Macroeconomic Fundamentals and Exchange Rate Dynamics in India: Some Survey Results

By

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Abstract

The present study examines the relevance of macroeconomic models in exchange rate determination in India. For this, the study has undertaken a primary survey, with the help of structured mailed questionnaire, on the Indian foreign exchange dealers to understand the dynamics of the market. The sample of the study is 91 dealers (24% of the total dealers). The findings from the primary survey is that majority of the dealers feel in the short and medium term, the changes in exchange rate is not influenced by the changes in macro fundamentals, rather is basically influenced by the micro variables like order flow, market movement, speculation, Central Bank intervention etc.. But in the long run, still it is the macro fundamentals that determines the exchange rates. Another interesting finding of this study is that the dealers feel speculation would increase volatility, liquidity and efficiency in the market and on the other hand, central bank intervention reduces volatility and market efficiency.

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Introduction

In the area of international economics, one of the basic issues that were not resolved till now is what are the determinants of exchange rate? Many approaches to explain and forecast the changes in exchange rates have been developed. However, these approaches have had little a success in explaining currency movements only in the long-term. After the seminal work of Meese & Rogoff (1983), who concluded that forecasts based on monetary approach to exchange rate determination could not out-perform the random walk forecasts, the macro models lost its allure. Even after almost twenty years of this finding, there is no such claim that theories based on fundamentals can provide best forecasts for the exchange rate movement (see Mark, 1995; Mark & Sul, 2001; Cheng, Chinn & Pascual, 2002; and Chinn & Meese, 1995, Evans & Lyons, 1999).

In a recent paper by Neely & Sarno (2002) one important question was raised: why should macro fundamentals forecast exchange rate movement? There is a need to address this very basic issue to strengthen the research in exchange rate economics and also to lay the future direction for this area. Assuming exchange rate forecast is necessary to the policy makers to determine output and inflation and to the fund managers for their asset allocation, Neely & Sarno (2002) argue that instead of forecasting exchange rates through fundamentals, the agents can directly predict output, inflation and uncovered interest rate parity (UIP). Here comes the role of time horizon. As exchange rate is an output derived out of market behaviour, merely concluding that exchange rate follows a random walk would mean that the market forces behind this rate are erratic. This is a conclusion to be contested and to be answered both at theoretical and at empirical level. On the other hand, over dependence on macro theories that it can explain and forecast exchange rates near-accurately at all time horizons is also not completely acceptable. In the short-run, the recent studies, particularly after the introduction of on-line trading systems that made the tick-by-tick (high frequency) data available, have shown that macroeconomic fundamentals are barely useful in predicting the rate movement (see Sarno & Taylor, 2001, for the survey). Hence, there is a need to search for some factors that can explain the exchange rate movement based on the time horizon. In this paper we would try to investigate the factors that determine the exchange rate

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in different time horizons with the help of primary information from the foreign exchange dealers.

This paper is organised as follows. In section II, we discuss alternative theories on asset price determination in the literature. Section III covers some review of empirical literature. In Section IV we laid down the specific objectives of this study. Section V discusses the empirical findings. Accordingly the conclusions are drawn in the last section.

Section – II

In the international economics literature, there are several macro models that deal with exchange rate determination (see Gandolfo, 2001 for detailed discussion on the macro models). One can observe from all these approaches that it considers only macro variables such as relative incomes, relative prices, relative interest rate differentials, relative cumulated current account balances etc. But in practice, do the market participants (dealers) consider only macro economic fundamentals such as these or any other variables (that are micro in nature)? Particularly, in the short run, "market participants do not in fact all use a common agreed-upon model for thinking about the foreign exchange market and do not all share the same expectations at any point of time." (Frankel & Froot, 1996).

Now the question is, in the short run, what are the factors that affect the dealers' decision-making? In the literature it was found that more than macroeconomic fundamentals, the dealers consider other variables that are micro in nature (Lyons, 1995). The micro variables are bid-ask spreads, trading volume, own volatility, nonsynchronous trading, information (both private and public), inventory cost, etc. In the financial market literature, to study the behaviour of asset prices and the market participants the researchers mostly use the *microstructure theory,* which is the only theory that considers all the micro variables.

Market microstructure theory is defined as the study of the process and outcomes of exchanging assets (i.e., currency, stock, etc.) under explicit trading rules (O'Hara, 1995). Basically, it consists of two models *viz.,* the inventory model and the information model. The crux of the inventory model is the problem of optimisation as the dealers' objective is to maximise expected profit per unit of time. This model also explains the relationship between the transaction cost and the bid-ask spreads. Information models, which are based on the

adverse selection problems, also explain the behaviour of market prices through information contents of the traders. Since there exist asymmetries of information between the dealers, their behaviour in making the quote will be different. These information models explain how the equilibrium market prices emerge in the presence of asymmetric information.

In microstructure theory there are two variables that play centre stage, which had no role in the macro approach. They are: (a) Order flow (b) Bid-ask spread. Both these variables are synonymous with the 'quantity' and 'price' in traditional microeconomics. Order flow, as used in microstructure theory, is a variant of a key term in microeconomics, "effective demand". It measures the net buyer-initiated orders and seller-initiated orders. Here the word 'initiated' is very important in differentiating between order flow and the effective demand. In microstructure theory, orders are initiated against a dealer. The dealer stands ready to absorb imbalances between buyers and sellers. These 'uninitiated' trades of the dealer account for the wedge between these two concepts. The application of this theory to exchange rate behaviour has gained momentum particularly after the introduction of *Reuters Broking system*, which provides the tick-by-tick data on the rate quotes.

In conclusion we can say there are two distinctive approaches in exchange rate determination, which we put in a flowchart below.

Exchange Rate Determination
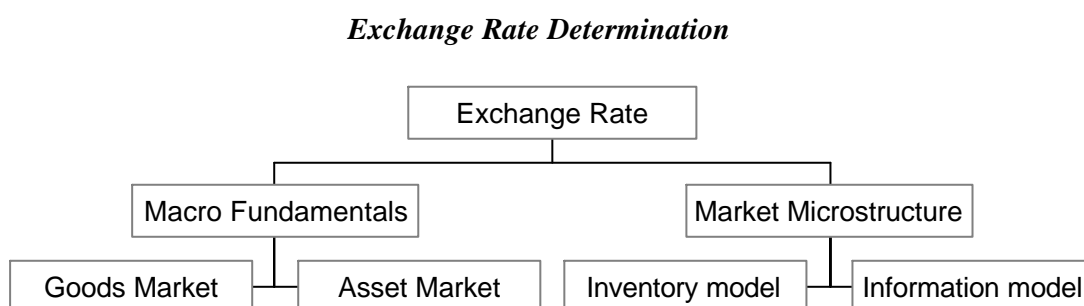
There were some research works that tried to merge both approaches. But the differences in the frequency of data used in these approaches were a major hindrance for research towards this direction.

Given this theoretical background, the present study tries to examine the relevance of macro fundamentals in the Indian foreign exchange market. A study of this kind has assumed importance in the Indian context particularly after 1991. With the introduction of economic

reforms, particularly in the financial sector and foreign investment, volatility in exchange rates may be more intense especially due to opening up of markets, increasing business of multinational enterprises, increasing foreign institutional investments, full convertibility on current account. Now that there is a talk of full convertibility on capital account also, it is very important to understand the exchange rate dynamics.

Section III

Review of literature

After the publication of Messe & Rogoff (1983) there were number of studies that tried to explain the behaviour of exchange rates only in terms of macro fundamentals. But in the beginning of 1990s, which coincides with the introduction of trading systems like Reuters and Telerates through which the market participants, mostly banks, can complete their transactions electronically in a short span, the studies on microstructure approach to exchange rates have begun.

One of the basic studies in this area is Goodhart & Figliuoli (1991). In this study, for the first time, high frequency data on exchange rates has been analysed and many issues have been raised for further research in this area. But the application of microstructure theory to exchange rates was initiated with a pioneering study by Lyons (1995). Till date there are few studies that applied microstructure theory but to the leading exchange rates like US dollar/UK Pound, deutsche mark/US dollar and Japanese Yen/US dollar. The review of some of the important studies can be found in Bhanumurthy (2003).

It is observed from the literature survey that the study on micro issues in foreign exchange market is limited to three major currencies and also on the information models. Only one study (Evans & Lyons (1999)) has tried to establish the relative importance of theories based on macro fundamentals and microstructures, were it was concluded that compared to macro fundamentals, micro variables have more significant impact on the exchange rate movement. But this kind of analysis would be incomplete if the perceptions of traders, who are the real decision makers in the market, about the importance of macro fundamentals in determining the exchange rates are not taken into account. Cheung & Chinn (1999) has recognised this issue and undertaken a survey on foreign exchange dealers in the United States. This study probes the causes and determinants of bid-ask spreads and the predictability of exchange rates

in the short-run. It was found that majority of traders responded that predictability of exchange rate changes is very low in the intra-day. And in the medium and long run more than two-thirds of the traders view that exchange rates cannot be predicted. Though this study did not focus on the factors that determine exchange rates over the time horizon, this is the beginning of the survey-based studies in the foreign exchange market.

In continuation of the above study, Cheung, Chinn & Marsh (2000) have done a survey on UK based foreign exchange dealers in 1998. This study focuses on three aspects: 1) the microeconomic operation of the foreign exchange market; 2) the beliefs of dealers regarding the importance of macroeconomic fundamentals in understanding exchange rate movements; and 3) microstructure variables in the foreign exchange market. The study found that majority of the dealers view non-fundamental factors dominate the short-term exchange rate movements. Alternatively, it was found that speculation is an important factor in the short-term market. Further, the dealers believe that fundamentals have significant effects on exchange rates in much shorter time than what the macro theorists' expect to be. Regarding the concept of purchasing power parity, the study concludes that though the dealers accept it as a representative of exchange rate's fundamental value, but the trading would not be based on this. Lastly, market convention has been found as an important determinant of bid-ask spread.

Cheung & Wong (2000) extended this survey to Hong Kong, Tokyo and Singapore foreign exchange markets. The findings of this study corroborates to the findings of Cheung, Chinn & Marsh (2000) that the short term exchange rate dynamics depend more on non-fundamental factors rather than on fundamentals. One extension of this study from Cheung, Chinn & Marsh (2000) is that it tried to examine the impact of speculation and central bank intervention on the short-run market movements. It was found that both increases market volatility. Also it was found that speculation increases liquidity and efficiency in the market while central bank intervention helps to restore equilibrium. Taking queue from the above empirical and survey based studies; the present study tries to undertake similar exercise in the Indian context.

Section IV

Objectives of the study

It may be noted that in the RBI's *Report on Currency & Finance, 1999-2000* (page IV-18-19), the Central Bank has raised the issue of studying the foreign exchange behaviour in a market microstructure framework. The apex bank seems to understand that the movements in the macro fundamentals may not back exchange rate movement in India. With the help of secondary data we have showed elsewhere that in the short run, more than macro fundamentals, micro variables play a major role in determining the INR/USD exchange rate (Bhanumurthy, 2003). With these results in the background, here we try to discern dealers' perception regarding the market movement and the forces behind it in the case of Indian foreign exchange market with the help of structured questionnaire survey.

The specific objectives of the present study would be as follows: 1) to test the importance of both macro and micro variables in determining exchange rate movements in different time horizons by using primary information; 2) to find out the predictability of exchange rates in different time horizons; 3) to analyse the effects of speculation and Central Bank intervention on the rate movement.

Section V

Empirical results based on primary survey

Structured questionnaire has been prepared and mailed to the foreign exchange dealers, who are registered with the Foreign Exchange Dealers' Association of India (FEDAI)[1]. We have also visited, discussed, and collected information from some of the leading foreign exchange dealers in Mumbai, Chennai, Bangalore and Delhi. In India, foreign exchange dealing rooms are located in seven cities (Ahmedabad, Bangalore, Chennai, Delhi, Kolkatta, Kochi, and Mumbai). But it has been observed that most of the operations has been undertaken by the banks in Mumbai, Chennai, and Bangalore.

Some of the dealing rooms in Mumbai, Chennai, Bangalore and Delhi were visited and held discussions with dealers and got the questionnaires filled. For the remaining dealers

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[1] Though there are some private primary dealers in the market, in this study we have covered dealers from the banks only.

questionnaires have been mailed. At the end we got responses from 91 dealers (around 23.3% of total). For a study of this type 23% would be a very good response. One of the problems that the researcher faced in getting the responses was that from most of the dealing rooms, where there are many dealers, the response was one or maximum of two. The reason for this poor response is due to the dealer's assumption that all the dealers in a dealing room would have same perception and make same decisions. But to the surprise of the researcher, it has been found that, wherever the responses are more than one from a single dealing room, no two dealers from same bank have same perception and posses same decision-making principle.

Distribution of the sample (spatial and dealers' profile)

For this study, we could collect information from 91 dealers. About two-thirds (61.5%) of the sample is from Mumbai. Chennai and Delhi consists of 17.6% and 9.9% respectively. From other cities like Bangalore and Kochi, we could get only 9 samples. We could not get any response from Ahmedabad.   The profile of the samples includes Managers, Treasurers, Chief/Senior dealers, and dealers/junior dealers. Large portion of the sample (about 49.5%) are dealers/junior dealers. Chief/Senior dealers are about 40.7%. We got only 9 responses from the Managers/Treasurers. In terms of experience, around 57% of people are having less than five years of experience and around 37% people have between 6 to 10 years and the remaining 6% have more than 10 years of experience. We have adopted this distribution basically to capture the changes in the trading systems and strategies over five-year period.

Daily dealing and bid-ask spread

We have also collected the information regarding volume of transaction of the bank so as to determine the size of the bank.   Given the sensitivity of this information, we could get responses only from 69 dealers (about 75%). It is also observed that most of the deals are in Indian Rupee-US dollar market and other foreign currencies like Euro are traded in crosses with US dollar. The range of dealing is found to be very large (minimum is US$ 0.5 million and maximum US$500 million). It was found that around 45% of the responded banks have a daily dealing between 10 to 50 million US dollars. Interesting aspect one can find from this chart is that about 19% banks have a daily dealing of more than 50 millions. This shows how important to study the India foreign exchange market.

The study tries to examine the basis of foreign exchange trading in India. In doing so the data on current trading and the trading five years ago has been collected from the banks. It has been found that five years ago the foreign exchange was traded mostly to adjust the changes in fundamentals and complete the customer orders. But after five years there seems to be a significant shift from these trades to the trading based on technical factors. (Over last five years technical trading has increased substantial from 33% to 62%, whereas trading based on customer orders have declined significantly from 42% to 25%).

Another important aspect of this study is to know what are the determinants of bid-ask spread of the quotations. It has been found that majority of the respondents (around 70%) determine their spreads based on the market convention and around 21% determine based on their potential costs of making the quote. But the information on spreads in Rupee/USD market shows a different picture. About 60% dealers quote the spread of half a paise and about 23% of dealers quote one paise spread. Also the discussions with the dealers found that though the spreads are quoted on the basis of market convention, the conventional spread is not the same across the banks.

Market convention and spreads

For a smooth functioning of the market, it is necessary that the bid-ask spreads quoted should follow the market convention. If both differ, then it may lead to or led by some factors that are exogenous to the market, like unexpected changes in the fundamentals, political news, etc. In this study we find mixed results (see chart-7). There are 30% of dealers who has less than 5% of their quotes larger than conventional spread. In the same way there are 22% dealers who has less than 30% of their quotes smaller than conventional spread.

But why should the dealers quote their spreads different from conventional one? Or conversely, why should the dealers quote the conventional spread? For the first question, more than 30% of the dealers answered that the presence of increased market volatility, holding position against the market trend, and unexpected change in the market activity due to various reasons are the prime factors (see chart-8). For the second question, more than 45% of the dealers felt that securing a good market image of the bank and maintaining reciprocal relationship with other banks are the main reasons (see chart-9).

Determination of exchange rates

One of the important questions this study address is what are the factors that determine exchange rates in any economy? In the area of international money and finance, there are many theories that explain the exchange rates. But are these theories helpful in practical trading? To answer this, we have asked the dealers what are the important factors that determine exchange rates over time horizon (like intra day, medium run, and the long run). It is interesting to note that in the intra day trade factors like news[2] (68.1%), bandwagon effect (50.5%), speculation (50.5%), and order flow (55.5%) are important (see chart-10). One striking thing is that no body expressed that economic fundamentals are important in the intra day trades. But in the medium run and long run economic fundamentals seems to be a major factor in determining the rate movement. In other words, over time horizon the importance of economic fundamentals is increasing. From this it can be concluded that macroeconomic theory may be useful only in the medium and long run. But to study the market behaviour in the short run one would need to consider non-macro fundamentals like news, order flow, etc. These are the major elements of market microstructure theory.

Macroeconomic fundamentals indeed have a role in the exchange rate determination. But it is not in the intra day. It may be noted from the chart-12 more than 80% of dealers feel that in intra day trading fundamentals have insignificant role. Over the time horizon the importance of fundamentals is increasing. If the intra day changes in exchange rate does not reflect changes in economic fundamentals, what are the other variables responsible? The response was loud and clear that both speculation and the central bank intervention are the major determinants (see chart-11). This vindicates the impression that in India Central Bank plays a 'spoil sport'[3] in the foreign exchange market activity and the rates move accordingly. But one may be interested to know what would be the exact impact of speculation and central bank intervention on the market.

Speculation, Central Bank Intervention, and the foreign exchange market

In the intra day trading, we found that there are two factors that affect the exchange rate movement, i.e., speculation and central bank intervention. But what is the exact effect of these factors on the market behaviour (like on market volatility, liquidity and market

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[2] Here the news could be any thing. It can be either political, economical, or some thing else which distorts the dealers expectations.

[3] Some of the dealers have used this word at the time of discussions.

efficiency)?   Though it is known that both speculation and central bank intervention could either increase or decrease volatility, liquidity and efficiency, this question was asked basically to bring out the dealers' general perception about the effect the presence of these two factors on the market.   The dealers were asked the same question separately and are presented in charts-13 and 14.

It was found that majority of the dealers (more than 50%) feel speculation leads to increase in market volatility, liquidity and efficiency.   Contrary to this, more than half of the dealers feel that central bank intervention would reduce both volatility and efficiency in the market.   One of the arguments given for the central bank intervention is that to "bring orderly movement" by removing speculation in the market.   But the dealers perceive the other way.   They feel that without speculation there is no 'charm' in the market and the central bank's intervention is very 'depressing'[4].

Macroeconomic announcements and exchange rate

In the intra day, it may be convincing from our survey results that exchange rates does not follow macroeconomic fundamentals.   This is true only when the new economic data coincides with the already formed expectations and which is already discounted in the market. But if the new macroeconomic data deviates from the market expectations, the market tries to adjust this new information.   Now the question is how fast the market assimilates the news. This depends on the kind of macroeconomic news.   To analyse this, we have taken interest rate, trade deficit, money supply, GDP, and inflation.   It was found that among all these variables, interest rate announcements assimilate within ten seconds (see chart-15).   The remaining variables take more than one minute.   Further, we have asked which economic announcement has bigger impact on the market movement now and five years ago.   This helps us to understand the changes in the market activism over five years period.   It is found that the importance of interest rate changes has increased substantially over the period (response was 50% five years back and now it is 73%) (see chart-16).   This may be due to substantial increase in the capital mobility and also gradual integration of financial markets (both domestic and foreign), which has immediate impact on the market.   But the importance of money supply, GDP and inflation has declined over the period.   One reason for this could

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[4] From the discussions with the dealers it was found that most of the big players in the foreign exchange market have shifted to other markets. Also it was viewed by these big players that there is no foreign exchange market in India.

be that these variables are behavioural and is predictable (unlike interest rate, which is still a policy variable).

Purchasing power parity and the exchange rate

The macroeconomic researchers believe that only theory that market practitioners believe is the purchasing power parity theory (PPP). It is assumed that the dealers hold position based on this theory. To check this, we have asked the dealers to express their views on the use of PPP and also whether PPP can help in predicting the exchange rate. Their response contradicts the macroeconomic researchers' belief that PPP condition would be helpful in tracking the exchange rate movement (see charts 17 and 18). Almost 45% of the dealers viewed that it is basically an academic jargon. Further, more than 60% of dealers felt that PPP condition couldn't help in predicting the rate change in the short run. But it can help predict only in the long run.

Conclusion

In the present study we tried to discern the factors that affect the exchange rate movements in different time horizons by using primary data. The study finds from the dealers' perception that more than fundamentals, order flow has more significant impact on the exchange rates in the intra-day. But it was found that fundamentals are more useful in predicting the rates in the long run. This is a new finding for any developing countries' foreign exchange market. These results might differ between the countries as it depends on the specific country's market regulations, 'maturity' and the economy itself. It may be interesting if one can compare this results with that of Cheung & Wong (2000) and Cheung, Chin & Marsh (2000). One of the propositions for this would be that the short run exchange rate dynamics depends on the factors like domestic market regulations, central bank's role, etc.

Given these conclusions, it can be inferred that the studies on exchange rate determination models should concentrate on the short-term forecasting with the help of micro variables like bid-ask spreads, volume of transaction, order flows, and public & private news. This type of study may be of much help in predicting the exchange rate near-accurately and help the risk managers in the market.

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Appendix

Chart6 - **Trading**

Technical: now 62, 5 years ago 33
fundamentals: now 49, 5 years ago 43
customer order: now 25, 5 years ago 42
other: now 7, 5 years ago 5

Legend: now, 5 years ago

Chart7 - **Quotes**

<1%: larger than convention 14, smaller than convention 8
<5%: larger than convention 30, smaller than convention 12
<10%: larger than convention 20, smaller than convention 11
<20%: larger than convention 9, smaller than convention 15
<30%: larger than convention 1, smaller than convention 22

Legend: larger than convention, smaller than convention

Chart8 - Reasons for spreads different from market convention (%)

thin&quirt market: 8.8
Thin and hectic: 24.1
unexpected change: 38.5
market news: 29.7
increased market volatility: 46
holding a position: 30.8
small trading bank: 15.4
infromed trading bank: 5.5
keeping position: 9.9
counter party quote: 4.4

Chart9- Reasons for spreads confirming to market convention (%)

Firm's policy: 8.8
Relationship with other: 53.8
Market image: 46.2
Maximise trading profits: 22
Follow major players: 11

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Chart10- Important factors that determine exchange rates over time horizon

50.5 68.1 50.5	55.5 45.1	
	4.4 18.7 58.3 9.9 22.1	1.1 63.8 11

intra   medium   long-run

bandwagon effect ■ news □ speculation
ecofund ■ order flow ■ technical trading

Chart11 - If exchange rate does not reflect changes in economic fundamentals, what are the factors responsible? (%)

46.2   58.2

19.8 16.5   23.1
        7.7   8.8 8.8   3.3

speculation   manipulation of bank   manipulation of insti   central bank intervention

■ yes □ no □ no opinion

Chart12 - Do you believe exchange rate changes accurately reflect changes in the fundamentals?

13.2 83.5   74.7 83.5
0   14.3 5.5   3.3 9.9

intra day   medium   long run

■ yes ■ no □ no opinion

chart13 - Effects of speculation on the market

■ increases □ decreases

70.3   62.6 53.8
14.3   41.8 34.1   19.6   25.3

volatility   rate from fundamentals   market liquidity   market efficiency

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Chart14- Effects of central bank intervention on the market

Legend: increases, decreases

- volatilty: increases 20.9, decreases 64.8
- rate from fundamentals: increases 44, decreases 39.6
- liquidity: increases 50.5, decreases 23.1
- market efficiency: increases 22, decreases 52.7

Chart15 - Assimilation of economic announcements when they are different from market expectations

Legend: <10 sec, <1 min, <10 min, <30 min, >30 min

- trade: 20.9, 40.7, 20.9, 7.7, 4.4
- inflation: 20.9, 38.5, 12.1, 14.3, 9.9
- GDP: 22, 35.2, 22, 3.3, 11
- interest rate: 56, 29.7, 5.5, 5.5, 1.1
- money supply: 20.9, 31.9, 24.2, 4.4, 8.8

Chart16- Which economic announcement has bigger impact on market movement (%)

Legend: now, 5 years ago

- interest rate: now 72.5, 5 years ago 49.5
- trade deficit: now 25.3, 5 years ago 24.2
- money supply: now 11, 5 years ago 16.5
- gdp: now 8.8, 5 years ago 18.7
- inflation: now 8.8, 5 years ago 15.4

Chart17- Use of purchasing power parity condion

- compute fair spot: 25.3
- parity: 26.4
- academic jargon: 44
- other: 6.6

Chart18- Do you think PPP condition can be used to predict rate? (%)

	intra day	medium	long
yes	17.6	31.9	51.6
no	60.4	38.5	24.2
no opinion	8.8	16.5	17.6