Earnings Quality Measures and Excess Returns

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This paper examines the relative usefulness of various common earnings quality measures as proxies for the information content of reported earnings. The hypotheses are derived from theoretical research and empirical studies. Our measure of the relative usefulness is the amount of hedge returns from portfolios constructed by using the respective earnings quality measures. Earnings quality affects the hedge returns through its effect on the estimated cost of capital and on market mispricing. We test the hypotheses for a large sample of U.S. non-financial firms over 1988-2007. Our findings are broadly consistent with the hypotheses and suggest that market-based measures (earnings response coefficient, value relevance) earn higher hedge returns than many accounting-based measures, of which accruals quality and abnormal accruals generally perform better than the others. We also find that the results for the market-based measures are more consistent with mispricing, whereas for persistence and predictability they are more in line with omitted risk factors.

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1. Introduction

There is considerable interest in the quality of financial reporting. For example, studies analyze earnings quality trends over time and their determinants; others measure the effects of specific changes in accounting standards, enforcement systems, or corporate governance within or across countries; further studies use earnings quality to explain variations in economic outcomes, such as the cost of capital.

Since earnings quality is not directly observable, the empirical literature has developed several measures as a proxy for earnings quality (see the surveys in, e.g., Schipper and Vincent (2003), Dechow and Schrand (2004), Francis, Olsson and Schipper (2006), and Dechow, Ge, and Schrand (2010)). Most measures are based on intuitive and plausible reasoning about desirable characteristics of an accounting system. The selection of the measures is a critical research design issue and has a significant effect on the results of the research. Despite the voluminous literature, there appears to be little guidance helpful in the selection and interpretation of earnings quality measures for specific research questions. This paper explores earnings quality measures and their usefulness in terms of the information content of earnings.

We consider several earnings quality measures commonly used in the literature, including persistence, predictability, smoothness, abnormal accruals, accruals quality, and value relevance. We formulate our first set of hypotheses based on Ewert and Wagenhofer (2010), who present a rational expectations equilibrium model that allows us to rank these earnings quality measures along the criterion how well they capture the information content of earnings reports. They find that value relevance measures perform better than accounting-based measures. They also suggest a new adjusted earnings response coefficient measure that we include. They do not study accruals quality; yet, we include accruals quality in our analysis because empirical work suggests it to be a very good measure.

Our measure of the usefulness of the earnings quality measures is the size of one-year hedge returns from portfolios constructed by ranking firms according to the respective measures.

There are two main reasons for obtaining hedge returns: (i) the model to estimate the cost of capital omits a risk factor, such as information risk that is decreasing in earnings quality; and (ii) market mispricing is higher for high-quality than for low-quality firms. While it is likely that both reasons influence the hedge returns, they predict different signs for the hedge returns for similar investment strategies, and therefore we can empirically measure which reason dominates.

Earlier work, for example, Francis, LaFond, Olsson, and Schipper (2005) and Core, Guay, and Verdi (2008) has focused on the cost of capital implications of earnings quality and discussed whether differences in expected returns are due to omitted risk factors, e.g., information risk. Our approach is more inclusive as we capture the effects of earnings quality on both the risk factor *and* mispricing reasons for hedge returns. An alternative approach is to use actual market data, such as trading volume, bid-ask spreads, or the characteristics of analyst forecasts cannot easily be traced back to individual earnings quality measures because they may jointly affect their variation. Hedge portfolio returns instead use market prices, where the portfolios are constructed ex post using a particular earnings measure. So, the relative performance can be directly attributed to the underlying measures.

A general advantage of our analysis is that using the same research design for all earnings quality measures mitigates any potential misspecifications in the hedge portfolio returns because the measures act as their own controls.

We test the hypotheses for a large sample of U.S. firms over a twenty-year period from 1988 to 2007. The earnings quality measures are defined similar to the extensive empirical literature. We estimate the risk-adjusted cost of capital of each firm using the three-factor asset pricing model of Fama and French (1993) augmented by the momentum factor. Hedge returns are the one-year returns of equal weighted portfolios for the top and bottom quartiles of firms based on each of nine earnings quality measures, both raw-form and residual-form measures, where residual-form measures are obtained from controlling for innate factors.

Our findings are broadly consistent with the hypotheses. Market-based measures generally earn higher hedge returns than (most) accounting-based measures. Accruals quality is also among the measures with the highest hedge returns. Different from the hypothesis, abnormal accruals also yield high hedge returns. On the other hand, persistence, predictability, and smoothness in residual form do not yield significant hedge returns. Further, we find that the market-based measures provide positive hedge returns from going long in high earnings quality measures, which is consistent with mispricing, whereas accounting-based measures yield positive hedge returns from going short in high earnings quality measures, which is consistent with the omitted risk factor explanation. We also discuss potential implications for the interpretation of smoothness, abnormal accruals, and accruals quality as carrying useful information or being the result of uninformative earnings management. Finally, we perform several sensitivity analyses and find that these results are robust to a broad set of alternative specifications.

In the empirical domain, Francis, LaFond, Olsson, and Schipper (2004) study seven earnings quality measures and their association with ex ante cost of equity capital and other proxies, including realized returns. Cost of capital is estimated from a Fama-French three-factor asset pricing model including the respective earnings quality measures and controlling for innate factors. They provide an intuitive discussion how the earnings quality measures may be related to information risk, but do not base them on theoretical results. Findings suggest that, generally, accounting-based measures have more explanatory power than market-based measures and that accruals quality is the dominant measure. Their results on predictability and conservatism are mixed. These results differ significantly from ours.

Francis, LaFond, Olsson, and Schipper (2004) also report correlations between their seven earnings quality measures. They are generally significant, but economically not large, which suggests there is little overlap between them. Dechow, Ge, and Schrand (2010) report correlations and find significant negative correlations among several of the earnings quality measures, indicating they may provide conflicting results when applied to the same research question. Our hedge returns approach provides additional insights into these results.

Aboody, Hughes, and Liu (2005) use two types of earnings quality measures, one based on abnormal accruals and the other on accruals quality. They construct hedge portfolios based on those measures and examine whether they are priced risks and, additionally, whether insiders can make a profit from trading shares based on the exposure to these measures. Their results are consistent with both of these hypotheses. Different from our model, their focus is not on the earnings quality measures directly.

There is little theoretical literature on earnings quality measures. Ewert and Wagenhofer (2010) provide a rational expectations model that addresses this issue. They model private information of management and earnings management opportunities based on a broad set of management incentives. By varying the incentives and operating and accounting characteristics, they compare several earnings quality measures in terms of their ability to capture the change in the information content of reported earnings. They find that value relevance is a particularly good proxy, whereas earnings smoothness and discretionary accruals are unreliable according to their model. We use several of their results to refine our hypotheses.

Marinovic (2010) also makes predictions on the behavior of earnings quality measures. He examines earnings management and capital market reactions when there is uncertainty whether the manager can bias the earnings report. He finds that persistence is a useful measure, whereas predictability and smoothness do not reflect earnings quality because they behave non-monotonically in the information content of reported earnings.

This paper proceeds as follows: In the next section, we develop the hypotheses based on the objective of providing decision-useful information and on the relative performance of commonly used earnings quality measures. Section 3 explains our research design, particularly, how the measures and hedge returns are calculated. Section 4 describes the sample, and Section

5 contains the main empirical tests for the two sets of hypotheses and sensitivity tests. Section 6 concludes.

2. Hypothesis development

2.1. Decision usefulness as the objective of earnings reports

In their survey, Dechow, Ge, and Schrand (2010) conclude that there is no single earnings quality measure that is generally useful but their performance is contingent on the decision context. For our analysis, we adopt the objective of the FASB and the IASB as stated in their joint Conceptual Framework (IASB 2010): Financial reporting should be useful to capital providers in making decisions about providing financing to firms. The information should enable them to assess the prospects for the firms' future cash flows.

Ewert and Wagenhofer (2010) operationalize this objective by defining higher earnings quality as a larger reduction of the market's uncertainty (variance) about the future cash flows conditional on an earnings report. This definition is consistent with Francis, Olsson, and Schipper (2006) and captures the information content of earnings reports with respect to future cash flows. A higher quality of earnings reports allows for a more precise estimate of future cash flows.

Adopting this over-arching objective of the standard setters, we ignore the use of accounting information for contracting and stewardship purposes, but we note that the predictions of good earnings quality measures can vary across different uses. A consequence of our focus on decision usefulness in the sense of the Framework is that we do not include in our analysis conservatism as a measure of earnings quality because the usefulness of conservatism is often linked to contracts, particularly debt contracts.

In addition to the extensive empirical literature, we use insights from theoretical work in Ewert and Wagenhofer (2010). They develop a rational expectations model in which a firm observes an earnings signal and can manage earnings so that reported earnings may be biased subject to management's incentives and based on its private information. The capital market rationally anticipates earnings management and takes the expected earnings management into account when setting market prices. Ewert and Wagenhofer examine persistence, predictability, smoothness, discretionary accruals, and value relevance, each suitably defined in their model. They vary managerial incentives, the amount of private information the manager has about the operating risk of the firm, and the precision of the accounting system to compare how the earnings quality measures react and how well they pick up changes in the conditional variance of future cash flows.

Their setting provides a theoretical basis for our analysis of the behavior of different earnings quality measures. While we do not explicitly condition our hypotheses on certain events they identify as sources for differences in the measures, such as an exogenous change in accounting standards or a change in incentives, our panel data offer a sufficient degree of variation over time to find measurable effects across these measures. .

Similar to the literature on earnings quality, we do not consider the wealth of other information that is included in the financial statements and elsewhere, but focus on the primary financial statements and, in particular, to the bottom-line earnings numbers. The analyses rest on the assumption that the amount of information from these subsidiary sources is held constant.

2.2. Earnings quality measures

The first set of measures we study are persistence and predictability. Persistence measures the extent that current earnings persist or recur in the future. It is commonly estimated by the slope coefficient from a regression of current earnings on lagged earnings or on components of lagged earnings, such as cash flows and accruals. High persistence is positively associated with high earnings quality, since it indicates a stable, sustainable and less volatile earnings generation process that is valued particularly by investors.

Predictability captures the notion that earnings are of higher quality the more useful they are to predict future earnings. Similar to persistence, predictability is generally viewed as a desirable attribute of earnings because it increases the precision of earnings forecasts. A common way to measure predictability is to take the R^2 of the regression of current earnings on lagged earnings.

Both measures track the information content of earnings reasonably well. But both deviate upon a variation of the difficulty, or cost of, earnings management, although differently. Persistence also deviates upon a variation of the precision of the accounting system and reacts non-monotonically in the information content change. Predictability deviates in a change in the private information of the manager. We expect both to be less useful than value relevance measures, but do not predict major differences between persistence and predictability, as both deviate for different reasons. Empirically, more controls would be necessary to arrive at better predictions.

Earnings smoothness has been interpreted differently in empirical studies. One interpretation is that smoothing is desirable. Similar to persistence and predictability, a smoother earnings stream is less volatile and allows better forecasting. Moreover, management uses its private information to decide on the amount of bias, so smoothing incorporates private information about future cash flows into concurrent earnings ("forward" smoothing). Under this interpretation, smoothness is positively associated with earnings quality.[1] Another interpretation is that smoothness is a result of earnings management: Assuming that earnings management masks a firm's "true" performance and destroys information, smoothness is undesirable, in which case smoothness is negatively associated with earnings quality. Smoothness is commonly measured based on the volatility of earnings or accruals relative to the volatility of operating

[1] This view is consistent with the analytical results in Ewert and Wagenhofer (2010) and with empirical evidence in Tucker and Zarowin (2006).

cash flows. This measurement assumes operating cash flows are the reference measure of performance, which in particular presupposes that cash flows are not subject to (real) earnings management.[2]

Another set of earnings measures focuses on accruals, defined as the difference between earnings and cash flow from operations. A common approach is to split accruals into "normal" and "abnormal" or discretionary accruals, based on a forecast model for total accruals (e.g., Jones (1991)). Abnormal accruals are the difference between actual and forecast accruals. Higher (absolute) abnormal accruals are commonly considered to indicate lower earnings quality because the firm's accrual process is less predictable and abnormal accruals can be a result of earnings management. However, there again is an alternative view, namely that abnormal accruals are the means to carry private information in the accounting system. If actual accruals are equal to their forecast values, there is nothing new one can learn from observing accruals. This view is supported in a rational expectations model. Since the market can anticipate and back out the average expected earnings management, there is not much loss in information content from the inclusion of anticipated earnings management in abnormal accruals.

Ewert and Wagenhofer (2010) find that abnormal accruals do not track the information content of earnings well in many situations. The reason for this result is that the amount of the abnormal accruals does not capture the equilibrium market reaction to the earnings announcement. Rational investors use their knowledge about management incentives to separate out the average earnings management from earnings. This process is distinctly different from that of obtaining abnormal accruals in empirical studies.

Another common measure that examines accruals is accruals quality (Dechow and Dichev (2002)). This measure maps working capital accruals to lagged, contemporaneous, and future cash flows from operations. The better this mapping explains the accruals, the higher is the

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[2] See also the discussion in Barth, Landsman, and Lang (2008).

earnings quality. Although Ewert and Wagenhofer (2010) do not examine this measure, we include it because the empirical literature suggests it is a better earnings quality measure than other accounting-based measures (Francis, LaFond, Olsson, and Schipper (2004, 2005)). However, accruals quality may be subject to a similar concern as abnormal accruals, as it may capture either earnings management or specific information.

In addition to these accounting-based measures, we consider market-based earnings quality measures. Value relevance is commonly measured either by the earnings response coefficient, which is the slope coefficient in a regression of the market returns on earnings, sometimes augmented by changes in earnings, or by the R^2 of such a regression. In the model of Ewert and Wagenhofer (2010), value relevance tracks the information content of earnings very closely and turns out to be the closest earnings quality measure of those they consider.

Ewert and Wagenhofer (2010) suggest a new, adjusted earnings response coefficient metric that directly proxies for the information content of earnings in their setting. It is defined as the square of the earnings response coefficient times the variance of earnings. This measure is directly linked with information content and should, therefore, be a preferable measure.

2.3. Excess returns

The above discussion provides a set of predictions about the direction and the degree with which the various earnings quality measures track the information content of earnings. We test these predictions by measuring the amount of hedge returns earned on portfolios constructed on the value of the respective earnings quality measure. In particular, we hypothesize that an earnings quality measure that tracks the information content of earnings better generates higher hedge returns. Hedge returns are the difference between the excess returns of going long in a portfolio and short in an equal-size portfolio selected on the basis of a particular earnings quality measure.

To see how earnings quality affects hedge returns, we analyze the reasons why excess returns can obtain. Excess returns are defined as the actual returns (*RET*) less the (real) risk-adjusted cost of capital (*COC*). In an efficient market, excess returns should be nil on average; otherwise, they indicate market inefficiencies or mispricing (ignoring transaction costs and trading constraints). The pricing error is

$$PRICINGERR = RET - COC$$

Actual returns *RET* are observable; cost of capital is not, but must be estimated by the expected returns. Expected returns are determined based on a model, and they measure cost of capital with a model error capturing omitted risk factors in the model,

$$MODELERR = COC - E[RET]$$

Thus, excess returns occur in our empirical setting due to two potential errors, pricing and model errors,

$$EXRET \equiv RET - E[RET] = PRICINGERR + MODELERR \qquad (1)$$

Earlier work has usually focused on the cost of capital implications of earnings quality and discussed whether differences in expected returns are due to omitted risk factors, e.g., information risk. Higher earnings quality reduces the uncertainty and, thus, the information risk, hence, the model error is expected to decrease in earnings quality. This design has the disadvantage that either there is no observable benchmark, or one has to assume that the pricing error is zero (consistent with an efficient market).

With our more comprehensive design, we consider both potential errors. We expect the pricing error to increase in earnings quality because investors may not fully incorporate the high information content in earnings into their trades. A wide body of literature examines accounting-based market anomalies that persist over time (see, e.g., Richardson, Tuna, and Wysocki (2009)). Various theories of market behavior consistent with pricing errors have been developed; explanations include unsophisticated investors (Bartov, Radhakrishnan and Kriski (2000)), limited attention (Hirschleifer, Lim, and Teoh (2010)), cost to acquire information (Landsman, Miller, Peasnell, and Yeh (2011)), transaction costs and limits to arbitrage (Ng, Rusticus, and Verdi (2008), Zhang, Cai, and Keasey (2010)), and divergence of opinions (Garfinkel and Sokobin (2006)).

There is little theoretical basis for determining which of the two reasons better explains excess returns. For example, Easley and O'Hara (2004) and Hughes, Liu, and Liu (2007) link the risk of asymmetrically distributed information among investors to the cost of capital. These results are inconsistent with a separate information risk factor and show that information asymmetry affects the other systematic risk factors. In a consumption CAPM economy with symmetric information, Yee (2006) shows that poorer earnings quality, measured in terms of accounting precision, increases the equity risk premium. The effect is more pronounced the higher is the undiversifiable fundamental uncertainty. Lambert, Leuz, and Verrecchia (2007) show that idiosyncratic information is not priced because it is diversified away in a large economy, but there is a direct effect of information on risk premiums due to the covariance between a firm's cash flows and the cash flows of other firms in the economy. Analogously to Hughes, Liu, and Liu, they find that the effect does not call for an additional information risk factor, but is captured by the market risk premium (if appropriately specified in a forward-looking beta).

Christensen, de la Rosa, and Feltham (2010) consider the effect of a change of accounting quality over time. While after the release of information the cost of capital decreases, there is no change in ex ante cost of capital, implying the lower cost of capital is offset by higher cost of capital before the information arrives. If uncertainty resolves over multiple periods, the model predicts no clear relationship between period risk premiums and the cost of capital because it depends on how much uncertainty resolves in interim periods and how much information risk is added. Hence, finding excess returns would indicate pricing errors.

In the empirical literature Francis, LaFond, Olsson, and Schipper (2005) study cost of capital implications of accruals quality and interpret their findings as suggesting accruals quality is a priced risk factor, capturing non-diversifiable information risk. However, they also find that the slope coefficients on the Fama-French risk factors change significantly if they include accruals quality. Chen, Dhaliwal, and Trombley (2008) provide empirical support for the implications of Yee's (2006) model, which predicts that accruals quality is negatively associated with the cost of equity capital and the magnitude of the association increases with fundamental risk. Core, Guay, and Verdi (2008) conduct a series of tests and find no support for the conclusion in Francis, LaFond, Olsson, and Schipper (2005) that accruals quality is a priced risk factor. They also show that the results vary substantially contingent on the sample period and on the frequency of portfolio rebalancing. Ng (2011) find that higher information quality is associated with lower liquidity risk and, therefore, with lower cost of capital.

In our paper, we need not distinguish between the pricing and model errors to gain insights into the earnings quality measures. In both cases, we expect earnings quality to affect the error. While we cannot separate the two errors, our setting offers an opportunity to empirically assess which of the two dominates in the data set because earnings quality affects them in different directions.[3] If the risk factor explanation dominates, then we expect to find positive excess returns if we go long in low-quality firms and short in high-quality firms because the information risk for low-quality firms is higher, so that they require a larger risk premium and larger expected returns. On the other hand, finding positive excess return going long in high-quality firms and short in low-quality firms is consistent with the dominance of the market mispricing effect as high-quality firms are priced too low and low-quality firms too high.

[3] Of course, finding insignificant hedge returns may then be due to both reasons to be approximately equally strong.

2.4. Hypotheses

To summarize the above discussion, we formulate the following hypotheses (each stated in alternative form).The first set of hypotheses rank the earnings quality measures based on their ability to earn hedge returns. The first two hypotheses are based on Ewert and Wagenhofer (2010) and the third on prior empirical work (e.g., Francis, LaFond, Olsson, and Schipper (2004)).

H1a: Hedge returns are higher for market-based measures than for the accounting-based measures studied (except accruals quality).

H1b: Hedge returns are higher for persistence and predictability than for smoothness and abnormal accruals.

H1c: Hedge returns are higher for accruals quality than for the other accounting-based measures studied.

The next hypothesis touches on the potential reasons for excess returns and the interpretation of high and low earnings quality. If mispricing dominates, then we expect positive hedge returns from going long in high-quality firms and short in low-quality firms; if information risk dominates, the direction reverses because higher hedge returns are a result of an estimate of the cost of capital that is too low. Accordingly, we formulate two hypotheses in opposite directions:

H2a (pricing error): Positive hedge returns obtain from going long in high-quality firms and short in low-quality firms.

H2b (model error): Positive hedge returns obtain from going short in high-quality firms and long in low-quality firms.

We cannot test this hypothesis directly for smoothness and for discretionary accruals because there is no theoretical basis to decide whether a high or low value of these measures is indicative of high and low earnings quality, respectively. If the information content in the accruals prevails, then higher values of the measures should be associated with higher excess hedge returns; if undesirable earnings management prevails, it should be the reverse relationship. Therefore, observing the sign of the hedge returns for smoothness and discretionary accruals does not provide a conclusive answer to the hypotheses.

3. Research design

3.1. Calculation of earnings quality measures

We determine the earnings quality (EQ) measures consistent with the pervasive literature (for surveys see Schipper and Vincent (2003), Dechow and Schrand (2004), Francis, Olsson, and Schipper (2006), and Dechow, Ge, and Schrand (2010)). As base "earnings" measure we use net income before extraordinary items (*NIBE*). Total accruals (*ACC*) is calculated from $ACC = \Delta CA - \Delta CL - \Delta CASH + \Delta STDEBT - DEPR$ where the variables are change in current assets, change in current liabilities, change in cash, change in short-term debt, and depreciation in the year ending at *t*, respectively. Cash flow from operations (*CFO*) is calculated from $CFO = NIBE - ACC$. Current accruals (*CACC*) is computed from $CACC = \Delta CA - \Delta CL - \Delta CASH + \Delta STDEBT$.

Persistence (EQ1) is equal to the slope coefficient β in the following regression:

$$NIBE_{i,t} = \alpha + \beta NIBE_{i,t-1} + \varepsilon_{i,t} \tag{2}$$

where *NIBE* is scaled by total assets at the beginning of period *t*. The model is estimated for each firm over rolling ten-year windows from t–9 to *t*.

Predictability (EQ2) is the R^2 of this regression.

We calculate two measures for smoothness of earnings. Our first measure (EQ3) is the ratio of the standard deviation of earnings over the standard deviation of cash flow from operations,

$$\frac{\sigma(NIBE_{i,t})}{\sigma(CFO_{i,t})} \tag{3}$$

where *NIBE* and *CFO* are scaled by total assets at the beginning of period *t*.

Our second smoothness measure (EQ4) is based on the correlation of accruals and cash flow from operations,

$$\rho(ACC_{i,t}, CFO_{i,t}) \tag{4}$$

ACC and *CFO* are scaled by total assets at the beginning of period *t*. Both smoothness measures are computed as firm-specific measures over rolling ten-year windows from t–9 to *t*.

Abnormal accruals (EQ5) are estimated based on the following regression:[4]

$$ACC_{i,t} = \alpha + \beta_1(\Delta REV_{i,t} - \Delta AR_{i,t}) + \beta_2 PPE_{i,t} + \varepsilon_{i,t} \tag{5}$$

where ΔREV is the change in revenues, ΔAR the change in accounts receivable, and *PPE* property, plant, and equipment. All variables are scaled by total assets at the beginning of period *t*. The abnormal accruals measure is the absolute residual, $|\varepsilon_{i,t}|$.[5] The model is estimated over firm-specific rolling ten-year windows from t–9 to *t*.

Accruals quality (EQ6) is defined as the standard deviation of the residuals of the following regression of current accruals

$$CACC_{i,t} = \alpha + \beta_1 CFO_{i,t-1} + \beta_2 CFO_{i,t} + \beta_3 CFO_{i,t+1} + \varepsilon_{i,t} \tag{6}$$

All variables are scaled by total assets at the beginning of period *t*. The estimation of the residuals and of their standard deviation is computed for each firm over rolling ten-year windows *t*–9 to *t*.

Value relevance is estimated based on the following regression:

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[4] See Dechow, Sloan, and Sweeney (1995).

[5] An alternative specification would be squared abnormal accruals (see Cohen, Dey, and Lys (2008)). Francis, LaFond, Olsson, and Schipper (2005), p. 299, suggest taking the absolute values for an earnings quality measure and signed accruals for studying earnings management.

$$RET_{i,t} = \alpha + \beta\, NIBE_{i,t} / P_{i,t} + \varepsilon_{i,t} \tag{7}$$

where *RET* denotes the 12-month return ending three months after the end of the fiscal year,[6] and *P* is the market value of equity at the beginning of period *t*. The regressions are computed for each firm over rolling ten-year windows *t*–9 to *t*.

Our first measure of value relevance (EQ7) is equal to the earnings response coefficient (*ERC*), which is the β in (7). The second measure of value relevance (EQ8) is the R^2 of the regression.

The adjusted ERC measure (EQ9) from Ewert and Wagenhofer (2010) is equal to the square of the earnings response coefficient times the variance of earnings

$$(ERC_{i,t})^2 \cdot Var(NIBE_{i,t}) \tag{8}$$

where *NIBE* is scaled by total assets at the beginning of period *t*. *ERC*s are from the earlier regression, and the variance is estimated for each firm over rolling ten-year windows from *t*–9 to *t*.

We refer to the first six measures (EQ 1 to EQ6) as accounting-based measures and to the last three measures (EQ7 to EQ9) as market-based measures. All measures are calculated for each firm consistently over ten years rolling, so their calculation basis is similar.[7]

The EQ measures include all sources for variations in reported earnings. In particular, they are affected by the business model, operating risk, and the operating environment (Francis, Olsson, and Schipper (2006) call these innate sources) and by financial reporting quality, which

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[6] This specification is consistent with the 12-month period to calculate hedge returns. Using 15-month windows, beginning at the fiscal year, does not qualitatively affect the results.

[7] There are some measures that can be calculated for each firm year. See, e.g., Barth, Konchitchki, and Landsman (2010) for such a measure. We do not include these because we develop our hypotheses for measures studied in Ewert and Wagenhofer (2010) plus accruals quality.

is a result of accounting standards, their application, management incentives, auditing, corporate governance, enforcement, and other aspects of the regulatory environment.

Besides the raw-form measures EQ1 to EQ9 as defined above, we define a corresponding set of measures where we control for the innate factors. Basically, there are two ways to do so: (i) running a two-stage regression in which the first regression attempts to capture the innate factors and then study the residual, which captures the discretionary factors in the earnings quality; or (ii) including the innate factors directly into the regression as control variables.[8] We follow the first approach and determine earnings quality measures as residuals from a regression of the original variable on a set of variables that control for innate factors. The corresponding measures are equal to the residuals from firm-specific regressions involving all the years in the sample. We index the residual-form earnings quality measures by an R, that is, $EQ1^R$ to $EQ9^R$. Table 1 summarizes the definitions of the earnings quality measures used.

[Table 1]

Based on the literature, we use the following control variables: *Size*: natural logarithm of total assets; *Operating cycle*: natural logarithm of the sum of days accounts receivable and days inventory;[9] *Intangible intensity*: reported R&D expense divided by sales (R&D expense is set equal to zero when missing); *Capital intensity*: net book value of property, plant and equipment divided by total assets; *Growth*: percentage change in sales; *Leverage*: total liabilities divided by equity book value.

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[8] This distinction into innate and discretionary factors is independent of the distinction between systematic and idiosyncratic information risk.

[9] The days accounts receivable are calculated from 365 times accounts receivables turnover over sales; the days inventory from 365 times inventory over cost of goods sold.

3.2. Computation of hedge returns

To compute hedge returns, we use the three-factor asset pricing model of Fama and French (1993) plus the momentum factor to estimate of the expected risk-adjusted return of each firm in the hedge portfolios.[10] There may be other common risk factors, but there is no consensus as to which ones are the most descriptive and whether adding additional factors improve the net benefit of forecasting and valuation. For example, industry appears to be such a factor, but we do not include it in our analysis. We follow the procedure in Landsman, Miller, Peasnell, and Yeh (2011) to calculate the expected returns.

For each firm and month we estimate the factor β's over a 36 month period prior to the respective month by

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_i^{MKT}(R_{M,t} - R_{f,t}) + \beta_i^{SMB} SMB_t + \beta_i^{HML} HML_t + \beta_i^{UMD} UMD_t + \varepsilon_{i,t} \qquad (9)$$

where $R_{i,t}$ is the actual monthly return of firm *i*, $R_{f,t}$ is the monthly riskless rate of return, $R_{M,t}$ is the monthly market return, SMB_t is the monthly return of the book-to-market factor mimicking portfolio, HML_t is the monthly return of the size factor mimicking portfolio, and UMD_t is the monthly return of the momentum factor mimicking portfolio.

Taking these estimated factor β's for month *t* as expected β's for month *t*+1 we calculate the expected risk-adjusted return from the following equation:

$$E[R_{i,t+1}] = R_{f,t+1} + \beta_i^{MKT}(R_{M,t+1} - R_{f,t+1}) + \beta_i^{SMB} SMB_{t+1} + \beta_i^{HML} HML_{t+1} + \beta_i^{UMD} UMD_{t+1} \qquad (10)$$

The excess return of each firm and month is the actual return minus the expected return,

$$EXRET_{i,t} = R_{i,t} - E[R_{i,t}] \qquad (11)$$

where $EXRET_{i,t}$ is the month *t* percentage excess return on the stock of a particular firm. Monthly excess returns are then aggregated using the following formula,

[10] The factor-mimicking portfolio returns for SMB, HML, and momentum are obtained from French's website http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

$$RET = \exp[\sum_{t=1}^{12} \ln(1 + ER_{i,t})] - 1$$

to obtain annual buy and hold returns.

We form equal-weighted portfolios of firms for each of the earnings quality measures we study. Assuming that financial reports of a specific year are available within three months after fiscal-year end, we start accumulating excess returns beginning in the fourth month for a 12-month period.[11] To avoid concerns regarding the potential influence of outliers that are likely to be accumulated at the extremes of the distributions, we use quartiles rather than deciles.[12] The top quartile contains the 25 percent of firms with the highest value of the earnings quality measure, the bottom quartile the 25 percent of firms with the lowest value of the earnings quality measure. Note that this ranking does not coincide with high and low earnings quality, as some measures are defined such that a high value of the measure indicates low earnings quality (see Table 1 for a list of the direction of the effects). For some measures, it is ex ante not clear what direction is the appropriate one.

Hedge returns are computed as the difference between the average excess returns of the firms in the top quartile minus the average of the excess returns of the firms in the bottom quartile. This procedure corresponds to a buy-and-hold strategy of half of the sample firms in each year. Rebalancing occurs once a year to mitigate concerns of bias due to bid-ask spread bounces (see Core, Guay, and Verdi (2008)).

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[11] With this procedure, we strictly assume that the portfolios are selected based on available information. Alternatively, one may assume that earnings quality is more sticky or leaks over the year; in such a case, the portfolios could be formed earlier. Gunny, Jacob, and Jorgensen (2009) document that annual earnings calculated from aggregating four quarterly earnings other than those derived from the fiscal-year have different properties.

[12] A potential disadvantage is a loss of explanatory power of differences in hedge returns because the EQ measures do not distinguish the firms in the portfolios so much. However, this should bias against finding significant results.

4. Sample description

The sample consists of U.S. non-financial firms drawn from Compustat and CRSP. To analyze earnings quality measures over a 20-year period from 1988 to 2007, we require financial statements data from 1978 to 2008 because all the earnings quality measures are computed over a ten-year rolling estimation period, and some of them involve items over two or three consecutive periods.[13] For each firm in a certain year, we require that data are available in the respective and nine prior years to avoid concerns that differences in the samples for measuring the earnings quality measures drive the results. This process does not allow the measures to react quickly to changes in the market environment, so we implicitly assume that the variables used in the analyses are fundamentally constant over that period of time. All data are winsorized on the 1% level to control for outliers.

We require that for each firm in a yearly sample we can calculate all 18 earnings quality measures. To avoid excluding too many firms, we do not require data availability for each firm over the full 30 year period. As a consequence, the composition of firms in the yearly samples varies. Survivorship bias is expected to play a minor role in the analysis because it only arises for the ten-year estimation periods. The number of firms in each year varies between 1,184 and 1,445, the average number is 1,334. The total sample includes 26,684 firm-year observations.

Table 2 reports descriptive statistics of the main variables used to calculate the earnings quality measures and the controls over the 20 years.

[Table 2]

[13] Since raw data on cash flows from operations are not available for the early periods, we calculate the *CFO* following the literature indirectly by adjusting net income for changes in certain balance sheet items. In untabulated analyses, we use the reported cash flows from operations for the periods for which they are available. This does not affect the main results.

Table 3 presents descriptive statistics for the 18 earnings quality measures. Some measures are not symmetrically distributed, and some of the top and bottom deciles include extreme values. To mitigate the effect of potential outliers, we use quartiles to construct the hedge portfolios.

[Table 3]

Table 4 shows the Pearson correlations of the 18 earnings quality measures. With few exceptions, the correlations are significant, although few of them are of economically relevant size.[14] The correlations between the earnings quality measures are generally positive; there are few measures which are negatively associated with other measures, and the negative correlations are of much smaller size than the positive ones. A positive correlation is consistent with the presumption that all measures should capture a similar underlying construct. However, there is no single measure that is consistently positively correlated with the rest of the measures. We would have expected more changing signs of the correlations for smoothness (EQ3 and EQ4) and discretionary accruals (EQ5) than for the other measures, because they pick up economic factors less consistently.

[Table 4]

[14] This result is consistent with earlier findings, for example, by Francis, LaFond, Olson, and Schipper (2004).

Moreover, given the theoretically strong link between the measures, it is surprising that the correlations are generally not very high. Two strong associations of raw-form EQ measures are those between EQ1 (persistence) and EQ2 (predictability) and between EQ3 and EQ4 (both smoothness). The residual-form measures are not highly correlated, except for the smoothness measures, $EQ3^R$ and $EQ4^R$. There are several economically large correlations between raw-form and residual-form measures, albeit most of them are between the corresponding ones, which is expected as controlling for innate factors should not affect the measures' ability to capture the underlying constructs. Interestingly, as an exception, the two measures EQ1 and EQ2 are not highly correlated with their residual forms $EQ1^R$ and $EQ2^R$, respectively, which implies that the raw-form measures pick up much of the variation in the economic environment. For this reason, we subsequently focus our discussion on the residual-form measures.

Table 5 gives insight into the change in the composition of the portfolios based on the 18 EQ measures over time. It reports the frequency of the annual changes of all firms across the different quartiles of earnings quality measures. No change occurs with around 67 percent on average and has the highest frequency; a change from a low (high) EQ to a high (low) EQ portfolio occurs rarely. Portfolio selection based on EQ5 ($EQ5^R$) is less stable than based on the other measures, because it includes the most changes in and out of the portfolios.

[Table 5]

5. Results

5.1. Hedge returns for earnings quality measures

Table 6 summarizes our main results for hypotheses H1a-c, which include the one-year mean excess returns for each of the nine raw-form and their residual-form EQ measures. The table lists the excess returns on the portfolio that contains the firms within the top quartile with the highest EQ measures and the excess returns on the portfolio with the firms within the bottom quartile. The hedge returns are computed as the difference between these two excess returns, and they represent the returns from going long in the high-EQ portfolio and short in the low-EQ portfolio. The last column reports unpaired samples t-statistics of the hedge returns.

[Table 6]

The first set of hypotheses provide partial rankings of measures and predict the relation of the amounts of hedge returns using the different EQ measures. To test these hypotheses, we consider the absolute values of the hedge returns rather than their signed values. The reason is that if Table 6 shows negative hedge returns for one measure, positive hedge returns of the same amount arise for the reverse investment strategy, i.e., going long in the low EQ and short in high EQ portfolios. Generally, this calculation reduces the differences between hedge returns, which biases against finding significant results. We come back to the signs when we test hypothesis H2.

Table 7 reports the differences of the absolute values of the hedge returns and a significance test for these differences, which are calculated from a two-sided *z*-test using the difference of the values divided by its standard error. The standard errors are obtained from a bootstrapping procedure with 1,000 replications.

[Table 7]

Hypothesis H1a predicts that hedge returns are greater for the three market-based measures (EQ7 to EQ9) than for the accounting-based measures (EQ1 to EQ5). The results differ for raw-form and residual-form measures. The hedge returns are highest for persistence (EQ1) and predictability (EQ2), closely followed by the two ERC-based measures (EQ7 and EQ9), then discretionary accruals (EQ5) and value relevance (EQ8). The hedge returns for the two smoothness measures (EQ 3 and EQ4) are low and not significantly different from zero. These results are inconsistent with hypothesis H1a.

However, we do find support for the hypothesis for the residual-form measures. The best-performing raw-form measures, persistence and predictability now yield insignificant hedge returns, the hedge return for $EQ1^R$ even turns positive, and the smoothness measures still earn insignificant hedge returns. The hedge returns for the other measures ($EQ5^R$ to $EQ9^R$) are still significantly positive. Looking at the size of the hedge returns, , they are highest for two ERC-based measures ($EQ9^R$ and then $EQ7^R$), followed by discretionary accruals ($EQ5^R$) and value relevance ($EQ8^R$). Table 7 reveals that the differences in the hedge returns between the set of EQ measures with significant returns ($EQ5^R$ to $EQ9^R$) and the other measures ($EQ1^R$ to $EQ4^R$) are generally significant, but that the differences within these groups are not. So, while the results largely support hypothesis H1a, only some of them are significant.

Hypothesis H1b ranks the accounting-based measures EQ1 to EQ5 based on theoretical findings. It predicts that hedge returns are higher for persistence and predictability than for smoothness and abnormal accruals. Again, the results differ for the raw-form or residual-form measures. For the raw-form measures, persistence (EQ1) and predictability (EQ2) are indeed the best-performing measures. However, abnormal accruals (EQ5) come close. On the other hand, smoothness provides no significant hedge returns. While the differences in hedge returns are large, only few of them are significant at conventional levels. In residual-form, abnormal accruals ($EQ5^R$) do best, followed by persistence ($EQ1^R$), and the rest of the measures providing low and insignificant hedge returns. Thus, the results provide limited support for hypothesis H1b.

Hypothesis H1c predicts that hedge returns under accruals quality (EQ6) are higher than for the other accounting-based measures (EQ1 to EQ5). This hypothesis is rejected for the raw-form measures, but is consistent with the results for the residual-form measures. Accruals quality

($EQ6^R$) indeed provides the largest hedge returns, although the hedge returns for abnormal accruals ($EQ5^R$) come close. The differences are significant for $EQ2^R$ to $EQ4^R$. This provides support for the high usefulness of accruals quality as a measure of earnings quality.

5.2. Reasons for obtaining hedge returns

We turn to the hypotheses H2a and H2b, which state a prediction of the signs of the hedge returns for the different EQ measures: hedge returns should be positive (negative) from going long in firms with high earnings quality and short in firms with low earnings quality. With this prediction, we expect to gain insights into whether market mispricing or omitted information risk is the dominant reason to yield hedge returns.

Table 6 reveals that the signs of the hedge returns for the three market-based measures are always positive and significant, which lends support to hypothesis H2a, the dominance of the mispricing explanation for these hedge returns.

On the other hand, the signs of the hedge returns for the accounting-based measures are such that positive hedge returns obtain by going long in low-quality and short in high-quality firms. The raw-form measures for persistence and predictability (EQ1 and EQ2) are negative and significant, which is consistent with hypothesis H2b, the dominance of the information risk explanation. However, the associated residual-form measures ($EQ1^R$ and $EQ2^R$) are not significant, so it is likely that the control variables also control for any potentially omitted risk factor. Abnormal accruals and accruals quality (EQ5 and EQ6) yield significant positive returns, which implies a similar finding as, by their definition, high values of the measures indicate low earnings quality.

As mentioned earlier, we do not make sign predictions for smoothness and discretionary accruals because their relationship to earnings quality (in the sense of higher information content) is theoretically not clear. The positive sign for the hedge returns for abnormal accruals (EQ5 and $EQ5^R$) is consistent with two different interpretations: (i) High values of the measures indicate low earnings quality (which is in line with the common use of these measures in the literature) *and* hedge returns obtain from an omitted information risk factor; or (ii) High values of the measures indicate high earnings quality (as their information content is high) *and* hedge returns obtain from market mispricing. Empirically, we cannot distinguish between these two interpretations of our results. Presuming the behavior of the accounting-based measures is broadly similar, our results for persistence and predictability would lend higher credibility to the first of the two interpretations.

These findings suggest that accounting-based measures seem to be more useful in determining the cost of capital than are market-based measures. The accounting-based measures are constructed based on accounting information only, whereas the market-based measures include both accounting and market information. Therefore, market-based measures capture investors' reactions to accounting information already. This signs pattern occurs even though most of the EQ measures are positively correlated with each other.

Interestingly, a similar signs pattern arises for the estimated cost of capital. Table 8 reports the differences in the cost of equity capital between the high-EQ and low-EQ portfolios for each EQ measure. The cost of equity capital estimate $E[RET]$ is defined in equation (10) based on the four-factor model, and it is the estimate is used to compute the excess returns for each portfolio. We aggregate the estimates by year to obtain an annual measure of the cost of equity capital.

[Table 8]

The cost of equity capital is generally in the range of 11 to 13 percent, which is consistent with findings in the earlier literature. The differences are economically small, although mostly significant, and they are much smaller than the hedge returns. One interesting observation is that the difference in the cost of capital is largest for the portfolios based on the adjusted ERC (EQ9) and the ERC (EQ7). Another interesting observation is that smoothness (EQ3 and EQ4) also result in large differences in the cost of capital in the sense that high smoothness increases the cost of capital. Recall that hedge returns are not significant for the smoothness measures. The third interesting observation from Table 8 is the fact that abnormal accruals (EQ5) and accruals quality (EQ6) do not give rise to significant differences in the cost of capital, whereas they do yield significant hedge returns.

We note that the cost of capital estimates are those from the four factor model, so strictly speaking they cannot be interpreted as to support the omitted information risk cause for hedge returns. If the cost of capital is higher for a high EQ measure, this could be because the firms in the top portfolio have higher exposure to the four factors or that there is an omitted factor.

These findings for accounting-based and market-based measures are consistent with earlier literature that finds it difficult, if not impossible, to distinguish between these two opposite explanations for hedge returns. They suggest that both reasons apply, although we find structural differences for accounting-based and market-based measures with respect to the relative impact of each cause.

5.3. Sensitivity tests

We run a number of alternative specifications to assess the robustness of our results. Our first test is whether horizons longer than the one-year holding strategy provide similar results. Extending the horizon is sometimes used to corroborate the findings for the explanations for earning excess returns, mispricing of information risk. For example, Landsman, Miller, Peasnell, and Yeh (2011) argue that mispricing is more like a short-term effect and should diminish over time, whereas the model error should be stable. To consider the potential effects of the length of the periods, Table 9 presents two-year and three-year hedge returns.[15]

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[15] Due to data limitations, the two-year returns cannot be calculated for 2007 and the three-year returns cannot be calculated for 2006 and 2007. The reported averages are without these years' results.

[Table 9]

The results show that the results reported in Table 6 are robust to an extension of the holding period. Considering, in particular, the residual-form measure results, again, the same pattern as in Table 6 obtains. However, hedge returns increase for accruals quality ($EQ6^R$) relative to the others. Indeed, hedge returns are highest for $EQ6^R$ and for the adjusted earnings response coefficient measure ($EQ9^R$).

Another test attempts to shed light on the reasons for excess returns. The accrual anomaly is one of the most well-known anomalies in accounting research (Sloan (1996), Richardson, Tuna, and Wysocki (2010)). It is based on the idea that the market does not fully take into account the different persistence of cash flows and accruals. We address the question if the accrual anomaly explains our hedge returns results. To do so, we form three portfolios based on the magnitude of accruals (ACC). The higher the accruals, the stronger should be the accrual anomaly. We run the full analysis for each of the three portfolios and then aggregate their results. Table 10 reports the excess and hedge returns. There is little effect on the results, which indicates that the accrual anomaly is not driving our results.

[Table 10]

To investigate the possibility that the significance of the results is affected by cross-correlated returns we examine mean excess returns aggregated by year (following Mashruwala, Rajgopal, and Shevlin (2006)) and treat them as single observations for each year. This yields 20 observations for each earnings quality measure. Table 11 reports the results. Due to the low number of observations a Wilcoxon signed rank test is used instead of a t-test. Again, the results are similar to those in Table 6, with earnings response coefficients ($EQ7^R$ and $EQ9^R$) yield the highest hedge returns, albeit in different order. The main deviation from earlier results is that the residual-form persistence measure ($EQ1^R$) yields a significantly positive hedge return.

[Table 11]

In untabulated tests, we check if alternative calculations of some of the measures provide different results. We compute the returns in the market-based measures for 15-month windows rather than 12-month windows (beginning three months after the balance sheet date). Furthermore, we repeat the analysis with 30 percent top and bottom portfolios instead of 25 percent. In all of these tests, we find no qualitatively different results. To address potential concerns that the results are driven by the period for which we collect data,[16] we run the tests with shorter periods of the last 15 years (1993 to 2007) and the last ten years (1998 to 2007) and find results that are qualitatively similar to those reported in Table 6 for 20 years. Results indicate that the results are affected by this distinction: they are relatively similar for profitable firms, but insignificant for most measures for loss firms. We also check whether there are non-monotonic relationships between the earnings quality measures and hedge returns. To do so, we run the analyses for portfolios formed of the extreme 40 percent and middle 40 percent of firms. We do not find significant results.

6. Summary

Earnings quality has been used extensively in empirical studies on the effects of accounting standards and other institutional changes. Earnings quality is also at the heart of the objective of standard setters such as the IASB and FASB. Despite its importance, there is little guidance

[16] See, e.g., Core, Guay, and Verdi (2008) who find strong differences for different periods.

which measures are more useful than others. This paper contributes to a better understanding of the usefulness and the performance of earnings quality measures. We study nine different measures, both in raw form and controlling for innate factors: six of them are accounting-based (persistence, predictability, two measures of smoothness, abnormal accruals, and accruals quality), and three are market-based measures (earnings response coefficient, value relevance, and an adjusted earnings response coefficient).

Unlike the broad literature that mainly focuses on capital market consequences of earnings quality, we use capital market data to derive a performance measure, hedge returns, for each individual earnings quality measure. We argue that a measure is (relatively) more useful if a hedge portfolio yields higher hedge returns. The advantage of hedge returns is that they capture two potential reasons for earning excess returns, market mispricing and estimation errors for the cost of capital. Both errors depend on earnings quality, and in both cases, higher hedge returns indicate higher information content of earnings.

Based on a theoretical analysis, we hypothesize that market-based measures are more useful than several accounting-based measures, and that accruals quality is more useful than other accounting-based measures. We test the hypotheses for a large sample of U.S. firms over a twenty-year period from 1988 to 2007. Our findings are broadly consistent with the hypotheses, but not for each specification. We find that market-based measures generally earn higher hedge returns than (most) accounting-based measures and that, in particular, the earnings response coefficients generally yield the highest hedge returns, indicating that it is the most informative earnings quality measure. Accruals quality is also among the measures with the highest hedge returns. Different from the hypotheses, abnormal accruals often yield high hedge returns. On the other hand, persistence, predictability, and smoothness are not useful to earn significant hedge returns.

We also test whether our results are consistent with the market mispricing or the omitted information risk explanation for obtaining hedge returns. For our market-based measures, we find that going long in firms with high earnings quality measures and short in firms with low earnings quality measures yields significant positive hedge returns; this is consistent with the mispricing explanation. In contrast, positive hedge returns obtain for going short in high accounting-based measures, which is more in line with the omitted risk factor explanation. Finally, we perform several robustness checks and find that these results are highly robust.

We note that our hypotheses are relatively broad and usually consist of several sub-hypotheses for the earnings quality measures. Moreover, our significance test for differences in hedge returns is a strict one. This is a bias against finding significant support for the hypotheses. Our earnings quality measures are firm-specific estimates, and they are estimated over a ten-year period. As a consequence, they do not vary heavily over periods and react to changes in the underlying economic factors slowly. Another issue is the level of variation in these factors itself. In our tests, we assume there is a sufficient variation in those factors over the 20 years. One avenue for further research would be to study sub-samples for which the variations are more pronounced or to single out certain changes in a factor that is predicted to change earnings quality and study the impact on the earnings quality measures.

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Table 1: Definition of earnings quality measures

This table describes the earnings quality measures used. *NIBE*: net income before extraordinary items; *CFO*: cash flow from operations; *ACC*: total accruals; *CACC*: current accruals; *PPE*: property, plant and equipment; *ΔREV*: variation in revenues; *ΔAR*: variation in accounts receivable. All the aforementioned variables are scaled by total assets at the beginning of the period. *RET*: 12-month stock return ending three months after the end of the fiscal year; *P* is market price of equity.

The earnings quality measures in residual form, indexed by R, are defined similarly, but are obtained as residuals from the original variables on six innate factors, i.e. *Size*: natural logarithm of total assets; *Operating cycle*: natural logarithm of the sum of days accounts receivable and days inventory; *Intangible intensity*: reported R&D expense divided by sales; *Capital intensity*: net book value of property, plant and equipment divided by total assets; *Growth*: percentage change in sales; *Leverage*: total liabilities divided by equity book value.

Measure	**Description**	**Definition**	**Direct-ion of effect**	**Hypo-thesis**
EQ1, $EQ1^R$	Persistence	Slope coefficient β from $NIBE_{i,t} = \alpha + \beta NIBE_{i,t-1} + \varepsilon_{i,t}$ or $NIBE^R_{i,t} = \alpha + \beta NIBE^R_{i,t-1} + \varepsilon_{i,t}$	+	H1a, H1b, H1c, H2
EQ2, $EQ2^R$	Predictability	R^2 from $NIBE_{i,t} = \alpha + \beta NIBE_{i,t-1} + \varepsilon_{i,t}$ or $NIBE^R_{i,t} = \alpha + \beta NIBE^R_{i,t-1} + \varepsilon_{i,t}$	+	H1a, H1b, H1c, H2
EQ3, $EQ3^R$	Smoothness	Standard deviation ratio $\sigma(NIBE)/\sigma(CFO)$ or $\sigma(NIBE^R)/\sigma(CFO^R)$	– (or +)	H1a, H1b, H1c
EQ4, $EQ4^R$	Smoothness	Correlation $\rho(ACC, CFO)$ or $\rho(ACC^R, CFO^R)$	– (or +)	H1a, H1b, H1c
EQ5, $EQ5^R$	Abnormal accruals	Absolute value of residual from $ACC_{i,t} = \alpha + \beta_1(\Delta REV_{i,t} - \Delta AR_{i,t}) + \beta_2 PPE_{i,t} + \varepsilon_{i,t}$ or $ACC^R_{i,t} = \alpha + \beta_1(\Delta REV_{i,t} - \Delta AR_{i,t}) + \beta_2 PPE_{i,t} + \varepsilon_{i,t}$	+ (or –)	H1a, H1b, H1c
EQ6, $EQ6^R$	Accruals quality	Standard deviation of residual $\varepsilon_{i,t}$ of $CACC_{i,t} = \alpha + \beta_1 CFO_{i,t-1} + \beta_2 CFO_{i,t} + \beta_3 CFO_{i,t+1} + \varepsilon_{i,t}$ or $CACC^R_{i,t} = \alpha + \beta_1 CFO^R_{i,t-1} + \beta_2 CFO^R_{i,t} + \beta_3 CFO^R_{i,t+1} + \varepsilon_{i,t}$	– (or +)	H1c
EQ7, $EQ7^R$	Earnings response coefficient (ERC)	Slope coefficient β from $RET_{i,t} = \alpha + \beta\, NIBE_{i,t}/P_{i,t} + \varepsilon_{i,t}$ or $RET_{i,t} = \alpha + \beta\, NIBE^R_{i,t}/P_{i,t} + \varepsilon_{i,t}$	+	H1a,H2
EQ8, $EQ8^R$	Value relevance	R^2 from $RET_{i,t} = \alpha + \beta\, NIBE_{i,t}/P_{i,t} + \varepsilon_{i,t}$ or $RET_{i,t} = \alpha + \beta\, NIBE^R_{i,t}/P_{i,t} + \varepsilon_{i,t}$	+	H1a,H2
EQ9, $EQ9^R$	Adjusted ERC	$(ERC_{i,t})^2 \cdot Var(NIBE_{i,t})$ or $(ERC^R_{i,t})^2 \cdot Var(NIBE^R_{i,t})$	+	H1a,H2

Table 2: Descriptive statistics of main variables

This table reports the mean, the standard deviation, the 10^{th}, 25^{th}, 50^{th}, 75^{th} and 90^{th} percentile for the main variables used. The sample period spans from 1988 to 2007 and it corresponds to 26,684 firm-year observations for which all the earnings quality measures considered can be computed. *NIBE*: net income before extraordinary items; *CFO*: cash flow from operations; *ACC*: total accruals; *CACC*: current accruals; *PPE*: property, plant and equipment; *ΔREV*: variation in revenues; *ΔAR*: variation in accounts receivable. All the aforementioned variables are scaled by total assets at the beginning of the period. *Size*: natural logarithm of total assets; *Operating cycle*: natural logarithm of the sum of days accounts receivable and days inventory; *Intangible intensity*: reported R&D expense divided by sales (R&D expense is set equal to zero when missing); *Capital intensity*: net book value of property, plant and equipment divided by total assets; *Growth*: percentage change in sales; *Leverage*: total liabilities divided by equity book value.

	Mean	*Std. Dev.*	*10%*	*25%*	*50%*	*75%*	*90%*
NIBE	0.0381	0.1291	-0.0488	0.0123	0.0467	0.0848	0.1319
CFO	0.0753	0.1417	-0.0359	0.0354	0.0844	0.1338	0.1910
ACC	-0.0371	0.0917	-0.1207	-0.0758	-0.0403	-0.0044	0.0469
CACC	0.0115	0.0885	-0.0629	-0.0208	0.0059	0.0388	0.0888
PPE	0.3681	0.2589	0.0930	0.1756	0.3047	0.5077	0.7547
ΔREV	-0.0029	0.0858	-0.0676	-0.0231	0.0000	0.0209	0.0587
ΔAR	-0.0161	0.5404	-0.3133	-0.1105	0.0000	0.1040	0.2695
Size	6.0669	2.1092	3.2671	4.4947	6.0044	7.6273	8.9647
Oper. cycle	4.7812	0.6454	4.0463	4.4531	4.8315	5.1830	5.5005
Intang. int.	0.0360	0.1546	0.0000	0.0000	0.0003	0.0336	0.0929
Capital int.	0.3391	0.2228	0.0884	0.1657	0.2866	0.4682	0.6972
Growth	0.0913	0.2720	-0.1162	-0.0109	0.0623	0.1557	0.3038
Leverage	1.4053	2.6436	0.2638	0.5473	1.1194	1.9112	3.0285

Table 3: Descriptive statistics of earnings quality measures

The table reports the mean, the standard deviation, the 10th, 25th, 50th, 75th and 90th percentiles for the 18 earnings quality measures. Descriptions of the measures are given in Table 1.

	Mean	*Std. Dev.*	*10%*	*25%*	*50%*	*75%*	*90%*
EQ1	0.3602	0.3649	-0.1038	0.1265	0.3793	0.5990	0.7755
EQ2	0.2327	0.2249	0.0063	0.0411	0.1629	0.3720	0.5739
EQ3	0.7284	0.3762	0.2944	0.4475	0.6842	0.9500	1.1970
EQ4	-0.6664	0.3334	-0.9658	-0.9150	-0.7850	-0.5270	-0.1682
EQ5	0.0416	0.0510	0.0039	0.0105	0.0255	0.0537	0.0977
EQ6	0.0416	0.0336	0.0110	0.0191	0.0322	0.0532	0.0842
EQ7	2.4794	5.4473	-1.8971	-0.0014	1.5159	4.1480	8.3164
EQ8	0.1737	0.1863	0.0045	0.0271	0.1074	0.2629	0.4527
EQ9	0.1787	2.2332	0.0002	0.0012	0.0077	0.0404	0.1710
$EQ1^R$	0.0486	0.3490	-0.4025	-0.1924	0.0495	0.2915	0.4954
$EQ2^R$	0.1134	0.1356	0.0023	0.0138	0.0604	0.1660	0.3060
$EQ3^R$	0.6619	0.3518	0.2819	0.4129	0.6120	0.8479	1.0802
$EQ4^R$	-0.7301	0.2847	-0.9690	-0.9273	-0.8285	-0.6344	-0.3567
$EQ5^R$	0.0313	0.0364	0.0031	0.0084	0.0204	0.0412	0.0715
$EQ6^R$	0.0262	0.0199	0.0077	0.0127	0.0208	0.0335	0.0520
$EQ7^R$	2.5578	7.2123	-3.1493	-0.4178	1.5451	4.7577	9.6683
$EQ8^R$	0.1551	0.1733	0.0032	0.0213	0.0899	0.2344	0.4144
$EQ9^R$	0.1096	1.2227	0.0001	0.0007	0.0047	0.0244	0.1068

Table 4: Earnings quality measures – Cross-correlations

The table reports Pearson correlation coefficients among the 18 earnings quality measures. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

	EQ1	EQ2	EQ3	EQ4	EQ5	EQ6	EQ7	EQ8	EQ9
EQ2	0.7472***								
EQ3	0.0813***	0.0511***							
EQ4	0.0626***	0.0383***	0.8402***						
EQ5	-0.0301***	-0.0388***	0.0179***	-0.0177***					
EQ6	-0.0916***	-0.1121***	0.4344***	0.3380***	0.4295***				
EQ7	0.0401***	0.0733***	-0.1318***	-0.1332***	-0.0545***	-0.1205***			
EQ8	-0.0430***	-0.0292***	-0.0607***	-0.0620***	0.0271***	0.0145**	0.3787***		
EQ9	0.0166***	0.0254***	0.0559***	0.1063***	0.0371***	0.0880***	-0.0111*	0.0990***	
EQ1^R	0.3399***	0.2763***	-0.0224***	-0.0298***	-0.0761***	-0.1243***	0.0379***	-0.0319***	-0.0258***
EQ2^R	0.1274***	0.2081***	0.0061	0.0085	-0.0120**	-0.0350***	0.0055	-0.0269***	-0.0077
EQ3^R	-0.0521***	-0.0651***	0.6407***	0.5936***	0.0150**	0.3375***	-0.0957***	-0.0371***	0.0541***
EQ4^R	-0.0570***	-0.0622***	0.5756***	0.6778***	-0.0002***	0.2971***	-0.1014***	-0.0377***	0.1032***
EQ5^R	-0.0567***	-0.0625***	-0.0137**	-0.0220***	0.5731***	0.3695***	-0.0482***	0.0318***	0.0525***
EQ6^R	-0.1145***	-0.1217***	0.3501***	0.3102***	0.3642***	0.7987***	-0.1140***	0.0060	0.0902***
EQ7^R	0.0407***	0.0604***	-0.0654***	-0.0818***	-0.0458***	-0.0906***	0.5575***	0.2122***	-0.0139**
EQ8^R	-0.0251***	-0.0199***	-0.0211***	-0.0274***	0.0058	0.0098	0.1959***	0.5332***	0.0379***
EQ9^R	-0.0026	-0.0022	0.0624***	0.1119***	0.0360***	0.1063***	-0.0443***	0.0505***	0.5937***

	EQ1^R	EQ2^R	EQ3^R	EQ4^R	EQ5^R	EQ6^R	EQ7^R	EQ8^R
EQ2^R	0.2138***							
EQ3^R	0.0420***	0.0332***						
EQ4^R	0.0324***	0.0399***	0.8201***					
EQ5^R	-0.0525***	-0.0070	-0.0231***	-0.0339***				
EQ6^R	-0.0349***	-0.0289***	0.4514***	0.3859***	0.3921***			
EQ7^R	0.0268***	0.0090	-0.0944***	-0.0937***	-0.0426***	-0.1080***		
EQ8^R	-0.0241***	-0.0274***	-0.044***	-0.0354***	0.0190***	0.0071	0.3181***	
EQ9^R	-0.0268***	0.0005	0.0707***	0.1253***	0.0421***	0.1074***	-0.0108*	0.0720***

Table 5: Frequency of annual changes across the different quartiles of earnings quality measures

The table presents the frequency of annual changes across the different quartiles (denoted by *Q*) of the earnings quality measures. The columns of the table refer to the quartile changes (for example, -3*Q* indicates the shift of a firm from the highest quartile to the lowest quartile of an EQ measure).

	-3Q	*-2Q*	*-1Q*	*no change*	*+1Q*	*+2Q*	*+3Q*
EQ1	0.3817%	1.9042%	16.6617%	64.3265%	13.4623%	2.6719%	0.5918%
EQ2	0.4203%	2.9206%	16.2971%	61.7747%	15.5766%	2.6376%	0.4160%
EQ3	0.0986%	0.9435%	11.3008%	76.3091%	10.0742%	1.0979%	0.1244%
EQ4	0.1158%	0.8835%	11.4380%	75.8374%	10.4902%	1.0507%	0.1158%
EQ5	3.2080%	9.7139%	19.8825%	34.6828%	19.9125%	9.4566%	3.2080%
EQ6	0.0043%	0.1072%	6.9349%	87.1553%	5.6783%	0.1801%	0.0043%
EQ7	0.9307%	2.3759%	12.2357%	70.5708%	10.4816%	2.3416%	1.1022%
EQ8	0.8234%	3.5511%	16.4344%	59.1972%	15.2850%	3.8641%	0.9006%
EQ9	0.5876%	2.7705%	15.2635%	65.8833%	12.4673%	2.5089%	0.5833%
$EQ1^R$	0.3731%	1.7970%	13.4451%	67.9890%	14.1528%	2.0543%	0.2273%
$EQ2^R$	0.9135%	4.2287%	17.0777%	55.9506%	16.7646%	4.1729%	0.9435%
$EQ3^R$	0.0300%	0.5318%	10.5159%	78.7794%	9.4523%	0.6047%	0.0386%
$EQ4^R$	0.0343%	0.4289%	10.9234%	78.1233%	9.8941%	0.5189%	0.0214%
$EQ5^R$	3.3581%	10.4473%	19.5179%	33.4949%	19.7667%	10.2029%	3.2594%
$EQ6^R$	0.0043%	0.0686%	6.3259%	87.8544%	5.6997%	0.1029%	0.0000%
$EQ7^R$	0.7377%	1.9042%	10.7990%	73.9246%	10.2672%	1.8270%	0.5618%
$EQ8^R$	0.6304%	3.0879%	15.8125%	61.3244%	15.3579%	3.1222%	0.7119%
$EQ9^R$	0.4417%	2.5475%	14.9247%	66.9383%	12.4759%	2.2859%	0.4503%

Table 6: One-year hedge returns

The table presents one-year mean hedge returns (as described in section 3.2) by earnings quality portfolio. *High EQ* refers to the top quartile portfolio of an earnings quality measure, *low EQ* to the bottom quartile portfolio. The hedge return is computed by going long in the high-EQ portfolio and short in the low-EQ portfolio. The return accumulation period starts three months after the end of the fiscal year and lasts 12 months. A *t*-test for the null hypothesis that the mean hedge return is zero is reported. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

	High EQ	*Low EQ*	*Hedge return*	*t-statistic*
EQ1	-0.7046	2.1576	-2.8622	-3.1121***
EQ2	-1.2062	1.6288	-2.8350	-3.2031***
EQ3	1.3936	0.3647	1.0289	1.0616
EQ4	0.8206	0.3317	0.4889	0.5135
EQ5	1.7594	-0.5545	2.3138	2.4966**
EQ6	1.3536	-0.4963	1.8499	1.9459*
EQ7	1.5865	-0.8897	2.4763	2.8970***
EQ8	1.6131	-0.5559	2.1690	2.4472**
EQ9	1.7703	-0.6010	2.3713	2.5641**
$EQ1^R$	0.8507	-0.2641	1.1147	1.2403
$EQ2^R$	0.1848	0.6045	-0.4197	-0.4578
$EQ3^R$	1.3158	0.6213	0.6945	0.7418
$EQ4^R$	0.9595	0.4084	0.5511	0.5929
$EQ5^R$	1.8214	-0.9378	2.7592	2.9026***
$EQ6^R$	2.0648	-0.8560	2.9208	3.0584***
$EQ7^R$	2.3281	-0.8845	3.2125	3.6749***
$EQ8^R$	1.7877	-0.5774	2.3651	2.5429**
$EQ9^R$	2.6551	-0.7993	3.4544	3.7564***

Table 7: Hedge returns differences across earnings quality measures

The table reports the difference in the absolute hedge returns of one-year hedge returns across the 18 earnings quality measures. Differences are calculated as absolute hedge return of the column EQ minus the absolute hedge return of the row EQ as reported in Table 6. Significance is computed by a *z*-test for the null hypothesis that the difference in hedge returns is zero, based on bootstrapped standard errors. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

	EQ1	EQ2	EQ3	EQ4	EQ5	EQ6	EQ7	EQ8
EQ2	0.0272							
EQ3	1.8333	1.8061						
EQ4	2.3733*	2.3461*	0.5400					
EQ5	0.5484	0.5212	-1.2849	-1.8249				
EQ6	1.0123	0.9851	-0.8210	-1.3610	0.4639			
EQ7	0.3859	0.3587	-1.4474	-1.9874*	-0.1625	-0.6264		
EQ8	0.6932	0.6660	-1.1401	-1.6801	0.1448	-0.3191	0.3073	
EQ9	0.4909	0.4637	-1.3424	-1.8824*	-0.0575	-0.5214	0.1050	-0.2023

	$EQ1^R$	$EQ2^R$	$EQ3^R$	$EQ4^R$	$EQ5^R$	$EQ6^R$	$EQ7^R$	$EQ8^R$
$EQ2^R$	0.6950							
$EQ3^R$	0.4202	-0.2748						
$EQ4^R$	0.5636	-0.1314	0.1434					
$EQ5^R$	-1.6445	-2.3395*	-2.0647	-2.2081**				
$EQ6^R$	-1.8061	-2.5011*	-2.2263**	-2.3697**	-0.1616			
$EQ7^R$	-2.0978*	-2.7928**	-2.518*	-2.6614*	-0.4533	-0.2917		
$EQ8^R$	-1.2504	-1.9454*	-1.6706	-1.8140*	0.3941	0.5557	0.8474	
$EQ9^R$	-2.3397**	-3.0347**	-2.7599**	-2.9033**	-0.6952	-0.5336	-0.2419	-1.0893

Table 8: Cost of equity capital by earnings quality portfolio

The table presents the average cost of equity capital (as described in section 3.2, we consider the cost of equity capital implied by the four-factor model used in the computation of excess returns) by earnings quality portfolio. *High EQ* refers to the top quartile portfolio of an earnings quality measure, *low EQ* to the bottom quartile portfolio. The difference between the average cost of equity capital in the high-EQ and in the low-EQ portfolio is also presented. The return accumulation period starts three months after the end of the fiscal year and lasts 12 months. A *t*-test for the null hypothesis that the mean difference is zero is reported. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

	High EQ	*Low EQ*	*Difference*	*t-statistic*
EQ1	12.4555	12.2493	0.2062	0.7335
EQ2	12.7720	12.1789	0.5931	2.1095**
EQ3	12.8221	12.1039	0.7183	2.4905**
EQ4	12.8728	12.0395	0.8333	2.8963***
EQ5	12.3630	12.4274	-0.0643	-0.2207
EQ6	12.6201	12.2344	0.3856	1.3201
EQ7	11.3304	12.7571	-1.4267	-5.2706***
EQ8	12.1914	12.9441	-0.7528	-2.6922***
EQ9	11.4781	13.2915	-1.8134	-6.3179***
$EQ1^R$	12.3749	12.4887	-0.1138	-0.4040
$EQ2^R$	12.6480	12.6079	0.0401	0.1438
$EQ3^R$	12.9245	12.3468	0.5777	2.0079**
$EQ4^R$	12.9749	12.3360	0.6389	2.2285**
$EQ5^R$	12.5472	12.4339	0.1133	0.3942
$EQ6^R$	12.5998	12.1703	0.4294	1.4936
$EQ7^R$	12.0861	12.5729	-0.4869	-1.7553*
$EQ8^R$	12.6540	12.6407	0.0132	0.0470
$EQ9^R$	12.0554	12.7517	-0.6963	-2.4072**

Table 9: Longer horizon hedge returns

The table presents two- and three-year mean excess returns (as described in section 3.2) by earnings quality portfolio. *High EQ* refers to the top quartile portfolio of an earnings quality measure, *low EQ* to the bottom quartile portfolio. The hedge return is computed by going long in the high-EQ portfolio and short in the low-EQ portfolio. The return accumulation period starts three months after the end of the fiscal year and lasts 24 months (Panel A) or 36 months (Panel B). A *t*-test for the null hypothesis that the hedge return is zero is reported. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Panel A – Two-year hedge returns

	High EQ	*Low EQ*	*Hedge return*	*t-statistic*
EQ1	-0.6214	6.4438	-7.0652	-4.6648***
EQ2	-1.4320	5.5938	-7.0258	-4.9524***
EQ3	4.2810	2.4592	1.8218	1.1926
EQ4	2.8574	2.9256	-0.0683	-0.0460
EQ5	5.2385	1.8593	3.3792	2.2822**
EQ6	6.1265	-0.5923	6.7189	4.5859***
EQ7	5.3888	0.2130	5.1758	3.6991***
EQ8	4.9072	1.6435	3.2637	2.2542**
EQ9	5.4929	1.1218	4.3711	2.8797***
$EQ1^R$	2.2274	2.3498	-0.1224	-0.0872
$EQ2^R$	2.5318	3.4517	-0.9199	-0.6090
$EQ3^R$	3.5649	2.2953	1.2696	0.8963
$EQ4^R$	3.1922	2.2564	0.9359	0.6621
$EQ5^R$	5.5499	0.9230	4.6268	3.0518***
$EQ6^R$	7.0976	-0.4109	7.5085	5.0046***
$EQ7^R$	6.4749	0.6406	5.8343	4.1421***
$EQ8^R$	5.6005	0.5296	5.0708	3.4038***
$EQ9^R$	7.6470	0.3228	7.3242	4.9320***

Panel B – Three-year hedge returns

	High EQ	*Low EQ*	*Hedge return*	*t-statistic*
EQ1	0.9085	10.2217	-9.3132	-4.1645***
EQ2	0.2744	10.3579	-10.0835	-4.6406***
EQ3	8.9887	5.2418	3.7469	1.7339*
EQ4	6.1468	6.1821	-0.0353	-0.0174
EQ5	10.0228	4.2512	5.7716	2.6372***
EQ6	13.0139	-0.4088	13.4226	6.5919***
EQ7	9.8527	2.2985	7.5542	3.6431***
EQ8	9.0486	4.0522	4.9964	2.2515**
EQ9	11.1147	3.1151	7.9997	3.3265***
$EQ1^R$	4.9679	5.5453	-0.5774	-0.3074
$EQ2^R$	4.7139	7.9398	-3.2259	-1.3903
$EQ3^R$	7.1040	5.5010	1.6030	0.7323
$EQ4^R$	7.2240	5.8109	1.4132	0.6373
$EQ5^R$	11.2325	2.8750	8.3574	3.5993***
$EQ6^R$	13.7567	0.2580	13.4987	6.3273***
$EQ7^R$	11.9685	2.5765	9.3919	4.4606***
$EQ8^R$	10.3349	3.4603	6.8745	2.9366***
$EQ9^R$	14.3908	2.8860	11.5047	4.7619***

Table 10: One-year hedge returns – Control for accrual anomaly

The table presents one-year mean excess returns (as described in section 3.2) by earnings quality portfolio. At the end of each year, firms are first assigned to three portfolios based on the magnitude of accruals (ACC). Within each accrual portfolio firms are assigned to the earnings quality portfolios. *High EQ* refers to the top quartile portfolio of an earnings quality measure, *low EQ* to the bottom quartile portfolio. The hedge return is computed by going long in the high-EQ portfolio and short in the low-EQ portfolio. The return accumulation period starts three months after the end of the fiscal year and lasts 12 months. A *t*-test for the null hypothesis that the hedge return is zero is reported. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

	High EQ	*Low EQ*	*Hedge return*	*t-statistic*
EQ1	-0.5290	1.8609	-2.3899	-2.5870**
EQ2	-0.9914	1.5745	-2.5659	-2.9314***
EQ3	1.1797	0.3005	0.8792	0.9101
EQ4	0.8359	0.7515	0.0844	0.0879
EQ5	1.6430	-0.7378	2.3809	2.5144**
EQ6	1.1924	-0.4461	1.6385	1.7113*
EQ7	1.6538	-1.0207	2.6746	3.1644***
EQ8	1.7541	-0.6859	2.4400	2.7264**
EQ9	1.6394	-0.5552	2.1946	2.3620**
$EQ1^R$	0.8491	-0.1472	0.9963	1.1044
$EQ2^R$	0.5210	0.7444	-0.2234	-0.2409
$EQ3^R$	1.1915	0.4824	0.7092	0.7568
$EQ4^R$	0.4660	0.7186	-0.2526	-0.2740
$EQ5^R$	1.0844	-0.7070	1.7914	1.9233*
$EQ6^R$	2.3573	-0.3804	2.7377	2.7857***
$EQ7^R$	2.5068	-0.8338	3.3406	3.7985***
$EQ8^R$	1.4838	-0.8076	2.2915	2.4776**
$EQ9^R$	2.9784	-0.4931	3.4715	3.7021***

Table 11: One-year hedge returns aggregated by year

The table presents one-year mean excess returns (as described in section 3.2) by earnings quality portfolio. Each year is here treated as a single observation: the means and the tests are therefore computed over 20 observations. *High EQ* refers to the top quartile portfolio of an earnings quality measure, *low EQ* to the bottom quartile portfolio. The hedge return is computed by going long in the high-EQ portfolio and short in the low-EQ portfolio. The return accumulation period starts three months after the end of the fiscal year and lasts 12 months. A Wilcoxon signed rank test for the null hypothesis that the median hedge return is zero is reported. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

	High EQ	*Low EQ*	*Hedge return*	*Wilcoxon- z*
EQ1	0.0339	2.2748	-2.2409	-3.0986***
EQ2	-0.0234	1.9621	-1.9856	-3.0239***
EQ3	1.9988	1.5134	0.4854	1.1946
EQ4	1.6763	1.4167	0.2596	0.9706
EQ5	2.3070	1.1561	1.1509	2.6133**
EQ6	1.5027	0.6782	0.8245	2.0533**
EQ7	2.1983	0.6156	1.5827	3.2479***
EQ8	1.8836	1.2934	0.5902	2.0906**
EQ9	1.6764	0.7261	0.9503	2.2773**
$EQ1^R$	2.1061	-0.1402	2.2463	3.9199***
$EQ2^R$	1.3394	1.3176	0.0217	-1.6800
$EQ3^R$	1.8969	1.8469	0.0500	0.6347
$EQ4^R$	1.6699	1.4318	0.2381	1.1200
$EQ5^R$	2.1808	0.6786	1.5022	2.4266**
$EQ6^R$	2.9032	0.2976	2.6056	2.4640**
$EQ7^R$	3.6471	-0.3065	3.9536	3.9199***
$EQ8^R$	2.3763	1.1702	1.2061	2.9119***
$EQ9^R$	3.6716	0.6681	3.0036	3.9199***