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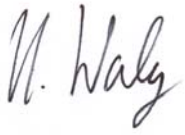

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CFS Working Paper No. 2010/18

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

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November 5, 2010

Abstract:
The CFS survey covers individual situations of banks and other companies of the financial sector during the financial crisis. This provides a rare possibility to analyze appraisals, expectations and forecast errors of 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. 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 can be considered the most severe economic crisis since the great depression of the 1930s. While its starting point in 2007 caught many by surprise it is still unclear whether it is overcome or still virulent. Explanations for the outbreak of the crisis are manifold: causational relationships on the micro and macroeconomic level have been addressed e.g. by Issing (2009). The microeconomic explanation is the persistent exploitation of information asymmetries in structured finance products. Misaligned incentives were induced by weak regulation, questionable ratings and a short-term focus of managerial compensation schemes. The macroeconomic story on the other hand is about global imbalances in consumption and production, combined with long-lasting low interest rates in the U.S. Over the last decade the leading global exporting countries, such as China and Germany, have acquired large funds and reinvested them in the well-developed financial markets of the U.S. where, in turn, the funding resulted in overinvestment in the real estate markets. Although these explanations are convincing, we believe 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 generally depend on trust in the business relationship and the overall financial system and high uncertainty amplifies the likelihood of runs on financial institutions. We believe it is this erosion of trust which amplified the crisis. Following Knight (1921) uncertainty of future events can be described as a state in which the underlying distribution is unknown. This resembles a distinct difference to the standard definition of risk, where an increase translates into an increase in volatility of future outcomes. Bloom (2009), following this tradition, argues 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 when future demand would not meet future capacities. Thus, recessions might arise in response to uncertainty, because cost-minimizing and risk-averse behavior cause rational inactivity until more certain expectations about the future economy will appear.

Bloom (2009) measured uncertainty by making use of a stock market volatility index. We are fortunate to use German survey data from the Center for Financial Studies (CFS,

Frankfurt) to measure confidence and uncertainty, as their data encloses the same time frame as the financial crisis. Germany is appealing to our research setting as it is the strongest European economy and it has been severely affected by the financial turmoil. Many banks in Germany, especially in the public sector, bore great risks in their credit portfolio. A large fraction of these banks were highly leveraged and had strongly invested in sub-prime markets using structured products. In addition, short-term financing increased the dependency on a well-functioning interbank market. As we know now, for many financial institutions, such a profile denoted a formula for failure.

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 a value added 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 well-established and new measures of uncertainty and compares them to real and financial data. Section 4 concludes.

2 CFS survey-based indicators: Construction and presentation

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, Steiner, 2009). We compare the concepts of the CFS Financial Center Index with the ifo and ZEW indicators and find that it features a distinct design which uniquely covers an existing research gap: The CFS surveys 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 intercept, 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). We believe the major contribution of the CFS index is to explicitly measure the business sentiment of the financial sector in Germany on firm level, as this allows us to exploit heterogeneity in responses controlling for firm characteristics. The CFS index is clearly a newcomer in the field of survey-based indicators and our paper is the first to analyze this financial sector data.

The ambition of the CFS Financial Center Index is to measure the business sentiment of the German financial system following a value added concept, which is incorporated by the type of questions asked and the composition of the panel. Concerning the latter, the CFS defines the financial center using four groups: at the core of a financial center are the financial intermediaries, including banks, asset managers, insurances, security exchanges,

brokers, venture capital and private equity enterprises (see Table A1 of the Appendix for a complete list). The intermediaries provide the market to channel funds between lenders and borrowers whilst generating added value by term transformation, convenience denomination and risk allocation. Around the core many service providers cluster. They are specialized in various ways on serving the needs of the intermediaries as advisors, accountants, lawyers, rating agencies, IT-service providers and media firms. The third group consists of supervisory and academic institutions. The institutions are not private companies and directly engaged in financial transactions or services but they either shape and monitor the legal framework of the financial center or accumulate finance-specific human capital as a resource for the first two groups and improve knowledge of finance. Finally, in the fourth cluster, connected enterprises benefit from the financial center without directly being involved in finance related activities. Airlines, hotels businesses, high end car dealers, fair organizers and real estate firms, belong to this group.

After firm entities are categorized in one of the four different groups, the CFS requires each entity's respondent to be in a leading executive position. This top-level approach is to ensure the participant's overview suffices to assess her current business situation as well as 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[1]. 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. This is in contrast to the ifo index, where this is not incorporated. Furthermore, we exploit the "no response" option in order 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

[1]The original wording used in the questionnaire (in German language) refers to "Geschäftsvolumen", "Ertragssituation", "Mitarbeiterzahl" and "Investitionssumme in Produkt- oder Prozessinnovationen".

workdays and results of the surveys are published within a time frame of ten workdays after the end of the survey. The CFS provides a press report of the current index value with an interpretation of the aggregated results and the most dominant movements in subindices. Additionally, a press conference is held twice a year, where a more detailed description is offered. Branch-specific information is exclusively distributed to respondents in order to induce them to participate by benefiting from a peer group comparison. The survey was repeated in 14 waves and the time range of the quarterly data is from January 2007 until April 2010 yielding 2,922 answers of an average of 442.

Levine (1997) provides a summary review on how economists link the real economy with the financial sector. This bond is well-established in the literature and dates back to Schumpeter (1911) who described a positive association between the per capita growth rate and the development of the financial sector. The research focus has advanced to which channels drive the dependency and how the causal direction between the two sectors can be identified. Rajan and Zingales (1998) promote an active role of the financials by presenting evidence of the impact of the financial sector on the real economy. A major argument is that the better the financial sector is developed, the less costly external financing for firms becomes which in turn reduces capital costs and promotes innovation and economic growth. But even if financial development should be nothing more but an indicator for economic growth, a reasonable prior in assessing the CFS data is that the financial sector and the real economy sector should be positively correlated.

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 responses of survey participants which are coded as

$$C_i = \begin{cases} 1 & \text{if respondent is positive (about current/future situation)} \\ 0 & \text{if respondent is neutral (about current/future situation)} \\ -1 & \text{if respondent is negative (about current/future situation)} \\ na & \text{if no certain answer (i.e. '+', '=' or '-') given} \end{cases} \tag{2.1}$$

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):

$$\overline{C} = \frac{1}{N} \sum_{i=1}^{N} C_i = P^+ - P^- \tag{2.2}$$

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. We find that *confidence* is U-shaped over the sample period for all of the four categories (Table 2.1 and Figure 2.1). 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 increase again (see Figure 2.1).

The climax of the financial crisis coincides with several prominent rescue events and subsequent restructuring in the German banking sector. The prelude of the financial crisis was the sub-prime crisis, triggered by the decline of the housing market in the U.S at the beginning of 2007. The bust of the asset bubble reached Germany in February as WestLB was rescued with federal state aid. In August 2007 Sachsen Landesbank collapsed due to their sub-prime investments and was taken over by Baden-Wuerttemberg Landesbank. In July 2007, IKB Deutsche Industriebank AG announced a large loss in the sub-prime market as well and was rescued by KfW Bankengruppe. An escalation of the crisis coincided

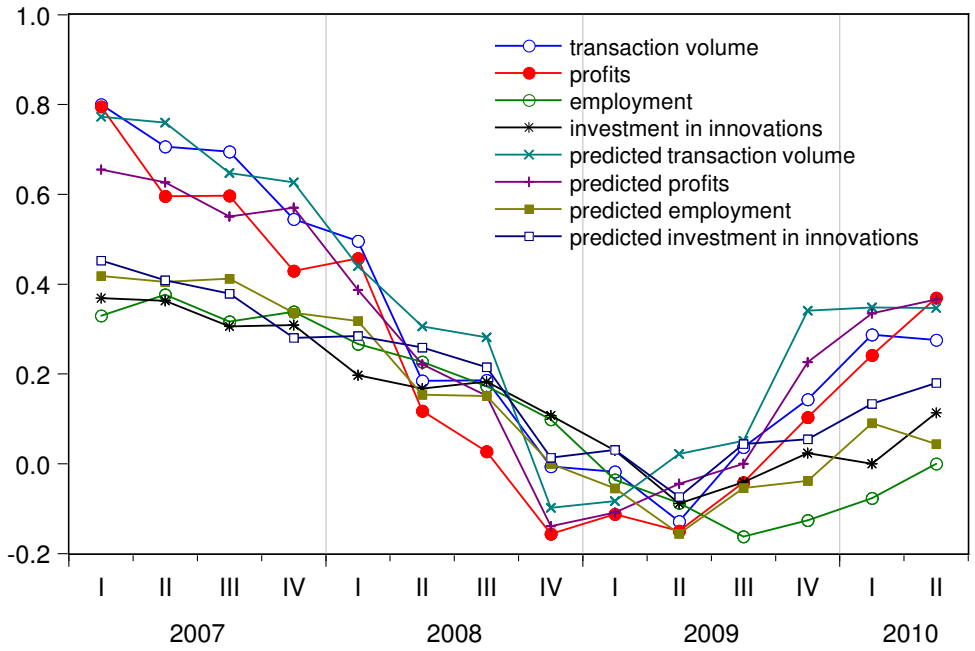
Table 2.1: Confidence and predicted confidence descriptive statistics

a) Confid. (Performance)	Mean	Std. Dev.	Min	Max	t(Min)	t(Max)
transaction volume	0.300	0.300	-0.128	0.800	1-Apr-09	1-Jan-07
profits	0.234	0.311	-0.157	0.795	1-Oct-08	1-Jan-07
employment	0.117	0.195	-0.162	0.376	1-Jul-09	1-Apr-07
investment in product and process innovations	0.146	0.151	-0.089	0.369	1-Apr-09	1-Jan-07

b) Predicted Confid.	Mean	Std. Dev.	Min	Max	t(Min)	t(Max)
transaction volume	0.340	0.292	-0.098	0.773	1-Oct-08	1-Jan-07
profits	0.271	0.274	-0.139	0.655	1-Oct-08	1-Jan-07
employment	0.145	0.200	-0.156	0.418	1-Apr-09	1-Jan-07
investment in product and process innovations	0.190	0.163	-0.074	0.452	1-Apr-09	1-Jan-07

i. The table summarizes confidence and predicted confidence measures from the CFS Financial Center Index. Confidence is the balance of positive and negative shares of replies across the four business categories of the CFS survey for a) the past and b) the forthcoming quarter. ii. In the second column means over the sample period from 2007.I to 2010.II and in the third column standard deviations followed by minima and maxima are shown. iii. In the last two columns t(Min) and t(Max) are the survey dates of the highest and lowest value of the confidence measures.

Figure 2.1: Presentation of confidence and predicted confidence indicators



Data source: CFS

with the failure of Lehman Brothers in September 2008, because the interconnectedness of the banking sector spread the fear of contagion effects. The vulnerability of the financial intermediaries to liquidity risk became evident since German financial institutions with a reliance on short-term refinancing were under stress as lending on the interbank market ceased. Banks hoarded liquidity, because the trust into their counterparties had abruptly eroded and the ECB stepped in as a lender of last resort. In October 2008 the severity of the crisis induced European leaders to create very large national rescue plans to reestablish confidence in the banking sector. The German rescue package consisted of €80 bn. in funds and €400 bn. in state-backed guarantees, and although the package was not fully depleted, the German government was forced to use it extensively to aid some of the largest German banks: In October 2008 Hypo Real Estate and Bayern LB were rescued from failure, followed by Commerzbank in January 2009 which, as one of the largest German commercial banks, was partially nationalized. In February 2009 HSH Nordbank received additional funds and federal state guarantees by Schleswig-Holstein. Finally, until March 2009, eighteen German banks had applied for state help, the identity of many institutes was not revealed in order to preserve the bank's reputation and prevent panic-based runs.

We start analyzing 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 2.2 gives a first impression of the strength of interrelationships by looking at (contemporaneous) correlation coefficients. CFS time series are positively correlated with current-situation indicators of ifo and ZEW. The correlation is very strong (in a range from 0,71 to 0,97) and highly significant at the one percent error level. Table 2.2 shows a positive correlation between most of the forecasts as well, with one exception: the correlation for ZEW situation is still strong (higher than 0,8), but the ZEW forecast is not significantly correlated with the confidence forecast and the ifo forecast. We thereby can unambiguously relate our sample to the ifo index and ZEW situation but not to the ZEW forecast. This result could be due to the ZEW question design, which addresses financial experts on the economic situation on the macro level, which seems to conceptually differ from the CFS and the ifo survey on the firm level.

Table 2.2: Contemporaneous Correlation Matrix of $r(X_t, Y_t)$

$X_t \backslash Y_t$		Confidence				Predicted Confidence				ZEW		ifo
		trans. vol.	profits	employ.	invest.	trans. vol.	profits	employ.	invest.	situation	forecast	situation
Confidence	profits	0.98**										
	employment	0.81**	0.72**									
	investment	0.90**	0.83**	0.95**								
Predicted Confidence	transaction volume	0.96**	0.95**	0.74**	0.84**							
	profits	0.96**	0.97**	0.71**	0.81**	0.99**						
	employment	0.96**	0.90**	0.92**	0.95**	0.90**	0.88**					
	investment	0.95**	0.92**	0.88**	0.93**	0.92**	0.90**	0.97**				
ZEW	situation	0.88**	0.80**	0.98**	0.96**	0.83**	0.80**	0.97**	0.93**			
	forecast	0.07	0.19	-0.47	-0.29	0.19	0.24	-0.18	-0.11	-0.21**		
ifo	situation	0.79**	0.71**	0.97**	0.94**	0.73**	0.70**	0.90**	0.90**	0.92**	-0.30**	
	forecast	0.82**	0.85**	0.58	0.69**	0.88**	0.89**	0.76**	0.82**	0.54**	0.48**	0.54**

i. The table summarizes the contemporaneous correlation of confidence measures from the CFS survey, the ifo economic situation and forecast as well as the ZEW economic situation and forecast. ii. On the axis are four items, confidence and predicted confidence measures from the CFS survey and the ifo and ZEW indices. Confidence relates to four business categories: transaction volume, profits, employment and investment in product- and process innovation iii. The ifo economic situation is the translation for the German "Geschäftsbeurteilung", the ifo economic forecast is the translation for "Geschäftserwartungen". The ZEW economic situation is "Beurteilung der aktuellen Lage" and the ZEW economic forecast are the "Konjunkturerwartungen" vi. The sample period is 2007.I to 2010.II. v. Quarterly data of ifo and ZEW are obtained by averaging original monthly data vi. **) denotes significant correlation at 1% level.

Are there significant leads or lags within the system of CFS indicators or with respect to the well-known ifo climate index (based on the geometric mean of appraisals and expectations) or ZEW indicators of current and expected economic situations? Table 2.3 shows extreme values of cross-correlation functions and corresponding correlation coefficients. Most variables can be assigned to either one or the other of two different groups. The first group consists of ifo climate and confidence 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.[2]

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 profits confidences 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, when we count the number of leads over all remaining indicators except the ZEW outlier in Table 2.3, we observe that confidence in profits and predicted profit confidence both have three one-quarter-leads compared to two one-quarter leads of ifo climate.

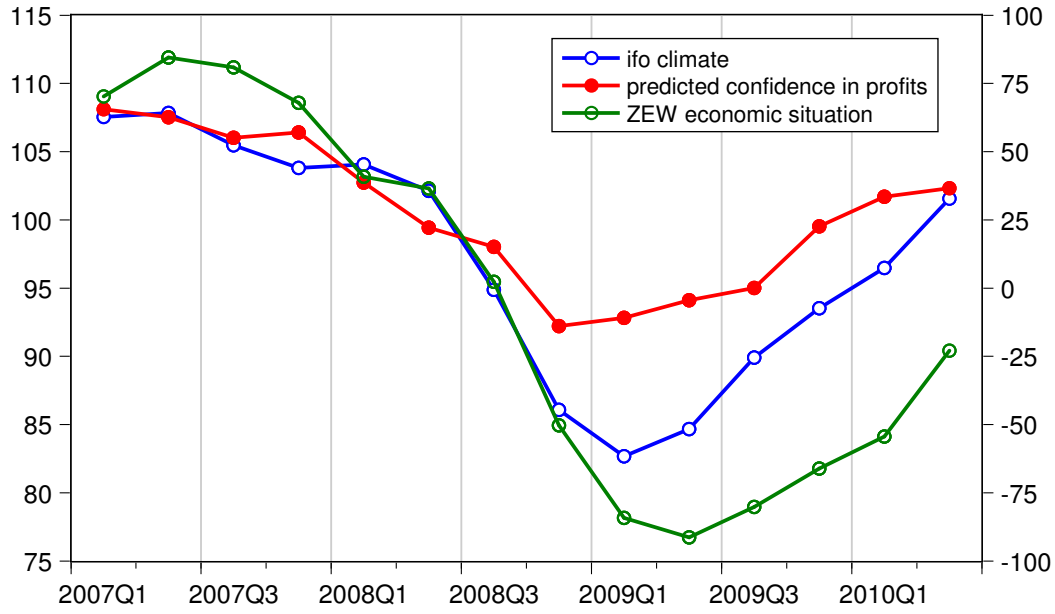
[2]Table 2.3 only reports positive local maxima of the cross-correlation function because we are primarily interested in pro-cyclical indicators. Analyzing (absolute) extreme values we find that these turn out to be minima which indicates some strong counter-cyclical behavior. This is not the case for other time series listed in Table 2.3. For instance, inspecting leads and lags with respect to the ifo climate, we found a (positive) maximum correlation of 0.57 at a lag of 3 quarters (reported in Table 2.3) and a (negative) minimum of -0.92 at a lead (of ifo climate) at 3. Of course, this would be no contradiction when the cycle length would be 12 quarters, because for cycles of length c a lead of τ periods with positive maximum cross correlation would be equivalent to a lag of $(\frac{c}{2} - \tau)$ with negative minimum cross correlation.

Table 2.3: 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. iv. **), *) denote significance at the 1%, 5% level.

Figure 2.2: Comparison of survey-based indicators



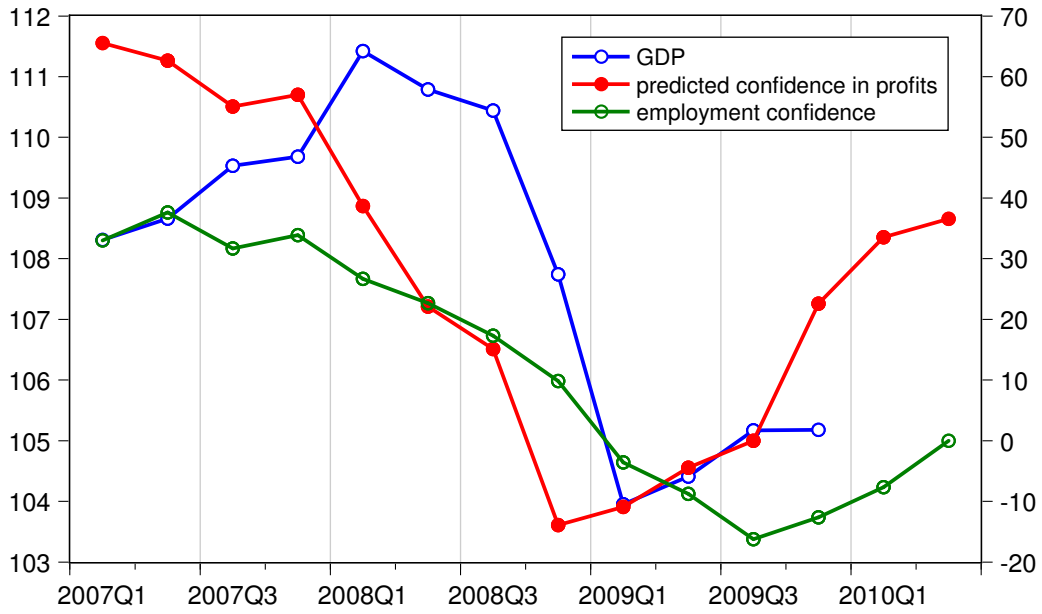
Data sources: ifo, ZEW, CFS

Figure 2.2 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 2.3 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; the next time series showing an upturn is ifo climate (based on the geometric mean of appraisals and expectations, i.e. something 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 2.2 to Table 2.3 reveals that leads or lags, which seem to be identifiable from nave cross-correlation analysis, not necessarily fit leads or lags at crucial turning points of the business cycle. However, it turns out that additional indirect

comparisons of the lead-lag structure and further consistency checks provide us more reliable overall evidence.

In Figure 2.3 CFS indicators are compared to the German GDP. As expected from the relative performance of the CFS indicators in Table 2.3, predicted profits is a leading indicator of the GDP, whereas employment confidence is lagging behind.

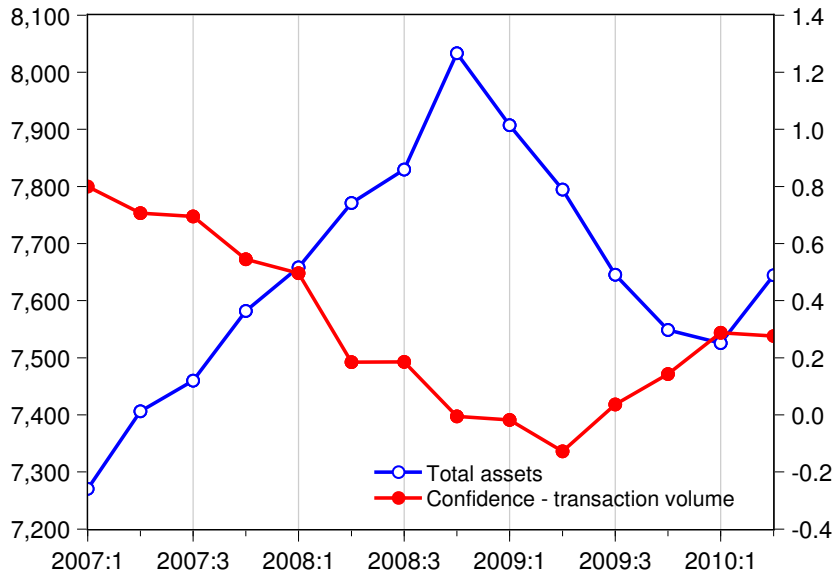
Figure 2.3: CFS confidence indicators as leading and lagging indicators of German GDP



Note: Left scale: German GDP, source: Statistisches Bundesamt; right scale: CFS confidence indicators.

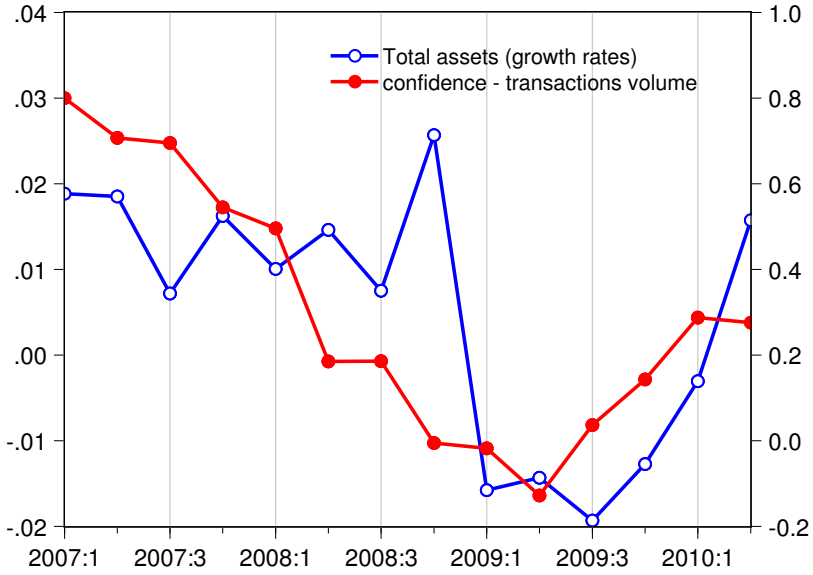
As CFS data focus on financial data, it is straightforward to compare survey data to data of the financial sector. We use total assets of all banks in Germany as reference time series of the 'real' financial sector which should be directly related to the survey question on transaction volume. Figure 2.4 shows levels of total assets together with the confidence indicator of the transaction volume. The graph does not reveal any evident relationship. However, using growth rates of total assets instead of levels reveals that CFS confidence data are helpful in predicting changes in total assets (see Figure 2.5).

Figure 2.4: Total assets and transaction-volume confidence



Data Source: CFS (Frankfurt, Germany) and Deutsche Bundesbank.

Figure 2.5: Growth rates of total assets and transaction-volume confidence



Note: growth rates of total assets are calculated using changes to the previous quarter; data source: CFS (Frankfurt, Germany) and Deutsche Bundesbank

Table 2.4 summarizes cross-correlation findings based on growth rates of total assets. As expected from Figure 2.5 CFS data show a lead of one quarter. The same holds for the ifo climate. Correlations are highest for predicted confidence and the ifo index.

Table 2.4: Maximal cross correlation of $r(X_t, Y_{t-\tau})$ and corresponding lag τ(of X behind Y), X = total assets (growth rates)

$X_t \backslash Y_{t-\tau}$	Confidence		Predicted Confidence		ifo	ZEW
	trans. vol.	profits	trans. vol.	profits	climate	situation
Total assets	0.70**	0.68**	0.73**	0.71**	0.75**	0.72**
	(+1)	(+1)	(+1)	(+1)	(+1)	(0)

i. Maxima of cross-correlation functions and corresponding leads and lags of reported time series. Read, for example: "quarterly growth rates of total assets have a lag of one quarter behind predicted confidence; the corresponding correlation coefficient at lag +1 is 0.73" ii. Sample period: 2007.I to 2010.II. iii. Quarterly data of ifo and ZEW are obtained by averaging original monthly data. iv. **), *) denote significance at the 1%, 5% level.

Summing up, CFS indicators provide an interesting source of information concerning the economic situation in general and the financial sector in particular. 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

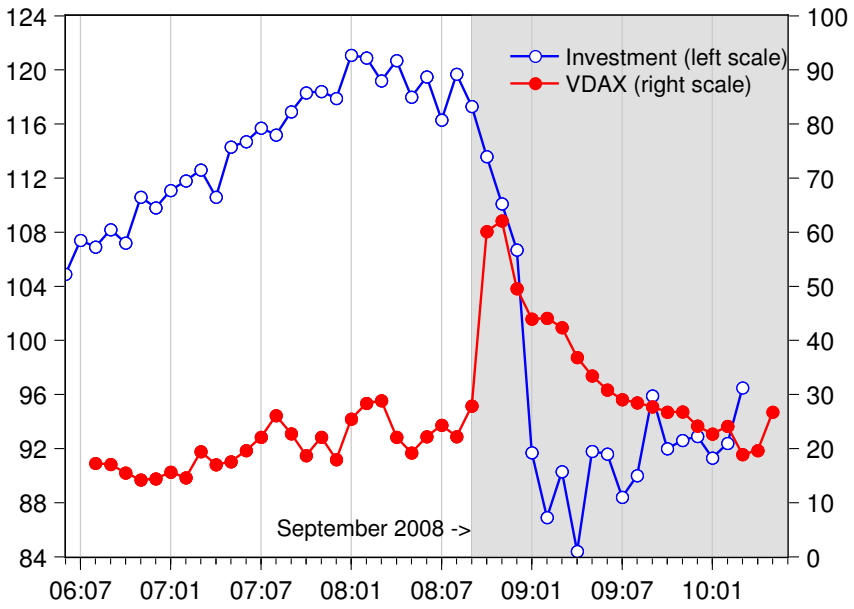
Uncertainty is considered as an important factor of economic recessions[3]. The recent paper by Bloom (2009) argues within an RBC model that firms postpone hiring and investment decisions when the future is highly uncertain because adjustment to optimal capital and labor inputs is costly and would need to be revised (perhaps more than once) when future demand would not meet future capacities. Thus, to avoid expensive sunk

[3]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.

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 are a major cause of recessions.

Figure 3.1: Stock market volatility and investment in Germany



Notes: Stock market volatility is measured by the 'volatility DAX' (VDAX) (source: Deutsche Börse), investment = total investment (source: Statistisches Bundesamt)

Analyzing the recent past of the German economy, this paper, too, cannot confirm a clear negative correlation between stock market volatility (measured by VDAX) and investment (see Figure 3.1) in the medium or long run. However, we do observe a clear decline of investment after the Lehman crisis in September 2008, whereas volatility sharply rose during October/November 2008[4]. The drop of investment activities started in October

[4]Note, however, that volatility did not immediately increase after the bankruptcy of the Lehman bank on September 15th, 2008. As can be seen from daily realizations of the VDAX (cf. Appendix Figure A.1), the sharp increase did not happen before October 2008.

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.

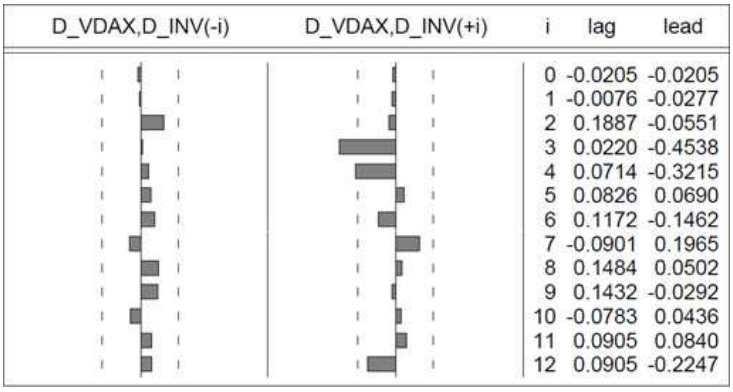
Using a tentative cross-correlation analysis based on the whole period 2006 until 2010 (last observation: March 2010), it can be confirmed that uncertainty (i.e. market volatility) has a lead over real activities (Figure 3.2.a). The cross-correlation function of uncertainty shocks and growth rates of investment has a significant minimum value of -0.45 at lead 3, suggesting that (unexpected) growth of uncertainty is followed by a decline of investment three months later. However, checking the robustness of this result (see Figure 3.2.b), it can be seen that both the estimated negative correlation and the lag of investment do not show up when we use data of the period before the default of the Lehman bank in September 2008: All correlation coefficients lie within the 95%-confidence band of 'white noise' time series. In contrast, the picture completely changes for the most recent months of the sample, i.e. after September 2008: Here (see Figure 3.2.c) the negative correlations correspond to the observation that the very strong volatility shock has been followed by a significant decline in investment. According to the cross-correlation function, the lag of real data to financial data amounts to four months. The delay might be due to existing contracts with suppliers and other reasons for retarding and slowing down production[5].

Given the limited reliability of stock market volatility for predicting recessions found in the recent literature, it seems to be promising to have a fresh look at well-established indicators of uncertainty and check whether they can be considered as useful alternatives to stock market volatility. Analyzing the interrelationship between 'uncertainty' and economic activity is not a new topic. 'Uncertainty' in the sense of Bloom (2009) has already been dealt with in early papers on survey expectations such as Knoebl (1974) and Koenig et al. (1981). Nerlove (1983) in his paper on 'expectations, plans and realizations' emphasizes that the expression 'expectation' in papers using survey data should not be confused with 'mathematical expectation'. Similar to the one in Bloom (2009) also Nerlove's motivation stems from making decisions under 'uncertainty'. For that reason he preferred to

[5]Taking levels of investment and volatility instead of their growth rates (which is misleading because of spurious correlation problems) reveals a positive bivariate correlation for both subperiods, i.e. before and after September 2008, whereas the cross-correlation function of the whole period under investigation shows a negative correlation and a lead of four months of the volatility index over investment (see Appendix, Figure A2).

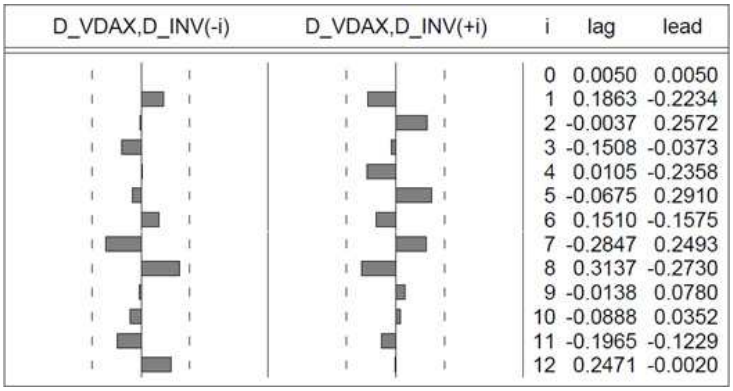
Figure 3.2: Cross correlation between stock market volatility and investment

(a) Total period 2006 - 2010



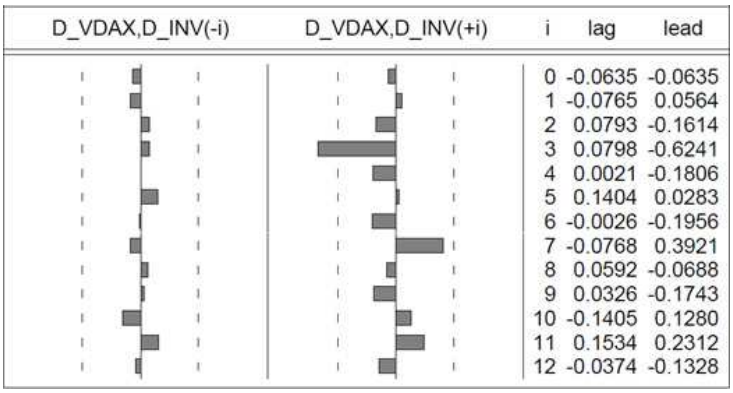
D_VDAX,D_INV(-i)	D_VDAX,D_INV(+i)	i	lag	lead
		0	-0.0205	-0.0205
		1	-0.0076	-0.0277
		2	0.1887	-0.0551
		3	0.0220	-0.4538
		4	0.0714	-0.3215
		5	0.0826	0.0690
		6	0.1172	-0.1462
		7	-0.0901	0.1965
		8	0.1484	0.0502
		9	0.1432	-0.0292
		10	-0.0783	0.0436
		11	0.0905	0.0840
		12	0.0905	-0.2247

(b) Pre-Lehman period 2006 until September 2008



D_VDAX,D_INV(-i)	D_VDAX,D_INV(+i)	i	lag	lead
		0	0.0050	0.0050
		1	0.1863	-0.2234
		2	-0.0037	0.2572
		3	-0.1508	-0.0373
		4	0.0105	-0.2358
		5	-0.0675	0.2910
		6	0.1510	-0.1575
		7	-0.2847	0.2493
		8	0.3137	-0.2730
		9	-0.0138	0.0780
		10	-0.0888	0.0352
		11	-0.1965	-0.1229
		12	0.2471	-0.0020

(c) Post-Lehman period (October 2008 and later)



D_VDAX,D_INV(-i)	D_VDAX,D_INV(+i)	i	lag	lead
		0	-0.0635	-0.0635
		1	-0.0765	0.0564
		2	0.0793	-0.1614
		3	0.0798	-0.6241
		4	0.0021	-0.1806
		5	0.1404	0.0283
		6	-0.0026	-0.1956
		7	-0.0768	0.3921
		8	0.0592	-0.0688
		9	0.0326	-0.1743
		10	-0.1405	0.1280
		11	0.1534	0.2312
		12	-0.0374	-0.1328

Notes: 'lead' and 'lag' denote lead or lag of quarterly (q.o.q.) growth rates of market volatility, d_vdax, compared to quarterly growth rates of investment, d_inv; values represent correlation coefficients at respective leads and lags. Monthly data range from June 2006 to May 2010.

deal not only with 'expectations' but he also introduced the notion 'plans' which are sometimes hard to distinguish from (non-mathematical) expectations, in particular when firms are asked for their future 'business conditions' (i.e. what is called 'Geschäftserwartungen' in the ifo questionnaire Marc Nerlove was analyzing in Nerlove, 1983). Moreover, Nerlove, too, points at the 'wait and see' effect of uncertainty:

Planning and decision making are themselves costly activities. Therefore only what is necessary to plan will be planned, only decisions which cannot be postponed will be made, and only the information about the future necessary to those plans and decisions and only to the accuracy warranted by the cost of error will be gathered. Plans will not always be fulfilled, single-valued expectations will often turn out to be wrong, and both will be continually revised. (Nerlove, 1983, p. 1252)

In our subsequent empirical analysis (Section 3.2), we are using both traditional and innovative concepts of measuring 'uncertainty' based on CFS data. All indices are based on individual qualitative responses of survey participants as defined in Section 2. We rewrite equation (2.1) for reasons of readability:

$$C_i = \begin{cases} 1 & \text{if respondent is positive (about current/future situation)} \\ 0 & \text{if respondent is neutral (about current/future situation)} \\ -1 & \text{if respondent is negative (about current/future situation)} \\ na & \text{if no certain answer (i.e. '+', '=' or '-') given} \end{cases} \tag{3.1}$$

As described in more detail in Section 2 of this paper, individual responses are aggregate as balances $\overline{C}$, which we interpret as indicators of confidence (see Section 2). 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

$$S_C = \sqrt{P^+ + P^- - (P^+ - P^-)^2} \tag{3.2}$$

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 measure 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 3.1, again not taking companies with uncertain answers into account at this stage.[6]

Table 3.1: 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

Using FE we compute mean, standard deviation and skewness across 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.

$$S_{FE} = \sqrt{FE^+ + FE^- - (FE^+ - FE^-)^2} \tag{3.3}$$

$$Sk_{FE} = \frac{(FE^+ - FE^-)(1 - 3S_{FE}^2 - (FE^+ - FE^-)^2)}{S_{FE}^3} \tag{3.4}$$

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).

[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.

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

$$P^U = \frac{1}{N^*} \sum_{i=1}^{N^*} na_i \tag{3.5}$$

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 participations.

3.2 Results

In this sub-chapter we compare four indicators of uncertainty which have been introduced above. These indicators are 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 real economic performance. Moreover, in order to learn how CFS survey-based measures of uncertainty relate to the standard stock market measure of

[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.

uncertainty, we add the German market volatility index, VDAX, to the list of variables under comparison.

Table 3.2 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. All but two[8] extreme values of estimated cross-correlation functions have the expected sign: a) High heterogeneity/uncertainty 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).

Table 3.2: 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	0.33	-0.41	-0.16	-0.29
	(-3)	(-3)	(+2)	(-1)
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)

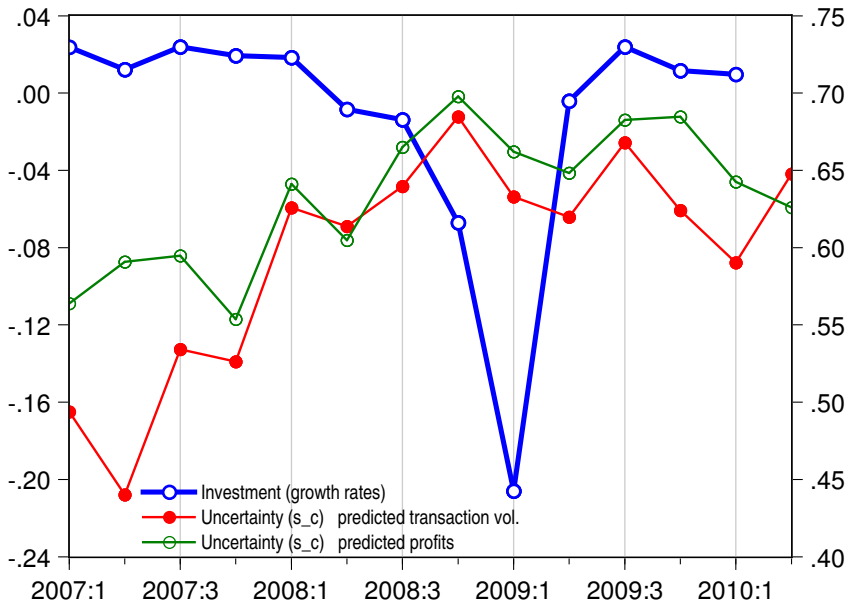
i. Maxima of cross-correlation functions $r(X_t, Y_{t-\tau})$ and corresponding lags τ(of X behind Y) of reported time series. Read, for example: "S_C -predicted profits has a lag of -1 (i.e. a lead of +1) with respect to quarterly (q.o.q.) GDP growth rates; the corresponding correlation coefficient 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. iv) **), *) denote significance at the 1%, 5% level.

As regards investment, Table 3.2 reveals that uncertainty measures based on the standard deviation of individual *confidence* responses, S_C, of predicted profits as well as of *predicted*

[8]The only exceptions are the positive correlation between 'S_{FE} - *profits*' and investment and the negative correlation between 'S_{FE} - *profits*' and VDAX.

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 3.2). The overall lead of both indicators is one quarter on GDP, even two quarters ahead of total assets. Figures 3.3 and 3.4 illustrate the negative association with investment and GDP, respectively. 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 highly significant correlation coefficients with zero lead or lag (Table 3.2). Figure 3.5 provides some additional graphical impression.

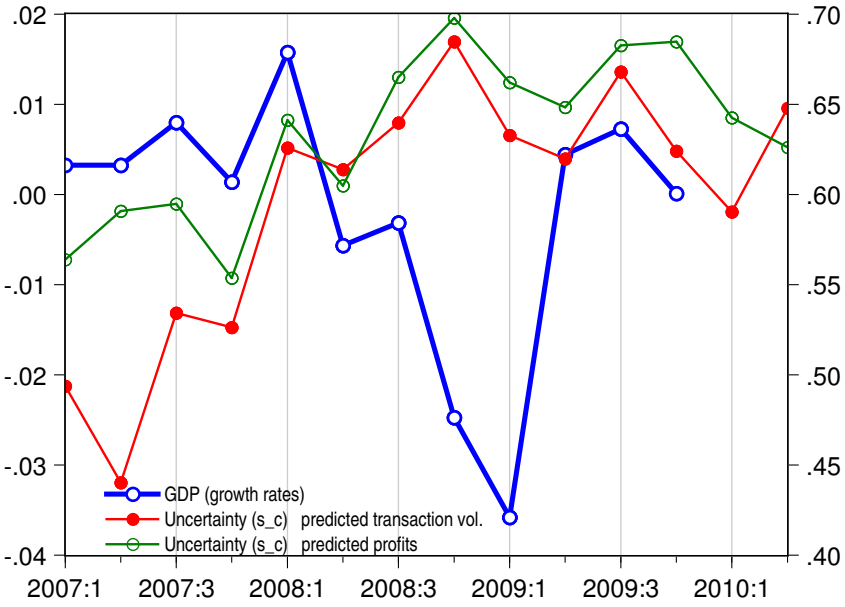
Figure 3.3: Uncertainty and investment growth



Note: Left scale: quarterly (q.o.q.) growth rates of investment; see text for the definition of displayed uncertainty measures (right scale).

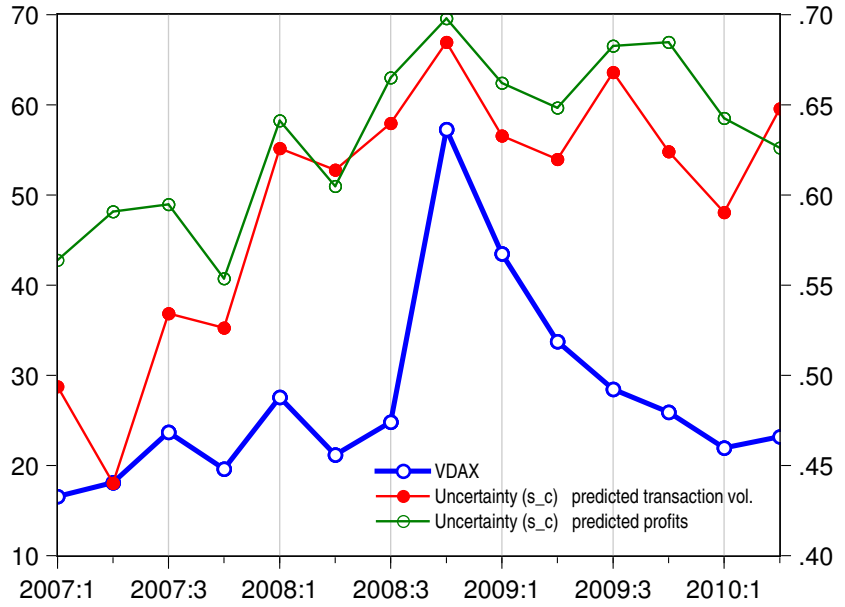
Compared to S_C, standard deviation and skewness of *forecast errors* both seem to have rather weak connections to investment. The same holds true for most estimated correlation coefficients measuring the interrelationship of S_{FE} and Sk_{FE} with GDP, total assets and VDAX. The only exception is Sk_{FE} - *profits* which is significantly correlated with total assets (-0.56, lead = one quarter) and VDAX (+0.56, lag = one quarter).

Figure 3.4: Uncertainty and GDP growth



Note: Left scale: Quarterly (q.o.q.) growth rates of GDP; see text for the definition of displayed uncertainty measures (right scale).

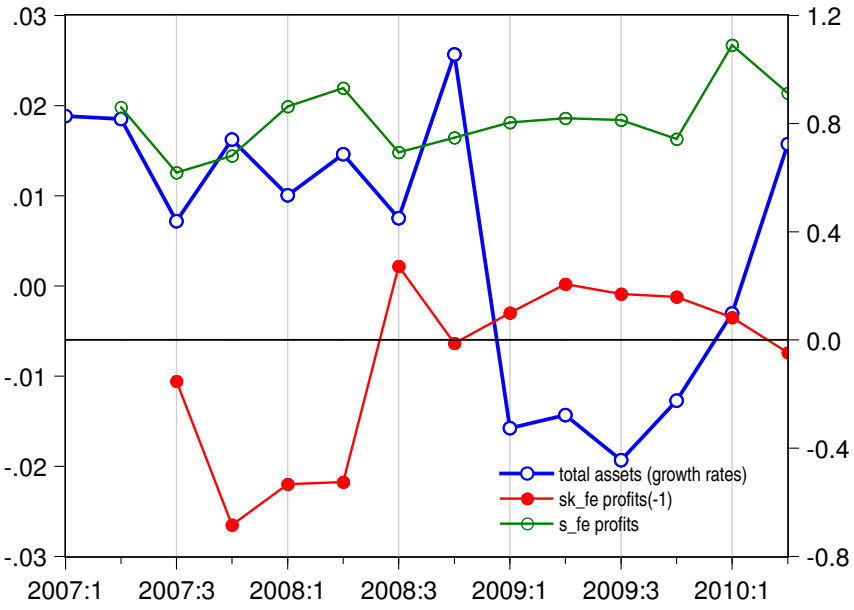
Figure 3.5: Uncertainty and VDAX



Note: VDAX = volatility of DAX (left scale); see text for the definition of displayed uncertainty measures (right scale).

Figure 3.6 reveals that skewness, i.e Sk_{FE}, might indeed entail some additional information on 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.

Figure 3.6: Growth of total assets, standard deviation and skewness of forecast errors in profits



Note: left scale: quarterly (q.o.q.) growth rates of total assets, right scale: sk_fe(-1) = $Sk_{FE}(-1)$ = one-quarter lag of Sk_{FE}, s_fe = S_{FE} ; see text for the definition of displayed uncertainty measures.

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. Figure 3.7 reveals that the share was about 10% - 14% in 2007.I, shrinking down to 4% - 5% in 2008.II and fluctuating around about 5% thereafter. As expected for uncertainty measures, the strongest fluctuations can be observed for predictions (of both transaction volume and profits).

Figure 3.7: Shares of 'no response' replies

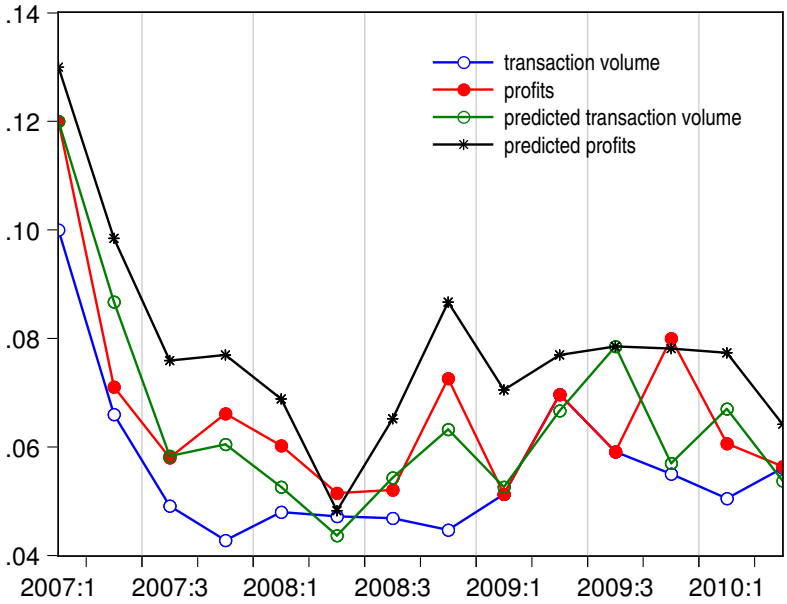


Table 3.3 presents the results of some cross-correlation analysis based on 'no response' shares. As the variance from the strong downward trends of the first six quarters would dominate the correlation analysis and cause misleading lead-lag patterns, all times series but VDAX enter the analysis as quarter-on-quarter 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, 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.

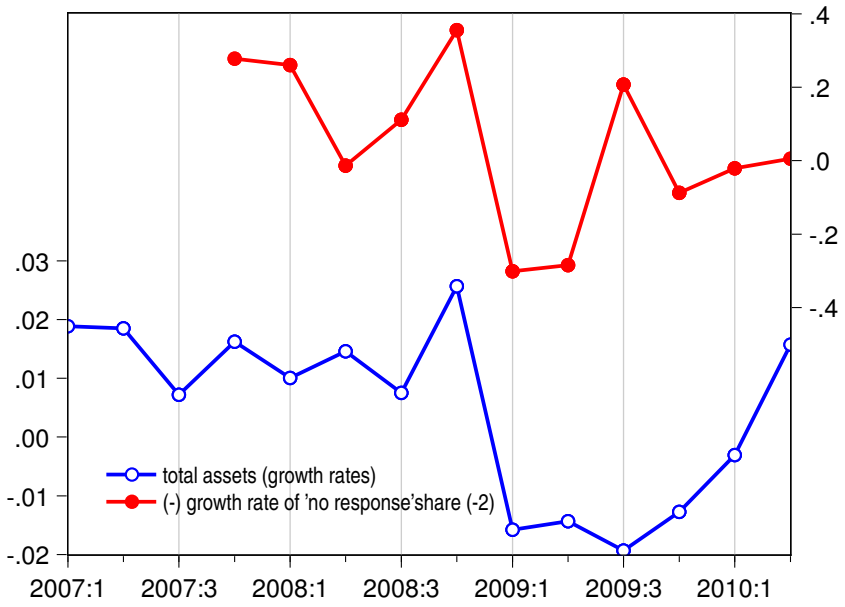
Table 3.3: Cross correlation functions $r(X_t, Y_{t-\tau})$: performance of 'no response' shares

$X_t \backslash Y_{t-\tau}$	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. iv. **), *) denote significance at the 1%, 5% level.

The two-quarter lead over total assets is illustrated in Figure 3.8. 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.

Figure 3.8: Share of 'no response' replies of profit prediction as leading indicator of total assets



Note: left scale: quarterly (q.o.q.) growth rates of total assets, right scale: negative values of quarterly growth rates of the share of 'no response' replies on profit predictions, displayed in quarter (t+2).

Of course, given the short time series we have, it is much 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.

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 use German survey data from the Center for Financial Studies (CFS, Frankfurt) to construct indicators of confidence and uncertainty. Germany is of particular interest as it is the strongest European economy and it has been severely affected by the financial turmoil.

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 the 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 excellent information about transaction volume, profits and other indicators of the current and future situation of the financial sector.

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A Appendix

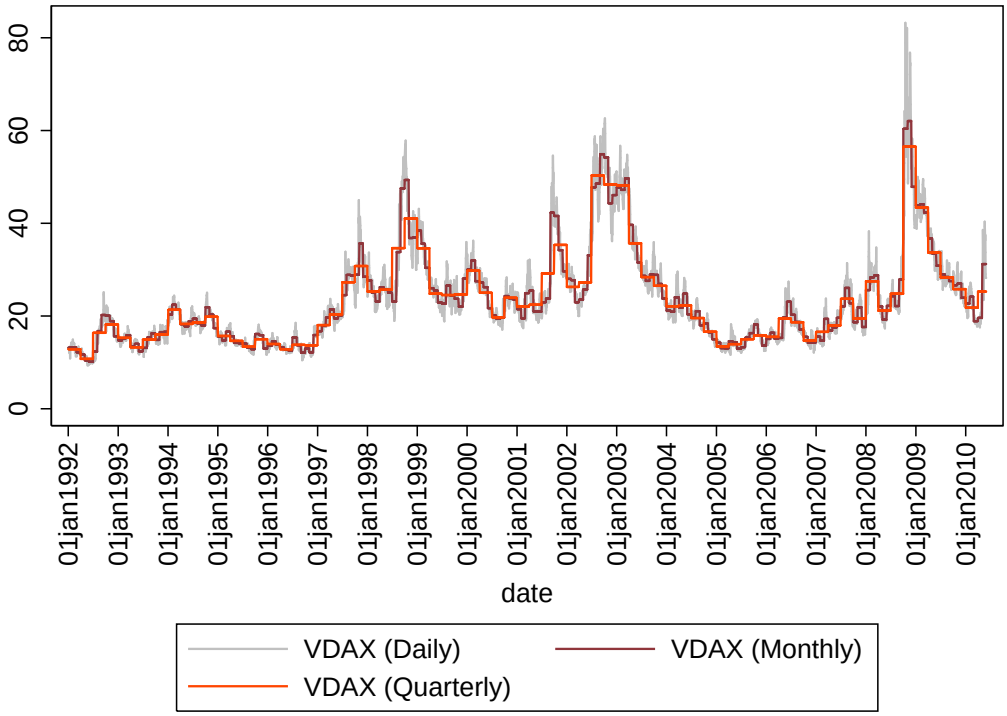
Table A.1: List of CFS survey participants by users

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	7	21	24	30	29	29	29	29	29	28	28	28	28	28	367	26
1	Bank	60	84	90	107	109	108	108	108	127	128	128	119	119	120	1515	108
1	Brokerage	0	11	12	15	15	15	15	15	15	15	15	15	15	15	188	13
1	Exchange	3	5	6	9	9	9	9	9	9	9	9	9	9	9	113	8
1	Insurance	12	14	14	21	25	25	25	25	25	25	25	25	25	25	311	22
1	Investment Bank	0	16	22	23	23	22	22	22	21	22	22	20	20	20	275	20
1	VC & PE	0	9	10	24	25	25	25	25	25	25	25	24	24	24	290	21
2	Accounting & Tax	11	15	15	26	27	27	27	27	27	27	27	27	27	27	337	24
2	Advisory	15	44	52	62	61	61	61	61	62	61	61	60	60	60	781	56
2	Financial Service	3	16	23	27	27	27	27	27	29	29	29	30	29	30	353	25
2	Lawyer	17	26	29	41	39	39	39	39	39	40	40	39	39	39	505	36
2	Media	0	18	17	21	20	20	20	20	20	19	19	17	18	18	247	18
2	Rating Agency	4	6	6	6	6	6	6	6	6	6	6	6	6	6	82	6
2	Wealth Management	4	12	13	22	22	20	20	20	20	19	19	19	19	19	248	18
3	Academic Institution	0	8	5	5	5	5	5	5	4	7	7	7	7	7	77	6
3	Interest Group	3	12	16	17	17	16	16	16	16	13	13	14	14	14	197	14
3	Supervisory	5	5	5	5	5	5	5	5	5	5	5	6	6	6	73	5
4	Nonfinancial Service	3	13	14	14	14	14	14	14	14	14	14	14	14	14	184	13
4	Real Estate	2	3	3	3	3	3	3	3	4	4	4	4	4	4	47	3
	Total	149	338	376	478	481	476	476	476	497	496	496	483	483	485	6190	442

Table A.2: List of CFS survey participants by entity

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	6	18	21	25	24	24	24	24	24	23	23	23	23	23	305	22
1	Bank	37	66	74	86	88	88	88	88	100	100	100	95	95	95	1200	86
1	Brokerage	0	10	11	13	13	13	13	13	13	13	13	13	13	13	164	12
1	Exchange	1	3	4	6	6	6	6	6	6	6	6	6	6	6	74	5
1	Insurance	10	12	12	16	18	18	18	18	18	18	18	17	17	17	227	16
1	Investment Bank	0	12	18	19	19	18	18	18	17	17	17	16	16	16	221	16
1	VC & PE	0	9	10	23	24	24	24	24	24	24	24	23	23	23	279	20
2	Accounting & Tax	6	10	10	15	16	16	16	16	16	16	16	16	16	16	201	14
2	Advisory	11	41	49	58	57	57	57	57	57	57	57	56	56	56	726	52
2	Financial Service	3	16	23	27	27	27	27	27	29	29	29	29	29	30	352	25
2	Lawyer	15	23	26	38	37	37	37	37	37	37	37	36	36	36	469	34
2	Media	0	16	16	19	18	18	18	18	18	17	17	16	17	17	225	16
2	Rating Agency	3	5	5	5	5	5	5	5	5	5	5	5	5	5	68	5
2	Wealth Management	4	12	13	22	22	20	20	20	20	19	19	19	19	19	248	18
3	Academic Institution	0	5	4	4	4	4	4	4	3	4	4	4	4	4	52	4
3	Interest Group	2	11	13	14	14	13	13	13	13	12	12	13	13	13	169	12
3	Supervisory	2	2	2	2	2	2	2	2	2	2	2	2	2	2	28	2
4	Nonfinancial Service	3	13	14	14	14	14	14	14	14	14	14	14	14	14	184	13
4	Real Estate	1	2	2	2	2	2	2	2	2	2	2	2	2	2	27	2
	Total	104	286	327	408	410	406	406	406	418	415	415	405	406	407	5219	373

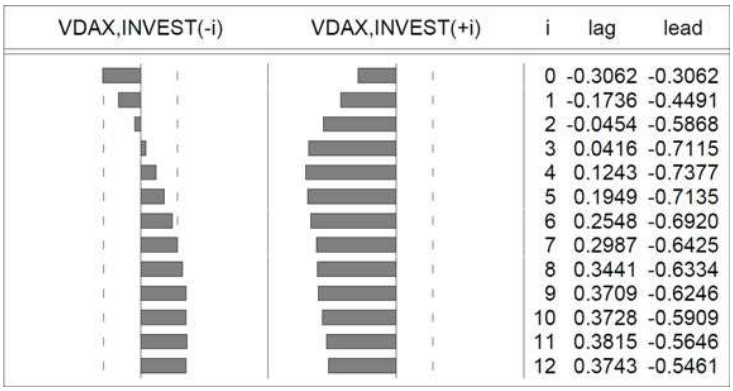
Figure A.1: VDAX



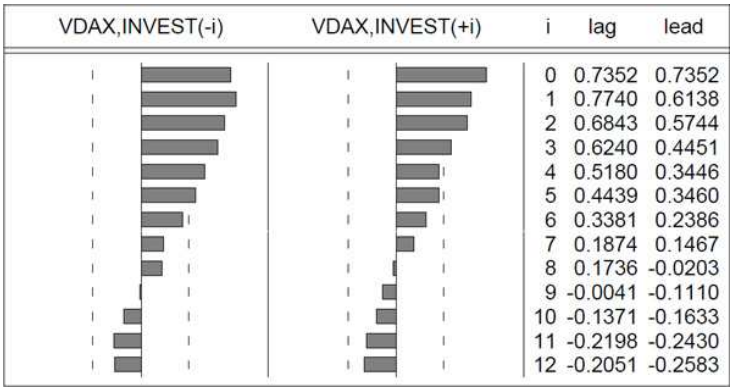
Note: Monthly and quarterly data are calculated as averages of daily data; Data source: Deutsche Börse AG

Figure A.2: Cross correlation between stock market volatility and investment

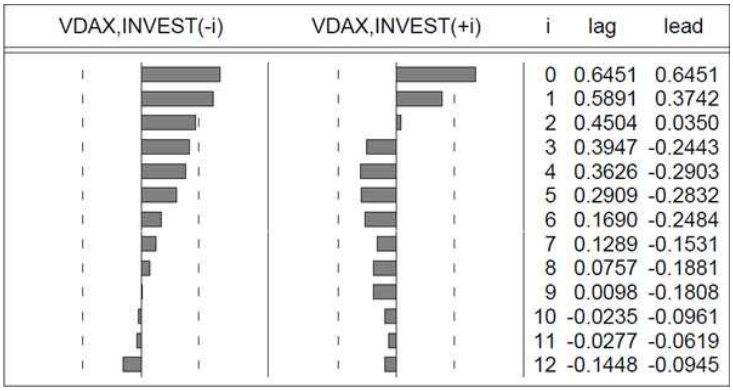
(a) Total period 2006 - 2010



(b) Pre-Lehman period 2006 until September 2008



(c) Post-Lehman period (October 2008 and later)



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