0952	-0.0068	1.91	39	-0.06	0.22
	0.0856	0.1689	0.0974	0.0897	0.5832	0.0331	0.1076				
AMEX 6 Month (Month)	-0.0596	0.0357	0.0117	-0.0223	0.2492	0.1005	-0.0549	1.99	39	-0.51	0.19
	0.0853	0.1683	0.0971	0.0897	0.5810	0.0335	0.1072				

*, ** indicate significance at 5% and 1% levels. $r2 corresponds to approximate F test on all non-intercept

TABLE 7b

REGRESSIVE EXPECTATIONS II / Independent variable: $\bar{s}(t) - s(t)$

Long Run Equilibrium PPP

SURVEY DATA REGRESSIONS

Direct Regression of Expected Change: $E[s(t+1)] - s(t) = a + b1(\bar{s}(t) - s(t))$

	a(uk)	a(fr)	a(wg)	a(sw)	a(ja)	Dummy 81-84	b1	DW	DF	t:b1=0	r2
SUR Regression	0.0153	−0.0605	0.0141	0.0220	0.0261		0.0564		59	3.56 **	0.15 $
Asymptotic se's	0.0040	0.0210	0.0064	0.0042	0.0034		0.0158				
OLS Regressions											
ECON 3 Month	0.0533	−0.0823	−0.0260	−0.0185	−0.2580		0.0512	2.12	59	3.83 **	0.84
	0.0095	0.0253	0.0162	0.0140	0.0758		0.0134				
ECON 6 Month	0.1014	−0.1771	−0.0606	−0.0484	−0.5664		0.1125	2.55	29	3.53 **	0.89
	0.0234	0.0576	0.0376	0.0332	0.1796		0.0318				
ECONII 6 Month	0.1396	−0.2853	−0.1273	−0.1080	−0.8696		0.1646	2.56	24	4.92 **	0.94
	0.0233	0.0607	0.0392	0.0345	0.1893		0.0334				
AMEX 6 Month (Day)	−0.0408	0.0721	0.0568	0.0421	0.2804	0.0397	−0.0490	2.85	39	−1.46	0.50
	0.0266	0.0525	0.0303	0.0279	0.1814	0.0103	0.0335				
AMEX 6 Month (Month)	−0.0406	0.0733	0.0570	0.0449	0.2815	0.0453	−0.0489	2.49	39	−1.77	0.68
	0.0220	0.0434	0.0250	0.0231	0.1496	0.0086	0.0276				

Direct Regression of Actual Change: $s(t+1) - s(t) = a + b2(\bar{s}(t) - s(t))$

	a(uk)	a(fr)	a(wg)	a(sw)	a(ja)	Dummy 81-84	b2	DW	DF	t:b2=0	r2
SUR Regression	−0.0479	−0.1636	−0.0529	−0.0346	−0.0144		0.1001		59	2.54 **	0.07 $
Asymptotic se's	0.0122	0.0541	0.0200	0.0184	0.0132		0.0394				
OLS Regressions											
ECON 3 Month	−0.0464	−0.0153	−0.0063	−0.0051	0.0465		−0.0090	2.21	59	−0.16	0.14
	0.0393	0.1046	0.0669	0.0579	0.3135		0.0554				
ECON 6 Month	−0.1594	0.0994	0.0680	0.0507	0.5491		−0.1037	3.08	29	−1.20	0.59
	0.0634	0.1561	0.1019	0.0900	0.4871		0.0863				
ECONII 6 Month	−0.0252	−0.1502	−0.0854	−0.0680	−0.2474		0.0423	2.79	24	0.26	0.27
	0.1141	0.2974	0.1924	0.1693	0.9280		0.1640				
AMEX 6 Month (Day)	−0.0443	0.1532	0.1241	0.1596	0.4745	−0.0646	−0.0746	1.84	39	−0.74	0.30
	0.0806	0.1591	0.0918	0.0845	0.5494	0.0311	0.1014				
AMEX 6 Month (Month)	−0.0178	0.0750	0.0779	0.1168	0.2279	−0.0680	−0.0293	1.96	39	−0.29	0.26
	0.0810	0.1598	0.0922	0.0851	0.5517	0.0318	0.1018				

Indirect Regression: $E[s(t+1)] - s(t+1) = a + b(\bar{s}(t) - s(t))$

	a(uk)	a(fr)	a(wg)	a(sw)	a(ja)	Dummy 81-84	b	DW	DF	t:b=0	r2
SUR Regression	0.0538	−0.0630	0.0215	0.0308	0.0277		0.0828		59	2.35 **	0.05 $
Asymptotic se's	0.0146	0.0490	0.0201	0.0195	0.0150		0.0352				
Bootstrap se's	0.0146	0.0723	0.0240	0.0204	0.0161		0.0539			1.54	
OLS Regressions											
ECON 3 Month	0.0997	−0.0669	−0.0197	−0.0133	−0.3045		0.0602	2.15	59	0.97	0.40
	0.0439	0.1167	0.0747	0.0646	0.3499		0.0618				
ECON 6 Month	0.2608	−0.2765	−0.1287	−0.0992	−1.1155		0.2161	3.54	29	2.25 *	0.79
	0.0706	0.1739	0.1135	0.1002	0.5427		0.0962				
ECONII 6 Month	0.1647	−0.1351	−0.0419	−0.0400	−0.6212		0.1223	2.94	24	0.68	0.58
	0.1255	0.3270	0.2116	0.1862	1.0205		0.1803				
AMEX 6 Month (Day)	0.0035	−0.0811	−0.0673	−0.1176	−0.1940	0.1043	0.0256	2.13	39	0.22	0.29
	0.0920	0.1815	0.1047	0.0964	0.6267	0.0355	0.1156				
AMEX 6 Month (Month)	−0.0228	−0.0018	−0.0210	−0.0718	0.0536	0.1133	−0.0197	2.01	39	−0.18	0.31
	0.0872	0.1721	0.0993	0.0916	0.5939	0.0342	0.1096				

*, ** indicate significance at 5% and 1% levels. $ r2 corresponds to approximate F test on all non-intercept parameters.

TABLE 8a
PPP EXPECTATIONS / Independent variable: $E[\pi-\pi^*]$
FORWARD DISCOUNT REGRESSIONS

Direct Regression of Expected Change: $f(t) - s(t) = a + b1(E[\pi-\pi^*])$

	a	dummy 1981-84	b1	DW	DF	t:b1=0	r2
SUR Regression	0.0072		0.4813		46	7.85 **	
Asymptotic se's	0.0012		0.0613				
OLS Regressions							
ECON 3 Month	0.0035		1.2173	0.97	46	8.85 **	0.62
	0.0011		0.1376				
ECON 6 Month	0.0084		1.2862	1.06	22	6.26 **	0.62
	0.0034		0.2053				
ECONII 6 Month	0.0077		1.1504	1.46	18	6.35 **	0.67
	0.0031		0.1812				
AMEX 6 Month (day)	0.0024	0.0167	0.6925	1.94	22	6.53 **	0.74
	0.0030	0.0050	0.1061				
AMEX 6 Month (Month)	0.0030	0.0161	0.6710	1.93	22	6.47 **	0.7334
	0.0029	0.0049	0.1037				

Direct Regression of Actual Change: $s(t+1) - s(t) = a + b2(E[\pi-\pi^*])$

	a	dummy 1981-84	b2	DW	DF	t:b2=0	r2
SUR Regression	-0.0254		1.3136		46	2.43 **	
Asymptotic se's	0.0104		0.5416				
OLS Regressions							
ECON 3 Month	-0.0230		1.1964	2.43	46	1.26	0.01
	0.0073		0.9510				
ECON 6 Month	-0.0639		1.2030	2.78	22	2.06	0.12
	0.0095		0.5826				
ECONII 6 Month	-0.0405		1.1259	1.96	18	1.43	0.05
	0.0134		0.7858				
AMEX 6 Month (day)	0.0559	-0.1086	1.3614	1.88	22	2.45 *	0.42
	0.0156	0.0263	0.5559				
AMEX 6 Month (Month)	0.0473	-0.1015	1.2819	1.86	22	2.38 *	0.40
	0.0151	0.0255	0.5381				

Indirect Regression: $f(t) - s(t+1) = a + b(E[\pi-\pi^*])$

	a	dummy 1981-84	b	DW	DF	t:b=0	r2
SUR Regression	0.0299		0.0089		46	0.02	
Asymptotic se's	0.0106		0.5308				
Bootstrap se's	0.0128		0.3572			0.02	
OLS Regressions							
ECON 3 Month	0.0265		0.0210	2.31	46	0.02	0.00
	0.0074		0.9596				
ECON 6 Month	0.0723		0.0834	2.66	22	0.14	0.00
	0.0099		0.6043				
ECONII 6 Month	0.0482		0.0245	1.88	18	0.03	0.00
	0.0147		0.8613				
AMEX 6 Month (day)	-0.0529	0.1247	-0.6903	2.04	22	-1.19	0.43
	0.0163	0.0276	0.5825				
AMEX 6 Month (Month)	-0.0449	0.1182	-0.5894	2.03	22	-1.05	0.42
	0.0158	0.0267	0.5639				

*, ** indicate significance at 5% and 1% levels. r2 corresponds to approximate F test on all non-intercept parameters.

TABLE 8b

PPP EXPECTATIONS / Independent variable: $E[\pi-\pi^*]$

SURVEY DATA REGRESSIONS

Direct Regression of Expected Change: $E[s(t+1)] - s(t) = a + b1(E[\pi-\pi^*])$

	a	dummy 1981-84	b1	DW	DF	t:b1=0	r2
SUR Regression	0.0245		1.1155		46	4.38 **	0.05
Asymptotic se's	0.0018		0.2546				
OLS Regressions							
ECON 3 Month	0.0237		1.2417	1.96	46	4.67 **	0.31
	0.0020		0.2657				
ECON 6 Month	0.0454		1.4251	1.69	22	5.13 **	0.52
	0.0046		0.2780				
ECONII 6 Month	0.0403		1.2658	1.71	18	5.45 **	0.60
	0.0040		0.2323				
AMEX 6 Month (day)	0.0085	0.0319	0.3797	1.60	22	2.75 **	0.62
	0.0039	0.0065	0.1383				
AMEX 6 Month (Month)	0.0076	0.0393	0.3426	1.70	22	2.34 *	0.66
	0.0041	0.0069	0.1463				

Direct Regression of Actual Change: $s(t+1) - s(t) = a + b2(E[\pi-\pi^*])$

	a	dummy 1981-84	b2	DW	DF	t:b2=0	r2
SUR Regression	-0.0254		1.3136		46	2.43 *	
Asymptotic se's	0.0104		0.5416				
OLS Regressions							
ECON 3 Month	-0.0230		1.1964	2.43	46	1.26	0.01
	0.0073		0.9510				
ECON 6 Month	-0.0639		1.2030	2.78	22	2.06	0.12
	0.0095		0.5826				
ECONII 6 Month	-0.0405		1.1259	1.96	18	1.43	0.05
	0.0134		0.7858				
AMEX 6 Month (day)	0.0559	-0.1086	1.3614	1.88	22	2.45 *	0.42
	0.0156	0.0263	0.5559				
AMEX 6 Month (Month)	0.0473	-0.1015	1.2819	1.86	22	2.38 *	0.40
	0.0151	0.0255	0.5381				

Indirect Regression: $E[s(t+1)] - s(t+1) = a + b(E[\pi-\pi^*])$

	a	dummy 1981-84	b	DW	DF	t:b=0	r2
SUR Regression	0.0502		0.3572		46	0.59	
Asymptotic se's	0.0117		0.6022				
Bootstrap se's	0.0150		0.3767			0.95	
OLS Regressions							
ECON 3 Month	0.0467		0.0454	2.18	46	0.04	0.00
	0.0082		1.0662				
ECON 6 Month	0.1093		0.2221	2.27	22	0.34	0.00
	0.0108		0.6574				
ECONII 6 Month	0.0808		0.1399	1.86	18	0.16	0.00
	0.0146		0.8527				
AMEX 6 Month (day)	-0.0473	0.1406	-0.9817	2.06	22	-1.75	0.52
	0.0157	0.0265	0.5594				
AMEX 6 Month (Month)	-0.0396	0.1409	-0.9394	1.93	22	-1.80	0.56
	0.0146	0.0248	0.5227				

* , ** indicate significance at 5% and 1% levels. r2 corresponds to approximate F test on all non-intercept parameters.

TABLE 9a
REGRESSIVE INFLATION ADJUSTED EXPECTATIONS / Independent variable: $\bar{s}(t)-s(t)$
FORWARD DISCOUNT REGRESSIONS

Direct Regression of Expected Change: $f(t) - s(t) - E[\pi-\pi^*] = a + b1(\bar{s}(t) - s(t))$

	a	dummy 1981-84	b1	DW	DF	t:b1=0	r2
SUR Regression	0.0070	--	-0.0078		46	-5.77 **	
Asymptotic se's	0.0011		0.0014				
OLS Regressions							
ECON 3 Month	0.0062		-0.0121	0.86	46	-2.22 *	0.08
	0.0016		0.0055				
ECON 6 Month	0.0120		-0.0227	0.80	22	-1.15	0.01
	0.0049		0.0197				
ECONII 6 Month	0.0177		-0.0489	1.01	18	-2.71 **	0.25
	0.0047		0.0180				
AMEX 6 Month (day)	0.0067	0.0136	-0.0087	1.79	22	-0.38	0.10
	0.0033	0.0070	0.0232				
AMEX 6 Month (Month)	0.0059	0.0145	-0.0089	1.83	22	-0.39	0.12
	0.0033	0.0070	0.0229				

Direct Regression of Actual Change: $s(t+1) - s(t) - E[\pi-\pi^*] = a + b2(\bar{s}(t) - s(t))$

	a	dummy 1981-84	b2	DW	DF	t:b2=0	r2
SUR Regression	-0.0260		-0.0125		46	-2.39 *	
Asymptotic se's	0.0115		0.0052				
OLS Regressions							
ECON 3 Month	-0.0223		-0.0032	2.42	46	-0.08	0.00
	0.0113		0.0387				
ECON 6 Month	-0.0600		-0.0240	2.92	22	-0.44	0.00
	0.0136		0.0551				
ECONII 6 Month	-0.0373		-0.0149	1.94	18	-0.16	0.00
	0.0226		0.0911				
AMEX 6 Month (day)	0.0535	-0.0928	-0.0663	1.60	22	-0.64	0.39
	0.0146	0.0310	0.1035				
AMEX 6 Month (Month)	0.0449	-0.0931	-0.0279	1.91	22	-0.28	0.37
	0.0142	0.0305	0.0996				

Indirect Regression: $f(t) - s(t+1) = a + b(\bar{s}(t) - s(t))$

	a	dummy 1981-84	b	DW	DF	t:b=0	r2
SUR Regression							
Asymptotic se's							
Bootstrap se's							
OLS Regressions							
ECON 3 Month							
ECON 6 Month							
ECONII 6 Month							
AMEX 6 Month (day)							
AMEX 6 Month (Month)							

SEE INDIRECT REGRESSION IN TABLE 7A

*, ** indicate significance at 5% and 1% levels. r2 corresponds to approximate F test on all non-intercept parameters.

TABLE 9b

REGRESSIVE INFLATION ADJUSTED EXPECTATIONS / Independent variable: $\bar{s}(t)-s(t)$

SURVEY DATA REGRESSIONS

Direct Regression of Expected Change: $E[s(t+1)] - s(t) - E[\pi-\pi^*] = a + b1(\bar{s}(t) - s(t))$

	a	dummy 1981-84	b1	DW	DF	t:b1=0	r2
SUR Regression	0.0237		0.0003		46	0.15	
Asymptotic se's	0.0025		0.0020				
OLS Regressions							
ECON 3 Month	0.0180		0.0259	1.65	46	2.54 **	0.10
	0.0030		0.0102				
ECON 6 Month	0.0339		0.0611	1.30	22	2.50 **	0.19
	0.0060		0.0245				
ECONII 6 Month	0.0330		0.0384	1.54	18	1.46	0.06
	0.0065		0.0264				
AMEX 6 Month (day)	0.0150	0.0231	0.0076	1.29	22	0.21	0.20
	0.0050	0.0107	0.0356				
AMEX 6 Month (Month)	0.0142	0.0279	0.0189	1.36	22	0.51	0.29
	0.0053	0.0114	0.0371				

Direct Regression of Actual Change: $s(t+1) - s(t) - E[\pi-\pi^*] = a + b2(\bar{s}(t) - s(t))$

	a	dummy 1981-84	b2	DW	DF	t:b2=0	r2
SUR Regression	-0.0260		-0.0125		46	-2.39 *	
Asymptotic se's	0.0115		0.0052				
OLS Regressions							
ECON 3 Month	-0.0223		-0.0032	2.42	46	-0.08	0.00
	0.0113		0.0387				
ECON 6 Month	-0.0600		-0.0240	2.92	22	-0.44	0.00
	0.0136		0.0551				
ECONII 6 Month	-0.0373		-0.0149	1.94	18	-0.16	0.00
	0.0226		0.0911				
AMEX 6 Month (day)	0.0535	-0.0928	-0.0663	1.60	22	-0.64	0.39
	0.0146	0.0310	0.1035				
AMEX 6 Month (Month)	0.0449	-0.0931	-0.0279	1.91	22	-0.28	0.37
	0.0142	0.0305	0.0996				

Indirect Regression: $E[s(t+1)] - s(t+1) = a + b(\bar{s}(t) - s(t))$

	a	dummy 1981-84	b	DW	DF	t:b=0	r2
SUR Regression							
Asymptotic se's							
Bootstrap se's							
OLS Regressions							
ECON 3 Month	SEE INDIRECT REGRESSION IN TABLE 7B						
ECON 6 Month							
ECONII 6 Month							
AMEX 6 Month (day)							
AMEX 6 Month (Month)							

* , ** indicate significance at 5% and 1% levels. r2 corresponds to approximate F test on all non-intercept parameters.

TABLE 10a
TESTS OF EXCESSIVE SPECULATION / Independent variable: f(t) - s(t)
FORWARD DISCOUNT REGRESSIONS

Direct Regression of Actual Change: s(t+1) - s(t) = a + b2(f(t) - s(t))

	a(uk)	a(fr)	a(wg)	a(sw)	a(ja)	Dummy 81-84	b2	DW	DF	t:b2=0	r2
SUR Regression	-0.0409	-0.0299	-0.0189	-0.0171	-0.0066		0.1801		59	0.31	.00 $
Asymptotic se's	0.0119	0.0173	0.0159	0.0199	0.0152		0.5721				
OLS Regressions											
ECON 3 Month	-0.0404	-0.0325	-0.0165	-0.0137	-0.0038		-0.0344	2.20	59	-0.03	0.14
	0.0146	0.0197	0.0188	0.0227	0.0203		1.1065				
ECON 6 Month	-0.0890	-0.0725	-0.0621	-0.0688	-0.0478		0.4646	2.82	29	0.60	0.58
	0.0209	0.0311	0.0268	0.0316	0.0294		0.7759				
ECONII 6 Month	-0.0372	-0.1507	0.0295	0.0688	0.0678		-2.7917	2.79	24	-2.57 **	0.42
	0.0238	0.0377	0.0343	0.0430	0.0377		1.0874				
AMEX 6 Month (Day)	0.0024	0.0212	0.0722	0.1250	0.0891	-0.0711	-0.8491	1.59	39	-1.09	0.31
	0.0242	0.0308	0.0255	0.0347	0.0315	0.0229	0.7766				
AMEX 6 Month (Month)	-0.0074	0.0118	0.0667	0.1190	0.0890	-0.0629	-0.9163	1.76	39	-1.17	0.28
	0.0246	0.0308	0.0255	0.0345	0.0316	0.0233	0.7836				

Indirect Regression: f(t) - s(t+1) = a + b(f(t) - s(t))

	a(uk)	a(fr)	a(wg)	a(sw)	a(ja)	Dummy 81-84	b	DW	DF	t:b=0	r2
SUR Regression	0.0409	0.0299	0.0189	0.0171	0.0066		0.8199		59	1.43	0.03 $
Asymptotic se's	0.0119	0.0173	0.0159	0.0199	0.0152		0.5721				
Bootstrap se's	0.0115	0.0176	0.0171	0.0219	0.0176		0.8652			0.95	
OLS Regressions											
ECON 3 Month	0.0404	0.0325	0.0165	0.0137	0.0038		1.0344	2.20	59	0.93	0.20
	0.0146	0.0197	0.0188	0.0227	0.0203		1.1065				
ECON 6 Month	0.0890	0.0725	0.0621	0.0688	0.0478		0.5354	2.82	29	0.69	0.64
	0.0209	0.0311	0.0268	0.0316	0.0294		0.7759				
ECONII 6 Month	0.0372	0.1507	-0.0295	-0.0688	-0.0678		3.7917	2.79	24	3.49 **	0.54
	0.0238	0.0377	0.0343	0.0430	0.0377		1.0874				
AMEX 6 Month (Day)	-0.0024	-0.0212	-0.0722	-0.1250	-0.0891	0.0711	1.8491	1.59	39	2.38 **	0.32
	0.0242	0.0308	0.0255	0.0347	0.0315	0.0229	0.7766				
AMEX 6 Month (Month)	0.0074	-0.0118	-0.0667	-0.1190	-0.0890	0.0629	1.9163	1.76	39	2.45 **	0.30
	0.0246	0.0308	0.0255	0.0345	0.0316	0.0233	0.7836				

* , ** indicate significance at 5% and 1% levels. $ r2 corresponds to approximate F test on all non-intercept parameters.

TABLE 10b

TESTS OF EXCESSIVE SPECULATION / Independent variable: E[s(t+1)]-s(t)

SURVEY DATA REGRESSIONS

Direct Regression of Actual Change: s(t+1) - s(t) = a + b2(E [s(t+1)] - s(t))

	a(uk)	a(fr)	a(wg)	a(sw)	a(ja)	Dummy 81-84	b2	DW	DF	t:b2=0	r2
SUR Regression	-0.0303	-0.0251	0.0011	0.0032	0.0123		-0.5211		59	-1.88	0.05 $
Asymptotic se's	0.0123	0.0163	0.0161	0.0177	0.0134		0.2773				
OLS Regressions											
ECON 3 Month	-0.0148	-0.0142	0.0286	0.0299	0.0376		-1.3193	2.34	59	-2.93 **	0.25
	0.0161	0.0148	0.0205	0.0202	0.0196		0.4503				
ECON 6 Month	-0.0746	-0.0730	-0.0139	-0.0186	0.0017		-0.5470	2.72	29	-1.30	0.60
	0.0224	0.0227	0.0354	0.0342	0.0348		0.4193				
ECONII 6 Month	-0.0295	-0.0632	0.0199	0.0276	0.0450		-0.8734	2.87	24	-1.28	0.31
	0.0315	0.0263	0.0505	0.0481	0.0491		0.6840				
AMEX 6 Month (Day)	0.0101	0.0352	0.0691	0.1033	0.0825	-0.0599	-0.7557	1.53	39	-1.64	0.34
	0.0220	0.0263	0.0228	0.0263	0.0272	0.0244	0.4598				
AMEX 6 Month (Month)	0.0030	0.0285	0.0591	0.0966	0.0774	-0.0580	-0.4932	1.88	39	-0.88	0.27
	0.0226	0.0270	0.0239	0.0272	0.0285	0.0285	0.5630				

Indirect Regression: E [s(t+1)] - s(t+1) = a + b(E [s(t+1)] - s(t))

	a(uk)	a(fr)	a(wg)	a(sw)	a(ja)	Dummy 81-84	b	DW	DF	t:b=0	r2
SUR Regression	0.0303	0.0251	-0.0011	-0.0032	-0.0123		1.5211		59	5.49 **	0.33 $
Asymptotic se's	0.0123	0.0163	0.0161	0.0177	0.0134		0.2773				
Bootstrap se's	0.0120	0.0159	0.0178	0.0195	0.0159		0.3386			4.49 **	
OLS Regressions											
ECON 3 Month	0.0148	0.0142	-0.0286	-0.0299	-0.0376		2.3193	2.34	59	5.15 **	0.58
	0.0161	0.0148	0.0205	0.0202	0.0196		0.4503				
ECON 6 Month	0.0746	0.0730	0.0139	0.0186	-0.0017		1.5470	2.72	29	3.69 **	0.83
	0.0224	0.0227	0.0354	0.0342	0.0348		0.4193				
ECONII 6 Month	0.0295	0.0632	-0.0199	-0.0276	-0.0450		1.8734	2.87	24	2.74 **	0.68
	0.0315	0.0263	0.0505	0.0481	0.0491		0.6840				
AMEX 6 Month (Day)	-0.0101	-0.0352	-0.0691	-0.1033	-0.0825	0.0599	1.7557	1.53	39	3.82 **	0.48
	0.0220	0.0263	0.0228	0.0263	0.0272	0.0244	0.4598				
AMEX 6 Month (Month)	-0.0030	-0.0285	-0.0591	-0.0966	-0.0774	0.0580	1.4932	1.88	39	2.65 **	0.42
	0.0226	0.0270	0.0239	0.0272	0.0285	0.0285	0.5630				

* , ** indicate significance at 5% and 1% levels. $ [illegible]