

Do Fundamentals Convey Ex Ante Information about Profit Warnings?

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Abstract

There is a long tradition of research using fundamentals to forecast the performance of firms. More recently some studies have suggested that managers tend to delay the disclosure of bad news. Combining these two facets, fundamentals should have some success in forecasting upcoming profit warnings. A profit warning usually triggers a big downward movement in the firm's share price, so predicting these disclosures beforehand would be of value. To answer the research question, if fundamentals can be used to predict profit warnings, accounting variables and share price movements are analyzed in a quarterly setting around profit warnings. The findings show that firms' profitability tends to decrease and their accrual accounts to increase already in the quarter before the profit warning is issued.

Keywords

Disclosure, forecasting, fundamental analysis, profit warnings

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1. Introduction

Previous research has provided rational reasons for managers to withhold bad news publications. Verrecchia's (2001) survey of the disclosure literature reveals several incentives for managers to withhold bad news publications, such as career concerns and direct financial losses due to decreases in pay.¹ Kothari et al. (2009) point out that managers may withhold bad news and hope that subsequent corporate events allow them to hide it. This idea is based on the survey evidence of Graham et al. (2005) where CFOs admit to delaying bad news in the hope that they never have to disclose it if the firm's business starts developing for the better. Following this, several papers write about a "tipping-point" which is as far as managers can go stockpiling bad news until it has to be disclosed (e.g. Hutton et al., 2009, Kim et al., 2011, Kim and Zhang, 2014). Previous research has shown that bad news announcements have higher stock market impacts compared to good news announcements, which can be due to managers stockpiling bad news whereas the threshold to publish good news is lower (Kothari et al., 2009).

The connection between fundamentals and firms' future performance has generated much research (e.g. Ou and Penman, 1989, Bernard and Thomas, 1990, Lev and Thiagarajan, 1993, Sloan, 1996, Piotroski, 2000, Richardson et al., 2005). Sloan's (1996) accrual anomaly may partly be the result of managers hiding weak performance with accruals. When the managers' hope of more tail wind in the business does not materialize, accruals have to be reversed, which in turn, results in negative earnings surprises. The post-announcement drift phenomenon and the serial correlation of quarterly earnings (Bernard and Thomas,

1990) suggest that earnings may express a degree of softness already in the quarter before the disclosure of the bad news.

This study tests the ability of fundamentals in predicting upcoming profit warnings. The main contribution comes from presenting evidence that fundamentals give signs of an upcoming profit warning already before it is published. This can be due to managers deliberately withholding bad news publications or that the weakening performance can be detected in the fundamentals before the weakness reaches the threshold when a profit warning must be published. As the fundamentals are used to forecast bad news disclosures, the evidence should also be of practical interest. Investors would gain if they beforehand could identify firms, which are likely to issue profit warnings as profit warnings usually generate significant price reductions in the firms' market prices. Reported average abnormal returns on the day of a firm's profit warning have been -8.5% in U.S (Bulkley and Herrerias, 2005) and -10.9% in Europe (Alves et al., 2009). These sizeable negative returns indicate that the disclosures in general come as surprises to the market.

The investigation in this paper, whether fundamentals show signs of an upcoming profit warning, is carried out with a sample of firms listed on the exchanges of Nasdaq OMX Nordic. All profit warnings issued by the listed firms on the exchange are retrieved for the years 2005-2011. The empirical results build on 318 profit warnings and an equally sized sample of matched observations. Accounting variables and stock market reactions to the quarterly reports are examined for the two samples during 12 quarters around the profit warning.

¹ The motivations to withhold bad news have similarities to Ball's (2009, 286) three motivations for a manager to commit financial fraud; inability to meet expectations, personal costs and "[b]eing able to convince oneself that real performance will improve soon."

The results indicate that for the profit warning firms, already the quarterly report issued closest before the profit warning shows signs of weakness. Profitability is depressed and the accounts receivable and inventory accruals are on high levels compared both to the matched firms and to the preceding quarter. At least some of this softness is picked up also by the financial markets because the earnings announcement closest to the profit warning on average results in a negative market reaction (-2.3% during a three-day window). Based on the fundamentals, a PW-risk score index is created. This index has some success in predicting profit warnings as it tends to increase before the profit warnings are issued.

The next section further presents related literature. Section three presents the data and methodology for the analysis. The empirical analysis is in section four and the conclusion is in section five.

2. Relation to previous literature

There is much research on conservatism in accounting earnings since Basu (1997). There is less evidence indicating voluntarily conservatism in managers' disclosure practices (Kothari et al., 2009). The empirical evidence of managers' voluntary disclosures of bad news tends to be connected with specific motivations, for example, litigation risk (Kasznik and Lev, 1995), stock-option grant dates (Aboody and Kasznik, 2000) and providing pre-IPO owners the possibility to sell shares at better prices (Ertimur et al., 2014). Several studies document an asymmetric market reaction to good versus bad news disclosures (Skinner, 1994, Kothari et al., 2009, Langberg and Sivaramakrishnan, 2010). The bigger share price response to bad news relative to good news can be interpreted as the result of managers withholding and stockpiling bad news to a "tipping point" whereas the thresh-

old to publish good news is much smaller (Kothari et al., 2009, Kim et al., 2011). These asymmetric stock returns may be influenced also by other factors, such as bad news publications revealing lower levels of managerial ability (Langberg and Shivamakrishnan, 2010) or maybe most likely, that bad news are considered more trustworthy than good news (Hutton et al., 2003). The latter is related to Miller's (2002) finding that managers tend to increase disclosure when earnings performance improves.

Accounting fundamentals and stock prices have been extensively used to predict future performance of firms (Ou and Penman, 1989, Bernard and Thomas, 1990, Lev and Thiagarajan, 1993, Sloan, 1996, Abarbanell and Bushee, 1997, Piotroski, 2000, Fama and French, 1992, Richardson et al., 2005).² The research linking fundamentals to future stock returns reports gross average yearly abnormal returns up to over 20% on hedge-portfolios were expected winners are bought and expected losers sold (e.g. Piotroski, 2000). In this kind of studies, the fundamentals used are mostly calculated on annual accounting data and their prediction power tested on time periods of one year or longer. Nevertheless, much of the documented yearly returns tend to materialize during shorter time intervals.

Sloan (1996) reports that over 80% of the documented abnormal yearly return for his buy portfolio comes from the four quarterly announcement periods. Also Piotroski (2000, 37) finds that his trading strategy earns substantial returns in earnings announcement periods which "demonstrates that the success of fundamental analysis is at least partially dependent on the market's inability to fully impound predictable earnings-related information into prices in a timely manner." This evidence suggests that fundamentals have

² Richardson et al. (2010) and Lewellen (2010) provide recent literature reviews on the subject.

prediction power over quarterly earnings development, and thus they may also give signals of upcoming profit warnings.

At the time of the earnings announcement preceding the profit warning, managers may still hope that circumstances will turn in their favor as suggested by Graham et al. (2005). Their thinking that firms are willing to hide weaknesses to not disappoint the market is enhanced in a more recent survey where a CFO is quoted saying “[y]ou will always be penalized if there is any kind of surprise” (Dichev et al., 2016, 29).³ Following this, the evidence presented in this study addresses the short-term predicting ability of quarterly data over voluntary bad news disclosures.

3. Data and method

3.1 Data

In the search for evidence to investigate if fundamentals can be used to forecast profit warnings, a sample of profit warnings from firms listed on the Nasdaq OMX Nordic Exchange is collected. As stipulated by the exchange, a profit warning must be issued immediately in the occurrence of new events that have changed the firm’s prospects significantly and is not previously known by the market. The decision to issue a profit warning is usually taken by the company board at the manage-

ment’s initiative. It is conjectured that there is a gestation period during which the performance of the firm gradually weakens and the management is trying to figure out if a profit warning must be issued or not. Especially, if managers are reluctant to publicly downgrade expectations and delays the publication as suggested by previous research (Verrecchia, 2001) some signals of the deterioration of the firms’ earnings power should be visible in the quarterly numbers preceding the profit warning.

The data on profit warnings is retrieved from Nasdaq OMX Nordic.⁴ The announcements of companies listed on the exchanges of Copenhagen, Helsinki, Iceland and Stockholm are reviewed on a daily basis to find the profit warnings. In contrast to, for example, the U.S where profit warnings are issued through filing a 8-K form⁵ at the Security and Exchange Commission, the profit warnings on Nasdaq OMX Nordic are issued through separate company announcements. In these separate announcements almost always already the heading revealed the nature of the announcement and if not, the announcement was clicked open and checked. The search for profit warnings extended from the start of 2005 to the end of 2011, the sample formation is showed in table 1.

Table 1. Sample formation

Initial amount of warnings found		836
- warnings that could not be classified/were for non-recurring items	71	
- warnings from financial institutions	82	
- warnings from companies that had been delisted/could not be found	136	
- warnings from companies whose financial period ≠ calendar year	31	
- warnings from companies that lacked financial or price data	198	-518
Number of warnings in the sample		318

³ Bursgtahler and Dichev (1997) were among the first to provide convincing evidence that managers manage earnings to meet benchmarks and thus try not to disappoint the market.

⁴ Nasdaq OMX Nordic is a part of the world’s largest stock exchange company Nasdaq OMX Group Inc.

⁵ The 8-K form is a standardized form used to report a wide list of material corporate events ranging from revised profit outlooks to issuance of securities and changes of management.

As fundamentals most likely will signal the development of the firms' core business operations, profit warnings issued due to non-recurring items were neglected from start. The search generated a total of 836 profit warnings. From these, warnings (8%) with conflicting or unclear news, for example a downgrade of sales guidance but an upgrade of the profit forecast, were omitted. Also profit warnings (10%) from banks and financial institutions were neglected due to their different financial statement layouts. After warnings from firms that had been delisted⁶ or were not found (16%), warnings from firms having a financial year other than the calendar year (4%) and warnings from firms with lacking price or accounting data for the quarter closest to the profit warning publication (24%) were left out, the sample was down to 318 profit warnings.

For comparability reasons firms' financial period were required to coincide with the calendar year. As noted, many observations were lost due to non-existent price and/or accounting data in the quarter before the profit warning which is a downside of using quarterly information. Many firms do not publish quarterly information at the detailed level required to calculate the fundamentals of this study. In all, 40% of the profit warning observations initially found were left out due to missing data which raises concerns if the sample is representative of the population. There is generally more data available for larger firms meaning that the sample of this study is biased in this direction. When com-

paring the sample to the median listed firm in Denmark, Finland and Sweden, the sample observations are roughly three times the size of this population.⁷

3.2 Method

The fundamental signals which are used in this study to predict performance have been used previously by, among others, Lev and Thiagarajan (1993) and Piotroski (2000). The main exception from several previous studies is that quarterly data is used instead of yearly data. The changes in the variables of the main analysis are relative to the comparable quarter of the previous year (i.e. y/y changes). As a robustness test the changes in the variables were also calculated relative to the preceding quarter (i.e. q/q changes).

The fundamentals used can be divided into signals measuring deterioration of profitability or efficiency, on one hand, and signals measuring weak business development or signs of hiding deteriorating performance, on the other hand. The choice of fundamentals to this study was influenced by the somewhat limited detail level of the data quarterly data. The signals measuring profitability and efficiency are the developments in the EBIT margin, in ROA and in asset turnover.⁸ ROA is calculated as net income before extraordinary items through assets and asset turnover is net sales through assets. In both ROA and asset turnover the denominator is the period beginning assets as in Piotroski (2000). Decreases in the EBIT margin, ROA and asset turnover are all considered as indications of

⁶ 82% of the profit warnings that were left out because of a delisting of the profit warning firm had been issued in the years 2005-2008. Many of these warnings had been issued by small firms and a merger with a larger firm appeared to be the most common reason for the delisting.

⁷ When all observations available in Worldscope for listed Danish, Finnish and Swedish firms were retrieved for the sample years 2005-2011, net sales, market capitalization and total assets had medians of 77 MUSD, 97 MUSD and 107 MUSD, which can be compared to the sample figures reported in table 3 (p. 12).

⁸ Both Lev and Thiagarajan (1993) and Piotroski (2000) apply gross margin instead of EBIT margin, in this study EBIT margin is used because gross profit is generally not available on a quarterly basis for the firms in the sample.

slowing performance increasing the likelihood of a profit warning.⁹

Balance sheet based signals are the developments of inventory, accounts receivables and total accruals. Accrual accounts have been extensively used in previous research to determine earnings quality (Richardson et al., 2005) and have also been recommended by CFOs as a tool for outsiders to evaluate a firm's earnings (Dichev et al., 2016). An inventory build-up may be a consequence of shrinking demand, leaving goods unsold or that the finished goods inventory has been pushed up to increase profits by capitalizing fixed costs in the inventory. An increase in sales receivables relative to sales may signal that the firm must boost sales by giving more generous payment terms or that the customers are unwilling to pay. In addition to the changes of inventory and sales receivables, total accruals capture also changes in some interesting accounts for which there is generally limited information in many quarterly reports. Changes in depreciation, as well changes in accrued expenses and payables are examples of these accounts. A decrease in depreciation increases accruals and can be a sign that the firm changes depreciation schedules or invests less. Decreasing payables and other non-interest bearing debt also increase accruals and may sign that purchases or discretionary purchases (e.g. marketing campaigns) are limited due to slowing demand. In this study, total accruals for one quarter is measured as the net income before extraordinary items minus the cash flow from operating activities. A disproportional (to sales) increase in inventory, accounts receivables and total accruals are assumed to be signs of weakness increasing the risk for a profit warning.

The last of the accounting based measures

is the change in leverage which is also used by Piotroski (2000). An increase in leverage is assumed to signal inability to generate sufficient internal funds. Increasing debt may also increase managers' willingness to withhold bad news due to possible debt covenant violations (Jha, 2013). Increasing leverage is thus a negative sign. In this study, leverage is measured as net debt by ending assets for the quarter and the change is measured compared to the corresponding quarter the year before. These accounting based fundamentals are complemented by the stock market reaction to the quarterly report publications as it is assumed that the market detects softness already in the report published closest before the profit warning. There may be many reasons for the disappointment, such as, despite optimistic accruals, the numbers do not quite live up to the expectations or that the analysts detect that the management has become more cautious. This market based signal is motivated also by the post announcement drift literature showing a serial correlation between quarterly earnings (Bernard and Thomas, 1990).

The analysis has both a time-series and a cross-sectional dimension.¹⁰ The profit warning firms are matched on quarter, industry and if possible also on country to firms which did not issue a profit warning. Industry matching is done based on the primary SIC-code. 47% of the observations are matched on the 2-digit level, 22% on the 3-digit level and 25% on the 4-digit level. For the remaining profit warning observations (6%) a match is found only on the 1-digit level. Size measured by the beginning of year market capitalization is used as a discriminating variable when several matches are available.

A given firm may occur in the two sam-

⁹ The motive the use both sales and asset denominated performance measures showing a Spearman correlation of 0.753 is motivated by the fact that they show that the profit warning sample is similar to the matched pair sample in the quarters before the profit warning. The other variables in this study do not show high correlations.

¹⁰ Based on the survey evidence in Dichev et al. (2016) CFOs think that peer comparisons are important in detecting softness in a firm's figures.

ples more than once. Multiple profit warning firms are left in the sample because the results should be applicable also on multiple warning firms and due to not finding a justified discriminating factor to leave these firms out. The inclusion of multiple warning firms should however arguably weaken (not strengthen) the results, because the period against to which the weakness or strength of a fundamental is measured, may also be a profit warning period. Even though attention is paid to choose variables which could be calculated from the available quarterly data, all variables could not be calculated for every period for many profit warnings and matched sample firms. This problem of missing observations for firms in the sample is coped with by matching of measurements per firm and

quarter so that if a firm's fundamental could not be calculated for one given quarter then the corresponding matched pair (or profit warning) observation is also left blank.

After analysing the variables on a quarterly level for both samples, the variables are used to create a summary measure for the profit warning risk. The aim is to use this summary measure, called the PW-risk score, to gauge the likelihood of a bad news disclosure to occur. The PW-risk score builds on binary values (0 and 1) for the 8 fundamental signals explained above. Thus, for each quarter the fundamental is assigned the value 1 if it assumingly increases the risk for a profit warning, otherwise it is assigned a 0. Thus, for one observation and quarter, the maximum PW-risk score value is 8 and the minimum 0.

Table 2. The fundamental variables and their obtained values in the PW-risk score

Variable	Calculated as	Valued 1 if
EBIT margin	$\frac{EBIT_{q,y}}{Net\ sales_{q,y}} - \frac{EBIT_{q,y-1}}{Net\ sales_{q,y-1}}$	< 0
ROA	$\frac{Net\ income_{q,y}}{Total\ assets_{q-1,y}} - \frac{Net\ income_{q,y-1}}{Total\ assets_{q-1,y-1}}$	< 0
Asset turnover	$\frac{Net\ sales_{q,y}}{Total\ assets_{q-1,y}} - \frac{Net\ sales_{q,y-1}}{Total\ assets_{q-1,y-1}}$	< 0
Accruals	$\frac{Net\ income_{q,y} - CFO_{q,y}}{Net\ sales_{q,y}} - \frac{Net\ income_{q,y-1} - CFO_{q,y-1}}{Net\ sales_{q,y-1}}$	> 0
Inventory	$\frac{Total\ inventory_{q,y}}{Net\ sales_{q,y}} - \frac{Total\ inventory_{q,y-1}}{Net\ sales_{q,y-1}}$	> 0
Accounts receivables	$\frac{Accounts\ receivable_{q,y}}{Net\ sales_{q,y}} - \frac{Accounts\ receivable_{q,y-1}}{Net\ sales_{q,y-1}}$	> 0
Leverage	$\frac{Net\ debt_{q,y}}{Total\ assets_{q,y}} - \frac{Net\ debt_{q,y-1}}{Total\ assets_{q,y-1}}$	> 0
CAR (tD,t2)	Three-day cumulative abnormal stock return from beginning of the day of earnings announcement q	< 0

Quarter and year are indicated with q and y, respectively. Net income is excluding extraordinary items, CFO is cash flow from operations. The abnormal stock return is calculated with the mean adjusted returns model relative to the return of the OMX all share index. The data source for the accounting variables are Worldscope and the data source for price data is Datastream.

The foundation for the PW-risk score lies in Piotroski's (2000) F-score. The calculations of the fundamental variables and their connection to the PW-risk score is summarized in table 2. The PW-risk score is calculated for each profit warning firm and its matched pair, for each quarter in the three year period surrounding the profit warning.

Quarter and year are indicated with *q* and *y*, respectively. Net income is excluding extraordinary items, CFO is cash flow from operations. The abnormal stock return is calculated with the mean adjusted returns model relative to the return of the OMX all share index.¹¹ The data source for the accounting variables are Worldscope and the data source for price data is Datastream.

4. Empirical analysis

4.1 Descriptive statistics

Descriptive statistics for the profit warning sample and the matched pairs are shown in table 3. The firms issuing the profit warnings appear to have higher sales, market capitalization and total assets than their peers. The sample period includes the financial crisis of 2008 during which several of the biggest Nordic companies in telecommunications and electronics, forest industry and engineering issued profit warnings and they had to be matched to smaller peers. It is argued that the size difference should at best have only a limited effect on the results as the accounting variables used are measured relative to size.

Table 3. Descriptive statistics

	Profit warning sample				Matched sample			
	Mean	Median	S.D.	N	Mean	Median	S.D.	N
SALES (MUSD)	2620.59	339.68	8217.40	318	1728.96	248.08	3979.18	318
MVE (MUSD)	2412.54	202.89	12811.82	318	1339.20	137.04	4079.53	318
ASSETS (MUSD)	2679.19	305.51	8022.12	318	1842.29	191.04	4841.17	318
EBIT margin	-0.0235	-0.0101	0.3340	2889	-0.0257	-0.0008	3.0228	2889
ROA	0.0015	-0.0028	0.4506	3192	-0.0017	-0.0005	0.0589	3192
Asset turnover	-0.0162	-0.0028	0.1854	3108	-0.0162	-0.0009	0.3289	3108
Accruals	1.5964	0.0014	87.9222	3100	-0.2196	-0.0043	30.4326	3100
Inventory	0.0261	0.0079	0.3184	2276	0.0767	0.0016	5.8596	2276
Receivables	0.0350	0.0035	1.4722	1936	-0.0594	0.0021	5.7017	1936
Leverage	0.0277	0.0118	0.3500	3221	-0.0053	0.0028	0.5774	3221
CAR (t0,t2)	-0.0080	-0.0095	0.0759	2928	-0.0049	-0.0080	0.0724	2928

SALES is net sales for the financial year the profit warning is published, MVE is market capitalization and ASSETS is the total assets at the beginning of the financial year the profit warning is published and reported in USD million. The values of the eight variables are from the 12 quarters available in the study. Variable specifications are in table 2. To be included the requirement for a variable is that it can be calculated both for the profit warning firm and its matched pair for the same quarter. CAR (t0,t2) is the cumulative abnormal return starting from the day the quarterly report is published and ending 2 days after this day.

¹¹ The market model is not used because many of the stocks in the sample are thinly traded and small which both affect the beta calculation (Hawawini, 1983).

The quarterly information retrieved lack in detail for many firms. Complete data would yield (318 PWs x 12 quarters) 3816 observations for each of the variables in the profit warning sample which is clearly more than the number of observations reported in table 3. Due to missing data the average number of observations is 2831 per variable which is 26% less compared to complete data. The biggest omission of data is due to the accounts receivable variable. There is a big variation in the variables which can be seen from the high standard deviations reported in table 3. A variable can yield a value close to zero in one quarter which easily results in an extreme value for the change in the variable. Because of these extreme values in the data the analysis is based on medians and frequencies and not the means.

4.2 Analysis of the fundamental variables

Table 4 reports the medians of the variables used in this study separately for the profit warning and the matched sample. The p-values indicate the statistical significance of the difference in the variables (two-tailed, Wilcoxon signed-rank test), the value of the difference is left out for clarity. The averages of the variables (not reported) show the same pattern as the medians but with higher magnitudes due to some extreme values. As expected, and in line with previous research stating that managers have incentives to postpone the publication of bad news (Verrecchia, 2001) there appears to be signs of weakness already in the quarterly report published closest to the profit warning (i.e. quarter 0).

A piece of evidence indicating that the disclosure of bad news is pushed forward is that profit warnings appear to be published towards the end of the year. In the sample, 37% of the profit warnings are published in the last quarter of the financial year.¹²

While some significant differences between the two samples are observed several quarters before the profit warning, those differences appear quite random across both quarters and variables. In quarter 0 the differences between the two groups are clearly accentuated. In the period closest to the profit warning, the EBIT margin and ROA have decreased significantly compared to their matched pairs. For example, the median EBIT margin shows a (y/y) decrease of 1.3% in this quarter, whereas almost no deterioration in the margin is seen in the matched sample. Indications of a slowing business are also given by the higher inventory and the marginally significant lower asset turnover in the profit warning sample. The higher value of accounts receivables in quarter 0 for the profit warning sample may indicate that the firms have taken measures (e.g. giving discounts) to boost the slowing sales development.¹³

Based on the -2.3% median abnormal return during the three-day window around the publication of the earnings announcement for period 0, the market has detected weakness in the report for the profit warning firms. The negative market reaction to the quarterly earnings announcement published closest to the profit warning is in line with the post-announcement drift phenomenon (e.g. Bernard and Thomas, 1990). Also the median abnormal return for the matched firms is sig-

¹² I.e. the profit warning publication is made after the earnings announcement for the third quarter but before the publication of the earnings announcement of the fourth quarter.

¹³ The predictive power of the variables was tested also with a logistic regression for period 0 in which the dependent variable was 1 for the profit warning observations and 0 for the matched pairs. When leaving out ROA from the independent variables (due to the high correlation with the EBIT margin) the overall prediction correctness was 63,6% and the Nagelkerke R² was 0.16.

nificantly¹⁴ below zero at -1.3% for the same time-frame indicating that also the matched pairs experienced a tougher market during the quarter. This is as expected due to the matching on industry.

Despite the negative surprise of the quarterly announcement before the warning, the profit warnings are still big negative surprises to the market. During a three-day window beginning the day of the profit warning, the average and median abnormal returns are -7.2% and -6.3%. These market reactions compare well to those reported by Alves et al. (2009) on their sample of profit warnings in different European countries.

As a robustness test, the accounting measures used are also calculated on a quarter-on-quarter (q/q) basis instead of the year-on-year (y/y) basis reported in table 4.¹⁵ Based on the q/q changes (not reported), the profit warning sample shows weaker EBIT margin and ROA as well as a slowing asset turnover and increasing inventory in the quarter closest to the warning when compared to the matched sample ($p < 0.05$). Compared to the y/y changes, the q/q development do not show higher accounts receivables for the profit warning sample compared to the matched sample.

The variables for the profit warning sample reported in table 4 are also tested statistically for the differences between period 0 and the preceding quarter (-1). Based on these time-series tests, the EBIT margin, ROA, asset turnover, inventory, receivables and leverage are statistically different at least on the $p < 0.05$ level (two-tailed, Wilcoxon signed-rank tests) in period 0 compared to the preceding period for the profit warning sample. When this test for differences between period 0 and period -1 in the profit warning sample is carried out also for the variables calculated as q/q changes, leverage and accruals lose their statistical significance.¹⁶

In all, the evidence suggests that fundamentals convey some information of the upcoming profit warning already in the quarter before the profit warning is published. In the sample, the profit warnings are published on average 62 days after the publication date of the earnings announcement for quarter 0. Maybe the hopes of better business circumstances have not materialized during this period and the accumulation of bad news have reached the tipping point identified in previous research (Kim et al., 2011, Kim and Zhang, 2014).

¹⁴ $P = 0.045$, two-tailed, Kolmogorov-Smirnov test

¹⁵ The specification on the year-on-year changes are given in table 2 (p. 11).

¹⁶ However, even using the q/q changes for the variables, the median difference for the variables between period 0 and period -1 for the EBIT margin, ROA, receivables, inventory and asset turnover continue to be significant at least on the $p < 0.10$ level.

Table 4. Examined variables around the profit warning publication of the PW-sample and the matched pairs sample

		Quarter relative to PW, quarter 0 is the quarter closest before the profit warning											
		-6	-5	-4	-3	-2	-1	0	1	2	3	4	5
Variables	Sample												
EBIT	PW	0.004	0.002	0.005	0.005	-0.001	-0.007	-0.013 ***	-0.041 ***	-0.043 ***	-0.025 ***	-0.012	0.008 *
	Matched	0.004	0.001	0.007	0.003	0.002	-0.003	-0.001	-0.001	-0.007	-0.007	-0.004	0.000
		(0.898)	(0.814)	(0.843)	(0.539)	(0.730)	(0.589)	(0.000)	(0.000)	(0.000)	(0.001)	(0.125)	(0.075)
ROA	PW	-0.001	-0.001	0.000	0.000	0.000	-0.001	-0.004 ***	-0.012 ***	-0.011 ***	-0.006 ***	-0.003	0.002 **
	Matched	0.001	0.000	0.001	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.002	-0.001
		(0.294)	(0.233)	(0.383)	(0.523)	(0.614)	(0.817)	(0.002)	(0.000)	(0.000)	(0.001)	(0.319)	(0.028)
Asset turn.	PW	0.004 **	0.001	0.001	0.001	0.002	0.001	-0.003 *	-0.015 ***	-0.013 **	-0.013	-0.005	0.004
	Matched	-0.005	0.002	0.001	0.001	0.004	0.002	0.001	0.000	-0.007	-0.005	-0.008	-0.003
		(0.048)	(0.512)	(0.812)	(0.935)	(0.761)	(0.556)	(0.082)	(0.000)	(0.043)	(0.266)	(0.617)	(0.165)
Accruals	PW	0.004	0.004	-0.014	0.015	0.017	0.010	0.018	0.001	-0.011	-0.008	-0.030	-0.021
	Matched	-0.005	0.001	0.004	0.002	0.008	0.004	0.001	0.001	-0.012	-0.035	-0.024	-0.015
		(0.795)	(0.617)	(0.481)	(0.604)	(0.808)	(0.714)	(0.153)	(0.250)	(0.947)	(0.149)	(0.770)	(0.569)
Inventory	PW	0.000	0.008	-0.001	0.003	0.013 *	0.008	0.022 **	0.040 ***	0.025 **	0.015	-0.006	-0.010
	Matched	0.000	-0.001	-0.003	0.001	-0.004	0.005	0.006	0.012	0.014	0.006	-0.002	-0.006
		(0.868)	(0.104)	(0.529)	(0.805)	(0.076)	(0.621)	(0.030)	(0.000)	(0.039)	(0.186)	(0.196)	(0.414)
Receivables	PW	-0.001 *	0.000 *	-0.009 **	-0.005	0.007	-0.001	0.009 **	0.012	0.014	0.009	-0.006	-0.003
	Matched	0.009	0.012	0.013	0.002	0.002	-0.003	-0.011	-0.004	0.002	-0.002	0.008	0.002
		(0.067)	(0.065)	(0.027)	(0.101)	(0.922)	(0.981)	(0.031)	(0.044)	(0.078)	(0.232)	(0.500)	(0.660)
Leverage	PW	0.002	0.002	0.002	0.009 **	0.010 *	0.011	0.020	0.031	0.023	0.021 **	0.014 *	0.000
	Matched	0.008	0.001	0.001	-0.003	-0.001	0.010	0.015	0.016	0.011	-0.002	-0.002	-0.006
		(0.564)	(0.826)	(0.180)	(0.048)	(0.079)	(0.372)	(0.407)	(0.120)	(0.111)	(0.015)	(0.055)	(0.190)
CAR (t0,t2)	PW	-0.003	-0.007	-0.007	-0.002	-0.009	-0.018	-0.023 ***	-0.013	-0.015	-0.011	-0.008	-0.003
	Matched	0.002	-0.007	-0.008	-0.012	-0.010	-0.010	-0.013	-0.005	-0.007	-0.009	-0.006	-0.005
		(0.541)	(0.743)	(0.623)	(0.143)	(0.643)	(0.011)	(0.012)	(0.350)	(0.516)	(0.625)	(0.371)	(0.794)

The table shows the medians for the respective variables and periods for the PW-sample and its matched pair sample. Asset turn. is asset turnover and receivables are accounts receivables. Variable specifications are in table 2. The Number in parenthesis is the p-value indicating the statistical significance for the difference in medians for the two samples (two-tailed, Wilcoxon signed-rank test). ***, ** and * next to the PW-sample median indicates statistical significance on the 0.01, 0.05 and 0.1 levels.

4.3 Analysis of the PW-risk score variables

To be used for successful hedging or trading strategies, the focus is now turned to finding the observations where the warnings are most likely. As in Piotroski (2000), it is assumed that the risk of a warning increases when more variables point in the same direction. In forecasting the business development, the consensus of the variables is probably more important compared to the individual magnitudes of the variables. For example, a high inventory level in one quarter may signal that the managers see a good demand outlook and not a sign of slowing sales, but if the inventory increases simultaneously with weakening profitability and asset turnover then it is much more of a warning sign. To measure the consensus of the variables, the PW-risk score, which was described in section 3.2, is used. For the sake of usability, and also due to lacking obvious good reasons, the variables in the index are not weighted according to their presumed forecasting propensity. It is admitted that this method of calculating the PW-risk score is somewhat *ad hoc*, but nevertheless it is based on findings of previous research (e.g. Lev and Thiagarajan, 1993, Sloan, 1996, Piotroski, 2000).

The examination starts with plotting the share of binary value 1 across the quarters and variables for the sample of profit warning observations and the matched sample. Based on the results in table 4 it is expected that there is a higher frequency of value 1 for quarter 0

for the profit warning sample compared to the previous quarters and compared to the matched sample. Table 5 verifies that this is the case. On the total level, the share of value 1 observations of the combined amount of both binary values range between 49% and 51% for quarters -6 to -3 in both samples. Following this, the share of the risk sign value 1 starts to increase especially in quarter -1 and continues to increase in quarter 0 reaching 62% when calculated for all variables. While the share of observations ranked with value 1 increases also in the matched sample, at 53% the share of warning signs stays 9%-points below the profit warning sample in the quarter closest to the warning.

When the variables are examined individually, especially the EBIT margin and ROA appear to sign for problems ahead. Profitability seems to be on a low level in a clear majority of the profit warning observations already in the quarter before the warning. Regarding the other individual accounting based variables, they all give at least some ($p < 0.10$) indication of problems in the profit warning sample. According to expectations, the quarterly report published closest to the profit warning is a disappointment in the majority, or 66%, of the observations.¹⁷ A negative return is witnessed also in 60% of the cases, in the matched sample which again can be explained by the fact that firms in the same industry experience weakness simultaneously due to market factors.

¹⁷ The mean (median) CAR from the start of the day of the publication to the end of the second day after the publication is -0.028 (-0.023) and both statistically significant on the 0.01-level (t-test for the mean and Wilcoxon -test for the median).

Table 5. Relative amounts of observations coded as 1 across quarters and variables in the two samples

	Quarter relative to profit warnings, 0 is the quarter closest before the profit warning											
	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5
PW-sample												
EBIT margin	46 %	46 %	45 %	46 %	50 %	59 %	64 %	(a) 83 %	78 %	69 %	61 %	47 %
ROA	52 %	52 %	49 %	51 %	49 %	55 %	68 %	(a) 82 %	78 %	67 %	58 %	44 %
Asset turnover	46 %	49 %	49 %	49 %	47 %	48 %	55 %	(c) 64 %	65 %	63 %	57 %	45 %
Accruals	52 %	51 %	46 %	55 %	55 %	54 %	57 %	(a) 50 %	47 %	48 %	44 %	46 %
Inventory	50 %	57 %	49 %	52 %	56 %	57 %	63 %	(a) 74 %	64 %	61 %	45 %	44 %
Accounts receivables	50 %	50 %	45 %	47 %	54 %	49 %	55 %	(c) 60 %	57 %	55 %	47 %	49 %
Leverage	52 %	51 %	52 %	54 %	54 %	55 %	62 %	(c) 67 %	68 %	65 %	61 %	51 %
CAR (t0,t2)	51 %	56 %	56 %	51 %	55 %	61 %	66 %	(a) 60 %	58 %	56 %	55 %	52 %
Total	50 %	51 %	49 %	51 %	52 %	55 %	62 %	(a) 68 %	65 %	61 %	54 %	47 %
Matched sample												
EBIT margin	45 %	49 %	45 %	48 %	47 %	53 %	51 %	(a) 51 %	58 %	56 %	53 %	51 %
ROA	47 %	48 %	47 %	52 %	52 %	55 %	55 %	(a) 54 %	57 %	54 %	55 %	51 %
Asset turnover	56 %	48 %	48 %	48 %	44 %	45 %	49 %	(c) 50 %	58 %	56 %	59 %	54 %
Accruals	47 %	52 %	52 %	50 %	50 %	51 %	50 %	(c) 51 %	47 %	39 %	41 %	44 %
Inventory	50 %	49 %	47 %	51 %	46 %	54 %	55 %	(c) 55 %	59 %	56 %	49 %	44 %
Accounts receivables	55 %	57 %	56 %	51 %	53 %	48 %	45 %	(c) 48 %	50 %	49 %	53 %	51 %
Leverage	55 %	52 %	50 %	48 %	50 %	55 %	57 %	61 %	57 %	48 %	49 %	47 %
CAR (t0,t2)	47 %	56 %	55 %	60 %	59 %	55 %	60 %	(a) 53 %	55 %	57 %	53 %	54 %
Total	50 %	51 %	50 %	51 %	50 %	52 %	53 %	53 %	55 %	52 %	52 %	49 %

A variable is coded with the binary value 1 if the measure is assumed to increase the risk of a profit warning or a 0 if not. The total amount of usable observations is equal for each variable during one time period in both the (profit warning) PW-sample and its matched sample. For quarter 0 the total amount of usable observations is 1976 for both samples. The profit warning is published after the quarterly report for quarter 0 is published and before the publication of the quarterly results for quarter 1. Variable definitions are in table 2. A X²-test is used to test the statistical significance of quarter 0 of the PW-sample on a time-series basis against periods -1 and -2 and for the matched sample against the PW-sample, (a) and (c) indicates statistical significance on 0.01 and 0.1 levels.

The analysis now proceeds to ranking the observations according to their PW-risk score. The intention is to examine how likely the observations yielding the highest scores are to be profit warning observations. Table 6 shows the number of firms in the nine PW-risk score groups in quarters -1 and 0 for both samples for which all variables can be calculated. That is, only observations are included for which all variables can be calculated both for the profit warning observation and the matched pair for periods -1 and 0. Assuming that the PW-risk score has profit warning forecasting power, the number of firms in the profit warning sample scoring a high PW-risk score in quarter 0 should be higher compared both to the preceding quarter and to their matched pairs. This is exactly what is observed when examining the number of observations in the highest PW-risk score brackets 7 and 8.

Table 6. Distribution of observations in quarters -1 and 0

PW-risk-score	Distribution of observations			
	PW-sample		Matched-sample	
	-1	0	-1	0
8	2	6	1	5
7	20	33	18	16
6	36	45	30	32
5	44	50	45	51
4	56	43	52	48
3	41	40	45	38
2	27	25	25	37
1	27	14	34	24
0	4	1	7	6
N	257	257	257	257
Z-value(T-S)		-4.137 ***		-1.260
Z-value(C-S)		-3.501 ***	-1.218	

The table shows the number of observations in the nine PW-risk score brackets in quarters -1 and 0 for observations with complete data for both quarters. A Wilcoxon signed-rank test was used to calculate the $Z\text{-value}_{(T-S)}$ to test the difference in distributions between the two quarters. A Mann-Whitney U test was used to calculate the $Z\text{-value}_{(C-S)}$ to test the difference in distributions between the two samples. Z-values indicating statistical significance on 0.1, 0.05 and 0.01 levels are indicated with *, ** and ***, respectively.

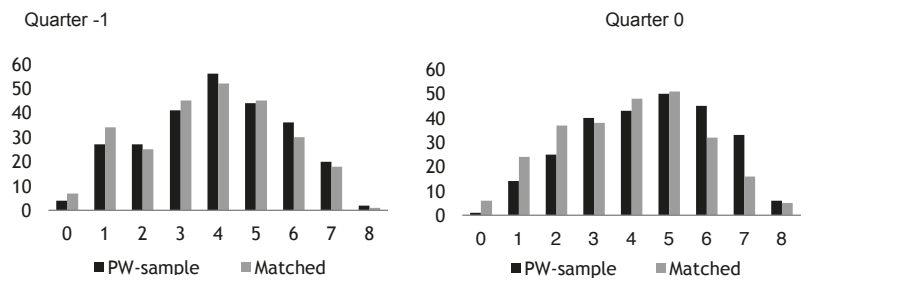
In the profit warning sample, the number of firms in scoring 7 and 8 increase in quarter 0 by 77% using the observations with complete data. The respective number in the matched sample is clearly lower at 11%.¹⁸ The number of firms scoring 7 or 8 in quarter 0 stands

¹⁸ It could be expected that also the variables used in the study would indicate some slowdown in the same time-span also in the matched sample as the firms operates in the same industry and are affected by similar market factors at the same time. However, on average, these firms are arguably affected less or are quicker to adjust to the external market factors as they need not to warn on their profit.

out also in the cross-sectional analysis. The number of firms with the two highest scores is 86% higher in the profit warning sample compared to the matched sample. The same pattern is repeated when also the PW-risk score 6 is included in the analysis albeit with a lower magnitudes. Figure 1 illustrates the relatively similar frequencies across the nine PW-risk

score rankings for the two groups in quarter -1 and the clear increase in observations with the highest rankings in quarter 0 for the profit warning sample. To summarize, high PW-risk score values seem to be connected to the likelihood that a profit warning will be issued in the near future.

Figure 1. Number of complete observations according to PW-risk score



Putting it the other way around, based on the observations in table 6 for year 0 receiving a PW-risk score value of 7 or 8, 65% actually publish a profit warning. Thus, about 35% are false alarms. It is difficult to make a conclusion based on this because the high success factor is obtained on profit warning rich data. When examining all other 11 quarters except the profit warning quarter used in the above analysis, a total number of 244 observations with the two highest PW-risk scores were found. Going through the data show that 16% of these actually resulted in a profit warning. Thus, the PW-risk score arguably has some power in functioning as a warning signal of increased risk of a profit warning but in the clear majority of cases it is a false alarm. Trading decisions should not be based on the PW-risk score alone but merely use it as a signal to take a closer look at the firms circumstances.

5. Conclusions

This study investigated if fundamentals can be used to forecast profit warnings. The previous studies showing that fundamentals can be used to forecast the performance of the firm together with the more recent findings that managers tend to withhold bad news disclosures set the scene for the study. Evidence of weak performance and optimistic accrual reporting were gathered using accounting variables derived from previous research. The research was based on the analysis of the quarterly numbers for 12 periods around 318 profit warnings and a matched sample. The findings indicate that profitability decreases and inventory and accounts receivables are on high levels in the quarter before the profit warning.

Based on the forecasting propensity of the fundamentals a PW-risk score was created

to flag for the cases where profit warnings are most likely. The empirical analysis shows that the number of observations receiving the highest PW-risk scores increases by 77% just before the warning in the profit warning sample and is 86% higher compared to the matched sample of firms not issuing a profit warning. However, when all the observations in the data receiving the highest PW-risk scores of 7 and 8 were examined only 16% of these observations actually issue profit warnings in the following quarter, so there are relatively many false alarms.

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