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Firm Valuation, Earnings Expectations, and the Exchange-Rate Exposure Effect

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ABSTRACT

Consistent with previous research, we fail to find a significant correlation between the abnormal returns of our sample firms with international activities and changes in the dollar. We investigate the possibility that this failure is due to mispricing. Lagged changes in the dollar are a significant variable in explaining current abnormal returns of our sample firms, suggesting that mispricing does occur. A simple trading strategy based upon these results generates significant abnormal returns. Corroborating evidence from returns around earnings announcements as well as errors in analysts' forecasts of earnings is also provided.

IT IS A WIDELY held view that exchange rate movement should affect the value of a firm. Standard economic analysis implies that the profitability and value of most U.S. firms with foreign sales or operations abroad should increase (decrease) with an unexpected depreciation (appreciation) of the dollar as expected foreign currency cash flows translate into larger (smaller) U.S. dollar cash flows. On a more practical level, both financial analysts and firms' managers point to movements in the dollar as responsible for changes in the performance of firms with international activities. For example, executives at Merck and Co. recently claimed that favorable currency rates added one percentage point to its nine-month increase in sales despite a decrease in the percentage of sales derived from overseas operations, and executives at Gillette Co. called the decline in the dollar "very beneficial" to its earnings.[1]

Recent studies, for example Jorion (1990), Amihud (1993), and Bodnar and Gentry (1993), have empirically examined U.S. firms' exchange rate exposures, i.e., the relation between changes in the value of the U.S. dollar and

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[1] *The Wall Street Journal* (1990).

contemporaneous changes in the value of the firm as measured by stock prices. Relying on the assumption that capital markets react fully and instantaneously to changes in the U.S. dollar, these studies have met with limited success in identifying a significant correlation between simultaneous stock returns and dollar fluctuations. This difficulty in identifying significant contemporaneous correlations seems surprising in light of the discussion above. There are, however, (at least) two possible explanations why these studies do not document exchange rate exposures on a broader scale.

One possible explanation for previous studies' results concerns potential drawbacks in their research designs, most notably in their sample selection procedures. The inclusion of firms with limited linkages to international conditions, firms with exposures of opposite signs, or firms that can react to changes in international conditions at very low cost introduces noise into the analysis and thereby reduces the ability of these studies to identify significant exchange rate exposures. To uncover evidence of a significant correlation between changes in the dollar and contemporaneous changes in firm values, it is necessary to apply sample selection criteria that reduce such noise in the data.

The second possible explanation for the limited success of prior studies in documenting significant relations between changes in the dollar and contemporaneous stock returns is the existence of mispricing arising from systematic errors by investors in the estimation of the relation between fluctuations in the dollar and firm value. This mispricing may arise because of the complex set of issues involved with modeling and estimating this relation and the relatively short history of fluctuating exchange rates (since 1973). This mispricing implies that stock price adjustments due to movements in the U.S. dollar take time (as opposed to occurring instantaneously), suggesting the inclusion of lagged changes in the dollar when analyzing the relation between changes in firm performance and the foreign currency value of the U.S. dollar.[2]

The purpose of this study is to reexamine the relation between expected changes in the dollar and equity value, focusing on these two possible explanations for the limited success of previous studies in documenting significant exchange rate exposures. First, to consider the possibility of sample selection problems, we select firms that are likely to have similar exchange-rate exposures, i.e., correlations between changes in firm value and the value of the U.S. dollar of the same sign. Second, to consider the possibility of mispricing, we examine the relation between lagged as well as contemporaneous changes in the U.S. dollar and firm value.

Employing a sample of U.S. firms from 1978 to 1989 with consistently large foreign currency adjustments reported on their past annual financial state-

[2] Amihud (1993) also considers the possibility of a lagged relation between changes in firm value and changes in the value of the U.S. dollar for a sample of the 32 largest U.S. exporters from 1982 to 1988. He finds little evidence of a relation between lagged monthly (or quaterly) changes in the U.S. dollar on changes in firm value for these firms.

ments that are *negatively* correlated with the corresponding changes in a trade-weighted index of the U.S. dollar, we find that abnormal returns of these firms show no correlation with the contemporaneous change in the dollar. However, a lagged change in the value of the dollar is a significant variable in explaining these returns. Tests for a structural shift in the relation between changes in the dollar and firm value suggest that, although it is significant in both subperiods, the size of the coefficient on the lagged change in the dollar is significantly more pronounced in an earlier sample subperiod, 1978 to 1983, than a later one, 1984 to 1990.[3] In addition, tests employing a simple trading strategy based upon these results reveal that this exchange rate exposure effect has resulted in abnormal returns that are economically as well as statistically significant for the sample period as a whole as well as for both subperiods.

One interpretation of these results is that investors do not use all freely available information—in particular, past changes in the dollar and the past relation between dollar changes and firm performance, assets, and liabilities —to predict changes in firm value. More specifically, at the end of a fiscal quarter investors observe the change in the value of the dollar over this period and have observed the impact of past dollar changes on firm performance, assets, and liabilities. Based upon this information, investors should be able to form an unbiased expectation about the economic impact of the recent change in the dollar on firm performance, assets, and liabilities and incorporate this effect into firm value by that time. However, at the end of the fiscal quarter investors systematically underestimate this impact (or perhaps even overlook it entirely). This underestimation is corrected only when additional information that directly relates to the impact of the past change in the dollar on firm performance, assets, and liabilities is disclosed during the following quarter.

To corroborate this interpretation of our findings, we consider two additional tests. In the first test, we take a closer look at the period over which the abnormal returns accrue and examine whether investors rely on earnings announcements to understand the impact of past changes in the dollar on firm value. One finding from this test suggests that investors use the information associated with earnings announcements to determine the impact of past changes in the dollar on firm performance; however, earnings announcement periods account for only about 20 percent of the abnormal stock price response in the quarter, suggesting that investors learn about the impact from other sources as well. In addition, since the influence of the change in the dollar will spill over into subsequent quarter's earnings, we test and find that the past change in the dollar also predicts abnormal stock returns around the earnings announcement in the subsequent quarter. In the second

[3] Note that the sample selection procedure uses accounting data for each firm through fiscal year 1989 but uses return data into 1990 because, for our tests, the necessary stock return data for firms with 1989 fiscal years extends in to the 1990 calendar year. Thus the full extent of our sample period is 1978 to 1990.

test, we examine the relation between past changes in the dollar and errors in analysts' forecasts of quarterly earnings. Consistent with the implications of the return data, we find significant evidence that analysts do not fully use the information in past changes in the dollar when predicting a firm's earnings.

Section I discusses the relation between changes in the value of the dollar and the value of the firm and the value of the firm and the motivations for this study. Section II develops our hypotheses. Section III outlines the model to be tested and defines the variables. Section IV describes the sample selection procedure and the data, and Section V presents the tests and results using market data. Section VI offers corroborating evidence for our results using abnormal returns around earnings announcements and errors in analysts' forecasts of quarterly earnings. Section VII offers our conclusions.

I. Background and Motivation

The exchange rate is one of the most important prices in the economy. It is the price of one country's currency in terms of another, and, as such, it converts prices denominated in one currency into prices denominated in another currency. Changes in exchange rates should therefore have a significant effect on the performance of firms involved in international activities.[4] Movements in the exchange rate (not resulting from changes in aggregate price levels) result in direct changes in the relative prices of domestic and foreign goods that influence both the current and future expected cash flows of firms with international operations.[5] Furthermore, changes in exchange rates alter the domestic currency value of foreign currency-denominated fixed assets and liabilities, thereby adding another dimension to how exchange rate changes affect the value of firms with international activities.

In general, the impact of a given exchange rate change on a firm is determined by whether the firm has a long or short economic position in foreign currency. Specifically, U.S. firms with a net long economic position in foreign currency will benefit (suffer) from a depreciation (appreciation) of the dollar, while U.S. firms with a net short economic position in foreign currency will suffer (benefit) from a depreciation (appreciation) of the dollar. If a firm has a long economic position in foreign currency, changes in the exchange rate influence expected future cash in-flows (revenues). Firms in this category include exporters and firms with foreign operations that have current or

[4] Economic analysis implies predictions for the relation between real firm value and unexpected changes in *real* exchange rates. In this analysis we consider nominal exchange rate changes because of the strong evidence that over short time intervals changes in nominal exchange rates are highly correlated with real exchange rate changes among the industrialized countries (e.g., Mussa (1979)). For a discussion of the relation between unexpected exchange rate changes and industry profits, e.g., Levi (1990) and Shapiro (1975).

[5] Because exchange rate changes result in changes in domestic prices as well as macroeconomic variables such as interest rates, they will also have an impact on firms that have no direct international activities.

future cash in-flows denominated in foreign currency.[6] For a firm with a short economic position in foreign currency, changes in the exchange rate influence expected future cash out-flows (expenses). Firms in this category include importers of final products or inputs to production or users of domestically available inputs whose prices are determined in international markets.

Despite U.S. firms' extensive involvement in international activities,[7] the volatility of floating exchange rates, and the implications of economic theory, previous empirical research on exchange rate exposure has found only limited evidence of a contemporaneous relation between the stock return and changes in the dollar exchange rate for U.S. firms. Jorion (1990, Table 1), using a sample of U.S. multinational firms with reported foreign operations data in the Value Line database, finds only random significance for individual firm exchange rate exposures for the period 1971 to 1987.[8] Amihud (1993) finds no evidence of a significant contemporaneous exchange rate exposure for the 32 largest U.S. exporting firms over the period 1982 to 1988. Bodnar and Gentry (1993), using all the firms on the CRSP File broken down into two-digit industry portfolios, find only eleven out of thirty-nine industries with significant exchange rate exposures for the period 1979 to 1988. In the next section, we consider two possible explanations for this surprising failure of previous research to document a contemporaneous relation between changes in the dollar and the value of U.S. firms.

II. Hypothesis Development

A. The Sample Selection Hypothesis

It is possible that the weak evidence of the relation between contemporaneous changes in the dollar and firm value in prior research is caused by drawbacks in the research design. The most likely source for problems is the sample selection procedure. In Bodnar and Gentry (1993), for example, the use of industry portfolios is beneficial for finding exchange rate exposure only to the extent that most firms in a particular industry participate in activities with a similar international linkage, such as exporting, importing, or foreign investment. To the extent that firms within a given industry are not uniformly involved in the international environment, the impact of fluctuations in the dollar on their values may be reduced. The samples used by Jorion

[6] This category also includes import competitors whose cash flows are influenced by the competitive pressure of foreign import prices. In this study, however, we focus on firms with direct international activities.

[7] In 1985, over 2500 U.S. firms had operating facilities overseas, with profits from international operations outstripping domestic earnings for a substantial number of major corporations. U.S. exports have also become more important to many firms; they accounted for 10 percent of GNP in 1984 and have continued to grow substantially in recent years. For more on the internationalization of U.S. firms, see Graziano (1986).

[8] Jorion (1990, Table 2) is able to reject that the exposures are jointly zero for certain portfolios of multinationals.

(1990) and Amihud (1993) consider only U.S. multinational firms with reported foreign operations and large U.S. exporting firms, respectively. These selection procedures do not necessarily yield firms with significant exposures, as firms with widespread foreign operations are likely to be able to hedge potential exchange rate exposure at low cost, or, as firms with inherently large exposures, such as heavy exporters, are more likely to undertake hedging activities (both financial and real). This endogeneity of hedging makes the detection of significant exchange rate exposures based upon simple sample selection techniques unlikely.

To examine the possibility that the difficulties of previous studies follow from sample selection procedure problems, we consider a sample of firms for which there are significant reported impacts from changes in the value of the U.S. dollar reported in their financial statements. This method of identifying firms alleviates both the problem of identifying firms with linkages to the international environment and the problem associated with the endogeneity of hedging, as only net foreign exchange impacts are reported in financial statements. The sample is further restricted to firms with negative correlations between reported foreign currency adjustments and corresponding fluctuations in the dollar. This increases the likelihood of selecting firms with economic exposures of a similar sign, thus alleviating the additional problem of potentially mixing positively and negatively exposed firms.[9]

Our sample selection procedure, however, is not without a possible drawback. Indeed, reported foreign currency adjustments have been criticized for not accurately representing the economic impact of currency changes on the firm, especially prior to Statement of Financial Accounting Standard (SFAS) No. 52 (Financial Accounting Standards Board (1981)).[10] This criticism implies that our use of this observable variable as an indicator of economic exposure may induce noise in our sample: some sample firms that are classified as having negative exposure may have either no exposure or positive exposure.[11] This potential problem, however, should not be overem-

[9] This choice of screening on negative and not on positive correlations is not without reason. Economic theory, as well as casual evidence from the financial press (e.g., *The Wall Street Journal* (1991)), suggests that the frequency of firms with negative exchange rate exposures substantially exceeds the frequency of firms with positive exchange rate exposures.

[10] The rules for reporting the performance of foreign operations under SFAS No. 8 (Financial Accounting Standards Board (1975)) were criticized by managers and investors in some cases for producing results that did not reflect the underlying reality of the foreign operations, as well as causing excessive volatility of reported earnings. SFAS No. 52 (Financial Accounting Standards Board (1981)) was introduced in December 1981 with the primary purpose of producing results that more closely represented the underlying economic reality of foreign operations. For more information on SFAS No. 8 and SFAS No. 52, see Choi and Mueller (1992) or Pahler and Mori (1988).

[11] Undoubtedly, for many firms the foreign currency adjustment is a very noisy indicator of the firm's economic exposure to currency movements. However, our sample selection procedure (discussed further below) is designed to identify firms for which the foreign currency adjustment is both large (as a function of income) and consistent with past changes in the dollar, thus improving the likelihood that the foreign currency adjustment provides useful information about the economic exposure of these firms to dollar fluctuations.

phasized. First, we only require the foreign currency adjustment to be "directionally sympathetic" with the economic exposure of the firm. Second, this directional relation between foreign currency adjustments and actual economic exposure should hold on average, not necessarily for all firms. Third, failure of our sample selection procedure to identify firms whose future economic performance is negatively related to changes in the dollar will result in our inability to document a relation between either contemporaneous or lagged changes in the value of the dollar and firm value. Thus, to the extent that noise is introduced into our sample, the primary reported results are stronger than they appear. A more detailed description of the sample selection procedure is provided in the next section.

B. The Lagged Response Hypothesis

It is also possible that these prior studies fail to document a significant correlation between changes in the dollar and contemporaneous abnormal stock returns because investors make systematic errors when characterizing the relation between firm value and changes in the dollar. These systematic errors may arise because of the complex set of issues associated with modeling and estimating this relation. Among these complexities are (i) identifying possible asymmetries in the impact of appreciations and depreciations on firm value, (ii) determining the extent to which a currency movement is temporary versus permanent, and (iii) judging the impact of the various changes in different foreign currencies relative to the dollar for the economic performance of the firm. In addition, determining the impact of a change in the dollar on firm performance is complicated by the fact that investors are not always aware of the firm's activities to hedge foreign currency exposures, how the firm's real internal activities will be altered in response to the new competitive conditions, or whether the currency movement will result in a change in the strategic behavior of the firm.

Reports in the financial press support the claim that the relation between firm value and changes in the dollar is difficult to characterize. For example, in an article about the effects of the rising U.S. dollar on firm performance, *The Wall Street Journal* (1991) quotes a financial analyst:

> *We're about to find out how important dollar-translation benefits are to a lot of companies. My feeling is that not even the companies know how big an impact it has.*

Moreover, *The Wall Street Journal* (1990) quotes an international affairs analyst at Boeing as claiming "it's uncertain what impact a fall of the dollar will have [on Boeing]," further suggesting that even officials of major U.S. multinationals are unable to predict the relation between changes in the dollar and the value of their own firm. Given managers' difficulties when characterizing the impact of these changes, it is reasonable to assume that investors face at least as much uncertainty.

This uncertainty can give rise to opportunities for systematic errors in investors' expectations that result in systematic mispricing of shares of the firm over limited periods of time. The specific reasons why complex circumstances lead to systematic mispricing are not well understood; however, this possibility is along the lines of phenomena documented in prior research. For example, Lakonishok and Vermaelen (1990) document stock mispricing around announcements of repurchase tender offers, and Bernard and Thomas (1990) and Bartov (1992) consider situations in which complex issues involved in modeling and estimating the time-series properties of earnings lead to systematic errors in predicting future firm performance and pricing stock.

Further contributing to this uncertainty is the recency of freely floating exchange rates. Clearly, even if a firm's exposure is constant, knowledge of the nature of the relation between changes in the dollar and firm performance may require a substantial amount of time-series data. The U.S. dollar, however, has been freely floating in the post-World-War-II period only since 1973; thus, the time span available for obtaining such data has been short.

Given these reasons for possible mispricing, there are several empirical implications surrounding the hypothesis that investors have difficulties characterizing the relation between changes in the dollar and firm performance and value. First, investors will learn the full impact of changes in the dollar on firm value only as information about the past performance of the firm is made available, leading to a lagged relation between changes in the dollar and firm value. Second, as the market obtains more time-series data and gains more experience with this relation, the extent of mispricing should diminish, resulting in a decrease in the importance of the lagged relation and an increase in the importance of the contemporaneous relation.

III. Model and Variable Definitions

The different implications for the relation between changes in the dollar and firm value outlined above translate into a set of hypotheses that can be nested within a single model. The model consists of a single regression of abnormal stock returns against a constant and a set of current and lagged changes in the foreign currency value of the U.S. dollar. In general the model can be written as

$$ASP_{i,t} = a_0 + \sum_{j=0}^{n} c_j \Delta CUR_{i,t-j} + \varepsilon_{i,t}, \tag{1}$$

where:

$ASP_{i,t}$ = the abnormal stock performance for security i in period t (in percentage form);
$\Delta CUR_{i,t-j}$ = the percentage change in a trade-weighted U.S. dollar exchange rate index for the period t to j;
a_0, c_j = parameters to be estimated; and
$\varepsilon_{i,t}$ = error term for firm i in period t.

Abnormal stock performance of firm i over a measurement period T is defined as follows:

$$ASP_{i,T} = \left[\prod_{k=t_1}^{t_2} (1 + AR_{i,k}) \right] - 1 \qquad ([t_1, \ldots, t_2] \in T) \tag{2}$$

where:

$AR_{i,t}$ = abnormal return for security i, from day $t - 1$ to day t (in percentage form).

We compute daily abnormal returns ($AR_{i,t}$) using the market model:[12]

$$AR_{i,t} = r_{i,t} - a_i - b_i r_{m,t} \tag{3}$$

where:

$r_{i,t}$ = the realized return for security i from day $t - 1$ to day t;
$r_{m,t}$ = the realized equally weighted market return, from day $t - 1$ to day t;
a_i, b_i = ordinary least squares (OLS) estimates of the intercept coefficient and the market beta for security i, computed over a 100-trading-day period beginning 300 days prior to the beginning of the measurement period (a minimum of 50 observations is required).

Unfortunately, theory provides little guidance about the length of the interval for calculating abnormal returns and changes in the dollar exchange rate. As shown in Figure 1, we calculate abnormal stock performances over a sixty-trading-day window commencing at the beginning of fiscal quarter t of year j, where data from fiscal years $\{j - 1, \ldots j - 5\}$ are used to select the sample. For each firm in the sample for a particular fiscal year, t denotes fiscal quarters two, three, and four as well as the first fiscal quarter of the next fiscal year (four firm-quarter observations per year). We skip the first quarter of the new fiscal year to allow the abnormal return period to be a period after the investor has received information about the past performance of the firm.[13] We measure the contemporaneous change in the dollar (lag 0) over fiscal quarter t. The first lagged change in the dollar (lag 1) is computed over the previous fiscal quarter, $t - 1$. A similar process is used to calculate the additional lagged changes in the dollar. Underlying the choice of the interval for measuring stock returns is the premise that, if stock prices in period $t - 1$ do not fully reflect concurrent changes in the dollar, adjustments

[12] Two points to note: (1) we use the standard market model—as opposed to an augmented market model using the exchange rate changes as an additional factor—in light of the evidence in Jorion (1991), which suggests that the exchange rate risk is not priced by the market; and (2) our sample consists primarily of large firms, but we verify that the results are not driven by nonsynchronous trading problems by using monthly data to estimate abnormal returns.

[13] We also consider abnormal returns calculated over a sixty-trading-day window commencing 10 trading days *after* the beginning of quarter t. This is to allow for the possibility that full financial statement information is not available for investors until the very end of the previous quarter. This alternative specification of abnormal returns has no impact on the results.

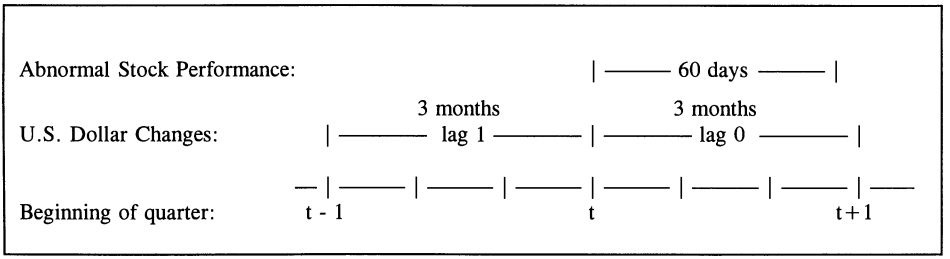

Figure 1. Time line of variable definitions. The figure shows the timing of the variables used in the empirical analysis. When a firm is selected into the sample based upon past financial data, the following variables are calculated for each quarter t, from the second fiscal quarter through the first fiscal quarter of the following year.

occur around the release of information about the performance of the firm, including financial statements of quarter $t-1$ (which become available sometime during quarter t), as investors learn the full impact of past changes in the dollar on firms' performance and value.[14]

The variable for the change in the dollar in period t, ΔCUR_t, represents the unexpected change in the U.S. dollar over the period. It is measured as the difference between the values of a trade-weighted exchange rate index for the U.S. dollar (among the G-7 countries) at the beginning and the end of period t, deflated by the index at the beginning of period t.[15] Two reasons underlie the choice of this measure. First, empirical evidence suggests that U.S. dollar exchange rates approximately follow a random walk process, implying that the entire change in the exchange rate is unanticipated.[16] Second, the methodology of the previous studies cited above employs a similar definition of exchange rate changes.

IV. Sample Selection Procedure and Data Description

Since one possible explanation for the limited success of the previously cited studies is their sample selection procedure, we describe our method here

[14] This approach is along the lines of prior research, which suggests that implications of past earnings for future earnings are fully reflected in stock prices only in future periods as investors use additional information, including information on future earnings, to understand fully these implications (e.g., Bernard and Thomas (1990) and Bartov (1992)).

[15] The weights used in creating the exchange rate index are constant over the entire sample period. For a further description of this index, see Appendix.

[16] Mussa (1979) shows that over 90 percent of quarter-to-quarter exchange rate changes are unpredictable. The percentage change in the exchange rate is therefore a reasonable proxy for the unexpected exchange rate change. An alternative possibility is to use forward data to remove the expected component of the exchange rate change. There is, however, a recent body of research indicating that the spot rate outperforms the forward rate as a predictor of future spot rates (e.g., Meese and Rogoff (1983) and Baillie and McMahon (1989)). While some evidence exists to suggest that U.S. exchange rates are not *exactly* random walks (e.g., Abuaf and Jorion (1990)), the degree of mean reversion is very small and not a serious omission for quarterly changes.

in detail. First, to avoid ex post sample selection bias yet to maintain a current sample with the appropriate characteristics, we use an updating method that considers firms once each fiscal year based upon past information only.[17] Our procedure attempts to identify firms with significant economic exposure to currency changes by using reported foreign currency adjustments on the firms' annual financial statements from the previous five years. Since exchange rates began floating in 1973, our sample begins in fiscal year 1978 and runs through fiscal year 1989. For each year, our selection begins by screening firms on their foreign currency adjustments reported in the financial statements. Specifically, we search the COMPUSTAT Merged-Expanded Annual Industrial File and Full Coverage File for firms that reported significant foreign currency gains or losses on their annual financial statements (more than 5 percent of pretax income in absolute value) in three or more of the past five years.[18] Further, to increase the chance of selecting firms with exposures of the same sign, we require that at least 75 percent of the reported foreign currency adjustments during the past five years be negatively related to the corresponding change in the value of the dollar.[19] Indeed, the reported foreign currency adjustment may not be a reliable indicator variable for the existence of an economic exposure (of a particular sign) for all firms. However, as explained above, this potential drawback does not represent a serious problem here. Firms that meet these two criteria for a given fiscal year are selected into the sample for the four fiscal quarters following the release of the annual financial statements.

Finally, in order to be able to calculate abnormal returns, we require at least fifty stock price observations within the 100-trading-day window commencing 300 days prior to the beginning of the current quarter. We also require that at least thirty observations within the sixty-trading-day window

[17] All information used to determine the sample is available to investors prior to the periods for which abnormal returns are calculated.

[18] The foreign currency adjustment is defined, for our purposes, as the specifically delineated impacts of exchange rate movements on the firms that are reported in the financial statements. Specifically, during the period of SFAS No. 8 (Financial Accounting Standards Board (1975)) this corresponded to the foreign currency adjustment entry reported in the income statement that was the combination of a translation adjustment from foreign financial statements plus the net foreign currency gain on transactions over the period. Under SFAS No. 52 (Financial Accounting Standards Board (1981)), the reported foreign currency adjustment consists of the foreign currency adjustment entry in the income statement, plus the change in the Cumulative Translation Adjustment item in the owner's equity section of the balance sheet (if the firm used the foreign currency as functional currency). It is important to note that both SFAS No. 8 and SFAS No. 52 stipulate that gains (losses) that arise from hedging activities are offset against the losses (gains) from the underlying foreign currency exposure. This implies that the foreign currency adjustment reported in the income statement is net of any financial hedging activity of the firm. For a detailed discussion of these and related issues regarding accounting for international activities, see Pahler and Mori (1988) or Choi and Mueller (1992).

[19] This required that at least four out of five, three out of four, or three out of three available observations for the foreign currency adjustment have the opposite sign of the change in the value of the dollar. We do not restrict this to 100 percent to allow for the possibility of unusual reported adjustments resulting from nonstandard activities.

commencing at the beginning of the current quarter be available on either the Center for Research In Securities Prices (CRSP) New York Stock Exchange (NYSE)/American Stock Exchange (AMEX) Daily Return File or the National Association of Securities Dealers Automated Quotation (NASDAQ) Daily and Master File. Of course, these criteria result in our sample being a small subset of publicly traded companies with international activities. However, we impose the first two criteria to reduce the noise in the data, and we apply the third criterion to ensure that stock return data are available in a machine-readable form. The final sample contains 208 distinct firms and 2264 firm-quarter observations.

The 208 sample firms are from 36 different 2-digit standard industrial classification (SIC) industries, so a broad cross-section of industries is represented in the sample. The mean and median ratios (across the firm-quarter observations of our sample) of foreign currency adjustment to pretax income (in absolute values) over the previous five-year periods are 33.3 percent and 16.7 percent, respectively, indicating that changes in the value of the dollar substantially influence the reported performance of our sample firms.

Table I reports a comparison of selected descriptive statistics for our sample firms and the COMPUSTAT population.[20] It is clear from the first two lines of Table I that our sample firms are larger than COMPUSTAT firms. Both the market value of common equity and the annual sales of our sample firms exceed the market value and annual sales of COMPUSTAT firms. This result is not surprising, as it is generally believed that larger firms are more frequently involved in international activities. However, with respect to their earnings per share to price ratios (row 3) and dividend yields (row 4), our sample firms and the sample of all COMPUSTAT firms appear quite similar.

V. Tests and Results

A. Contemporaneous and Lagged Relation between Exchange Rate Changes and Firm Value

We begin our testing[21] by considering whether a contemporaneous relation between changes in the foreign currency value of the dollar and abnormal stock returns is evident for our sample firms. This is similar to the test for exchange rate exposure that is carried out by Jorion (1990), Amihud (1993), and Bodnar and Gentry (1993). As our sample selection procedure is designed to choose firms with past negative exposure, we expect to find a significant negative correlation between stock returns and contemporaneous changes in

[20] The comparison is for fiscal year 1984 (arbitrarily chosen).

[21] For consistency of exposition, since all parameters (except the intercepts) have predicted signs, tests of all regression coefficients are one-tailed, except intercept coefficients, which are two-tailed.

Table I

Descriptive Statistics for Firms in Our Sample and in COMPUSTAT Population

The table compares some descriptive statistics for our sample to the remaining population on the COMPUSTAT Merged-Expanded Annual Industrial File and Full Coverage File for the year 1984 (arbitrarily chosen). The stock prices used as deflators in this table are as of the beginning of the year. The z-statistic tests the null that the median (mean) of our sample firms equals that of COMPUSTAT firms, using the two-sample Wilcoxon rank sums (Student t) test. Observed significance levels for two-tailed tests are reported.

	Our Sample		COMPUSTAT		z-Statistic p-Value	
Statistic	Median	Mean	Median	Mean	Median	Mean
Market value of common equity ($ million)	133.8	1015.9	40.9	418.8	0.00	0.01
Annual sales ($ million)	246.8	2631.9	54.8	851.4	0.00	0.02
Ratio of annual earnings per share to stock price	0.074	0.029	0.064	0.025	0.43	0.76
Annual dividend yield	0.015	0.020	0.001	0.022	0.01	0.38

the dollar. We estimate the following regression, where the variables are defined as in equation (1);[22]

$$ASP_{i,t} = a_0 + c_0 \, \Delta CUR_{i,t} + \varepsilon_{i,t} \tag{4}$$

Panel A of Table II (Regression 1) shows that there is no significant correlation between the change in the dollar and abnormal stock performance. The estimate of the coefficient on the current change in the dollar (-0.059) is not significantly different from zero at standard levels. The estimate of the intercept coefficient is very small and not significantly different from zero, indicating, as expected, that the abnormal stock performance for these firms is approximately zero when the dollar does not change. This finding is consistent with the results of prior research.

The failure of our tests to document a relation between contemporaneous changes in the dollar and firm value for our sample of firms leads us to

[22] Jorion (1990), Amihud (1993), and Bodnar and Gentry (1993) all use a one-step approach with raw returns on the left-hand side and the market portfolio on the right-hand side of the regression instead of the two-step procedure used here. Christie *et al.* (1984) argue that the two-step method can result in downward biased t-statistics, while Levinsohn and MacKie-Mason (1990) argue that the one-step approach may result in inconsistent estimates of the parameters. We chose the two-step approach for consistency and conservatism. If Christie *et al.* (1984) are correct, the t-statistics we obtain are "too small."

Table II

Tests for the Relation between Abnormal Stock Performance and Changes in the Trade-Weighted Value of the U.S. Dollar

$$\text{Model:} \quad ASP_{i,t} = a_0 + \sum_{j=0}^{n} c_j \Delta CUR_{i,t-j} + \varepsilon_{i,t}$$

$ASP_{i,t}$ is abnormal stock performance over the sixty-trading-day window commencing at the beginning of fiscal-quarter t, of the ith firm. The market model is employed to compute daily abnormal returns; its parameters are estimated over the 100-trading-day period that starts 300 trading days prior to the beginning of quarter t. The daily returns for an observation are aggregated across the sixty-trading-day window as follows: $ASP_{i,T} = [\Pi_j(1 + AR_{i,j})] - 1$ ($T = j_1, \ldots, j_{60}$); $\Delta CUR_{i,t-j}$ is the percentage change in a trade-weighted exchange rate index for the U.S. dollar over a contemporaneous ($j = 0$) and lagged ($j = 1$) period; $\varepsilon_{i,t}$ is an error term. White (1980)-corrected estimates of the standard errors are in parentheses. In Panel B, tests for the medians are Wilcoxon sign rank tests. The sample period is 1978 to 1990.

Panel A: Results of Regression of Abnormal Stock Returns on Contemporaneous and Lagged Changes in the U.S. Dollar

Regression	No. of Lags	a_0	c_0	c_1	Observations	Adj. R^2
1	$n = 0$	−0.001	−0.059	—	2264	0.000
		(0.005)	(0.110)	—		
2	$n = 1$	−0.004	−0.009	−0.282***	2264	0.002
		(0.005)	(0.113)	(0.110)		

Effect of a given change in the dollar on current and future abnormal returns
Sum of c_0 and c_1 = −0.291** (0.139)

Panel B: Mean Estimated Coefficients from Annual Regressions of Abnormal Stock Returns on Contemporaneous and Lagged Changes in the U.S. Dollar

	a_0	c_0	c_1	Observations
Mean coefficient	−0.029	−0.219	−0.863*	13
Standard deviation	(0.023)	(0.366)	(0.640)	
Median coefficient	−0.027	−0.134	−0.551*	13

*, **, and *** denote significance at the 10, 5, and 1 percent levels, respectively, for one-tailed tests; significance on the intercepts are for two-tailed tests.

consider the possibility of systematic mispricing.[23] If investors are unable to characterize the relation between fluctuations in the dollar and firm value without bias, systematic adjustments to firm value occur as information on the full impact of past changes in the dollar on the economic performance of the firm is disclosed, leading to a relation between lagged changes in the

[23] Of course, this finding may represent our lack of success in selecting firms with an identifiable relation between stock returns and contemporaneous changes in exchange rates. Our failure to document a contemporaneous relation between stock returns and changes in exchange rates should therefore be cautiously interpreted. However, it is important to note that if our sample selection procedure was not appropriate, we are also unlikely to find a relation between stock returns and a lagged change in the exchange rate.

dollar and firm value. A simple way to model this explanation is to add a lagged change in the dollar to the abnormal return regression (equation (4)). We therefore estimate the following regression, where the variables are defined as in equation 1:

$$ASP_{i,t} = a_0 + c_0 \Delta CUR_{i,t} + c_1 \Delta CUR_{i,t-1} + \varepsilon_{i,t} \tag{5}$$

Panel A of Table II (Regression 2) displays the results. As in Regression 1, the estimate of the intercept (-0.004) is very close to zero, as is the estimate of the coefficient on the contemporaneous change in the dollar (-0.009), and neither is significantly different from zero at standard levels. In contrast, the estimate of the coefficient on the lagged change in the dollar is negative as predicted (-0.282) and significantly different from zero at the 1 percent level. Moreover, the influence of a given change in the dollar on abnormal return (measured by $c_0 + c_1$) is negative (-0.291) and significant at the 5 percent level. This result is expected, as our selection criteria make it likely that the total impact of a given dollar change on firm performance is negative. The regression has an adjusted R^2 of 0.2 percent.[24]

These results suggest that freely available public information concerning past changes in the U.S. dollar proves useful in explaining abnormal future stock price performance for this set of firms. This result is consistent with the view that investors have had difficulties that result in biased characterization of the relation between contemporaneous changes in the value of dollar and firm performance.

An alternative explanation for the significance of the regression results above is the existence of positive cross-sectional correlation among the regression residuals. The reason for this possible correlation is a common contemporaneous component to the abnormal returns of our sample firms (other than the changes in the dollar). Such an effect, however, is unlikely, as our sample is composed of a broad cross-section of firms and spans twelve years. Nonetheless, to consider this possibility, we calculate t-statistics for the parameter estimates using the techniques of Fama and MacBeth (1973). To guarantee that there is no time-series correlation between years, we eliminate all sixty trading-day returns that contain observations in two calendar years. Equation (5) is then estimated yearly using this restricted data set. Panel B of Table II reports the mean and standard deviation of the resulting time series of parameter estimates. The time-series mean of the estimate of the coefficient on the contemporaneous change in the dollar, c_0, is not significant; however, as above, the time-series mean of the coefficient on the lagged change in the dollar, c_1, is negative (-0.863) and significant at the 10

[24] To consider the possibility that additional lagged dollar changes may also be important in explaining abnormal stock performance, we estimate a specification of the model with two lagged dollar changes. The estimate and significance of the coefficient on both the contemporaneous and first lagged dollar change are similar to those reported in Regression 2 of Panel A in Table II. The estimate of the coefficient on the second lagged dollar change is not different from zero at standard levels of significance, suggesting that additional lagged dollar changes are not useful.

percent level. The lower significance of this result, relative to its counterpart in Panel A, should not be surprising; this test is less efficient than the firm-quarter regression. Furthermore, to demonstrate that these results are not driven by outliers, the medians of the annual cross-sectional regression coefficients are also reported in Panel B. The size of the estimates as well as the pattern of significance is similar to that of the means. Therefore, while they do not indicate an absence of positive cross-sectional correlation among the residuals, these results do indicate that such correlation is not driving the significance of the exchange rate exposure effect.

B. Structural Break in the Relation between Exchange Rate Changes and Firm Value

Next, we test for the stability of the relation between changes in firm value and movements of the U.S. dollar. This test is motivated by two reasons. First, if the relation is due to the recency of floating exchange rates and investors' limited experience with the impact of floating rates on firms in the early portion of the sample, then, given the passage of time and the accumulation of knowledge, possibly large systematic errors in the first years of the sample period would decrease in size and perhaps even become random later. Second, a change in the relation between changes in the dollar and firm value may be due to the introduction of a new accounting technique for firms with foreign operations during our sample period.[25] Although the new technique for translating foreign operations has no effect on actual cash flows, SFAS No. 52 (Financial Accounting Standards Board (1981)) was designed to increase the informativeness of the reported results for identifying the true relation between changes in the U.S. dollar and firm value.[26]

To test for the stability of the parameters, we break our sample period into two subperiods around January 1984. We choose this break point for two reasons. First, it is approximately the middle of our sample period, and it thus provides approximately equal subperiods. Second, it corresponds (roughly) to the introduction of SFAS No. 52 (Financial Accounting Standards Board (1981)).[27]

[25] This new standard is *Statement of Financial Accounting Standard No. 52: Foreign Currency Translation*. For a full description of SFAS No. 52 see Financial Accounting Standards Board (1981).

[26] An additional question that arises is distinguishing between these two possible reasons for a structural break. Although an interesting question, it is not crucial for our study, and a comprehensive examination of this possibility is well beyond its scope. We therefore leave it for future research.

[27] Although SFAS No. 52 (Financial Accounting Standards Board (1981)) was effective for fiscal years beginning on December 15, 1982, the choice of January 1984 as the break point corresponds to the change in accounting rules because of evidence (e.g., Griffin and Castanias (1987) and Cerf (1992)) that investors require time to understand the implication of an accounting standard change on the relation between reported earnings and firm value.

We consider the possibility of a structural break on both the contemporaneous and the lagged change in the value of the dollar.[28] Specifically, the following equation is tested,

$$ASP_{i,t} = a_0 + c_0\,\Delta CUR_{i,t} + c_1\,\Delta CUR_{i,t-1} + d_0\,\Delta CUR_{i,t}\cdot DUM_t + d_1\,\Delta CUR_{i,t-1}\cdot DUM_t + \varepsilon_{i,t} \quad (6)$$

where all the variable definitions are as before with the addition of:

DUM_t = a variable that is 1 if the 60-trading-day window for calculating $ASP_{i,t}$ starts on January 1, 1984, or later, and zero otherwise;

d_k = the coefficient that measures the difference between the coefficient of the kth lag ($k = 0, 1$) of the change in the dollar for 1984 to 1990 as compared to 1978 to 1983.

Panel A of Table III contains the results of this regression. The estimate of the coefficient c_0, representing the relation between contemporaneous change in the dollar and abnormal stock performance over the period 1978 to 1983 (the first subperiod), is not significantly different from zero. The estimate of the coefficient for a structural break in the relation between the subperiods 1978 to 1983 and 1984 to 1990, d_0, is also not significantly different from zero. The estimate of the coefficient c_1, representing the relation between stock returns and the lagged change in the dollar over the first subperiod, is negative (-1.007) and significant at the 5 percent level. The estimate of the coefficient for a structural break in the relation between lagged change in the dollar and firm value between the first subperiod and the second subperiod, d_1, is positive (0.818) and significant at the 5 percent level, suggesting a decrease in the size of the relation between lagged changes in the dollar and abnormal stock performance across the two subperiods. The linear combination of the estimates for c_0 and d_0 (-0.053), which is the contemporaneous relation between changes in the dollar and abnormal stock performance in the second subperiod, is not significantly different from zero, suggesting a continued lack of a significant contemporaneous exposure in the second subperiod. The linear combination of c_1 and d_1, which is the relation between lagged changes in the dollar and abnormal stock performance in the second subperiod, is still negative (-0.189) and significant at the 5 percent level. These results suggest a significant structural break in the relation between the two subperiods. While the lagged dollar change is still significantly negatively related to abnormal stock performance in the second subperiod, the coefficient on the lagged dollar change is significantly smaller (less negative) than it is in the first period, implying that the degree of the mispricing is significantly lower in the later period.

[28] We exclude additional lags of the change in the dollar as they were not significant in the previous regressions and adding variables with no explanatory power, while not violating the assumptions of OLS, reduces the power of the regression. Results of regressions including a second lagged dollar change yield similar results to those shown in Table III for the other variables, while the coefficient on the second lag of the change in the dollar as well as the coefficient for its structural break are not significantly different from zero.

Table III

Structural Break Tests for the Relation between Abnormal Stock Performance and Changes in the Trade-Weighted Value of the U.S. Dollar

$$\text{Model:}\quad ASP_{i,t} = a_0 + \sum_{j=0}^{1} c_j \Delta CUR_{i,t-j} + \sum_{j=0}^{1} d_j \Delta CUR_{i,t-j} DUM_t + \varepsilon_{i,t}$$

See Table II for a description of $ASP_{i,t}$ and ΔCUR_t; DUM_t takes on a value of 1 if the sixty-day window for calculating $ASP_{i,t}$ starts on January 1, 1984 or later, 0 otherwise; $\varepsilon_{i,t}$ is an error term. In Panel A, d_0 and d_1 represent changes in the relation between abnormal returns and dollar changes in the later subperiod of the sample. The implicit parameter estimates for the relation between dollar changes and abnormal stock performance in the second subperiod are derived as $(c_j + d_j)$, and the standard error is calculated accordingly. White (1980)-corrected estimates of the standard errors are in parentheses. In Panel B, tests for the medians are Wilcoxon sign rank tests. The sample period is 1978 to 1990.

Panel A: Tests for a Structural Break in the Relation between Abnormal Stock Returns and Dollar Changes

a_0	c_0	c_1	d_0	d_1	Observations	Adj.-R^2
− 0.003	0.299	−1.007**	−0.352	0.818**	2264	0.004
(0.005)	(0.479)	(0.486)	(0.493)	(0.500)		

Parameter estimates (standard error) for relation between exchange rate changes and abnormal stock performance in the second period (linear combination of c_j and d_j):

Contemporaneous Relation	Lagged Relation
$c_0 + d_0 = -0.053\ (0.109)$	$c_1 + d_1 = -0.192^{**}\ (0.104)$

Panel B: Mean Estimated Structural Break Coefficients from Annual Regressions of Abnormal Stock Returns on Dollar Changes

	a_0	c_0	c_1	d_0	d_1
Mean coefficients	−0.029	0.005	−2.328***	−0.417	2.721**
Std. dev. of mean	(0.023)	(0.707)	(0.975)	(0.757)	(0.938)
Observations	13	6	6	7	7
Median coefficient	−0.027	0.581	−1.932**	−0.762	2.081**

** and *** denote significance at the 5 and 1 percent levels, respectively, for one-tailed tests; significance on the intercepts are for two-tailed tests.

To determine the role of positive cross-sectional correlation in the residuals for the significance of this result, we carry out tests using Fama and MacBeth's (1973) technique. Using the sample that omits firm-quarter observations for which the sixty-trading-day return spans two calendar years (to eliminate any potential overlap), equation (6) is estimated year by year. The time-series means of the coefficients and their standard errors are displayed in Panel B of Table III. As with the results from the pooled regression, over the first subperiod 1978 to 1983, only the lagged dollar coefficient is statistically significant, with a mean across years of −2.328, which is significant at the 1 percent level. For the structural break parameters only the lagged

structural break coefficient, d_1, is statistically significant, with a mean coefficient across years of 2.721, which is significant at the 5 percent level.[29] The mean second subperiod estimates for the contemporaneous dollar-change variable ($c_0 + d_0 = -0.412$) and for the lagged dollar-change variable ($c_1 + d_1 = 0.393$) are insignificantly different from zero.[30] Results for the median of the annual regression coefficients are also reported in Panel B. The similarity of the means and medians suggests that the significance is not driven by one or two unusual years. Overall, these results confirm a significant negative correlation between the lagged change in the dollar and abnormal returns (at least in the first subperiod) and a weakening of this relation over time.[31]

C. Economic Significance of the Results

We note that the R^2 in the regressions above are extremely small. While such small R^2 are not that unusual for regressions predicting abnormal returns, they encourage an examination of the economic importance of this result. To assess the economic significance of this exchange rate exposure effect, we consider the abnormal return to a simple trading strategy using our portfolio of firms. The trading strategy consists of selling short the set of firms presently in our sample in quarters when the previous fiscal quarter has seen an appreciation of the dollar and buying long our set of firms when the previous fiscal quarter has seen a depreciation of the dollar.[32] As Panel A of Table IV demonstrates, the mean abnormal stock performance to this trading strategy for the sixty-trading-day holding period is 0.956 percent and

[29] The structural break estimates are the difference between the mean of the estimated dollar coefficients in the second subperiod and the means of the estimated dollar coefficients in the first subperiod.

[30] Unlike the other tests in the article, here the pooled regression results and the annual cross-sectional regression results do not completely agree. The annual cross-sectional results suggest that the structural break may be larger than suggested by the pooled regression results, resulting in an insignificant lagged dollar-change coefficient in the second subperiod.

[31] As discussed in Bartov and Bodnar (1993), most firms under SFAS No. 52 (Financial Accounting Standards Board (1981)) will report larger (in absolute value) foreign currency translation adjustments for a given change in the value of the dollar. Therefore, by maintaining a consistent acceptance standard, our selection procedure is less restrictive for firms using the foreign currency as functional currency in the second subperiod than for all firms in the first subperiod. This could lead to a natural tendency for the exchange rate exposure effect to appear to diminish in the second period. In an attempt to control for this problem, we increased the foreign currency adjustment to pretax income ratio acceptance requirement for firms using the foreign currency as functional in the second subperiod from 5 percent to 10 percent for at least three of the previous five years. Obviously, this results in a drop in the number of observations in the later years, but the empirical results are similar to those presented in Tables II and III.

[32] This approach is conservative in that it chooses neither the best strategy nor the optimal sample for this purpose. Therefore, the results should *not* be considered as an upper bound to our ability to exploit the exchange rate exposure effect. All tests of trading strategy returns ignore transaction costs, and significance levels are for one-tailed tests. To verify that outliers are not driving these results, tests were carried out using the median returns to the trading strategy. The results of these nonparametric tests reveal no change in the pattern of significance reported in Table IV.

Table IV

Abnormal Stock Returns for Trading Strategies based on Lagged Changes in the Trade-Weighted Value of the U.S. Dollar

This table presents returns to a trading strategy based upon the exchange rate exposure effect. The trading strategy consists of shorting equal dollar amounts in all firms currently in the portfolio when the change in the dollar over the previous three months was positive (appreciation) and buying equal dollar amounts of all the firms currently in the portfolio when the change in the dollar over the previous three months was negative (depreciation). The firms in the portfolio are reevaluated once per fiscal year and transactions occur (if necessary) only once per fiscal quarter. The abnormal stock performance for this buy-and-hold strategy for a firm-quarter observation is computed over the sixty-trading-day window commencing at the beginning of the fiscal quarter. The observations are firm-quarter observations. The sample period is 1978 to 1990.

Panel A: Full Sample (1978–1990)

Lagged Dollar Movement	Observations	Mean Abnormal Stock Performances	Standard Error
All	2264	0.956%**	0.471
Appreciation	936	1.247*	0.705
Depreciation	1328	0.751	0.631

Panel B: By Subperiods

Subperiod	Observations	Mean Abnormal Stock Performances	Standard Error	Median Absolute Monthly Change in the U.S. Dollar Index	Median Absolute Foreign Currency Adjustment (% of Income)
1978–1983	298	2.195%*	1.598	1.69%	16.65
1984–1990	1966	0.768*	0.481	1.91%	16.70

Panel C: Large Changes in the Value of the U.S. Dollar Index ($\geq \pm 5\%$ per quarter)

Lagged Dollar Movement	Observations	Mean Abnormal Stock Performances	Standard Error
All	550	3.050%***	0.944
Appreciation	166	2.942**	1.542
Depreciation	384	3.092***	1.176

Panel D: By Size of Reported Impact of Past Currency Movement on Financial Statement

Size of Reported Impact of Past Currency Adjustments on Financial Statement	Observations	Mean Abnormal Stock Performances	Standard Error
Above the median	1138	1.423%**	0.742
Below the median	1126	0.487	0.571

*, **, and *** represent significance at the 10, 5, and 1 percent levels respectively, for one-tailed tests.

significantly different from zero at the 5 percent level.[33] This trading period return translates into an annualized abnormal return of approximately 4 percent for this trading strategy. Panel A also displays the returns to the trading strategy based upon the direction of the past movement of the dollar. When the dollar appreciated over the previous quarter, the mean abnormal stock performance to this trading strategy for the sixty-trading-day holding period is 1.25 percent, and this return is significant at the 5 percent level. When the dollar depreciated over the previous quarter, the mean abnormal stock performance to this trading strategy for the sixty-trading-day holding period is 0.75 percent; however, this return is not significant at standard levels (it is marginally significant at the 11 percent level).

In order to determine whether this abnormal return changes over time, Panel B of Table IV displays the results for this trading strategy for the two subperiods. Consistent with the regression results above, the abnormal return to this strategy for the first subperiod, 2.20 percent (significant at the 10 percent level), is larger than the abnormal return for the second subperiod 0.77 percent (also significant at the 10 percent level).

These abnormal returns are small when compared to other studies that document mispricing. For example, Bartov (1992) finds abnormal returns of 3 percent per quarter from an unexpected earnings trading strategy, and Jegadeesh and Titman (1993) find abnormal returns of 3 percent per quarter from a winner/loser trading strategy. However, these two studies use extreme portfolios to maximize the reported abnormal returns and thus do not compare directly to our full sample abnormal returns. To demonstrate that the exchange rate effect provides abnormal returns of comparable size when calculated in a similar fashion, we calculate the return to our trading strategy for periods following changes in the value of the dollar of more than 5 percent per quarter. This restriction reduces our sample size by approximately 75 percent, to 550 observations, thus making it roughly comparable to the extreme decile calculations of the previously mentioned studies. Our results are displayed in Panel C of Table IV. The return to the trading strategy for the sixty-trading-day period, conditional on large changes in the dollar is 3.05 percent and significant at the 1 percent level. In addition, the return to the trading strategy following large dollar depreciations is 3.09 percent, significant at the 1 percent level, and the return to the trading

[33] Tests for the significance of the abnormal return to the trading strategy that incorporate the influence of possible positive cross-sectional correlation were also carried out. The time-series mean of individual mean abnormal returns for each year of the sample period 1978 to 1990 was 2.63 percent, which was significant at the 5 percent level. As before, observations that spanned two calendar years were deleted. This suggests that positive cross-sectional correlation is not driving the significance of the trading strategy returns. Note that it is also unlikely that the significance of these results could be due to a size phenomenon in abnormal returns, as (i) roughly the same firms are bought long or sold short depending on the movement of the dollar, and (ii) the median size of the portfolios are similar across currency movements ($179 million for dollar depreciations and $117 million for dollar appreciations, both of which are larger than the median size of COMPUSTAT firms).

strategy following large dollar appreciations is 2.94 percent, significant at the 5 percent level. Thus the abnormal returns conditional on large dollar changes are comparable in size to the abnormal returns of other studies of mispricing.

Finally, we can use the trading return strategy to evaluate the relation between our accounting proxy for exchange rate exposure and the extent of the exchange rate exposure effect. We break the sample into two groups based upon the median of the five-year average of the ratio if the reported foreign currency adjustment to pretax income (the variable used to select the sample) for all firms in the sample. The returns to the trading strategy for these two groups of firms is shown in Panel D of Table IV. The return to the trading strategy for the firms with an average foreign currency adjustment to income ratio at or above the median is 1.423 percent and significant at the 5 percent level. The return to the trading strategy for firms with an average foreign currency adjustment to income ratio below the median is not significantly different from zero. Thus, consistent with our expectations, when the average ratio of foreign currency adjustment to income is high, we find large and significant returns to the trading strategy; however, due to the arbitrariness of our sample selection criteria, when the average ratio of foreign currency adjustment to income is low we find small and insignificant returns to our strategy. This result increases our confidence that the financial statement variables we use to select our sample indeed capture exchange rate exposure.

D. Summary and Interpretation

The results of the analyses presented in this section show that the failure of previous studies to document a significant contemporaneous relation relation between the change in the dollar and firm value does not appear to be the result of sample selection problems. Instead, the evidence supports the explanation that stock prices do not fully reflect changes in the dollar on a timely basis. These results, however, do appear to weaken over time. In addition, we show the economic significance of this mispricing by documenting the returns that can be obtained for our set of firms using a simple trading strategy based upon past changes in the dollar.

One interpretation of these results is that investors do not use all freely available information—in particular, the past change in the dollar and the past relation between dollar changes and firm performance, assets, and liabilities—to predict changes in firm value. More specifically, at the end of the fiscal quarter investors observe the change in the value of the dollar over this period and should be able to form unbiased expectations about the impact of this change on firm performance, assets, and liabilities and incorporate this effect into firm value by that time. However, investors systematically underestimate (or perhaps even overlook entirely) this impact at the end of the quarter. This underestimation is corrected only when additional information is released during the following quarter. In other words, with respect to the impact of a change in the dollar over a given quarter on firm

value, the associated stock price adjustment occurs during the following quarter even though information with significant predictive power for abnormal returns is known at the end of the given quarter.

In the next section we consider two additional tests that are designed to help corroborate this interpretation of our findings. First, we take a closer look at the period over which abnormal returns accrue by disaggregating the period into earnings announcement periods and nonearnings announcement periods. This disaggregation allows us to discover whether investors react to earnings announcements, which are important information events, in a manner consistent with our predictions based upon the lagged change in the dollar and whether their reaction is not limited to the current earnings announcement in some mechanical fashion. Second, to enhance the validity of our inferences from the return data, we test for a relation between past changes in the dollar and errors in analysts' forecasts of quarterly earnings.

VI. Lagged Dollar Changes, Stock Price Reactions to Earnings Announcements, and Errors in Analysts' Forecasts of Earnings

A. Lagged Dollar Changes, Earnings Announcements, and Abnormal Returns

The previous section has documented that past changes in the dollar provide predictive power for a firm's abnormal return. However, the analysis does not provide information on how investors ultimately incorporate the impact of dollar changes on the value of the firm. Our interpretation of the results suggests that investors rely on news about past firm performance in order to determine this impact. Because earnings announcements are the primary source of news about past firm performance, we examine whether the abnormal stock price reaction is significant around the firm's earnings announcement. Furthermore, to demonstrate that this stock price reaction to the lagged change in the dollar is an economic phenomenon and not purely a mechanical relation between reported earnings and the foreign currency adjustment variable used to select our sample, we test for significant abnormal returns in both the nonannouncement periods and the subsequent quarter's earnings announcement period. Finding a significant stock price reaction in either of these two periods clearly implies that the relation between the lagged dollar change and firm value for our sample is not mechanical.

While earnings announcements are greatly anticipated for information about a firm's performance, they are not explicit about the impact of the change in the dollar on the firms. In most cases, the information released on the day of an earnings announcement is limited to total sales revenue, total net income, and total net income per share.[34] Information about the impact of the previous quarter's change in the dollar on the earnings of the firm comes

[34] These announcements typically occur within 20 to 40 trading days of the end of the quarter.

through its impact on the previous quarter's total revenues and earnings plus the foreign currency adjustment resulting from consolidation.[35] However, the impact of the dollar change on the previous quarter's reported earnings represents only a portion of the full economic impact of a change in the dollar on firm cash flows; it does not capture changes in future expected earnings resulting from the currency movement. Moreover, additional financial disclosures about a firm's performance, assets, and liabilities, including balance sheets and income statements that disclose specific information about the impact of currency changes on the firm, do not occur until the release of the 10Q or 10K forms.[36] Thus, formal financial statement information is released at two different times during the quarter. In addition, other forms of information that may also be pertinent may appear randomly over the subsequent quarter.

The ambiguity about the timing and form in which the impact of dollar changes on firm performance is released lead us to use a long (sixty-trading-day) abnormal return window in our tests. However, given the attention that earnings announcements receive in the media and evidence that earnings announcements are followed by significant stock price reactions (e.g., Beaver (1968)), we examine the extent to which the abnormal return related to the previous quarter's change in the dollar is associated with information released around the firm's earnings announcement. Showing that the abnormal return results hold for a short (three-trading-day) window will lend additional credence to our results and will increase confidence that they represent an economic phenomenon rather than flaws in the research design such as mismeasurement of abnormal return, cross-sectional correlation, or omitted variables.

To determine the extent to which the earnings announcement conveys information about the relation between past dollar changes and firm value, the return to the trading strategy is calculated for a three-trading-day window (Days $-1, 0, +1$) around the reported date of the announcement (Day 0).[37] To examine the extent to which nonearnings announcement information is useful to investors for determining the value of the firm, the return to the trading strategy is also calculated for the remaining fifty-seven nonearnings announcement trading days within the original sixty-trading-day window. Finally, since the previous quarter's change in the dollar will result in changes in future, as well as current, reported earnings, and since previous research (e.g., Bernard and Thomas (1990)) suggests that future earnings announcements may be required before these implications are fully incorpo-

[35] Note that the accounting adjustment from consolidation included in the foreign currency adjustment, which for some firms is included in the announcement of net earnings, is not specifically identified until the full income statement is released.

[36] Formally, 10Q Forms must be filed with the Security and Exchange Commission within 45 days of the end of the quarter, and the 10K Form must be filed with the Security and Exchange Commission within 90 days of the end of the fiscal year.

[37] The quarterly earnings announcement dates for 1545 firm-quarter observations are obtained from the COMPUSTAT Quarterly Industrial File Tape and *The Wall Street Journal Index*.

rated into stock prices, we calculate the abnormal return accruing to the trading strategy for the three-trading-day window $(-1, 0, +1)$ around the earnings announcement date in subsequent quarters.

The results of this analysis are displayed in Table V. The return to the trading strategy for the three-trading-day window around the earnings announcement is 0.28 percent and is significant at the 5 percent level.[38] This suggests that earnings announcements do provide useful information to investors about the relation between changes in the dollar and the change in firm value. However, it appears that this is not the only source of useful information about this relation. The return to the remaining fifty-seven-trading-day window is 1.037 percent and is significant at the 5 percent level. This result suggests that, during nonearnings announcement periods, investors are also obtaining useful information about the impact of past changes in the dollar on firm value that allows them to price the firm more accurately. Finally, consistent with prior research that suggests that implications of current earnings for future earnings are fully incorporated in stock prices only after several additional announcement periods and the fact that cash flow effects of past dollar changes may take several periods to be fully revealed in earnings, we find a (weakly) significant positive return to this trading strategy even for the next quarter's earnings announcement period.[39]

B. Lagged Dollar Changes and Analysts' Forecast Errors of Quarterly Earnings

To add credibility to our interpretation of the results and to enhance the validity of the tests using return data, we study the ability of past fluctuations in the dollar to explain errors in analysis forecasts of quarterly earnings. An ample body of research documents a positive correlation between unexpected earnings and changes in firm value in general (e.g., Ball and Brown (1968) and Beaver (1968)) and a positive correlation between errors in analysts' forecasts of quarterly earnings and stock returns in particular (e.g., Brown, Foster, and Noreen (1985) and Brown, Griffin, Hagerman, and Zmijewski (1987)). If the errors in analysts' forecasts of quarterly earnings are correlated with past changes in the dollar, this would provide support for the view that the impact of dollar fluctuations on firm value is reflected in stock prices with a lag. This supporting evidence is important because it helps in distinguishing between the proposed explanation for our results and such alternative explanations as the mismeasurement of abnormal returns.

The following analysis requires the calculation of errors in analysts' forecasts of quarterly earnings. These errors, denoted $AFE_{i,t}$, are defined as the difference between quarter t reported earnings and the corresponding most

[38] Note that the potential impact of positive cross-sectional correlation is significantly less in this calculation as the returns are calculated over (approximately) random three-day windows within each fiscal quarter.

[39] No significant returns based upon past changes in the dollar exist for additional future announcement periods.

Table V

Abnormal Return from Trading Strategy Breakdown Between Earnings Announcement Period and Nonearnings Announcement Period

The trading strategy consists of shorting equal dollar amounts in all firms currently in the portfolio when the change in the dollar over the previous three months was positive (appreciation) and buying equal dollar amounts of all the firms currently in the portfolio when the change in the dollar over the previous three months was negative (depreciation). The firms in the portfolio are updated once a year and transactions occur (if necessary) only once per fiscal quarter. Abnormal stock performance (for this buy-and-hold strategy) is calculated over the following three intervals. Row 1 is the return to the trading strategy for the three-trading-day $(-1, 0, +1)$ window around the date of firm's quarterly (annual) earnings announcement (Day 0). Row 2 is the return to the trading strategy for the sixty-trading-day window commencing at the beginning of the firm's fiscal quarter, less the three-trading-day return around the earnings announcement date. Row 3 is the return to the trading strategy for the three-trading-day $(-1, 0, +1)$ window around the date of the subsequent quarter's earnings announcement (Day 0). Proportion of Positive Returns column is the percentage of observations with positive returns to the trading strategy. The p-value for the median is from a Wilcoxon sign rank test. The p-value for the proportion of positive returns is from a sign test. The sample period is 1978 to 1990.

Event	Observations	Mean Abnormal Stock Performance (Standard Error)	Median Abnormal Stock Performance [p-Value]	Proportion of Positive Returns (%) [p-Value]
Three-trading-day window around earnings announcements	1545	0.28%** (0.15)	0.30%** [0.02]	53.0*** [0.01]
Remaining fifty-seven non-announcement days in original sixty-trading-day window	1545	1.04** (0.50)	0.71** [0.02]	51.7* [0.08]
Three-trading-day window around next quarter's earnings announcement	1540	0.20* (0.15)	0.26** [0.03]	52.5** [0.03]

*, **, and *** represent significance at the 10, 5, and 1 percent levels, respectively, for one-tailed tests.

recent median earning forecast appearing on the Institutional Brokers Estimate System (IBES) Database before the release of quarter t earnings, normalized by its standard deviation (taken from the IBES tape). The sample consists of the same firms as above, with firms for which IBES does not report earnings forecasts deleted. The remaining sample covers the period from October 1983 to October 1988 and consists of 97 distinct firms and 553 firm-quarter observations.

The timing of the exchange rate variable is somewhat different from before, since the announcements of earnings are usually made at some point during the next quarter while analysts' forecasts are made on average six weeks

earlier.[40] To allow for the possibility that the most recent forecast of earnings may have been made at some point during the actual forecasting quarter, we define the exchange rate variable as the three-month change in the trade-weighted index of the U.S. dollar ending one month prior to the end of the forecast quarter. Since the most recent forecast may have been made at some point after the end of the forecast quarter, the definition of a contemporaneous change in the dollar has no role in this analysis. Therefore, to examine whether analysts fully incorporate the impact of past dollar changes into their forecasts, we regress errors in analysts' forecasts of quarterly earnings on a constant and the past change in the dollar. More formally:

$$AFE_{i,t} = a_0 + g_1 \Delta CUR_{i,t-1} + \varepsilon_{i,t} \tag{7}$$

where

$AFE_{i,t}$ = the error in analysts' forecasts of quarterly earnings for period t as defined above;
$\Delta CUR_{i,-1}$ = the lagged percentage change in the trade-weighted value of the dollar for the period ending one month prior to the end of quarter t and beginning four months prior;
a_0 and g_1 = parameters to be estimated; and
$\varepsilon_{i,t}$ = the error term for firm i at time t.

The results of this regression appear in Panel A of Table VI.[41] Consistent with the stock return regressions, the estimate of the coefficient for the past change in the dollar is negative (-4.13) and significant at the 5 percent level, indicating that past change in the dollar is a useful variable in predicting the errors in the median analysts' forecast of quarterly earnings.

An additional observation from this regression concerns the estimate of the intercept coefficients. The estimate of the intercept, -0.386, is significant at the 1 percent level, indicating that analysts systematically overestimate quarterly earnings. This result is consistent with the findings of prior research (e.g., Fried and Givoly (1982) and Bartov (1991)) that analysts are excessively optimistic.

Panel B of Table VI reports the results of nonparametric tests of the relation between the change in the dollar and errors in analysts' forecasts of quarterly earnings using all of the available observations. Consistent with the regression results presented in Panel A, both the Spearman correlation coefficient (-0.084) and the Kendall Tau B correlation coefficient (-0.058) are significant at conventional levels. These nonparametric results provide further evidence for the relation between changes in the dollar and current errors in analysts' forecasts of quarterly earnings.

[40] For a discussion on lags between an individual forecast and its first appearance on the IBES database as well as other drawbacks of the forecasts on the IBES database see O'Brien (1988).

[41] Note that the regression analysis was performed on 514 observations instead of 553 observations (the full sample) due to the exclusion of outliers ($|AFE_{i,t}| > 10$). Below, we also report the results for nonparametric tests using the full sample of 553.

Table VI

Tests for the Relation between Errors in Analysts' Forecasts of Earnings and Lagged Changes in the Trade-Weighted Value of the U.S. Dollar

$AFE_{i,t}$ is the error in the median analysts' forecast of earnings for the ith firm for fiscal quarter t; $\Delta CUR_{t,-1}$ is the percentage change in a trade-weighted exchange rate index (among the G-7 countries) over a lagged period ending one month prior to the end of the forecast quarter and commencing four months prior, as described in the text; $\varepsilon_{i,t}$ is an error term. To eliminate outliers $|AFE_{i,t}| < 10$ is applied. White (1980)-corrected estimates of the standard errors are in parentheses. The sample period for tests using errors in analysts' forecasts of quarterly earnings is October 1983 to October 1988. In Panel B, the nonparametric methods used are the Spearman Correlation coefficient and the Kendall Tau B Correlation coefficient. Standard errors are in parentheses. These measures are robust to outliers and therefore use all available 553 observations.

Panel A: Regression Results for Errors in Analysts' Forecasts of Earnings and Lagged Dollar Changes

Model: $AFE_{i,t} = a_0 + g_1 \Delta CUR_{t,-1} + \varepsilon_{i,t}$

a_0	g_1	Observations	Adj. R^2
− 0.386***	−4.129**	514	0.0048
(0.016)	(2.33)		

Panel B: Rank Correlations between Errors in Analysts' Forecasts and Lagged Dollar Changes

Spearman Correlation	Kendall Tau B Correlation
− 0.084**	−0.058**
(0.042)	(0.029)
553	553

** and *** denote significance at the 10, 5, and 1 percent levels respectively for one-tailed tests.

In summary, the results presented in Table VI indicate that analysts can improve the accuracy of their estimates by using information contained in the past movements of the U.S. dollar.[42] These results also give further credence to the view that investors fail to assess correctly the contemporaneous relation between dollar fluctuations and firm value when they form expectations about the future value of a firm.

VII. Conclusion

This article presents an empirical exploration of the relation between abnormal stock performance and contemporaneous and lagged changes in the

[42] The accuracy of earnings forecasts is one of the four criteria by which security analysts are ranked in the annual "All-America Research Team" selected by *Institutional Investor*. (The other three criteria are picking stocks, writing reports, and overall client service.)

value of the U.S. dollar for a set of firms chosen because of substantial foreign currency adjustment on their financial statements. Regression results show that contemporaneous changes in the dollar have little power in explaining abnormal stock returns for our sample firms. This finding is consistent with the failure of prior research to document a contemporaneous relation between dollar fluctuations and firm value and suggests that problems with sample selection techniques are not a complete explanation for their failure. We also find that a lagged change in the dollar is negatively associated with abnormal stock returns as expected, based upon our sample selection procedure. This result supports the explanation that, due to the complexity of the relation between currency changes and firm performance, assets, and liabilities, a complete market response to the impact of past changes in the dollar on firm value is delayed until information regarding past performance, assets, and liabilities of the firm is disseminated.

A test for a structural break in the relation between dollar fluctuations and firm value for two subperiods, 1973 to 1983 and 1984 to 1990, reveals that the relation between lagged changes in the dollar and current abnormal stock performance is more pronounced in the first subperiod than the second subperiod. Thus the extent of mispricing appears to weaken over time.

To assess the economic significance of this observed exchange rate exposure effect, we consider the abnormal return to a simple trading strategy using our portfolio of firms. Over the full period, this strategy yields an annualized abnormal return of approximately 4 percent. When the sample was restricted to large changes in the value of the dollar, the abnormal return rose substantially. In addition, consistent with the regression results, the returns to this trading strategy fall between the two subperiods.

Closer examination of when investors obtain information that allows them to price the firm correctly suggests that such information is forthcoming from earnings announcements as well as from sources of information that become available at other times during the subsequent quarter. In addition, regression results show that a lagged change in the dollar has explanatory power with respect to errors in analysts' forecasts of quarterly earnings for our sample firms.

Appendix

Trade-Weighted Exchange Rate Index

We calculate the end-of-period effective exchange rate for the U.S. dollar against the six other members of the G-7: Japan, Germany, France, Italy, Canada, and the United Kingdom. The method and relative weights we use are identical to those the International Monetary Fund uses to calculate its multilateral exchange rate model (MERM) exchange rate index; the MERM index is a period average value and therefore is not directly applicable to this study. The raw exchange rate data for each of the six countries we use are series [ag] (end-of-month observations) from the International Financial

Statistics (IFS) tapes and monthly reports. The (constant) relative weights are calculated from the MERM table of weights available in the *IFS Supplement on Exchange Rates*. The weights of the six other members of the G-7 countries constitute over 77 percent of the U.S. weights for the full MERM exchange rate, making this exchange rate measure a good approximation to the actual MERM-weighted exchange rate for the United States. Indeed, to the extent that individual firms in our sample have different relative international linkages with these six countries or to countries not included in this index, our ability to uncover any relation between exchange rate changes and firms' value should be reduced. The exchange rate is an index in the form of units of foreign currency per U.S. dollar (FC/$). In this form, an appreciation of the U.S. dollar is represented by a increase in the index.

REFERENCES

Abuaf, N., and P. Jorion, 1990, Purchasing power parity in the long run, *Journal of Finance* 45, 157–174.

Amihud, Y., 1993, Evidence on exchange rates and valuation of equity shares, in Y. Amihud and R. Levich, Eds.: *Exchange Rates and Corporate Performance* (Business One Irwin, Homewood, Ill.)

Baillie, R., and P. McMahon, 1989, *The Foreign Exchange Market* (Cambridge University Press, Cambridge, U.K.).

Ball, R., and P. Brown, 1968, An empirical evaluation of accounting income numbers, *Journal of Accounting Research* 6, 159–178.

Bartov, E., 1991, Open-market stock repurchases as signals for earnings and risk changes, *Journal of Accounting and Economics* 14, 275–294.

———, 1992, Patterns in unexpected earnings as an explanation for post-announcement drift, *The Accounting Review* 67, 610–622.

———, and G. M. Bodnar, 1993, Accounting choices and the information environment: Theory and evidence, Working Paper, University of Pennsylvania.

Beaver, W., 1968, The information content of annual earnings announcements, *Journal of Accounting Research* 6 (Supplement), 67–92.

Bernard, V., and J. Thomas, 1990, Evidence that stock prices do not fully reflect the implications of current earnings for future earnings, *Journal of Accounting and Economics* 13, 305–340.

Bodnar, G. M., and W. M. Gentry, 1993, Exchange-rate exposure and industry characteristics: Evidence from Canada, Japan and the U.S., *Journal of International Money and Finance* 12, 29–45.

Brown, L., P. Griffin, R. Hagerman, and M. Zmijewski, 1987, An evaluation of alternative proxies for the security market's expectation of corporate earnings, *Journal of Accounting and Economics* 14, 159–194.

Brown, P., G. Foster, and E. Noreen, 1985, *Security Analyst Multi-Year Earnings Forecasts and the Capital Market*, Accounting Research Study (American Accounting Association, Sarasota, Fla.).

Cerf, D., 1992, The effect of the mandated change in accounting rules for pensions on intertemporal variation of earnings response coefficients, Working paper, California Polytechnic State University, San Luis Obispo.

Choi, F. D. S., and G. G. Mueller, 1992, *International Accounting*, 2nd ed. (Prentice Hall, Englewood Cliffs, N.J.).

Christie, A., and M. D. Kennelley, J. W. King, and T. F. Schaeffer, 1984, Testing for incremental information content in the presence of colinearity, *Journal of Accounting and Economics* 6, 205–217.

Fama, E., and J. MacBeth, 1973, Risk return and equilibrium: Empirical tests, *Journal of Political Economy* 71, 607–636.

Financial Accounting Standards Board, 1975, *Statement of Financial Accounting Standard No. 8: Accounting for Foreign Currency Transactions and Foreign Currency Financial Statements* (Financial Accounting Standards Board, Stamford, Conn.).

———, 1981, *Statement of Financial Accounting Standard No. 52: Foreign Currency Translation* (Financial Accounting Standards Board, Stamford, Conn.).

Fried, D., and D. Givoly, 1982, Financial analysts' forecast of earnings: A better surrogate for earnings expectations, *Journal of Accounting and Economics* 4, 85–107.

Graziano, L., 1986, *Currency Fluctuations and the Perception of Corporate Performance* (Quorum, New York, N.Y.).

Griffin, P. A., and R. P. Castanias II, 1987, *Accounting for the Translation of Foreign Currencies: The Effect of Statement 52 on Equity Analysts* (Financial Accounting Standards Board, Stamford, Conn.).

International Monetary Fund, 1985, *IFS Supplement on Exchange Rates* (International Monetary Fund, Washington, D.C.) p. 143.

Jegadeesh, N., and S. Titman, 1993, Returns to buying winners and selling losers: Implications for stock market efficiency, *Journal of Finance* 48, 65–92.

Jorion, P., 1990, The exchange-rate exposures of U.S. multinationals, *Journal of Business* 63, 331–345.

———, The pricing of exchange risk in the stock market, *Journal of Financial and Quantitative Analysis* 26, 353–376.

Lakonishok, J., and T. Vermaelen, 1990, Anomalous price behavior around repurchase tender offers, *Journal of Finance* 45, 455–478.

Levi, M., 1990, *International Finance* 2nd ed. (McGraw Hill, New York).

Levinsohn, J., and J. MacKie-Mason, 1990, Estimating disturbance components in financial models, *Review of Economics and Statistics* 72, 516–520.

Meese, R. A., and K. Rogoff, 1983, Empirical exchange rate models of the seventies, *Journal of International Economics* 14, 3–24.

Mussa, M., 1979, Empirical regularities in the behavior of exchange rates and theories of the foreign exchange market, *Carnegie-Rochester Conference Series on Public Policy* 11, 9–54.

O'Brien, P. C., 1988, Analysts' forecasts as earnings expectations, *Journal of Accounting and Economics* 10, 53–83.

Pahler, A. J., and J. E. Mori, 1988, *Advanced Accounting: Concepts and Practice* (Harcourt Brace Jovanovich, San Diego, Calif.).

Shapiro, A. C., 1975, Exchange-rate changes, inflation and the value of the multinational corporation, *Journal of Finance* 30, 485–502.

The Wall Street Journal, 1990, How the dollar's plunge aids some companies, does little for others, October 22, A1.

———, 1991, The dollar rally: Hit on profits may drag down stock market..., July 8, C1.

White, H., 1980, A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity, *Econometrica* 48, 817–838.