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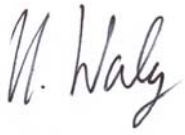

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Measuring Confidence and Uncertainty during the Financial Crisis: Evidence from the CFS Survey*

Horst Entorf[1], Christian Knoll[2], and Liliya Sattarova[1]

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Abstract:
The CFS survey covers individual situations of banks and other companies of the financial sector. This provides a rare opportunity to analyze appraisals, expectations and forecast errors of the core sector of the recent financial crisis. Following standard ways of aggregating individual survey data, we first present and introduce the CFS survey by comparing CFS indicators of confidence and predicted confidence to ifo and ZEW indicators. The major contribution is the analysis of several indicators of uncertainty. In addition to well-established concepts, we introduce innovative measures based on the skewness of forecast errors and on the share of 'no response' replies. Results show that uncertainty indicators fit quite well with patterns of real and financial time series of the time period 2007 to 2010.

JEL Classification: G01, G17, G21

Keywords: Business Sentiment, Financial Crisis, Survey Indicator, Uncertainty

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1. Introduction

The global financial crisis of 2007/2009 can be considered the most severe economic crisis since the great depression of the 1930s. Explanations for the outbreak of the crisis are causal relationships on the micro and macroeconomic level, which have been addressed e.g. by Issing et al. (2008). Although these explanations are convincing, economists agree that another factor has to be taken into account: a high degree of uncertainty about the current and future situation of the banking system and its inherent systemic risk. Financial transactions depend on trust in the

business relationship and the overall financial system, high uncertainty amplifies the likelihood of runs on financial institutions.

This paper uses new German survey data from the Center for Financial Studies (CFS, Frankfurt) to measure the degree of confidence and uncertainty during the financial crisis. The innovative feature of the CFS survey compared to well-established ifo (Munich) and ZEW (Mannheim) surveys of Germany's economic prospects is twofold. First, the focus is on the financial sector, i.e. respondents of the financial sector report on their individual situation within the financial sector (which differs from the ZEW financial experts' panel and from ifo, where respondents are interviewed regarding the economy as a whole, or about individual situations within manufacturing or service companies, respectively). Thus, typical questions regarding financial institutions as, for instance, transaction volume will be covered in the CFS survey (and are not reported elsewhere). A second, perhaps minor but still interesting and innovative point is the presence of a 'no response' category in the CFS questionnaire. This feature might help to avoid reporting biases from forced responses. In this paper, we also interpret variations in the 'no response' replies as an indicator of uncertainty.

The availability of survey data covering individual situations of banks and other companies of the financial sector during the financial crisis provides a unique source allowing us to analyze the core sector of the recent turmoil. Following standard ways of aggregating individual survey data, we first present and introduce the CFS survey by comparing CFS indicators of confidence and predicted confidence to ifo and ZEW indicators. The major contribution is the analysis of several indicators of uncertainty which are based on both standard deviation and skewness of individual appraisals of current situations, expectations and forecast surprises (forecast errors), as well as on 'no response' replies. Comparisons with real (GDP, investment) and financial data (total assets, VDAX) reveal that the CFS survey provides an added value to already existent surveys on Germany's current and future economic and financial situation.

The paper is organized as follows: Section 2 gives a description of CFS data and provides comparisons with well-known reference time series. Section 3 presents measures of uncertainty and compares them to real and financial data. Section 4 concludes.

2. CFS survey-based indicators: Construction and description

The ifo Business Climate Index and the ZEW indicator of Economic Sentiment are the two most popular German sentiment indices. Both possess a long tradition and can claim to have an impact on markets as changes in the indices regularly transform into subsequent security price changes (see Entorf, Gross, and Steiner, 2009). The CFS survey complements existing indicators

as it focuses on the financial sector in Germany, while the ifo Business Climate Index addresses firms in manufacturing, construction, wholesaling and retailing. The ZEW indicator of Economic Sentiment addresses financial experts, but although the group of participants could partially overlap, the aim of the ZEW index does not, because the ZEW respondents do not report on their own business, but on the perspective of macroeconomic figures in global markets (e.g. inflation, interest and exchange rates, commodities prices and equity markets). The major and innovative contribution of the CFS survey is to explicitly measure the business sentiment of the financial sector in Germany at the firm level which allows and to exploit heterogeneity in firm responses. This paper is the first to analyze this financial sector data.

The CFS requires each entity's respondent to be in a leading executive position. This top-level approach is to ensure that the participant's overview suffices to assess her current business situation and to make meaningful forecasts. The survey form contains questions about the participant's view on four different business parameters: transaction volume, profits, employment and investment in product and process innovations.[3] The answers to the questions may be given qualitatively as "positive", "neutral", "negative" or "no response" and a reply is requested for the elapsed and the forthcoming quarter. The CFS index explicitly allows the "no response" option in order to circumvent a response bias. We exploit the "no response" option to generate a new uncertainty measure (see Section 3.2 of this paper). The survey is carried out quarterly, in four waves per year, at the beginning of each January, April, July and October. Hence, the timing is always at the junction of two quarters and yields a response for the elapsed quarter, which the CFS labels "Performance", as well as a forecast for the forthcoming quarter, the "Prediction". The wave period is seven workdays and results of the surveys are published within a time frame of ten workdays after the end of the survey. At the time of carrying out the estimations underlying this paper, the survey was repeated in 14 waves and the time range of the quarterly data is from January 2007 until April 2010 yielding a total of 2,922 answers and an average of 209 responses per wave.[4]

The CFS provided us with the raw dataset of the survey responses in an anonymous form and throughout the paper we use this data to create several measures and relate them to the financial crisis. We first compute indicators of confidence as a time series of balances of equally weighted positive and negative answers. More formally, these indicators are based on individual qualitative

[3]The original wording used in the questionnaire (in German language) refers to "Geschäftsvolumen", "Ertragssituation", "Mitarbeiterzahl" and "Investitionssumme in Produkt- oder Prozessinnovationen". For the design of the questionnaire, see Table A.6 in the Appendix.

[4]The complete list of the survey's participants is provided in the Appendix in Table A.5.

responses of survey participants which are coded as:

$$C_i = \begin{cases} 1 & \text{if respondent is positive (about current/future situation)} \\ 0 & \text{if respondent is neutral (about current/future situation)} \\ -1 & \text{if respondent is negative (about current/future situation)} \\ na & \text{if no certain answer (i.e. '+', '=' or '-') given} \end{cases} \tag{1}$$

At the aggregate level, like many CIRET survey institutes such as ifo (Munich) and ZEW (Mannheim) in Germany, so-called balances are calculated as the difference between the shares of positive and negative answers in the sample (i.e. by ignoring respondents who are uncertain about their answers):

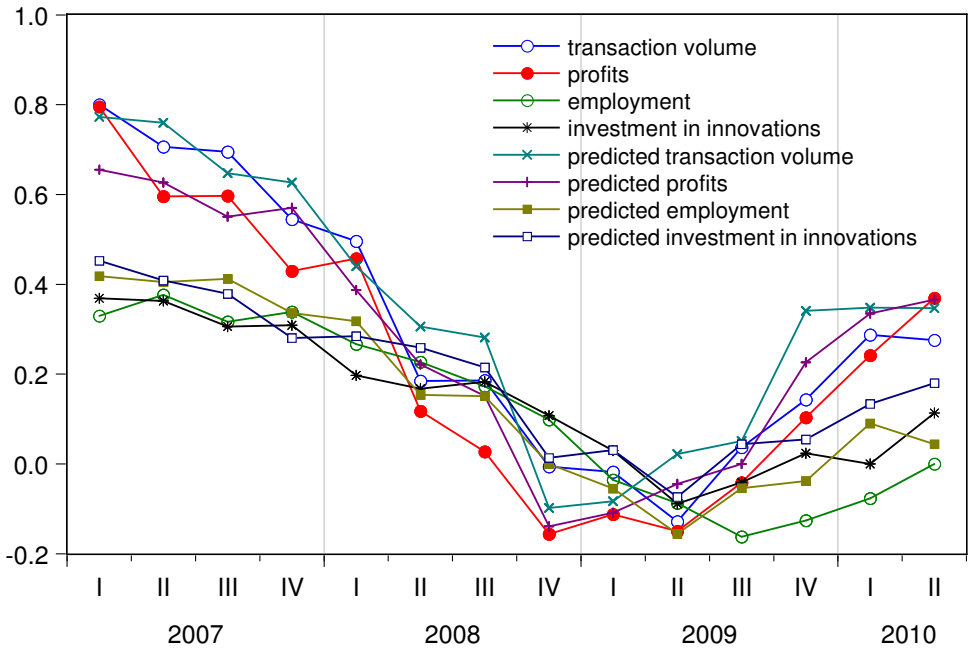
$$\overline{C} = \frac{1}{N} \sum_{i=1}^{N} C_i = P^+ - P^- \tag{2}$$

where $P^+ = \frac{C^+}{N}$ share of positive answers in the sample (with N being the number of valid +,= and - responses; P^- is defined analogously). ifo uses the same concept for surveying the current ("Geschäftslagebeurteilung") and expected economic situation ("Geschäftslageerwartung"), also ZEW economic forecasts ("ZEW - Konjunkturerwartungen") are based on the balance of positive and negative replies. Using the notion of *"confidence"* (following Bachmann et al., 2010) we believe that changing levels of $\overline{C}$ represent varying confidence levels of transaction volume, profits, employment and investment in product and process innovations.

We distinguish between the appraisal of the current (performance) *confidence* and the (expected) *predicted performance* during the forthcoming quarter. Figure 1 shows that *confidence* is U-shaped over the sample period for all of the four categories. At the beginning of the survey, in January 2007, the time series show the highest values followed by an erosion of confidence for several waves. We locate the minima of confidence levels between October 2008 and April 2009, a time period which many consider the climax of the financial crisis, while from the second half of 2009 confidence figures start increasing again.

We start describing time series characteristics by comparing the behavior of CFS confidence relative to ZEW and ifo indices, as all three indices are based on balances of positive and negative replies, and all sources report aggregate survey information on current and future economic situations. Table 1 gives an impression of the strength of interrelationships by looking at extreme values of cross-correlation functions and corresponding correlation coefficients. Two groups of clustered variables can be identified. The first group consists of ifo climate and CFS confidence

Figure 1: Presentation of confidence and predicted confidence indicators



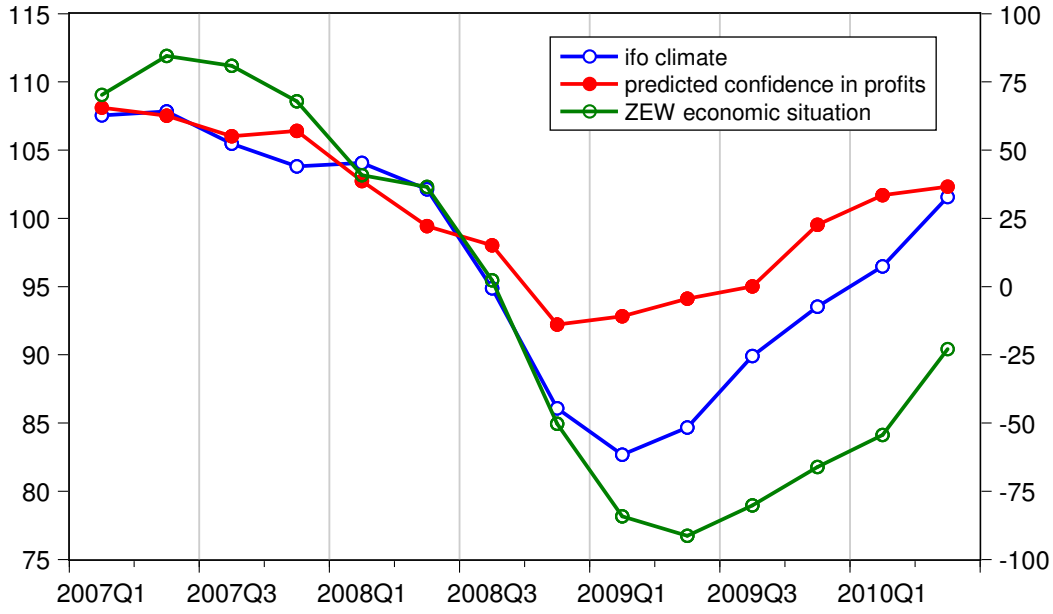
indicators related to transaction volume and profits. Also predicted confidence of transaction volume and profits belong to this group. All five group members have neither lead nor lag compared to other members of the same group. At the same time all variables of this first group have a lead of one quarter over employment confidence, all but ifo climate lead one quarter over ZEW economic situation, and all but both transaction volume variables have a lead over investment confidence. Thus, a second group, comprising ZEW economic situation, investment confidence and employment confidence, is somewhat lagging behind. The only remaining indicator, the ZEW economic forecast (ZEW economic sentiment), can be considered an outlier. Looking at the cross-correlation evidence since 2007, it has a lead of at least two quarters and even more over all other indicators, but higher leads come at the cost of much lower correlation. Summarizing results from cross-correlations, ifo climate and CFS indicators related to transaction volume and profits all have some similar leading indicator business cycle pattern. However, some indirect inference reveals that both CFS transaction volume and profits might even have a small lead over the ifo climate index. Its cross-correlation function with the ZEW economic situation has its maximum at lag = 0, whereas both CFS indicators have a lead of one quarter over the ZEW indicator. Moreover, the 'transaction volume' (confidence) and 'profits' (confidence as well as prediction) both indeed have a lead of one quarter over the ifo climate index when we repeat the cross-correlation analysis using first differences (see Table A.7 in the Appendix).

Table 1: Maximal cross correlation of $r(X_t, Y_{t-\tau})$ and corresponding lag τ(of X behind Y)

	$X_t \backslash Y_{t-\tau}$	Confidence				Pred. Conf.		ifo	ZEW
		trans. vol.	profits	employ.	invest.	trans. vol.	profits	climate	situation
Confidence	profits	0.98							
		(0)							
	employ.	0.90	0.86						
		(+1)	(+1)						
	investments	0.90	0.83	0.95					
		(0)	(+1)	(0)					
Predicted Confidence	trans. vol.	0.96	0.95	0.85	0.83				
		(0)	(0)	(-1)	(0)				
	profits	0.96	0.97	0.85	0.82	0.99			
		(0)	(0)	(-1)	(-1)	(0)			
ifo	climate	0.92	0.93	0.86	0.85	0.94	0.95		
		(0)	(0)	(-1)	(-1)	(0)	(0)		
ZEW	situation	0.92	0.92	0.96	0.96	0.90	0.91	0.91	
		(+1)	(+1)	(0)	(0)	(+1)	(+1)	(0)	
	forecast	0.46	0.54	0.51	0.47	0.48	0.55	0.57	0.48
		(-3)	(-3)	(-5)	(-5)	(-3)	(-2)	(-3)	(-4)

i. Maxima of cross-correlation functions and corresponding leads and lags of reported time series. Read, for example: "ZEW economic situation has a lag of +1 behind 'confidence in profits'; the corresponding correlation coefficient at lag +1 is 0.92". ii. The sample period is 2007.I to 2010.II. iii. Quarterly data of ifo and ZEW are obtained by averaging original monthly data.

Figure 2: Comparison of survey-based indicators



Left scale: ifo index value; right scale: ZEW index value; CFS confidence is rescaled to [-100, 100]; data source: Ifo Institute for Economic Research (ifo), Centre for European Economic Research (ZEW), Center for Financial Studies (CFS)

Figure 2 gives a visual impression of the time series behavior of the predicted CFS confidence indicator of profits (balances) in comparison to the ifo climate index and the ZEW economic situation indicator (balances). The graph is in line with results from Table 1 and confirms the promising performance of 'expected profits' compared to the well acknowledged ifo and ZEW indicators. All time series indicate an excellent economic situation in 2007, a lasting downswing starting in the first half of the year 2008, and a recovery in 2009. However, the exact timing of the turning point ranges between the fourth quarter of 2008 and the second quarter of 2009. In October 2008, the earliest indication of an upswing is observed for the CFS indicator which is supposed to cover future profits in the finance sector. Surprisingly in contrast to the other indicators representing the general economic situation, 'predicted confidence in profits' only slightly moves into negative territory. This pattern confirms that the financial sector itself seems to be less affected by the financial crisis than other sectors such as manufacturing or services. The next time series showing an upturn is ifo climate (based on the geometric mean of appraisals and expectations, i.e. on averaging early and coinciding indicators), finally followed by the ZEW survey indicator representing the prevailing economic situation of considered survey periods (ZEW economic situation). The comparison of Figure 2 to Table 1 reveals that leads or lags, as far as these are identifiable from naïve cross-correlation analysis, not necessarily fit leads or lags at crucial turning points of the business cycle.

However, additional comparisons of the lead-lag structure based on first differences and further indirect consistency checks provide us with a more reliable, though tentative, overall picture.

Summing up, CFS indicators offer an interesting source of information concerning the economic situation in general and the financial sector in particular. Descriptive cross-correlations and visual inspections show a strong correlation with well-established indicators such as the ifo climate index or the ZEW economic situation. Future experience with the CFS is required in order to learn more about the particularities and special features of the CFS data. The evidence in this chapter reveals that CFS confidence indicators do behave in a familiar fashion known from other well-acknowledged indicators.

3. Measuring uncertainty during the Financial Crisis

3.1. Motivation and Methods

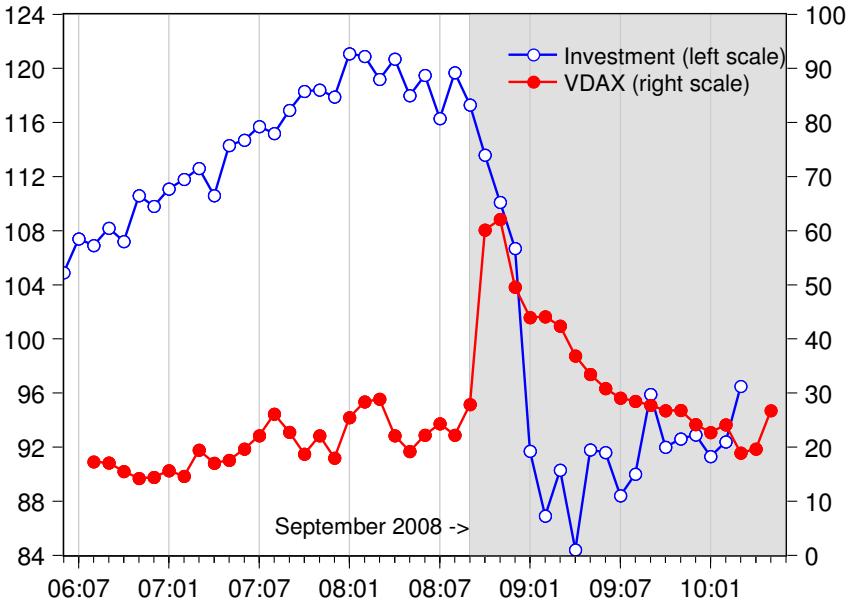
Uncertainty is considered as an important factor of economic recessions.[5] The recent paper by Bloom (2009) argues within an RBC model that firms postpone hiring and investment decisions when the future is highly uncertain because adjustment to optimal capital and labor inputs is costly and would need to be revised (perhaps more than once) when future demand would not meet future capacities. Thus, to avoid expensive sunk costs from excess capacity or from hiring and firing labor, it makes sense to wait for more certain expectations of the future economy before final decisions will be made.

Bloom (2009) measured uncertainty by making use of a stock market volatility index. Bachmann et al. (2010) (see their Appendix), replicating Bloom (2009) using U.S. data and employing Bloom's measure of uncertainty, finds that only in the 1975, 1980 and 1991 recessions (out of 15 NBER recessions) volatility was high at the beginning of a recession, in no case was volatility high prior to a recession. Also, papers by Chugh (2009) and Popescu and Smets (2009) cast some doubt on the claim in Bloom (2009) that stock market uncertainty shocks can be considered as general predictors for all recessions.

Analyzing the recent past of the German economy, Figure 3, too, cannot confirm a clear negative correlation between stock market volatility (measured by VDAX) and investment. However, we do observe a clear decline of investment after the Lehman crisis in September 2008, whereas volatility sharply rose during October/November 2008. The drop of investment activities started

[5] To avoid confusion, here 'uncertainty' does not necessarily imply uncertainty in the sense of mathematical statistics, where dealing with uncertainty means knowledge of statistical regularities such as distribution parameters or population moments. Thus, contrary to statistical uncertainty, 'uncertainty' does not allow calculation of mathematical expectations.

Figure 3: Stock market volatility and investment in Germany



Left scale: German investment index of manufacturers (adjusted for price differences, base year 2005 = 100); right scale: implied volatility of the DAX (VDAX); data source: Deutsche Börse, Statistisches Bundesamt: Genesis Datenbank

in October 2008, i.e. within the same month of the rapid rise of stock market volatility, but the most dramatic change occurred during December 2008 and January 2009, i.e. three months later, when the investment index plummeted from 107.1 down to 79.5.

In our subsequent empirical analysis (Section 3.2), we use CFS survey data to construct alternative measures of uncertainty and all indices are based on the individual qualitative responses of survey participants. As described in more detail in Section 2 of this paper, individual responses are aggregated as balances $\overline{C}$, which we interpret as indicators of confidence. The first measure of uncertainty used in this paper is the standard deviation S_C of responses C_i which, after employing $S_C^2 = \overline{C^2} - \overline{C}^2$, is calculated as

$$S_C = \sqrt{P^+ + P^- - (P^+ - P^-)^2} \tag{3}$$

S_C covers 'uncertainty' among survey respondents about the prevailing economic situation (this measure is also used by Bachmann et al., 2010). When applied to the *current* situation of respondents, S_C measures the degree of heterogeneity of companies during the current economic situation. This is different from the dispersion of 'uncertain' *future* 'plans and expectations' (in the sense of Nerlove, 1983) which can be quantified using survey questions about forthcoming time periods (the CFS survey asks for investment and hiring decisions three months ahead).

The second and third measures of uncertainty we are going to implement are based on what Nerlove (1983) referred to as 'surprises'. These are forecast errors or non-fulfillment of plans. For each quarter t we have a look at the realization (assessment of the current situation) and at the forecast made for t in period $t-1$. Following Nerlove (1983), we quantify the surprise of the forecast error (FE) as shown in Table 2, again not taking companies with uncertain answers into account at this stage.[6] Using FE we compute mean, standard deviation and skewness across

Table 2: Definition of the Forecast Error (FE): potential outcomes

	'Increase' in t	'Unchanged' in t	'Decrease' in t
Expected 'Increase' for t in t-1	0	-1	-1
Expected 'Unchanged' for t in t-1	1	0	-1
Expected 'Decrease' for t in t-1	1	1	0

all firms (given we have valid data in $t-1$ and t) for each period. Standard deviation, S_{FE}, and skewness, Sk_{FE}, represent the second and third measure of uncertainty used in the empirical study.

$$S_{FE} = \sqrt{FE^{+} + FE^{-} - (FE^{+} - FE^{-})^2} \tag{4}$$

$$Sk_{FE} = \frac{(FE^{+} - FE^{-})(1 - 3S_{FE}^2 - (FE^{+} - FE^{-})^2)}{S_{FE}^3} \tag{5}$$

Taking the skewness in addition to the standard deviation allows us to draw some additional conclusions about the asymmetry of positive and negative surprises (whereas the standard deviation weighs positive deviations from the mean equal to negative deviations such that no further information about the reasons of measured uncertainty can be obtained).

Unlike other survey data on business expectations, the CFS survey does not force respondents to fill in '+', '=' or '-'. Participants are offered a 'no response' category if they are uncertain about their assessment or expectation.[7] Thus, the share of 'no response' answers represents a

[6] Note that extreme surprises (such as a realization of -1 after an expectation of +1) are not defined as -2 or +2, but rather as -1 and +1. This has the disadvantage that extreme surprises are not treated differently from simple surprises, but it has the advantage that FE has just three potential outcomes and that summing up squared and cubic terms for obtaining second and third moments is not highly sensitive to few outliers.

[7] Of course, likewise participants might be unwilling to respond because they do not want to share any private information with others. Moreover, changes in no-response behavior might indicate uncertainty changes.

straightforward motivation of the fourth measure of uncertainty. It is simply defined as follows:

$$P^U = \frac{1}{N^*} \sum_{i=1}^{N^*} na_i \tag{6}$$

where $na_i = 1$ if respondent i had 'no response' in two subsequent periods t and $t-1$ ($na_i = 0$ otherwise), and N^* being the number of valid responses in two subsequent waves of the CFS survey. Here, two subsequent periods are employed in order to capture systematic response behavior and to exclude casual participation.

3.2. Results

In this sub-chapter we compare four indicators of uncertainty which have been introduced above. These indicators are applied as follows:

a) Standard deviation S_C of individual survey responses regarding current and future confidence in terms of transaction volume and profits

b) Standard deviation of errors ('surprises') of forecasting/planning in terms of transaction volume and profits of the current period, when the prediction was made three months ago, S_{FE}

c) Skewness of errors ('surprises') of forecasting/planning transaction volume and profits of the current period, when the prediction was made three months ago, Sk_{FE}

d) Share of 'no response' replies in terms of transaction volume and profits, P^U

We compare CFS survey data to GDP, *investment* and *total assets* which we use as reference time series of the real economic activity. Moreover, in order to learn how CFS survey-based measures of uncertainty relate to the standard stock market measure of uncertainty, we add the German market volatility index, VDAX, to the list of variables under comparison.

Table 3 shows results of a cross-correlation analysis. To avoid spurious results arising from trending data, time series of investment, GDP and total assets are used as quarterly (quarter-on-quarter) growth rates. VDAX has no evident long-run trend such that we employ the original time series. The same holds for the CFS uncertainty measures introduced above.[8] All extreme values of estimated cross-correlation functions have the expected signs: a) High heterogeneity/uncertainty

[8] Alternative calculations using first differences of CFS uncertainty measures have resulted in randomly located extreme values of the cross-correlation functions at unreasonably high leads or lags. Signs, too, vary in a non-systematic way.

about current/future economic situations at the micro level is associated with low rates of aggregate economic performance, b) survey-based indicators of uncertainty are positively correlated with stock market volatility, VDAX, i.e. the standard measure of uncertainty used in the literature (see, e.g., Bloom, 2009). As regards investment, Table 3 reveals that uncertainty measures based on

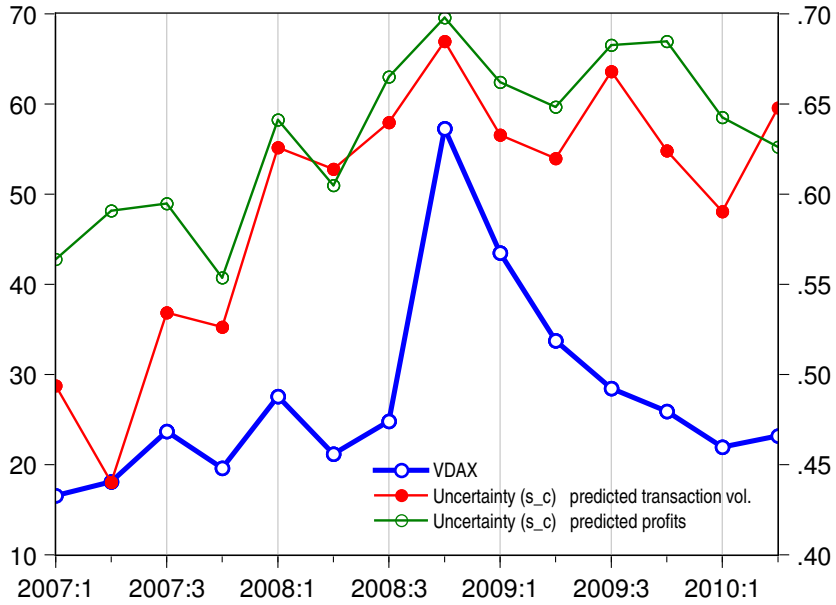
Table 3: Cross-correlation functions $r(X_t, Y_{t-\tau})$: performance of survey-based indicators

$X_t \backslash Y_{t-\tau}$	Investment (growth rates)	GDP (growth rates)	Total assets (growth rates)	VDAX
S_C - transaction volume	-0.52	-0.50	-0.63	0.64
	(0)	(0)	(0)	(+1)
S_C - profits	-0.42	-0.38	-0.59	0.49
	(0)	(0)	(0)	(0)
S_C - predicted transaction volume	-0.52	-0.59	-0.49	0.63
	(-1)	(-1)	(-2)	(0)
S_C - predicted profits	-0.50	-0.62	-0.55	0.69
	(-1)	(-1)	(-2)	(0)
S_{FE} - transaction volume	-0.23	-0.25	-0.41	0.41
	(-1)	(-1)	(-4)	(-3)
S_{FE} - profits	-0.60	-0.41	-0.16	0.70
	(+4)	(-3)	(+2)	(+5)
Sk_{FE} - transaction volume	-0.31	-0.34	-0.50	0.37
	(0)	(0)	(-1)	(+1)
Sk_{FE} - profits	-0.43	-0.52	-0.56	0.56
	(0)	(0)	(-1)	(+1)

i. Maxima of cross-correlation functions $r(X_t, Y_{t-\tau})$ and corresponding lags τ(of X behind Y) of reported time series. Read, for example: "S_C -predicted profits has a lag of -1 (i.e. a lead of +1) with respect to quarterly (q.o.q.) GDP growth rates; the corresponding correlation coefficient at lag -1 (lead +1) is -0.62". ii. Sample period: 2007.I to 2010.II. iii. Quarterly data on investment and VDAX are obtained by averaging original monthly data.

the standard deviation of individual *confidence* responses, S_C, of predicted profits as well as of *predicted transaction volumes* have a lead of one quarter over investment growth, whereas S_C related to the current situation does not show any clear lead or lag. Results on GDP, total assets and VDAX, too, confirm that S_C of *predicted transaction volume* and *predicted profits* deliver the highest correlation with actual economic data (see rows 3 and 4 of Table 3). The overall lead of both indicators is one quarter on GDP, even two quarters ahead of total assets. VDAX and 'S_C of *predicted transaction volume*' as well as VDAX and 'S_C of *predicted profits*' show closely related and coinciding patterns, as can be seen from the high correlation coefficients with zero lead or lag (Table 3). Figure 4 provides some additional graphical impression. Compared to S_C, standard deviation and skewness of *forecast errors* show weak correlations with reference time series or unreasonably high leads or lags. The only exception is Sk_{FE} - *profits* which is negatively correlated

Figure 4: Uncertainty and VDAX



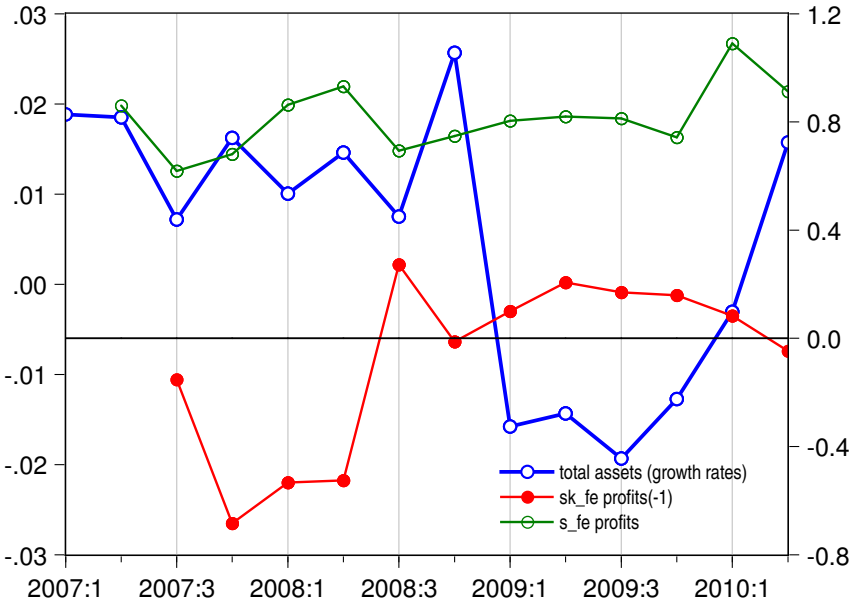
Left scale: implied volatility of the DAX (VDAX); right scale: S_C uncertainty indicators;
data source: Deutsche Börse, Center for Financial Studies (CFS)

with total assets (-0.56,lead = one quarter) and positively correlated with VDAX (+0.56, lag = one quarter).

Figure 5 reveals that skewness, i.e Sk_{FE}, might indeed entail some complementary information in addition to the standard deviation, i.e S_{FE}. The skewness indicator (displayed in period $t + 1$) is clearly negative until the second quarter of 2008, indicating that there have been more negative than positive surprises throughout the pre-Lehman time period. In 2009, after having realized the surprisingly well performing economy, the picture changed as the sign of the skewness indicator turned positive. Some final reversal can be observed for the 2nd quarter 2010, when the Greece crisis led to some negative shocks.

In contrast to other business surveys, CFS questionnaires offer 'no response' categories for those participants who deliberately decide not to respond to given survey categories. Given that such behavior represents 'uncertainty' about the exact current or future situation, it seems quite natural to interpret the share of 'no response' respondents as independent indicators of uncertainty. Table 4 presents the results of some cross-correlation analysis based on 'no response' shares. As the variance from the strong downward trends of the first six quarters would dominate the correlation analysis and cause misleading lead-lag patterns, all times series but VDAX enter the analysis as quarter-on-quarter growth rates. All signs are as expected. The highest correlation with all included 'real world' time series has the 'no response' share of predicted profits. Moreover,

Figure 5: Growth of total assets, standard deviation and skewness of forecast errors in profits



Left scale: quarterly growth rates of bank total assets; right scale: one-quarter lag of Sk_{FE} and S_{FE} uncertainty indicators; data source: Deutsche Bundesbank, Center for Financial Studies (CFS)

it has a lead of one quarter over investment and GDP, it is two quarters ahead of total assets, and even one quarter ahead of VDAX. The two-quarter lead over total assets is illustrated in Figure 6. For expository reasons, the sign of the no-response growth rate is turned negative and the lead is exposed by displaying no-response realizations of period t in period $(t + 2)$. After doing so, we observe a highly coinciding time series behavior during the period 2008.III until 2009.II. Disregarding the outlier of GDP growth in 2009.III, both time series share the same upward trend until 2010.II.

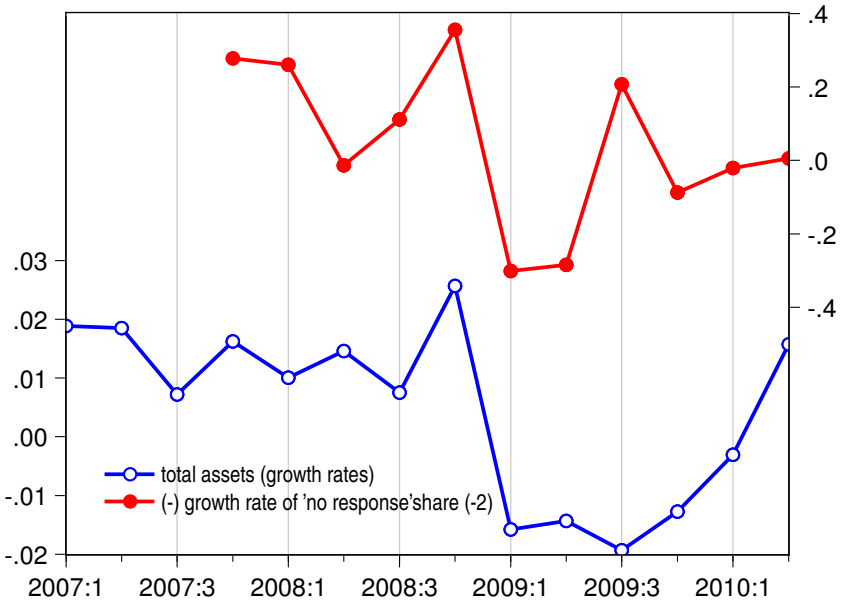
Of course, given the short time series we have, it might be too early to consider reported coinciding patterns as evidence of highly reliable (leading) indicators of the financial sector or even the economy as a whole. However, the reported results represent some interesting and promising observations that should be focused on in future research and analyzed after forthcoming waves of the CFS survey will appear.

Table 4: Cross correlation functions $r(X_t, Y_{t-\tau})$: performance of 'no response' shares

$X_t \backslash Y_{t-\tau}$		Investment (growth rates)	GDP (growth rates)	Total assets (growth rates)	VDAX
P^U	- transaction volume (growth rates)	-0.61 (+1)	-0.60 (+1)	-0.47 (-2)	0.42 (+1)
P^U	- profits (growth rates)	-0.39 (-1)	-0.35 (-1)	-0.34 (+1)	0.39 (0)
P^U	- predicted transaction volume (growth rates)	-0.38 (-1)	-0.37 (-2)	-0.56 (-2)	0.52 (-1)
P^U	- predicted profits (growth rates)	-0.60 (-1)	-0.61 (-1)	-0.59 (-2)	0.67 (-1)

i. Maxima of cross-correlation functions $r(X_t, Y_{t-\tau})$ and corresponding lags τ(of X behind Y) of reported time series. Read, for example: "the quarterly growth rate of the share of 'no response' replies regarding the prediction of profits, P^U , has a lag of -1 (i.e. a lead of +1) with respect to quarterly GDP growth rates; the corresponding correlation coefficient at lag -1 is -0.61". ii. Sample period: 2007.I to 2010.II. iii. Quarterly data on investment and VDAX are obtained by averaging original monthly data.

Figure 6: Share of 'no response' replies of profit prediction as leading indicator of total assets



Left scale: quarterly growth rates of bank total assets; right scale: negative values of quarterly growth rates of P^U on profit predictions, displayed in quarter (t+2); data source: Deutsche Bundesbank, Center for Financial Studies (CFS)

4. Conclusion

A high degree of uncertainty about the current and future situation of the banking system and its inherent systemic risk is considered as one of the main reasons for the recent financial crisis. Many authors, see in particular Bloom (2009), argue that uncertainty and wait-and-see behavior cause recessions because firms refrain from committing themselves to costly investment and hiring decisions. Thus, measuring uncertainty might help to better understand the reasons driving the recent turmoil and should improve the forecasting of future recessions. In this paper, we present and use new German survey data from the Center for Financial Studies (CFS, Frankfurt) to construct indicators of confidence and uncertainty.

The most important innovative feature of the CFS survey compared to well-established ifo (Munich) and ZEW (Mannheim) surveys of Germany's economic prospects is the focus on the financial sector, i.e. respondents of the financial sector report on their individual situation within the financial sector. This gives a unique opportunity to analyze the core sector of the recent turmoil during the time period of financial instability. Following standard methods of aggregating individual survey data, we first present and introduce the CFS survey and compare CFS indicators of confidence and predicted confidence to ifo and ZEW indicators. The major methodological contribution is the analysis of several indicators of uncertainty. In addition to well established concepts, we introduce new measures of uncertainty based on the skewness of forecast errors and on the share of 'no response' replies. Results show that uncertainty indicators fit quite well with patterns of real and financial time series of the time period 2007 to 2010.

So far, CFS survey data are only available for a relatively short time period. However, results presented in this paper show a promising performance for measures of confidence and uncertainty such that future waves of the CFS survey will provide researchers, professional financial analysts and economic forecasters with some sensitive indicators of transaction volume, profits and other indicators of the current and future situation of the financial sector.

Appendix A. Tables

Table A.5: List of CFS survey participants

Group	Branch / Wave	2007 1	2007 2	2007 3	2007 4	2008 1	2008 2	2008 3	2008 4	2009 1	2009 2	2009 3	2009 4	2010 1	2010 2	Total	Ave
1	Asset Management	4	11	16	16	17	14	17	9	12	9	13	13	12	11	174	12
1	Bank	35	59	60	66	66	62	40	49	71	67	58	59	56	57	805	58
1	Brokerage	2	7	6	6	9	7	6	5	8	8	7	5	5	6	87	6
1	Exchange	3	4	5	6	5	4	6	5	6	3	3	5	3	4	62	4
1	Insurance	8	7	8	11	14	13	12	11	11	10	12	10	11	10	148	11
1	Investment Bank	6	7	11	13	10	10	6	5	8	5	5	5	6	6	103	7
1	VC & PE	0	3	5	12	10	10	9	8	9	8	7	9	8	8	106	8
2	Accounting & Tax	7	7	10	14	13	14	12	10	16	14	12	12	14	16	171	12
2	Advisory	8	29	36	35	32	28	24	24	28	21	23	26	27	25	366	26
2	Financial Service	0	7	10	12	8	10	8	7	10	8	9	9	11	9	118	8
2	Lawyer	9	15	17	21	20	22	17	15	21	17	22	18	18	17	249	18
2	Media	4	11	11	14	13	14	12	10	10	11	10	7	9	8	144	10
2	Rating Agency	1	3	2	4	4	3	1	3	2	0	1	1	0	0	25	2
2	Wealth Management	4	6	8	13	8	9	8	8	11	7	9	7	7	7	112	8
3	Academic Institution	0	1	2	1	2	2	1	1	2	2	3	2	2	3	24	2
3	Interest Group	3	9	12	10	12	9	10	6	6	7	7	4	7	7	109	8
3	Supervisory	4	4	4	4	4	4	3	3	4	3	3	4	4	3	51	4
4	Nonfinancial Service	3	6	6	6	5	2	1	1	2	3	3	4	2	3	47	3
4	Real Estate	2	2	2	2	2	2	1	1	1	2	1	1	1	1	21	2
	Total	103	198	231	266	254	239	194	181	238	205	208	201	203	201	2,922	209

Table A.6: Survey Questionnaire

Business Climate	The firm's observed dynamics in the 1. quarter of 2011				The firm's forecasted dynamics for the 2. quarter of 2011			
	positive	neutral	negative	no response	positive	neutral	negative	no response
Transaction volume	○	○	○	○	○	○	○	○
Profits	○	○	○	○	○	○	○	○
Employment	○	○	○	○	○	○	○	○
Investment in product and process innovations	○	○	○	○	○	○	○	○

Example questionnaire in April 2011; data source: Center for Financial Studies (CFS)

Table A.7: Maximal cross correlation of $r(\Delta X_t, \Delta Y_{t-\tau})$ and corresponding lag τ(of ΔX behind ΔY)

	$\Delta X_t \backslash \Delta Y_{t-\tau}$	Confidence				Pred. Conf.		ifo	ZEW
		trans. vol.	profits	employ.	invest.	trans. vol.	profits	climate	situation
Confidence	profits	0.89							
		(0)							
	employ.	0.73	0.66						
		(+1)	(+1)						
	investments	0.39	0.47	0.63					
		(0)	(+2)	(0)					
Predicted Confidence	trans. vol.	0.54	0.51	0.55	0.76				
		(0)	(0)	(-2)	(-2)				
	profits	0.66	0.64	0.62	0.71	0.95			
		(0)	(0)	(-1)	(-2)	(0)			
ifo	climate	0.56	0.67	0.68	0.61	0.63	0.70		
		(+1)	(+1)	(-2)	(-1)	(0)	(+1)		
ZEW	situation	0.62	0.67	0.74	0.65	0.60	0.68	0.87	
		(+1)	(+1)	(0)	(0)	(+2)	(+2)	(0)	
	forecast	0.68	0.70	0.64	0.55	0.63	0.74	0.62	0.68
		(-2)	(-3)	(-4)	(-2)	(-2)	(-2)	(-3)	(-4)

i. Maxima of cross-correlation functions and corresponding leads and lags of the first differences of the reported time series. Read, for example: "The first difference of the ZEW economic situation has a lag of +1 behind the first difference of 'confidence in profits'; the corresponding correlation coefficient at lag +1 is 0.67". ii. The sample period is 2007.II to 2010.II. iii. Quarterly data of ifo and ZEW are obtained by averaging original monthly data.

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