Final Report:

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First of all, I would like to emphasize that I am grateful to NSC for having provided me funds to attend an international conference, hire research assistants, buy research-related stuffs. I believe that all opportunities that NSC provided to me have helped me greatly improve my papers. In my NSC research project, I proposed two research ideas. The first project provides evidence on the determinants of the professionals' expectations in Japanese stock market by using a monthly forecast micro survey dataset on the TOPIX distributed by QUICK Corporation, a Japanese financial information vendor in the Nikkei Group. In the second research project, I document the determinants of the expectation heterogeneity of stock price forecasters on the Japanese Nikkei Stock Average by using the QUICK survey data.

Due to the big support from NSC, the first one was published to *Journal of Economic Dynamics and Control, (SSCI: Impact factor 1.117)* titled: "Strategy switching in the Japanese stock market."

"Strategy switching in the Japanese stock market," *Journal of Economic Dynamics and Control* 37, 2010-2022.

In addition, this research paper was selected as Best paper prize for junior researchers, Association of Behavioral Economics and Finance Annual Conference, 2011,

http://www.iser.osaka-u.ac.jp/abef/event/20111210/syourei_award_5th.pdf.

The second one has been completed and published to: *Pacific-Basin Finance Journal* 20, 723-744 *(SSCI),* titled: "Belief changes and expectation heterogeneity in buy- and sell-side professionals in the Japanese stock market" The contents of these papers are pretty much the same as I proposed in my NSC project.

The first paper, titled: "Strategy switching in the Japanese stock market" is summarized as follows:

Unstable stock price movements have a significant impact on the economic activities of firms and financial institutions. Practitioners attempt to determine the sources of the unstable price movements for better risk management in financial markets. It is also important that monetary policymakers clarify the cause of the instability and provide stable environments for financial market participants. As found in the laboratory works by Hommes,

Sonnemans, Tuinstra, and van de Velden (2005, 2008), expectations or beliefs about future states of financial markets crucially influence the trading decisions by investors in financial markets, and the aggregated behavior of the investors determines the actual realization of economic variables. The results of the laboratory works suggest that expectations feedback mechanism plays an important role in financial markets for determining the market outcomes. Thus, improved explanations of investors' expectation formation processes can facilitate a better understanding of the sources of risk in financial markets. This paper provides empirical evidence for understanding the determinant of expectations using a monthly forecast survey dataset on the TOPIX distributed by QUICK Corporation, a Japanese financial information vendor in the Nikkei Group.[1]

We empirically demonstrate that professionals involved in the Japanese stock market utilize either fundamental or technical trading strategies in their expectation formation processes and that they switch between fundamental and technical trading strategies over time. We then interpret our result by discussing that the strategy switching would be key to understanding the persistent deviations of the stock index price from the fundamental value, which is a stylized fact of stock markets.[2]

Our conclusions are consistent with what several agent-based models predict and are presented as follows. Recent agent-based theoretical models successfully explain the cause of the price deviations from the fundamental price, which is still not adequately explained by traditional asset-pricing models using efficient market and rational expectation hypotheses.[3] Many agent-based theoretical models assume that agents' expectations are formed from combining several investment strategies. The price deviations from the fundamental value are explained in an environment in which agents switch the level of dependence on the strategies over time. Standard agent-based models, popularly exemplified by a model created by Brock and Hommes (1998), assume that agents combine fundamental and trend-following strategies in their forecasting. Investors using the fundamental strategy expect future prices to hover around the fundamental or intrinsic value of the asset, which is often measured by a firm's earnings or dividends. The trend-following strategy states that investors expect future price movements persistent with the past price trend. Thus, they will buy shares in response to the recent upward price movements, and sell them for the downward price changes in the past. The models demonstrate that when most agents select the trend-following strategy, the stock price tends to deviate from the fundamental value, which explains such phenomena as bubbles and crashes. Conversely, when most agents adopt the fundamental strategy, the market stabilizes, pushing the market price back towards the fundamental price and leading the market to be informationally efficient. Standard agent-based theoretical models demonstrate that investors utilize the two strategies over time interchangeably; this "strategy switching" is a major factor in explaining the unstable price movements of financial assets.[4]

[1] TOPIX is a Japanese stock market index and is computed and published by the Tokyo Stock Exchange. It consists of 1,669 firms listed in the first section of the Tokyo Stock Exchange, and the market value of the index is 197.4 trillion yen as of February 1, 2011. The unit of the TOPIX is the "point."

[2] See, for example, Shiller (1981).

[3] Agent-based models also replicate volatility clustering, fat tails of return distribution, nonzero volume, autocorrelations of volume, and positive, contemporary cross-correlations between the volume and the squared returns. See, for example, LeBaron, Arthur, and Palmer (1999). Hommes (2006) and LeBaron (2006) survey the literature on agent-based computational finance and explain its usefulness in generating financial market phenomena.

[4] Kirman (1991), Lux and Marchesi (1999, 2000), and Gaunersdorfer, Hommes, and Wagner (2008) also explain the strategic interactions and volatility. In addition, Chiarella, Iori, and Perelló (2009) and Farmer and

Our paper provides empirical evidence on strategy switching in Japanese stock markets and argues whether strategy switching can explain persistent price deviations from economic fundamentals.

We explore the strategy switching in the Japanese stock markets by sorting forecasters into buy-side and sell-side professionals. Buy-side professionals are those who work for investment institutions, such as mutual funds, pension funds, and insurance firms, which purchase securities on their own account. Sell-side professionals work for companies that sell investment services to asset management firms, or buy-side professionals, and provide research, including recommendations to their clients.[5] Rather than measuring the characteristics of the average forecasts across survey respondents as in previous studies on expectation formations, such as those of Branch (2004), Brown and Cliff (2004, 2005), Lux (2009, 2010), and Verma, Baklaci, and Soydemir (2008), this paper identifies empirically the strategy switching of buy-side and sell-side professionals.

This paper has the following four significant contributions to the literature. First, this paper empirically validates the strategy switching, which is an important contribution of several agent-based models to the literature for understanding empirical features in financial markets. Some laboratory experiments with human subjects, such as those of Hommes, Sonnemans, Tunstra, and van de Velden (2008) and Heemeijer, Hommes, Sonnemans, and Tuinstra (2009), support this important observation in theoretical agent-based stock markets. In the literature on foreign exchange markets, Frankel and Froot (1990), Westerhoff and Reitz (2003), and Gilli and Winker (2003) provide evidence being consistent with strategy switching. The literature in foreign exchange not only demonstrates that professionals typically combine technical trading and fundamentals but also indicates that they switch between them. This phenomenon is modeled in Frankel and Froot (1990), and the justification for this approach is based, for example, on Frankel and Froot (1987), showing that professionals rely on regressive expectation formation (fundamentals) and extrapolative expectation formation (chartist), and that weights change. This becomes explicit in Menkhoff, Rebitzky, and Schröder (2009) and Jongen, Verschoor, Wolff, and Zwinkels (2012), who demonstrate that chartists and fundamentalists change forecasting behavior over time, depending on earlier trends and the degree of fundamental misalignment. An empirical study by Boswijk, Hommes, and Manzan (2007) confirms this phenomenon in the US stock market. In the literature on inflation expectations, Branch (2004) and Pfajfar and Santoro (2010), using a survey on inflation expectations, provide empirical evidence that agents switch prediction regimes. Although we have seen theoretical and laboratory works as well as conventional empirical evidence, direct evidence is still required to empirically support strategy switching in the Japanese stock market.

Second, we empirically identify the types of professionals, which are buy-side and sell-side professionals, who actually switch strategies. Previous theoretical research on agent-based models concludes that investors switch their strategies and their behaviors are key in explaining several empirical features in stock markets. Nonetheless, those papers identify neither the specific type of financial institutions to which those agents belong nor their respective business categories.

Joshi (2002) demonstrate that trend-following strategies amplify noise and cause stylized phenomena in financial markets, such as excess and clustered volatility.

[5] For more information on the various activities in which buy-side and sell-side professionals engage, see Groysberg, Healy, and Chapman (2008) and Busse, Green, and Jegadeesh (2012).

Third, we empirically analyze the behavior of both buy-side and sell-side professionals, and show that both types of professionals behave similarly. Several papers, such as Clement (1999) and Hong and Kubik (2003), investigate the behavior of sell-side investors from a cross-sectional viewpoint, but focus exclusively on the sell-side professionals. Accordingly to Groysberg, Healy, and Chapman (2008), this is due to a lack of data on buy-side professionals. Within the relatively limited amount of research conducted on buy-side professionals, Cowen, Groysberg, and Healy (2006) and Groysberg, Healy, and Chapman (2008) examine the forecasts made by both buy-side and sell-side professionals, but show different behavior of these two groups.

Fourth, we validate the strategy switching in the Japanese stock market on a monthly frequency. Boswijk, Hommes, and Manzan (2007) find strategy-switching behavior on a yearly frequency. It still remains unknown, however, with what specific frequency stock investors actually change their strategies.

Boswijk, Hommes, and Manzan (2007) provide evidence of strategy switching in US stock market. They create an estimation using Brock and Hommes's (1998) type of agent-based model on regime switching. They use the yearly S&P 500 and the corresponding earning data from 1871–2003, emphasizing the amplification mechanism, e.g. bubbles are triggered by shocks to economic fundamentals which are then amplified by trend-following behavior.

Our paper differs from that of Boswijk, Hommes, and Manzan (2007) as follows: first, we characterize expectation formations of the buy-side and sell-side professionals. Thus, we demonstrate the mechanisms of strategy switching by different types of professionals. Second, Boswijk, Hommes, and Manzan (2007) assume an agent-based model in estimating regime switching, such that the market is in equilibrium, on average. As indicated in the following section, we follow the approach of Boswijk, Hommes, and Manzan (2007) to derive a fundamental price, which is estimated based on the Gordon growth model, and construct a fundamental strategy. However, our estimation equation is not an equilibrium pricing equation; instead, it utilizes forecast survey data from stock market professionals to investigate strategy switching. Thus, compared to Boswijk, Hommes, and Manzan (2007), we make fewer assumptions while validating the phenomenon.

The second research project, titled: "Belief changes and expectation heterogeneity in buy- and sell-side professionals in the Japanese stock market" is summarized as follows.

In contrast with common assumptions about traditional rational representative agents, several papers investigate survey data regarding professional forecasts of such macroeconomic series as inflation and GDP, as well as such financial series as stock prices and foreign exchange rates, and find expectations to be heterogeneous.[6] While Mankiw, Reis, and Wolfers (2003) suggest that "disagreement may be a key to macroeconomic dynamics" (p. 242), several recent agent-based models demonstrate that heterogeneity drives observed features in real stock markets that have not yet been sufficiently explained by traditional

[6] For example, Allen and Taylor (1990), Ito (1990), and Frankel and Froot (1990) identify expectation heterogeneity in foreign exchange markets, while Mankiw, Reis, and Wolfers (2003) and Capistran and Timmermann (2009) find heterogeneity in inflation expectations. Meanwhile, Patton and Timmermann (2010) demonstrate expectation heterogeneity for GDP growth and inflation.

asset-pricing models under efficient market and rational expectation hypotheses, such as clustered volatility and fat tails of the return distribution.[7] Thus, providing better explanations of the factors determining the differences in expectations can facilitate a better understanding of risk management and option pricing in financial markets. While several studies have examined the determinants of expectation heterogeneity in inflation, GDP, or foreign exchange rates, recent empirical research has faced the challenge of explaining the expectation heterogeneity that exists among stock market professionals. Utilizing a panel dataset of monthly surveys of market professionals regarding TOPIX forecasts, conducted by QUICK Corporation, a Japanese financial information vendor in the Nikkei Group, this paper empirically examines the determinants of expectation heterogeneity or "dispersion" in the Japanese stock market.

The academic literature offers three possible sources of expectation heterogeneity.[8] One explanation revolves around the idea that forecasters share the same information-processing technology but have access to different sets of information about the current state of the economy (see, for example, Carroll, 2003; Kyle, 1985; Lucas, 1973; Mankiw and Reis, 2002). The second source of expectation heterogeneity offered in the literature indicates that agents who share the same information about the current state of the economy interpret it differently (see, for example, Laster, Bennett, and Geoum, 1999; Patton and Timmermann, 2010). A third possibility presented is that the forecast dispersion arises as a result of the existence of fundamentally different types of agents in the market (for example, in the noise-traders and rational-arbitrageurs model presented by De Long, Shleifer, Summers, and Waldmann, 1990 and a series of fundamentalists and chartists models).[9] Due to the difference in types, the third strand of opinion in the literature contends that agents not only observe different information, but also have different ways of interpreting the same information. Thus, an implication of the third explanation of the source of expectation heterogeneity in the literature overlaps with the first and second explanations. We investigate whether or not this third assertion in the literature can be empirically validated in the Japanese stock market. In particular, we explore the reason that professionals' expectations are heterogeneous by disaggregating the forecasts in our sample offered by professionals into those of fundamentally different types, namely, into buy- and sell-side professionals.

Buy-side professionals are those who work for investing institutions, such as mutual funds, pension funds, and insurance firms, which purchase securities on their own account. Buy-side analysts research and make recommendations to their own institutions' investors regarding purchasing securities. Such buy-side recommendations are usually not available to the public. Meanwhile, sell-side professionals work for companies that sell investment services to investors, that is to say, the buy-side professionals, and provide recommendations to the public. Sell-side analysts work for brokerage firms; their research is used to promote

[7] For example, Hommes (2006) and LeBaron (2006) survey the literature on agent-based computational finance and explain the importance of heterogeneity in generating financial market phenomena.
[8] We refer to Frijns, Lehnert, and Zwinkels (2010) with regard to categorizing the literature into three strands.
[9] See, for example, Hommes (2006) and LeBaron (2006), who survey papers on agent-based computational finance. Boswijk, Hommes, and Manzan (2007), Branch (2004), Frankel and Froot (1990), Menkhoff, Rebitzky, and Schröder (2009), and Reitz, Stadtmann, and Taylor (2009) empirically demonstrate that the existence of fundamentalists and chartists in the same market generates the forecast dispersion.

securities to buy-side investors.[10] We demonstrate that our results are consistent with the explanations offered by the third strand of the literature in the manner outlined below.

We first present evidence that buy-side and sell-side professionals utilize different information in order to make their forecasts. Meanwhile, they often interpret the same information differently, resulting in varied expectations. Secondly, we demonstrate that certain forms of information exchange take place between buy-side and sell-side professionals that contributes to the heterogeneity in expectations. More precisely, we show that buy-side professionals refer to sell-side professionals' evaluation of the market, particularly when the sell-side professionals share opinions resembling those of the buy-side professionals. In contrast, buy-side professionals do not take this action when attempting to relate foreign exchange rates to future stock prices. On the other hand, sell-side professionals seek to share market views similar to those of their customers, that is to say, to the views of buy-side professionals. Our results imply that expectation heterogeneity can be attributed to the fact that buy-side and sell-side professionals with different business goals interact with one another and differ with regard to the contents of the information accessed as well as their interpretations of the same information in their forecasts. Thus, we conclude that the existence of fundamentally different types of professionals within the same market is an important factor involved in generating the dispersion.

In addition, we demonstrate the robustness of our results after controlling for important events in the Japanese economy during our sample periods, such as the Lehman shock, the Bear Stearns shock, the Resona shock, the merger of the Mitsubishi Tokyo Financial Group and UFJ Holdings, the quantitative easing monetary policy, the settlement of the account in each fiscal year, and the January effect.

This paper makes the following six contributions. First, we empirically explain the determinants of the expectation dispersion among Japanese stock market professionals. While several papers investigate the sources of the dispersion in expectations of exchange rates, inflation, GDP, and unemployment, they do not specifically explore the expectations of Japanese stock market professionals.[11] Second, we demonstrate the causes of the forecast dispersion related to the stock index by examining professionals' opinions regarding the various macroeconomic, political, and psychological factors that influence future stock prices. The QUICK corporation asks respondents to select the factors that influence future stock prices from the following choices: "Business conditions," "Interest rates," "Foreign exchange rates," "Politics and diplomacy," "Internal factors and market psychology in stock markets," and "Stock and bond markets abroad." These macroeconomic, political, and psychological factors are among the most likely candidates with which to explain stock index price forecasts. Our panel dataset enables us to directly relate professionals' ideas about these factors to the expectation dispersion. This approach differs from those presented in previous papers, such as that of Lamont (2002), in which the expectation dispersion is explained by investigating the forecasters' age and reputation.

[10] For more information on the different activities in which buy-side and sell-side professionals engage, see Groysberg, Healy, and Chapman (2008) and Busse, Green, and Jegadeesh (forthcoming).

[11] See, for example, Menkhoff, Rebitzky, and Schröder (2009) and Reitz, Stadtmann, and Taylor (2009) for heterogeneity in exchange rate expectations; Mankiw, Reis, and Wolfers (2003) and Capistran and Timmermann (2009) for heterogeneity in inflation; Patton and Timmermann (2008) and Döpke and Fritsche (2006) for heterogeneity in both GDP and inflation; and Lamont (2002) for the heterogeneity in GDP, inflation, and unemployment.

Third, we empirically analyze both buy-side and sell-side professionals' dispersions of the stock index forecasts. While several papers investigate the behavior of sell-side investors from a cross-sectional viewpoint, their efforts focus exclusively on sell-side professionals.[12] According to Groysberg, Healy, and Chapman (2008), this action is due to the lack of data on buy-side professionals. Among the relatively limited amount of research conducted on buy-side professionals, Cowen, Groysberg, and Healy (2006) and Groysberg, Healy, and Chapman (2008) examine the forecasts made by both buy-side and sell-side professionals, but focus on individual stocks and do not characterize the forecast dispersion of buy-side and sell-side professionals.

Fourth, we empirically identify the types of professionals who actually drive the forecast dispersion. We demonstrate that buy-side and sell-side professionals significantly impact the dispersion. The third strand of literature mentioned above poses the idea that the existence of different types of professionals within the same market, such as noise traders and rational arbitrageurs in the noise-trader model and fundamentalists and chartists in agent-based models, contributes to the forecast dispersion. Nonetheless, those papers identify neither the type of financial institutions to which noise traders, rational arbitrageurs, fundamentalists, and chartists specifically belong nor their respective business categories.

Fifth, we demonstrate that a form of information exchange between buy-side and sell-side professionals exists that determines the forecast dispersion. The research of sell-side professionals is usually available to the public, whereas that of buy-side professionals is conducted exclusively for buy-side firms' portfolio managers (Cheng, Liu, and Qian, 2006). However, it is not empirically validated as to whether or not they utilize each other's analyses in making their forecasts. Even if they do, the information from sell-side professionals used by buy-side professionals and the information from buy-side professionals that sell-side professionals utilize in making their forecasts remains unknown.[13]

Sixth, in addition to analyzing the relationship between professionals' behavior and the expectation dispersion, we examine the impacts of important economic and financial events upon the dispersion. These events include the global financial crises, the nationalization of Resona Bank, and the merger of the Mitsubishi Tokyo Financial Group and UFJ Holdings, each of which have given rise to important structural changes in Japanese financial markets. Such an approach can be taken with our dataset, as our sample covers the past 10 years in which these events have taken place.

[12] See, for example, Clement (1999) and Hong and Kubik (2003).

[13] Busse, Green, and Jegadeesh (forthcoming) find sell-side analysts' recommendations to be informative to buy-side professionals but do not find the reverse to be true.

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