NEW EVIDENCE ON THE PROPERTIES
OF THE FINANCIAL STATEMENT INFORMATION
PRICING PROCESS

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Key words: financial statement information, market reaction, market efficiency

JEL Classification: G12, G14

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New evidence on the properties of the financial statement information pricing process

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Abstract
This study contributes to our knowledge of how information contained in financial statements is interpreted and priced by the stock market in two aspects. First, the empirical findings indicate that investors interpret some of the information contained in new financial statements in the context of the information of prior financial statements. Second, two central hypotheses offered in earlier literature to explain the significant connection between publicly available financial statement information and future abnormal returns, that the signals proxy for risk and that the information is priced with a delay, are evaluated utilizing a new methodology. It is found that the mentioned significant connection for some financial statement signals can be explained by that the signals proxy for risk and for other financial statement signals by that the information contained in the signals is priced with a delay.

JEL classification: G12; G14

Keywords: financial statement information; market reaction; market efficiency

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1 Introduction

An anomalous relationship between publicly available financial statement information and future abnormal stock returns has been well, if not indisputably, established since it first appeared in the Ball and Brown (1968) study. The topic has continued to attract research efforts throughout the years; especially during the last decade the pile of research in the matter has become daunting, witnessing of the perceived importance of the subject.

Ball and Brown (1968) first documented the predictive properties of corporate earnings with respect to future abnormal stock returns. McKibben (1972) extended this concept somewhat by also including the price to earnings and dividend payout ratios into the analysis. A step forward was taken by Ou and Penman (1989) as they integrated a large collection of financial statement signals into one measure that was utilized for the purpose of forecasting future excess returns. They found that publicly available historical fundamental information indeed has some predictive abilities with respect to future earnings and excess returns. These findings were later confirmed by other US studies conducted by Holthausen and Larcker (1992), Lev and Thiagarajan (1993), Abarbanell and Bushee (1997) and Abarbanell and Bushee (1998). Charitou and Panagiotides (1999) report similar findings for the UK market. Furthermore, the phenomenon has been reported on Finnish data by, for example, Martikainen (1993), Kallunki (1996), Kallunki and Martikainen (1997) and Booth, Kallunki and Martikainen (1997).

This paper contributes to prior research in two major aspects. First, ever since the study of Ou and Penman (1989), the annual change, or first derivative, of financial statement signals has been used rather routinely without further discussion, hence implying that investors expect no change in the investigated fundamental signals from one period to another. This study presents evidence indicating that investors expect past change to persist for some fundamental signals and hence interpret new changes in the context of past changes. More
specifically, the empirical findings indicate that the second derivatives of some financial statement signals contain information incremental to the information contained in the first derivatives of the same signals.

Second, the seemingly perpetual question of whether the connection between publicly available financial statement information and future abnormal stock returns actually represents market inefficiency, or simply risk premium, is tackled with a new methodology. This analysis yields the conclusion that some of the investigated fundamental signals that show a significant connection with future abnormal returns actually proxy changes in company risk, whereas others contain new information that is priced by the market with a delay.

The paper is organized as follows. Section 2 presents hypotheses and methodology employed in the study. The investigated fundamental signals are presented and discussed in section 3. Section 4 describes the utilized dataset. Results are presented and discussed in section 5. Finally, the study is summarized in section 6.

2 Hypotheses and methodology

2.1 Conditional information interpretation

Implicitly, using the first derivative\(^1\), or the annual change, of financial statement signals with respect to time to forecast future abnormal returns states that the market on aggregate expects a zero change in financial statement signals. Consequently, if the value of a financial statement signal is constant, the signal provides zero information about future returns and otherwise either positive or negative information. Now, the issue boils down to whether the market actually uses the zero-growth assumption or not.

\(^1\) The first derivative \(\Delta S_t\) is throughout this paper defined as \(\Delta S_t = (S_t - S_{t-1}) / |S_{t-1}|\). The absolute value of the denominator is used as the denominator may take negative values.
Let us assume that, for instance, changes in company sales contain significant information that should be priced by the market. The first derivative approach states that an increase in sales between periods t-1 and t is interpreted as a positive signal by the market as zero growth was expected. However, practical experience and intuition states that the growth between periods t-2 and t-1 is perhaps a more natural assumption for the growth in sales for the period t-1 and t. This intuition can be derived from human behavior in the sense that past development is expected to continue. Stated more formally, this framework suggests that the signals follow sub martingale processes. Empirical evidence strongly supports this view in the case of, for instance, earnings\(^2\).

The sales figure is hence, according to the latter view, only interpreted as a positive signal if the growth during the period t-1 to t exceeds that of t-2 to t-1. Consequently, the hypothesis claims that the second derivative of the financial statement signal contains information that should be priced by the market. The second derivative\(^3\) of financial statement signal \(S\) at time \(t\) is constructed according to the following specification:

\[
\Delta^2 S_t = \left( \frac{(S_t - S_{t-1})}{|S_{t-1}|} \right) - \left( \frac{(S_{t-1} - S_{t-2})}{|S_{t-2}|} \right)
\]  

(1)

However, this concept can of course not be expected to hold for all financial statement signals. More specifically, for financial statement signals constructed as relative measures (such as Return On Invested Capital), and which hence are expected to be rather stable\(^4\), the first derivative can be expected to contain more information with respect to future abnormal

\(^2\) Refer to White, Sondhi and Fried (1997): 1074-1076 for a discussion on the topic.

\(^3\) The definition actually expresses a proxy for the second derivative. This proxy is used as the correct specification most certainly would yield in extreme values due to small denominators.

\(^4\) Lev (1969) suggests that the industry mean should be the equilibrium level for any financial ratio.
returns than the second derivative. We will not attempt to ex-ante discriminate between the two categories of financial statement signals.

2.2 Risk shifting versus market inefficiency

The market inefficiency hypothesis states that the observed phenomenon is a function of the market only gradually adapting to new financial statement information. Hence, the hypothesis states that the market is inefficient with respect to the Fama (1970) semi-strong criteria but “adaptively efficient” as suggested by, for instance, Daniel and Titman (2000). The risk shift hypothesis on the other hand argues that the observed abnormal returns are in fact simply risk premiums, induced by changes in company risk that are signaled by new financial statement information. The issue is thus how to discriminate between the two different explanations.

Consider a certain financial statement signal $S_t$ for a specific company at a certain disclosure date $t$. We can test the risk-shift hypothesis by recognizing that if the market is efficient and the investigated financial statement signal $S_t$ proxies for changes in company risk we should witness:

I) significant t-statistics for the parameter estimate for signal $S_t$ estimated against disclosure day $t$ abnormal returns

II) significant t-statistics for the parameter estimate for signal $S_t$ estimated against abnormal returns for the time period $t+1$ to $t+X$, where $X>0$

III) inverse signs for the parameter estimates in I) and II)

The logic behind the above-presented arguments is easily understood by considering the above-mentioned situation with signal $S_t$. Assume that new financial statement information is
released to the market at time t and that signal $S_t$ indicates an increase in the risk of the company. As indicated by the risk-shift hypothesis, the expected return to the company stock will increase due to the increased risk and hence, under the assumption of market efficiency, generate future returns that exceed the expected returns indicated by the old benchmark that anticipates less risk. However, investors will also immediately at date t discount the company stock with a higher discount rate and thus generate returns for date t that are less than the expected returns indicated by the old benchmark. Thus in this case we should witness negative abnormal returns for disclosure date t and positive cumulative abnormal returns for future periods (t+1 to t+X). In the case of reduced company risk, the inverse is expected under the risk-shift hypothesis. It should finally be stressed that the methodology naturally also holds for parameter estimates showing signs inverse to those expected (possibly indicating correlation with some unknown left out variable).

To strengthen the validity of the methodology, cumulative abnormal returns prior to and including the disclosure dates (t-30 to t, t-14 to t and t-7 to t) are also investigated. It is then possible to control for the possibility that risk shifts occur before disclosure dates due to information leakages before the official disclosure of new information.

3 The fundamentals

Two collections of financial statement signals were created to reflect changes in company economic performance. The first signal collection follows the proceedings of earlier US research and the second was created to fit Finnish financial statement data. Both collections include company earnings and five other financial statement signals.
3.1 The Abarbanell and Bushee signal collection

The defined signals are essentially equal to the ones used by Abarbanell and Bushee (1998). The signals are listed in Table 1 and briefly discussed below. The interested reader is referred to Abarbanell and Bushee (1998) for a deeper discussion on the economic intuition behind the signals.

<table>
<thead>
<tr>
<th>Signal</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earnings</td>
<td>Net Income</td>
</tr>
<tr>
<td>Inventory</td>
<td>Sales / Inventory</td>
</tr>
<tr>
<td>Accounts Receivable</td>
<td>Sales / Accounts Receivable</td>
</tr>
<tr>
<td>Gross Margin</td>
<td>Gross Margin / Sales</td>
</tr>
<tr>
<td>Effective Tax Rate</td>
<td>Taxes / EBT</td>
</tr>
<tr>
<td>Labor Force</td>
<td>Sales / Employees</td>
</tr>
</tbody>
</table>

A relative increase in sales to inventory is interpreted as a good sign for earnings. When inventories grow faster than sales, it is interpreted as a bad sign for earnings as it suggests difficulties in generating sales. Inventory increases in relation to sales may also suggest that the company has slow moving or obsolete inventories that will be written off in the future (and thereby not generate any cash-flow). A relative increase in sales to accounts receivable is interpreted as a good sign for earnings. When accounts receivable grow faster than sales, it is interpreted as a negative signal for earnings as it might be an indication of problems in collecting outstanding receivables and thereby approving credit extensions. A relative increase in the gross margin relative to sales is interpreted as a positive sign for earnings and
vice versa. The gross margin is, in general, a good measure of the firm's input and output prices that reflect some fundamental underlying factors such as competition and operating leverage. Thus this signal should be a good indicator for the company’s long-term performance. A relative increase in the effective tax rate (ETR), not attributable to permanent factors such as legalistic changes, is interpreted as a good sign for future earnings and vice versa. This intuition springs from the reduced possibilities for discounting prior losses and making reservations, due to several subsequent profitable periods. The labor force signal measures the change in sales per employee and is intended to reflect both changes in the efficiency of labor and in the number of employees.

Four of the signals used by Abarbanell and Bushee (1998) were, for various reasons, excluded from this study. The excluded signals and the motivations for excluding them are presented in Table 2.

Table 2 - Abarbanell and Bushee (1998) signals that were excluded from the study.

<table>
<thead>
<tr>
<th>Signal</th>
<th>Motivation for exclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Expenditures</td>
<td>Not compulsory information in Finland</td>
</tr>
<tr>
<td>Selling and Administrative Expenses</td>
<td>Not compulsory information in Finland</td>
</tr>
<tr>
<td>Earnings Quality</td>
<td>Not available</td>
</tr>
<tr>
<td>Audit Qualification</td>
<td>Not meaningful in Finland (all companies listed on the HSE are unqualified)</td>
</tr>
</tbody>
</table>
3.2 The Laitinen signal collection

The signal collection was constructed according to the guidelines on the work of Laitinen (1990) in the field of bankruptcy prediction in Finland. The aim was to create a collection of signals which is fitted for the Finnish equity market and which combines different dimensions of company performance. The selected signals are defined in Table 3 and briefly discussed below.

Table 3 - The Laitinen financial statement signal collection

<table>
<thead>
<tr>
<th>Name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earnings</td>
<td>Net Income</td>
</tr>
<tr>
<td>Quick ratio</td>
<td>(Cash + Short-Term Securities + Accounts Receivables) / Current liabilities</td>
</tr>
<tr>
<td>Dynamic Liquidity</td>
<td>Cash Surplus 2 / Sales</td>
</tr>
<tr>
<td>Capital Structure</td>
<td>Shareholders’ equity / (Shareholders’ equity + Current liabilities + long-term liabilities)</td>
</tr>
<tr>
<td>Return On Assets</td>
<td>EBIT / Average total assets</td>
</tr>
<tr>
<td>Sales</td>
<td>Sales</td>
</tr>
</tbody>
</table>

The quick ratio signal expresses the change in the ability of the company to answer for its current liabilities, hence expressing the short-term liquidity dimension of the company. Depending on whether the signal is viewed from a bankruptcy or agency cost perspective, the sign can be expected to be either positive or negative. The dynamic liquidity signal expresses the change in the ability of the company to generate cash flows from sales. The signal thus represents the long-term liquidity dimension of the company and is expected to be positively associated with company value and thus positive correlation is also expected between the signal and abnormal returns. The capital structure signal expresses the change in equity
relative to total capital and thus represents the solidity dimension of the company. Again, the sign can be expected to be either positive or negative depending on whether the signal is viewed from a bankruptcy or agency cost perspective. The return on assets signal expresses the change in earnings before interests and taxes relative to average total assets. The signal thus represents the profitability dimension of the company. The return on assets signal is expected to be positively associated with company value and thus positive correlation is also expected between the signal and abnormal returns. The sales signal expresses the change in sales. The signal thus represents the growth dimension of the company. The sales signal is expected to be positively associated with company value and thus positive correlation is also expected between the signal and abnormal returns.

4 The data

Company disclosure dates during the years 1994 to 1999 were investigated. All investigated companies had fiscal years ending in December and were listed on the Helsinki Stock Exchange (hereafter HEX). The stock price dataset was obtained from Datastream information service and was corrected for splits and dividends by reinvesting the proceedings in the stocks. Financial statement data for the years 1991-1998 was received from the Department of Accounting at the Swedish School of Economics and Business Administration, Helsinki.

Exact disclosure dates for the years 1994-1999 for all companies were obtained from the HEX. A proxy of monthly accuracy has routinely been implemented instead of exact

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5 Inactive companies were allowed for in the sample to escape the risk of a possible survivorship bias.
disclosure dates in prior research. However, the above-discussed methodology for evaluating the risk-shift hypothesis requires an exact identification of the disclosure dates.

To ensure the maximal validity of the investigated data sample, the following three criteria were set up for each observation to meet:

I) A value for each of the defined financial statement signals
II) Return data sufficient for estimating the market model and the cumulative abnormal returns
III) Valid values for the defined signals with respect to the other observations

The eventual datasets contained between 190 and 211 observations, depending on the specifications for the datasets.

4.1 Abnormal returns

Expected returns were calculated according to the market model methodology. For each stock and disclosure date, daily returns for the 730 calendar days preceding each disclosure date were first OLS regressed against corresponding return data for the HEX
Portfolio Index\textsuperscript{11}. The expected returns were then cumulated for each stock and event window by implementing the market model estimates and event window returns for the HEX Portfolio Index\textsuperscript{12}. Cumulative abnormal returns were finally calculated by subtracting observed returns for each stock and event window with corresponding expected returns.

Monthly\textsuperscript{13} cumulative abnormal returns were calculated to gain a fairly detailed and accurate picture of the pricing process. Event day (0 day), 7 day and 14 day cumulative abnormal returns were also calculated to enable evaluation of the market inefficiency versus the risk shift hypotheses\textsuperscript{14}. Cumulative abnormal returns were further calculated for three periods preceding and including the disclosure dates by moving the event windows backward in time (–30 days, -14 days and –7 days) in order to be able to identify possible information leaks before the investigated disclosure dates. It is important to notice that –30, -14, -7 and event (0) day cumulative abnormal returns include disclosure date abnormal returns, whereas all other cumulative abnormal returns exclude disclosure date abnormal returns.

5 Results

Both signal collections were OLS regressed against each of the earlier specified time horizons. The procedure was repeated for both the 1st derivative and 2nd derivative specifications. Hence, altogether 2 * 2 * 18 = 72 models were estimated.

\textsuperscript{11} The HEX Portfolio Index is a value weighted index where all companies listed on the main list of the Helsinki Stock Exchange are represented. However, the weight of any individual company is limited to 10\% thus eliminating the dominance of a few big companies listed on the HEX (especially Nokia).

\textsuperscript{12} Disclosure date cumulative abnormal returns were only included in the 0 day cumulative abnormal returns. Other, 7 day to 360 day, cumulative abnormal returns were aggregated from the day after the disclosure date.

\textsuperscript{13} 30 days – 360 days

\textsuperscript{14} Indeed neither 7 nor 14 day cumulative abnormal returns should be required for investigating the hypotheses as only the event day cumulative abnormal return is needed per definition. However, 7 and 14 day cumulative abnormal returns were calculated to be able to observe “adaptively efficient” features with regard to incorporating shifts in risk.
5.1 First Derivative Specification Models

The first derivative specification models for the Abarbanell and Bushee signal collection were defined as

\[
\text{CAR}_{t, t+n} = \alpha + \beta_1 \Delta \text{Earnings} + \beta_2 \Delta \text{Inventory} + \beta_3 \Delta \text{Accounts Receivable} \\
+ \beta_4 \Delta \text{Gross Margin} + \beta_5 \Delta \text{Effective Tax Rate} + \beta_6 \Delta \text{Labor Force}
\]  

(2)

where \(\Delta\) denotes the first derivative, or the annual change, and \(\text{CAR}_{t, t+n}\) denotes cumulative abnormal returns during time period \(t\) to \(t+n\). The first derivative specification models for the Laitinen signal collection were defined as

\[
\text{CAR}_{t, t+n} = \alpha + \beta_1 \Delta \text{Earnings} + \beta_2 \Delta \text{Quick ratio} + \beta_3 \Delta \text{Dynamic Liquidity} \\
+ \beta_4 \Delta \text{Capital Structure} + \beta_5 \Delta \text{Return On Assets} + \beta_6 \Delta \text{Sales}
\]  

(3)

where \(\Delta\) denotes the first derivative, or the annual change, and \(\text{CAR}_{t, t+n}\) denotes cumulative abnormal returns during time period \(t\) to \(t+n\).

Both first derivative specification models show that a significant connection between the first derivatives of the investigated financial statement signals and future abnormal returns can be observed on the Finnish stock market during the investigated period (Figure 1). Both models show significant or very significant F-statistics\(^{15}\) for 330 days and 360 days abnormal returns. Further, the Laitinen model also shows significant F-statistics for 240, 270 and 300 days abnormal returns. The results hence indicate that the information in the Laitinen financial statement signal collection is priced by the market more timely than that of the

\(^{15}\) All F-statistics were calculated with respect to the mean of the dependent variable (cumulative abnormal return), to prevent possible biases in the cumulative abnormal returns from affecting the results.
Abarbanell and Bushee financial statement signal collection. For both models the F-statistic is most significant for the 360 day cumulative abnormal returns, which is an observation that probably can be explained by positive autocorrelation in the information of company annual reports.\textsuperscript{16}

\textbf{Figure 1 - Significance of first derivative specification models}

The connection between publicly available financial statement information and future abnormal returns (excess market model returns) was investigated by OLS regressing cumulative abnormal returns (CAR) for several time periods against the first derivatives of two collections of accounting ratios. CARs were measured around the disclosure of annual reports (t=0). 30 to 360 day CARs exclude disclosure date ARs whereas 0 day (event day) CARs include disclosure date ARs. Expected returns were estimated by implementing market models that were estimated on 730 calendar days of daily returns for each company and disclosure date separately. The p-value for the F-statistic for each model is plotted in the graph and reported in the table below the graph.

Also worth noting is that the F-statistic for the Abarbanell and Bushee model is significant with respect to disclosure day (0 day) cumulative abnormal returns, indicating a

\textsuperscript{16} Improvements in the financial health of the company are succeeded by further improvements, and vice versa. The phenomenon is reviewed by Lev (1989) in the context of company earnings.
possibility of risk-shifting. However, a closer examination of the parameter estimates is needed for further conclusions.

5.2 Second derivative specification models

The second derivative specification models for the Abarbanell and Bushee signal collection were defined as

\[ \text{CAR}_{t, t+n} = \alpha + \beta_1 \Delta^2 \text{Earnings} + \beta_2 \Delta^2 \text{Inventory} + \beta_3 \Delta^2 \text{Accounts Receivable} \\
+ \beta_4 \Delta^2 \text{Gross Margin} + \beta_5 \Delta^2 \text{Effective Tax Rate} + \beta_6 \Delta^2 \text{Labor Force} \quad (4) \]

where \( \Delta^2 \) denotes the second derivative, or the annual change, and \( \text{CAR}_{t, t+n} \) denotes cumulative abnormal returns during time period \( t \) to \( t+n \). The second derivative specification models for the Laitinen signal collection were defined as

\[ \text{CAR}_{t, t+n} = \alpha + \beta_1 \Delta^2 \text{Earnings} + \beta_2 \Delta^2 \text{Quick ratio} + \beta_3 \Delta^2 \text{Dynamic Liquidity} \\
+ \beta_4 \Delta^2 \text{Capital Structure} + \beta_5 \Delta^2 \text{Return On Assets} + \beta_6 \Delta^2 \text{Sales} \quad (5) \]

where \( \Delta^2 \) denotes the second derivative, or the annual change, and \( \text{CAR}_{t, t+n} \) denotes cumulative abnormal returns during time period \( t \) to \( t+n \).

The results for the second derivative specification models are indeed very interesting. The F-statistic for the Laitinen model is significant or very significant throughout 60 to 360 day cumulative abnormal returns (Figure 2). The corresponding is true for the Abarbanell and Bushee model with regard to only 60 and 360 day cumulative abnormal returns. The evidence hence suggests that the information contained in the second derivatives of the Laitinen financial statement signals is uniformly priced 60 days after the disclosure date and that the
information further indicates persistent changes in the valuation equilibriums of the
investigated companies. The findings for the Abarbanell and Bushee financial statement
signals on the other hand indicate that the second derivatives contain information that is first
priced (after 60 days), but that does not change the valuation equilibriums of the investigated
companies permanently. Investor over-reaction can thus be offered as a feasible explanation
for the phenomenon in the latter case, however a closer examination of the parameter
estimates is needed to be able to draw further conclusions.

Figure 2 - Significance of second derivative specification models
The connection between publicly available financial statement information and future abnormal returns (excess
market model returns) was investigated by OLS regressing cumulative abnormal returns (CAR) for several time
periods against the second derivatives of two collections of accounting ratios. CARs were measured around the
disclosure of annual reports (t=0). 30 to 360 day CARs exclude disclosure date ARs whereas 0 day (event day)
CARs include disclosure date ARs. Expected returns were estimated by implementing market models that were
estimated on 730 calendar days of daily returns for each company and disclosure date separately. The p-value for
the F-statistic for each model is plotted in the graph and reported in the table below the graph.

<table>
<thead>
<tr>
<th>0d</th>
<th>30d</th>
<th>60d</th>
<th>90d</th>
<th>120d</th>
<th>150d</th>
<th>180d</th>
<th>210d</th>
<th>240d</th>
<th>270d</th>
<th>300d</th>
<th>330d</th>
<th>360d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abarbanell and Bushee</td>
<td>0.35</td>
<td>0.48</td>
<td>0.33</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.02</td>
<td>0.02</td>
<td>0.03</td>
</tr>
<tr>
<td>Laitinen</td>
<td>0.35</td>
<td>0.48</td>
<td>0.03</td>
<td>0.00</td>
<td>0.01</td>
<td>0.04</td>
<td>0.02</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.03</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Summing up, the presented evidence suggests that the second derivatives of financial
statement signals contain incremental information to the first derivatives, hence supporting
the conditional information interpretation hypothesis.
5.3 Parameter estimates for the first derivative specification models

The parameter estimates for the first derivative specification models (Table 4) reveal two major features. First, the accounts receivable signal of the Abarbanell and Bushee signal collection shows significant positive parameter estimates for 330 and 360 day cumulative abnormal returns and a significantly negative parameter estimate for 0 day cumulative abnormal returns, hence pointing towards risk shifting according to the framework presented earlier. Further, it is interesting to notice that the accounts receivable parameter estimate for –14 day cumulative abnormal returns is also significantly negative, indicating the possibility that the information leaks into the market before the official disclosure. Second, the sales signal of the Laitinen signal collection shows significant negative parameter estimates for 240 to 360 day cumulative abnormal returns, but insignificant parameter estimates for all other periods. The sign of the parameter estimate is opposite to that expected, hence indicating correlation with some unidentified significant variable. Nevertheless, as no correction for risk can be observed, the observation could be explained with delayed reaction to new information, or market inefficiency.
Table 4 - Estimated parameters for first derivative specification models

The connection between publicly available financial statement information and future abnormal returns (excess market model returns) was investigated by OLS regressing cumulative abnormal returns (CAR) for several time periods against the first derivatives of two collections of accounting ratios. CARs were measured from the disclosure of annual reports (t=0) for periods succeeding disclosure of new information (7 to 360 days) and up to the disclosure date for periods preceding disclosure of new information (-30 to -7 days). -30 to 0 day CARs include disclosure date ARs whereas other periods’ CARs exclude disclosure date ARs. Expected returns were estimated by implementing market models that were estimated on 730 calendar days of daily returns for each company and disclosure date separately. P-values equal to or less than 0.05 are marked with bolded font.

<table>
<thead>
<tr>
<th>Abarbanell and Bushee</th>
<th>-30 days</th>
<th>-14 days</th>
<th>-7 days</th>
<th>0 days</th>
<th>7 days</th>
<th>14 days</th>
<th>30 days</th>
<th>60 days</th>
<th>90 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Int Derivative</td>
<td>Estimate</td>
<td>p-value</td>
<td>Estimate</td>
<td>p-value</td>
<td>Estimate</td>
<td>p-value</td>
<td>Estimate</td>
<td>p-value</td>
<td>Estimate</td>
</tr>
<tr>
<td>Intercept</td>
<td>0.0129</td>
<td>0.18</td>
<td>0.0086</td>
<td>0.09</td>
<td>-0.0211</td>
<td>0.51</td>
<td>0.0003</td>
<td>0.92</td>
<td>0.0011</td>
</tr>
<tr>
<td>Earnings</td>
<td>0.0072</td>
<td>0.03</td>
<td>0.0039</td>
<td>0.08</td>
<td>0.0311</td>
<td>0.61</td>
<td>0.0008</td>
<td>0.59</td>
<td>-0.0012</td>
</tr>
<tr>
<td>Inventory</td>
<td>-0.0811</td>
<td>0.65</td>
<td>0.0064</td>
<td>0.81</td>
<td>-0.0994</td>
<td>0.64</td>
<td>0.0093</td>
<td>0.54</td>
<td>-0.0552</td>
</tr>
<tr>
<td>Accounts Receivable</td>
<td>-0.0188</td>
<td>0.61</td>
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5.4 Parameter estimates for the second derivative specification models

The parameter estimates for the second derivative specification Abarbanell and Bushee signal collection models (Table 5) further confirm both risk shifting and delayed pricing of new information. The parameter estimate for the accounts receivable signal again displays a significant reversal of signs, as in the case of the first derivatives, hence possibly indicating risk shifting. Further, the effective tax rate signal shows significantly negative parameter estimates for 60 and 90 day cumulative abnormal returns, which leaves room for interpretation. Possible explanations are that investors initially over-react negatively to the information, but the over-reaction is reversed due to the disclosure of Q1 or T1 figures, or that the signal simply correlates with some unidentified variable.

The Quick Ratio signal of the second derivative specification Laitinen signal collection shows significantly negative parameter estimates for 60 to 360 day cumulative abnormal returns, but insignificant parameter estimates for all other periods. The sign of the parameter estimate is negative, indicating either that investors interpret the signal from an agency cost perspective or that the signal correlates with some unidentified significant variable. No correction for risk can however be observed and the observation must thus be interpreted as a delayed response to new information that persistently changes the valuation equilibrium. Further, the parameter estimates for the earnings signal with respect to 60 and 90 day cumulative abnormal returns are significantly negative. As in the case of the effective tax rate signal, plenty of room is left for interpretation.

Finally, it is stressed that the signals indicating delayed pricing of new information, or market inefficiency, are not equal for the first and the second derivative specifications for neither of the two signal collections. Evidence thereby points to that the second derivatives of some of the investigated financial statement signals contain incremental information to that
contained by the first derivatives of the investigated financial statement signals. The conditional information interpretation thus gains support from the empirical findings.
Table 5 - Estimated parameters for second derivative specification models

The relationship between publicly available financial statement information and future abnormal returns (excess market model returns) was investigated by OLS regressing cumulative abnormal returns (CAR) for several time periods against the second derivatives of two collections of accounting ratios. CARs were measured from the disclosure of annual reports (T=0) for periods succeeding disclosure of new information (7 to 360 days) and up to the disclosure date for periods preceding disclosure of new information (-30 to 0 day CARs include disclosure date ARs whereas other periods' CARs exclude disclosure date ARs. Expected returns were estimated by implementing market models that were estimated on 730 calendar days of daily returns for each company and disclosure date separately. P-values equal to or less than 0.05 are marked with bolded font.

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The table above shows the estimated parameters for second derivative specification models. The models were estimated using OLS regression of cumulative abnormal returns (CAR) against the second derivatives of various accounting ratios. The table includes estimates for different time periods, with p-values marked for significance levels of 0.05 or less.
5.5 Model diagnostics

All models were checked for multicolinearity by computing both the coefficient of correlation between the independent variables and the $R^2$ for each independent variable regressed against the other independent variables.

The first derivative Abarbanell and Bushee models showed little evidence of multicolinearity with correlation coefficients peaking at 0.52 and a maximum $R^2$ of 32.1%. Corresponding values for the first derivative Laitinen models were 0.57 and 38.3%. No severe problem with multicolinearity could thereby be detected for the first derivative specification models. The second derivative Abarbanell and Bushee models displayed correlation coefficients peaking at 0.47 and a maximum $R^2$ of 26.4%. Corresponding values for the second derivative Laitinen models were 0.33 and 16.1%. No severe problem with multicolinearity could hence be detected for the second derivative specification models either.

Only the first derivative Abarbanell and Bushee 0 day cumulative abnormal return model showed heteroskedastic residuals, of the altogether 72 estimated models, when investigated with the Breuch-Pagan-Goldfeldt test. The heteroskedastic model was re-estimated utilizing the White (1980) heteroskedasticity-consistent covariance matrix before reporting.

6 Summary and conclusions

This paper investigates how the aggregate of investors react to new financial statement information available in Finnish company annual reports. Two pieces of information regarding the properties of the financial statement information pricing process are revealed.

First, a hypothesis concerning how investors interpret new financial statement information is presented and empirically investigated. The empirical findings indicate that the aggregate of investors interpret changes in some of the investigated financial statement
signals in the context of earlier changes. Hence the second derivatives of some of the investigated financial statement signals provide significant incremental information that is priced by the aggregate of the investors. More specifically, empirical evidence indicates that the information contained in the second derivatives might be timelier priced by the market than the information contained in the first derivatives. The finding is new to literature.

Second, two central hypotheses offered as explanations for the anomaly in prior research are evaluated using a new methodological approach. Evidence supporting both the risk-shifting hypothesis and the market inefficiency hypothesis is gathered. It is found that some of the investigated financial statement signals proxy for risk whereas other signals contain information that is uniformly priced by the market with a delay. This finding underlines the importance of implementing a firm methodology when detecting the pricing of risk.
Appendix A – Adjusted $R^2$ Statistics

Figure 3 – Adjusted $R^2$ of first derivative specification models
The connection between publicly available financial statement information and future abnormal returns (excess market model returns) was investigated by OLS regressing cumulative abnormal returns (CAR) for several time periods against the first derivatives of two collections of accounting ratios. CARs were measured around the disclosure of annual reports ($t=0$). 30 to 360 day CARs exclude disclosure date ARs whereas 0 day (event day) CARs include disclosure date ARs. Expected returns were estimated by implementing market models that were estimated on 730 calendar days of daily returns for each company and disclosure date separately. The adjusted $R^2$ for each model is plotted in the graph and reported in the table below the graph.
The connection between publicly available financial statement information and future abnormal returns (excess market model returns) was investigated by OLS regressing cumulative abnormal returns (CAR) for several time periods against the second derivatives of two collections of accounting ratios. CARs were measured around the disclosure of annual reports (t=0). 30 to 360 day CARs exclude disclosure date ARs whereas 0 day (event day) CARs include disclosure date ARs. Expected returns were estimated by implementing market models that were estimated on 730 calendar days of daily returns for each company and disclosure date separately. The adjusted R^2 for each model is plotted in the graph and reported in the table below the graph.
REFERENCES


Laitinen K., 1990, Konkurssin ennustaminen (Vaasan Yritysinformaatio Oy).


