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Agreeing on Disagreement: Heterogeneity or Uncertainty?*

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Abstract

Disagreement is used as a measure of both investor heterogeneity and uncertainty. We study whether disagreement captures heterogeneity or uncertainty for the foreign exchange market. We do so by relating disagreement to alternative measures of uncertainty, as well as by taking advantage of the different asset pricing implications of the two concepts. We find that whereas disagreement measures uncertainty conditionally, unconditionally this is only true during the peak of the global financial crisis.

Keywords: [foreign exchange markets, disagreement, heterogeneous expectations, uncertainty]

JEL classification codes: G12, G15

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1 Introduction

The heterogeneous nature of agents in economic and financial markets is becoming increasingly embedded in the (international) finance literature, typically captured by the disagreement between market participants (i.e. dispersion of beliefs)[1]. The question remains, however, what economic mechanism is behind disagreement. In this paper we study whether heterogeneity or uncertainty is causing investor disagreement.

Despite the fact that the literature on dispersion of beliefs is already quite extensive, a solid conclusion about the different interpretations of disagreement has not been reached. This might be illustrated best by two papers from Anderson et al. (2005, 2009). In their 2005 paper they argue, both theoretically and empirically, that heterogeneous beliefs matter for asset pricing. They first derive the pricing kernel assuming agents with heterogeneous beliefs. In the empirical part of the paper, where heterogeneity of beliefs is measured by disagreement of earnings forecasts, the authors show that heterogeneity (earnings disagreement) is a priced risk factor in equity markets. In their 2009 paper, the authors also find that disagreement is a priced risk factor. However, in this case disagreement is assumed to proxy for uncertainty and therefore the conclusion is that uncertainty is a priced risk factor. Although there are many differences in the two approaches, of which the most important is perhaps the difference between disagreement of idiosyncratic earnings and aggregate corporate profits, the fact that a similar measure is used to measure heterogeneity and uncertainty respectively is characteristic for this measure[2].

Both arguments for disagreement being a measure of heterogeneity and

[1] Several authors have, for example, linked disagreement to foreign exchange puzzles. Fisher (2006) proposes a model where the foreign exchange forward premium depends on the diversity of prior beliefs about a country's inflation process. Gourinchas and Tornell (2004) propose a solution for both the forward premium puzzle and the delayed overshooting puzzle based on investor's distorted beliefs about interest rates. Beber et al. (2010) show that disagreement about future currency returns has a large impact on currency risk premia.

[2] A possible explanation for the case of Anderson et al. (2005, 2009), might be that idiosyncratic disagreement measures heterogeneity, and aggregate disagreement measures uncertainty.

a measure of uncertainty are appealing. If there is high uncertainty about future prices, distance between forecasts is large (i.e. agents heavily disagree about their point forecasts). The measure is becoming increasingly popular to proxy for uncertainty as a part of risk that volatility alone does not cover[3]. Bomberger (1996) analyzes the relation between disagreement and uncertainty measured as the conditional variance of an individual forecast, and concludes that the two are strongly related. Likewise, Giordani and Soderlind (2003) show that disagreement is a better proxy of inflation uncertainty than what previous literature has indicated. Various studies have found that uncertainty has an impact on the risk premium of assets. Anderson et al. (2009) link a disagreement factor, based on the weighted cross-sectional volatility of equity return forecasts, to equity premia. They find that this measure of uncertainty is more important in explaining the equity premium than volatility.

However, the distance between forecasts may also be large because investors have heterogeneous priors. The heterogeneity can in this case be due to different forecasting models, which is essentially the same as differences in interpretation of common information (Brock and Hommes, 1998; Varian, 1989; Harris and Raviv, 1993), information asymmetry (Shalen, 1993), limited attention (DellaVigna and Pollet, 2009), or other psychological traits.

In this paper, we will analyze to what extent disagreement is capturing heterogeneity of agents' beliefs, or rather uncertainty. Our identification strategy consists of several steps. First of all, we compare disagreement to several proxies for uncertainty, both market-based and real economy based. Examples of the former include implied volatility indices and currency specific implied volatility. We measure macroeconomic uncertainty using the index developed in Jurado, Ludvigson and Ng (2015) (hereafter called "JLN"). Second, although uncertainty and heterogeneity have similar asset pricing

[3] In finance and economics, different definitions of risk and uncertainty are used. In some cases, uncertainty is the 'umbrella' term, capturing both risk (known unknowns) and ambiguity (unknown unknowns). In other cases risk is defined as the aggregate of known and unknown unknowns, but proxied by measures of known unknowns. In other papers, risk is the 'umbrella' term and composed out of volatility (known unknowns) and uncertainty (unknown unknowns). We follow the latter approach.

implications in certain cases, they differ in some other cases. For example, uncertainty and heterogeneity have different effects on trading volume and liquidity. Whereas heterogeneity has a positive effect on volume (and to some extent liquidity), uncertainty generally reduces volume and liquidity as investors are more hesitant to update their portfolios (Buraschi and Whelan, 2012; de Castro and Chateauneuf, 2011). Therefore, we look into the (possibly time-varying) relation between disagreement and volume and disagreement and liquidity, to investigate the different effects that heterogeneity and uncertainty may have on these market conditions.

We measure disagreement by means of a survey executed amongst foreign exchange dealers in London. The data we employ captures disagreement about future exchange rate movements for the largest and most liquid currency pair, the EUR/USD. One of the main benefits of focusing our analysis on the foreign exchange market is that our results will not be affected by short sale constraints. This reason was also brought forward by Beber et al. (2010) for studying the foreign exchange market, and by Carlin et al. (2012) for studying the MBS market.

Our results suggest that unconditionally disagreement measures currency specific uncertainty. This unconditional relationship, however, is only driven by certain specific periods in our sample, especially crisis periods. It is unrelated to other measures of uncertainty during the largest part of our sample. The same conclusions hold when looking into the asset pricing implications: disagreement is only a proper measure of uncertainty during crisis periods.

The remainder of the paper is set up as follows. Section 2 describes the data and methodology. Section 3 discusses to what extent disagreement measures uncertainty, and what the implications are for market conditions such as liquidity and trading activity. Section 4 concludes and discusses implications for current and future research.

2 Methods and Data

2.1 Methodology

We apply two methods to test whether disagreement captures uncertainty or heterogeneity. First of all, we compare disagreement with a set of alternative uncertainty measures, such as implied volatility, realized volatility, VXY, VIX, and macroeconomic uncertainty. Second, we look into the different asset pricing implications that heterogeneity and uncertainty might have. For both tests, we study the unconditional as as well as the conditional relation.

Specifically, we estimate the unconditional relationship between uncertainty and disagreement by the following equation:

$$Unc_t = \alpha + \beta Disagree_t + \varepsilon_t \tag{1}$$

In order to capture the possibly time-varying importance of disagreement as a measure of uncertainty, we implement a state-space setup with a Kalman filter to obtain a state estimate at every point of time in our sample. Specifically,

$$\begin{aligned} Unc_t &= \alpha + \beta_t Disagree_t + \varepsilon_{1,t} \\ \beta_t &= \beta_{t-1} + \varepsilon_{2,t} \end{aligned} \tag{2}$$

in which Unc is the uncertainty measure and $Disagree$ the cross-sectional standard deviation over the survey respondents; $E(\varepsilon_t^1 \varepsilon_t^2) = 0$. The estimated states can be interpreted as time-varying coefficients for the relation between disagreement and other uncertainty measures, and between disagreement and measures of market conditions in an OLS setup. The Kalman filter is a recursive algorithm that can provide estimates of the contemporaneous mean and variance of the state, as well as a one-step ahead estimate of the mean and variance of the state based on new information up until that point.

The second set of tests we apply, builds on the premise that uncertainty has different asset pricing implications than heterogeneity. It is by now well established that the large volume of foreign exchange markets cannot be explained by international trade only (Frankel and Froot, 1990), and that heterogeneity of market participants is necessary for such large volumes. Unless disagreement is caused by uncertainty, it will lead to more trading. This positive relation between heterogeneous beliefs and volume is documented by, amongst others, Buraschi and Jiltsov (2006), Banerjee and Kremer (2010), and Buraschi and Whelan (2012). Lee and Swaminathan (2000) even use high trading volume as a proxy for differences of opinion. Carlin et al. (2012) find that higher disagreement in the MBS market (stemming from model choice and information interpretation) is followed by higher volume and higher volatility. Whereas heterogeneity has a positive effect on volume (and to some extent liquidity), uncertainty generally reduces volume and liquidity, as investors are more hesitant to update their portfolios (Buraschi and Whelan, 2012; de Castro and Chateauneuf, 2011). This is to some extent confirmed by Carlin et al. (2012), who find that volatility does not lead to higher trading volume. Therefore we can use volume as a distinguishing factor between uncertainty and heterogeneity.

The unconditional relation between volume (liquidity) and disagreement is estimated using

$$Vol_t \ (Liq_t) = \alpha + \beta Disagree_t + \varepsilon_t \tag{3}$$

Similarly, in the second part of the analyses we consider the time-varying relation between disagreement and market conditions volume and liquidity:

$$\begin{aligned} Vol_t \ (Liq_t) &= \alpha + \beta_t Disagree_t + \varepsilon_{1,t} \\ \beta_t &= \beta_{t-1} + \varepsilon_{2,t} \end{aligned} \tag{4}$$

2.2 Data

The variable of interest used for our analyses is disagreement between analysts, also referred to as dispersion of analyst forecasts. To be more precise, disagreement is the cross-sectional (across respondents) standard deviation of the analysts' one month ahead forecasts. To measure disagreement, we use a dataset with monthly forecasts from financial analysts and investors gathered by Consensus Economics®. Consensus Economics is the world's leading international economic survey organization and their datasets are unique in terms of their long time span, large number of respondents, level of responding institutions, and the disaggregate level of forecasts. Forecasts are given every month for the future value of the US Dollar against the Euro one month ahead. As previously mentioned, a main benefit of focusing our analysis on the foreign exchange market is that our results will not be affected by short sale constraints. Our survey sample runs from January 1999 to December 2009[4].

We use the Euro/Dollar implied volatility, VIX, VXY, and exchange rates from Thomson Reuters (obtained through Datastream). Realized volatility is calculated as the sum of squared 15 minute returns over the past 30 days. Data on 15 minute prices is obtained from Reuters RTCE (Reuters Tick Capture Engine)[5]. Our high-frequency return sample runs from January 2001 to December 2009. Macroeconomic uncertainty is measured by the index created by Jurado, Ludvigson and Ng in "Measuring Uncertainty" (2015).

Our liquidity measures relate to the trading at low costs (bid-ask spread) and trading without moving the price (high-low spread). High bid-ask spreads (computed as the difference between the ask and bid spread divided by the mid-spread) reflect high transaction costs and make it more expensive to trade. High-low spreads (log of the highest price of the day minus log of the lowest price of the day divided by the log of the number of trades) indicate the impact that trades have on prices, per unit of trade. In illiquid markets, trades have a larger impact on prices and we would therefore see larger high-low spreads. We obtain bid-ask spreads and high-low spreads from Reuters.

[4]Because the sample of our other data runs from 2001, we will use a sample from January 2001 until December 2009 for all our analyses.

[5]Most inter-dealer FX trading is executed on either the Reuters or EBS platform. Although EBS is the main trading platform for the EURUSD, a substantial amount of trading for this currency pair takes place via Reuters.

Bid ask-spreads are averaged over the day and over the future month, following the Consensus forecast date. High-low spreads are converted to monthly frequency by taking the maximum 'high' and minimum 'low' over the day, averaging these over the future month following the Consensus forecast date, and dividing the resulting spreads by the trading volume of that month.

A direct measure of FX trading volume is difficult, if not impossible, to obtain as the foreign exchange market is decentralized. The RTCE data provides us with two different proxies for trade: number of trades (per 15 minutes) and ask-quote frequency (per 15 minutes). Hartmann (1999) uses reported Japanese FX broker volume to proxy for trading volume, and finds his results are robust to using Reuters FXFX quoting frequency ('tick count'). In an earlier paper, Hartmann (1998) shows that monthly Reuters ticks are strongly correlated with monthly trading volumes (from Japanese FX brokers). However, there are a few disadvantages of using tick frequency. First of all, Hartmann (1998) found that the relationship between volume and ticks is unstable over time. Also, tick frequency is not the same as transaction frequency – there may not be trading at every quote. We therefore choose to use number of trades (also referred to as 'trade count' in the rest of the paper) as our main proxy for trading volume. Finally, we standardize our variables for the ease of coefficient comparability[6].

2.2.1 Descriptive statistics

Table 1 presents the descriptive statistics of our variable of interest (disagreement), the uncertainty benchmark variables (implied volatility, realized volatility, VXY, VIX, and macroeconomic uncertainty), and the variables measuring market conditions (bid-ask spread, high-low spread, and volume).

Figure 1 shows graphs of the same variables. We can clearly see that all variables spiked in 2008-2009, where some variables (implied volatility, VXY, disagreement) picked up the uncertainty buildup much faster than some other (realized volatility, illiquidity). Although volume (trade frequency) already started to decline in 2007, our measures of illiquidity did not spike until

[6] The variables are standardized as to having a mean of zero and a standard deviation of one.

Table 1: **Descriptive Statistics**

	Bid-Ask	High-Low	IV	RV	Disagree	Vol	Macro unc	VIX	VXY
Mean	0.001	0.0371	10.199	2.5843	0.028	35329	0.6752	22.369	10.455
Median	0.0004	0.0114	9.8375	1.9044	0.026	36290	0.6562	20.27	9.915
Maximum	0.0123	0.3176	21.75	17.977	0.065	70797	0.8495	59.98	20.69
Minimum	0.0002	0.004	5.05	0.9768	0.014	5521	0.5538	10.71	6.16
Std. Dev.	0.0022	0.0584	2.987	2.5269	0.0097	14255	0.0674	10.493	2.9075
Skewness	3.8756	2.5146	1.6698	3.9488	1.4546	-0.1755	1.0739	1.4474	1.8465
Kurtosis	17.571	9.2801	7.2152	19.702	5.395	2.6276	3.4641	5.2821	6.8289

Notes: Descriptive statistics of our variable of interest (disagreement), various measures of uncertainty (implied volatility, realized volatility, macroeconomic uncertainty, VIX and VXY), and measures of market conditions (liquidity: bid-ask spread and high-low spread, and volume).

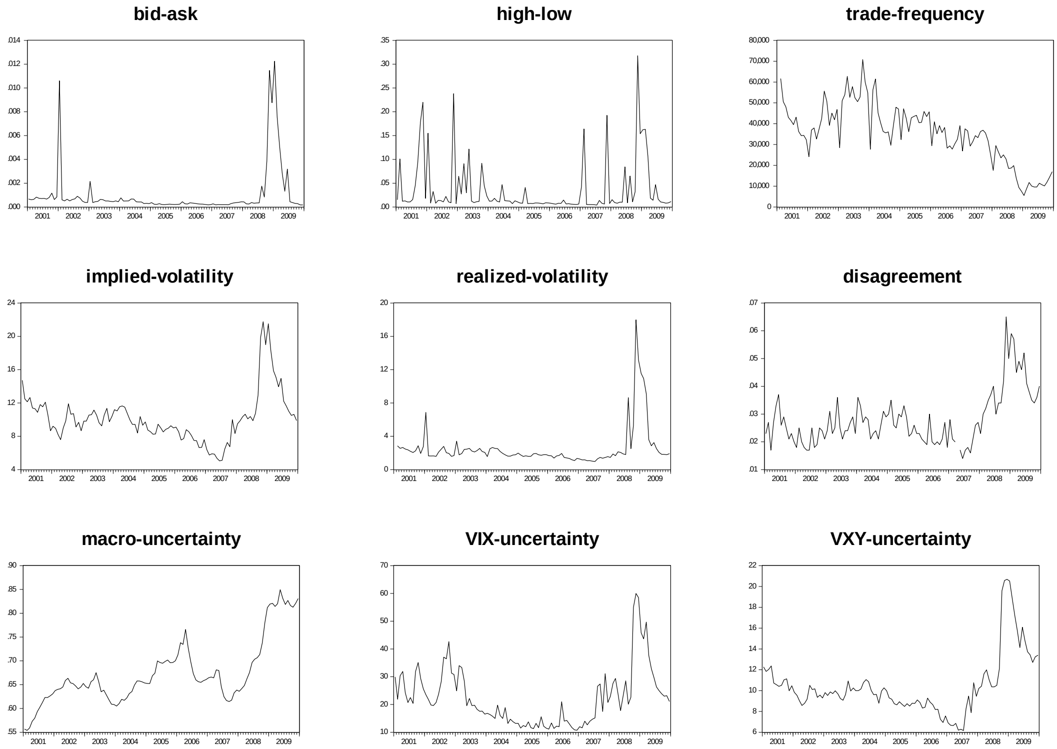

Figure 1: Graphical representations of our variable of interest (disagreement), various measures of uncertainty (implied volatility, realized volatility, macroeconomic uncertainty, VIX and VXY), and measures of market conditions (liquidity: bid-ask spread and high-low spread, and volume).

mid-2008. We can see that the EURUSD market is very liquid with low and relatively stable bid-ask spreads almost all the way through the sample, with the exception of the spikes in the early 2000s and in 2008-2009. Spikes in the high-low spread are somewhat more frequent. Macroeconomic uncertainty moves most different from all the other variables, but has a similar peak in 2008-2009.

3 Results

3.1 Disagreement versus uncertainty measures

Table 2 presents the unconditional estimation results of the relation between disagreement and the set of exogenous uncertainty measures.

Table 2: **Estimation Results Uncertainty Measures**

	IV	VXY	VIX	RV	MACRO
			Unconditional		
α	0.0135	0.0115	0.0086	0.0059	-0.001
	(0.0598)	(0.0537)	(0.0823)	(0.0788)	(0.0754)
β	0.7813***	0.8302***	0.5319***	0.5900***	0.6380***
	(0.0601)	(0.0540)	(0.0827)	(0.0792)	(0.0757)
LL	-99.444	-87.910	-133.627	-128.924	-124.201
			Conditional		
α	-0.0438	-0.1568***	-0.2184***	-0.1539	-0.4028***
	(0.0610)	(0.0502)	(0.0764)	(0.1240)	(0.0508)
σ^{ε}	0.0270	0.0420	0.0703	0.2283	0.0647
LL	-87.759	-72.917	-118.853	-104.021	-93.565
LLR	23.370***	29.986***	29.548***	49.805***	61.271***

Notes: Estimation results of Equations (1) (upper half) and Equation (2) (lower half) representing the unconditional and conditional relationship between disagreement and various measures of uncertainty, respectively. LL denotes the likelihood value, and LLR the likelihood ratio test statistic. *, **, *** represents significance at the 10, 5, and 1% significance level, respectively.

The estimation results in the top half of Table 3 reveal that there is a positive and significant relation between our measure of foreign exchange disagreement and all exogenous measures of uncertainty. Given that our measures are standardized, we can directly compare the coefficients. As such, we observe that implied volatility and VXY have the closest relation with disagreement judging from the coefficients as well as the likelihood values. This makes intuitive sense as both implied volatility and VXY are constructed using foreign exchange data and both are forward looking measures, just as our measure of disagreement. Macroeconomic uncertainty and realized volatility have intermediate values, whereas VIX shows the lowest value. The latter might be explained by the fact that VIX is based on the equity market.

All in all, the unconditional results suggests that disagreement is indeed suitable as a measure of uncertainty. The question is, though, whether this relationship is constant over time. As such, we apply the Kalman filter analyses to look into the conditional relationship between disagreement and uncertainty. The lower half of Table 3 shows the estimation results. For all uncertainty measures we find that the relationship with disagreement is not constant; the likelihood ratio tests indicate that the state-space representation has a better fit than the unconditional model. The estimated σ give an indication about the variability of the relationship. For especially realized volatility we find a highly volatile state variable. This is the lowest for implied volatility.

The fact that the relationship between uncertainty and disagreement is time-varying does not say anything about the sign of the relationship. Therefore, we present figures of the filtered state series.

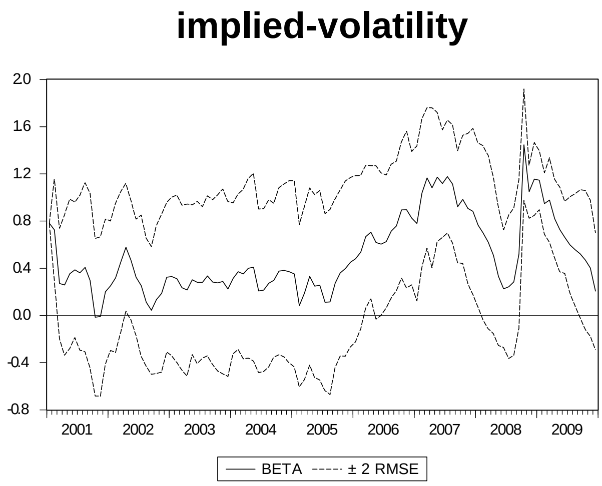

Figure 2: Filtered relation between disagreement and EURUSD uncertainty (measured by EURUSD option implied volatility).

Figure 2 displays the time-varying relation between EURUSD disagreement and implied volatility obtained by applying a Kalman filter. We can clearly see that there is no significant relation between currency specific uncertainty as measured by implied volatility and disagreement up until 2006. From 2006, the relation between these two measures of uncertainty is sig-

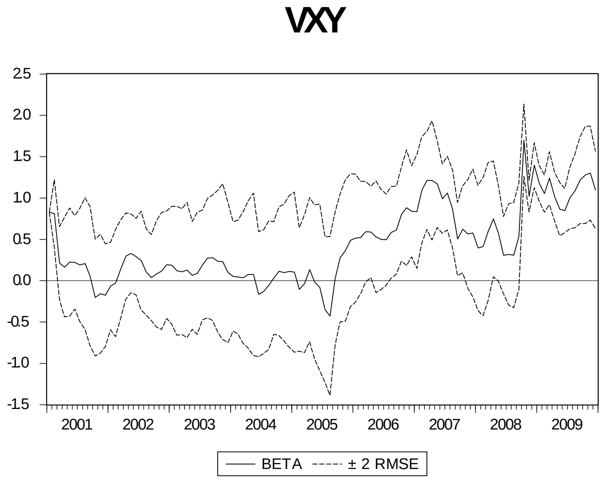

Figure 3: Filtered relation between disagreement and FX uncertainty (measured by VXY).

nificantly positive, with the exception of a short episode in 2008. Figure 3 shows that the relation between disagreement and VXY is very similar. This is not surprising, as the EURUSD implied volatility has a high weight in the weighted currency implied volatility index VXY, and the correlation between VXY and EURUSD implied volatility is 0.92.

As can be seen from Figure 4, there is no clear relation between EURUSD disagreement and stock market uncertainty, as measured by the VIX. The only time that the relation becomes significantly positive is between 2008 and 2009, when there was large global financial turmoil and all uncertainty measures spiked.

The relation between disagreement and realized volatility can be seen in Figure 5. Interestingly, the results rather resemble the results obtained with the VIX than with implied volatility. This indicates that the uncertainty measured by disagreement captures more than just volatility. There is practically no relation between disagreement and realized volatility, until mid-2008, when the correlation shoots up and stays high for about a year. There is also a very short episode where the correlation between realized volatility and disagreement is negative, but considering this is very short

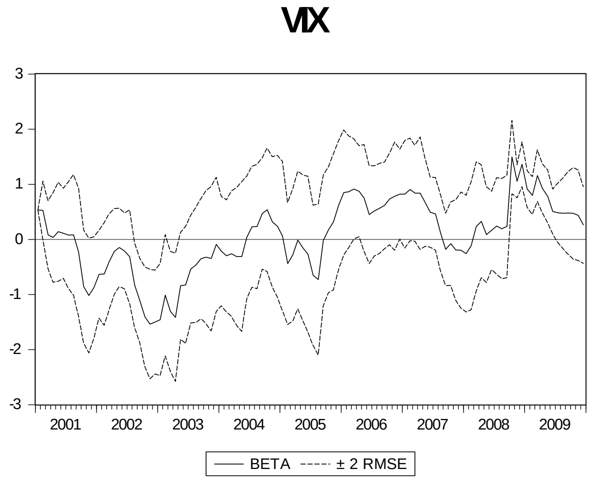

Figure 4: Filtered relation between disagreement and stock market uncertainty (measured by VIX).

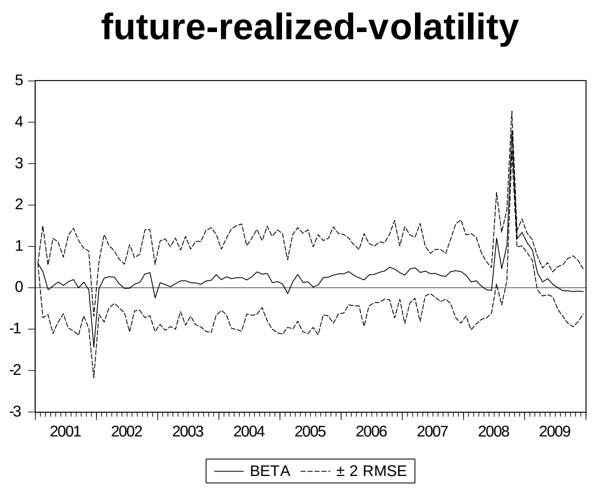

Figure 5: Filtered relation between disagreement and realized volatility in the month following the forecast.

and at the beginning of the sample, it is more likely to be a result of the estimation method.

Figure 6 shows the co-movement between disagreement and macroeconomic uncertainty. The pattern we see is quite different from the other results, with the exception of the first half of the sample where there is no correlation between disagreement and any of our benchmarks. Interestingly, the correlation between disagreement and macroeconomic uncertainty is negative for a short time in 2006, after which it becomes significantly positive around mid-2008. Unlike the VIX, which is sometimes also used to proxy for macroeconomic uncertainty, the correlation between JLN macroeconomic uncertainty and disagreement stays significantly positive until the end of our sample.

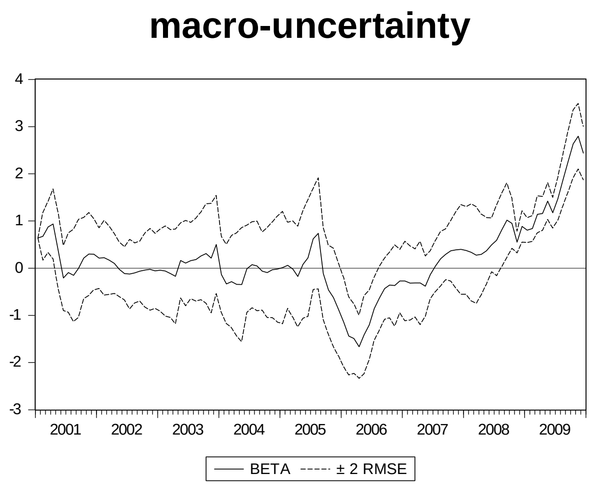

Figure 6: Filtered relation between disagreement and macroeconomic uncertainty.

Belief dispersion (disagreement) does not have a stable relation with any of the uncertainty measures. It seems to be most closely related to currency specific implied volatility, but only at certain times. A comparable conclusion can be drawn for the disagreement – VXY relation, but this makes sense considering EURUSD has a very high weight in the VXY. Dispersion of beliefs about the EURUSD is only positively correlated to more general uncertainty measures such as the VIX and macroeconomic uncertainty during the global financial crisis.

3.2 Implications for market conditions: volume and liquidity

Our results from Section 3.1 show that disagreement is not a stable measure to use for either heterogeneity or uncertainty. However, as summarized in Section 1, there is ample evidence in the literature that disagreement, and uncertainty derived from disagreement, have asset pricing implications. We therefore turn to analyzing the effect of disagreement on trading volume. We do this in a similar fashion as for the relation between disagreement and the various uncertainty measures, so by first examining the unconditional relation followed by the state-space approach. Table 3 presents the estimation results.

Table 3: **Estimation Results Market Implications**

	FREQ	BID-ASK	HI-LO
		Unconditional	
α	0.0023	0.0036	0.0051
	(0.0826)	(0.0783)	(0.0907)
β	-0.5343***	0.5987***	0.3665***
	(0.083)	(0.0787)	(0.0911)
LL	-133.998	-128.237	-144.012
		Conditional	
α	0.3996	-0.26	-0.1124
	(0.0736)	(0.0298)	(0.1311)
σ^{ε}	0.0533	0.4192	0.0550
LL	-121.759	-63.471	-138.792
LLR	24.478***	129.532***	10.440***

Notes: Estimation results of Equations (3) (upper half) and Equation (4) (lower half) representing the unconditional and conditional relationship between disagreement and market conditions, respectively. LL denotes the likelihood value, and LLR the likelihood ratio test statistic. *, **, *** represents significance at the 10, 5, and 1% significance level, respectively.

The unconditional estimation results show, consistent with the previous section, that disagreement unconditionally captures uncertainty. We find a negative and significant relationship between disagreement and the number of trades. This implies that investors trade less as there is more disagreement, consistent with the uncertainty hypothesis. The second column indicates that there is a positive signifcant relationship between disagreement and the bid-ask spread. Hence, more disagreement is correlated with lower liquidity. The third column shows that there is a positive and significant relationship between disagreement and the high-low spread. Again, this is an indication that the market is less capable of processing orderflow in periods of high disagreement. The first two columns show similar coefficient estimates of around 0.5, whereas the final column shows a somewhat weaker relationship with a beta of 0.36.

The bottom part of Table 3 presents the estimation results for the state-space representation. For all three measures we find significant time-variation in the relationship between market conditions and disagreement. The relationship is especially volatile for the bid-ask spread. As before, finding significant time-variation alone does not allow us to draw inference about the direction of the relationship, so we plot the filtered state series below.

Figure 7 shows the time-varying relation between disagreement and number of trades for the EURUSD. Before 2007, the relation between disagreement and volume is insignificant. Although heterogeneity induces trading overall, there does not seem to be a direct correlation between movements in belief dispersion and volume. However, there is a clear drop in the relation around 2007/2008, when markets started to be more uncertain, after which the coefficient stays significantly negative.

We now turn to our liquidity analyses. Because our measures are actually illiquidity measures (a higher bid-ask spread and high-low spread indicate lower liquidity) we expect the relation to be positive if disagreement measures uncertainty. We estimate the same relation again with a Kalman filter in order to get time-varying coefficients and confidence bands for the relation between disagreement and liquidity (bid-ask spread).

A graphical representation of this time-varying relation can be seen in Figure 8 and Figure 9. We do not find a negative relation between heterogeneity and liquidity. However, EURUSD is considered the most liquid currency pair, and generally has very low and efficient bid-ask spreads. It is therefore questionable whether more heterogeneity would be able to make this market even more liquid. However, we do see a very clear rise in the relation during the recent period of turmoil from 2007 to the end of our

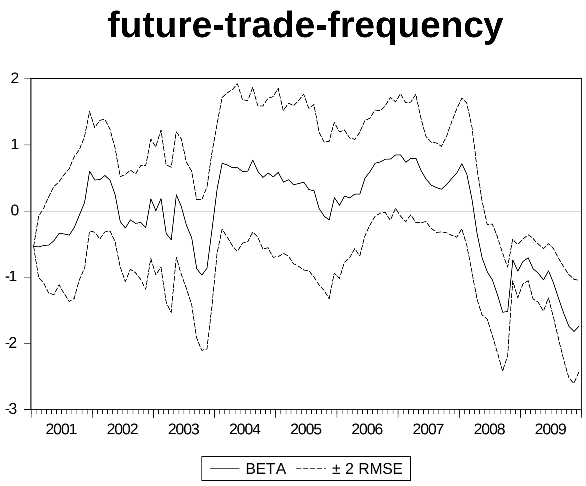

Figure 7: Filtered relation between disagreement and trading volume in EURUSD in the month following the forecast.

sample. In this period, the bid-ask spread and high-low spread widen when disagreement increases. This coincides with the second 'uncertainty' episode as identified in Section 3.1.

The results from our time-varying analyses reveal that changes in belief dispersion do not affect trading volume and liquidity in a liquid market like the EURUSD, unless this belief dispersion is related to uncertainty.

4 Conclusion

Dispersion of investor beliefs, or disagreement, is interchangeably used as a measure of heterogeneity and as a measure of uncertainty. Although arguments for disagreement being a measure of heterogeneity or uncertainty are appealing for both interpretations, they may in times have different (asset pricing) implications. We therefore investigated whether disagreement is an appropriate measure of uncertainty.

To this end we compared disagreement with various other measures of uncertainty, covering macroeconomic uncertainty, financial uncertainty, and currency specific uncertainty. We find that disagreement is unconditionally

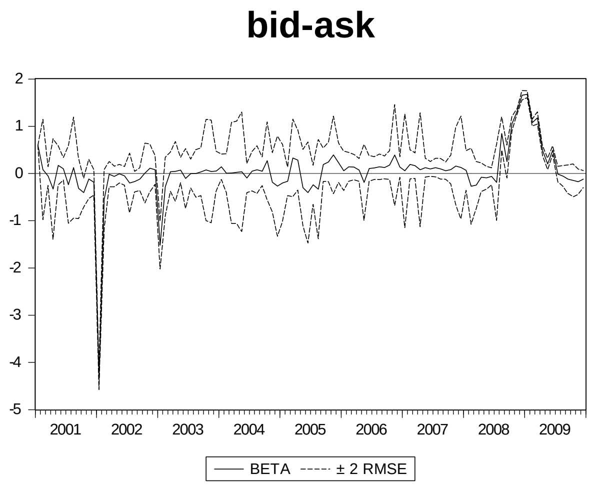

Figure 8: Filtered relation between disagreement and liquidity, as measured by the EURUSD interbank bid-ask spread.

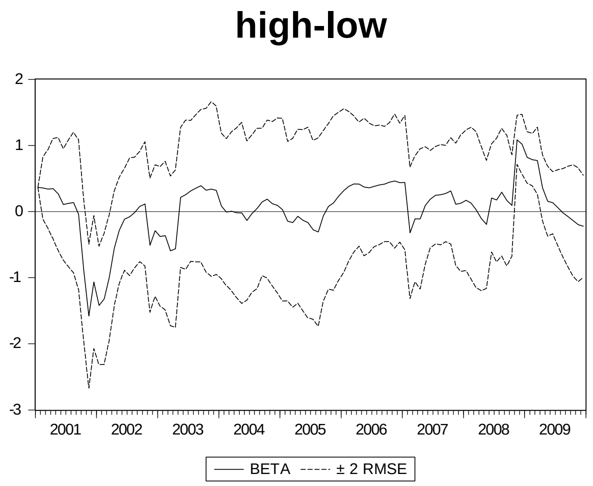

Figure 9: Filtered relation between disagreement and liquidity, as measured by the EURUSD interbank high-low spread.

related to currency specific measures of uncertainty, such as implied volatility and the VXY, but only at certain times. In our sample, which runs from January 2001 to December 2009, disagreement seems to measure currency specific uncertainty from 2006 onwards, with an interruption in 2008.

After having established this, we looked at the effect that heterogeneity (up until 2006) or uncertainty (from 2006 onwards) has on foreign exchange market conditions, such as trading volume and liquidity. Again, we only found a significant impact during the global financial crisis. In this period, higher disagreement coincides with higher bid-ask spreads, larger high-low spreads, and lower trading activity.

Based on these results, we can say that disagreement rather measures plain heterogeneity of expectations, and that it is not appropriate to use disagreement as a measure for uncertainty. Disagreement only episodically measures uncertainty, and based on our sample this episode coincides with a period of market turmoil.

Future research could further investigate the use of disagreement in different market states (tranquil and turmoil), from different underlying fundamentals (such as interest rates), and for a large cross-section of currencies. When using an unconditional measure of disagreement, one should be wary of the fact that there is not a clear interpretation of disagreement that holds in different states of the market. We conclude that disagreement is not reliable as a measure of uncertainty and should be more broadly used as a measure of heterogeneity.

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