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Uncertainty over Exchange Rates and Exports:
Evidence from dispersion of expectations as a measure of uncertainty

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Abstract

This paper, using quarterly firm-level survey data, analyzes the time-series property of the exchange rate uncertainty and its relationship with exports. Dispersion of firms' expected exchange rate is used as a proxy for uncertainty. The major findings are as follows. First, uncertainty over exchange rates was enhanced after the Lehman Brothers collapse and after the announcement of the quantitative and qualitative monetary easing policy under Abenomics. Second, dispersion of expected exchange rates has a positive relationship with the volatility of the past exchange rates, but the dispersion does not have predictive power for future exchange rate volatility. Third, expected exchange rates are more dispersed among small and medium-sized enterprises (SMEs) than for large companies. Fourth, we detect some evidence that uncertainty over exchange rates has a negative effect on exports. The estimation result suggests that uncertainty of one standard deviation larger reduces the growth of planned exports by approximately five percentage points. These findings suggest the importance of international cooperation to stabilize exchange rates and the potential role of market intervention when exchange rate uncertainty is enhanced.

Keywords: Exchange rate, Uncertainty, Disagreement, Volatility, Export
JEL Classifications: F14, F17, F31,

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Uncertainty over Exchange Rates and Exports: Evidence from dispersion of expectations as a measure of uncertainty

1. Introduction

This paper, using quarterly firm-level survey data for exchange rate expectations, presents novel findings about the time-series property of the exchange rate uncertainty and its relationship with exports.

In recent years, the yen exchange rate has fluctuated greatly. The yen had appreciated against the U.S. dollar from 120 yen/dollar in June 2007 to 76 yen/dollar in September 2011 with small high-frequency fluctuations. In particular, during the international financial crisis period, the yen appreciated nearly 20 yen/dollar in a short period of time from August 2009 to January 2009. Since autumn 2012, in parallel with the introduction of "Abenomics" macroeconomic policy, the overvalued yen exchange rate had depreciated, and the current rate (at the time of writing) is approximately 120 yen/dollar. This recent movement can be interpreted as a correction toward the equilibrium (Morikawa, 2012). In terms of the effective exchange rate that considers the Euro and some other non-U.S. currencies, we observe a similar movement.

However, policy makers have been disappointed with the sluggish response of Japan's export volume in spite of the weaker yen. Many researchers have analyzed the reasons behind the weak export performance in these three years. The often-made argument is the advances in overseas production by the Japanese manufacturing companies during the period of the overvalued yen. The author conjectures that 1) the weak growth of the world economy and 2) the strengthening of the price competitiveness of Japanese manufacturers owing to the transformation of their domestic production to high value-added products are the factors behind the slow growth of export volume (Morikawa, 2014).[1] The latter factor reflects the fact that Japanese manufacturers have pursued the strategy of commodity goods—those with little differentiation and that are easily exposed to international competition—to overseas while retaining the production of highly differentiated products in Japan. As a result of such a strategic shift toward high value-added manufacturing, the pass-through of exchange rates into export prices has dropped significantly, whereas a weaker yen has only led to a marginal increase in export volume; at least, this is the standard interpretation. Under this situation, leading manufacturers with the ability to control prices are posting strong earnings, as a weaker yen increases the

[1] Another argument is the global value chain (GVC) reduces the exchange rate elasticity of exports (Ahmed et al., 2015).

yen-denominated amount of their revenue.

The location choice of factories depends not only on the current exchange rate level but also on the expectation about the future course of exchange rate movements because exports and foreign direct investment entail fixed sunk costs. In other words, whether yen depreciation boosts exports volume and domestic production is affected by the expectation over future exchange rate and the degree of its certainty. For example, even if a company expects a mean depreciation of 10 yen/dollar, the resulting export behavior or location choice will be different whether the movement is completely certain or the probability of 20-yen/dollar depreciation and no movement are fifty-fifty. In fact, according to a survey for Japanese companies on uncertainties over various economic variables and their effects on businesses, exchange rate movement is highly uncertain and has a strong effect on business operation (Morikawa, 2013). The majority of respondents perceive that exchange rate uncertainty "significantly affects" their business decisions, and the ratio is approximately two-thirds among manufacturing companies. In this respect, a study on uncertainty in exchange rate expectation is an important research agenda to foresee the future export performance. Therefore, the exchange rate uncertainty may be another source of Japan's weak export performance after the recent depreciation of the yen.

The effect of exchange rate uncertainty on export performance has been extensively studied both theoretically and empirically. Theoretically, whether exchange rate uncertainty has positive or negative effects depends on the model assumptions, and the sign of the effect is ambiguous. Many empirical studies have been published, but the conclusions are mixed (see McKenzie, 1999, for a survey). More recent studies include Bacchetta and Wincoop (2000), IMF (2004), Campa (2004), Bahmani-Oskooee and Hegerty (2008), Thorbecke (2008), Hayakawa and Kimura (2009), Grier and Smallwood (2007, 2013), Baum and Caglayan (2010) among others, but we still do not have a definitive answer.

Past studies generally use time-series volatility of exchange rate or estimation errors calculated from time-series econometric models such as the GARCH (Generalized Autoregressive Conditional Heteroscedasticity) model as measures for exchange rate uncertainty, but cross-sectional dispersion of exchange rate expectations has rarely been used in the literature.[2] There is a sharp contrast with studies on uncertainties over major macroeconomic variables such as GDP growth rate and inflation rate, where dispersion or

[2] Although many studies have been conducted on companies' exchange rate expectations (e.g., Frankel and Froot, 1987a, b; Ito, 1990, among others), cross-sectional dispersion of the expectations have not been used as a measure of expectation uncertainty. The determinants of exchange rate volatility (e.g., Devereux and Lane, 2003; Bacchetta and Wincoop, 2006) and the effects of exchange market intervention on exchange rate volatility (e.g., Ito, 2005; Chen *et al*., 2012) have been extensively studied.

disagreement of subjective expectation is frequently used as proxies for uncertainty.[3]

Against these backgrounds, this paper calculating dispersion of the expected exchange rate obtained from a nationally representative business survey ("Tankan" survey) as a proxy for uncertainty presents time-series properties of this measure and compares them with the movements of exchange rate volatility. Then, we empirically analyze the effect of this dispersion-based measure of exchange rate uncertainty on exports.

The major findings can be summarized as follows. First, uncertainty over exchange rates was enhanced after the Lehman Brothers collapse and after the announcement of the quantitative and qualitative monetary easing policy under "Abenomics." Second, the dispersion of expected exchange rates has a positive relationship with the near past volatility of exchange rates, but the dispersion does not have a predictive power over the future exchange rate volatility. Third, expected exchange rates are more dispersed among small and medium-sized enterprises (SMEs) than among large companies. Fourth, we detect suggestive evidence that uncertainty over exchange rates has a negative effect on exports. According to our preferred estimation result, one standard deviation larger uncertainty reduces planned exports by approximately 5 percentage points.

The rest of this paper is organized as follows. Section 2 explains the data used in this paper and the method of analysis. Section 3 reports the descriptive findings on the movements of exchange rate uncertainty followed by the regression results on the relationship between exchange rate uncertainty and companies' export plans. Section 4 concludes with policy implications.

2. Data and Methodology

This paper uses original, compiled quarterly data from the micro data of the Short-Term Economic Survey of Enterprises in Japan ("Tankan" survey) conducted by the Bank of Japan. This order-made data from the Tankan survey is obtained through the procedures determined by the Statistics Act. Specifically, this paper uses data for the mean and variance of expected exchange rates of individual companies and the mean projection of exports. In the Tankan survey, the expected exchange rate is defined as the "expected rate assumed in the individual export plans."

The Tankan is a nationally representative business survey in Japan. The purpose of the survey is to provide an accurate picture of business trends in Japan and to contribute to the appropriate

[3] See Bloom (2014) and Jurado *et al*. (2015) for surveys.

implementation of monetary policy. The survey is conducted quarterly in March, June, September, and December, and the number of sample companies is approximately 11 thousand.[4] The survey covers both manufacturing and non-manufacturing companies. The sample companies are categorized into large companies (capital with 1 billion yen and more), medium-sized companies (capital with 100 million yen to less than 1 billion yen), and small companies (capital with 20 million yen to less than 100 million yen) based on the size of capital. Major survey items are divided into "judgments" (business conditions, supply and demand conditions for products and services, production capacity, employment conditions, financial position, lending attitude of financial institutions, etc.) and "semiannual and annual projections" (sales, exports, operating profits, fixed investments, etc.). This paper used data on the expected (yen-dollar) exchange rate and the projection of exports. The figure of exports is the amount of "population estimates" calculated by industry and size classes.

The sample period of this paper is 42 quarters from March 2004 to September 2014. Because the expected exchange rate is generally affected by the time horizon of the projection, this paper mainly focus on the projections for the 1st half of the fiscal year (April to September) in the March surveys and those for the 2nd half of the fiscal year in the September surveys. In other words, we look at the exchange rate expectations for the future six months at the time of the surveys.

The dispersion of the expected exchange rate is calculated as the standard deviations of the expectations of individual companies. We calculate and compare the dispersion by industry (manufacturing and non-manufacturing) and by size classes (large, medium, and small). When analyzing the effect of exchange rate uncertainty on exports, we construct a cell-level panel data by industry*size classes to obtain a sufficient number of samples for the estimation.

In addition to the data from the Tankan survey, we also use actual daily exchange rates to calculate the volatility of the exchange rate. The actual yen-dollar exchange rates (Tokyo, central rates) are obtained from the website of the Bank of Japan. We calculate the volatility of exchange rates as the standard deviations of six month prior to the months of the Tankan surveys.[5] For example, when comparing with the cross-sectional dispersion of expected exchange rates at the March survey, we use time-series volatility of the actual daily rates for the six months from the previous October to March.

Ideally, subjective uncertainty over future exchange rates should be calculated from the point projection and its probability distribution of individual respondents, but in reality, such data for

[4] The details of the Tankan survey (survey method, coverage, survey items, etc.) are described on the website of the Bank of Japan (http://www.boj.or.jp/en/statistics/outline/exp/tk/extk03.htm/).

[5] Because we obtained the variance of the expected exchange rates, standard deviations are calculated as the square roots of the variance.

individual companies rarely exist. However, empirical studies on the projected production indicate that cross-sectional dispersion (or disagreement) of projections is a useful proxy as measuring uncertainty (e.g., Bachmann *et al*., 2013).

The expected exchange rates surveyed by Tankan are the yen-dollar rates, which is different from the effective exchange rate that considers the Euro and some other non-U.S. currencies. However, we can observe that the yen-dollar exchange rate is highly correlated with the (nominal) effective exchange rate. The correlation coefficient is 0.923 for the period from January 2003 to December 2014.

By using the data, we first observe the time-series property of the dispersion of the expected exchange rate and the relationship of this uncertainty measure that obtained from the volatility of the daily exchange rate. Our attention is on the leads and lags relationship of these measures. Then, we compare the exchange rate uncertainties by industries and by size classes. Next, we run a simple regression to estimate the relationship between exchange rate uncertainty and the projected exports. In the estimation, we use industry*size*quarter panel data, and the planned export growth ($\Delta lnEXP_t^e$: changes from the same half fiscal year of the previous year) is used as the dependent variable. The planned export growth rate ($\Delta lnEXP_t^e$) sometimes shows extremely large values when, for example, some small exporters whose exports in the previous year were small increase their exports significantly. To avoid the confounding effect of the outliers and to treat increases and decreases symmetrically, we convert the export value to logarithmic form to calculate growth rate of exports.

The main explanatory variable is the dispersion-based exchange rate uncertainty (σs_t^e). To control the mean exchange rate expectation, the change of the mean expected exchange rate from the mean actual exchange rate of the previous quarter (s_t^e-s_{t-1}) is also used as an explanatory variable. Because we use pooled data for six categories (industry*size) in the estimations, a dummy for non-manufacturing industry (*Industry*) and dummies for medium and small companies (*Size*) are used as control variables. To have sufficient samples for estimation, expected exchange rates and projection of exports for the 1st and 2nd half fiscal years of the next fiscal year in the March survey, those for the 1st and 2nd half fiscal years in the June survey, that of the 2nd half fiscal year in the September survey, and that of the 2nd half fiscal years in the December survey are pooled for the estimation. As a result, we have six observations a year for each industry/size cell. To control for the difference in the time horizons of the expectations/projections, dummies for the length of the time horizon (*Planning Horizon*) are included in the estimation. For example, the expectations/projections for the 1st half fiscal year of the June survey or those for the 2nd half fiscal year of the December survey are treated as the "0 quarter ahead" expectations/projections. Similarly, the expectations/projections for the 1st half of the fiscal year in the March survey or the 2nd half year expectations/projections are

treated as the "1 quarter ahead" figures. The figure for the 2nd half fiscal year in the June survey is "2 quarters ahead", and that of the 2nd half fiscal year of the next fiscal year in the March survey is "3 quarters ahead." The dummies for "1 quarter ahead," "2 quarters ahead," and "3 quarters ahead" are included in the regression. Finally, to control for seasonal effects, a dummy for the 2nd half fiscal year (*Second Halfyear*) is used.

To summarize, the equation to be estimated can be expressed as follows. Our interest is whether the estimated coefficient (β_2) for the exchange rate uncertainty (σs_t^e) is significantly negative or not.

$$\Delta \ln EXP_t^e = \alpha + \beta_1 (s_t^e - s_{t-1}) + \beta_2 \sigma s_t^e + \beta_3 Industry + \beta_4 Size + \beta_5 Planning\ Horizon + \beta_6 Second\ Halfyear + \varepsilon \quad (1)$$

However, uncertainty over the exchange rate may be an endogenous variable in the equation. To correct for the possible endogeneity bias, we employ instrumental variable estimation (2SLS estimation). The reverse causality that planned exports affect exchange rate expectations is unlikely, but some omitted variables such as world business cycle and macroeconomic policy may affect both exchange rate expectation and planned exports simultaneously. In this paper, we employ the volatility of the daily exchange rate during the past half-year (*vol*) at the time of projection, which is used as an instrument for the dispersion of exchange rate expectations (σs_t^e). The logic behind using this variable as the instrument is that the volatility of exchange rate in the recent past, a predetermined variable, likely affects the current exchange rate expectations. However, it does not directly affect future exports, and the effects on the future exports are realized through its effect on the formation of exchange rate expectations.

As discussed later, just after the collapse of Lehman Brothers, the dispersion of exchange rate expectations significantly increased, and the world exports declined dramatically. To check the robustness of the results, we make the same estimations removing the data for the 2nd half of the fiscal year in 2008 from the sample.

Major variables and their summary statistics are shown in Table 1. We can observe from the table that the dispersion of exchange rate expectations and the volatility of daily exchange rates have relatively large variations.

3. Results

The time-series movements of the exchange rate uncertainty calculated as the standard deviation of the expected exchange rates for all industries and all size classes is indicated in

Figure 1. The mean value is approximately 4 yen/dollar. It may seem to be a small figure, but the standard deviation of 4 yen/dollar means that the difference between the 95th percentile and the 5th percentile is approximately 13 yen/dollar if we assume a normal distribution. The uncertainty over exchange rates was greatly enhanced twice. The first time was after the Lehman Brothers collapse, and the second time was after the announcement of the aggressive quantitative and qualitative monetary easing under "Abenomics" macroeconomic policy. At the peak of the uncertainty after the collapse of Lehman Brothers, the difference between the 95th percentile and the 5th percentile widened to nearly 20 yen/dollar.

When comparing exchange rate expectations and their uncertainties by industry and by size classes (Table 2), the mean exchange rate expectations are statistically indistinguishable, but the dispersions of the medium and small companies are larger than that of large companies, and the differences are statistically significant at the 1% level.

Figures 2 and 3 depict the relationship between exchange rate volatility (past six months) and the dispersion of expected exchange rate. These two measures have a relatively high correlation (correlation coefficient is 0.64), but the dispersion of the exchange rate expectation and the realized volatility during the future six months have a weak negative correlation (correlation coefficient is -0.35). These results suggest that the past volatility positively affects the current dispersion of exchange rate expectations, but the dispersion does not have a predictive power for the future exchange rate volatility.

The regression results to explain the growth of projected exports ($\Delta ln\ EXP_t^e$) are indicated in Table 3. The results suggest that exchange rate uncertainty negatively influences exports after accounting for the effect of the change in the mean level of the expected exchange rate. The estimated OLS coefficient for the uncertainty over exchange rate (σs_t^e) is negative and statistically significant at the 5% level (column (1) of Table 3). The size of the coefficient is quantitatively non-negligible: uncertainty that is one standard deviation larger reduces the planned export growth rate by approximately 2.3 percentage points.[6] However, the estimated coefficient for the change in the mean expected exchange rate is statistically insignificant. That is, after accounting for the uncertainty of the exchange rate, the mean expectation of the depreciating (appreciating) yen/dollar rate does not have a relationship with higher (lower) planned export growth rates. In short, the result suggests that exchange rate uncertainty is detrimental to the export performance of the individual companies.

The 2SLS estimation result using the volatility of the daily exchange rate during the past half

[6] As indicated in the summary statistics (Table 1), the mean and standard deviation of planned exports growth rate are 24.7% and 24.8%, respectively. The figure of 2.3 percentage points' reduction corresponds to approximately one-tenth of the mean or the standard deviation of export growth. We conjecture that the effects of the expectation over world economic growth may be more important determinants of the planned exports.

year (*vol*) as an instrument for the dispersion of exchange rate expectations (σs_t^e) is shown in column (2) of Table 3. The F-statistic of the first-stage regression is 175, indicating that the past exchange volatility has a strong predictive power over the current dispersion of expectations. According to the second-stage regression, the estimated coefficient for the exchange rate uncertainty (σs_t^e) is negative and statistically significant at the 1% level. This result strongly suggests that causality runs from uncertainty to planned exports.[7] Quantitatively, uncertainty that is one standard deviation larger reduces the growth of planned exports by 5.5 percentage points: the magnitude more than doubles compared with the OLS result.

The results excluding data for the 2nd half of the fiscal year of 2008, that is, the period just after the collapse of Lehman Brothers, are presented in Table 4. In the OLS estimation, the coefficient for the uncertainty measure (σs_t^e) is negative but statistically insignificant (column (1) of Table 4). However, the estimated coefficient for this exchange rate uncertainty from the 2SLS estimation is negative and statistically significant at the 5% level (column (2) of Table 4), although the magnitude is somewhat smaller than the result in Table 3. This result suggests that the relationship between the exchange rate uncertainty and exports was strong just after the collapse of Lehman Brothers but that the negative relationship holds even excluding the period of this extraordinary event.[8]

Although companies engaged in international trade employ various measures to hedge risk arising from unexpected exchange rate movements, the above results suggest that exporting companies cannot completely hedge the risk and, as a result, that uncertainty over the future course of exchange rate has a negative effect on exports.[9]

4. Conclusion

This paper, using quarterly firm-level survey data obtained from a representative business survey in Japan (Tankan survey) during the last decade, presents empirical findings on the time-series property of the exchange rate uncertainty proxied by the dispersion of companies' expected exchange rates and on the relationship between uncertainty and planned exports. There have been many studies on the relationship between the time-series volatility of exchange rate

[7] With the volatility of the actual exchange rate volatility during the last six months as a direct explanatory variable instead of the dispersion-based uncertainty measure, we observe a negative relationship with the planned export growth. This suggests that the exchange rate volatility affects exports through its direct effect on subjective uncertainty over future exchange rate movements.

[8] We obtain similar results by including a dummy for the Lehman crisis instead of removing the data for the 2nd half of the fiscal year of 2008.

[9] Regarding the actual measures for hedging exchange rate risk by the Japanese companies, Ito *et al.* (2015) report detailed results from their original survey.

and international trade. However, as far as the author is aware, no attempt has been made to employ cross-sectional dispersion of exchange rate expectations to analyze its effect on exports. Although the analysis of this paper is very simple, we present new findings in the literature.

The findings can be summarized as follows. First, uncertainty over exchange rates was enhanced after the Lehman Brothers collapse and after the announcement of the quantitative and qualitative monetary easing around the launch of "Abenomics" macroeconomic policy. Second, dispersion of expected exchange rates has a positive relationship with the volatility of the past exchange rates, but the dispersion does not have a predictive power over the future exchange rate volatility. Third, expected exchange rates are more dispersed among small and medium-sized enterprises (SMEs) than among large companies. Fourth, we detect some evidence that uncertainty over exchange rates has a negative effect on exports. Our preferred estimation result indicates that one standard deviation larger uncertainty reduces the growth rate of planned exports by approximately 5 percentage points. Although the effect of exchange rate uncertainty on planned exports was strong after the collapse of Lehman Brothers, the result holds even if we remove the period just after the Lehman crisis.

In spite of the rapid depreciation of the Japanese yen beginning from the autumn of 2012, the performance of export volume has been disappointing for policymakers. Various factors such as 1) the weak growth of the world economy and 2) the strengthening of the price competitiveness of Japanese manufacturers have contributed to the slow growth of goods exports, but the result of this paper suggests a possible additional mechanism that exchange rate uncertainty may also have played some role. The Japanese companies were not confident about the durability of the depreciated yen, and this exchange rate uncertainty may have prevented them from making aggressive export plans.

From a policy viewpoint, the results suggest the importance of reducing uncertainties over exchange rates by conducting sensible macroeconomic policy and by international cooperation. In addition, a potential role of exchange market intervention, if effective, in the case of enhanced uncertainty over exchange rate movements is supported.

This paper presents novel findings about the uncertainty of exchange rate expectations by employing newly constructed order-made data from the Tankan survey. However, there are some limitations of the analysis. First, because we cannot directly use the micro data of the Tankan survey, our analysis uses cell-level panel data. As a result, we cannot control for various company characteristics other than industry and size classes. Second, although the period of the analysis covers interesting events such as the trade collapse after the Lehman crisis and the aggressive monetary easing policy under "Abenomics," we can use only approximately 10 years of data from 2004 to 2014. The period is not long enough to conduct a quarterly time-series analysis. Third, the time horizon of the exchange rate expectations is less than one year even at

the longest time horizon (the 2nd half fiscal year of the next year in the March survey). We have not dealt with the medium- to long-term exchange rate uncertainty.

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Table 1 Summary statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
$\Delta lnEXP_t^e$	780	0.247	0.248	-0.368	1.507
s_t^e	780	99.638	12.217	78.506	117.881
σs_t^e	780	4.069	0.987	1.313	7.040
$s_t^e - s_{t-1}$	780	-0.104	3.788	-16.552	12.225
vol	780	2.496	1.268	0.895	6.663

Notes: $\Delta ln\ EXP_t^e$ is the growth rate of planned exports from the previous year. s_t^e, σs_t^e, and *vol*, are the mean of the expected exchange rate, dispersion (standard deviation) of expected exchange rates, and volatility (standard deviation) of the daily exchange rate during the past six months, respectively.

Table 2 Dispersion of exchange rate expectations by industries and by size classes

Manufacturing	4.23
Non-manufacturing	3.91
Large companies	3.58
Medium companies	4.17
Small companies	4.46

Notes: The figures are the means of the expected exchange rate throughout the sample period (from March 2004 to September 2014).

Table 3 Estimation results for the growth of planned exports

	(1) OLS		(2) 2SLS	
$s_t^e - s_{t-1}$	-0.0023		-0.0015	
	(0.0053)		(0.0202)	
σs_t^e	-0.0238	**	-0.0574	***
	(0.0102)		(0.0202)	
Non-manufacturing	-0.0931	***	-0.1034	***
	(0.0195)		(0.0199)	
Medium size	0.0422	**	0.0571	***
	(0.0190)		(0.0210)	
Small size	0.1884	***	0.2094	***
	(0.0268)		(0.0283)	
R-squared	0.2052		0.1846	
Nobs.	390		390	
			(First stage)	
vol			0.3984	***
			(0.0301)	
F-statistics			174.71	***

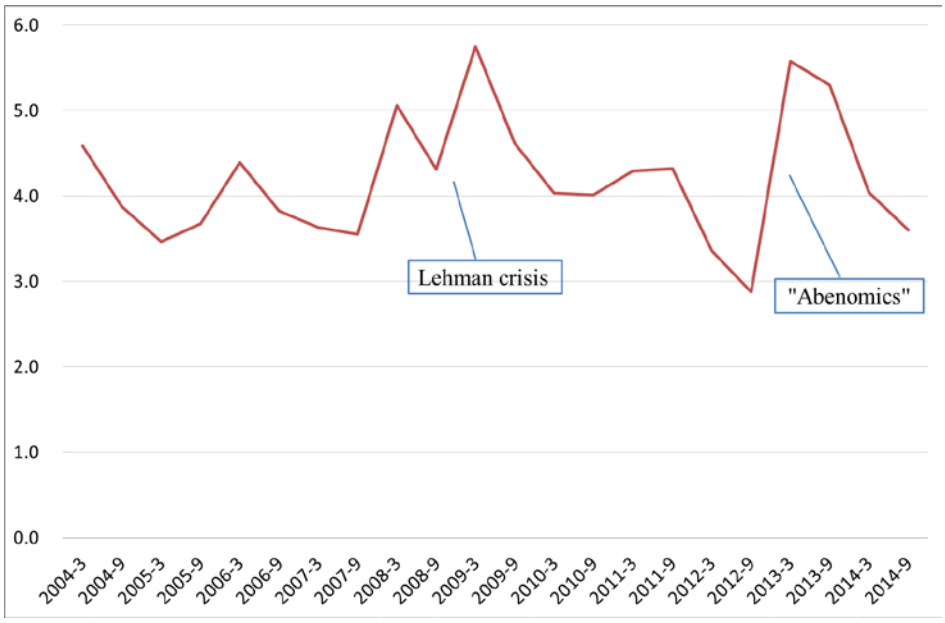
Note: The dependent variable is the growth rate of planned exports from the previous year ($\Delta ln\ EXP_t^e$). s_t^e, σs_t^e, and *vol*, are the mean of the expected exchange rate, dispersion (standard deviation) of expected exchange rates, and volatility (standard deviation) of the daily exchange rate during the past six months, respectively. Explanatory variables include dummies for the length of the time horizon (Planning Horizon), a dummy for the second half fiscal year (Second Halfyear), and a constant term. The figures in parentheses are the robust standard errors. ***: P<0.01; **: P<0.05; *: P<0.1.

Table 4 Estimation results excluding the period of the collapse of Lehman Brothers

	(1) OLS		(2) 2SLS	
$s_t^e - s_{t-1}$	0.0012		0.0013	
	(0.0053)		(0.0211)	
σs_t^e	-0.0134		0.0428	**
	(0.0099)		(0.0211)	
$vs_{t,t-1}$				
Non-manufacturing	-0.0927	***	-0.1013	***
	(0.0192)		(0.0196)	
Medium size	0.0397	**	0.0530	***
	(0.0177)		(0.0202)	
Small size	0.1711	***	0.1902	***
	(0.0265)		(0.0280)	
R-squared	0.1957		0.1791	
Nobs.	378		378	
			(First stage)	
vol			0.3820	***
			(0.0300)	
F-statistics			162.25	***

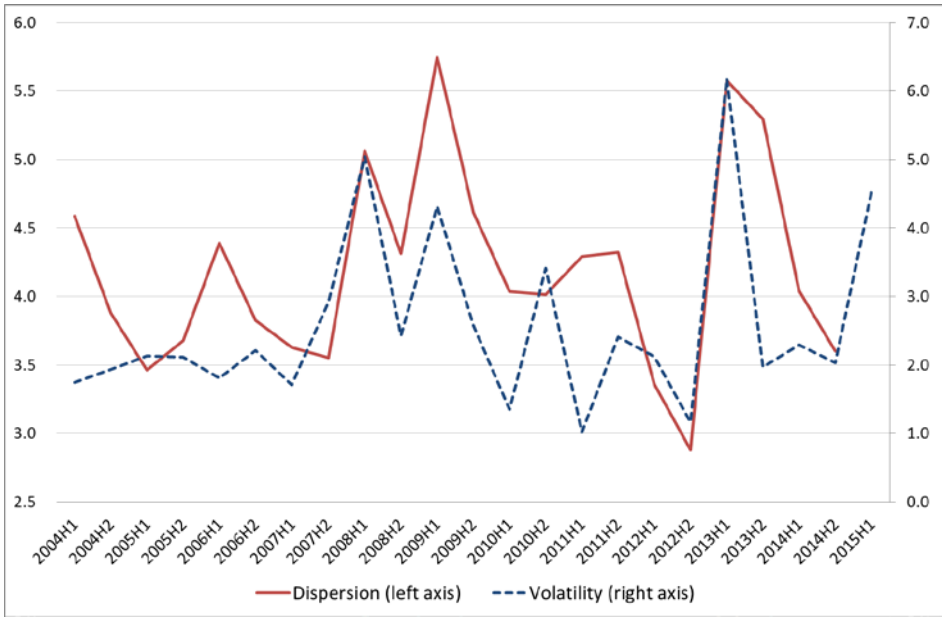
Note: The dependent variable is the growth rate of planned exports from the previous year ($\Delta ln\ EXP_t^e$). s_t^e, σs_t^e, and *vol* are the mean of the expected exchange rate, dispersion (standard deviation) of expected exchange rates, and volatility (standard deviation) of the daily exchange rate during the past six months, respectively. Explanatory variables include dummies for the length of the time horizon (Planning Horizon), a dummy for the second half of the fiscal year (Second Halfyear), and a constant term. The figures in parentheses are the robust standard errors. ***: P<0.01; **: P<0.05; *: P<0.1.

Figure 1 Cross-sectional dispersion of expected exchange rates



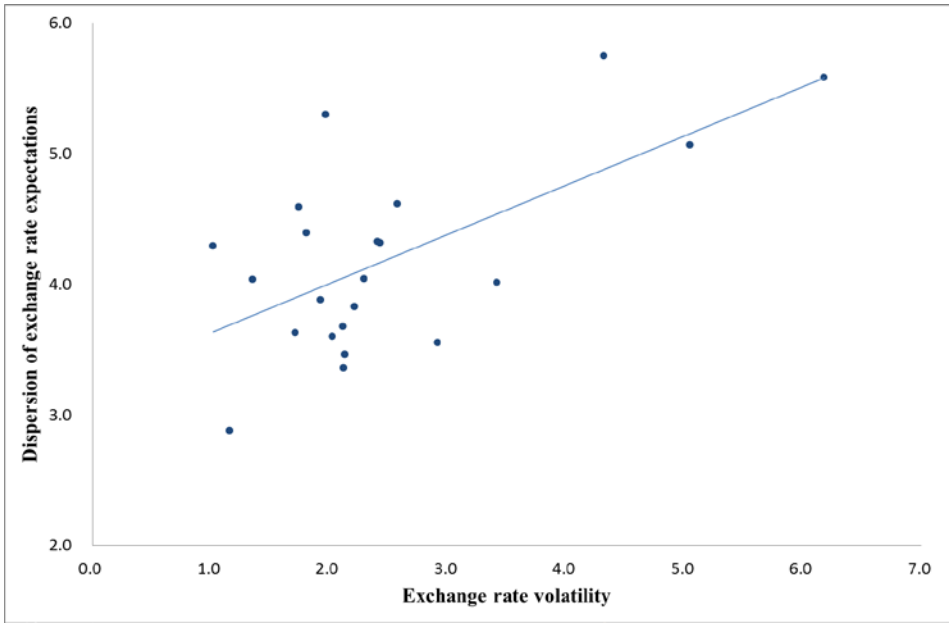
Notes: The line depicts the dispersion of expected exchange rates for all industry and all size classes.

Figure 2 Movement of the dispersion of expectations and the volatility of exchange rates



Notes: The volatility of the actual exchange rates is calculated from daily yen/dollar exchange rates (Tokyo, central rates) for the six months prior to the timing of the Tankan survey. The dispersion is for the six months after the timing of the Tankan survey.

Figure 3 The relationship between the dispersion of expectations and the volatility of exchange rates



Notes: The volatility of the actual exchange rates is calculated from daily yen/dollar exchange rates (Tokyo, central rates) for the six months prior to the timing of the Tankan survey. The dispersion is for the six months after the timing of the Tankan survey.