

Cheung, Yin-Wong; Chinn, Menzie D.

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Currency Traders and Exchange Rate Dynamics: A Survey of the U.S. Market

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CURRENCY TRADERS AND EXCHANGE RATE DYNAMICS: A SURVEY OF THE U.S. MARKET

Yin-Wong Cheung
Menzie D. Chinn*

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CESifo
Poschingerstr. 5
81679 Munich
Germany
Phone: +49 (89) 9224-1410/1425
Fax: +49 (89) 9224-1409
<http://www.CESifo.de>

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CURRENCY TRADERS AND EXCHANGE RATE DYNAMICS: A SURVEY OF THE U.S. MARKET

Abstract

We report findings from a survey of United States foreign exchange traders. Our results indicate that: (i) in recent years electronically-brokered transactions have risen substantially, mostly at the expense of traditional brokers; (ii) the market norm is an important determinant of interbank bid-ask spread and the most widely-cited reason for deviating from the conventional bid-ask spread is a thin/hectic market; (iii) half or more of market respondents believe that large players dominate in the dollar-pound and dollar-Swiss franc markets; (iv) technical trading best characterizes about 30% of traders, with this proportion rising from five years ago; (v) news about macroeconomic variables is rapidly incorporated into exchange rates; (vi) the importance of individual macroeconomic variables shifts over time, although interest rates always appear to be important; (vii) economic fundamentals are perceived to be more important at longer horizons, while short-run deviations from the fundamentals are attributed to excess speculation and institutional customer/hedge fund manipulation; (viii) speculation is generally viewed positively, as enhancing market efficiency and liquidity, even though it exacerbates volatility; (ix) central bank intervention does not appear to have substantial effect, although there is general agreement that it increases volatility, and finally; (x) traders do not view purchasing power parity as a useful concept, even though a significant proportion (40%) believe that it affects exchange rates at horizons of over six months.

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Yin-Wong Cheung
University of California, Santa Cruz
Department of Economics, Social Sciences I
Santa Cruz, CA 95064
USA
e-mail: cheung@cats.ucsc.edu

Menzie D. Chinn
University of California, Santa Cruz
Department of Economics
Santa Cruz, CA 95064
USA
e-mail: chinn@cats.ucsc.edu

1. Introduction

Conventional wisdom holds that a wide gulf separates the concepts forwarded by academic economists, and the day-by-day concerns of practitioners. Nowhere is this apparent gap more pronounced than in the area of international finance. Trade deficits do not matter in the standard monetary model of exchange rates, yet casual empiricism suggests that currency traders do pay attention to trade balance announcements. Similar contrasts can be drawn for purchasing power parity and the efficient market hypothesis. Perhaps because of this gap, the microstructure approach to exchange rates has garnered an increasingly large number of adherents over recent years. However, data sets that enable formal testing of microstructure-based hypotheses are only now becoming available. It seems, therefore, a profitable enterprise to examine evidence available from alternative sources.

In this spirit, this paper uses information drawn from a survey of U.S.-based foreign exchange traders designed to elicit information about several aspects of exchange rate dynamics not observable in typical data sets. In contrast to the conventional research methodology adopted in economics -- theoretical modeling, estimation, and testing -- our survey attempts to ascertain directly how market participants behave, document their experiences, and solicit their views on the workings of the foreign currency market.

Two issues will likely arise in the reader's mind. The first is the economists' long held skepticism of survey methods, which is derived from the aphorism of "watch what I do, not what I say." There is a concern that those individuals surveyed will respond strategically, distorting their answer to gain some advantage. However, in the current context, there seems little incentive of strategic distortion as the responses to our survey questions are unlikely to convey competitive advantage to the concerned agents. Moreover, as argued by Blinder (1991), Shiller *et al.* (1991), among others, the results from a properly designed survey can provide valuable facts that are not found in standard models and not available to econometricians.

Furthermore, the use of survey data has some well-known advantages. Rather than using the representative agent paradigm, one can document the extent to which agents are heterogeneous in their beliefs and behavior. This allows a more fully fleshed-out interpretation of observed exchange rate dynamics. In view of empirical inadequacies exhibited by extant exchange rate models, the findings uncovered by a well-constructed survey may provide some useful insights on the market structure and practitioners' behavior.

Admittedly, the use of survey data imposes certain limitations upon the researcher. In certain instances, it is difficult to quantify the association between variables, and to construct easily interpretable hypothesis tests. Hence, we cannot overstate the point that we view survey data as a complement, rather than a substitute, for standard empirical analysis.

The second issue pertains to the relevance of individual trader beliefs for those aspects of economic behavior of interest to economists. One is tempted to assert that the activities at the individual level are but a mere sideshow compared to the underlying movements in the macroeconomic fundamentals. This perspective has held sway because, in part, economists have not been able to observe

what traders react to. In recent work, Evans and Lyons (1999) have used previously unavailable *market* (as opposed to individual trader) data on quotes and transactions to link up the activities of traders and asset prices over several months. They find a strong relationship between customer order flow, and the DM/US\$ exchange rate, even after taking into account interest differentials. Cai *et al.* (1999) detect a link between the Yen/US\$ rate and customer order flow, even after taking into account macroeconomic announcements, during 1998. These two studies, then, document an explicit tie between the microstructure of the forex market and macroeconomic variables. As the availability of such finely-detailed data increases, it is likely that such links will become better established.

Our study focuses on several interesting issues in exchange rate economics, in both the microstructural and macroeconomic areas. One set of survey questions examines the bid-ask spread of interbank quotes, which has received considerable attention recently. As it is difficult to gather marketwide data (e.g., trading volume) on foreign exchange trading, the survey method offers an alternative means to study bid-ask spreads in the interbank market. We also examine other microstructure issues, including the channels by which interbank foreign exchange transactions take place, the composition of currency trading, the existence of dominant players in certain currency markets, the sources of competitive advantage for large players, and the predictability of exchange rates.

Using the questions on the macroeconomics of exchange rates, we gather information on the main trading methodology pursued by individual traders, the effects of macroeconomic news, the relative importance of macroeconomic variables over time, factors (including both fundamental and non-fundamental variables) affecting exchanges rates at different horizons, the effects of speculation and central bank intervention, and the market perceptions of the well known notion of purchasing power parity.¹

The outline of the paper is as follows. Section 2 describes the survey methodology and overviews the data set. In section 3, we discuss the survey responses in the context of several major issues in the exchange rate microstructure literature. Section 4 reports the survey results related to various macroeconomic issues. In section 5, we consider the possible interactions between responses to different questions in the survey. Specifically, we formally test whether traders' responses to one question depend on their responses to another question.. We offer some concluding remarks in Section 6.

2. Survey Methodology and Sample Overview

The data used in this study were obtained from a mail survey of the foreign exchange traders located in the United States. As of April 1998, the United States foreign exchange market was the second largest after the London market, and constituted about one-fifth of the daily turnover of US\$1971.0

¹ To our knowledge, this study is the first to document the trading practices *and* views in the US foreign exchange market. Other related studies examine London (Taylor and Allen, 1992), Germany (Menkhoff, 1998) and East Asia (Cheung and Wong, 2000).

billion (Bank for International Settlements, 1998).² The survey was conducted between October 1996 and November 1997. The mailing list was compiled from the 1996 and 1997 editions of the *Dealers' Directory* published by the Hambros Bank. In preparing the questionnaire, we solicited and incorporated advice and suggestions from several experienced practitioners.³ A total of 1796 surveys were mailed, 44 of which proved undeliverable. The number of completed questionnaires returned was 142. The response rate was approximately 8.1%. This rate is typical for mail surveys.⁴ As discussed above, there is no apparent reason for a specific group of traders to choose to respond or not to respond to our survey. Thus, we are confident the sample is not likely to be biased one way or the other.

Information about the respondents and their organizations is summarized in Table 1. As indicated in Figure 1.a, most respondents are experienced practitioners. Over 80% of them have the title "chief/senior dealer" or "treasurer/manager." We therefore believe that the views recorded in the survey are representative of participants with extensive experience in the foreign exchange market. In fact, the proportion of experienced traders in our sample is comparable to the one in the mailing list. Thus, our sample is reasonably representative of the traders in the U.S. market.

The intraday position limit is the maximum open position a dealer is authorized to assume during the day. Since, in most cases, dealers square their positions at the end of a trading day, the intraday position limit can be used as a proxy for a dealer's trading capacity. To buttress this point, note that Lyons (1998) documents the half-life of a dealer's position is only 10 minutes. Most respondents in Table 1.b have a daytime position limit below US\$25 million.⁵ Only a few respondents stated their position limits in terms of the value at risk.

Figure 1.c indicates that, as expected, a plurality of the respondents are associated with banks headquartered in the United States. Europe comes a close second. Japan comes far behind as the next most likely headquarters location, with only 8%.

Data on average daily turnover, which measures the activity and market share of a trading bank, are reported in Figure 1.d. The response pattern indicates a bimodal distribution, with 31% reporting a daily turnover of US\$100-499 million, and 28% a figure of between US\$1000-5000 million.

3. Microstructure-Related Empirical Results

3.1 Trading Channels and Business Composition

It is of interest to view the evolution of the forex market. We document some salient features in Table 1. In Panel 1.a, we investigate the proportion of transactions via either interbank trades, traditional

² Figures are for traditional foreign exchange market activity, including spot, outright forward and foreign exchange swaps.

³ A copy of the questionnaire is reproduced as Appendix A.

⁴ 8% is bracketed by the "typical" rates of 5% and 10% cited by Alreck and Settle (1995).

⁵ Typically, these limits can be exceeded on authority of the chief dealer, although the precise rules vary from organization to organization.

brokers, and electronic brokers.⁶ The mean responses together with the modal responses and the standard error are presented. Both the mean and modal responses indicate that five years prior to the survey, transactions were apportioned equally between interbank and traditional broker trades. Transactions via electronic brokers constituted only about 2% (mean responses) of total trades. In the more recent period, the average response on interbank transactions had fallen to roughly one-third of total transactions; at the same time, traditional brokers lost considerable ground to electronic brokers, such that the latter constituted 46% of total trades, and the former only 17%. The standard error measure indicates that there is a wide variation in the way these traders channel their trades. For example, the proportion of trades channeled through the interbank market range from 0 to 100%.

The upsurge in electronic brokers documented in the survey is in accord with the 1998 Federal Reserve Bank of New York survey which indicated that almost 1/3 of all April 1998 spot transactions were conducted through order-matching systems (Federal Reserve Bank of New York, 1998: 6).⁷ Perhaps more telling are the minimum and maximum estimates of trade conducted through each mode. Five years ago, the maximum response for trade taking place through traditional brokers was 100%; the more recent maximum proportion is 80%. The maximum proportion taking place through electronic brokers was 30% in the earlier period; more recently, it is 95! Overall, it appears that electronic broker transactions have substituted out mostly, but not exclusively, for traditional broker trades.

While the *method* of the transactions has changed substantially, the nature of the business has remained remarkably constant. Panel 1.b reports that, on average, 62% of transactions were interbank business related, virtually the same proportion as five years earlier, while 35% were customer related. In fact, we found that there is no significant difference between the distributions of interbank and customers transactions during the five years period.

3.2 The Interbank Bid-Ask Spread

Responses to survey questions regarding the magnitude of interbank bid-ask spreads are presented in Figure 2. The questions involve (a) the magnitude of the average bid-ask spread, (b) the frequency distribution of deviations from convention, (c) the frequency of adhering to the convention, (d) reasons for adherence to the convention, and (e) reasons for deviation from the convention. Conventional spreads in the interbank market, according to respondents, are displayed in Figure 2.a. While a wider spread is acceptable in a hectic market, the ability to consistently offer quotes with these conventional spreads in a hectic market is regarded as an essential characteristic of a market leader. The conventional spreads for four major trading currencies reported in Figure 2.a are largely in accordance with those described by traders. These numbers also confirm the observation that actual interbank spreads are

⁶ Goodhart, Ito and Payne (1996) document the characteristics of the activities of the Reuters D2000-2 electronic brokering system.

⁷ A more detailed discussion is presented in New York Foreign Exchange Committee (1997).

narrower than indicative quotes on the Reuters screen (Bessembinder, 1994; Lyons, 1995).⁸

In accordance with the reported clustering of bid-ask spreads at a few distinct values (Bollerslev and Melvin, 1994; Lyons, 1995), our survey indicates that only a small proportion of interbank bid-ask spreads differ from the conventional one (Figure 2.b). Most of the non-conventional spreads are narrower and only a few are wider: 26% of the respondents say that over 20% of their quotes have spreads narrower than the conventional one, while 75% indicate that less than 10% of their interbank quotes have a spread wider than the conventional one. One respondent provided some possible explanations for this asymmetry. "Lower volatility enables the professional trader to quote tighter prices, due to less risk. Secondly, professional dealers pride themselves on the risk they are able to 'endure' via tighter pricing."

Figures 2.c to 2.e shed some insights on the rationale of deviating from the conventional interbank spread. 69% of the respondents suggest the market norm, rather than the potential cost of making a quote, determines their interbank bid-ask spreads in most circumstances (Figure 2.c).

By far, the most frequently cited reason for adopting the conventional spread is to "maintain an equitable and reciprocal trading relationship" (Figure 2.d). In the interbank market, foreign exchange trading is conducted according to several tacit agreements that reduce transaction costs and create a perception of fair trading. For example, traders are expected to respond to a request for quotes within a reasonable time span. A two-way price with a conventional spread is another practice traders expect from each other. The responses confirm that practitioners tend to observe the tacit agreement to maintain an equitable trading environment.

Traders postulate that frequent violations of tacit agreements result in loss of reputation. It is important for both banks and traders to maintain their reputation so others will choose to trade with them. Offering quotes with a conventional spread is one of the ways in which a trader can establish his reputation. Thus, it is not surprising to see "secure a good market image for the firm and the dealer" as the second most cited reason for conforming to the conventional spread.

Compared with the two preceding reasons, trading profits are a much less significant factor for setting the spread. Less than 6% of respondents select this choice. This reinforces the presumption that potential costs play a minor role in determining the spread (Figure 2.c). As one trader said, "The bid/ask spread is hardly sufficient for a dealer to make money, unless his/her desk has significant business on both sides of the market, such that they are able to 'capture' the spread by both buying and selling with different counterparties. Dealers make the majority of their profit on rate movement, not spread." The comment highlights a fundamental difference between an organized exchange such the New York Stock Exchange and the decentralized multiple-dealer foreign exchange market. In the New York Stock

⁸ The mean and median spreads are not substantially different from the modal values reported in Figure 2.a. The means are 5.09, 3.49, 3.37 and 4.70, as compared against the modal and median values of 5, 3, 3 and 5.

Exchange, specialists match buyers and sellers for most of the trading hours and the spread represents a considerable portion of their profits. On the other hand, in the interbank foreign exchange market, dealers have to accommodate one-way transactions based on (their) quotes. Given the quick movement in exchange rates and the decentralized nature of the market, it is not common for dealers to maintain the same quote to exploit the profit from the bid-ask spread.

As reported in Figure 2.e, the most cited reason for deviating from the conventional spread is a "thin and hectic market" (31%). This choice and the one of "thin and quiet market" account for more than 40% of the responses. Liquidity effects, especially in the presence of uncertainty as exemplified by a hectic market, seem to have significant implications for bid-ask spreads.

The role of uncertainty is further illustrated by 43% of the responses claiming "increased market volatility," "before/after a major news release," and "unexpected change in market activity" are the reasons for deviating from the market convention. These three reasons are related to a potential increase in the level of market uncertainty. The choices of the volatility factor lend support to the empirical findings reported in Bollerslev and Melvin (1994). Thus, our respondents confirm anecdotal evidence, garnered from conversations, that wider bid-ask spreads tend to occur under such circumstances. They also match the statistical results obtained by Jorion (1996) indicating a correlation between volatility and bid-ask spreads.

Only a small percentage of respondents say they widen the spread when they are holding a position against the market trend or the cost of keeping their positions is increasing. The importance of these two inventory-cost related factors is played down (2%).

Market traders we interviewed confirm that, given the trading mechanism, it is not unexpected to observe the weak association between bid-ask spreads and trading positions reported in Figure 2.e. Traders rely on interbank trading to access information on market sentiments and other market makers' activities. Market moving news is mainly disseminated through direct interbank dealing before brokered interbank transactions. Therefore, active traders do not want to reveal information on their own unfavorable positions by offering a wide spread quote. Compared with the wide swing of intraday exchange rates, a few points advantage associated with a wide spread has very limited impact on trading profits. In addition, making wide spread quotes under normal market conditions has the side effect of damaging a trader's reputation and driving away potential trading opportunities, which can severely hinder a dealer's ability to read the market and make profitable trade in the future. Thus, most traders do not widen the spread solely because of adverse positions. On the other hand, some practitioners pointed out that a good trading position, for example a long dollar position when the dollar is strengthening, gives a dealer an opportunity to establish or enhance his reputation as a trader by offering a good two-way price in a hectic market without incurring a loss.

Our survey results provide some indirect evidence of the asymmetric information effect on interbank bid-ask spreads. A standard microstructure theory (Glosten and Milgrom, 1985) predicts a trader will quote a wide spread when he believes his counterparty has superior information. However,

only a relatively small percentage of the responses consider dealing with either a small bank or an informed trading bank as reasons for offering non- conventional spreads. If the two types of banks represent market participants with, respectively, little and superior market information, then most traders do not consider informational asymmetry in determining their bid-ask spreads. This finding complements the implication of a model recently developed by Perraudin and Vitale (1996). The authors model the trading process as the means by which traders acquire timely market information from other market participants and, consequently, show the standard asymmetric costs argument may not apply to the decentralized foreign exchange market.

Compared with the factors related to inventory and asymmetric costs, a slightly lower percentage of responses say "a wide spread quote from a counterparty" is a reason for offering a wide spread quote. Market participants offer two possible interpretations. First, the counterparty's wide spread quote may signal some information which the trader is not aware of. Second, as a protest and a demand for a fair trading relationship, traders do retaliate and offer a wide spread quote back to the same counterparty.

Overall, the traders suggest that the market convention, an element not commonly mentioned in the literature, is an important determinant of interbank bid-ask spreads. In contrast with the literature on bid-ask spreads in organized equity exchanges, factors such as profits, inventory and asymmetric information are not considered prominent reasons for deviating from the conventional interbank spread. Market uncertainty is perceived to be an obvious reason to deviate from the market convention. Even though market uncertainty is intrinsically related to inventory effects, informational advantage, and profitability, traders attribute their adherence to conventional spreads to non-pecuniary factors such as norm, market image, and personal pride.

3.3 Do Dominant Players Exist?

In the US foreign exchange market, dollar/mark, dollar/yen, dollar/pound, and dollar/Swiss franc are the four most actively traded exchange rates (Federal Reserve Bank of New York, 1998). Less than 25% of our respondents believe the dollar/mark and dollar/yen markets are dominated by a few big players (Figure 3.a). On the other hand, there is a split of opinion over the dollar/pound rate. About 50% of the respondents say the dollar/pound market is dominated by a few big players. Even more striking, for the Swiss franc almost 60% indicate that the big players exert dominance. These two results may be related to the relatively small dollar/pound and dollar/Swiss franc trading volumes in this markets. The Federal Reserve Bank of New York survey shows that the daily average turnover of dollar/mark spot dealings in the New York market was US\$43.8 billion and that of the dollar/yen was US\$30.5 billion in April 1998. During the same period, however, the total daily average turnover of dollar/pound and dollar/Swiss franc transactions in this market was only US\$10.2 billion and US\$7.6 billion, respectively.⁹ In line with this view, one trader suggested that low liquidity, rather than few players, was a key factor in

⁹ These figures are for spot market trading which constitutes roughly half of total foreign exchange trading (the other components are forward contracts and swaps).

the dollar/Swiss franc market.¹⁰

Interestingly, the response that large players exist, and do possess advantages, is in disagreement with remarks in Federal Reserve Bank of New York (1998: 8) that “the foreign exchange market remained similarly competitive in 1998 compared to 1995.” The New York Fed’s conclusions were based on a 5-firm market share of 31%, and a Herfindahl-Hirschman index of market concentration of 317, interpreted by the New York Fed survey as a high value.

With regard to the sources of large players' competitive advantage, respondents say "large customer base" and "better information" about the market are the two main factors. These two factors account for 56% of the total responses. Essentially, large players are perceived to have a better customer and market network, which, in turn, give them better information on order flow and the activity of other trading banks. The importance of a large customer base underscores recent efforts to use customer orders to explain the trading mechanism and trading volume (Lyons, 1997). The next two frequently mentioned sources are "deal in large volumes" and "ability to affect exchange rates." Other factors receive a much lower response rate (15% and 9%, respectively).

3.4 The Predictability of Exchange Rates

There is an enormous literature documenting the difficulties of predicting exchange rates using structural or time series models (Frankel and Rose, 1995). In this section, we ask the foreign exchange traders themselves how predictable they believe exchange rates are. This is an interesting question because presumably the traders themselves have a larger information set than the typical econometrician who has access only to macro data available intermittently, and to selected financial variables such as interest rates and stock prices at high frequencies.

We asked traders to rate the degree of predictability at three horizons – intraday, medium run (up to six months) and long run (over six months). In Figure 4, a rating of 1 indicates no predictability, while a rating of 5 indicates high predictability. Perhaps not surprisingly, at the intraday frequency, exchange rates are viewed as essentially unpredictable. 62% give ratings of 1 or 2. The modal response is a 2 rating. Only 11% give ratings of 4 or 5.

As the horizon moves to the medium and long run, the modal response becomes a rating of 3. Interestingly, the distinction of medium- and long-run does not seem to matter for the traders’ views on predictability. 30% of traders rate medium-run predictability as a 4 or 5, and 35% view predictability at the long-run similarly.¹¹

The question why this pattern obtains remains a key puzzle in international finance. As pointed out by Flood and Rose (1995), among many others, floating exchange rates are far more variable than the

¹⁰ Although this same trader allowed that the relative paucity of traders in the Australian and Canadian dollar markets may explain the dominance of a few players.

¹¹ The mean (median) responses for intraday, medium and long run horizons are 2.26, 3.07 and 2.96 (2, 3 and 3), respectively. The standard deviations of responses are 1.01, 1.08 and 1.35, respectively.

observable macro determinants such as money stocks, interest and inflation rates. The most persuasive explanations have been rooted in microstructural explanations, such as Osler (1998). Osler presents a model wherein random shocks are translated into near random walk behavior of the exchange rate by the activities of noise traders (De Long, *et al.*, 1990).

Apparently, exchange rates are perceived to be more predictable in the medium and long terms. However, dealers in general hold an open position for very short periods. In fact, in most cases, dealers close out their daily positions before leaving offices. Given their views on predictability, why doesn't a typical dealer maintain an open position for a long period? Two observations are in order. First, the change in perceived predictability is not large in magnitude. The modal response increases from 2 for the intraday horizon to 3 in the medium to long run. Second, respondents do not view predictability and low variability as synonymous. The traders realistically attach a higher level of risk to a longer-term open position. Indeed, the position limit (both daytime and overnight) is an mechanism for the banks to control the exposure to a level the management feels comfortable with (also, see Goodhart, 1988).

4. Macroeconomic Related Empirical Results

4.1 Chartists and Fundamentalists

Frankel and Froot (1990b) argue that the endogenously changing prevalence of technical trading (what they termed chartism) might explain the seemingly random nature of exchange rate movements, especially in relation to the macroeconomic fundamentals that economic theory indicates should be relevant. Taylor and Allen (1992) report that 90% of London traders surveyed used at least some technical analysis. In this survey, we ask for the description *that best describes* their trading practices. We believe that responses to this question are more informative about the relative importance of technical trading in determining exchange rate dynamics.¹²

The results in Figure 5 indicate that technical trading best describes only 30% of trading behavior. This is only a slightly greater proportion than that ascribed to fundamental analysis (25%). The rest of the trading is characterized as either customer order driven (22%) or "jobbing" (23%), defined further below. The prevalence of technical trading appears to have changed over time; five years ago, only 19% of respondents indicated that technical trading was the best description of their trading strategy. However, it would be a mistake to conclude that chartists have come to dominate over fundamentalists. Rather, technical trading seems to have gained at the expense of jobbing, rather than fundamentalist analysis.

The *a priori* effect of this shift on exchange rate dynamics is uncertain. "Jobbing" describes a trading style in which the trader continuously buys and sells in order to make many profits in perhaps small increments. As such, one could interpret this strategy as one of speculation at the very high

¹² Menkhoff (1998) examines various hypotheses concerning the differential behavior of fundamentalists and noise traders, using a survey tailored specifically toward this purpose.

frequency. To the extent that jobbing performs the same type of role as Friedman-type stabilizing speculation, the Frankel-Froot conjecture on endogenously changing trader proportions would still hold true, although the buying and selling is undertaken at such a short horizon, it would be somewhat difficult to interpret adherents of the jobbing approach as “fundamentalists”. Furthermore, it is not clear that speculation is always stabilizing. Osler (1998) has forwarded a model wherein random shocks are propagated by the actions of rational agents acting (in the presence of noise traders) in such a manner as to make the exchange rate follow a near random walk. Even when all agents are rational, speculation may induce more, rather than less, volatility when interest rates are taken into account (Carlson and Osler, 1996).

In contrast to the trends discussed above, the other two categories – fundamentals and customer orders – have each accounted for remarkably stable proportions of responses to this question over the two time periods. The fundamentals characterization declines negligibly, from 25% of responses to 23%, while customer orders rises slightly from 22% to 23%. Presumably, traders using primarily fundamentalist techniques are looking at variables like interest and inflation rates, GDP and money stocks. The issue of what variables traders pay attention to is discussed below in Section 4.3. The constancy of the fundamentalists is notable because it contrasts very strongly with the tabulation undertaken by Frankel and Froot (1990a). They found that according to data reported in *Euromoney* the number of foreign exchange forecasting firms, or *services* (not individual forecasters), that used fundamentals fell from 19 to 0 from 1978 to 1984 (the peak of the dollar), and then rose back up to 7 in 1988. Our results suggest that dramatic shifts in trading strategies among interbank dealers have not occurred during the 1990s.

Customer orders are of interest because they constitute another link between the larger macroeconomic forces in the economy, and the factors that individual traders contend with.¹³ One is tempted to ascribe a relatively minor role to customer order flows because presumably they are primarily a function of trade-based motivations. Further the absolute value of all annual current accounts is equal to a day’s forex trading volume. However, Lyons (1997) has forwarded a model in which customer orders act as the exogenous shocks that perturb the foreign exchange market. As risk averse dealers attempt to manage their inventories, the initial order is magnified several-fold; hence such inventory models can explain the enormous volume in the foreign exchange market. Lyons (1996) provides empirical evidence consistent with this hypothesis.

This complex mix of trading strategies suggests that any integrated model will need to map the theoretical motivations to the particular trading methods in order to successfully explain exchange rate dynamics.

¹³ See for instance Evans (1998) for a persuasive graph of the DM/\$ rate and cumulative customer order flow imbalance.

4.2 The Effect of News

The idea that “news” -- that is innovations in macroeconomic variables -- causes the great bulk of movements in exchange rates has a venerable history, going back at least as far as Frenkel (1981). However, empirical attempts to link exchange rate movements to news effects of specific macroeconomic variables have been hampered by the difficulty in extracting the unexpected component of the news, as well as the fact that the studies are often conducted with relatively low frequency data. In particular, it may be that announcement effects have dissipated by the time the exchange rate data are sampled, even when the data frequency is daily or even hourly.

According to our survey results, the exchange rate responds to news with extreme rapidity – on the order of minutes for most variables. Figure 6 presents the time that market participants indicate is necessary for full adjustment to economic announcements regarding a number of macroeconomic variables: unemployment, the trade deficit, inflation, GDP, the interest rate, and the money supply. For the first five variables, the bulk of the adjustment takes place within one minute. In fact, there is a striking uniformity in the responses. Consistently, about 1/3 of the respondents indicate that full adjustment takes place in less than 10 seconds! (Money is an exception – less than 20% respond thus.) In these cases, even minute by minute data might not catch this news effect. For instance, Tanner (1997) reports complete adjustment of the DM-\$ rate to trade deficit figures in half an hour, but no significant responses to news about money supply, industrial production or unemployment. His results may be driven by the fact that the data -- in five minute installments -- are of insufficiently high frequency. In contrast, using tick-by-tick data, Ederington and Lee (1993) find adjustment of volatility within the first minute to major announcements, confirming the need for relatively high frequency data to detect announcement effects. More recently, Anderson and Bollerslev (1998) analyzed a year’s worth of 5-minute returns and concluded that volatility adjusts to news announcements within 10 to 20 minutes.

Interestingly, in the survey responses money supply announcements appear to be an outlier in several respects. First, 12% of respondents indicate that it takes more than 30 minutes for the adjustment to take place. This contrasts starkly with the 3% of respondents who indicate more than 30 minutes for the other five variables. Second, as mentioned above, the proportion of respondents indicating that adjustment to money announcements occurs within the initial 10 seconds is markedly less than the proportion reported for the other variables (except perhaps GDP). It is not clear why the response to the money supply announcement should differ so much from that of the others, although there is a striking pattern in the low importance accorded to monetary aggregates, as shown in Figure 7 and discussed below.

4.3 What Matters and When Does It Matter?

While Figure 6 indicates the rapidity by which adjustment takes place, it does not shed any light on the relative importance of each of these macroeconomic variables, and the relevant time horizon. In this section, we first assess the impact of each of these variables on the foreign exchange market now, and five years ago; then we examine more closely the horizon at which these variables have their effects.

Figure 7 reports the effects of economic announcements on the foreign exchange market. The two most important variables, by far, are unemployment and the interest rate, at 33% and 31% respectively. The money supply and GDP rank as the least important. As noted in the discussion of Figure 6, these two variables evinced the slowest rate of adjustment. Perhaps the adjustment is slowest because these variables are widely considered irrelevant. Furthermore, GDP may also be ranked of lower importance because of the relative infrequency of GDP announcements, especially as compared to other indicators of aggregate activity such as unemployment and industrial production, both reported at a monthly, rather than quarterly, frequency.

Besides the issue of data frequency, some traders have pointed out that there are some ambiguities in the interpretation of GDP announcements. GDP is the sum of many components, so the growth rate of aggregate output may not be a sufficient statistic, and in fact may require more analysis in order to determine the true impact of the economic release. One concrete example of this factor is the distinction between growth arising from an export surge, versus that arising from inventory accumulation. The former has a positive implication for future output growth, while the latter has the converse and hence the two have different implications on exchange rate movements.

It is of interest to compare the import adduced to each variable as compared to five years ago. The respondents (see Figure 7) pointed to the trade deficit as the key variable, which makes sense since at that time (approximately 1991-92), the trade deficit was starting to rise again, after declining to near zero during the 1990-91 recession. Unemployment, which ranks first in the current survey period, was then only second. To the extent that unemployment proxies for expected inflation or, more likely, for anticipated Fed monetary policy, this pattern makes sense as the economy is widely thought to be currently operating very near potential.¹⁴ The factor that garnered the second most number of responses is the interest rate; this was also the second ranked item for the current period, suggesting a consistent role for interest rates in exchange rate determination. We conjecture that the importance accorded interest rate announcements arises from the fact that such news flows continuously from the markets; in contrast, the other variables are announced at scheduled intervals. In sum, this prominence should not be very surprising, given the fact that, of all the macroeconomic variables that find their way into empirical models of exchange rates, it is the interest rate or interest differential that most often shows statistical and economic importance.¹⁵

¹⁴ The unemployment rate as a indicator of future Fed policy seems more plausible, since current inflation announcements are not viewed as very informative. Interestingly, employment announcements appear to be very influential in the Anderson and Bollerslev (1998) analysis of the period corresponding to the early period (5 years prior to the survey) referred to in the survey.

¹⁵ See for instance MacDonald and Taylor (1993) and Baxter (1994) among others. On theoretical grounds, the interest rate shows up as a determinant of the exchange rate in almost any extant model, ranging from ad hoc models such as the Frenkel (1976) and Dornbusch (1976) variants, to general equilibrium models of the Lucas (1982) type.

These results have a number of implications for conventional empirical approaches to exchange rate determination. First, the fact that the rankings of variables changes over time may provide an explanation for why quasi-structural models of the exchange rate appear to evidence parameter instability (Frankel and Rose, 1995). It might also provide a rationale for the superiority of time-varying parameter approaches in short-horizon exchange rate forecasting. Wolff (1987) estimated a monetary model using a Kalman filter to update coefficients; he found that he could outperform a random walk in out-of-sample forecasts. Schinasi and Swamy (1989) used a different time-varying parameter model to obtain similar results.

In Figure 8, we attempt to discern at what horizon fundamentals matter, and what other factors besides fundamentals may influence exchange rates. Figure 8.a supports the general presumption that at short horizons such as the intraday, exchange rate movements do not reflect changes in fundamental values. In the medium run, which we have defined as a horizon of up to six months, 59% of respondents believe that exchange rate movements do reflect fundamentals. This proportion rises to 88% for the long run (over six months).

The result mirrors the emerging consensus that the conventional macroeconomic fundamentals have little effect at short horizons, but do have an impact at longer horizons (Flood and Taylor, 1996 for relative PPP; Meredith and Chinn, 1998, for uncovered interest rate parity). For instance, Mark (1995) documents the out-of-sample performance of a flexible-price monetary model of the exchange rate. Chinn and Meese (1995) provide similar results for various models, including ones that include a role for money supplies, incomes, interest and inflation rates, and -- in certain cases -- cumulated trade balances and the relative price of nontradables to tradables (the latter is a proxy for sectoral productivity differentials).

The question naturally arises as to what causes the deviations from fundamental values. We offer a variety of possible explanations, including excess speculation, major trading bank manipulation, institutional customer or hedge fund manipulation, and excessive central bank intervention. In Figure 8.b excess speculation garners the largest positive response, at 74% of respondents. Only 19% disagree with this conclusion. Surprisingly, institutional customer/hedge fund manipulation comes a close second, with 68% of respondents ascribing some blame there. There appears to be an even split regarding the role of major trading banks, with a relatively large proportion (12%) of respondents indicating no opinion. Central bank intervention -- often characterized as ineffectual -- is viewed as exacerbating deviations of the exchange rate from their fundamentals by 39% of the respondents.

The role of institutional customer/hedge funds merits some discussion, especially in light of the recent debate over the East Asian currency crisis. Eichengreen *et al.* (1998) argue that hedge funds were not exacerbating factors in the onset of the crisis; moreover, such hedge funds typically control relatively small amounts of capital. On the other hand, the gyrations of the yen in late 1998 have given renewed credence to the view that other institutional investors tend to follow the lead of hedge funds. Moreover, due to their sometimes very high leverage, hedge funds such as Long Term Capital Markets and Tiger

Management can at times exert a powerful influence on prices, especially on thinly traded currencies (*Economist*, October 10, 1998; Sesit and Pacelle, 1998).

In order to assess the temporal dimension of these deviations from fundamentals, we ask at what horizon these factors come into play (Figure 8.c). At the intraday horizon, most respondents indicate either over-reaction to news, bandwagon effects, or speculative forces as the primary factors in exchange rate movements (29%, 30% and 26% respectively). Technical trading enters in with a 14% response rate. In the medium run, economic fundamentals tie with technical trading (32% versus 31%) in gathering the most responses. However, speculative forces are still accorded surprisingly high importance (24%). Consistent with the earlier responses, traders believe that there is essentially no over-reaction to news in the medium run. Turning to the long run, one finds that economic fundamentals are of paramount importance, while all other factors – bandwagon, over-reaction, speculation, *and* technical trading – fade into insignificance.

How do these responses correlate with survey data on exchange rate expectations? Bandwagon effects can be defined explicitly in the context of the equation,

$$\Delta \hat{s}_{t,t+k}^e = \alpha_0 + \alpha_1(s_t - s_{t-1}) + u_t \quad (1)$$

where s is the nominal exchange rate, and $\Delta s_{t,t+k}^e$ is the expected nominal depreciation between time t and $t+k$, using time t information. A caret (“^”) indicates that this is the survey-based measure of expectations.

A coefficient of $\alpha_1 > 1$ is consistent with bandwagon effects. Neither Frankel and Froot (1987), nor Chinn and Frankel’s (1994) update, report any statistically significant evidence of bandwagon effects.¹⁶ However, the forecast horizons they examine are 3, 6 and 12 months. The bandwagon effects are likely to manifest themselves at particularly high frequencies. Froot and Ito (1989) use weekly data from the surveys conducted by Money Market Services (MMS), and detect bandwagon effects at the one week horizon, and to a lesser extent, at the one month horizon. At all longer horizons, they obtain coefficient estimates indicating that, overall, there is short term over-reaction relative to long term expectations.¹⁷ Hence, Froot and Ito (1989) and Ito (1990) conclude that there is an “expectational twist” in traders’ views.

In sum, traders believe that economic fundamentals play a substantial role in setting exchange rates over the long haul. Nonetheless over one-half of the respondents select non-fundamental factors such as speculative forces and technical analysis as the factors determining exchange rates up to the

¹⁶ Frankel and Froot (1987) use mean forecasts from *The Economist*, *American Express Bank Review*, and Money Market Services. Chinn and Frankel (1994) use geometric mean response forecasts from *Currency Forecasters’ Digest*, now published under the title *Financial Times Currency Forecaster*.

¹⁷ See also Lai and Pauly (1992). In contrast, using a shorter sample Taylor and Allen (1990) fail to reject a static null hypothesis against any particular alternative for four of six individual forecasters.

medium-run horizon. Further, the relative importance of individual macroeconomic variables on exchange rate movement is not the same over time. In order to provide an adequate description of exchange rate movements, structural models, for example, have to address at least the issues of the time-varying nature of macroeconomic effects and the difficulty in quantifying the non-fundamental elements.

4.4 The Effects of Speculation and Central Bank Intervention

The effect of speculation in foreign exchange markets is a perennial favorite topic among journalists and policymakers. Evidence of this can be found in for instance the recent IMF report on the activities of hedge funds in causing the East Asian currency crises of 1997 (Eichengreen, *et al.*, 1998).

In Figure 9, we report the results from our inquiry regarding the effects of speculation. Overwhelmingly, traders agree with the proposition that speculation increases volatility (84%). While this appears to indicate a pernicious role for speculation, interestingly, traders also view speculation as pushing exchange rates *toward* their fundamental values. Moreover, speculation is viewed as enhancing market liquidity by 81%, and improving market efficiency by 74%. Hence, an interesting outcome of this pattern of responses is that speculation is viewed as an integral aspect of the foreign exchange market, and that volatility is not inimical to working markets.

The idea that speculation is stabilizing goes back to Friedman's (1953) conjecture. This view is, however, inconsistent with the McKinnon (1976) argument that locates excessive exchange rate volatility in insufficient speculation. The opinions reflected in this survey propound the idea that volatility, stabilization (in the sense of moving towards fundamentals) and speculation go hand in hand. To the extent that volatility is measured by higher variance in changes, and stabilization as being closer on average to the "correct" value, the seeming inconsistency can be resolved.

The role of central bank intervention in the foreign exchange market has generated a large body of research. Typically, researchers conclude that foreign exchange intervention has little effect on the first moment (Obstfeld, 1990), although Edison (1993), Dominguez and Frankel (1993) and Kaminsky and Lewis (1996) have argued for a channel for intervention through the signalling of future monetary policy. Our survey results (Figure 10) are consistent with the view of little effect, with opinion about evenly split between intervention pushing currencies away and toward their fundamental value. There is similarly a split opinion on whether such intervention is "successful" where the criterion of success is determined by the respondent's interpretation of the central bank's goal. There is a slightly more positive response on the appropriateness of the timing of central bank intervention (60%). Finally, 61% of respondents view central bank intervention as exacerbating volatility (Figure 10.a). One might view these last two responses as mutually inconsistent; however, as in the question regarding the effects of speculation, increases in volatility may go hand in hand with market efficiency, in the view of market participants. These results are not inconsistent with those obtained by Edison (1998) in her case studies of central bank intervention. She finds that US intervention in recent years (which would be most prominent in the memory of these traders) has been infrequent, and sizable by historic standards; moreover, they have effected changes, albeit short-lived, in the trend of exchange rates. This experience

may explain why the US traders have a relatively positive view of central bank intervention.¹⁸

4.5 Purchasing Power Parity

In our last set of questions, we attempt to determine what the traders' views are on a popular model of exchange rates, namely purchasing power parity (PPP). First we wish to assess the definition which traders use to interpret purchasing power parity. In Figure 11.a, response rates are displayed for four definitions. By a large majority -- 63% -- respond that PPP is "merely academic jargon." 16% interpreted PPP as meaning that price levels are the same in the same currency unit. Only 11% responded that PPP gave fair exchange rates, about the same proportion of respondents that gave "other" explanations. One representative statement is that PPP "...is rarely reached or maintained." Another signals a befuddlement shared by the economics profession, indicating that "it should work but doesn't, maybe the basket is wrong, or it excludes capital flows and real interest rates".

The disdain the traders held for PPP as a useful business concept is reflected in the numbers in Figure 11.b. A dollar overvaluation indicated by PPP would induce no action on 81% of traders. Only 13% would sell dollars. On the other hand, the proportion of traders saying PPP is a condition relevant to exchange rate prediction increases as the horizon goes from the intraday to the long run, according to the results in Figure 11.c. At the intraday horizon, PPP has no role according to 93% of respondents. At horizons of up to six months, a resounding 81% of respondents still view PPP as irrelevant; 9% disagree. Only at the long horizon of over six months -- what these traders would likely characterize as "only academic" -- does any substantial proportion of traders view PPP as having any influence: 40%, which is still less than one half of the respondents.

The very low importance accorded deviations from PPP provides one possible explanation for why real exchange rates appear to revert very slowly to PPP. Froot and Rogoff (1995) put the consensus estimate of a PPP deviation half life at between 4 to 5 years. More recently, Cheung and Lai (2000) have shown that the impulse response function of a shock to real exchange rate is hump shaped; they argue that the half life of a deviation is substantially shorter -- on the order of a year and a half -- if one measures the beginning of shock decay from the peak of the shock, rather than from the initial impact. If the traders do not respond to PPP deviations, or respond perversely, then it is no surprise PPP deviations are slow to decay.

Another check on these results can be undertaken by correlating these verbal characterizations with survey-based expectations. Frankel and Froot (1987) estimate the following relationship between expected depreciation and the gap between spot and long run (S^{LR}) rates:

$$\Delta \hat{s}_{t,t+k}^e = \beta_0 + \beta_1 (s_t - s_t^{LR}) + v_t \quad (2)$$

¹⁸ The recent intervention on the behalf of the Japanese yen in June 1998 might also be construed as successful, even though the yen continued to stay at a relatively weak level for the subsequent month. By mid-November 1998, the yen had strengthened to considerably 125 ¥/\$.

using survey measures of expectations.¹⁹ In this case, they obtain estimates for an *expected* half-life of a deviation from PPP of about 2.5 years. Given these slow adjustment rates (from the perspective of the foreign exchange trader), one should not be surprised that the typical trader does not take a particular action on the basis of a PPP overvaluation. At the daily, or even monthly frequency, reversion to PPP is likely to be unobservable relative to movements in exchange rates induced by interest rate movements, for example. In terms of implications for researchers, these results mean that outside observers should expect to see foreign exchange traders responding to almost every variable *but* relative price levels.

5. Discussion

As indicated in the previous sections, the direct responses of market participants provide some interesting information on several issues in exchange rate economics. It is conceivable that additional information can be extracted by comparing responses across related questions. To this end we use a nonparametric test of homogeneity (DeGroot, 1975) to investigate if the responses to a question are related to choices selected for another question. In the subsequent discussion, the generic null hypothesis considered is that there is no dependence between responses to different questions. The nonparametric procedure is employed as the survey data typically do not satisfy the Normality assumption, which is commonly imposed in regression analysis. As the survey responses can be sorted and arranged in many different ways, we present only a selected sample of comparisons below.

First, we examine if the response pattern depends on individual trader's attributes. The attributes considered are seniority, trading limit, headquarters location, and turnover volume. For example, when the seniority attribute is examined, we test if the response pattern is related to whether the respondent is a treasurer/manager, a chief/senior dealer, or a dealer/junior dealer. In general, we found no significant evidence that the responses to the survey depend on any of these four attributes. To conserve space, detailed results are not reported.

Next, we examine the responses to the question on trading methods. The test statistic for the hypothesis that the proportions of respondents selecting technical trading rules, customer orders, fundamental analysis, and jobbing are the same in the five years period is 21.89. Under the null of homogeneity, the statistic has a chi-square distribution with 3 degrees of freedom. Given the sample value 21.89, the p-value is 0.00007 and the null hypothesis is strongly rejected. That is, the distribution of trading methods evolves significantly during the five year period. As the numbers indicated (Figure 5), the change in trading methods is likely due to a substantial shift from the jobbing approach to the technical trading method.

To investigate the possibility that the trading method adopted by traders is related to the nature of their business (Table 1.b and Figure 5), we test whether the choice of trading methods depends on the relative share of interbank and customer business. Before calculating the homogeneity test statistic, the

¹⁹ The long-run nominal exchange rate is proxied by relative price levels.

four trading methods are grouped into two categories - the fundamental category that includes fundamental analysis and customer orders and the technical category that includes trading rules and jobbing. The aggregation is necessary to ensure that different combinations of responses contain a reasonable number of observation to construct the test statistics. The test of homogeneity indicates that the choice of trading methods and the nature of business are closely related. When the responses under the time stamp “now” are considered, the sample statistic is 10.91 with a p-value 0.001. For the practices prevailing “five years ago,” the sample statistic is 6.77 with a p-value 0.009. In both cases, we find that for traders who say customer business accounts for a bigger share of their foreign exchange transactions tend to assert their trading is based on fundamental analysis or is driven by customer orders.

An interesting question is whether a trader’s view on effects of speculation depends on his/her trading method. To shed light on this question, we compare the choices of trading methods and responses to the two survey questions that are related to speculation. Again the trading methods are grouped into the fundamental and technical categories as discussed above. First, we cross-check the responses to the questions on trading methods and on whether excessive speculation is the reason for exchange rates to differ from their fundamental values (Figure 8.b). The sample statistic turns out to be 0.169 (p-value = 0.681); thus there is no evidence that the opinion on excessive speculation is affected by the trading method pursued by the trader. Next, we examine the implication of the choice of trading method for responses to the effect of speculation. For the four effects of speculation listed in Figure 9, the test of homogeneity statistic has a value from 0.014 (p-value 0.906) to 0.402 (p-value = 0.526). Apparently, views regarding the effects of speculation are *not* related to the trading method adopted by individual traders. In fact, we find no evidence that the choices of trading method significantly influence the views on the effects of central bank intervention (Figure 10) and the long-run predictive power of PPP (Figure 11.c). Overall, there is very limited evidence on the systematic relationship between traders’ trading methods and their views about the market.

Do the traders’ views on speculation correlate to those on central bank intervention? With respect to exchange rate volatility, the traders’ opinions on the effects of speculation and central bank intervention are independent (statistic = 0.971, p-value = 0.324). However, the respondents who believe speculation moves the exchange rate away from its fundamental level tend to perceive central bank intervention as moving the exchange rate toward its fundamental value. This observation is confirmed by the test statistic for homogeneity, which has a value of 17.284 (p-value = 0.000). Thus, the traders have a systematically different view on whether speculation and central bank intervention widen or narrow the deviation from equilibrium. Even though more than one half of the respondents believe speculation and central bank intervention narrow the gap, a considerable number of respondents view speculation and central bank intervention as playing different roles in terms of eliminating the disequilibrium exchange rate.

In Figure 6, it appears that the market takes a longer time to adjust to unexpected news on money supply and GNP. The test of homogeneity confirms that the adjustment profiles advocated by the traders

are different across various macro announcements. Specifically, the adjustment profiles of money supply and GNP are statistically the same (statistic = 1.51, p-value = 0.22). However, these two profiles are significantly different from those of the remaining four macro variables. The sample statistic for testing the hypothesis of the adjustment profile of money supply or GNP is the same as the profile of another macro variable ranges from 3.28 (p-value = 0.070) to 15.37 (p-value = 0.000). Interestingly, the adjustment profiles of trade deficits, unemployment rate, inflation, and interest rate are not statistically different from each other. Thus, there is strong evidence that the traders believe the surprises on money supply and GNP entail a different exchange rate adjustment path.

Last, but not the least, we compare the trader's interpretation of PPP and the long-run predictive power of PPP. To conduct the analysis, we treat the choices of "academic jargon" and "other" as one group and the other two as another group (Figure 11a). Then we test the hypothesis that the views on whether PPP predicts exchange rates in the long run and the choices of the meaning of PPP are independent. The statistic is computed to be 20.552 with a p-value of 0.000. Thus a trader's view on the long-run predictive ability depends on his/her perception of PPP. When we examine the actual responses, we find that respondents selected "academic jargon" or "other" for PPP are more inclined to say PPP has no predictive power for exchange rates even in the long run. Similar results were obtained for opinions about the predictive power in the intraday and medium-run horizons.

6. Conclusions

We have examined the responses of interbank foreign exchange traders to questions regarding the operations of the foreign exchange market at both the microstructural and macroeconomic levels. With respect to the microstructural characteristics of the market, the share of customer business, versus interbank business, has remained fairly constant. However, the channels by which these transactions take place have experienced considerable transformation, as electronically-brokered transactions have become much more prominent.

We also elicit interesting responses regarding the motivations for certain observable behaviors in the foreign exchange market. First, the respondents do not view trading profits as the most important reason for following the market convention; rather the desire to maintain equitable and reciprocal trading relationships, followed by a desire to maintain a positive market image, are the prominent answers. This pattern of responses indicates that other motivations not easily captured by standard microstructure models may explain the adherence to market norms. Second, the most commonly cited reason for departing from the convention on bid-ask spreads is the onset of a thin/hectic market. This appears to conform to some recent empirical work linking volatility and wide spreads. However, traders seldom refer to adverse trading position and asymmetric information as direct reasons for deviating from the conventional bid-ask spreads. Third, when it comes to the issue of large players the foreign exchange market is not monolithic. In particular, while the DM/dollar market is widely viewed as fairly competitive, the smaller dollar-pound and Swiss franc markets are perceived as more dominated by the

larger banks. Fourth, exchange rate predictability is viewed as fairly low. Surprisingly, there is little variation in the proportion of traders who hold this view over the various horizons – from intraday to over six months. However, this final display of relative unanimity stands in stark contrast to the substantial heterogeneity in forex trader views exhibited on a wide range of subjects.

At the macroeconomic level, short-run exchange rate dynamics are believed to mainly depend on non-fundamental forces (e.g., bandwagon effects, over-reaction to news, technical trading, and excessive speculation) rather than fundamentals. This reinforces the consensus view regarding the inadequacy of structural exchange rate models based on macroeconomic fundamentals for data at high frequencies. The respondents also resoundingly affirm that technical trading has non-trivial impact on short- and medium-run exchange rates. At longer horizons, fundamentals (variously described by the practitioners themselves) are seen to exert more and more influence. However, we have an only imprecise knowledge of what these fundamentals are. These results challenge economists to combine fundamentals and non-fundamentals in a unified model for both short-run and long-run dynamics (De Long *et al.*, 1990; Frankel and Froot, 1990b; Mark and Wu, 1998; and Osler, 1998). Moreover, a successful model should also allow for changes in the relative importance of macroeconomic fundamentals over time and a speedy adjustment to unexpected macroeconomic news.

The traders offer mixed evaluations on speculation and intervention. For instance, both speculation and central bank intervention are perceived to increase market volatility. However, practitioners contend that both speculation and intervention are also likely to restore equilibrium by moving exchange rates toward their long run values. In this light, volatility is the means by which deviations are eliminated. On balance, a substantial proportion of traders assign a positive role to speculation; they say speculation provides market liquidity and improves market efficiency. While 60% of respondents agree the timing of intervention is appropriate, there is a split of opinion on whether intervention achieves its goal or not.

Finally, in this survey, we confirm the widespread impression that traders themselves do not view purchasing power parity as a relevant measure of foreign currency values, except perhaps at the very long horizon. This latter finding offers a market traders' perspective on the difficulties in detecting reversion to PPP in the short run and the highly persistent behavior of real exchange rates. At the same time, it yields some rather troubling implications for international finance more generally, as some form of PPP is embodied in nearly every modern model of the open economy.

References

- Allen, H. and Taylor, M.P., 1990, "Charts, Noise and Fundamentals in the London Foreign Exchange Market," *Economic Journal* 100:49-59
- Alreck, P.L. and R.B. Settle, 1985, *The Survey Research Handbook* (Richard D. Irwin Inc., Homewood, Illinois).
- Andersen, T.G. and T. Bollerslev, 1998, "DM-Dollar Volatility: Intraday Activity Patterns, Macroeconomic Announcements, and Longer Run Dependencies," *Journal of Finance* 53: 219-265.
- Bank for International Settlements, 1998, "Central Bank Survey of Foreign Exchange and Derivatives Market Activity in April 1998: Preliminary Global Data," *Press Release* (Basle: BIS, undated).
- Baxter, M., 1994, "Real Exchange Rates and Real Interest Differentials: Have We Missed the Business-Cycle Relationship?" *Journal of Monetary Economics* 33: 5-37.
- Bessembinder, H., 1994, "Bid-Ask Spreads in the Interbank Foreign Exchange Markets," *Journal of Financial Economics* 35, 317-348.
- Blinder, A.S., 1991, "Why Are Prices Sticky? Preliminary Results from an Interview Study," *American Economic Review* 81, 89-100.
- Bollerslev, T. and M. Melvin, 1994, "Bid-Ask Spreads and Volatility in the Foreign Exchange Market," *Journal of International Economics* 36, 355-372.
- Cai, J., Cheung, Y.-L., Lee, R.S.K., and Melvin, M., 1999, "'Once-in-a-Generation' Yen Volatility in 1998: Fundamentals, Intervention, and Order Flow, Mimeo (Arizona State University, August).
- Carlson, J. and C.L. Osler, 1996, "Rational Speculators and Exchange Rate Volatility," *Federal Reserve Bank of New York Staff Paper* 13 (May).
- Cheung, Y.-W., and K.S. Lai, 2000, "On the Purchasing Power Parity Puzzle," forthcoming, *Journal of International Economics*.
- Cheung, Y.-W. and Wong, C. Y.-P., 2000 "A Survey of Market Practitioners' Views on Exchange Rate Dynamics," forthcoming, *Journal of International Economics*.
- Chinn, M.D. and Frankel, J.A., 1994, "More Survey Data on Exchange Rate Expectations: More Currencies, More Horizons, More Tests," Paper presented at American Economic Association panel, AEA Winter Meetings, January 1995.
- Chinn, M.D. and Meese, R.A., 1995, "Banking on Currency Forecasts: Is Change in Money Predictable?" *Journal of International Economics* 38: 161-78.
- De Long, J.B., A Shleifer, L. Summers, and R. Waldmann, 1990, "Noise Trader Risk in Financial Markets," *Journal of Political Economy* 98, 703-738.

- DeGroot, M.H., 1975, *Probability and Statistics*, MA:Addison-Wesley Publishing Company.
- Dominguez, K.M. and J.A. Frankel, 1993, *Does Foreign Exchange Intervention Work? Consequences for the Dollar* (Washington, DC: Institute of International Economics).
- Dornbusch, R., 1976, "Expectations and Exchange Rate Dynamics," *Journal of Political Economy* 84: 1161-76.
- Economist, 1998, "Finance and Economics: Freefall," *Economist* 349(8089):78-79.
- Ederington, L. and J.H. Lee, 1993, "How Markets Process Information: News Releases and Volatility," *Journal of Finance* 48: 1161-1191.
- Edison, H.J., 1993, "The Effectiveness of Central Bank Intervention: A Survey of the Literature After 1982," *Special Papers in International Economics* #18 (Princeton, NJ: Princeton University International Finance Section).
- Edison, H.J., 1998, "On Foreign Exchange Intervention: An Assessment of the U.S. Experience," Mimeo (Washington, DC: Board of Governors of the Federal Reserve System).
- Eichengreen, B. and D. Mathieson, with B. Chadha, A. Jansen, L. Kodres and S. Sharma, 1998, "Hedge Funds and financial Market Dynamics," *Occasional Paper* 166 (Washington, DC: International Monetary Fund, May).
- Evans, M.D.D., 1998, "The Microstructure of Foreign Exchange Dynamics," Mimeo (Washington, DC: Georgetown University).
- Evans, M.D.D. and Richard K. Lyons, 1999, "Order Flow and Exchange Rate Dynamics," *NBER Working Paper* #7317.
- Federal Reserve Bank of New York, 1998, *Foreign Exchange and Interest Rate Derivatives Markets Survey Turnover in the United States* (New York: Federal Reserve Bank of New York, September 29th).
- Flood, R.P. and A.K. Rose, 1995, "Fixing Exchange Rates - A Virtual Quest for Fundamentals," *Journal of Monetary Economics* 36:3-37.
- Flood, R.P. and M.P. Taylor, 1996, "Exchange Rate Economics: What's Wrong with the Conventional Macro Approach?" in Frankel, J.A., G. Galli, and A. Giovannini, eds., *The Microstructure of Foreign Exchange Markets* (Chicago: University of Chicago Press), pp. 261-302.
- Frankel, J.A. and K.A. Froot, 1987, "Using Survey Data to Test Standard Propositions Regarding Exchange Rate Expectations," *American Economic Review* 77: 133-153.
- Frankel, J.A. and K.A. Froot, 1990a, "Chartists, Fundamentalists, and Trading in the Foreign Exchange Market," *American Economic Review* 90: 180-185.
- Frankel, J.A. and K.A. Froot, 1990b, "Chartists, Fundamentals, and the Demand for Dollars," in A.

- Courakis and M. Taylor, eds., *Private Behavior and Government Policy in Interdependent Economies* (Oxford: Clarendon Press), pp. 73-126.
- Frankel, J.A. and A.K. Rose, 1995, "Empirical Research on Nominal Exchange Rates," in G. Grossman and K. Rogoff, eds., *Handbook of International Economics*, Vol. III (Amsterdam: North-Holland), pp. 1689-1729.
- Frenkel, J.A., 1976, "A Monetary Approach to the Exchange Rate: Doctrinal Aspects and Empirical Evidence," *Scandinavian Journal of Economics* 78: 200-224.
- Frenkel, J.A., 1981, "Flexible Exchange Rates, Prices, and the Role of "News": Lessons from the 1970s," *Journal of Political Economy* 89: 665-705.
- Friedman, M., 1953, The Case for Flexible Exchange Rates, in M. Friedman ed., *Essays in Positive Economics* (Chicago: University of Chicago Press), pp. 157-203.
- Froot, K.A. and T. Ito, 1989, "On the Consistency of Short-run and Long-Run Exchange Rate Expectations," *Journal of the Japanese and International Economies* 8: 487-510.
- Froot, K.A. and K. Rogoff, 1995, "Perspectives on PPP and Long-Run Real Exchange Rates," in G. Grossman and K. Rogoff, eds., *Handbook of International Economics*, Vol. III (Amsterdam: North-Holland).
- Glosten, L. and P. Milgrom, 1985, "Bid, Ask, and Transactions Prices in a Specialist Market with Heterogeneously Informed Agents," *Journal of Financial Economics* 14: 71-100.
- Goodhart, C., T., 1988, The Foreign Exchange Market: A Random Walk with a Dragging Anchor, *Economica* 55, 437-460.
- Goodhart, C., T. Ito and R. Payne, 1996, "One Day in June 1993: A Study of the working of the Reuters 2000-2 Electronic Foreign Exchange Trading System," in Frankel, J.A., G. Galli, and A. Giovannini, eds., *The Microstructure of Foreign Exchange Markets* (University of Chicago Press, Chicago), pp. 107-179.
- Ito, T., 1990, "Foreign Exchange Rate Expectations: Micro Survey Data," *American Economic Review* 80(3): 434-449.
- Jorion, P., 1996, "Risk and Turnover in the Foreign Exchange Market," in Frankel, J.A., G. Galli, and A. Giovannini, eds., *The Microstructure of Foreign Exchange Markets* (University of Chicago Press, Chicago), pp.19-36.
- Kaminsky, G.L. and L.K. Lewis, 1996, "Does Foreign Exchange Intervention Signal Future Monetary Policy," *Journal of Monetary Economics* 37: 285-312.
- Lai, K.S. and P. Pauly, 1992, "Random Walk or Bandwagon: Some Evidence from Foreign Exchange in the 1980s," *Applied Economics* 24:693-700.
- Lyons, R.K, 1995, "Tests of Microstructural Hypothesis in the Foreign Exchange market," *Journal of*

- Financial Economics* 39, 321-351.
- Lyons, R.K., 1996, "Foreign exchange Volumen: Sound and Fury Signifying Nothing?" in Frankel, J.A., G. Galli, and A. Giovannini, eds., *The Microstructure of Foreign Exchange Markets* (Chicago: University of Chicago Press), pp. 183-201.
- Lyons, R.K., 1997, "A Simultaneous Trade Model of the Foreign Exchange Hot Potato," *Journal of International Economics* 42, 278-298.
- Lyons, R.K., 1998, "Profits and Position Control: A Week of FX Dealing," *Journal of International Money and Finance* 17: 97-115.
- Lucas, R., 1982, "Interest Rates and Currency Prices in a Two-Country World," *Journal of Monetary Economics* 10(3): 335-359.
- MacDonald, R.R. and Mark P. Taylor, 1993, The Monetary Approach to the Exchange Rate: Rational Expectations, Long Run Equilibrium and Forecasting," *IMF Staff Papers* 40: 89-107.
- Mark, N.C., 1995, "Exchange Rates and Fundamentals: Evidence on Long-Horizon Predictability," *American Economic Review* 85: 201-218.
- Mark, N.C. and Y. Wu, 1998, "Rethinking Deviations from Uncovered Interest Parity: The Role of Covariance Risk and Noise," *Economic Journal* 108: 1686-1706.
- McKinnon, R.I., 1976, "Floating Exchange Rates 1973-1974: The Emperor's New Clothes," *Carnegie-Rochester Conference Series on Public Policy* 3: 79-114.
- Menkhoff, L., 1998, "The noise trading approach - questionnaire evidence from foreign exchange," *Journal of International Money and Finance* 17: 547-564.
- Meredith, G. and M.D. Chinn, 1998, "Long Horizon Uncovered Interest Parity," *NBER Working Paper* #6797.
- New York Foreign Exchange Committee, 1997, "A Survey Assessing the Impact of Electronic Broking on the Foreign Exchange Market," mimeo (New York: Federal Reserve Bank of New York, November).
- Obstfeld, M., 1990, "The Effectiveness of Foreign-Exchange Intervention: Recent Experiences, 1985-1988," in W. H. Branson, J.A. Frenkel and M. Goldstein, eds., *International Policy Coordination and Exchange Rate Fluctuations* (Chicago: U. Chicago Press).
- Osler, C.L., 1998, "Short-term Speculators and the Puzzling Behavior of Exchange Rates," *Journal of International Economics* 45: 37-58.
- Perraudin, W. and P. Vitale, 1996, "Interdealer Trade and Information Flows in a Decentralized Foreign Exchange Market," in Frankel, J.A., G. Galli, and A. Giovannini, eds., *The Microstructure of Foreign Exchange Markets* (Univ. of Chicago Press, Chicago), pp. 73-99.

- Schinasi, G. and P.A.V.B. Swamy, 1989, "The Out-of-Sample Forecasting Performance of Exchange Rate Models When Coefficients Are Allowed to Change," *Journal of International Money and Finance* 8: 375-90.
- Sesit, M.R. and M. Pacelle, 1998, "Selling Blitz Hits Dollar 7.4% on Tokyo's Move: Hedge Funds Scramble in Bid to Cut Losses," *Wall Street Journal* (Oct. 8): C1.
- Shiller, R.J., K.-Y. Fumiko, and Y. Tsutsui, 1991, "Investor Behavior in the October 1987 Stock Market Crash: The Case of Japan," *Journal of the Japanese and International Economies* 5:1-13.
- Tanner, G., 1997, "A Note on Economic News and Intraday Exchange Rates," *Journal of Banking & Finance* 21:573-585.
- Taylor, M.P. and H. Allen, 1992, "The Use of Technical Analysis in the Foreign Exchange Market," *Journal of International Money and Finance* 11: 304-314.
- Wolff, C.C.P., 1987, "Time-Varying Parameters and the Out-of-Sample Forecasting Performance of Structural Exchange Rate Models," *Journal of Business and Economic Statistics* 5: 87-97.

Table 1
FX transaction Types

	Now	5 years ago
1.a Transactions Via		
Interbank	35.72% (25.00%, 27.38)	48.10% (50.00%, 22.00)
Traditional Brokers	17.16% (15.00%, 13.67)	49.79% (50.00%, 21.14)
Electronic Brokers	46.93% (50.00%, 25.32)	2.10% (0.00%, 4.96)
1.b Nature of Business		
Interbank Business	63.65% (70.00%, 26.85)	66.49% (70.00%, 26.85)
Customer Business	36.34% (30.00%, 25.41)	33.50% (30.00%, 22.86)

NOTE: Figures are arithmetic averages of responses. The median response and standard error of responses are reported in parentheses under the average response.

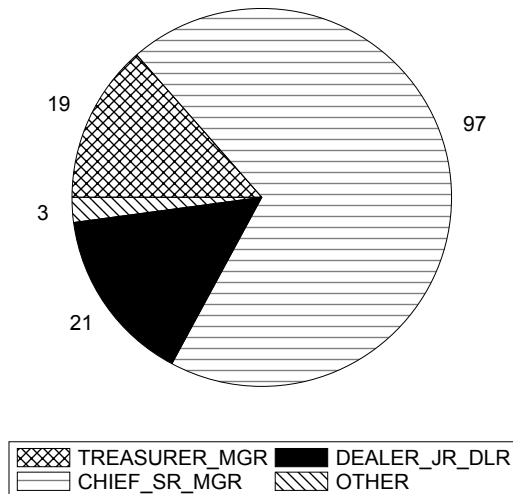


Figure 1.a: Respondent's Position

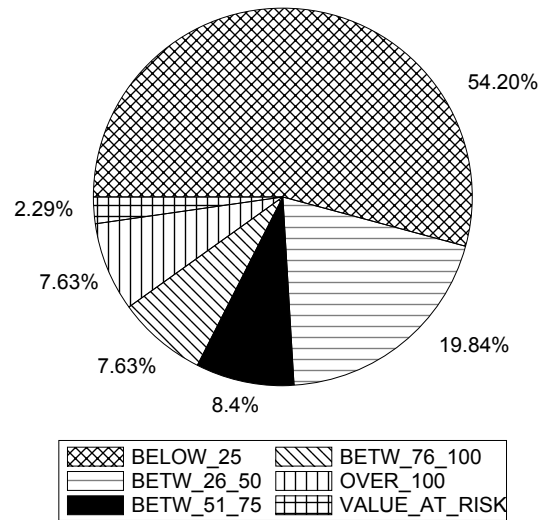


Figure 1.b: Daytime Position Limit (in millions of US\$)

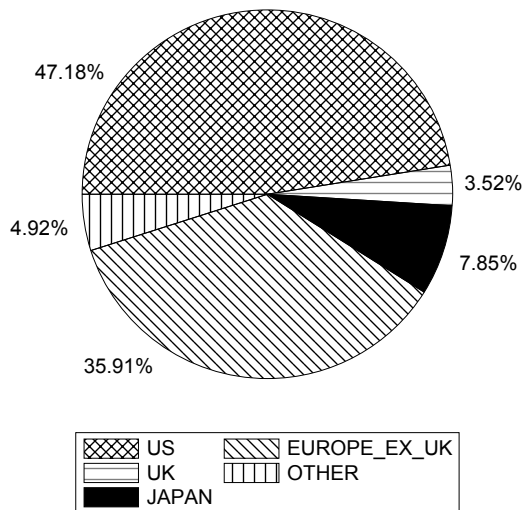


Figure 1.c: Headquarters Location

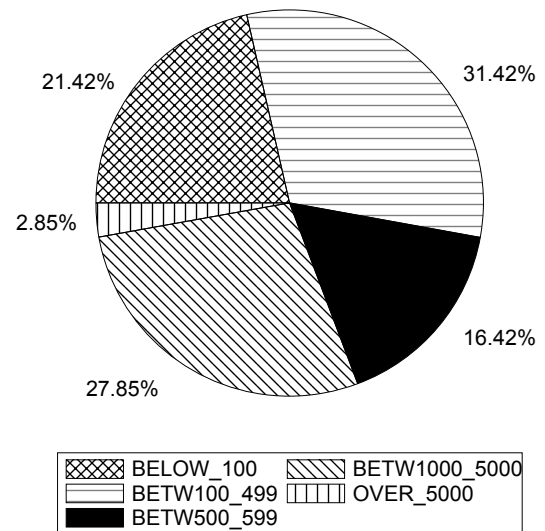


Figure 1.d: Average Daily Turnover of the Organization (in millions of US\$)

NOTE: Figure 1.a reports the number of respondents under each of the listed job capacities. Other figures present the percentages of respondents who select the listed choices. For some questions, the component frequencies of a category do not sum to one due to rounding. In some cases, there are multiple responses or incomplete replies.

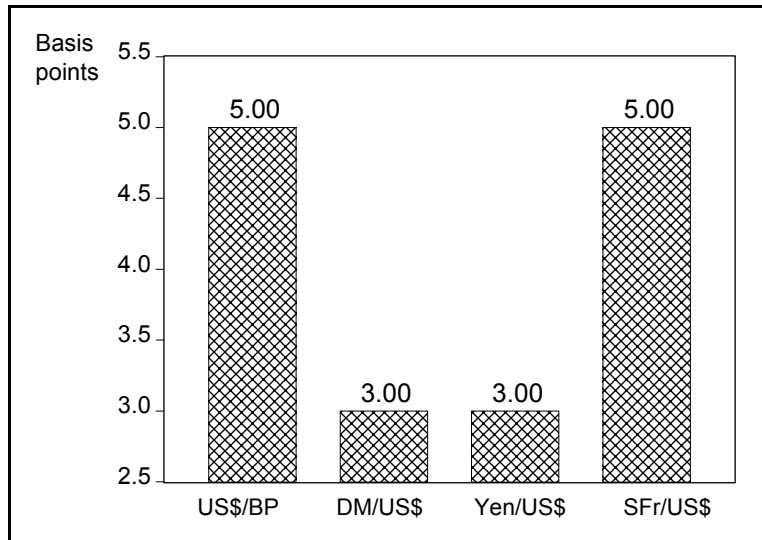


Figure 2.a: Conventional Interbank Bid-Ask Spread (in points, mode).

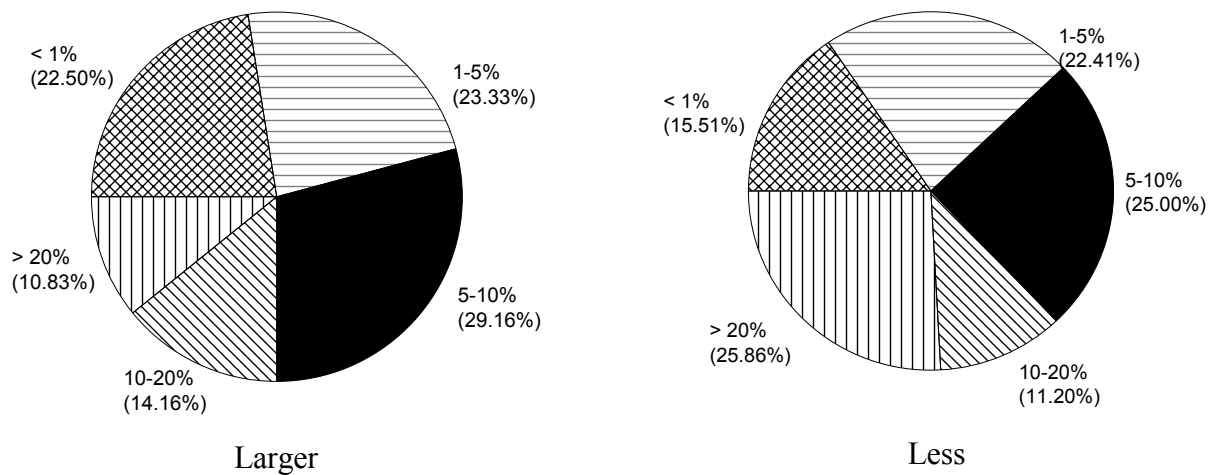


Figure 2.b: Frequencies of Quotes Different from the Convention

NOTE: The number in the parentheses gives the proportion of respondents indicating the percentage of their quotes (e.g., 5-10%) that are larger, or less, than the conventional spread.

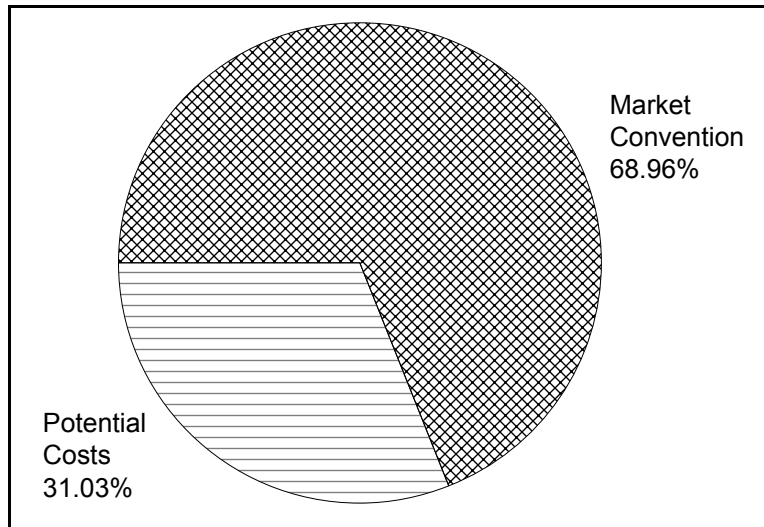


Figure 2.c: Choice of Interbank Bid-Ask Spread

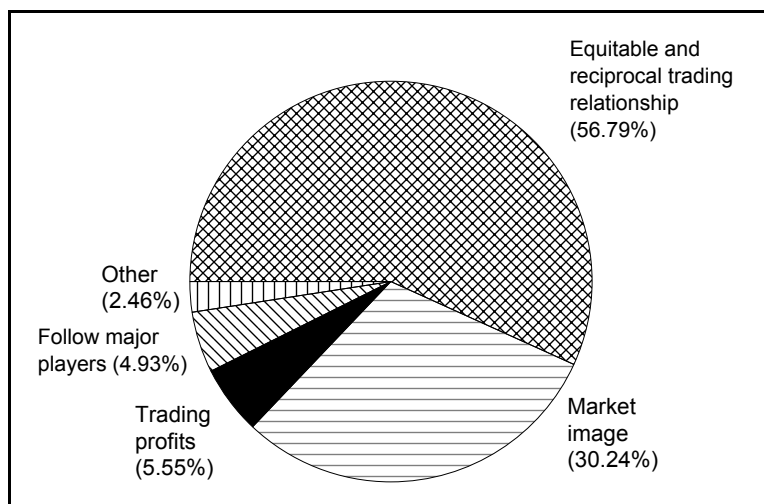


Figure 2.d: Reasons for Deviating from the Market Convention

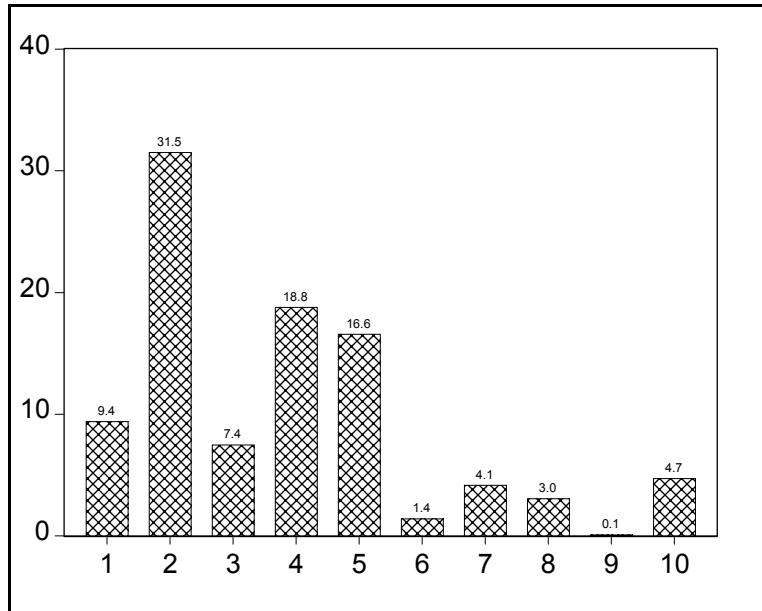


Figure 2.e: Reasons for Deviating from the Market Convention

Key

- Reason 1: Thin/Quiet Market
- Reason 2: Thin/Hectic Market
- Reason 3: Unexpected Change in Market Activity
- Reason 4: Before/After a Major News Release
- Reason 5: Increased Market Volatility
- Reason 6: A Position against the Market Trend
- Reason 7: Quote for Small Bank
- Reason 8: Quote for Informed Trading Bank
- Reason 9: Costs of Keeping the Position
- Reason 10: Wide-Spread Quote from a Counterparty

NOTE: Figure 2.a reports, for each exchange rate, the mode of bid-ask spreads indicated by respondents. Other figures present the percentages of respondents who select the listed choices. For some questions, the component frequencies of a category do not sum to one due to rounding. In some cases, there are multiple responses or incomplete replies.

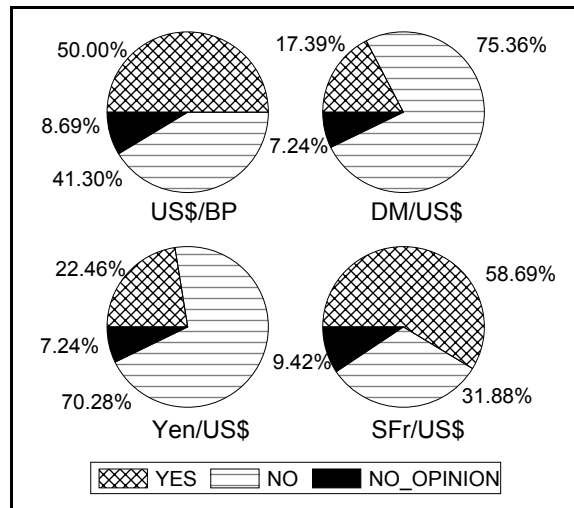


Figure 3.a: Do Dominant Players Exist in the Major Markets?

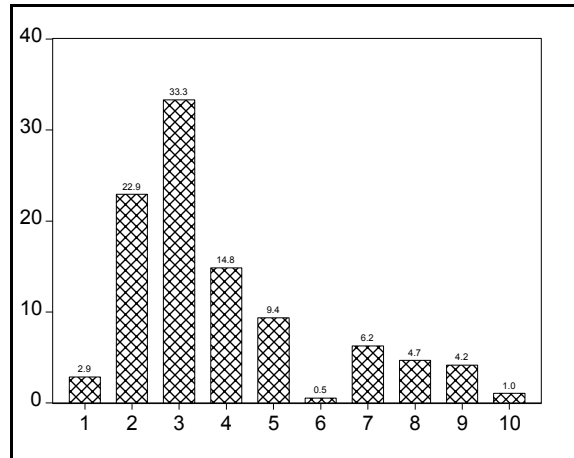


Figure 3.b: Competitive Advantage for Large Players

Key:

- Reason 1: Lower Costs
- Reason 2: Better Information
- Reason 3: Large Customer Base
- Reason 4: Deal in Large Volumes
- Reason 5: Ability to Affect Exchange Rates
- Reason 6: Smaller Counterparty Risk
- Reason 7: Ability to Offer New FX Products
- Reason 8: Accessing the Global Trading Network
- Reason 9: Experienced Traders
- Reason 10: Others

NOTE: The percentages of respondents in each category are reported. For some questions, the component frequencies of a category do not sum to one due to rounding. In some cases, there are multiple responses or incomplete replies.

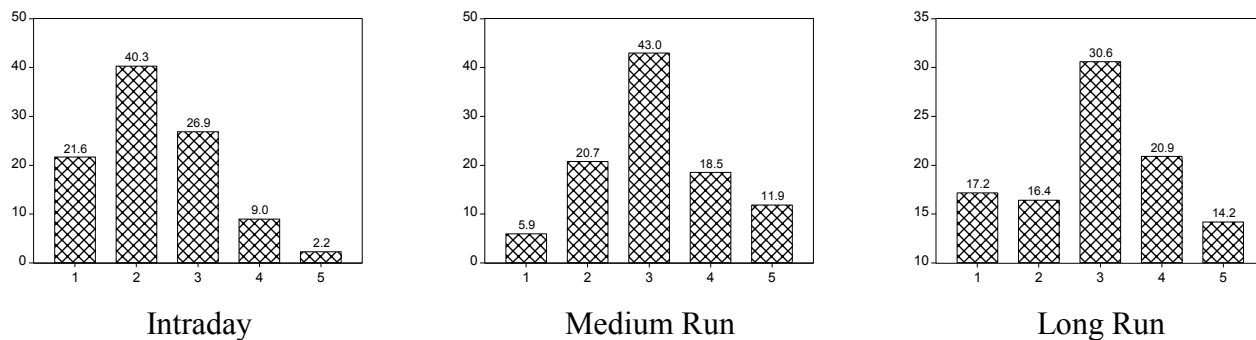


Figure 4: Predictability

NOTE: The percentages of respondents in each category are reported. For some questions, the component frequencies of a category do not sum to one due to rounding. In some cases, there are multiple responses or incomplete replies. "Medium-run" refers to periods shorter than six months while "long-run" refers to periods longer than six months. For the 1-5 scale, 1 indicates no predictability and 5 indicates high predictability.

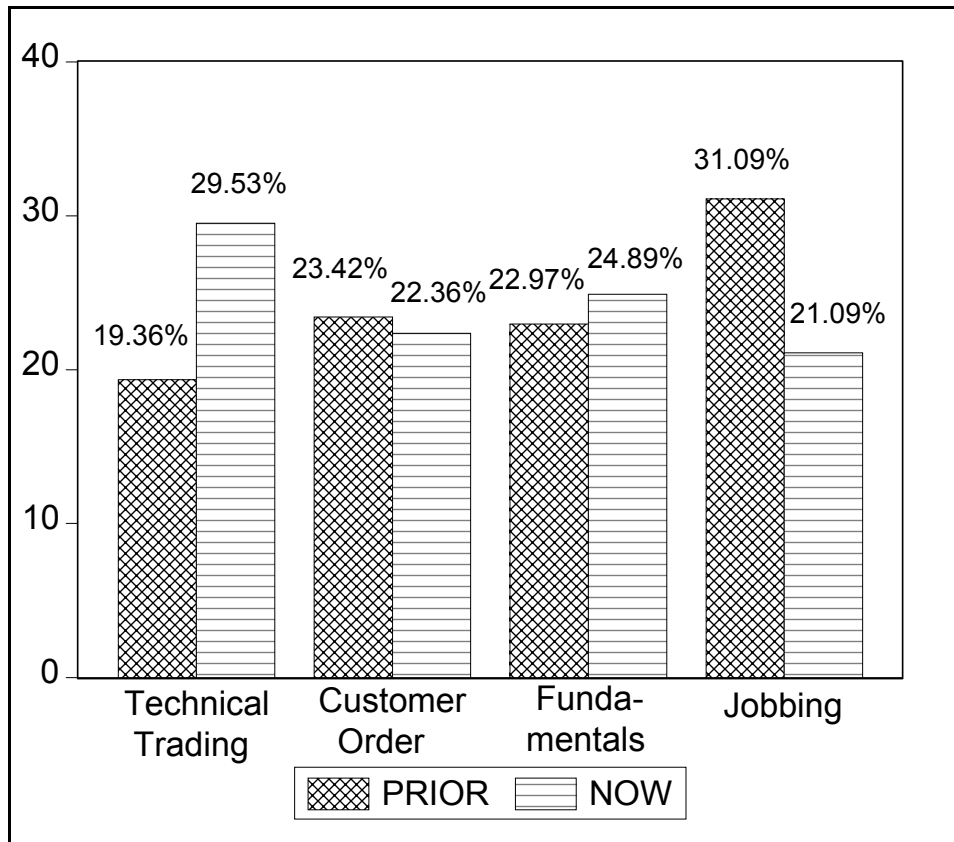


Figure 5: Spot Foreign Exchange Trading Method, Five Years Ago versus Today

NOTE: The percentages of respondents in each category are reported. The component frequencies of a category do not always sum to one due to rounding. In some cases, there are multiple responses or incomplete replies.

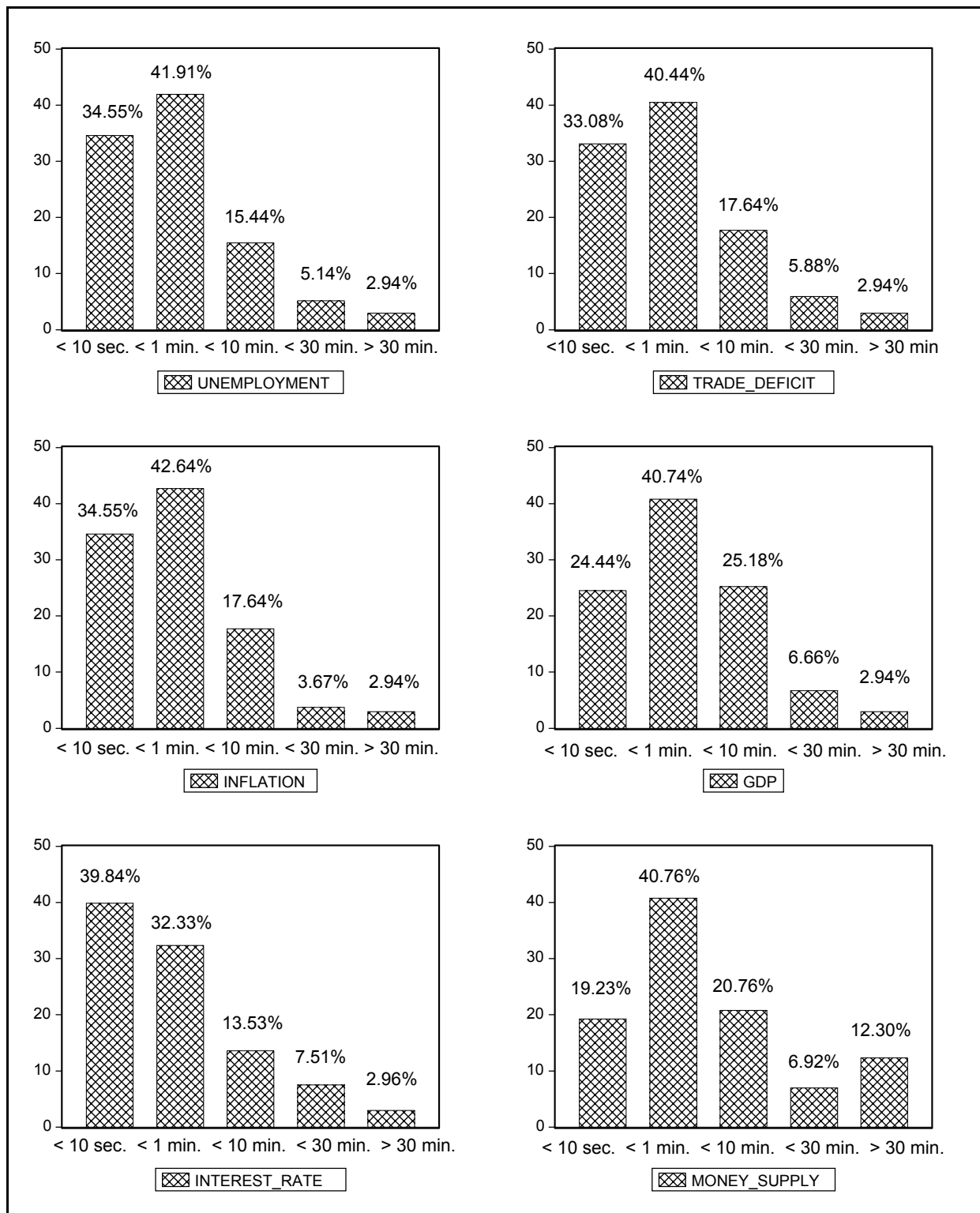


Figure 6: Adjustment to the Unexpected Component of Economic Announcements

NOTE: The percentages of respondents in each category are reported. For some questions, the component frequencies of a category do not always sum to one due to rounding. In some cases, there are multiple responses or incomplete replies.

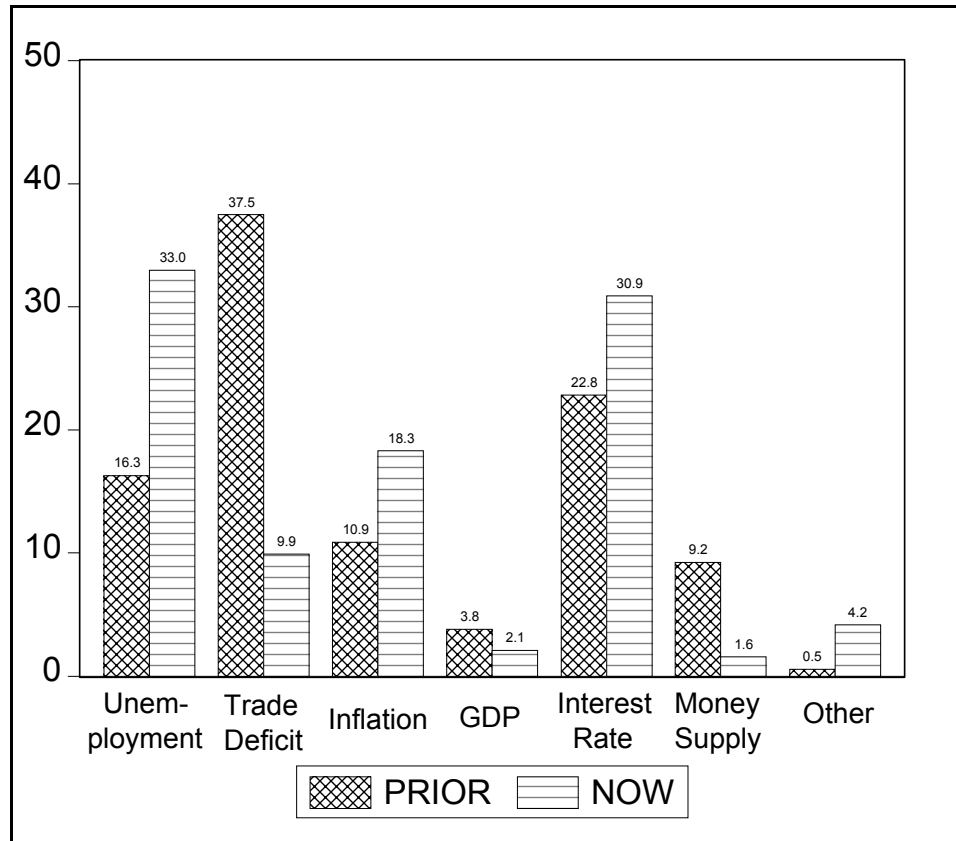


Figure 7: Effects of Economic Announcements on the Foreign Exchange Market, Five Years Ago versus Now

NOTE: The percentages of respondents in each category are reported. For some questions, the component frequencies of a category do not always sum to one due to rounding. In some cases, there are multiple responses or incomplete replies.

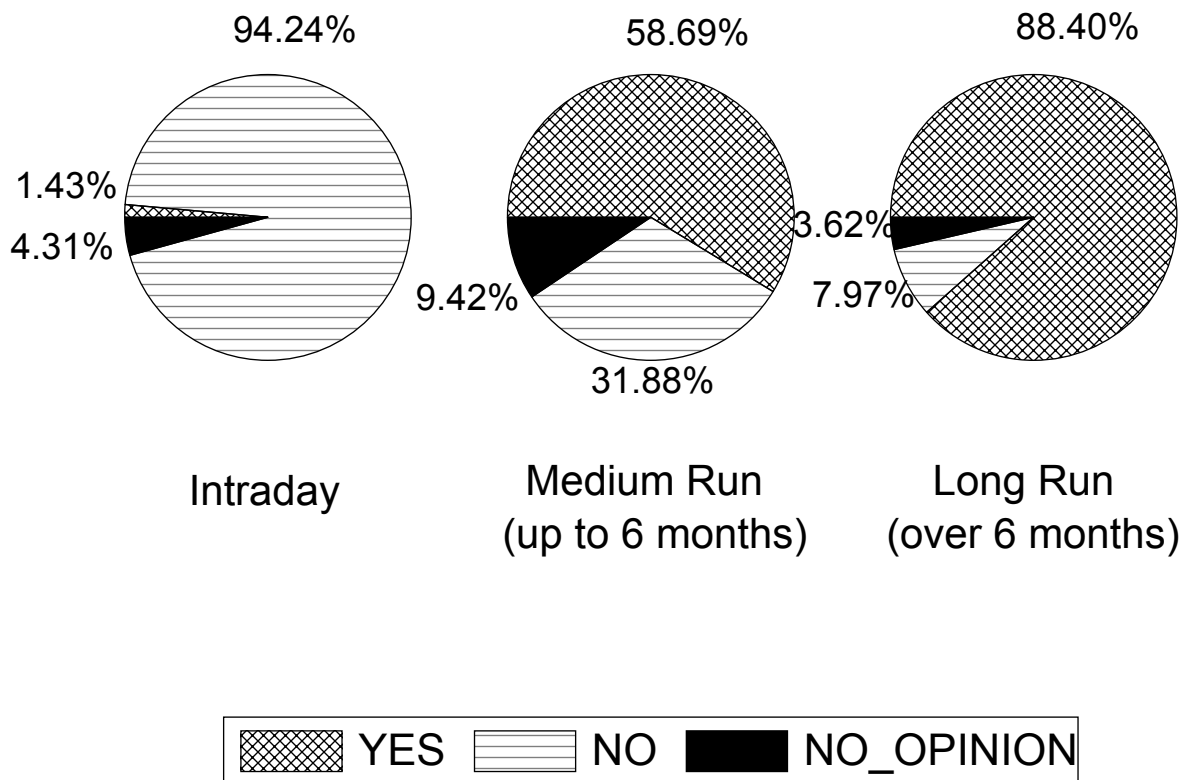
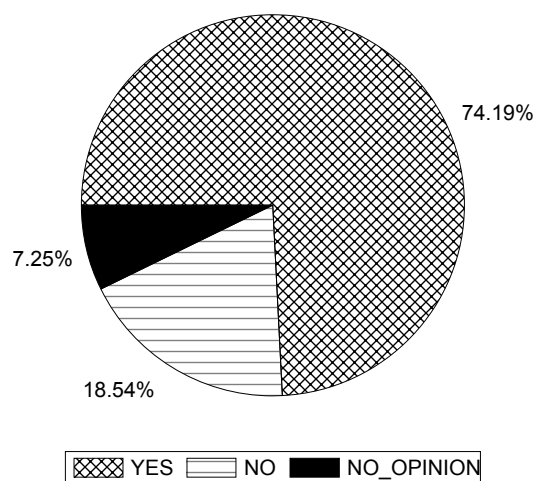
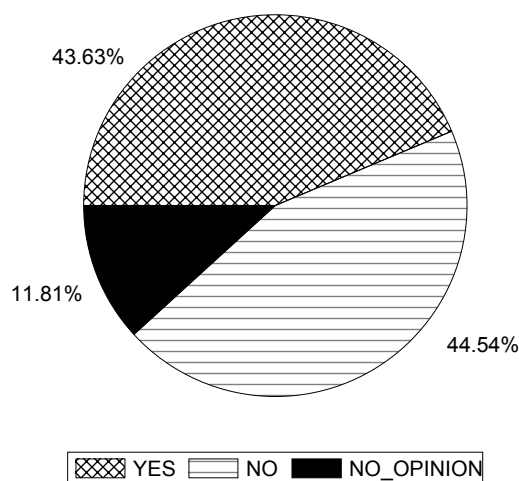


Figure 8.a: Do Exchange Rate Movements Reflect Changes in the Fundamental Value?

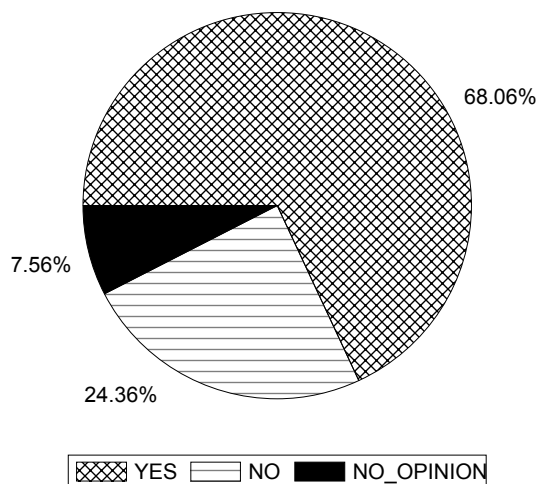
NOTE: The percentages of respondents in each category are reported. For some questions, the component frequencies of a category do not always sum to one due to rounding. In some cases, there are multiple responses or incomplete replies.



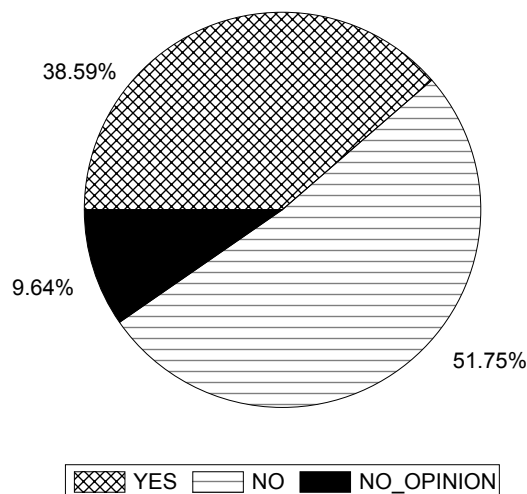
Excess Speculation



Major Trading Bank Manipulation



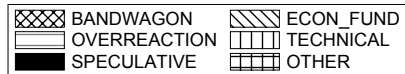
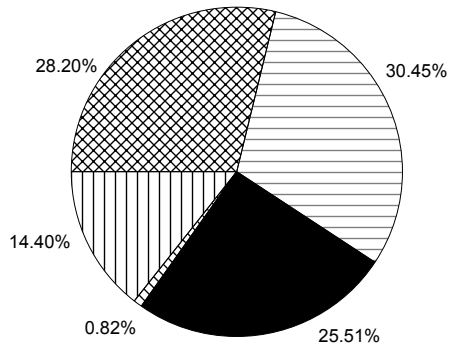
Institutional Customer/Hedge Fund Manipulation



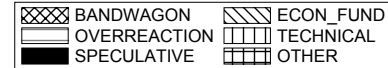
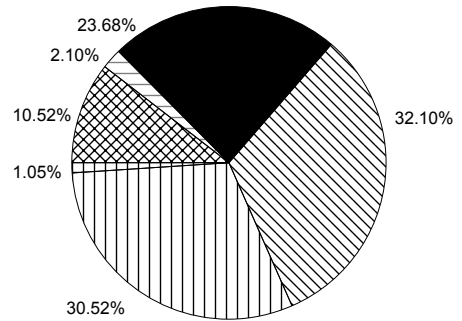
Excessive Central Bank Intervention

Figure 8.b: Reasons Exchange Rate Movements Do Not Reflect Changes in the Fundamental Value

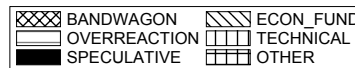
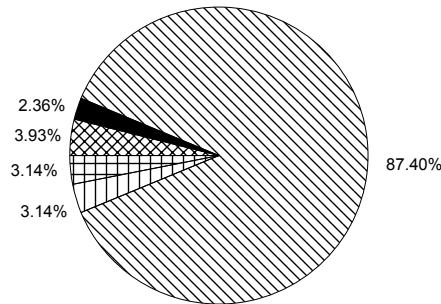
NOTE: The percentages of respondents in each category are reported. For some questions, the component frequencies of a category do not always sum to one due to rounding. In some cases, there are multiple responses or incomplete replies.



Intraday



Medium Run (up to 6 months)



Long Run (over 6 months)

Figure 8.c: Factors Determining Exchange Rate Movements

NOTE: The percentages of respondents in each category are reported. For some questions, the component frequencies of a category do not sum to one due to rounding. In some cases, there are multiple responses or incomplete replies.

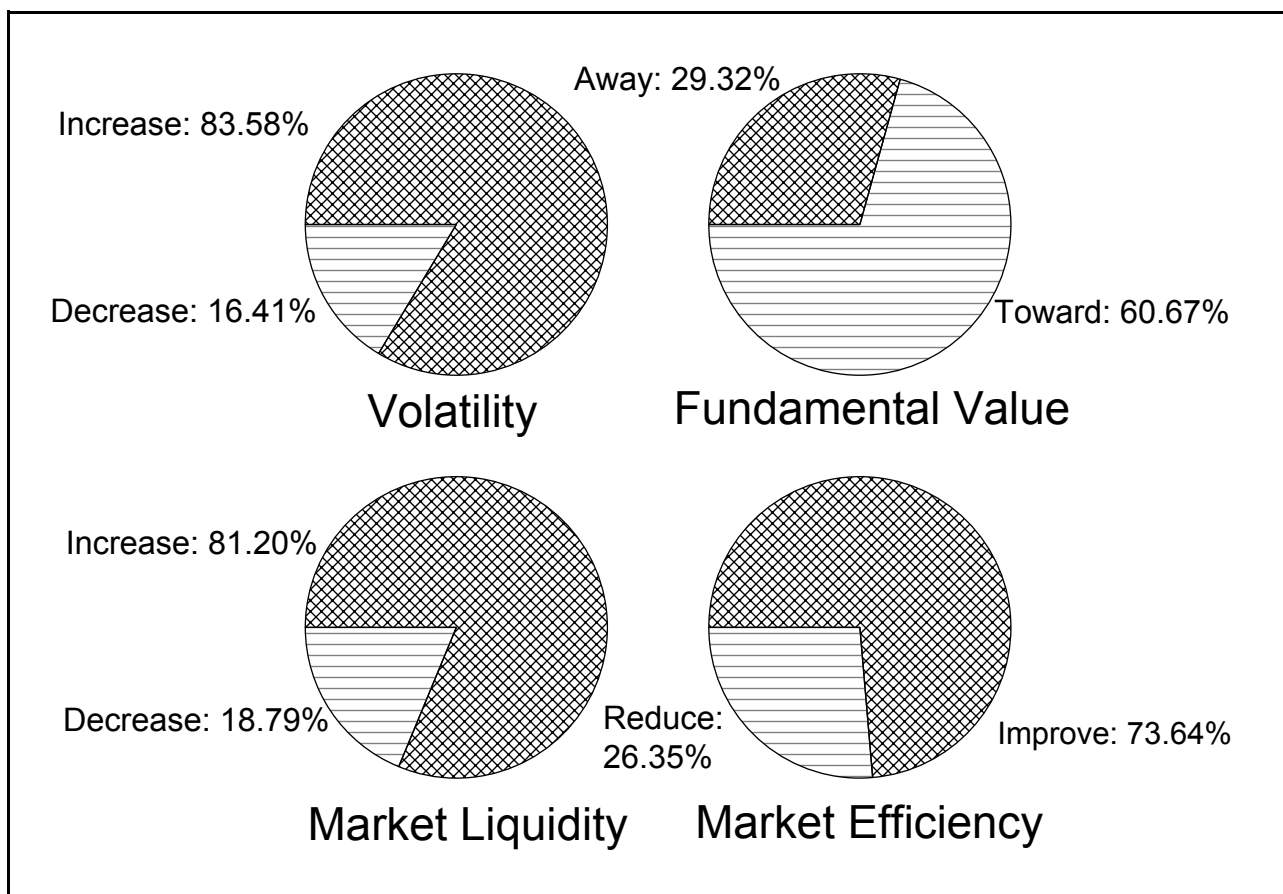


Figure 9: Effects of Speculation

NOTE: The percentages of respondents in each category are reported. For some questions, the component frequencies of a category do not sum to one due to rounding. In some cases, there are multiple responses or incomplete replies.

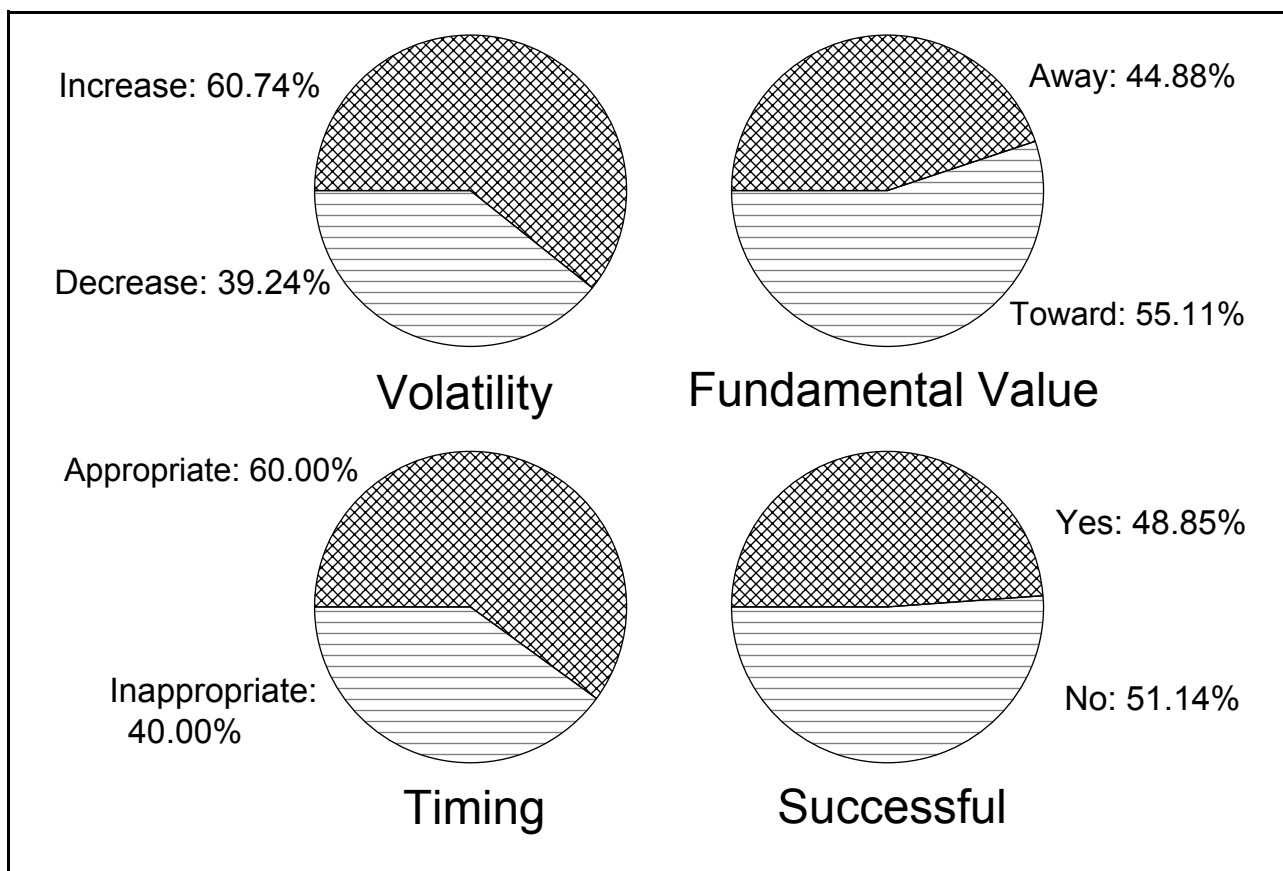


Figure 10: Effects of Central Bank Intervention

NOTE: The percentages of respondents in each category are reported. For some questions, the component frequencies of a category do not sum to one due to rounding. In some cases, there are multiple responses or incomplete replies.

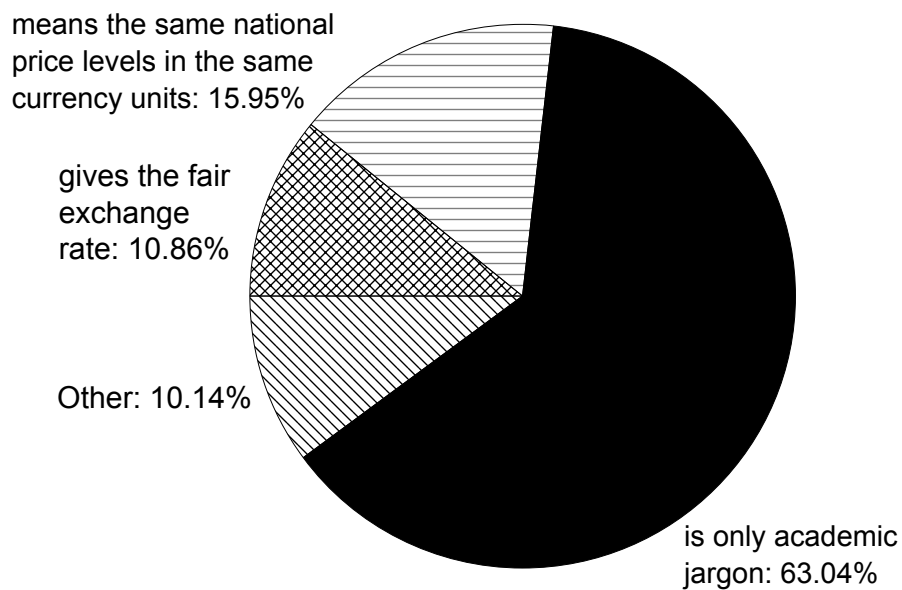


Figure 11.a: PPP

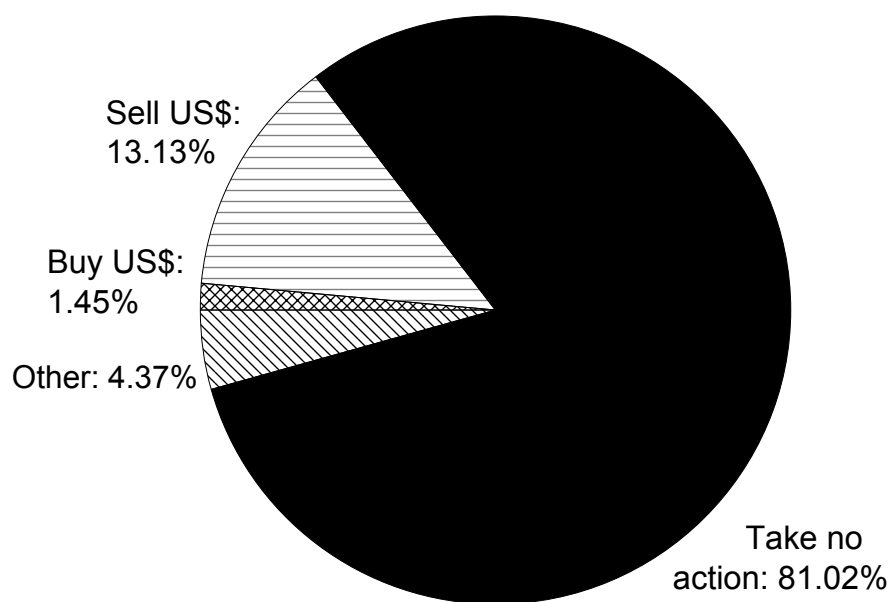


Figure 11.b: Action in Response to a PPP Overvaluation of the US\$:

NOTE: The percentages of respondents in each category are reported. For some questions, the component frequencies of a category do not always sum to one due to rounding. In some cases, there are multiple responses or incomplete replies.

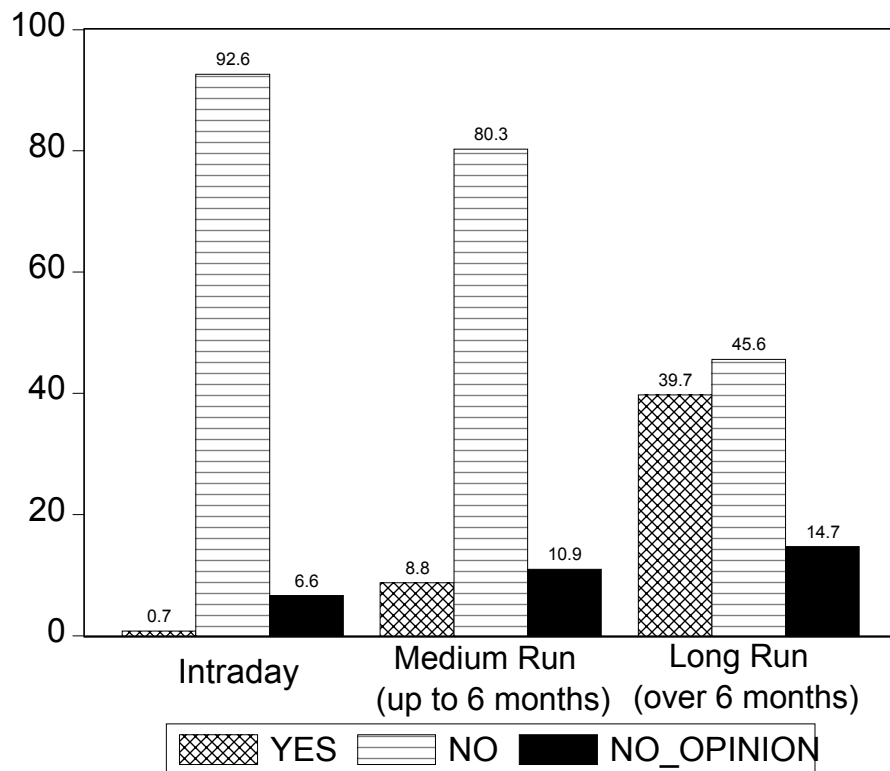


Figure 11.c: Does PPP Predict Exchange Rate Movements?

NOTE: The percentages of respondents in each category are reported. For some questions, the component frequencies of a category do not always sum to one due to rounding. In some cases, there are multiple responses or incomplete replies.