Essays on Expectation Formation

（期待形成をめぐる研究）

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早稲田大学大学院　経済学研究科
応用経済学専攻

中園善行
Yoshiyuki Nakazono

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Chapter 1

Introduction

1.1 Expectations: a major role in economics and finance

Expectations play a major role in many areas of economics and finance, because decision making by agents depends on the formation of expectations. For example, individuals decide how much to consume and save based on the discounted value of future income. Investment plans are affected by the economic outlook and economic agents calculate asset prices based on the expected future cash flows. Expectations constitute a main part of the theories of economics and finance.

The important role in expectations has been pointed out in economic theories. One of the most famous and provocative examples is the Lucas critique. Lucas (1976) criticizes the naive analysis for the effect of economic policies without considering the change of agents' expectations due to the policy changes and emphasizes the change of expectations in the policy analysis. According to Lucas (1976), the policy announcement without any surprises has no effects on the real economy. In that case, the policy effects cannot be

tested any more because individuals already have changed their behavioral patterns before the release of the policy changes. On the other hand, the unexpected change of the policy rule has the potential effects on the actual economy; rational agents respond to the new policy in order to maximize their utility as soon as the new rule is publicly available. Since the Lucas critique, the macro economic models has been developed based on the forward-looking decision making.

Although the central role in expectations is widely known in economic theories, there are contentious issues for the theoretical assumption of expectations. The economics and finance require agents to behave rationally and to be homogeneous. Under the rational expectations hypothesis, individuals make full use of available information to make decisions. Rationality includes perfect knowledge about how the real economy and market works. Furthermore, under the assumption of homogeneity, the economic agents' formation of expectations are homogenized. People are all rational and have precise information about the actual economy and markets. However, these assumptions are too strong and counterintuitive. You do not always have perfect knowledge about the structure of the economy and financial markets. Rather, you may learn through trial and error and some of you may make decisions based on a rule-of-thumb.

Are expectations rational, biased? What properties do expectations have? Are economic agents are homogeneous? Before we discuss these questions, we focus on forecast, which is a proxy for expectations in the next section.

1.2 Forecasts: a proxy for expectations

While expectations formed by agents are unobservable, forecasts made by individuals are sometimes observable and available. Thus, forecast is also an

important concept in economics and finance. When you want to observe how expectations work in the real economy, you need forecast data on economic variables such as GDP growth rates, inflation rates, corporate earnings, asset prices, etc. In empirical analysis, forecasts can provide an important proxy for expectations by agents.

The fact that forecasts are a superior proxy for expectations implies that studies on forecasts shed light on the behavior of forecasting. In fact, the literature examines the rationality of forecasts and how individuals make forecast because the analysis of forecasts allow you to consider whether the assumptions of rationality and homogeneity in the economic and finance theories are reasonable or not.

1.3 Bounded rationality and heterogeneity

Using forecasts as a proxy for expectations, there are a number of empirical studies about testing the rationality and homogeneity of economic agents. The past empirical studies using forecast data tend to reject the rationality and homogeneity, and find the bounded-rationality and heterogeneity. The literature tests accuracy of forecasts, rationality and homogeneity of forecasters by using data on inflation forecasts, forecasts on macroeconomic variables, earning forecasts, stock price forecasts, interest rate forecasts, etc. Most of the previous studies fail to support rationality in the sense that agents sometimes show herding behavior, strategic behavior, and cheating behavior based on the individuals' motivations. Put differently, not all agents are always rational: they show bounded rationality and heterogeneity.

There is a huge amount of literature on the rationality of forecasts, particularly, on the formation of inflation expectations. How inflation expectations are formed is examined by Gordon (1979), Mullineaux (1980), Jacobs and

Jones (1980), and Figlewski and Wachtel (1981) for the economist survey, Van Duyne (1982) for the household survey, and Leonard (1982) and De Leeuw and McKelvey (1981) for the business survey. Most of them tend to reject the null hypothesis that forecasts are rational in the sense that they efficiently incorporate available in formation. Batchelor and Dua (1987), Batchelor and Dua (1989), and Pacquet (1992) show that forecasts are boundedly rational using survey data on inflation. Makiw and Reis (2002) examines a model of dynamic price adjustment based on the assumption that information disseminates slowly throughout the population. Carroll (2003) shows that while empirical household expectations are not rational in the usual sense, expectational dynamics are well captured by a model in which households' views derive from news reports of the views of professional forecasters. The model estimates imply that people only occasionally pay attention to news reports; this inattention generates \stickyness" in aggregate expectations, with important macroeconomic consequences [1] .

Furthermore, there is a growing number of literature on the homogeneity of decision-makers, which support the heterogeneity of agents. The comprehensive surveys about the heterogeneous expectations are given by Hommes (2006) and Pesaran and Weale (2006). Gramlich (1983), Bryan and Gavin (1986), Makiw et al. (2003), and Capistran and Timmermann (2009) discuss the critical role played by expectations of inflation and focus on the heterogeneity. For example, Gramlich (1983) and Bryan and Gavin (1986) compare forecasts made by household with those of economist and show that inflation expectations appear to be more biased and inefficient for economists than for households. Heterogeneous expectations between the policy-makers and the

[1] Their \sticky-information" models can explain many phenomena that are unexplained by fully rational models, including the following reasons why disinflations are inevitably contractionary, why monetary policy affects the economy with considerable lags, why rapid economic growth leads to rising inflation, and why productivity slowdowns are associated with a rise in the natural rate of unemployment (Carroll, 2003).

private sector have been analyzed by Honkapohja and Mitra (2004).

By examining micro-data at the level of the individual drawn from a number of the United Kingdom sources, Blanchflower and Kelly (2008) investigate how accurately individuals form inflation expectations. Blanchflower and Kelly (2008) find that numbers of individuals do not know what the inflation rate is and how it has changed; they are increasingly unable to predict how it might change in the future and suggests that financial literacy, which is influenced by age, gender, education, income, past experience, etc. affects the accuracy of inflation forecasts. The fact that how inflation expectations are formed and accurate depends on financial literacy supports the hypothesis that decision-makers are heterogeneous.

In order to test the hypothesis that agents are rational and homogeneous, Chapters 2 and 3 examine the properties of forecasts with Japanese forecast data, rather than those of the United States or the United Kingdom. They show that forecasts made by Japanese professionals are behavioral and significantly influenced by past forecasts and behavioral biases vary in the different types of firms. These findings suggest that the expectation formations are neither national nor homogeneous.

1.4 Interdependence between expectations and economic activity

Given the heightened importance of expectations (and forecasts as a proxy for expectations), it is natural to pay attention to interdependence between expectations and actual economies. You may be interested in the difference between rational expectations and adoptive expectations; when the expectations formation of agents are not rational but adoptive, the equilibrium

implied by the theory assuming adaptive expectations may be different from that of rational expectations.

One of the most well-known examples that implies the relationship between expectations formation and actual economies is the stabilization policy of controlling inflation by the Federal Reserve in the United States. There is a clear consensus among economists that the run-up of inflation in the 1960s and 1970s and the sharp disinflation in the early 1980s were caused by failure of the Federal Reserve to achieve stable and low inflation.

In response to the question "why inflation rose and fell", Primiceri (2006) answers it by presenting a model in which rational policy-makers learn about the behavior of the economy in real time and set stabilization policy optimally, conditional on their current beliefs. Primiceri (2006) concludes that the fluctuations of inflation were caused by the backward-looking responses to the realized inflation and unemployment rates rather than the forward-looking responses to the expected value of inflation and unemployment. It is the adaptive stabilization policy by the Federal Reserve that resulted in \the greatest failure of American macroeconomic policy in the postwar period" (Mayer, 1999). The disgraceful event suggests why analysis on mutual dependence between expectations and real economies is one of the important issues.

Particularly, the formation process and properties of inflation expectations have been drawing more and more attentions from central bankers. The reason is because the aim for monetary policy is to stabilize inflation. Considering the self-fulfilling prophecy of inflation, the central bankers have strong interests in inflation expectations. In fact, Bernanke (2007) states:

> Undoubtedly, the state of inflation expectations greatly influences actual inflation and thus the central bank's ability to achieve

> price stability. But what do we mean, precisely, by \the state of inflation expectations"? How should we measure inflation expectations, how should we use the information for forecasting and controlling inflation? I certainly do not have complete answers to those questions, but I believe that they are of practical importance.

Bernanke (2007) suggests that it is an urgent issue to understand the inflation expectations on actual inflation and economic activity, and the relationship between policy actions and the formation of inflation expectations.

In response to the growing interests about the mutual interdependence between inflation expectations and economic activity, Chapter 4 aims to investigate into this relationship. First, we find that it is found that an unexpected monetary policy shock lowers realized and expected inflation. This suggests that monetary policy is one of important policy instruments for controlling the expectation of inflation. Second, we explain that inflation expectations affected by a contractionary monetary policy shock exhibit the self-fulfilling property.

The remainder of this paper is structured as follows. In Chapter 2, we first focus on the rationality of economic agents. Using a unique database, we test whether professional forecasters forecasts rationally or behaviorally. Chapter 3 investigates into not only the rationality but also the homogeneity of individual forecasters. We test both of them in order to verify the assumption of the traditional economic theory. Chapter 4 examines the mutual dependence between expectations and economic activity. We analyze the effect of monetary policy on inflation expectations using forecast data collected from professional forecasters. Chapter 5 concludes.

Chapter 2

Financial Markets Forecasts Revisited: Are They Rational, Stubborn or Jumpy?

2.1 Introduction

In this chapter, we test whether professional forecasters forecast rationally or behaviorally using a unique database, QSS database. This survey includes forecasts on both stock prices and bond yields for various time horizons. The history of forecasts made by a particular individual forecaster can be also tracked.

Testing rationality of decision{making, including forecasting, is not a new subject. There have been a vast and growing number of studies from both theoretical and empirical perspectives. The seminal study by Tversky and Kahneman (1974) shows the possibility that the decision{making is not perfectly rational and rather heuristic[1]. Decision makers tend to use a simple

[1]Heuristics which is first proposed by Tversky and Kahneman (1974) is widely known in the arena of behavioral economics and finance. Kahneman (2003) defines heuristics that

rule such as anchoring, where the decision is based on some uninformative targets.[2] In particular, Tversky and Kahneman (1974) report that answers to such a simple but unfamiliar question as \how many countries in Africa are the member of the United Nations" can be heavily influenced by the number suggested by the Wheel of Fortune. Kahneman and Knetsch (1993), Wansink et al. (1998), and Beggs and Graddy (2009) also show similar results on different economic activities.

Many studies examine irrational behavior in the financial markets, particularly forecasting behavior taken by analysts or professional forecasters. De Bondt and Forbes (1999) define excessive agreement among analyst predictions, that is, a surprising degree of consensus relative to the predictability of corporate earning. Ehrbeck and Waldmann (1996) raise the possibility of rational cheating, a tendency to mimic able forecasters.[3] Cooper et al. (2001) empirically support this rational cheating using analysts' performances, and Grinblatt et al. (1995), Graham (1999), and Welch (2000) also report similar results for mutual fund managers. Park and Sabourian (2011) investigate the relationship between herding and contrarian behavior.[4] Ashiya (2009) inquires into strategic motives of macroeconomic forecasters and the effect of their professional affiliations. Ichiue and Yuyama (2009) find irrationality of professional forecasts for the Fed Funds futures market.

Previous studies also report behavioral biases in terms of sensitivity of

people use and the biases to which they are prone in various tasks of judgment under uncertainty, including predictions and evaluations of evidence.

[2]For the developments in studies on anchoring, see Chapman and Johnson (2002).

[3]Ichiue and Yuyama (2009) point out that Ehrbeck and Waldmann (1996) develop a model in which less-able professional forecasters rationally choose to change their forecasts by smaller amounts than the changes in their beliefs, if able forecasters do not have to change their forecasts by large amounts since their forecasts are relatively accurate. This mimicking strategy by less-able forecasters contributes to concealing their inferior skills and to keeping the relationship with their clients, the users of forecasts. See Ichiue and Yuyama (2009).

[4]Park and Sabourian (2011) define contrarian behavior as acting against the crowd.

forecasts to new information. For example, Abarbanell and Bernard (1992) show that security analysts under-react to earnings information. Amir and Ganzach (1998) use the Institutional Brokers Estimate System (IBES) database and find that analysts' earnings forecasts over-react when the forecast revisions are positive and under-react when the forecast revisions are negative. Using the forecasts on the GDP in Japan, Ashiya (2003) reports that forecasters tend to over-react to new information.

We revisit biases of forecasting behavior with a new, unique database. The estimation results show that (i) professional forecasts are behavioral, namely, significantly influenced by past forecasts, and (ii) there exists a stock–bond dissonance: while forecasting behavior in the stock market seems to be stubborn in the sense that forecasts stick to previous forecasts or under-react to new information, forecasting behavior in the bond market seems to be jumpy in the sense that forecasts tend to be negatively related to past forecasts or over-react to unexpected information. We also show that forecasting behavior in the Japanese financial markets has little to do with individual experiences as professional forecasters. This finding is contrary to the previous studies such as Hong et al. (2000) and Lamont (2002), but is consistent with the results in Ashiya and Doi (2001).

These are new results and altogether imply a complex forecasting behavior in the Japanese financial markets. Even in the same country, forecasting behavior is quite different by market. This suggests that the nature of professionals in the stock market is fundamentally different from that in the bond market. This might be caused by the fact that many respondents do not report for both stock and bond markets, and that the composition of the stock market forecasters is different from that of the bond market forecasters. Findings reported by Ashiya (2009) and Nakazono (2012) seem to be related here. They report that forecasting behavior can be quite different by

professional affiliation.

The remainder of this chapter is structured as follows. Section 2 shows the details of the data used in this chapter and estimation strategy. Then, we report estimation results in Section 3. Finally, Section 4 concludes.

2.2 Estimation

2.2.1 The QSS data

The QSS (QUICK Survey System which is provided by QUICK corp) monthly conducts the paper-based surveys of forecasts as well as attitudes made by professional forecasters in the Japanese financial markets. This survey includes forecasts on both stock prices and bond yields for various time horizons (see Tables 2.1 and 2.2). We use forecasts on the stock prices (TOPIX) and newly-issued JGB yields (5-year, 10-year and 20-year maturities) for the one-, three-, and six month horizons. Each respondent is asked to answer a point forecast for each horizon. Surveys are collected from securities firms, asset managements, investment advisers, banks, trust banks, life insurances, general insurances, and pension funds. On average, we have approximately 150 forecasts each month. We can also track the history of forecasts made by a particular individual forecaster.

The QSS launched surveys of TOPIX in June 2000. For bond yields, surveys of 20-year bond started in April 2003, those of 10-year bond in July 1998, and those of 5-year bond in May 2001. In this chapter, we use the data up until November 2010.

Figures 2.1 and 2.2 illustrate the means and the one standard deviation confidence intervals of monthly survey forecasts on TOPIX and 10-year JGB yield for 3-month horizon, respectively. Figures 2.1 and 2.2 indicate that ex

post realized stock prices and JGB yields move within around one standard deviation of forecasts.

2.2.2 Estimation strategy

Do professional forecasters determine their own forecasts rationally or behaviorally relying on past forecasts? We first evaluate this question only using macro aggregated data. We then test how individual forecasts are influenced by their own past forecasts or publicly available past mean forecasts.

In this chapter, $S_{t,\,t+n}$ denotes a survey forecast conducted in period t of the stock price or bond yields in period t + n, and K_{t+n} denotes ex post realized value in period t + n. Since we have a panel data set, we have two definitions of survey forecasts. The first is what we call the aggregate mean forecast $\bar{S}$ and the second is the individual i's forecast S^i. E_t denotes the expectation operator under rational expectations.

Following Ichiue and Yuyama (2009), we consider a partial adjustment model of survey forecasts:

$$S^i_{t,\,t+n} = \rho S^i_{t-k,\,t+n} + (1-\rho)E^i_t K_{t+n}; \tag{2.1}$$

where ρ measures the degree of the inertia in survey forecasts. Naturally, if $\rho = 0$, the current survey forecasts $S^i_{t,\,t+n}$ are equal to the rational expectations conditional on the information available in period t, namely $E_t K_{t+n}$. $\rho \neq 0$ implies that current survey forecasts are influenced by previous surveys. By using the definition of the forecast error, equation (2.1) can be transformed into

$$K_{t+n} - S^i_{t,\,t+n} = \beta(S^i_{t,\,t+n} - S^i_{t-k,\,t+n}) + \eta^i_{t,\,t+n}; \tag{2.2}$$

where

$$\beta = \frac{\rho}{1-\rho};$$

and

$$\eta^{i}_{t,\,t+n} = K_{t+n} - E^{i}_{t} K_{t+n}.$$

$\eta_{t,\,t+n}$ denotes the forecast error, which is not predictable from information known in period t under rational expectations. As a result, we can test a null hypothesis of $\beta = 0$, that implies rational forecasts, by estimating equation (2.2).[5] [6] When $\beta \neq 0$, forecasts are behavioral. Especially when $\beta > 0$, forecasts are pulled by past forecasts and therefore are considered stubborn. When $\beta < 0$, the current forecast tends to be revised more widely than the changes in the rational expectations, and toward opposite directions from past forecasts. Such forecast is considered jumpy.

When testing rationality of forecasts, we examine three cases depending on the definition of survey forecasts: (Case A) aggregate mean forecasts on aggregate past mean forecasts, namely $\bar{S}$ on $\bar{S}$; (Case B) individual forecasts on aggregate past mean forecasts, namely S^i on $\bar{S}$; (Case C) individual forecasts on individual past forecasts namely S^i on S^i. Regarding the combinations of (n; k), we examine three cases: (n; k) = (1; 2), (3; 3) or (1; 5).

We also evaluate the differences by professional experience for (Case B) and (Case C). We divide forecasts into three categories: (1) all, (2) more than 1 year of experiences, and (3) more than 2 years of experience. Since mean for each category (1), (2) and (3) is not publicly available, we always use $\bar{S}$

[5]Note that a constant term is not included in the regression, since the forecast errors of market expectations $\eta_{t,\,t+n}$ should be unbiased at least ex ante, according to Nordhaus (1987). Thus if the estimated forecast errors are biased, we interpret the biases as a sample artifact.

[6]In estimation, standard errors are computed using the robust variance matrix estimator proposed by Newey and West (1987) or Arellano (1987) in case that residuals are serially correlated.

as reference forecasts.[7]

2.3 Results

2.3.1 Aggregate data

Table 2.3 shows the estimation results in (Case A), namely β and $\rho = \frac{\beta}{1+\beta}$ from

$$K_{t+n} - \bar{S}_{t,\ t+n} = \beta(\bar{S}_{t,\ t+n} - \bar{S}_{t-k,\ t+n}) + \eta_{t,\ t+n}:$$

All β and ρ are positive and significant in forecasts on stock prices.[8] As have been reported in such previous studies as Ehrbeck and Waldmann (1996), forecasts on stock prices are judged behavioral and stubborn. The significant, positive ρ implies that current forecasts in the stock market stick or are anchored to past forecasts. On the other hand, all coefficients are not significant in forecasts on bond yields. This is not inconsistent with rational forecasting in the bond market. Below, we will inquire into this forecasting behavior in more detail using individual forecasts.

2.3.2 Individual data

Reliance on aggregate mean forecast

Table 2.4 shows the estimation results in (Case B), namely β and $\rho = \frac{\beta}{1+\beta}$ from

$$K_{t+n} - S^i_{t,\ t+n} = \beta(S^i_{t,\ t+n} - \bar{S}_{t-k,\ t+n}) + \eta^i_{t,\ t+n}: \tag{2.3}$$

[7] Average months of experience are 20.18 for TOPIX, 18.71 for 20-year bond, 17.44 for 10-year bond, and 18.78 for 5-year bond.

[8] Standard errors are computed using Newey and West (1987) estimator.

Even when forecasting behavior is evaluated with micro individual forecasts, we can still find stubborn behavior in forecasts on stock prices[9]; the positive ρ suggests that forecasters stick to past consensus. On the other hand, regarding forecasts on bond yields, all β and ρ are significantly negative. According to the results here, forecasting behavior in the bond market is considered jumpy. Professional forecasters have a tendency to revise their forecasts to the opposite directions from the previous consensus.[10]

Results so far exhibit a stock{bond dissonance: while forecasting behavior in the stock market is considered stubborn, individual forecasters in the bond market are characterized jumpy. These results are new and altogether imply very complex forecasting behavior in the Japanese financial markets.

Reliance on individual forecast

We seek for the reason behind the stock{bond dissonance by looking into the individual forecasting behavior, namely estimating how individual forecasts are related to their own past forecasts. Table 2.5 shows the estimation results in (Case C), namely β and $\rho = \frac{\beta}{1+\beta}$ from

$$K_{t+n} - S^{i}_{t!\ t+n} = \beta(S^{i}_{t!\ t+n} - S^{i}_{t-k!\ t+n}) + \eta^{i}_{t!\ t+n}: \tag{2.4}$$

Forecasts in the stock market are stubborn or under-react to unexpected information, namely having a tendency to follow their past individual forecasts. On the other hand, those in the bond market are considered to be jumpy or over-react to new available information. Consequently, forecasts tend to be revised drastically and quite often to the opposite directions from their own

[9]Standard errors in Cases B and C are computed using the robust variance matrix estimator proposed by Arellano (1987) .

[10]This forecasting behavior is also called bold in the literature. For the intuitive explanation of the bold forecast, please refer to the Figure 1 in Clement and Tse (2005).

previous forecasts.

We can also compare the absolute values of coefficients in (Case B) with those of (Case C). There are contrasting tendencies between the two markets; in the stock market, jρj in (Case B) is smaller than that of (Case C). However, jρj in (Case B) is larger than that of (Case C) in the bond market. These findings indicate that stock market forecasters are likely to put significant weights on past individual forecasts than past consensus while forecasters in the bond market tend to revise current forecasts more drastically from previous consensus than past individual forecasts. The opposite outcomes also support a stock–bond dissonance in the Japanese financial markets.

Estimation results in this chapter show that even in the same country, forecasting behavior is quite different by market. This suggests that the nature of professionals in the stock market is fundamentally different from that in the bond market. This might be caused by the fact that many respondents do not report for both stock and bond markets, and that the composition of the stock market forecasters is different from that of the bond market forecasters. Findings reported by Ashiya (2009) and Nakazono (2012) seem to be related here. They report that forecasting behavior can be quite different by professional affiliation. The question whether forecasting behavior is affected by professional affiliation is answered in Chapter 3.

2.3.3 Differences by experience

Hong et al. (2000) conclude that experienced forecasters are more likely to provide bold forecasts than inexperienced forecasters. Lamont (2002) also finds that with the more experiences, forecasts become more radical. On the other hand, Ashiya and Doi (2001) report that forecasting behavior is not influenced by experience as professional forecasters. We test whether

forecasting behavior in the Japanese financial markets differs by experience.

Table 2.6 and 2.7 show the estimation results for (Case B) in equation (2.3) and (Case C) in equation (2.4) respectively by experience. We cannot observe any clear difference by experience. Forecasting behavior in the Japanese financial market is characterized by market and not by experience.

2.4 Conclusion

In this chapter, we find that (i) professional forecasts are behavioral and significantly influenced by past forecasts, and (ii) there exists a stock-bond dissonance: while forecasting behavior in the stock market seems to be stubborn, forecasting behavior in the bond market seems to be jumpy. Forecasting behavior in the financial markets is not unique and different by market. Furthermore, the degree of such behavioral forecasting is not influenced by experience as professional forecasters.

As far as we know, there is no study that finds the twisted results among stock and bond markets in a unified manner by using one data set. Thus, findings of sticky forecasting in the stock markets and jumpy revision in the bond markets are novel. Using the QSS data we use, Yamamoto and Hirata (2012) examine the determinants of the expectation heterogeneity and show that the difference between buy-side and sell-side professionals contributes to the heterogeneity of expectation. While Yamamoto and Hirata (2012) focus on the Japanese stock markets, we use the QSS data on the stock market as well as the bond market and lead to the contrasting results between two markets. Nakazono and Ueda (2011) also use the QSS data on inflation expectations as well as interest rate expectations to evaluate the effects of quantitative easing policy conducted by the Bank of Japan. But, Nakazono and Ueda (2011) analyze the policy effects on interest rates rather than the

forecasting behavior in the stock and bond markets in Japan. Therefore, the opposite outcomes from two markets contribute to a better understanding of forecasting behavior of market participants.

Table 2.1: Questionnaires in the QSS: Forecasts on stock prices

Stock price	Period	Time horizon of forecast
NIKKEI 225	April 1994 { November 2010	1, 3, 6 months
TOPIX	June 2000 { November 2010	1, 3, 6 months
JASDAQ	June 2000 { November 2010	1, 3, 6 months

Table 2.2: Questionnaires in the QSS: Forecasts on newly-issued JGB yields

Bond yields	Period	Time horizon of forecast
20-year bond	April 2003 { November 2010	1, 3, 6 months
10-year bond	July 1998 { November 2010	1, 3, 6 months
5-year bond	May 2001 { November 2010	1, 3, 6 months

Table 2.3: Estimation results (Case A)

Stock Price / Interest Rates	(n,k)	β	ρ
TOPIX	(1,2)	0:229**	0:186
	(3,3)	0:443**	0:307
	(1,5)	0:101**	0:092
20y	(1,2)	0:097	0:089
	(3,3)	0:001	0:001
	(1,5)	−0:036	−0:037
10y	(1,2)	0:053	0:050
	(3,3)	−0:213	−0:271
	(1,5)	−0:047	−0:049
5y	(1,2)	0:105	0:095
	(3,3)	−0:042	−0:044
	(1,5)	−0:024	−0:025

Note: Standard errors are computed using the robust variance matrix estimator which is proposed by Newey and West (1987). ** denotes significance at 1% level.

Table 2.4: Estimation results (Case B)

Stock Price / Interest Rates	(n,k)	β	ρ
TOPIX	(1,2)	−0:004	−0:004
	(3,3)	0:036**	0:035
	(1,5)	0:041**	0:039
20y	(1,2)	−0:108**	−0:121
	(3,3)	−0:264**	−0:359
	(1,5)	−0:119**	−0:135
10y	(1,2)	−0:093**	−0:102
	(3,3)	−0:357**	−0:554
	(1,5)	−0:105**	−0:118
5y	(1,2)	−0:082**	−0:090
	(3,3)	−0:271**	−0:372
	(1,5)	−0:090**	−0:098

Standard errors are computed using the robust variance matrix estimator proposed by Arellano (1987). Note: ** denotes significance at 1% level.

Table 2.5: Estimation results (Case C)

Stock Price / Interest Rates	(n,k)	β	ρ
TOPIX	(1,2)	0:080**	0:074
	(3,3)	0:167**	0:143
	(1,5)	0:055**	0:052
20y	(1,2)	−0:012	−0:013
	(3,3)	−0:108**	−0:122
	(1,5)	−0:062**	−0:066
10y	(1,2)	−0:002	−0:002
	(3,3)	−0:164**	−0:196
	(1,5)	−0:039**	−0:041
5y	(1,2)	0:002	0:001
	(3,3)	−0:122**	−0:139
	(1,5)	−0:047**	−0:049

Note: Standard errors are computed using the robust variance matrix estimator proposed by Arellano (1987). ** denotes significance at 1% level.

Table 2.6: Estimation results by experience (Case B)

Stock Price / Interest Rates		all		more than 1y		more than 2y	
	(n,k)	β	ρ	β	ρ	β	ρ
TOPIX	(1,2)	−0.004	−0.004	−0.006	−0.006	−0.003	−0.003
	(3,3)	0.036**	0.035	0.034**	0.033	0.041**	0.039
	(1,5)	0.041**	0.039	0.039**	0.037	0.039**	0.037
20y	(1,2)	−0.108**	−0.121	−0.136**	−0.158	−0.141**	−0.164
	(3,3)	−0.264**	−0.359	−0.284**	−0.396	−0.288**	−0.404
	(1,5)	−0.119**	−0.135	−0.125**	−0.143	−0.120**	−0.137
10y	(1,2)	−0.093**	−0.102	−0.091**	−0.100	−0.093**	−0.102
	(3,3)	−0.357**	−0.554	−0.315**	−0.460	−0.294**	−0.417
	(1,5)	−0.105**	−0.118	−0.093**	−0.103	−0.085**	−0.093
5y	(1,2)	−0.082**	−0.090	−0.078**	−0.085	−0.068**	−0.073
	(3,3)	−0.271**	−0.372	−0.264**	−0.358	−0.268**	−0.366
	(1,5)	−0.090**	−0.098	−0.088**	−0.096	−0.087**	−0.096

Note: Standard errors are computed using the robust variance matrix estimator proposed by Arellano (1987). ** denotes significance at 1% level.

Table 2.7: Estimation results by experience (Case C)

Stock Price / Interest Rates		all		more than 1y		more than 2y	
	(n,k)	β	ρ	β	ρ	β	ρ
TOPIX	(1,2)	0.080**	0.074	0.078**	0.072	0.080**	0.074
	(3,3)	0.167**	0.143	0.168**	0.144	0.173**	0.148
	(1,5)	0.055**	0.052	0.054**	0.051	0.053**	0.050
20y	(1,2)	−0.012	−0.013	−0.029**	−0.030	−0.033**	−0.034
	(3,3)	−0.108**	−0.122	−0.114**	−0.128	−0.112**	−0.127
	(1,5)	−0.062**	−0.066	−0.064**	−0.068	−0.061**	−0.065
10y	(1,2)	−0.002	−0.002	0.001	0.001	0.010	0.010
	(3,3)	−0.164**	−0.196	−0.126**	−0.144	−0.092*	−0.101
	(1,5)	−0.039**	−0.041	−0.034*	−0.035	−0.025*	−0.025
5y	(1,2)	0.002	0.001	0.003	0.003	0.007	0.007
	(3,3)	−0.122**	−0.139	−0.120**	−0.136	−0.123**	−0.140
	(1,5)	−0.047**	−0.049	−0.047**	−0.049	−0.047**	−0.049

Note: Standard errors are computed using the robust variance matrix estimator proposed by Arellano (1987). * and ** denote significance at 5% and 1% level, respectively.

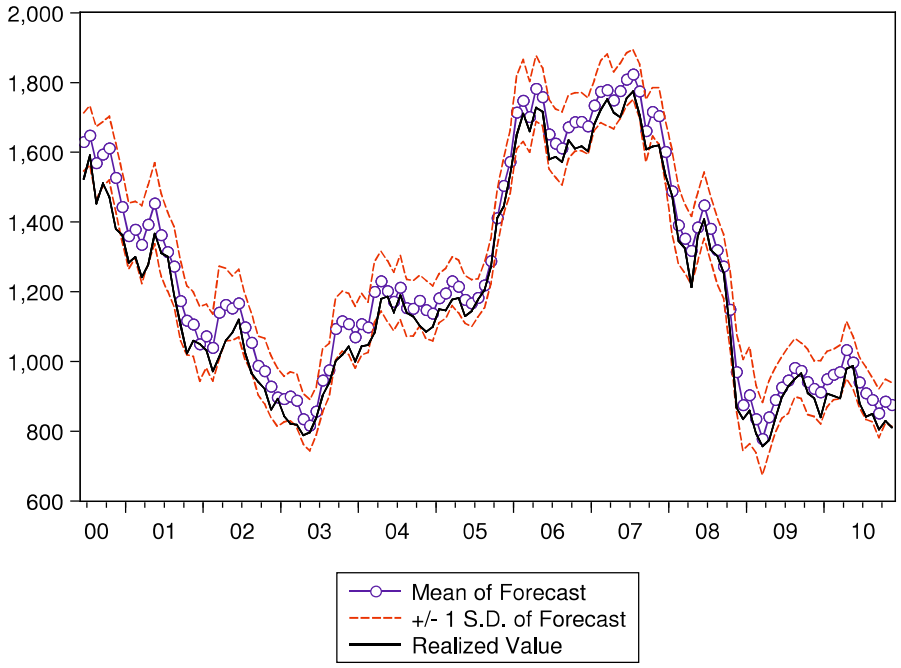


Figure 2.1: Forecast on TOPIX for 3-month horizon

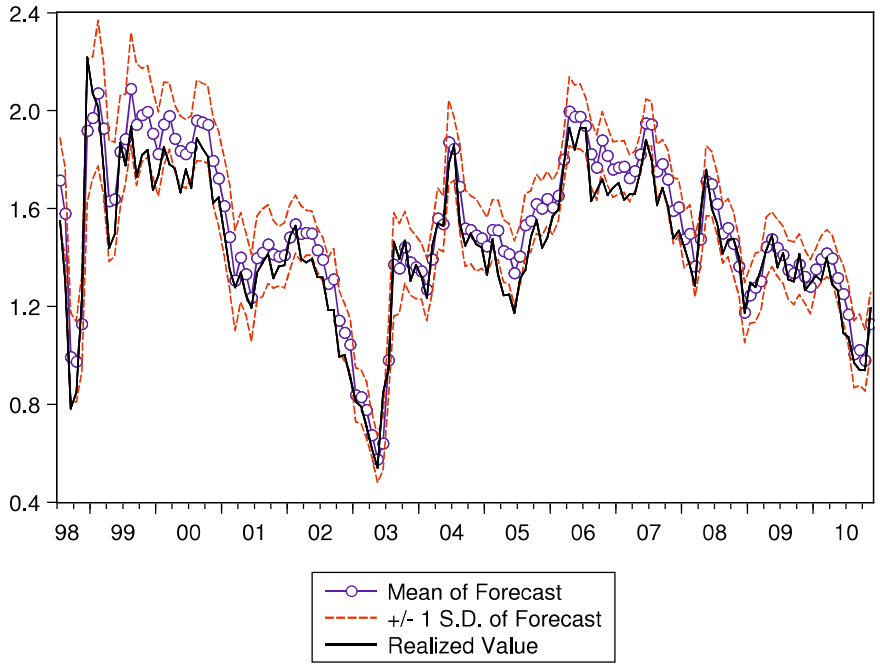


Figure 2.2: Forecast on 10-year JGB yield for 3-month horizon

Chapter 3

Heterogeneity and Anchoring in Financial Markets

3.1 Introduction

Motivation in this chapter is to test the efficient market hypothesis in the traditional financial theories. We test the homogeneity of market participants and the rationality of the expectation formations using a rich individual survey, QSS (QUICK Survey System), provided by QUICK corporation.

By analyzing the forecasts made by market participants, we find two things. First, participants in Japanese stock markets are not homogeneous; the types of firms of respondents affect the expectation formations. The traditional finance theories such as CAPM (Capital Asset Pricing Model) and MPT (Modern Portfolio Theory) insist that market is efficient based on the position of the rational market theory, while past literatures claim that market participats are heterogeneous. For example, Lamont (2002) discusses that the longer experience respondents gain in financial markets, the more radical their forecasts become. Ito (1990) finds that in the prediction of exchange

rates the individual effects in its expectation formation have a characteristic of \wishful expectations".

Second, the majority of market participants {even institutional investors{ predicts stock prices irrationally; in most cases, forecasts by respondents tend to bias toward their past forecasts. Interestingly, the anchoring effect, which was first claimed by Tversky and Kahneman (1974), is found in the expectation formations of almost all of the firms: forecasts by domestic security firm have strong effects of anchoring while anchoring effects are not found from the expectation formations of foreign security firm under "normal" financial market conditions. These results may be caused by compensation structure and internal promotion system between domestic and foreign security firms. The two findings in this chapter are inconsistent with the assumption of the traditional financial theories that the expectation formations of market participants are homogeneous and rational.

A number of empirical studies exist regarding whether the expectation formations are homogeneous and rational. Through empirical research on stock markets in the United States, Fama (1970) concludes that with but a few exceptions, the efficient markets model stands up well. Contrary to such a rational market theory, behavioral finance presents a valid theory even if there are investors behaving irrational.[1] Behavioral finance insists that the assumption of the efficient market hypothesis that the stock prices fully reflect all available information is too strong and far from human capability.

Furthermore, Tversky and Kahneman (1974), in the decision-making under uncertainty, say that you are unable to complete the decision-making process rationally as the traditional finance theories expect. They find that biases in judgments reveal some heuristics of thinking under uncertainty and propose to call as anchoring a phenomenon that judgment under uncertainty

[1] See, Simon (1955) and Simon (1956)

tends to yield irrational estimates, which are biased toward the initial values.

This "anchoring phenomenon" has been studied in various fields and also in financial markets such as forecasting macroeconomic variables, stock prices, bond yields, exchange rates, etc. As for forecasting Japanese stock prices and bond yields, Fujiwara et al. (2012) show that forecasts made by market participants in Japanese financial markets have the anchoring effects. Although Fujiwara et al. (2012) find anchoring effects overall, this chapter examines whether each professional forecaster puts significant weights on past forecasted values using an useful characteristics of panel data and find differences in anchoring effects within the types of firms which respondents work for.

This chapter is structured as follows. In Section 2, we explain the data and estimation strategy. Section 3 provides estimation results. Section 4 concludes.

3.2 Data and estimation strategy

3.2.1 The QSS data

We use the QSS (QUICK Survey System) provided by QUICK corp. The QSS is important in conducting broad and continuing surveys about market participants' sentiments. From July 1996, it asks market participants monthly about their views on equity prices, bond yields, and the real economy. Respondents include market participants from securities firms, banks, investment trusts, insurance firms, pension funds, and other private financial institutions (see Table 3.1). The QSS is an unbalanced panel and asks about 150 people per month.

Among many survey items, we focus on surveys on expectations about stock prices (see Table 3.2). As for stock prices, we use NIKKEI 225, TOPIX

and JASDAQ. For each, 1, 3, and 6-months ahead expectations of the stock prices are available. QSS enables us to classify and analyze the data to each of those surveyed, and QSS can identify firms to which respondents belong.

3.2.2 Estimation strategy

The first analysis using the QSS data is whether the expected rates of return on equity prices are homogeneous or not. CAPM assumes the homogeneous expectations. If the assumption is reasonable, the expected rates of return by any market participants are homogeneous.

The QSS data reveals the type of firms. "Firm" includes the following firms: domestic security firms, foreign security firms, investment trust management firms, investment advisors, banks, trust banks, life insurance firms, general insurance firms, and pension funds. In order to verify whether the expectation formations in all firms are identical, we test whether the differences between individual forecasts and the mean of individual forecasts significantly vary across each type of firms. If the assumption of the homogeneous expectation is reasonable, the differences are not significant. For example, forecasts predicted by those who belong to a foreign security firm should not be significantly different from the mean of forecasts made by individual forecasters. For testing homogeneities, we estimate the following model for each type of firms (j),

$$\frac{S^i_{t,\,t+n} - \bar{S}_{t,\,t+n}}{\bar{S}_{t,\,t+n}} = \alpha^j + \varepsilon^i_{t+n}; \tag{3.1}$$

where $S^i_{t,\,t+n}$ denotes an individual i's survey forecast conducted in period t of the stock price in period $t+n$, $\bar{S}_{t,\,t+n}$ denotes the average of $S^i_{t,\,t+n}$ for all i, and the type of firm, j, includes the following types of fimrs; security firms (domestic), security firms (foreign), investment trust firms, banks and trust banks, and insurance companies. The null hypothesis is that survey

forecasts made by the type j of firms are equal to those by all forecasters, that is $\alpha^{j} = 0$.

The second estimation tests whether anchoring effects are different by types of firms using a model applied in Ichiue and Yuyama (2009). Fujiwara et al. (2012) clarify that forecasts made by market participants in Japan are not rational and anchoring effects exist. This second estimation strategy focuses on how different anchoring effects are in each firm.

For testing anchoring effects by each firm, we consider a partial adjustment model of survey forecasts as in Ichiue and Yuyama (2009):

$$S^{i}_{t!\ t+n} = \rho S^{i}_{t-k!\ t+n} + (1-\rho)E^{i}_{t}[K_{t+n}]; \tag{3.2}$$

where ρ measures the degree of the inertia in expectation. Naturally, if $\rho = 0$, the current survey forecasts by individual i, $S^{i}_{t!\ t+n}$, are equal to the market expectations conditional on the information available at time t, namely $E^{i}_{t}[K_{t+n}]$. Here, $0 \leq \rho < 1$ implies that the current survey forecasts are influenced by the previous surveys. By using the definition of forecast errors, equation (3.2) can be further rewritten as

$$K_{t+n} - S^{i}_{t!\ t+n} = \frac{\rho}{1-\rho}(S^{i}_{t!\ t+n} - S^{i}_{t-k!\ t+n}) + \eta^{i}_{t!\ t+n}; \tag{3.3}$$

where

$$\beta = \frac{\rho}{1-\rho};$$

and

$$\eta^{i}_{t!\ t+n} \equiv K_{t+n} - E^{i}_{t}[K_{t+n}]:$$

$\eta^{i}_{t!\ t+n}$ denotes the forecast errors of the market expectations, which are not

predictable from information known in period t under rational expectations. Thus, $\eta^{i}_{t,\ t+n}$ should be considered white noise. As a result, we can test whether the degree of the inertia ρ is nonzero or, in other words, a null hypothesis of $\beta = 0$, by regressing equation (3.3)[2] [3].

3.3 Estimation results

3.3.1 Homogeneity

Table 3.3 summarizes the test whether the differences between forecasts by each firms and the mean of forecasts are significant. "Sec. (D)" and "Sec. (F)" indicate domestic security firms and foreign security firms, respectively. "Inv." consists of investment trust management firms and investment advisors, \Banks" consists of bank and trust bank, \Ins." consists of life insurance and general insurance firms.

According to the estimation results, the heterogeneity exists in every classification. Table 3.3 shows that forecast by each firm is significantly different from the mean of individual forecasts in almost all cases: the null hypothesis, $\alpha = 0$, is rejected in about 84% of the cases. This estimation results are inconsistent with the above assumption of CAPM or MPT. Furthermore, note that looking at the second row of Table 3.3, the estimated values of foreign security firms are significantly negative and the smallest in all types of firms. These results indicate that the heterogeneity of market participants, especially that of foreign security firm is remarkable.

[2]Note that a constant term is not included in the regression, since the forecast errors of market expectations $\eta^{i}_{t,\ t+n}$ should be unbiased at least ex ante. Thus if the estimated forecast errors are biased, we interpret the biases as a sample artifact. Ichiue and Yuyama (2009).

[3]In estimation, standard errors are computed using the robust variance matrix estimator proposed by Arellano (1987) in case that residuals are serially correlated.

3.3.2 Anchoring effects

As for anchoring effects, we estimate three patterns of sample periods. The estimation results are showed in Tables 3.4 to 3.6. Table 3.4 covers the full sample period and this sample periods is divided into two, one of which is before the financial turmoil and the other of which is after that turmoil, respectively.

The estimation results suggest the following three points. First, Table 3.4 indicates that anchoring effects exist in almost all types of firms. In fact, 27 cases reject the null hypothesis, H_0: $\rho = 0$. This result is supported by Table 3.5, which also shows the anchoring effects before the financial turmoil.

Anchoring effects may occur because those who are engaged in forecasting on stock prices every month are conscious about their consistency between present and past forecasts. Consider a person who is responsible for informing their customers about stock price forecasts. Such a person as an investment advisor may anchor her present forecast to her past forecast because if she suddenly changed their perspective drastically for stock markets, she would have to explain what had fundamentally changed and why they had been wrong. As a result, anchoring effects vary in most types of firms.

The second finding is that foreign security firm (Sec. (F)) has weaker effects of anchoring than other types of firms. The second column in Table 3.4 indicates that we fail to reject H_0 during the full sample period. Furthermore, when we estimate our model over the period before the financial turmoil, we find no anchoring effects in foreign security firm. These results are very interesting because it is the only type of firm that anchoring effects are not found while the other firms, such as domestic securities and investment advisory or investment trust companies have anchoring effects. Based on this exceptional result on foreign security firm, the heterogeneity of foreign securi-

ties is remarkable. Remember that in the first analysis for the heterogeneity, the heterogeneity of foreign securities is also worthy of mentioning because their forecasts are more cautious than the overall average in all indices. One possibility of the heterogeneity of foreign securities may come from the compensation structure and internal promotion system which are different from Japanese companies.

Finally, we find that there are stronger effects of anchoring after the financial crisis in all types of firms. Table 3.6 shows that null hypothesis is rejected in 34 out of 45 cases (76%). Moreover, the values of ρ are higher than those of Table 3.4, which means that forecasters weighted more strongly on their past forecasts than before the financial turmoil. It is interesting that once the market collapses, all of the respondents significantly stick to their past forecast. Even in the foreign security firms' case, we find anchoring effects, which are slightly larger than those of other types of firms. One possibility that explains the behavioral forecasts by foreign security in sub sample 2 may come from panic associated with the financial crisis. We fail to reject H_o for foreign securities in sub sample 1, while Table 3.6 shows anchoring effects even among foreign securities in sub sample 2. This evidence indicates that each forecaster which falls into a state of panic during the financial turmoil may heavily weight on past forecasted values. The view of \panic forecasting" seems to be consistent with Tversky and Kahneman (1974). Tversky and Kahneman (1974) show that bounded rationality arises under uncertainty, which seems to correspond to the financial turmoil in our analysis.

3.4 Conclusion

In this chapter, through a definitive analysis of panel data of Japanese stock markets forecasting, the following two points are clarified. First, market

participants are heterogeneous. The second finding is that the majority of market participants –even institutional investors– put significant weights on past forecasted values. The fact that anchoring effects vary in the different types of firms suggests that the expectation formations are also affected by what types of firms which respondents work for.

Table 3.1: Types of firms and affiliation of respondents

Type of firms	Abbreviation	Affiliation
Security firms (Domestic)	Sec. (D)	Security firms (Domestic)
Security firms (Foreign)	Sec. (F)	Security firms (Foreign)
Investment trust firms	Inv.	Investment trust management firm Investment advisor
Banks and Trust banks	Bank	Bank Trust bank
Insurance companies	Ins.	Life insurance firm General insurance firm

Table 3.2: Questionnaires in the QSS

Item	Period	Time horizon of forecast
NIKKEI 225	April 1994 { November 2010	1, 3, 6 months
TOPIX	June 2000 { November 2010	1, 3, 6 months
JASDAQ	June 2000 { November 2010	1, 3, 6 months

Table 3.3: Test on homogeneity (α)

NIKKEI 225			
Horizon	1M	3M	6M
Security firms (Domestic)	0.53%**	0.99%**	1.50%**
Security firms (Foreign)	−0.97%**	−2.13%**	−2.43%**
Investment trust firms	0.13%**	0.19%*	0.06%
Banks and trust banks	−0.24%**	−0.54%**	−0.66%**
Insurance companies	−0.42%**	−0.59%**	−1.11%**
TOPIX			
Horizon	1M	3M	6M
Security firms (Domestic)	0.45%**	0.83%**	1.22%**
Security firms (Foreign)	−0.86%**	−2.11%**	−2.58%**
Investment trust firms	0.17%**	0.31%**	0.35%**
Banks and trust banks	−0.38%**	−0.81%**	−1.08%**
Insurance companies	−0.41%**	−0.65%**	−1.22%**
JASDAQ			
Horizon	1M	3M	6M
Security firms (Domestic)	0.34%**	0.53%**	0.78%**
Security firms (Foreign)	−0.57%**	−1.38%**	−1.80%**
Investment trust firms	0.01%	0.12%	0.06%
Banks and trust banks	−0.14%	−0.37%	−0.28%
Insurance companies	−0.37%**	−0.42%**	−0.64%**

Note: Statistical significance is denoted by ** and * at the 1% and 5% levels, respectively.

Table 3.4: Anchoring effects (ρ) during full sample period

	NIKKEI 225			TOPIX			JASDAQ		
(n, k)	(1, 2)	(3, 3)	(1, 5)	(1, 2)	(3, 3)	(1, 5)	(1, 2)	(3, 3)	(1, 5)
Sec. (D)	0.04**	0.13**	0.05**	0.08**	0.14**	0.06**	0.01	0.04	0.02**
Sec. (F)	0.00	0.00	0.03	0.02	0.04	0.03	−0.01	0.04	0.01
Inv.	0.07**	0.17**	0.06**	0.10**	0.17**	0.06**	0.07**	0.11**	0.04**
Bank	0.02	0.12**	0.04**	0.06	0.15**	0.05**	0.04	0.11**	0.04**
Ins.	0.01	0.06**	0.01	0.06**	0.11**	0.03**	0.00	0.04	0.01

Note: Nikkei 225 covers April 1994 to November 2010 and TOPIX, and JASDAQ cover June 2000 to November 2010. Standard errors are computed using the robust variance matrix estimator proposed by Arellano (1987). Statistical significance is denoted by ** and * at the 1% and 5% levels, respectively.

Table 3.5: Anchoring effects (ρ) in sub sample period 1

	NIKKEI 225			TOPIX			JASDAQ		
(n, k)	(1, 2)	(3, 3)	(1, 5)	(1, 2)	(3, 3)	(1, 5)	(1, 2)	(3, 3)	(1, 5)
Sec. (D)	0.03*	0.11**	0.05**	0.06**	0.11**	0.05**	0.01	0.04	0.02**
Sec. (F)	−0.01	−0.02	0.02	−0.02	−0.02	0.00	−0.02	0.01	0.00
Inv.	0.07**	0.17**	0.06**	0.09**	0.16**	0.06**	0.06**	0.12**	0.04**
Bank	0.02	0.11*	0.04	0.04	0.13**	0.05**	0.04	0.12*	0.06**
Ins.	−0.01	0.03	−0.00	0.03	0.07**	0.00	−0.01	0.03	0.01

Note: Nikkei 225 covers April 1994 to June 2008 and TOPIX, and JASDAQ cover June 2000 to June 2008. Standard errors are computed using the robust variance matrix estimator proposed by Arellano (1987). Statistical significance is denoted by ** and * at the 1% and 5% levels, respectively.

Table 3.6: Anchoring effects (ρ) during sub sample period 2

	NIKKEI 225			TOPIX			JASDAQ		
(n, k)	(1, 2)	(3, 3)	(1, 5)	(1, 2)	(3, 3)	(1, 5)	(1, 2)	(3, 3)	(1, 5)
Sec. (D)	0.11**	0.19**	0.07**	0.13**	0.21**	0.09**	0.06**	0.02	0.02*
Sec. (F)	0.16	0.27*	0.12**	0.21*	0.31**	0.14**	0.15*	0.27**	0.09
Inv.	0.10**	0.18**	0.06**	0.13**	0.20**	0.07**	0.08*	0.05	0.02
Bank	0.07*	0.16*	0.04	0.10**	0.18**	0.05*	−0.00	0.04	−0.01
Ins.	0.12**	0.17**	0.06**	0.16**	0.22**	0.07**	0.10**	0.09	0.03

Note: Nikkei 225, TOPIX, and JASDAQ cover July 2008 to November 2010. Standard errors are computed using the robust variance matrix estimator proposed by Arellano (1987). Statistical significance is denoted by ** and * at the 1% and 5% levels, respectively.

Chapter 4

Monetary Policy and Inflation Expectations in Japan

4.1 Introduction

The nature of short-run inflation dynamics is one of the central issues in macroeconomics and Keynesian economics predicts that even nominal disturbances have marked effects (Ball and Romer (1990) and Blanchard (1990)) because nominal wage and prices are rigid. From the standpoint of Keynesian economics, macroeconomic outcomes such as output are affected through short-term inflation dynamics. Inflation dynamics[1] is examined both theoretically and empirically, for example, by Gali and Gertler (1999), Sbordone (2002), and Gali et al. (2001), who provide evidence for the fit of the New Phillips Curve and suggest that the degree of price stickiness implied by the estimates is substantial.

There is extensive literature about the relationship between actual inflation dynamics and inflation expectations, which are closely related to each

[1]Goodfriend and King (1997) provide a comprehensive survey on inflation dynamics.

other in an intuitive manner. The fact that inflation dynamics is determined by inflation expectations is supported by empirical studies, such as Canova and Gambetti (2010), Nunes (2010), Ang et al. (2007), and Ball and Croushore (2003). From an examination of the role of expectations during the \Great Moderation", which started in the mid-1980s (Blanchard and Simon (2001)), Canova and Gambetti (2010) suggest that expectations explain the dynamics of inflation and interest rates. Nunes (2010) shows that survey expectations are a statistically significant component of firms' expectations and inflation dynamics.

It is natural that macroeconomists pay considerable attention not only to the determinants of actual inflation dynamics but also to inflation expectations, particularly when central banks set the stance of monetary policy to achieve their objectives. Inflation expectations are considered a key economic indicator. First, inflation expectations determine real interest rates, which could affect the real economy. Second, inflation forecasts are often referred to in wage negotiation between employers and employees; thus inflation expectations could affect the price of goods and services. Third, inflation expectations are often said to have a self-fulfilling property that leads to actual inflation (Leduc et al. (2007)).

Our aim in this chapter is to analyze the effect of short-term nominal interest rates on inflation expectations using quantitative, frequently collected data from professional forecasters. We examine the relationship between monetary policy and inflation expectations to clarify the determinants of inflation expectations in Japan[2].

Although the importance of the role of inflation expectations in determining monetary policy is widely known, very few studies have examined

[2]There are a number of empirical studies on inflation expectations formation. Pesaran and Weale (2006) focus on survey expectations and review models of expectations formation.

this topic. Berk (2002) analyzes the effects of monetary policy decisions on households' inflation expectations obtained from a qualitative survey of European consumers. Ueda (2010) investigates the determinants of households' inflation expectations in Japan and the United States obtained from quarterly survey data and finds that inflation expectations respond to not only changes in energy and food prices but also monetary policy shocks. Hori and Shimizutani (2005) suggest that a series of quantitative easing monetary policies are only slightly effective in changing price expectations because the policy announcements cause revision of price expectations only for a small portion, i.e., 5{10% of people surveyed.

Although the literature contains some interesting findings, the analyses mainly utilize qualitative data. We, however, use quantitative data on inflation expectations obtained from Consensus Economics, which are monthly forecasts made by professional forecasters. This avoids the need to transform qualitative data into quantitative data via an appropriate approach, such as the Carlson and Parkin (1975) method.

This chapter examines the relationship between monetary policy and inflation expectations, which are important in determining monetary policy. We study the effect of monetary policy on inflation expectations with not qualitative, quarterly data provided by households, but quantitative, monthly data made by professional forecasters for Japan. The following two points summarize the contributions of this chapter. First, we find that an unexpected monetary policy shock lowers realized and expected inflation. This suggests that monetary policy is one of important policy instruments for controlling the expectation of inflation. Second, we explain that inflation expectations affected by a contractionary monetary policy shock exhibit the self-fulfilling property. These findings are similar to those of Ueda (2010) using quarterly, qualitative survey data on inflation made by Japanese household.

The rest of this chapter is structured as follows. In Section 2, we provide an overview of data on inflation expectations and estimation strategy by using a structural vector autoregression (SVAR). In Section 3, we show estimation results and robustness check. Section 4 concludes.

4.2 Data and estimation strategy

In this section, we examine the relationship between inflation and inflation expectations in Japan by using a SVAR, following the estimation strategy used in Ueda (2010). Assume that the true SVAR(n) model is the following:

$$A_0 X_t = A(L) X_{t-1} + e_t; \quad I_n = E[e_t e_t^0];$$

where $X_t = (y_t; i_t, \pi_t, \pi_t^e)^0$ is a vector of n endogenous variables, and A_0 and $A(L)$ are coefficient matrices, and L is the lag operator. Here X_t consists of the monthly-output gap (y), short-term nominal interest rate (i), inflation rate (π), and current expected inflation rate obtained from Consensus Economics (π^e).

The output gap (y) is defined as the percentage of difference from the trend of monthly-GDP by the Hodrick-Prescott filter ($\lambda = 14; 400$).[3] Short-term nominal interest rates (i) are the uncollateralized overnight call rates available from the Bank of Japan. The inflation rates (π) are the change in CPI, excluding fresh food prices. Current expected inflation rates (π^e) are obtained from Consensus Economics. In addition, three exogenous variables are included in our estimation. One is year-on-year oil price changes (dPoil) taken from the Nikkei oil index, the second is year-on-year fresh food price

[3]The output gap is defined as the percentage of difference from the trend of monthly GDP, which is released by the Japan Center for Economic Research, by the Hodrick{ Prescott filter (Hodrick and Prescott (1997)) with the smoothing parameter, $\lambda = 14; 400$ (Backus and Kehoe (1992); Mise et al. (2005)).

changes (dPf resh), and the third is consumption tax dummies, which take the value of unity from April 1997 to March 1998, and zero otherwise. Our sample period ranges from January 1994 to December 2010.

We use surveys conducted by Consensus Economics Inc. as monthly data for inflation expectations. The data from Consensus Economics are international surveys of professionals' economic forecasts. Since 1991, these surveys have covered estimates for principal macroeconomic indicators, including GDP growth, inflation, interest rates, and exchange rates. Among many survey items, we focus on surveys of inflation rate expectations, for which we use the year-on-year rate of change in the CPI. Inflation expectations at the end of each year and the next year are available. We define the 1-year ahead inflation expectation at t (month m, year h) as π^e_t, as Gorter et al. (2008) adopt the following equation:

$$\pi^e_t = \frac{13-m}{12}\pi^e_h + \frac{m-1}{12}\pi^e_{h+1}: \tag{4.1}$$

Figure 4.1 shows the movement of the 1-year ahead inflation expectations derived from equation (4.1) and core consumer price index.

The structured shocks, e_t, are assumed to be mutually orthogonal, and their variance-covariance matrix is a 4×4 identity matrix. The reduced form of this SVAR is described as the following:

$$X_t = \Phi_1 X_{t-1} + \cdots + \Phi_4 X_{t-4} + "_t; \quad \Sigma_4 = E["_t "^0_t];$$

where $\Phi_j = A_0^{-1}\Phi^*_j$ and $\Sigma_j = A_0^{-1}(A_0^{-1})^0$. The shocks, $"_t$, are mutually correlated.

We impose restrictions to identify the monetary policy shock. We adopt the non-recursive scheme put forward by Ueda (2010) and impose $4 \times (4 -$

1)=2 = 6 zero restrictions on the matrix contemporaneous relationships A_0. By imposing the following restrictions on matrix A_0,

$$A_0 = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & a_{24} \\ a_{31} & 0 & 1 & a_{34} \\ a_{41} & a_{42} & a_{43} & 1 \end{pmatrix}; \tag{4.2}$$

we estimate the reduced form of a SVAR model with the restrictions on the parameters of A_0. The lag length is four, in line with the results from the standard Akaike information criterion (AIC).

The restrictions on the parameters of A_0 allow us to examine the concurrent dependence among endogenous variables. First, inflation expectations are concurrently affected by all of other endogenous variables, that is, y, i, and π. Thus, our estimation strategy enables concurrent interdependence of inflation expectations on other economic variables. Second, short-term nominal interest rate is concurrently affected only by inflation expectations. This assumption implies that a central bank takes account of current inflation expectations but it can not observe the current inflation rate and the current output gap. It is allowed to analyze the relationship between inflation expectations and short-term nominal interest rate. Third, output gap and inflation expectations affect actual inflation contemporaneously. Due to this strategy, we can examine the concurrent relationship between inflation and inflation expectations. It is noted that output gap is not affected by current variables because the responses of output gap delay structural shocks of other variables.

4.3 Estimation results

4.3.1 Main results

In this section, we present the description of data used and illustrate the impulse responses of endogenous variables. Figure 4.2 shows the impulse responses of the four endogenous variables to four structural shocks. Each column represents a structural shock of one standard deviation and each row represents the response of an endogenous variable. Dotted lines represent the 16^{th} and 84^{th} percentiles (68% confidence interval)[4].

In the first column, a positive output gap shock increases the output gap, short-term interest rate, inflation, and inflation expectations significantly. Thus, this shock is interpreted as the demand shock.

The second column illustrates the responses to a positive interest rate shock in the monetary policy. The contractionary monetary policy shock reduces output gap, inflation, and inflation expectations. A decrease in inflation suggests that the price puzzle is resolved[5] because the non-recursive restriction is imposed as described in equation (4.2). We also find that the initial response of inflation expectations, -0.074, is larger than that of inflation, -0.062. Furthermore, the responses of inflation expectations to a contractionary monetary policy shock bottom out earlier than those of inflation. These result suggest the presence of price stickiness.

In the third column, we observe that a positive inflation shock raises inflation and that an initial response to inflation leads to an increased interest rate in medium term. In contrast, the impact of a positive inflation shock on inflation expectations is large and significant.

[4]We follow Ueda (2010) as for the confidence interval.

[5]Empirical studies find a protracted rise in the price level following an exogenous contractionary monetary policy shock. See, for example, Sims (1992), Eichenbaum (1992), and Hanson (2004).

The fourth column shows the responses to a positive inflation expectation shock. This shock leads to increases in all variables. We also note that inflation reacts significantly to an inflation expectations shock. This implies that expectations shocks are self-fulfilling.

On the whole, our estimation strategy and restrictions are valid because these impulse responses appear reasonable and our results are consistent with those of Ueda (2010).

4.3.2 Variance decompositions

Table 4.1 shows variance decompositions and contributions made by structural shocks to the forecast error variances of realized and expected inflation at horizons of 3, 12, 24, and 60 months.

Table 4.1 reports, first, that the monetary policy shock has a considerable effect. The contribution of the monetary policy shock to inflation expectations is about 50% in the short run. While its contribution to realized inflation is negligible in the short run probably because of price stickiness, it increases to about 30% within 2–5 years. Second, the effect of the demand shock on realized inflation is less than 3% within 3 months. However, it increases to about 20% within 1–5 years. These findings suggest that changes in realized inflation are largely caused by fundamentals such as output and monetary policy in the medium to long run. Finally, the contribution of the shock of inflation expectation on realized inflation is smaller than 5% within 3 months. However, it increases to about 17% within 1{5 years. This implies the self-fulfilling property of inflation: an unexpected increase in inflation forecasts causes a rise in realized inflation rate.

4.3.3 Robustness check

We check robustness of these estimation results (1) by changing sample periods to January 1994 through December 2007 in Figure 4.3, (2) by changing y from output gap to demean output, i.e. logarithm of monthly GDP minus logarithm of average of monthly GDP in Figure 4.4, (3) by changing sample periods to January 1994 through December 2001 in Figure 4.5, and (4) by changing sample periods to January 1998 through December 2006 in Figure 4.6. As Figures 4.3 and 4.6 show, our robustness checks support the above findings: inflation expectations respond to a contractionary monetary policy and inflation expectations can be inferred to have a self-fulfilling property, even when we change the sample for just covering `zero-interest-rate-policy' (ZIRP) period from 1998 to 2006 in Figure 4.6. Hence, our estimation strategy is plausible.

While robustness checks support the main findings, Figure 4.5 illustrates that inflation expectations positively respond to a contractionary monetary policy during the sub sample which cover from 1994 to 2001. This response of inflation expectation is not consistent with the above finding that monetary policy works as one of effective policies in controlling inflation expectations. The possible reason may come from delay in lifting monetary tightening after the bursting of the bubble (Okina and Shiratsuka, 2002). Given the fact that monetary policy fell behind the curve after the bursting bubble, the response of inflation expectation to a rise in monetary policy shock may lead to be positive rather than negative. Still, Figure 4.5 supports the other finding; inflation expectations have a self-fulfilling property.

Although Figures 4.3 to 4.6 provide the reasonable impulse responses, we need careful interpretation of the impulse responses, given the fact that the samples cover ZIRP periods. We identify monetary policy shocks by using

uncollateralized overnight call rate. Because the call rate hardly moved during ZIRP period, the strategy for identifying monetary policy shocks using the overnight call rate which is almost zero, can be criticized as unappropriated. Furthermore, it should be pointed out that under ZIRP period we may fail to evaluate the effect of an accommodative monetary policy shock on inflation or inflation expectations because there is little room for interest rates to decrease. The studies on the identification method of monetary policy shocks and the effect of an expansionary shock during ZIRP period are left for our future research.

4.4 Conclusion

This chapter examines the relationship between monetary policy and inflation expectations, which are important in determining monetary policy. We study the effect of monetary policy on inflation expectations with not qualitative, quarterly data provided by households, but quantitative, monthly data made by professional forecasters for Japan.

The following two points summarize the contributions of this chapter. First, we find that an unexpected monetary policy shock lowers realized and expected inflation. This suggests that monetary policy is one of important policy instruments for controlling the expectation of inflation. Second, we explain that inflation expectations affected by a contractionary monetary policy shock exhibit the self-fulfilling property.

Table 4.1: Variance decomposition

(1) Inflation rate	y	i	π	π^e
T = 3	2:2	9:5	85:0	3:2
T = 12	20:8	24:7	43:8	10:8
T = 24	18:4	28:9	35:3	17:3
T = 60	18:4	28:9	35:1	17:6
(2) Inflation expectations	y	i	π	π^e
T = 3	8:0	51:3	2:2	38:5
T = 12	8:0	45:4	4:4	42:2
T = 24	7:1	44:0	4:0	44:9
T = 60	7:0	43:5	4:0	45:6

Figure 4.1: Movement of core inflation (π) and inflation expectations (π^e)

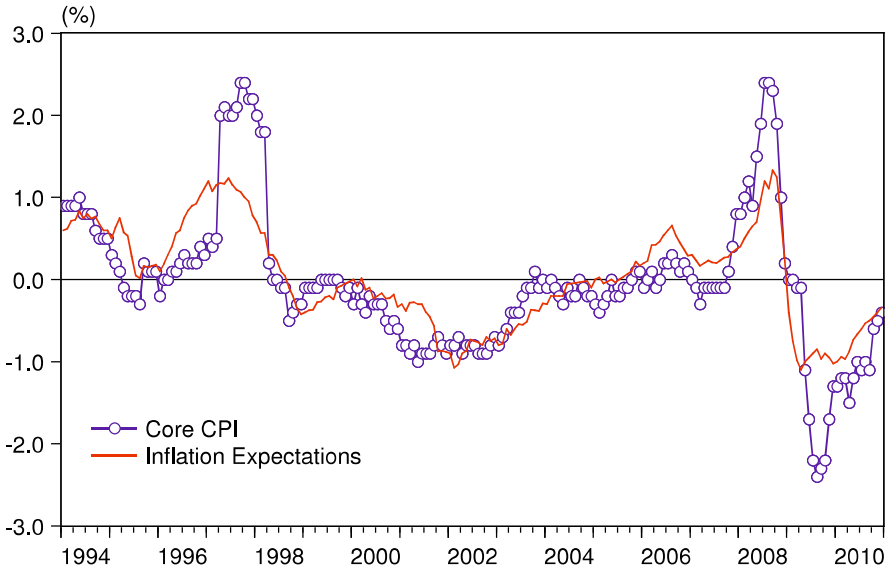


Figure 4.2: Impulse responses to structural shocks from January 1994 to December 2010

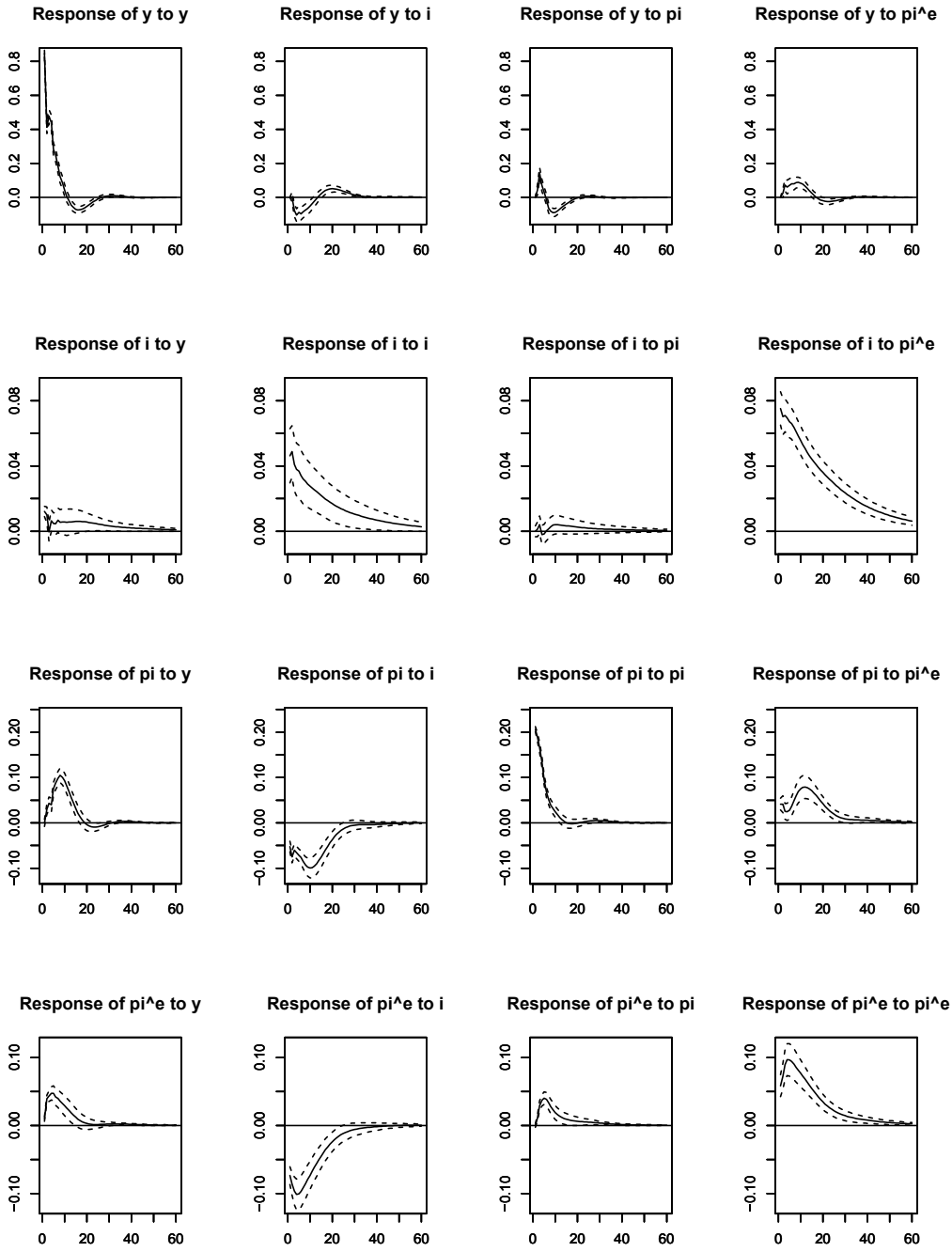


Figure 4.3: Robustness check (1) Impulse responses to structural shocks from January 1994 to December 2007

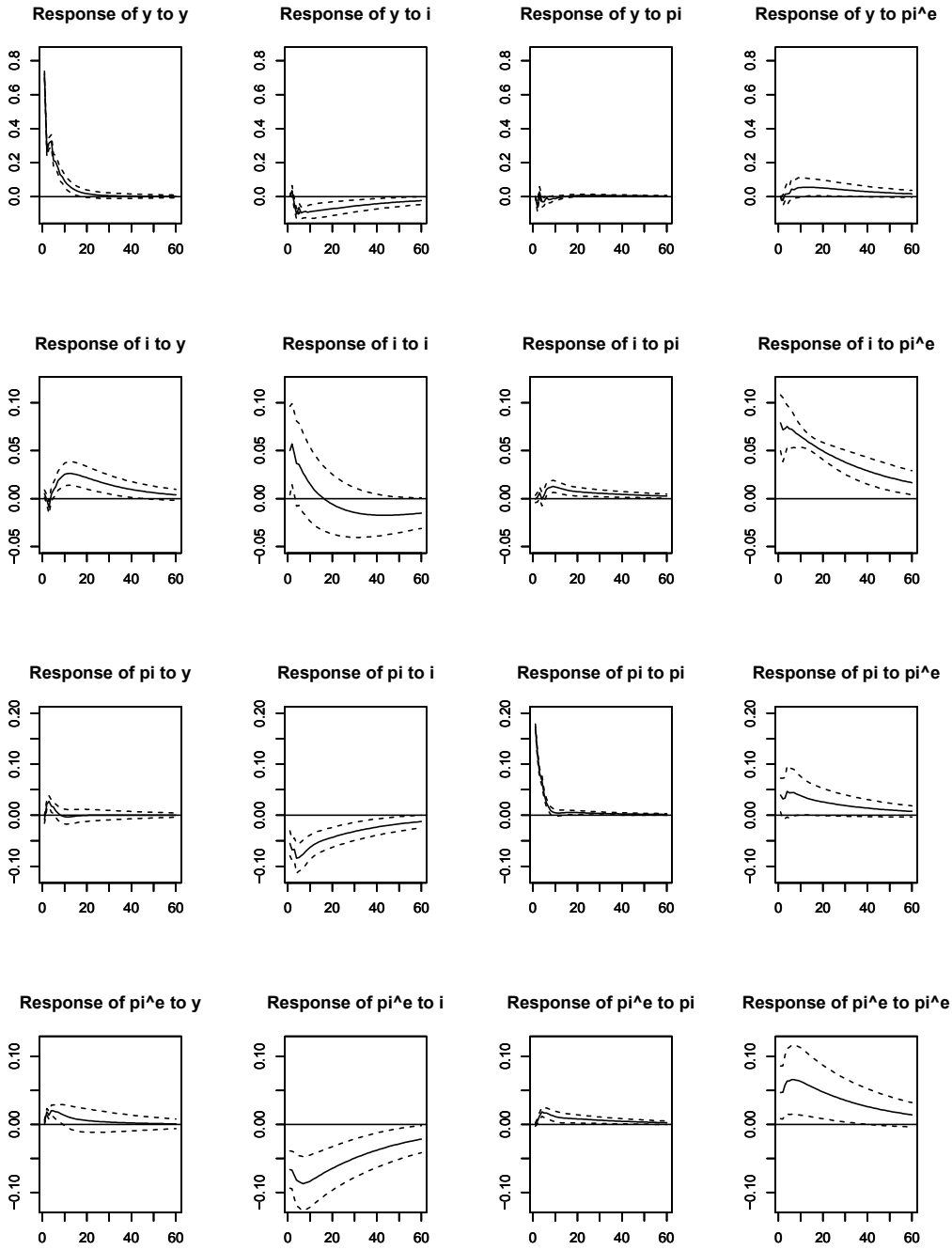


Figure 4.4: Robustness check (2) Impulse responses to structural shocks from January 1994 to December 2010

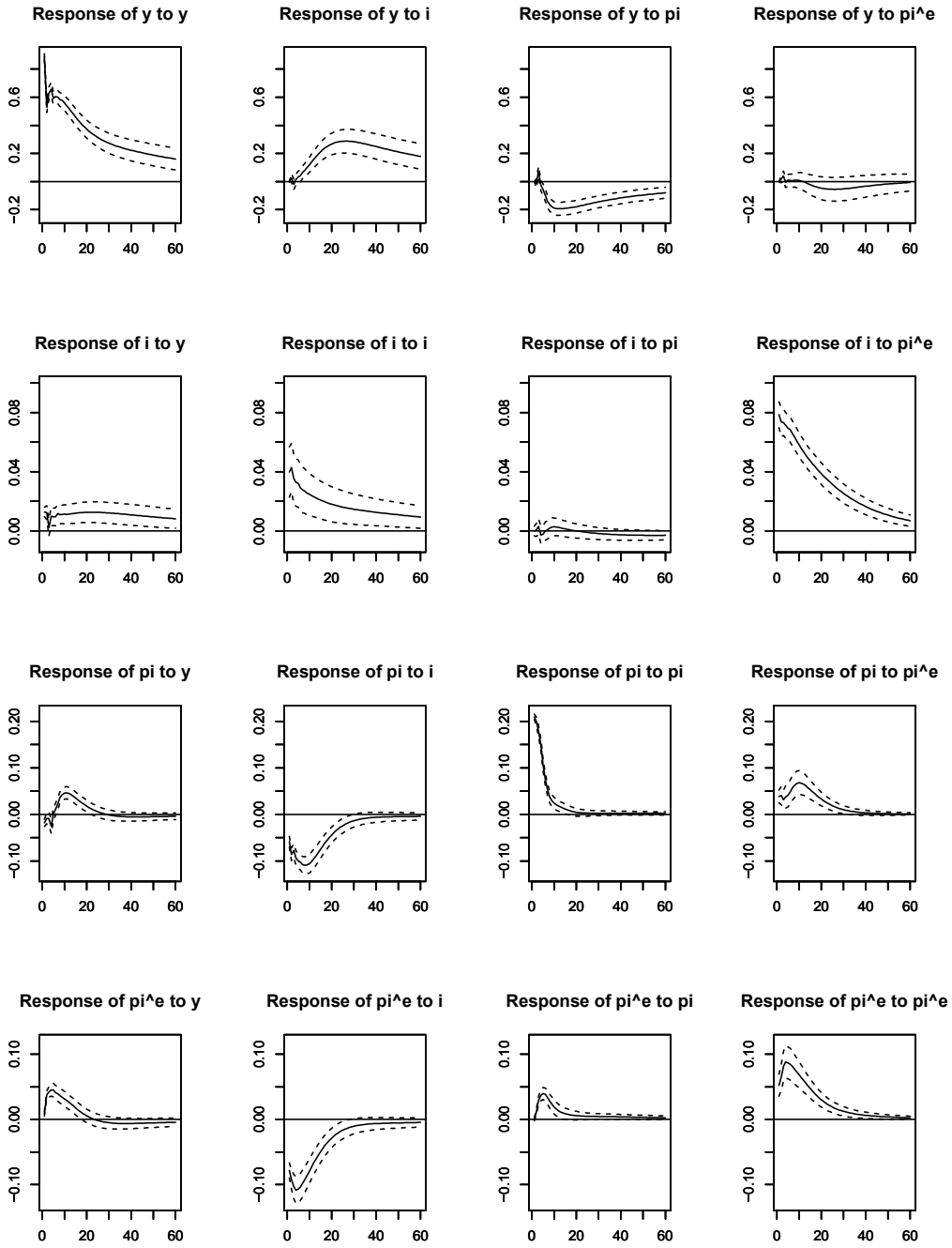


Figure 4.5: Robustness check (3) Impulse responses to structural shocks from January 1994 to December 2001

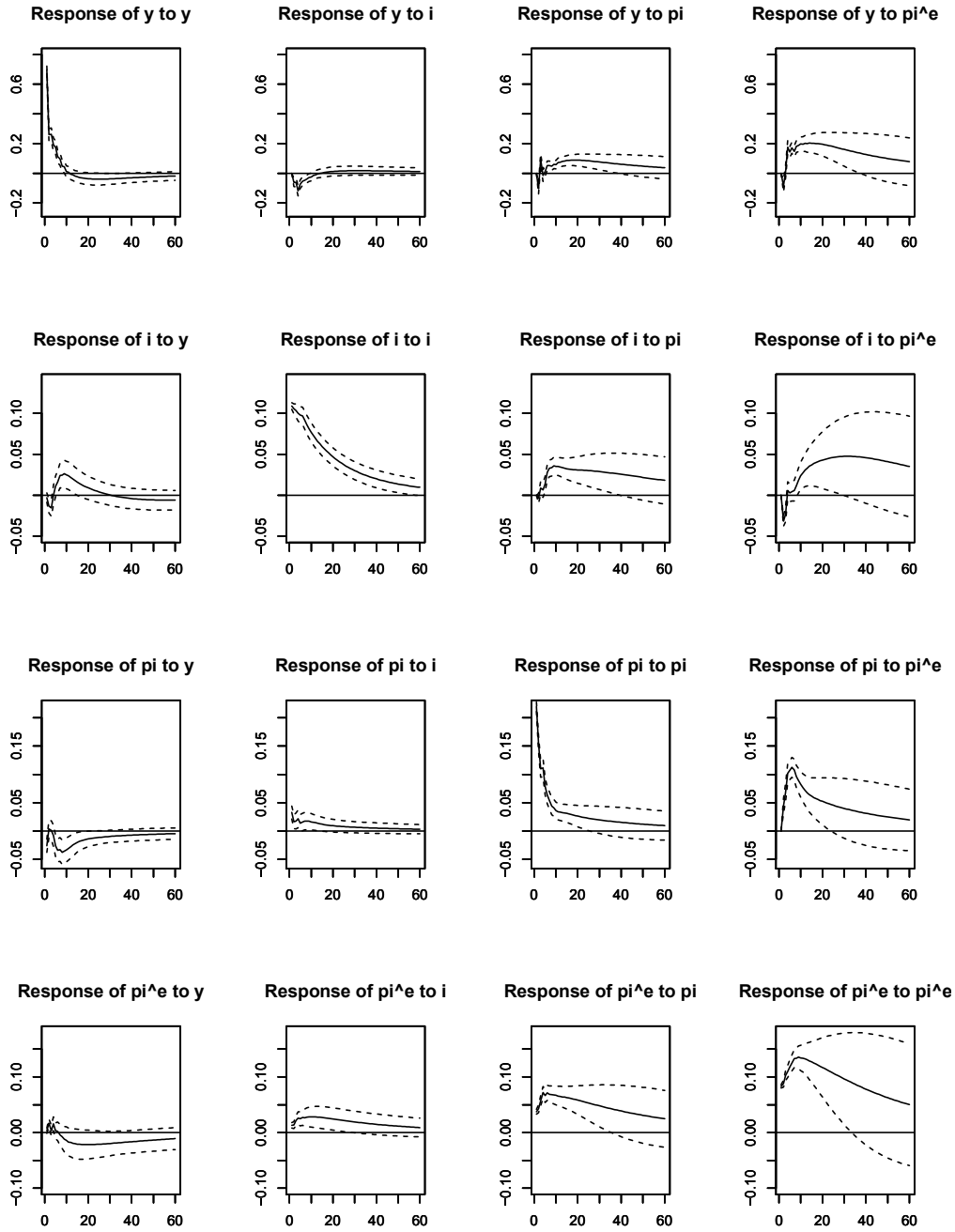
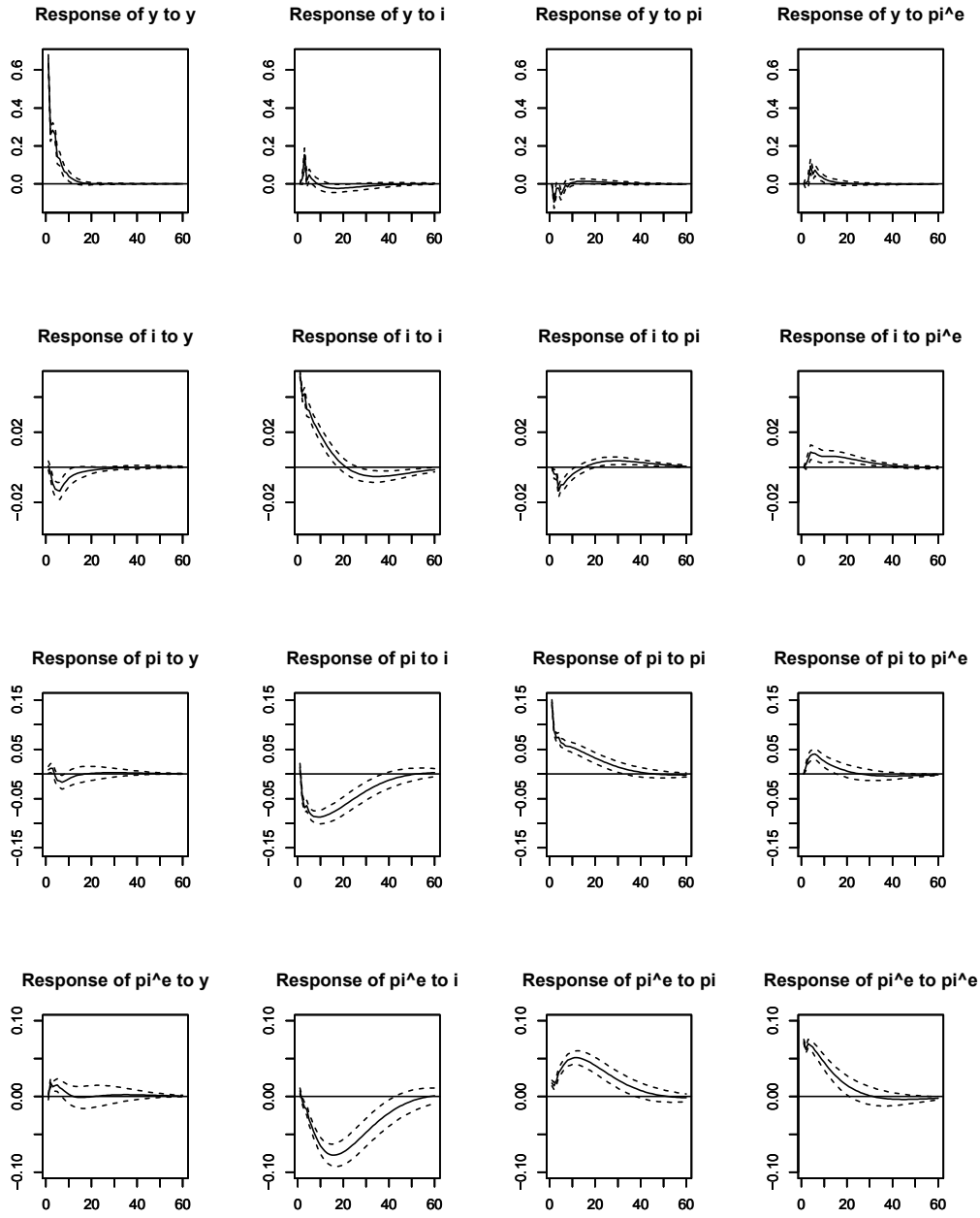


Figure 4.6: Robustness check (4) Impulse responses to structural shocks from January 1998 to December 2006



Chapter 5

Conclusion

5.1 Summary

The motivation behind this paper is to examine the properties of expectations formation and analyze the interdependence between individuals' expectations and economic activity.

In Chapter 2, we test whether professional forecasts are rational or behavioral with unique database, which includes forecasts on both stock prices and bond yields for various time horizons. The estimation results show that (i) professional forecasts are bounded-rational, namely, significantly influenced by past forecasts, and (ii) there exists a stock{bond dissonance: while forecasting behavior in the stock market seems to be stubborn, forecasting behavior in the bond market seems to be jumpy. We also show that forecasting behavior in the Japanese financial markets has little to do with individual experiences as professional forecasters.

Chapter 3 shows that the heterogeneity of market participants in Japan and their behavioral forecasts through a definitive analysis of panel data of Japanese stock markets forecasting. Motivation in Chapter 3 is to verify the

efficient market hypothesis in the traditional financial theories. We test the homogeneity of market participants and the rationality of the expectation formations using a rich individual survey, and conclude that the efficient market hypothesis is rejected in the sense that expectations formation made by market participants are heterogeneous and their forecasts tend to bias upward. Heterogeneity is revealed because the institutional affiliations of respondents affect the expectation formations. Thus, various affiliations yield different formation of expectations. Furthermore, the rationality is rejected; even institutional investors predicts stock prices behaviorally. We find the anchoring effect in the expectation formations of almost all of the firms: forecasts by domestic security firm have strong effects of anchoring while anchoring effects are not found from the expectation formations of foreign security firm under "normal" financial market conditions. The two findings in Chapter 3, heterogeneity and behavioral forecasts, are inconsistent with the assumption of the traditional financial theories.

Chapter 4 examines the relationship between monetary policy and inflation expectations, which are important in determining monetary policy. Interdependence between expectations formation and real economic activity has become a growing concern for central bankers. We study the effect of monetary policy on inflation expectations with not qualitative, quarterly data provided by households, but quantitative, monthly data made by professional forecasters for Japan. We first find that a contractionary monetary policy shock brings down realized and expected inflation. This suggests that monetary policy is one of important policy instruments to achieve low and stable inflation. Second, we show the effect of an unexpected monetary policy on inflation expectations and the self-fulfilling property of inflation. These findings are similar to those of Ueda (2010) using quarterly, qualitative survey

data on inflation made by Japanese household.

5.2 Future research

5.2.1 Incentive structures behind biased behavior and heterogeneity

Although we investigate how expectations are formed by agents and what properties expectations have, our studies do not clarify the motivations of agents behind the biased behavior. As we mentioned, the literature on bounded-rationality, heterogeneity, or strategic behavior suggests that incentive structures may motivate irrational behavior. For example, in Chapter 2, we show a complex forecasting behavior in the Japanese financial markets; even in the same country, forecasting behavior is quite different by market in the sense that stubborn forecasts in the stock market and jumpy forecasts in the bond marke[1]. Yet, we have not investigated the structural reason behind this dissonance. This requires a microeconomic modelling of professional forecasters.

The past studies about the incentive structures of forecasters based on a microeconomic consideration point out that strategic behavior such as \reputation" and "career concern" may affect the expectations formation and result in the bounded-rationality, the heterogeneity, or herding behavior. Ehrbeck and Waldmann (1996), Graham (1999), Laster et al. (1999), Hong et al. (2000), Welch (2000), Lamont (2002), and Ashiya (2009) suggest that strategic behavior based on incentives prevents individuals from making rational

[1]Furthermore, we find stronger effects of anchoring after the financial crisis in Chapter 3. Reexamination of forecasting behavior with the updated data covering the European sovereign crisis will clarify the reason why behavioral forecasting becomes stronger during financial turmoils. Still, this is left for our future work.

forecasts. For example, Lamont (2002) provokes a discussion about the reason why the rationality of forecasts does not hold and implies that the agency problem based on reputation may explain the strategic behavior. In fact, Lamont (2002) shows that if forecasters have an incentive that motivates them to achieve reputation, the rationality of forecasts tends to be rejected.

The career-concern hypothesis is a dominant view, which explains the bounded-rationality and heterogeneity. For example, Chevalier and Ellison (1999) examine the labor market for mutual fund managers and identify possible implicit incentives created by the relationship between the fund managers' performance and termination using data on the managers' career outcomes and their performance. The shape of the termination-performance relationship may give younger managers an incentive to avoid unsystematic risk and to lead to \herding" behavior. This study also suggests that an agency problem can be the main cause of the irrationality and heterogeneity.

More and more empirical studies stimulate the theoretical analysis about the incentive structures behind the behavioral forecasts and heterogeneity. Avery and Chevalier (1999) develop a model of decision-making, which illuminates recent empirical work on career concerns. Avery and Chevalier (1999) show that herding behavior is observed if decision makers have sufficient private information about their abilities thanks to abundant experience in markets. On the other hand, managers inefficiently anti-herd if they have no private information about ability early in their career. Their model develops a theoretical framework for explaining the fact that the formation of forecasts rely on experience. Ottaviani and Sorensen (2006) and Fehr and Tyran (2008) also analyze the effect of strategic behavior on the rationality of forecasts. They imply that heterogeneous processing of available information may stems from the microeconomic incentives of forecasters.

This paper points out that the compensation structure and internal pro-

motion system may cause behavioral forecasts and the dissonance between the stock and bond market participants. The dissonance may be attributable to volatility of the return between stock prices and bond yields, or the gap of the investment horizon between stocks and bonds. Structural understanding of the biased forecasts and the dissonance results, which may stem from the microeconomic incentives is left for our future research.

5.2.2 Rational expectations versus adaptive expectations

Although there is extensive literature about the expectations formation, studies about the relationship between the expectations formation and real economic activity as in Chapter 4, are now developing. In fact, the dynamics of expectations has been widely discussed in academic journals such as Journal of Economics Dynamics and Control, Macroeconomic Dynamics, Review of Economic Dynamics, Journal of Economic Behavior and Organization, etc.

Many contributions are added to the literature, where macroeconomists pay considerable attention not only to the dynamics of the rational expectations but also to that of the adaptive expectations (i.e. learning). For example, Branch and McGough (2009) incorporate bounded rationality at the individual agent level, and consider a case where a fraction of agents are rational and the remainder are adaptive. Branch and McGough (2009) find that specifications that are determinate under adaptive expectations may possess multiple equilibria in case of expectations heterogeneity. This is a novel article in the sense that they study a new Keynesian monetary model with heterogeneous expectations[2].

As central bankers have great concerns about the relationship between the

[2]See Branch and McGough (2009).

adaptive expectations and monetary policy, Evans and Honkapohja (2003), and Muto (2008), and Evans and Honkapohja (2009) provide the comprehensive surveys about the adaptive expectations and monetary policy. Milani (2007) presents an estimated model that departs from rational expectations and nests learning by economic agents, using Bayesian methods. Furthermore, Milani (2007) empirically shows that when adaptive learning replaces rational expectations, the persistence of aggregate output and inflation arises in the model economy mainly from adaptive expectations.

Findings obtained in the literature on learning imply the possibility that when a representative agent forms adaptive expectations, the expectations formation of learning-type attributes to the macroeconomic dynamics. Or, are there any possibilities that adaptive expectations formed by financial market participants attribute to a boom-and-burst mechanism in stock markets? One way to analyze the dynamics and the interaction between `rational' and `adoptive' agents is by the overlapping generations model, where the young and old, for example, are assumed to be rational and adaptive, respectively. Another way for further research can be based on numerical simulation as in Novales (2010). The theoretical and numerical analyses based on various types of expectations formation are also left for future research.

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Bibliography

Abarbanell, Jeffery S., and Bernard, Victor L., (1992), "Tests of Analysts' Overreaction/ Underreaction to Earnings Information as an Explanation for Anormalous Stock Price Behavior," Journal of Finance, 47, pp.1181{1207.

Amir, Eli, and Ganzach, Yoav, (1998), \Overreaction and Underreaction in Analysts' Forecasts," Journal of Economic Behavior and Organization, 3, pp.333{347.

Ang, Andrew, Bekaert, Geert, and Wei, Min, (2007) \Do Macro Variables, Asset Markets, or Surveys Forecast Inflation Better?" Journal of Monetary Economics, 54, pp.1163{1212.

Arellano, Manuel, (1987), \Computing Robust Standard Errors for Within-Groups Estimators," Oxford Bulletin of Economics and Statistics, 49, pp.431{434.

Ashiya, Masahiro, (2003), \Testing the Rationality of Japanese GDP Forecasts: The Sign of Forecast Revision Matters," Journal of Economic Behavior and Organization, 50, pp.263{269.

Ashiya, Masahiro, (2009), "Strategic Bias and Professional Affiliations of Macroeconomic Forecasters," Journal of Forecasting, 28, pp.120{130.

Ashiya, Masahiro, and Doi, Takero, (2001), \Herd Behavior of Japanese

Economists," Journal of Economic Behavior and Organization, 46, pp.343{346.

Avery, Christopher N. and Chevalier, Judith Ann, (1999), \Herding over the Career," Economics Letters, 63, pp.327{333.

Backus, David, K., and Kehoe, Patrick, J., (1992), \International Evidence on the Historical Properties of Business Cycles," American Economic Review, 82, pp.864{888.

Ball, Laurence, and Croushore, Dean, (2003), "Expectations and the Effects of Monetary Policy," Journal of Money, Credit and Banking, 35, pp.473{484.

Ball, Laurence, and Romer, David, (1990), \Real Rigidities and the Non-neutrality of Money," Review of Economic Studies, 57, pp.183{203.

Batchelor, Roy, and Dua, Pami, (1987), \The Accuracy and Rationality of UK Inflation Expectations: Some Quantitative Evidence," Applied Economics, 19(6), pp.819{828.

Batchelor, Roy, and Dua, Pami, (1989), \The Accuracy and Rationality of UK Inflation Expectations: Some Quantitative Evidence," Journal of Money, Credit and Banking, 21, pp.252{257.

Beggs, Alan, and Graddy, Kathryn, (2009), "Anchoring Effects: Evidence from Art Auctions," American Economic Review, 99, pp.1027{1039.

Berk, Jan, M., (2002), "Consumers' Inflation Expectations and Monetary Policy in Europe," Contemporary Economic Policy, 20, pp.122{132.

Bernanke, Ben, S. (2007), "Inflation Expectations and Inflation Forecasting," Remarks at the NBER Monetary Economics Workshop.

Blanchard, Olivier, and Simon, John, (2001), \The Long and Large Decline in U.S. Output Volatility," Brookings Papers on Economic Activity, 32, pp.135{164.

Blanchard, Olivier, (1990), "Why does money affect output? A survey," in Friedman, Benjamin, and Hahn, Frank, (eds), Handbook of Monetary Economics, North Holland, Amsterdam.

Blanchflower, David G., and Kelly, Roger, (2008), "Macroeconomic Literacy, Numeracy and the Implications for Monetary Policy," Bank of England.

Branch, William A., and McGough, Bruce, (2009), \A New Keynesian Model with Heterogeneous Expectations," Journal of Economic Dynamics and Control, 33, pp.1036{1051.

Bryan, Michael F., and Gavin, William T., (1986), "Models of Inflation Expectations Formation: A Comparison of Household and Economist Forecasts: Comment," Journal of Money, Credit and Banking, 18, pp.539{544.

Canova, Fabio, and Gambetti, Luca, (2010), \Do Expectations Matter? The Great Moderation Revisited," American Economic Journal: Macroeconomics, 2, pp.183{205.

Capistran, Carlos, and Timmermann, Allan, (2009), \Disagreement and Biases in Inflation Expectations," Journal of Money, Credit and Money, 41, pp.365{396.

Carlson, John, A., and Parkin, Michael, (1975), "Inflation Expectations," Economica, 42, pp.123{138.

Carroll, Christopher D., (2003), \The Epidemiology of Macroeconomic Expectations," The Quarterly Journal of Economics, 118, pp.269{298.

Chapman, Gretchen B., and Johnson, Eric J. (2002), Incorporating the Irrelevant: Anchors in Judgment of Belief and Value, in Griffin, Dale, Gilovich, Thomas, and Kahneman, Daniel, (eds), Heuristics and Biases: The Psychology of Intuitive Judgement, Cambridge University Press.

Chevalier Judith, and Elliosn, Glenn, (1999), \Career Concerns of Mutual Fund Managers," The Quarterly Journal of Economics, 114, pp.389{432.

Clement, Michael B., and Tse, Senyo Y., (2005), \Financial Analyst Characteristics and Herding Behavior in Forecasting," Journal of Finance, 60, pp.307{341.

Cooper, Rick A., Day, Theodore E., and Lewis, Craig M., (2001), \Following the Leader: A Study of Individual Analysts' Earnings Forecasts," Journal of Financial Economics, 61, pp.383{416.

De Bondt, Werner F. M., and Forbes, William P., (1999), \Herding in Analyst Earnings Forecasts: Evidence from the United Kingdom," European Financial Management, 5, pp.143{163.

De Leeuw, F. and McKelvey, M. J. (1981), \Price Expectations of Business Firms," Brookings Papers on Economic Activity, 1, pp.299{314.

Ehrbeck, Tilman, and Waldmann, Robert, (1996), \Why Are Professional Forecasters Biased? Agency versus Behavioral Explanations," Quarterly Journal of Economics, 111, pp.21{40.

Eichenbaum, Martin, (1992), \Comment on Interpreting the Macroeconomic Time Series Facts: The Effects of Monetary Policy," European Economic Review, 36, pp.1001{1011.

Evans, George, and Honkapohja, Seppo, (2003), \Adaptive Learning and Monetary Policy Design," Journal of Money, Credit, and Banking, 35, pp.1045{1072.

Evans, George, and Honkapohja, Seppo, (2009), \Expectations, Lerning and Monetary Policy: An Overview of Recent Research," in Schmidt-Hebbel, Klaus, Walsh, Carl E., and Loayza, Norman, (eds), Monetary Policy under Uncertainty and Learning, Central Banking, Analysis, and Economic Policies Book Series, Central Bank of Chile.

Fama, Eugene, (1970), "Efficient Capital Markets: A Review of Theory and Empirical Work," Journal of Finance, 25, pp.383{417.

Fehr, Ernst, and Tyran, Jean-Robert, (2008), \Limited Rationality and Strategic Interaction: The Impact of the Strategic Environment on Nominal Inertia," Econometrica, 76, pp.353{94.

Figlewski, Stephen, and Wachtel, Paul, (1981), "The Formation of Inflationary Expectations," Review of Economics and Statistics, 63, pp.1{10.

Fujiwara, Ippei, Hibiki, Ichiue, Nakazono, Yoshiyuki, Shigemi, Yosuke, (2012), \Financial Markets Forecasts Revisited: Are They Rational, Stubborn or Jumpy?" Economics Letters, forthcoming.

Gali, Jordi, and Gertler, Mark, (1999), "Inflation Dynamics: A Structural Econometric Analysis," Journal of Monetary Economics, 44, pp.195{222.

Gali, Jordi, Gertler, Mark, and Lopez-Salido, David J., (2001), \European Inflation Dynamics," European Economic Review, 45, pp.1237{1270.

Goodfriend, Marvin, and King, Robert G., (1997), \The New Neoclassical Synthesis and the Role of Monetary Policy," NBER Macroeconomics Annual, 12, pp.231{296.

Gordon, Robert J., (1979), \New Evidence that Fully Anticipated Monetary Changes Influence Real Output After All," NBER Working Paper, 361.

Gorter, Janko, Jacobs, Jan, and Haan, Jakob, (2008), \Taylor Rules for the ECB Using Expectations Data," Scandinavian Journal of Economics, 110, pp.473{488.

Graham, John R., (1999), \Herding among Investment Newsletters: Theory and Evidence," Journal of Finance, 54, pp.237{268.

Gramlich, Edward M., (1983), "Models of Inflation Expectations Formation: A Comparison of Household and Economist Forecasts," Journal of Money, Credit and Banking, 15, pp.155{73.

Grinblatt, Mark, Titman, Sheridan, and Wermers, Russ, (1995), \Momentum Investment Strategies, Portfolio Performance, and Herding: A Study of Mutual Fund Behavior," American Economic Review, 85, pp.1088{1105.

Hanson, Michael S., (2004), \The `Price Puzzle' Reconsidered," Journal of Monetary Economics, 51, pp.1385{1413.

Hodrick, Robert J., and Prescott, Edward C., (1997), \Postwar U.S. Business Cycles: An Empirical Investigation," Journal of Money, Credit and Banking, 29, pp.1{16.

Hommes, Cars, (2006), \Heterogeneous Agent Model in Economics and Finance," in Tesfatsion, Leigh, and Judd, Kenneth L., (eds), Handbook of Computational Economics, North-Holland, Amsterdam, Elsevier.

Hong, Harrison, Kubik, Jeffrey D., and Solomon, Amit, (2000), "Security Analysts' Career Concerns and Herding of Earnings Forecasts," RAND Journal of Economics, 31, pp.121{144.

Honkapohja, Seppo, and Mitra, Kaushik, (2004), \Are Non-fundamental Equilibria Learnable in Models of Monetary Policy," Journal of Monetary Economics, 51, pp.1743{1770.

Hori, Masahiro, and Shimizutani, Satoshi, (2005), \Price Expectations and Consumption under Deflation: Evidence from Japanese Household Survey Data," International Economics and Economic Policy, 2, pp.127{151.

Ichiue, Hibiki, and Yuyama, Tomonori, (2009), \Using Survey Data to Correct the Bias in Policy Expectations Extracted from Fed Funds Futures," Journal of Money, Credit and Banking, 41, pp.1631{1647.

Ito, Takatoshi, (1990), \Foreign Exchange Rate Expectations: Micro Survey Data," American Economic Review, 80, pp.434{449.

Jacobs, Rodney L., and Jones, Robert A., (1980), \Price Expectations in the United States: 1947{75," American Economic Review, 70, pp.269{277.

Kahneman, Daniel, and Knetsch, Jack L., (1993), \Anchoring or Shallow Inferences: The Effect of Format," mimeo.

Kahneman, Daniel, (2003), \Maps of Bounded Rationality: Psychology for Behavioral Economics," American Economic Review, 930, pp.1449{1475.

Lamont, Owen, (2002), \Macroeconomic Forecasts and Microeconomic Forecasters," Journal of Economic Behavior and Organization, 48, pp.265{280.

Laster, David, Bennett, Paul, and Geoum, In Sun, (1999), \Rational Bias in Macroeconomic Forecasts," The Quarterly Journal of Economics, 114, pp.293{318.

Leduc, Sylvain, Sill, Keith, and Stark, Tom, (2007), "Self-fulfilling Expectations and the Inflation of the 1970s: Evidence from the Livingston Survey," Journal of Monetary Economics, 54, pp.433{459.

Leonard, Jonathan S., (1982), \Wage Expectations in the Labor Market: Survey Evidence on Rationality," Review of Economics and Statistics, 64, pp.157{161.

Lucas, Robert E., (1976), \Econometric Policy Evaluation: A Critique," Carnegie-Rochester Conference Series on Public Policy, 1, pp.19{46.

Mankiw, Gregory, and Reis, Ricardo, (2002), \Sticky Information Versus Sticky Prices: A Proposal to Replace the New Keynesian Phillips Curve," The Quarterly Journal of Economics, 117, pp.1295{1328.

Mankiw, Gregory, Reis, Ricardo, and Wolfers, Justin, (2003), \Disagreement about Inflation Expectations," NBER Macroeconomics Annual, 18, pp.209{248.

Mayer, Thomas, (1999), Monetary Policy and the Great Inflation in the United States: The Federal Reserve and the Failure of Macroeconomic Policy, 1965{1979, Edward Elgar Publisher.

Milani, Fabio, (2007), \Expectations, Learning and Macroeconomic Persistence," Journal of Monetary Economics, 54, pp.2065{2082.

Mise, Emi, Kim, Tae-Hwan, and Newbold, Paul, (2005), \On Suboptimality of the Hodrick{Prescott Filter at Time Series Endpoints," Journal of Macroeconomics, 27, pp.53{67.

Mullineaux, Donald J., (1980), "Inflation Expectations and Money Growth in the United States," American Economic Review, 70, pp.149{161.

Muto, Ichiro, (2008), \Adaptive Learning and Monetary Policy, Monetary and Economic Studies," Monetary and Economic Studies, 27, pp.125{76.

Nakazono, Yoshiyuki, (2012), \Heterogeneity and Anchoring in Financial Markets," Applied Financial Economics, 22, pp.1821{1826.

Nakazono, Yoshiyuki, and Ueda, Kozo, (2011), \Policy Commitment and Market Expectations: Lessons Learned from Survey Based Evidence under Japan's Quantitative Easing Policy," IMES Discussion Paper Series, 2011-E-12, pp.1{57.

Novales, Alfonso, Fernndex, Esther, and Ruz, Jess (2010), Economic Growth: Theory and Numerical Solution Methods, Springer Berlin Heidelberg.

Newey, Whitney K., and West, Kenneth D., (1987), \A Simple Positive Semi-definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix," Econometrica, 55, pp.703{708.

Nordhaus, William D., (1987), "Forecasting Efficiency: Concepts and Applications," Review of Economics and Statistics, 69, pp.667{674.

Nunes, Richardo, (2010), "Inflation Dynamics: The Role of Expectations," Journal of Money, Credit and Banking, 42, pp.1161{1172.

Okina, Kunio, and Shiratsuka, Shigenori, (2001), \Asset Price Bubbles, Price Stability," Monetary Economic Studies, 20, pp.35{76.

Ottaviani, Marco, and Sorensen, Peter Norman, (2006), \The Strategy of Professional Forecasting," Journal of Financial Economics, 81, pp.441{466.

Pacquet, Alain, (1992), "Inflationary Expectations and Rationality," Economics Letters, 40, pp.303{308.

Park, Andreas, and Sabourian, Hamid, (2011), \Herding and Contrarian Behavior in Financial Markets," Econometrica, 79, pp.973{1026.

Pesaran, Hashem, and Weale, Martin, (2006), \Survey Expectations," in Elliott, Graham, Granger. Clive, and Timmermann, Allan, (eds), Handbook of Economic Forecasting, North Holland, Amsterdam, Elsevier.

Primiceri, Giorgio E., (2006), "Why Inflation Rose and Fall: Policy-makers' Beliefs and U.S. Postwar Stabilization Policy," The Quarterly Journal of Economics, 121, pp.867{901.

Sbordone, Argia, M., (2002), \Prices and Unit Labor Costs: A New Test of Price Stickiness," Journal of Monetary Economics, 49, pp.265{292.

Simon, Herbert, (1955), \A Behavioral Model of Rational Choice," Quarterly Journal of Economics, 69, pp.99{118.

Simon, Herbert, (1956), \Rational Choice and the Structure of the Environment," Psychological Review, 63, pp.129{138.

Sims, Christopher, A., (1992), \Interpreting the macroeconomic time series facts: The effects of monetary policy," European Economic Review, 36, pp.975{1000.

Tversky, Amos, and Kahneman, Daniel, (1974), \Judgment under Uncertainty: Heuristics and biases," Science, 185, pp.1124{1131.

Ueda, Kozo, (2010), "Determinants of Households' Inflation Expectations in Japan and the United States," Journal of the Japanese and International Economies, 24, pp.503{518.

Van Duyne, Carl, (1982), "Food Prices, Expectations, and Inflation," American Journal of Agricultural Economics, 64, pp.419{430.

Wansink, Brian, Kent, Robert. J., and Hoch, Stephen. J, (1998), \An Anchoring and Adjustment Model of Purchase Quantity Decisions," Journal of Marketing Research, 35, pp.71{81.

Welch, Ivo, (2000), \Herding among Security Analysts," Journal of Financial Economics, 58, pp.369{396.

Yamamoto, Ryuichi, and Hirata, Hideaki, (2012), \Belief Changes and Expectation Heterogeneity in Buy- and Sell-side Professionals in the Japanese Stock Market," *Pacific Basin Finance Journal*, 20, pp.723-744.