Financial Reporting Quality and Idiosyncratic Return Volatility over the Last Four Decades

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Abstract:

Campbell, Lettau, Malkiel and Xu (2001) show that stock returns of individual firms have become more volatile in the U.S. since 1960. We hypothesize and find that two proxies for financial reporting quality– deteriorating earnings quality (using two accrual based measures) and higher dispersion in analysts' forecasts of earnings – are statistically associated with higher idiosyncratic return volatility over the period 1962-2001. These results are robust to controlling for stock return performance, cash flow operating performance, cash flow variability, growth, leverage and firm size. Moreover, the temporal link between idiosyncratic volatility and financial reporting quality persists even after accounting for new listings, high-technology firms and firm-years with losses, mergers and acquisitions and financial distress.

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1. Introduction

Campbell, Lettau, Malkiel and Xu (2001) document an intriguing result – the level of average stock return volatility has increased considerably from 1962 to 1997 in the U.S. Furthermore, most of this increase is attributable to idiosyncratic stock return volatility as opposed to the volatility of the stock market index. In a similar vein, Morck, Yeung and Yu (2000) find that the ratio of idiosyncratic risk to systematic risk has surged over time in the U.S. This upward trend in idiosyncratic volatility has important implications for (i) portfolio diversification; (ii) arbitrageurs, who require substitutes for mispriced stocks with lower idiosyncratic risk; and (iii) the pricing of employee stock options and managerial compensation policies.

In this paper, we explore whether deteriorating financial reporting quality, proxied by earnings quality and dispersion in analyst forecasts of future earnings, can plausibly explain the increase in idiosyncratic volatility over the last four decades.[1] Kothari (2000) points to rising stock return volatility around the globe and wonders whether transparency in financial statement information is related to these trends in stock return volatility. Several practitioner accounting bodies, most notably 'the Jenkins Committee,' contend that the traditional financial statements have lost their usefulness due to the transition of the U.S. economy from a manufacturing to a high-technology, intangible and

[1] There is neither an agreed upon meaning of the terms "financial reporting quality" and "earnings quality" nor a generally accepted approach to measure them. We assume poor earnings quality or poor financial reporting quality is consistent with financial statements that are not transparent. Pownall and Schipper (1999) define transparency as an accounting or disclosure system that "reveals the events, transactions, judgments and estimates underlying the financial statements and their implications." Our proxies (Dechow-Dichev earnings quality measure, absolute abnormal accruals, and analyst forecast dispersion discussed in more detail in Section 3 are intended to capture transparency of financial reporting numbers and voluntary disclosures by management.

information-intensive service oriented economy. Our paper provides evidence consistent with this conjecture.

Recent accounting research that examines the trends in informativeness of accounting numbers has reported mixed findings. Brown, Lo and Lys (1999) and Lev and Zarowin (1999) argue that the relevance of financial statements for stock market participants has declined over time while Collins, Maydew and Weiss (1997), Francis and Schipper (1999) and Landsman and Maydew (2002) conclude that the informativeness of financial statements has either stayed constant or increased over time. These studies generally examine time trends in the cross-sectional association between firms' stock returns (or stock prices) and summary accounting measures such as earnings and book values. In contrast, we focus on different market based measures (the variance of stock returns) and financial reporting quality variables (earnings quality and analyst forecast dispersion) and find that deterioration in financial reporting quality is related to rising idiosyncratic volatility over the last 40 years.

In particular, we investigate whether the upward trend in idiosyncratic volatility is related to (i) earnings quality operationalized in two ways: the extent to which accounting accruals map into operating cash flows as in Dechow and Dichev (2002) (DD), and the absolute value of abnormal accruals (|ABACC|); and (ii) dispersion in analysts' earnings forecasts. The earnings quality measures we consider are based on two distinct but related measurement approaches. The first, the DD measure, is based on Dechow and Dichev (2002) who argue that better the mapping of accounting accruals into past, current and future annual operating cash flows, greater the earnings quality. DD captures the extent to which accruals do not map into cash flows and hence, represents an inverse measure of earnings quality. The |ABACC| measure is based on the Jones' (1991) model of the normal component of accruals. This approach assumes that accruals are determined by fundamental shifts in operating activities of the firm such as revenues and fixed assets and any deviations from such fundamentals are due to managerial manipulation. Therefore, we consider the absolute value of abnormal accruals as an inverse measure of earnings quality, because greater deviations from the accrual model reflect greater earnings management.

We also investigate dispersion in analyst earnings forecasts because greater dispersion in forecasts implies lower predictability of the firm's earnings numbers due to poor information quality. Moreover, analyst forecasts have the advantage of incorporating information beyond that contained in financial statements, such as non-financial measures and disclosures that managers voluntarily communicate to potentially compensate for poor earnings quality.

Using data from 1962 to 2001, we document a noticeable decline in earnings quality (based on increasing DD and |ABACC| over time) and an increase in forecast dispersion over time. To examine whether financial reporting quality is related to idiosyncratic return volatility we conduct two sets of analyses. First, we verify that, in the cross-section, earnings quality and forecast dispersion explain differences in firm specific idiosyncratic volatility. Second, and more pertinent, we investigate whether the time series trend in return volatility is explained by time trends in earnings quality and forecast dispersion. We conduct a time-series analysis because identifying a cross-sectional association between idiosyncratic volatility and financial reporting quality does not automatically imply a time-series relation between these constructs. For example, there is ample evidence on a positive cross-sectional relation between earnings and stock returns. Yet, Kothari, Lewellen and Warner (2006) find a *negative* relation between aggregate returns and aggregate earnings across time. Thus, documenting both the cross-sectional and a time-series association between reporting quality and idiosyncratic risk offers some assurance that the association between time trends in two variables is not spurious.

Consistent with theory (e.g., Diamond and Verrechia 1991; Leuz and Verrechia 2000; Easley and O'Hara 2004 and O'Hara 2003), results from cross-sectional regressions indicate a strong association between idiosyncratic return volatility and financial reporting quality, proxied by both earnings quality and forecast dispersion. These cross-sectional results obtain after controlling for the effects of stock return performance, operating performance, cash flow variability, book-to-market ratio, leverage and firm size. More important, the time-series regressions suggest that the increasing trend in idiosyncratic volatility is associated with a decline in earnings quality and increase in forecast dispersion over time. The time-series evidence obtains after accounting for inter-temporal changes in firms' fundamentals.

Next, we investigate institutional factors and trends in financial reporting practices that might contribute to the time-series association between financial reporting quality and idiosyncratic volatility. We find that the temporal link between idiosyncratic volatility and the two information quality proxies persists even after (i) recognizing the spurt in new listings in the 1980s documented by Fama and French (2004); (ii) accounting for technology-intensive firms where new business models may decrease the quality of accounting information; (iii) identifying firm-years with negative earnings as the increasing incidence of negative earnings may have contributed to the decline in earnings quality over the last several decades (Collins, Pincus and Xie 1999); and (iv) controlling for mergers and acquisitions activity and financial distress.

We make two important contributions to extant finance and accounting literatures. First, we document that earnings quality (based on Dechow Dichev measures and abnormal accruals) and analyst forecast dispersion, our proxies for financial reporting quality, have systematically fallen over the last 40 years. Although we do not claim that falling earnings quality and rising idiosyncratic volatility are necessarily causally related to one another, this provocative finding appears, on the surface, to be consistent with practitioner complaints that financial reports have become more opaque and less relevant over time. Second, we are among the first to empirically identify the role of deteriorating earnings quality and increasing analyst forecast dispersion as important factors associated with the temporal increase in idiosyncratic volatility documented by Campbell et al. (2001). In that sense, we integrate the literature in finance related to time trends in idiosyncratic volatility with the literature in accounting related to time trends in the informativeness of accounting numbers for market participants.

The remainder of the paper proceeds as follows. Section 2 discusses related research and develops the hypothesized relation between financial reporting quality with idiosyncratic volatility. Section 3 discusses the empirical measures for earnings quality (both DD and |ABACC| measures) and analyst forecast dispersion. Section 4 reports the sample selection process, measurement of key variables and descriptive statistics. Section 5 features the results of the cross-sectional and time-series regressions linking idiosyncratic volatility with both earnings quality and analyst forecast dispersion. In

Section 6, we consider several institutional and accounting factors to help explain the time-series trends in idiosyncratic risk and reporting quality. We present our conclusions in Section 7.

2. Related Research and Hypothesis

2.1 Stock return volatility

Campbell et al. (2001) find that the volatility of the stock market has remained relatively constant over the period 1962 to 1997. However, idiosyncratic volatility has increased substantially over this time period to the point where idiosyncratic volatility is the largest component of firm-specific return volatility. Campbell et al. (2001) suggest a number of possible explanations for this phenomenon including increasing leverage, higher incidence of spin-offs of conglomerates, firms issuing stocks earlier in their life-cycles and increase in option-based compensation. We are aware of three papers that explore some of these conjectures. Xu and Malkiel (2003) investigate whether shocks to institutional sentiment explain the idiosyncratic volatility of stock returns. They find that the proportion of institutional ownership is correlated with volatility. Wei and Zhang (2004) find that variation in firm performance over time is related to the inter-temporal variation in idiosyncratic volatility. Irvine and Pontiff (2005) attribute the Wei and Zhang (2004) result to fundamental cash flow shocks on account of rising economy-wide competition. Following Kothari (2000) and O'Hara (2003) we identify deteriorating financial reporting quality as another explanation for the upward trend in idiosyncratic volatility.

2.2 Financial reporting quality and idiosyncratic volatility

Improving disclosures and the quality of financial reporting mitigates information asymmetries about a firm's performance and reduces the volatility of stock prices (Diamond and Verrechia, 1991; Healy, Hutton and Palepu, 1999). An increase in stock return volatility is likely to increase the information asymmetric component of the cost of capital (Leuz and Verrechia (2000), Froot, Perold and Stein (1992)).[2]

In the finance literature, Easley and O'Hara (2004) and O'Hara (2003) posit that a firm's accounting treatment of earnings and its disclosure policy — its financial reporting quality — can influence the firm's information environment (information risk) and consequently, its idiosyncratic volatility and the cost of capital. Francis, LaFond, Olsson and Schipper (2005) and Aboody, Hughes and Liu (2004) use accounting earnings quality as a proxy for information risk and demonstrate that earnings quality is related to expected returns. However, neither paper examines the cross-sectional or time-series relation between the quality of accounting information and idiosyncratic volatility.

Leuz and Verrecchia (2000) examine the consequences of improved disclosure quality on a firm's bid-ask spreads, trading volume and stock-return volatility in the context of German firms that switched from German GAAP to U.S. GAAP or IAS. They hypothesize that German firms switch to an arguably better financial reporting regime, commit to increased disclosure and hence experience a reduction in the asymmetric

[2] Note that the broader question of whether idiosyncratic volatility is priced by the stock market is controversial. For example, Goyal and Santa-Clara (2003) argue that idiosyncratic volatility is associated with returns to the market index while Bali, Cakici, Yan and Zhang (2005) show that the Goyal and Santa-Clara (2003) result is specific to certain time periods and is attributable only to small stocks. Even if idiosyncratic risk were not priced in stock returns, we believe that documenting a link between deteriorating financial reporting quality and increasing stock return volatility is valuable. This is because increasing stock return volatility has important implications for arbitrage opportunities, portfolio diversification and stock option pricing.

component of the cost of capital. The authors find that bid-ask spreads decline and trading volume improves when German firms switch to an international reporting regime.

Pastor and Veronesi (2003) posit that significant uncertainty about a firm's average profitability influences stock return volatility. To the extent that financial reporting quality is poor, uncertainty about a firm's future profitability is likely to be high. Thus, the Pastor and Veronesi (2003) model is also consistent with the hypothesis that poor information quality is associated with increased idiosyncratic volatility.[3]

It is important to emphasize that the above-cited papers argue primarily for a positive association between poor financial reporting quality and idiosyncratic volatility in the *cross-section of firms*. Our focus, however, is on the time-series trends in the two constructs. *A priori*, it is conceivable that despite the existence of a cross-sectional relation, there may be no time-series association between idiosyncratic volatility and deteriorating financial reporting quality. Nevertheless, we test for a cross-sectional association to i) ensure the existence of a systematic relation between the two variables and ii) guard against the charge that we have documented an association between two variables that merely happen to have increasing time trends.

2.3 Related finance research

At first blush, our prediction of a positive time-series association between idiosyncratic volatility and deteriorating financial reporting quality might appear to be somewhat inconsistent with two prominent finance papers— Morck, Yeung and Yu

[3] Both Pastor and Veronesi (2003) and Wei and Zhang (2004) find that idiosyncratic volatility is related to volatility of accounting return on equity. However, these papers do not distinguish between sources of increased uncertainty about a firm's profitability, viz., volatility of cash flow stream as opposed to information about future cash flow volatility arising from the quality of accounting information. Our paper identifies earnings quality as an important determinant of idiosyncratic volatility after controlling for a firm's underlying cash flow or earnings volatility.

(2000) and Jin and Myers (2004) – that document a cross-sectional association between lower stock market synchronicity and higher transparency of financial reporting across countries. Market synchronicity is typically measured as the R^2 of the regression of firm stock returns on the returns to a market index. Note that higher (lower) R^2 from such a market model or higher (lower) market synchronicity would typically imply lower (higher) idiosyncratic volatility relative to total stock return volatility.[4] Morck et al. (2000) and Jin and Myers (2004) find that the U.S. stocks have very low market synchronicity relative to stocks in other developing countries although (i) U.S. accounting standards are generally regarded as more transparent; (ii) the U.S. has more auditors per capita of the population; and (iii) the dispersion of the analysts following the average U.S. firm is lower than those related to firms in developing countries.

Our paper is different from these finance papers in at least four important ways. First, there is no consensus in the finance literature on whether higher market synchronicity and hence lower idiosyncratic volatility is consistent with more or less informative stock prices. Contrary to Morck et al. (2000) and Jin and Myers (2004), Blackwell, Marr and Spivey (1990) use idiosyncratic volatility as a measure of information asymmetry and thus assume that higher idiosyncratic volatility means less informative stock prices. Other examples of papers that interpret greater idiosyncratic volatility as evidence of less informative stock prices include Dierkins (1991), Krishnaswami and Subramaniam (1999), Krishnaswami, Spindt and Subramaniam (1999) and Lee and Liu (2006). The empirical evidence is also consistent with this

[4] However, this assumes that the level of the variance of stock returns is the same across different countries. To the extent the variance of stock returns differs across countries, R^2, which reflects the proportion of the variance of stock returns explained by the market model, may not capture the same construct as the level of idiosyncratic volatility, which is the focus of this paper.

interpretation. Bhagat, Marr and Thompson (1985) find that firms with higher firm-specific daily return volatility have higher equity issuing costs and they argue that firms with greater idiosyncratic volatility are characterized by greater asymmetric information between firm insiders and outsiders. Kelly (2005) finds firms with better information environments are associated with higher market model R-square i.e., smaller idiosyncratic volatility. In supplementary analyses reported in section 5.5, we demonstrate that lower earnings quality is associated with lower earnings response coefficients. Thus, low earnings quality could plausibly be associated with higher idiosyncratic return volatility and less informative stock prices.

Second, as mentioned above, Morck et al. (2000) and Jin and Myers (2004) generally argue that countries with more transparent financial reporting systems would have more firm-specific public information available to all investors, which, in turn, enables investors to make precise predictions regarding firm-specific stock price movements and thus reduces market synchronicity (leading to lower R^2 or higher relative idiosyncratic return volatility). In other words, Morck et al. (2000) and Jin and Myers (2004) assume that publicly available accounting information is unambiguous and completely precise. However, our measure of financial reporting quality — the DD measure and abnormal accruals—although derived from accounting information, does not make that assumption. Instead we argue that when the earnings quality is poor, the stock market knows less about the firm's future cash flows from accounting information, ceteris paribus.

Third, Morck et al. (2000) and Jin and Myers (2004) are designed to exploit institutional differences across countries in property rights and quality of government to explain international differences in market synchronicity. Their objective is not as much to explore intra-country patterns in idiosyncratic volatility and financial reporting, keeping the quality of the government and the property rights environment in that country constant. We are interested, however, in the time-series relation between reporting transparency and idiosyncratic volatility within the U.S. markets, assuming that the property rights in the U.S and the quality of U.S. government is relatively constant over our sample period. Finally, these finance papers compare international differences in stock return volatility over only the 1990s whereas we follow Campbell et al. (2001) to investigate U.S. firms' idiosyncratic volatility over the last 40 years.

2.4 Why should lower earnings quality result in higher stock return volatility?

Our primary premise is that a decline in earnings quality over time is associated with higher stock return volatility. A plausible counterargument is that if earnings become pure noise, there should be no reason to expect any change in return volatility. That is, if a signal is noisier, rational actors should put less weight on that signal and, in the extreme, place zero weight when the signal is pure noise. Consequently, less informative earnings should lead to lower stock return volatility.

We offer two responses. First, it is unlikely that traders would put no weight on noisy earnings and essentially ignore them. If stock prices were fully revealing and not affected by noise at all, then no investor will engage in trading [the "no trade theorem" proposed by Milgrom and Stokey (1982)]. Second, an inherent assumption in the counterargument is that idiosyncratic stock return volatility can arise only due to the arrival of value-relevant information to the stock market. As discussed in section 2.3, this need not be the case. Harris (2003) argues that "fundamental volatility is due to unanticipated changes in instrumental values and transitory volatility is due to trading activity by uninformed traders." Thus, opaque earnings can cause stock return volatility either on account of informed trading or noise in price or both. Related to the informed trading motivation, opaque earnings can make stock prices deviate from fundamental values over time and this, in turn, results in greater stock return volatility. Consistent with this conjecture, we provide evidence in section 5.5 that the temporal increase in stock return volatility around earnings announcements is associated with lower earnings quality. Further, noise trading could also be associated with opaque financial reporting and hence result in higher stock return volatility. For example, Lee (1992) documents that small traders (arguably uninformed) tend to be net buyers around earnings related events. Hedge funds are alleged to trade on the earnings surprise without regard for the "fundamentals" of the stock (Graham, Harvey and Rajgopal 2005).

3. Proxies for financial reporting quality

We consider two proxies for financial reporting quality: earnings quality and analyst forecast dispersion. As mentioned earlier, we employ two measures of earnings quality. The first measure, labeled DD, is derived from Dechow and Dichev (2002) and Francis et al. (2005). The second measure of earnings quality is the magnitude of abnormal accruals, labeled |ABACC| (used in several prior studies such as Warfield et al. 1995, Bowen et al. 2004). These measures are described in greater detail below.

3.1 Earnings quality measure based on Dechow and Dichev (2002)

Our first measure of earnings quality, DD, is based on an approach proposed by Dechow and Dichev (2002) and Francis et al. (2005). The underlying premise of this approach is that earnings quality is primarily determined by the quality of accruals as earnings are composed of the sum of operating cash flows and accruals. The intuition is that accounting accruals either anticipate future operating cash flows or reflect current cash flows or reversals of past cash flows. Measurement error in determining accruals could potentially distort the ability of accruals to anticipate future cash flows or to reflect past and current cash flows. Such measurement error could be the result of unintentional errors arising from business uncertainty and management lapses, or due to intentional estimation errors arising from managerial incentives to manipulate earnings.

The principal idea behind Dechow and Dichev (2002) is to determine the extent of this measurement error in the mapping of accruals and cash flows. The variance of this measurement error can be viewed as an inverse measure of earnings quality. Dechow and Dichev (2002) model the relation between accruals and cash flows as follows (all variables including the intercept are scaled by average assets):

$$TCA_{it} = \phi_0 + \phi_1 CFO_{it-1} + \phi_2 CFO_{it} + \phi_3 CFO_{it+1} + \nu_{it} \qquad (1)$$

where *TCA* is total current accruals calculated as $\Delta CA - \Delta CL - \Delta Cash + \Delta STDEBT$, ΔCA is change in current assets (Compustat # 4), ΔCL is change in current liabilities (Compustat # 5), $\Delta Cash$ is change in cash (Compustat # 1), $\Delta STDEBT$ is change in debt in current liabilities (Compustat # 34). *CFO* is cash flow from operations computed as *IBEX –TCA+DEPN*, where *IBEX* is net income before extra-ordinary items (Compustat # 18), *DEPN* is depreciation and amortization expense (Compustat # 14). Subscripts *i* and *t* are firm and time subscripts respectively.

Under equation (1) higher accrual quality implies that accruals capture most of the variation in current, past and future cash flows and as a consequence the firm-specific residual, ν_{it}, forms the basis of the earnings quality proxy used in the study. Specifically, the earnings quality (DD_{it}) metric is defined as the standard deviation of firm *i*'s residuals, calculated over years t-4 through t i.e., $DD_{it} = \sigma(\nu_{it-4,t})$. We treat larger standard deviations of residuals as an indication of poor accruals and earnings quality.

Francis et al. (2005) and McNichols (2002) suggest that the earnings quality measure derived from (1) can be improved by controlling for two important determinants of accruals, viz., growth in revenues and the level of property, plant and equipment (see also Jones (1991)). So, we augment equation (1) as follows:

$$TCA_{it} = \phi_0 + \phi_1 CFO_{it-1} + \phi_2 CFO_{it} + \phi_3 CFO_{it+1} + \phi_4 \Delta REV_{it} + \phi_5 PPE_{it} + \nu_{it} \quad (1a)$$

where ΔREV is change in revenues (Compustat # 12), *PPE* is gross value of property, plant and equipment (Compustat # 7). We estimate equation (1a) for every firm-year in each of Fama and French's (1997) 49 industry groups where we can find at least 20 firms in year *t*.[5]

3.2 Abnormal accruals (|ABACC|)

As an alternative measure of earnings quality, we consider the absolute value of the firm's abnormal accruals. This measure relies on the idea that changes in a firm's accruals are primarily determined by changes in firm fundamentals particularly, changes in revenues and changes in property, plant and equipment. If a firm's accruals deviate significantly from the level determined by changes in firm fundamentals then such deviations are deemed abnormal and such abnormal accruals are assumed to reduce the quality of accruals and hence, earnings quality.

[5] Consistent with Francis et al. (2005), we winsorize the extreme values of the distribution of the dependent and the independent variables to the 1 and 99 percentiles.

To determine abnormal accruals, we apply Jones' (1991) model, and estimate the following regression for each of Fama and French's (1997) 49 industry groups with at least 20 firms in year t (all variables including the intercept are scaled by average assets).

$$TA_{it} = \delta_0 + \delta_1 \Delta REV_{i,t} + \delta_2 PPE_{it} + \eta_{it} \quad (2)$$

where *TA* = firm i's total accruals, computed as *TCA-DEPN*.[6] The other terms have been defined before.

The industry-and year-specific parameter estimates obtained from equation (2) are used to estimate firm-specific normal accruals (as a percent of average total assets):

$$NA_{i,t} = \hat{\delta}_0 + \hat{\delta}_1 \Delta REV_{i,t} + \hat{\delta}_2 PPE_{it} \quad (2a)$$

where *NA* refers to "normal" accruals. We calculate abnormal accruals, ABACC, in year t as TA_{it} - NA_{it} and treat the absolute value of ABACC as our second proxy for earnings quality. We interpret higher (lower) values of |ABACC| as measures of lower (higher) earnings quality.

An advantage of |ABACC| over DD is that |ABACC| can be computed for annual intervals (and even shorter intervals such as quarters as discussed in section 5.4) whereas DD can be computed only over a five-year moving average window.

3.3 Analysts forecast dispersion

We consider dispersion in analyst forecasts as another proxy for financial reporting quality. Dispersion in analyst earnings forecasts likely indicates a more volatile and a less predictable earnings stream (fundamentals). There are two advantages to considering dispersion in analysts' forecasts over earnings quality measures as a proxy

[6] Research by Kothari, Leone and Wasley (2005) suggest that adjusting for firm performance is important when determining abnormal levels of accruals. In sensitivity analysis (unreported) we estimate equation (2) after controlling for firm performance proxied by return on assets and use the resultant abnormal accruals in all our empirical tests and find that the inferences are unchanged.

for financial reporting quality. First, analysts likely incorporate both financial statement information and soft information such as earnings guidance and other voluntary disclosures made by management. Earnings quality measures, on the other hand, only consider firm fundamentals from hard financial data (e.g., earnings, cash flows, revenues). Second, analysts' forecast dispersion is likely to incorporate private information about the firm's earnings gathered by diligent or smart analysts whereas earnings quality is based solely on public information, if information acquisition activities by analysts compensates for lower earnings quality.

A significant drawback related to the dispersion measure is that analysts are likely to avoid covering small, illiquid firms and hence, the composition of the sample is unavoidably tilted towards large stocks. We measure forecast dispersion (DISP) as the ratio of standard deviation of analysts' earnings forecast to the absolute value of mean forecast for the fiscal year. In determining DISP we only consider forecasts issued by analysts during the three months following the month after the end of the prior fiscal year. This ensures that the earnings forecasts used in determining the dispersion are made with foreknowledge of the annual earnings of the previous fiscal year. Also, we consider only the last available forecast for each analyst so as to avoid duplicate forecasts in constructing the dispersion measure.

4. Sample, variable measurement and descriptive statistics

4.1 Sample

We use three samples for conducting the data analyses in this paper: (i) the Dechow-Dichev (DD) sample; (ii) the abnormal accruals (|ABACC)| sample, and (iii) the analyst forecast dispersion (DISP) sample. The DD sample and the |ABACC| sample spans the time-period 1962-2001 and is created from the intersection of stock return volatility data from the CRSP database, which includes firms from NYSE, AMEX and NASDAQ, and accounting data from COMPUSTAT. Eliminating firms with missing data to calculate both stock return volatility and the DD measure leaves a sample of 95,270 observations. The |ABACC| sample, due to fewer variable requirements in estimating abnormal accruals, is slightly larger than the DD sample and consists of 103,589 observations. The DISP sample is drawn from the intersection of CRSP, COMPUSTAT and analyst forecast data from Zacks database. The DISP sample is much smaller (24,477 observations) than the other two samples for three reasons: (i) the Zacks database contains analyst forecast data only from 1978, (ii) not all firms in the DD and |ABACC| sample have analyst coverage and, (iii) we require at least three analysts to cover a firm in any period.

4.2 Measurement of Variables

We compute two measures of stock return volatility: VAR^{raw} and VAR^{Rmadj}. VAR^{raw} refers to the average monthly variance of raw returns for firm *i* in year *t*. Monthly variance of raw returns is computed as the sample variance of daily raw returns within a month, multiplied by the number of trading days in the month. VAR^{Rmadj} refers to the average monthly variance of market-adjusted returns, where we measure market-adjusted returns as the excess of daily stock return for firm *i* over the daily return on the value-weighted market portfolio. Consistent with prior work (e.g., Campbell et al. 2001) we use returns from the in-sample value-weighted market portfolio, as opposed to the value-weighted index provided in the CRSP dataset. However, our inferences are unchanged if we use the CRSP value-weighted index.

Consistent with Campbell et al. (2001), we adopt a simple market-adjustment procedure where value-weighted market returns are subtracted from the firm's returns. We do not attempt to adjust for market return based on the firm's CAPM beta (or even more sophisticated adjustments based on the SMB and HML loadings proposed by Fama and French 1993) because such adjustments for daily returns tend to be unstable over time. Moreover, results in Xu and Malkiel (2003) suggest that adjusting for Fama and French (1993) factors has virtually no effect on the time-series trends in idiosyncratic return volatility. Results in the forthcoming tables are based on VAR^{Rmadj}. However, we have re-estimated all regressions with VAR^{Raw} and find no change in the reported inferences.

In analyzing the relation between idiosyncratic stock return volatility and reporting quality, we control for several variables that are posited to influence idiosyncratic return volatility in the cross-section.

Cash flow volatility:

Vuolteenaho (2002) shows that firm level stock returns are a function of both expected return news and unexpected cash flow news. In other words, idiosyncratic return volatility is related to the variance of cash flows. Hence, we control for the conditional variance in cash flow news via the variance of cash flows (VCFO).[7] We measure VCFO for each firm-year as the variance of annual operating cash flows scaled by total assets over the trailing five year window for that firm. The relation between VCFO and stock return volatility is expected to be positive.

[7] Our inferences are unaltered if we use the variance of earnings (scaled by assets or book value of equity) instead of variance of cash flows.

Operating performance:

Hanlon, Rajgopal and Shevlin (2004) find that operating performance, defined either as earnings or operating cash flows scaled by total assets, is negatively associated with stock return volatility in the cross-section. Therefore, we introduce CFO, computed as cash flows scaled by average total assets, as a control variable.[8]

Stock return performance:

Duffie (1995), among others, observes that stock return performance is negatively related to return volatility. We define firm stock returns (RET) as annual buy-and-hold returns.

Size:

Pastor and Veronesi (2003) show that small firms experience higher return volatility. Hence, we control for firm size, where SIZE is the natural logarithm of market capitalization. Market values are determined three months after the end of fiscal year to ensure that stock prices reflect all available financial accounting information for that fiscal year.

Book-to-market:

We expect a negative relation between book-to-market and idiosyncratic return volatility because firms with greater growth opportunities are likely to be experience greater stock return volatility. We measure book-to-market as the ratio of book value of

[8] Our inferences are unchanged if we use accounting return on assets (ROA) or accounting return on equity (ROE) instead. Callen and Segal (2004) extend Voulteenaho's (2002) variance decomposition framework to document that in addition to cash flow news, information about accruals explain return volatility. In untabulated results, we control for accrual volatility in all our empirical specifications and find that none of our inferences change.

equity, defined as total assets (Compustat # 6) minus total liabilities (Compustat #181), divided by the market value of equity.[9]

Leverage:

Levered firms are more likely to experience financial distress suggesting a positive association between stock-return volatility and financial leverage in the cross-section. We define financial leverage (LEV) as the ratio of long-term debt (Compustat #9 + Compustat #34) to book value of total assets (Compustat #6).

4.3 Descriptive Statistics

Table 1 presents summary information for the variables used in the study. Results indicate that the average monthly idiosyncratic volatility, based on either raw or market adjusted returns, is about 4%. The average firm has a market capitalization of $75 million (untabulated), a book-to-market ratio of about 0.99, significant operating cash flows as a percentage of total assets (5%) and financial leverage of 24% of total assets.[10]

In order to examine time-trends in return volatility and proxies for financial reporting quality, we divide the entire sample period into ten four-year sub-periods. For the DISP sample, however, we have six sub-periods as analyst forecasts are available only since 1978. Panel A of Table 2 presents average idiosyncratic return volatility, earnings quality (both DD and |ABACC| measures) and forecast dispersion across the various sub-periods. Consistent with prior research, we find that idiosyncratic volatility has grown by a factor of six over the last four decades, from 1.13% in the 1962-1965

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[9] We do not use common equity (COMPUSTAT#60) as our measure of book equity because this data item contains many missing values until 1966 (see Collins, Maydew and Weiss 1997).

[10] To control for potential outliers, we winsorize the financial statement variables in the extreme 1% of the respective distributions. We do not winsorize idiosyncratic volatility to stay consistent with Campbell et el. (2001). However, in untabulated analyses, we verified that idiosyncratic volatility, when winsorized at the 1% and 99% levels, yields inferences similar to those tabulated in the paper.

time window to about 7.22% in the 1998-2001 window.[11] The last two decades, in particular, have witnessed a big increase in idiosyncratic return volatility. The DD measure of earnings quality measure has tripled over the last four decades rising from 2.01 in the 1962-1965 time frame to 5.96 in the 1998-2001 time-window. The |ABACC| measure of earnings quality has increased from 4.45 in the 1962-1965 window to 6.84 in the 1998-2001 window. This implies a significant decline in earnings quality as higher DD and |ABACC| signify poorer earnings quality. However, the rate of the increase in DD and |ABACC| over time is more evenly distributed over time. Note that analyst forecast dispersion has almost doubled over the last two decades, from 10.91 in 1978-1981 to 19.43 in 1998-2001. Much of the increase in forecast dispersion is concentrated in the early 1980s. There is a noticeable increase in the number of firms over time for both the earnings quality and the DISP samples. Due to data restrictions discussed earlier, the size of the analyst sample is generally only about a third of the earnings quality sample.

To provide a visual representation of the data in Table 2, we present the time-series trends in idiosyncratic volatility, DD, |ABACC| and DISP in Figure 1. Consistent with prior work, idiosyncratic volatility has been on the rise. More important, the upward trends in both earnings quality measures and forecast dispersion point to a time-series relation between idiosyncratic volatility and proxies for reporting quality. For a more rigorous analysis of the underlying relation between return volatility and reporting quality we conduct several empirical tests detailed below.

[11] The trend is very similar when we consider variance of raw returns.

5. Empirical tests of the relation between idiosyncratic volatility and financial reporting quality

5.1 Cross-sectional tests

We begin with a set of cross-sectional regressions of idiosyncratic volatility on three proxies of reporting quality, DD, |ABACC| and DISP, after incorporating the control variables discussed in section 4.2. Although the primary focus of the paper is the time-series association between idiosyncratic volatility and financial reporting quality, it is useful and important to demonstrate the existence of cross-sectional relation between idiosyncratic return volatility. At the outset, we estimate a simple regression that relates return volatility with both earnings quality and forecast dispersion:

$$VAR_{it} = \omega_0 + \omega_1 EQ_{i,t-1} + \omega_2 DISP_{i,t-1} + \zeta_{it} \qquad (3)$$

We use the label "EQ" to imply that either the DD or the |ABACC| measure applies to the argument. Note that EQ and DISP are lagged by one year relative to VAR to avoid picking up mere contemporaneous associations between idiosyncratic volatility and proxies for reporting quality. We estimate equation (3) as a pooled cross-sectional and time-series regression, for the two earnings quality measures separately. To control for auto-correlation in error terms we use the Generalized Method of Moments Procedure that incorporates the Newey and West (1987) auto-correlation correction. For sub-periods between 1962 and 1977 we do not have analyst forecast dispersion data and hence, we estimate equation (3) without the DISP measure for those four sub-periods.

Results of estimating equation (3) using DD (|ABACC|) measure are presented in Panel B (Panel C) of Table 2. Results in panel B indicate that the coefficient on DD is positive and statistically significant across all sub-periods. This suggests that poor earnings quality is associated with greater firm-level return volatility. We also document a positive association between DISP and return volatility incremental to the role of DD. In panel C, where we substitute |ABACC| in place of DD our inferences are unchanged. Thus, lower earnings quality and higher forecast dispersion are associated with higher idiosyncratic return volatility in the cross-section across various sub-periods. Results are unchanged when we estimate a modified version of equation (3) that includes the control variables identified in section 4.2.

5.2 Pooled cross-section and time-series tests

The results presented in section 5.1 demonstrate the existence of a cross-sectional association between idiosyncratic volatility and proxies for financial reporting quality. In this section we assess (i) whether idiosyncratic return volatility has increased over time; and (ii) whether such an increase is associated with decreases in reporting quality. For this, we employ a dataset of pooled cross-sectional and time-series observations.

We begin with the result that idiosyncratic volatility has increased over time, represented by a positive β_1 in equation (4) below:

$$VAR_{it} = \beta_0 + \beta_1 TIME_{i,t} + \varepsilon_{it} \tag{4}$$

where TIME is a time trend variable that takes on values from 1 to 40 for each of the years 1962 to 2001 in the sample.[12] The key hypothesis in the paper is that the link between idiosyncratic volatility and time is associated with proxies for reporting quality:

$$\beta_1 = \delta_0 + \delta_1 EQ_{i,t-1} + \delta_2 DISP_{i,t-1} + \eta_{it} \tag{5}$$

Substituting (5) into (4) yields the following model specification applied to a dataset consisting of pooled cross-sectional time-series observations:

$$VAR_{it} = \lambda_0 + \lambda_1 TIME_{i,t} + \lambda_2 TIME_{i,t} * EQ_{i,t-1} + \lambda_2 TIME_{i,t} * DISP_{i,t-1} + \varepsilon_{it} \tag{6}$$

[12] For the DISP sample where data is available for 24 years from 1978-2001 the TIME variable ranges from 1 to 24.

We augment equation (6) with controls for potential omitted variables that might affect the temporal link between time and idiosyncratic risk and estimate the following specification:

$$
\begin{aligned}
VAR_{it} = {} & \lambda_0 + \lambda_1 TIME_{i,t} + \lambda_2 TIME_{i,t} * EQ_{i,t-1} + \lambda_3 TIME_{i,t} * DISP_{i,t-1} + \lambda_4 TIME_{i,t} * CFO_{i,t-1} \\
& + \lambda_5 TIME_{i,t} * VCFO_{i,t-1} + \lambda_6 EQ_{i,t-1} + \lambda_7 DISP_{i,t-1} + \lambda_8 CFO_{i,t-1} + \lambda_9 VCFO_{i,t-1} + \lambda_{10} BM_{i,t-1} \\
& + \lambda_{11} SIZE_{i,t-1} + \lambda_{12} LEV_{i,t-1} + \lambda_{13} RET_{i,t} + \varepsilon_{it}
\end{aligned}
\quad (7)
$$

As before, we estimate equation (7) using the GMM procedure with Newey and West (1987) correction for autocorrelation for three lags.

Consistent with prior research, we predict a positive coefficient on TIME. We interact time with four variables in (7): EQ, DISP, CFO and VCFO. If deterioration in earnings quality explains the increasing trend in idiosyncratic volatility, we expect a positive coefficient on TIME*EQ. Similarly, if increases in analyst forecast dispersion over time are associated with increases in idiosyncratic volatility, we expect a positive coefficient on the interaction of TIME with forecast dispersion (TIME*DISP). The interactions of TIME with CFO and VCFO consider the possibility that time-trends in cash flow performance and variability of cash flows are potential competing explanations for increases in return volatility. We also include main effects for EQ, DISP, CFO and VCFO to control for cross-sectional differences in these variables over the sample period.[13]

We estimate equation (7) using both earnings quality measures (DD and |ABACC|) with and without the forecast dispersion variable. Results are presented in Table 3. In the discussion of results that follow we focus on the DD measure (columns 1

[13] Our inferences are unaffected if we do not include the main effects. Further, in an untabulated sensitivity check, we include TIME interaction terms for SIZE, BM and LEV and find that our inferences are unaltered even after including those additional interaction terms.

and 2) as the results for the |ABACC| measure (columns 3 and 4) are similar. As expected, the coefficient on TIME*DD reported in column (1) is positive (coefficient = 0.020) and significant (t = 10.38) suggesting that part of the temporal increase in idiosyncratic volatility is associated with decreases in earnings quality. Further, this result obtains after controlling for other plausible explanations for time-trend in volatility such as decreases in firm performance captured by TIME*CFO and increases in cash flow volatility TIME*VCFO. Consistent with prior work by Wei and Zhang (2004) we find that poor performance is associated with an increase in idiosyncratic risk.

Results for the analyst forecast sample further reinforce the importance of reporting quality in explaining the increasing time-series trend in return volatility. In column (2), the coefficient on TIME*DISP is positive (coefficient = 0.029) and statistically significant (t = 3.36). The effect of DISP on return volatility is incremental to the positive coefficient on TIME*DD (coefficient = 0.016, t = 7.89). Further, the positive coefficients on TIME*|ABACC| and TIME*DISP in column (2) reinforce the point that decreases in earnings quality (proxied by |ABACC| in panel B) and increases in forecast dispersion are likely explanations for the increasing trend in idiosyncratic volatility.

5.3 Firm fixed effects analysis

Readers may be concerned that inferences about the association between time-trends of information quality and return volatility in section 5.2 are based on a pooled-cross-section and time-series regression where multiple annual observations for the same firm are used. While the Newey and West (1987) autocorrelation correction mitigates such concerns, we examine the robustness of our results by estimating a fixed-effects version of equation (7) where every firm in the sample and every year in the sample is assigned a dummy variable. Results (unreported) from the fixed-effects model, however, suggest that the positive coefficients on TIME*DD, TIME*|ABACC| and TIME*DISP are robust.

5.4 Pure time-series tests

Estimating equation (7) using a pooled cross-sectional time-series dataset, as in section 5.2, has the advantage of significant statistical power to test our hypothesis that the secular upward trend in idiosyncratic volatility is related to a similar secular trend in reporting quality. A potential disadvantage of using a pooled dataset is the possibility of spurious cross-sectional correlations affecting inferences about the time-series relation. For example, idiosyncratic volatility and proxies for financial reporting quality could be related in the cross-section without displaying any time-series associations (although Figure 1 and Table 2 would suggest otherwise). To guard against the possibility that pooled cross-sectional time-series design potentially induces a spurious significant coefficient on the *TIME*DD* (or *|ABACC|*) and *TIME*DISP* variables while estimating equation (7), we also conduct a pure time-series test to relate VAR_t with $|ABACC|_t$ and $DISP_t$.

A limitation of the time-series test conducted over annual time intervals is the potential small sample size (n= 40 years) and the consequent low statistical power. To increase statistical power, we conduct the time-series tests using quarterly time intervals. We restrict our analysis to the |ABACC| earnings quality measure because the DD measure cannot be easily constructed on a quarterly basis. Because quarterly data for determining accruals is not available until 1976 from COMPUSTAT and analyst forecasts are only available since 1978 from the Zacks database, we use data available for 94 quarters starting from the third quarter of 1978 to the fourth quarter of 2001.

In particular, we estimate time-series regressions of the following type:

$$VAR_t = \theta_0 + \theta_1 TIME_t + \theta_2 |ABACC|_{t-1} + \theta_3 DISP_{t-1} + \theta_4 CFO_{t-1} + \theta_5 VCFO_{t-1} + \theta_6 BM_{t-1} + \theta_7 SIZE_{t-1} + \theta_8 LEV_{t-1} + \theta_9 RET_t + \kappa_t \quad (8)$$

where VAR_t is equally-weighted average variance of daily market-adjusted returns measured every quarter, and $|ABACC|_{t-1}$ is equally-weighted average |ABACC| measured every quarter. Abnormal accruals are estimated using the procedure described in section 3.2 except that we rely on quarterly data. DISP is measured using analyst forecasts available during the time period spanning two months before and one month after the end of each fiscal quarter. As before, we consider only the last available forecast for each analyst in constructing the dispersion measure. The other independent variables in (8) represent equally-weighted quarterly averages.

The regression error-terms from equation (8) are likely to be auto-correlated with conditional heteroscedasticity. Hence, we employ GMM based t-statistics that use Newey-West (1987) type corrections (up to three lags) for auto correlation. The regression results reported in Table 4. Column (1) reports the results where we consider only the earnings quality measure |ABACC| along with the control variables. The evidence indicates a clear time-series association between VAR and |ABACC| (coefficient on |ABACC| is 4.425, t-statistic = 4.17). The results also suggest a positive time-series association between VAR and DISP (coefficient on DISP is 0.151, t-statistic = 2.46) when considered without the inclusion of |ABACC|. When |ABACC| and DISP are considered together in column (3), DISP loses significance perhaps due to collinearity with |ABACC| (correlation between DISP and |ABACC| is 0.58, $p < 0.01$). However, the link between VAR and |ABACC| is still positive and significant (coefficient on |ABACC| is 4.429, t-statistic = 3.90). Thus, there is reliable evidence of a time-series based association between a downward trend in earnings quality and a concurrent increase in idiosyncratic return volatility.

The results from the time-series tests serve to underscore that a cross-sectional association between idiosyncratic risk and financial reporting quality in cross-section (reported in section 5.2) does not mechanically imply a time-series association as well. For example, in the cross-section, SIZE exhibits a very significant negative association with idiosyncratic risk (t-statistics ranging from -30.06 to -39.96 in Table 3), suggesting that smaller firms have more volatile stock returns. However, the time-series relation between idiosyncratic risk and size in the time-series results is a modest positive (t-statistics range from 0.98 to 1.62), suggesting that both idiosyncratic return volatility and firm size have increased over time.

5.5 Do poor accruals mean less informative earnings and greater stock return volatility?

Our tests document an increase in stock return volatility and a concurrent decrease in earnings quality. We rely on the implicit premise that earnings have become less informative over time to interpret the documented temporal association between poor earnings quality and higher stock return volatility as evidence that a decline in earnings quality leads to volatile stock prices. In this section, we provide evidence on this implicit premise by investigating whether lower earnings quality, as measured by our proxies DD and |ABACC|, is reflected in lower earnings response coefficients and greater return volatility around earnings announcements.

First, we modify the empirical specification in Ryan and Zarowin (2003) as follows:

$$ABRET_{it} = \gamma_0 + \gamma_1 EARN_{i,t} + \gamma_2 TIME_{i,t} * EARN_{i,t} + \gamma_3 TIME_{i,t} * EARN_{i,t} * EQ_{i,t-1} + \xi_{it} \quad (9)$$

where ABRET is annual abnormal return, measured as fiscal period raw return adjusted for value weighted market return and EARN is annual income before extraordinary items for the year scaled by market value of equity at the beginning of the fiscal year.

Table 5, panel A shows that the coefficient on TIME*EARN is negative suggesting that contemporaneous earnings-returns association has fallen over time consistent with findings in Ryan and Zarowin (2003). More important, the coefficient on TIME*EARN*EQ is also negative suggesting that the decline in earnings response coefficients is associated with a fall in earnings quality (recall that higher EQ reflects lower earnings quality). Thus, our evidence is consistent with poor accruals quality leading to less informative earnings.

To provide additional evidence on this issue we next examine stock return volatility around earnings announcements. Landsman and Maydew (2002) document that abnormal return volatility around earnings announcements (measured as the return volatility surrounding earnings announcement days scaled by volatility around non-announcement days) has increased over time and they interpret this time trend as consistent with an increase in the informativeness of quarterly earnings. We extend their work to examine whether decreasing earnings quality could plausibly explain the increased return volatility around earnings announcement dates. In particular, we estimate the following empirical specification:

$$EVAR_{it} = \gamma_0 + \gamma_1 TIME_{i,t} + \gamma_2 TIME_{i,t} * EQ_{i,t-1} + \xi_{it} \quad (10)$$

where EVAR is return volatility surrounding earnings announcement days scaled by average monthly return volatility during the year. Specifically, we compute the variance of market-adjusted returns for the seven days surrounding an earnings announcement and average this variance across all the earnings announcements for a firm-year. We then scale this by the average monthly variance of market-adjusted returns for the firm-year. In computing the average monthly variance we exclude the seven days surrounding earnings announcements. As described previously, TIME and EQ are time trend variables and proxies for earnings quality respectively.

Results of estimating equation (10) are presented in Panel B of Table 5. Consistent with Landsman and Maydew (2002) we find that the time trend variable, TIME, is positive and statistically significant suggesting an increase in earnings announcement window return volatility over time. However, when we introduce the interactive term of time trend variable with earnings quality proxies, TIME*EQ, the time trend variable loses its significance. More important, the coefficient on the interaction term is positive and strongly significant suggesting that declining earnings quality is an important contributor to the increasing return volatility around earnings announcements over time.[14]

[14] Although we do not claim a causal relation between increasing volatility and decreased earnings quality, we acknowledge that the direction of causality could be reversed. That is earnings management may increase in volatile times. For example, Cohen, Dey, and Lys (2005) document that earnings management increased dramatically in the 1999-2003 period which was characterized by a runaway bull market, several accounting scandals and the passage of the Sarbanes-Oxley act.

6. Can institutional and accounting factors explain the time-series relation between idiosyncratic volatility and financial reporting quality?

In this section we examine whether specific institutional and accounting factors can explain time-trends in both idiosyncratic risk as well as financial reporting quality. We consider only the pooled time-series cross-sectional analysis discussed in section 5.2 because incorporating proxies for institutional factors such as new listings or loss firms into a pure time-series analysis is difficult.

6.1 New listings

Research by Wei and Zhang (2004) attributes most of the upward trend in return variance to new listings. Recall that the descriptive statistics reported in Table 1 show a steady increase in the number of stocks in the sample. It is quite plausible that newly listed firms are associated with poorer reporting quality and also contribute to most of the stock return volatility in the sample. In other words, the link between idiosyncratic volatility and reporting quality documented thus far may very well be driven by new listings.

To explore this conjecture, we create a constant sample of firms. In particular, we require a firm to exist for at least 25 (12) years in the earnings quality (forecast dispersion) sample. In other words, the constant DD (DISP) sample excludes any new firms that have listed on the exchanges in the 25 (12) years prior to 2001. This sample filter reduces the DD (DISP) sample from the original 95,270 (24,477) observations to 28,327 (12,027) observations. To conserve space, we only tabulate and discuss results related to the smaller DISP sample where we can employ both the EQ and DISP proxies. Untabulated results related to the EQ sample yield inferences similar to those reported for DISP. Results of estimating equation (7) for this relatively “constant sample” are presented in column (1) of both panels of Table 6. To be consistent with previous tables, we present results for both the DD and DISP samples in panel A and for the |ABACC| and DISP samples in panel B. In panel A, the results suggest that the coefficient on TIME*DD continues to be positive and statistically significant in column (1) of panel A and B. However, the coefficient on TIME*DISP though positive (coefficient = 0.012) is only weakly significant (t=1.73). Recall that TIME*DISP is introduced in the model incremental to TIME*DD, which is strongly significant (t=5.25). The positive coefficients on TIME*|ABACC| and on TIME*DISP in column (1) of panel B are consistent with the results reported in panel A. Hence, we conclude that the observed relation in trends in idiosyncratic volatility and reporting quality is not solely attributable to newly listed firms.

6.2 Technology firms

Amir and Lev (1996) and Francis and Schipper (1999) argue that reported earnings of high-technology firms may fail to recognize items that have future cash flow implications due to the application of Generally Accepted Accounting Practices (GAAP). For example, GAAP requires firms to expense R&D outlays although such outlays, in expectation, likely yield future cash flows for several years into the future. Because accruals for high-technology firms may fail to accurately reflect future cash flows relative to other firms, earnings quality for high-technology firms is likely to be relatively poor. Moreover, due to the inherent uncertainty associated with the future cash flows of high-technology firms, earnings forecasts of analysts are more likely to be dispersed. Chan, Lakonishok and Sougiannis (2001) also find that R&D intensive firms experience greater stock return volatility relative to other firms. Given the increasing number of high-technology firms in recent times, it is quite plausible that the relation between poor earnings quality and idiosyncratic volatility is driven by high-technology firms.

To investigate this hypothesis, we estimate equation (7) after removing firms that belong to high-technology industries. Specifically, we remove firms in the 14 three-digit SIC codes (283, 357, 360-368, 481, 737 and 873) identified as technology-intensive industries by Francis and Schipper (1999). This reduces the DISP sample to 18,981 observations.

Results presented in column (2) of Table 6 suggest that the positive association between return volatility and proxies for reporting quality persists even when high technology firms are removed from the sample. In particular, for the sample without high-technology firms, the coefficient on both TIME*DD and TIME*DISP are positive and statistically significant. The same conclusion obtains when TIME*|ABACC| and TIME*DISP are considered in column (2) of panel B.

6.3 Loss firms

Collins, Pincus and Xie (1999) and Givoly and Hayn (2000) document a monotonic increase in the frequency of losses over the last five decades. Increased losses reflect either lower operating cash flows or significant negative accruals or a combination of the two. If losses are predominantly driven by negative accruals as opposed to lower operating cash flows, then the DD and |ABACC| measures are likely to be higher reflecting poorer earnings quality. Moreover, firms that report losses experience greater bid-ask spreads (Ertimur 2004). Therefore, we explore whether the increase in the proportion of losses drives our findings. Hence, we eliminate firm-years with negative earnings and re-estimate equation (7).

Results presented in column (3) of Table 6 suggest that even after excluding loss firms, the coefficients on the interactions TIME*DD and TIME*DISP (TIME*|ABACC| and TIME*DISP) are positive and statistically significant in panel A (B). Therefore, the increasing frequency of losses in recent years cannot fully explain our results.[15]

6.4 Mergers and acquisitions and foreign currency translation

For the two accruals-based measures of accounting quality reported earlier, we rely on changes in balance sheet accounts to measure accruals because the sample period spans a period prior to SFAS No. 95 when cash flow statements were first required (1988). As Hribar and Collins (2002) point out, one potential problem with such a measure is that mergers and acquisitions (M&A), divestitures and foreign currency translation can introduce measurement error into balance sheet estimates of accruals. For instance, consider the Dechow and Dichev measure of accruals quality where we regress accruals in period t on cash flows from operations for periods t-1, t and t+1. Because of the way purchase accounting works and because cash flow statement restated data are not readily available, reported cash flows from operations for periods t-1 and t+1 are likely measured for a different entity than the entity used to measure accruals in period t when a firm is involved in mergers and acquisitions. This means that firms active in mergers and acquisitions will exhibit higher residuals (less accruals quality) simply because of changes in the reporting entity over time. Furthermore, there is reason to believe that M&A, divestitures and foreign currency translation can contribute to increased return

[15] Dechow and Dichev (2002) show that firms with longer operating cycle will have lower accrual and earnings quality. Hence, we also include an interaction term of TIME with operating cycle and re-estimate equation (7) and find no change in our inferences. The interaction term, TIME*Operating Cycle, is positive but only weakly significant.

volatility, thus causing a spurious correlation between the accruals-based measures of earnings quality and idiosyncratic risk.

To address this potential confound, we (i) recalculate accruals for both the accrual quality measures, since 1988, using SFAS 95 cash flows as per Hribar and Collins (2002); and (ii) we eliminate firms that have experienced M&A transactions as reported in COMPUSTAT annual footnote code #1, divestitures (COMPUSTAT data item 66) or foreign currency translations (COMPUSTAT data item 150). The resulting inferences, reported in column (4) of Table 6, panels A and B, remain substantively similar to the main results in the paper.

6.5 Distress risk

Another competing explanation for the results is that distress risk is likely related to idiosyncratic return volatility and such risk might have increased over time. To address this issue, we use the Altman-Z scores (ALTZ) for every firm-year to measure a firm's distress risk. Specifically, we eliminate firms in the extreme lowest quintile of ALTZ and re-estimate equation (7).[16] As shown in column 5 of Table 6, the results indicate that even after eliminating firms with greater distress risk the temporal association between earnings quality and return volatility is robust.

6.6 Combined analysis

In Table 7, we estimate a modified version of equation (7) that integrates the five explanations explored individually earlier (new listings, technology firms, loss making and distressed firms) into one specification via the use of interaction terms on TIME*EQ, TIME*DISP and TIME*|ABACC|. For example, for TIME*EQ, we add the following

[16] We compute ALTZ consistent with prior research as follows: ALTZ = 1.2 * (data179/data6) + 1.4* (data36/data6) + 3.3 *(data18+data16+data15)/data6 + 0.6 * (data199*data25)/data181 +data12/data6. All data item numbers referred above are COMPUSTAT data items.

five interaction terms: TIME*EQ*AGE, TIME*EQ*HITECH, TIME*EQ*LOSS. TIME*EQ*M&A and TIME*EQ*ALTZ. AGE is defined as the number of years since the first day for which we can find a stock price in the CRSP tapes, HITECH is a dummy variable that is set to one (zero otherwise) if the firm-year belongs to the high technology SIC codes defined in section 5.6.2,LOSS is a dummy variable that is set to one (zero otherwise) if the firm-year reports negative earnings, M&A is a dummy variable that is set to one (zero otherwise) if the firm experiences a merger, acquisition, divestiture or foreign currency translations, ALTZ is the Altman Z score. If these five variables together explain the relation between time trends in earnings quality and time trends in idiosyncratic volatility then the main interaction effect on TIME*EQ and TIME*DISP would become insignificant.

Results presented in all columns of Table 7 show that the coefficient on TIME*DD continues to be positive and significant even after simultaneously controlling for the five explanations. The coefficient on TIME*DISP is weakly significant although note that such weak significance is driven by the correlation between TIME*DD and TIME*DISP. On balance, it appears as though the positive association between proxies for reporting quality and idiosyncratic stock return volatility is found even after accounting for new listings, high-technology, losses, M&A activity and financial distress.

6.7 Changes analysis

Although the above analysis controls for a wide variety of potentially omitted firm characteristics that might account for the temporal relation between return volatility and accruals quality, endogeneity is always a concern in studies such as this. Because accounting method choices are endogenous, we recognize that the relations documented in this paper are likely to be driven by underlying firm characteristics that determine firms' accounting choices rather than poor earnings quality. One way to address endogeneity concerns is to conduct a "changes" analysis. That is, if a decline in earnings quality drives the increase in idiosyncratic risk over time, then firms with the largest decrease (increase) in earnings quality over time should exhibit the greatest increase (decrease) in idiosyncratic returns. Therefore, we modify the "levels" specification in equation (7) to a "changes" specification, where in we regress annual changes in idiosyncratic stock return volatility on changes in the EQ, by itself, and interacted with a time trend variable along with changes in other economic determinants.

In the results presented in Table 8 we continue to find a positive association between changes in idiosyncratic stock return volatility and changes in financial reporting quality over time although the results are slightly weaker for the reduced sample where we include forecast dispersion as a measure of earnings quality. Overall, we are able to document that firms with the greatest declines in earnings quality over time are associated with the greatest increases in stock return volatility.

6. Conclusions

Recent work in the finance literature finds that idiosyncratic volatility has increased substantially over the last four decades. In this paper, we investigate whether changes in financial reporting quality can explain this trend in return volatility. We use two proxies for capturing reporting quality: earnings quality (proxied by Dechow-Dichev measure of earnings quality and the absolute value of abnormal accruals) and analyst forecast dispersion. We find that, in the cross section, both these proxies are systematically related to return volatility. More importantly, earnings quality has deteriorated over the last 40 years and dispersion in analysts' forecasts of earnings has also increased considerably over that period. Furthermore, these trends in earnings quality and dispersion in analyst forecasts exhibit a strong positive statistical association with the time-trend in return volatility. The positive association persists even after controlling for newly listed firms and after accounting for technology-intensive firms and firm-year observations with negative earnings, merger activity and financial distress.

Note that we do not claim to have found causal links between increasing return volatility and declining earnings quality. However, we believe our findings have implications for policy-makers, investors and managers with the usual caveat that drawing policy implications from statistical relations is inherently problematic. First, identifying the reasons for the temporal trends in idiosyncratic volatility and reporting quality can help rule makers and investors decide what (if anything) should be done to address the situation. The temporal links between volatility and information quality could have also been affected by several recent legislative events. Three examples include Regulation FD, which bans selective disclosure by management to analysts, the 1995 Securities Litigation Reform Act that lowers penalties for managers to disclose forward-looking information and the Sarbanes-Oxley rules that increase punitive costs associated with accounting earnings management.

Second, understanding the reasons for the temporal shift in return volatility can help investors identify better diversification strategies. If deteriorating earnings quality is responsible for increased volatility, investors may improve their diversification strategies by focusing on firms with higher reporting quality. Finally, managers may care about changes in idiosyncratic risk to the extent it has implications for asset pricing.

Controversial recent work by Goyal and Santa-Clara (2003) finds that, contrary to conventional wisdom, idiosyncratic risk is relevant for asset pricing. Hence, managers may have incentives to improve reporting quality for their firms so as to reduce the firm's cost of capital. Whether the temporal trend between worsening financial reporting quality and increased stock return volatility increases firms' cost of capital over time would be an interesting question for future research.

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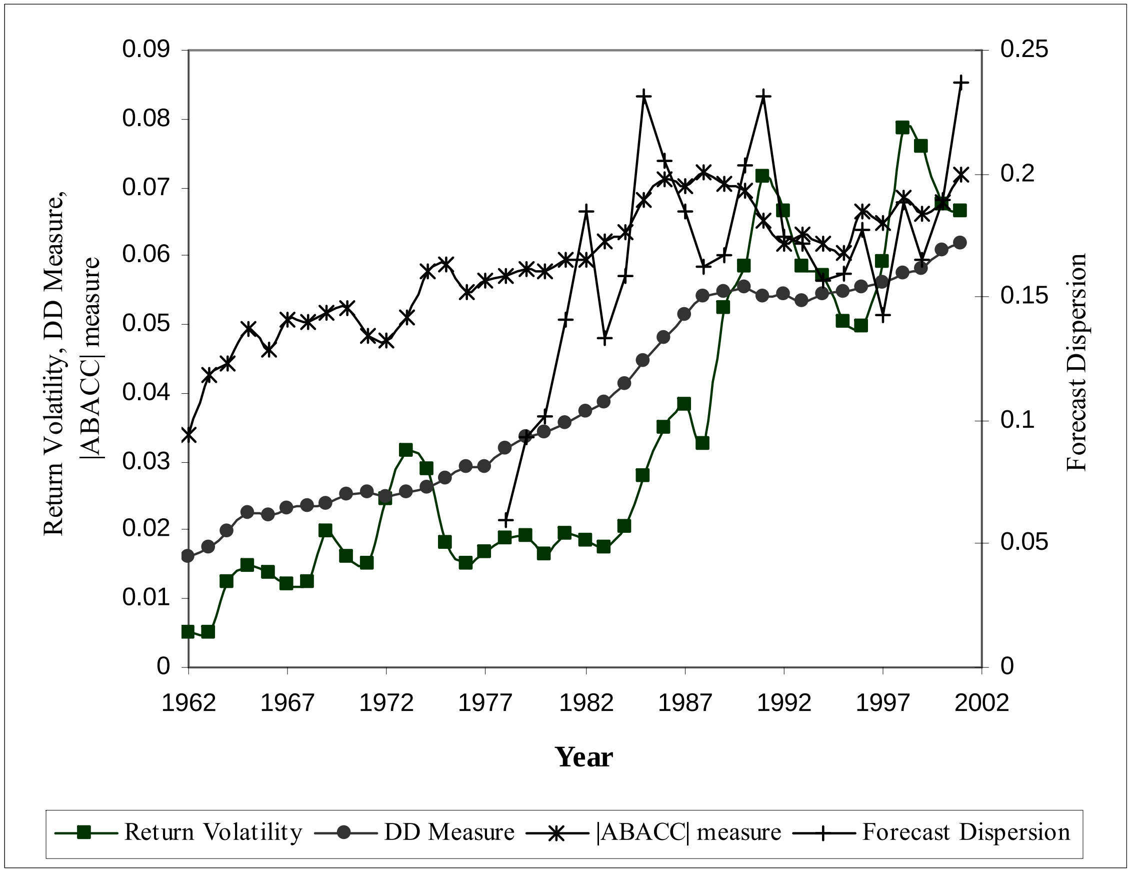
Figure 1

Average Return Volatility, Earnings Quality, Absolute Discretionary Accruals and Forecast Dispersion over time



The above figure plots the average return volatility, DD measure, |ABACC| measure and forecast dispersion for the period 1962-2001. The forecast dispersion graph spans 1978-2001 because analyst forecasts are available only from 1978. Return Volatility refers to the average monthly variance of market-adjusted returns for each fiscal year, where we measure market adjusted returns as the excess of daily firm stock return over the daily return on the value-weighted market portfolio. DD measure is calculated from the modified version of the Dechow and Dichev (2002) model. |ABACC| measure is the absolute value of abnormal accruals determined using Jones (1991) model. A detailed description of these two earnings quality measures is provided in section 3 of the text. Forecast dispersion is measured as the standard deviation of analyst forecasts scaled by the absolute value of mean earnings forecasts. Forecast dispersion is measured using forecasts during the three months following the month after the end of the prior fiscal year.

Table 1

Summary Statistics

Variable	Mean	Median	Std dev	Q1	Q3
VAR^{Raw} (*100)	4.18	1.74	14.00	0.80	3.91
VAR^{Rmadj} (*100)	4.11	1.66	14.00	0.77	3.78
DD (*100)	4.47	3.18	4.15	1.83	5.59
|ABACC| (*100)	6.43	4.16	7.09	1.81	8.39
DISP (*100)	17.58	5.59	41.59	2.69	13.86
CFO	0.05	0.07	0.16	0.01	0.13
VCFO	8.58	6.39	7.77	3.68	10.81
BM	0.99	0.67	1.46	0.37	1.14
SIZE	4.32	4.13	2.12	2.75	5.76
LEV	0.24	0.23	0.18	0.09	0.36
RET (*100)	16.16	5.33	76.48	-20.80	35.82

The sample consists of 95270 (103589) observations for the DD and |ABACC| samples while the forecast dispersion sample has 24477 observations. Descriptive statistics for control variables (CFO, VCFO, SIZE, BM, LEV, RET) are reported using the DD sample of 95270 observations. VAR^{raw} refers to the average monthly variance of raw returns for a fiscal year. Monthly variance of raw returns is computed as the sample variance of daily raw returns within a month, multiplied by the number of trading days in the month. VAR^{Rmadj} refers to the average monthly variance of market-adjusted returns for a fiscal year, where we measure market adjusted returns as the excess of daily firm stock return over the daily return on the value-weighted market portfolio. DD measure is calculated from the modified version of the Dechow and Dichev (2002) model. |ABACC| measure is the absolute value of abnormal accruals determined using Jones (1991) model. A detailed description of these two earnings quality measures is provided in section 3 of the text. DISP is analyst forecast dispersion measured as the standard deviation of analyst forecasts scaled by the absolute value of mean earnings forecasts. For this calculation, forecasts during the three months following the month after the end of the prior fiscal year are used. CFO is operating cash flows scaled by average total assets. VCFO is variance of operating cash flows scaled by average total assets over the trailing five years. BM is book-to-market ratio. SIZE is natural logarithm of market value of equity. Market value of equity is measured three months after the fiscal year end. LEV is financial leverage computed as the ratio of long-term debt to total assets. RET is annual buy-and-hold return. Variables VAR^{raw}, VAR^{Rmadj}, RET, DD, |ABACC|, DISP have been multiplied by 100 for expositional convenience.

Table 2

Time Series Trends in Idiosyncratic Volatility, Earnings Quality and Forecast Dispersion

Panel A: Descriptive statistics over time

Variable	1962-1965	1966-1969	1970-1973	1974-1977	1978-1981	1982-1985	1986-1989	1990-1993	1994-1997	1998-2001
VAR (*100)	1.13	1.48	2.31	1.95	1.85	2.09	3.97	6.38	5.40	7.22
DD (*100)	2.01	2.32	2.53	2.81	3.38	4.04	5.21	5.43	5.52	5.96
|ABACC| (*100)	4.45	5.00	4.98	5.68	5.80	6.34	7.10	6.48	6.34	6.84
N	2000	3804	6811	9196	10853	10062	10599	12485	14255	15205
DISP (*100)					10.91	17.73	17.90	19.42	15.93	19.43
N					1721	2547	3622	4853	5877	5857

Panel B: Cross-sectional relation between idiosyncratic volatility, earnings quality (defined as the DD measure) and forecast dispersion over time

$$VAR_{it} = \omega_0 + \omega_1 EQ_{i,t-1} + \omega_2 DISP_{i,t-1} + \zeta_{it} \qquad (3)$$

Variable	1962-1965	1966-1969	1970-1973	1974-1977	1978-1981	1982-1985	1986-1989	1990-1993	1994-1997	1998-2001
EQ = DD	0.372	0.302	0.452	0.372	0.126	0.159	0.217	0.189	0.206	0.317
	(12.28)	(22.12)	(18.17)	(20.44)	(8.06)	(10.73)	(9.36)	(19.36)	(18.72)	(16.19)
DISP					0.009	0.006	0.007	0.007	0.011	0.014
					(4.66)	(6.60)	(8.74)	(6.98)	(9.87)	(10.12)
R^2	14.24%	14.94%	8.98%	9.67%	11.13%	18.22%	21.11%	10.40%	16.78%	13.38%
N	2000	3804	6811	9196	1721	2547	3622	4853	5877	5857

Table 2 (continued)

Panel C: Cross-sectional relation between idiosyncratic volatility, earnings quality (defined as the |ABACC| measure) and forecast dispersion over time

$$VAR_{it} = \omega_0 + \omega_1 EQ_{i,t-1} + \omega_2 DISP_{i,t-1} + \zeta_{it} \qquad (3)$$

Variable	1962-1965	1966-1969	1970-1973	1974-1977	1978-1981	1982-1985	1986-1989	1990-1993	1994-1997	1998-2001
EQ = |ABACC|	0.100	0.059	0.091	0.074	0.034	0.053	0.056	0.072	0.086	0.146
	(7.65)	(13.77)	(10.43)	(20.44)	(7.44)	(7.85)	(8.31)	(11.12)	(13.18)	(13.05)
DISP					0.009	0.007	0.009	0.008	0.012	0.016
					(4.65)	(7.41)	(10.46)	(7.47)	(10.41)	(10.52)
R^2	6.27%	4.96%	2.67%	2.60%	9.38%	14.84%	11.50%	6.34%	10.70%	9.15%
N	2530	4023	7179	10231	1721	2547	3622	4853	5877	5857

The sample consists of 95270 (103589) observations for the DD and |ABACC| samples while the forecast dispersion sample has 24477 (24245) observations. VAR refers to the average monthly variance of market-adjusted returns for a fiscal year, where we measure market adjusted returns as the excess of daily firm stock return over the daily return on the value-weighted market portfolio. Monthly variance is computed as the sample variance within a month, multiplied by the number of trading days in the month. DD measure is calculated from the modified version of the Dechow and Dichev (2002) model. |ABACC| measure is the absolute value of abnormal accruals determined using Jones (1991) model. A detailed description of these two earnings quality measures is provided in section 3 of the text. DISP is analyst forecast dispersion measured as the standard deviation of analyst forecasts scaled by the absolute value of mean earnings forecasts. For this calculation, forecasts during the three months following the month after the end of the prior fiscal year are used. In Panel A, the descriptive statistics of variables VAR, DD, |ABACC|, and DISP have been multiplied by 100 for expositional convenience. T-statistics are presented in parentheses.

Table 3
Results from Regression of Idiosyncratic Volatility that Captures Trends over the period 1962-2001 and Interactions of Trend with Proxies of Reporting Quality

$$VAR_{it} = \lambda_0 + \lambda_1 TIME_{i,t} + \lambda_2 TIME_{i,t} * EQ_{i,t-1} + \lambda_3 TIME_{i,t} * DISP_{i,t-1} + \lambda_4 TIME_{i,t} * CFO_{i,t-1} + \lambda_5 TIME_{i,t} * VCFO_{i,t-1} + \lambda_6 EQ_{i,t-1} + \lambda_7 DISP_{i,t-1} + \lambda_8 CFO_{i,t-1} + \lambda_9 VCFO_{i,t-1} + \lambda_{10} BM_{i,t-1} + \lambda_{11} SIZE_{i,t-1} + \lambda_{12} LEV_{i,t-1} + \lambda_{13} RET_{i,t} + \varepsilon_{it} \quad (7)$$

	EQ = DD measure		EQ = |ABACC| measure	
	WITHOUT DISP	WITH DISP	WITHOUT DISP	WITH DISP
	(1)	(2)	(3)	(4)
Intercept	0.046	0.024	0.045	0.024
	(21.02)	(21.85)	(22.98)	(21.53)
TIME	0.001	0.001	0.002	0.001
	(16.60)	(16.02)	(25.15)	(18.75)
TIME*EQ	0.020	0.016	0.008	0.003
	(10.38)	(7.89)	(6.82)	(4.44)
TIME*DISP		0.029		0.034
		(3.36)		(3.77)
TIME*CFO	-0.004	-0.003	-0.005	-0.003
	(-11.86)	(-8.74)	(-11.49)	(-6.94)
TIME*VCFO	0.003	-0.000	0.005	0.004
	(4.32)	(-0.15)	(7.64)	(4.56)
EQ	-0.335	-0.161	-0.152	-0.020
	(-7.05)	(-5.17)	(-6.18)	(-1.98)
DISP		0.002		0.002
		(2.02)		(1.48)
CFO	0.068	0.030	0.076	0.024
	(7.38)	(5.31)	(7.19)	(4.01)
VCFO	-0.078	0.038	-0.111	-0.006
	(-4.26)	(2.65)	(-6.41)	(-0.46)
BM	-0.081	-0.028	-0.112	-0.039
	(-1.22)	(-1.46)	(-1.81)	(-2.03)
SIZE	-0.012	-0.004	-0.014	-0.004
	(-36.55)	(-30.10)	(-39.96)	(-30.06)
LEV	0.026	-0.005	0.025	-0.007
	(7.87)	(-4.32)	(7.48)	(-5.64)
RET	-0.003	-0.004	-0.003	-0.004
	(-2.11)	(-5.71)	(-2.79)	(-5.43)
R^2	9.73%	33.01%	9.63%	33.01%
N	95270	24477	103589	24245

Table 3 (continued)

The sample consists of 95270 (103589) observations for the DD and |ABACC| samples while the forecast dispersion sample has 24477 (24245) observations. VAR refers to the average monthly variance of market-adjusted returns for a fiscal year, where we measure market adjusted returns as the excess of daily firm stock return over the daily return on the value-weighted market portfolio. Monthly variance is computed as the sample variance within a month, multiplied by the number of trading days in the month. DD measure is calculated from the modified version of the Dechow and Dichev (2002) model. |ABACC| measure is the absolute value of abnormal accruals determined using Jones (1991) model. A detailed description of these two earnings quality measures is provided in section 3 of the text. DISP is analyst forecast dispersion measured as the standard deviation of analyst forecasts scaled by the absolute value of mean earnings forecasts. For this calculation, forecasts during the three months following the month after the end of the prior fiscal year are used. CFO is operating cash flows scaled by average total assets. VCFO is variance of operating cash flows scaled by average total assets over the trailing five years. BM is book-to-market ratio. SIZE is natural logarithm of market value of equity. Market value of equity is measured three months after the fiscal year end. LEV is financial leverage computed as the ratio of long-term debt to total assets. RET is annual buy-and-hold return. TIME is a time trend variable that takes on the value 1..N representing each of the years in the sample. Coefficients BM and TIME*DISP has been multiplied by 100 for expositional convenience. T-statistics are presented in parentheses.

Table 4

Results from Time-Series Regressions that relate Idiosyncratic Return Volatility with Reporting Quality

$$VAR_t = \theta_0 + \theta_1 TIME_t + \theta_2 | ABACC |_{t-1} + \theta_3 DISP_{t-1} + \theta_4 CFO_{t-1} + \theta_5 VCFO_{t-1} + \theta_6 BM_{t-1} + \theta_7 SIZE_{t-1} + \theta_8 LEV_{t-1} + \theta_9 RET_t + \kappa_t \quad (8)$$

	Including |ABACC| Only	Including DISP only	Including both |ABACC| and DISP
	(1)	(2)	(3)
Intercept	-0.402	-0.310	-0.402
	(-3.95)	(-2.58)	(-3.98)
TIME	0.032	0.052	0.032
	(1.57)	(2.03)	(1.51)
|ABACC|	4.425		4.429
	(4.17)		(3.90)
DISP		0.151	-0.001
		(2.46)	(-0.01)
CFO	-3.115	-1.948	-3.116
	(-4.85)	(-2.87)	(-4.75)
VCFO	0.692	2.673	0.688
	(0.61)	(2.20)	(0.59)
BM	0.099	0.117	0.099
	(2.76)	(2.71)	(2.77)
SIZE	0.023	0.018	0.023
	(1.62)	(0.98)	(1.61)
LEV	0.635	0.305	0.636
	(2.69)	(1.16)	(2.57)
RET	-0.070	-0.075	-0.070
	(-2.49)	(-2.41)	(-2.46)
R^2	63.33%	55.43%	62.93%
N	94	94	94

The sample consists of 94 quarterly observations from the third quarter of 1978 to the fourth quarter of 2001. All variables are averages across firms in each quarter. VAR refers to the quarterly variance of market-adjusted returns, where we measure market adjusted returns as the excess of daily firm stock return over the daily return on the value-weighted market portfolio. Quarterly variance is computed as the sample variance within a quarter, multiplied by the number of trading days in the quarter. |ABACC| measure is the absolute value of abnormal accruals determined using Jones (1991) model from quarterly data. A detailed description of |ABACC| is provided in section 3 of the text. DISP is analyst forecast dispersion measured as the standard deviation of analyst forecasts scaled by the absolute value of mean earnings forecasts. For this calculation, forecasts available during the period spanning two months before and one month after the end of each fiscal quarter are considered. CFO is operating cash flows scaled by average total assets. VCFO is variance of operating cash flows scaled by average total assets over the trailing five years. BM is book-to-market ratio. SIZE is natural logarithm of market value of equity. Market value of equity is measured three months after the fiscal year end. LEV is financial leverage computed as the ratio of long-term debt to total assets. RET is quarterly buy-and-hold return. TIME is a time trend variable that takes on the value from 1to 94 representing each of the quarters in the sample. T-statistics are presented in parentheses.

Table 5
Earnings quality and Earnings Informativeness

Panel A: Results from Regression of Abnormal Stock Returns on Earnings, a Time Trend and Interaction with Proxies of Reporting Quality

$$ABRET_{it} = \gamma_0 + \gamma_1 EARN_{i,t} + \gamma_2 TIME_{i,t} * EARN_{i,t} + \gamma_3 TIME_{i,t} * EARN_{i,t} * EQ_{i,t-1} + \xi_{it} \qquad (9)$$

	EQ = DD measure	EQ = |ABACC| measure
Intercept	0.020	0.022
	(7.17)	(7.68)
EARN	0.732	0.816
	(15.36)	(15.95)
TIME*EARN	-0.023	-0.028
	(-9.21)	(-12.21)
TIME*EARN*EQ	-0.047	-0.017
	(-1.92)	(-1.74)
R^2	0.28%	0.29%
N	95270	103589

Panel B: Results from Regression of Return Volatility around Earnings Announcements on Time Trend and Interaction with Proxies of Reporting Quality

$$EVAR_{it} = \gamma_0 + \gamma_1 TIME_{i,t} + \gamma_2 TIME_{i,t} * EQ_{i,t-1} + \xi_{it} \qquad (10)$$

	EQ = DD measure		EQ = |ABACC| measure	
Intercept	-0.059	-0.069	-0.068	-0.049
	(-1.29)	(-1.51)	(-1.54)	(-1.10)
TIME	0.004	0.002	0.004	0.000
	(2.48)	(1.20)	(2.88)	(0.30)
TIME*EQ		1.416		0.052
		(3.90)		(7.84)
R^2	0.01%	0.03%	0.01%	0.09%
N	73737	73737	79822	79822

The sample consists of 95270 (103589) observations for the DD and |ABACC| samples. Lack of availability of earnings announcement dates reduces the sample for Panel B to 73737 (79822) observations. DD measure is calculated from the modified version of the Dechow and Dichev (2002) model. |ABACC| measure is the absolute value of abnormal accruals determined using Jones (1991) model. A detailed description of these two earnings quality measures is provided in section 3 of the text. ABRET is annual abnormal return measured as raw return adjusted for value weighted market return. EARN is income before extraordinary items scaled by market value of equity at the beginning of the year. TIME is a time trend variable that takes on the value 1..N representing each of the years in the sample. EVAR is annual average variance of market-adjusted returns during the week surrounding the earnings announcement scaled by the average monthly variance of market-adjusted returns during non-announcement days. We measure market adjusted returns as the excess of daily firm stock return over the daily return on the value-weighted market portfolio. Monthly variance is computed as the sample variance (excludes returns on any days surrounding the earnings announcement) within a month, multiplied by the number of trading days in the month.

Table 6

Results from Regression of Idiosyncratic Volatility that Captures Trends over the period 1962-2001 and Interactions of Trend with Proxies of Reporting Quality Exploring Alternative Explanations

$$VAR_{it} = \lambda_0 + \lambda_1 TIME_{i,t} + \lambda_2 TIME_{i,t} * EQ_{i,t-1} + \lambda_3 TIME_{i,t} * DISP_{i,t-1} + \lambda_4 TIME_{i,t} * CFO_{i,t-1} + \lambda_5 TIME_{i,t} * VCFO_{i,t-1} + \lambda_6 EQ_{i,t-1} + \lambda_7 DISP_{i,t-1} + \lambda_8 CFO_{i,t-1} + \lambda_9 VCFO_{i,t-1} + \lambda_{10} BM_{i,t-1} + \lambda_{11} SIZE_{i,t-1} + \lambda_{12} LEV_{i,t-1} + \lambda_{13} RET_{i,t} + \varepsilon_{it} \quad (7)$$

Panel A: EQ = DD measure

	Constant sample	Low-Tech Sample	Profit firms	Sample excluding firms with M&A, discontinued /foreign operations	Sample excluding firms with extreme distress risk
	(1)	(2)	(3)	(4)	(5)
Intercept	0.016	0.025	0.024	0.025	0.025
	(18.37)	(21.65)	(26.02)	(20.54)	(19.17)
TIME	0.000	0.001	0.001	0.001	0.001
	(4.94)	(14.52)	(10.52)	(13.18)	(13.74)
TIME*EQ	0.009	0.013	0.014	0.014	0.016
	(5.25)	(6.86)	(7.03)	(6.37)	(7.06)
TIME*DISP	0.012	0.019	0.036	0.027	0.033
	(1.73)	(1.95)	(2.92)	(2.82)	(3.44)
TIME*CFO	-0.001	-0.004	-0.001	-0.004	-0.004
	(-1.90)	(-10.55)	(-4.14)	(-8.36)	(-8.18)
TIME*VCFO	0.003	0.001	0.001	0.001	-0.000
	(3.76)	(1.06)	(1.33)	(0.46)	(-0.39)
EQ	-0.080	-0.143	-0.136	-0.128	-0.151
	(-3.72)	(-4.96)	(-4.73)	(-3.75)	(-4.24)
DISP	0.003	0.003	0.003	0.002	0.002
	(3.53)	(2.63)	(1.79)	(1.78)	(1.33)
CFO	0.004	0.039	0.008	0.029	0.037
	(0.64)	(7.69)	(2.29)	(4.70)	(5.38)
VCFO	0.0071	0.026	0.026	0.032	0.038
	(0.50)	(1.86)	(2.16)	(2.07)	(2.20)
BM	0.010	0.033	-0.061	-0.000	0.003
	(0.50)	(1.37)	(-4.87)	(-1.50)	(0.13)
SIZE	-0.002	-0.004	-0.003	-0.004	-0.004
	(-22.30)	(-29.52)	(-32.27)	(-28.38)	(-27.93)
LEV	-0.004	-0.000	-0.009	-0.005	-0.000
	(-5.71)	(-0.12)	(-9.64)	(-3.81)	(-0.27)
RET	-0.002	-0.007	-0.004	-0.003	-0.004
	(-4.55)	(-10.62)	(-4.98)	(-4.20)	(-4.78)
R^2	29.13%	30.82%	30.87%	33.44%	32.59%
N	12027	18981	21238	19756	19582

Table 6 (continued)

Panel B: EQ = |ABACC| measure

	Constant sample	Low-Tech Sample	Profit firms	Sample excluding firms with M&A, discontinued /foreign operations	Sample excluding firms with extreme distress risk
	(1)	(2)	(3)	(4)	(5)
Intercept	0.015	0.025	0.023	0.025	0.025
	(17.57)	(21.44)	(-25.99)	(17.76)	(19.16)
TIME	0.000	0.001	0.001	0.001	0.001
	(6.20)	(16.40)	(13.23)	(15.30)	(16.26)
TIME*EQ	0.004	0.003	0.002	0.004	0.004
	(2.25)	(3.70)	(3.76)	(4.64)	(4.20)
TIME*DISP	0.012	0.018	0.036	0.029	0.038
	(1.74)	(1.92)	(2.91)	(3.08)	(3.88)
TIME*CFO	-0.001	-0.004	-0.001	-0.003	-0.004
	(-1.57)	(-10.29)	(-4.14)	(-7.18)	(-6.61)
TIME*VCFO	0.007	0.005	0.005	0.004	0.003
	(8.49)	(5.89)	(7.01)	(4.26)	(3.01)
EQ	0.014	-0.020	-0.006	-0.026	-0.023
	(1.73)	(-2.00)	(-0.80)	(-2.22)	(-2.00)
DISP	0.002	0.003	0.003	0.176	0.001
	(3.35)	(2.57)	(1.69)	(1.42)	(0.74)
CFO	0.003	0.038	0.008	0.023	0.032
	(0.76)	(7.42)	(2.12)	(3.73)	(4.29)
VCFO	-0.030	-0.017	-0.025	-0.003	0.003
	(-3.38)	(-1.36)	(-2.25)	(-0.19)	(0.20)
BM	0.009	0.036	-0.065	-0.000	-0.000
	(0.47)	(1.47)	(-5.10)	(-2.04)	(-0.39)
SIZE	-0.002	-0.004	-0.003	-0.004	-0.004
	(-21.82)	(-29.13)	(-32.38)	(-28.53)	(-27.97)
LEV	-0.005	-0.001	-0.011	-0.007	-0.002
	(-6.51)	(-1.16)	(-12.01)	(-4.95)	(-1.21)
RET	-0.002	-0.007	-0.004	-0.003	-0.004
	(-4.35)	(-10.38)	(-4.93)	(-4.03)	(-4.54)
R^2	28.26%	30.82%	30.87%	9.60%	31.50%
N	12027	18981	21224	19530	19339

Table 6 (continued)

The sample observations varies across different subsamples. Constant sample consists of firms that have at least 25 (12) years of data for the without DISP (with DISP) sample. For the Low-Tech sample we eliminate firms in the High-technology industries identified by Francis and Schipper (1999). For the sample in column (4) we (i) recalculate accruals for both the accrual quality measures, since 1988, using SFAS 95 cash flows as per Hribar and Collins (2002); and (ii) we eliminate firms that have experienced M&A transactions as reported in COMPUSTAT annual footnote code #1, divestitures (COMPUSTAT data item 66) or foreign currency translations (COMPUSTAT data item 150). For column (5) we eliminate firms in the lowest quintile of Altman Z score computed using COMPUSTAT data as follows: ALTZ = 1.2 * (data179/data6) + 1.4* (data36/data6) + 3.3 *(data18+data16+data15)/data6 + 0.6 * (data199*data25)/data181 +data12/data6. VAR refers to the average monthly variance of market-adjusted returns for a fiscal year, where we measure market adjusted returns as the excess of daily firm stock return over the daily return on the value-weighted market portfolio. Monthly variance is computed as the sample variance within a month, multiplied by the number of trading days in the month. DD measure is calculated from the modified version of the Dechow and Dichev (2002) model. |ABACC| measure is the absolute value of abnormal accruals determined using Jones (1991) model. A detailed description of these two earnings quality measures is provided in section 3 of the text. DISP is analyst forecast dispersion measured as the standard deviation of analyst forecasts scaled by the absolute value of mean earnings forecasts. For this calculation, forecasts during the three months following the month after the end of the prior fiscal year are used. CFO is operating cash flows scaled by average total assets. VCFO is variance of operating cash flows scaled by average total assets over the trailing five years. BM is book-to-market ratio. SIZE is natural logarithm of market value of equity. Market value of equity is measured three months after the fiscal year end. LEV is financial leverage computed as the ratio of long-term debt to total assets. RET is annual buy-and-hold return. TIME is a time trend variable that takes on the value 1..N representing each of the years in the sample. Coefficients BM and TIME*DISP has been multiplied by 100 for expositional convenience. T-statistics are presented in parentheses.

Table 7
Results from Regression of Idiosyncratic Volatility that Captures Trends over the period 1962-2001 and Interactions of Trend with Proxies of Reporting Quality Exploring Alternative Explanations Together

$$\begin{aligned} VAR_{it} = {} & \lambda_0 + \lambda_1 TIME_{i,t} + \lambda_2 TIME_{i,t} * EQ_{i,t-1} + \lambda_{2a} TIME_{i,t} * EQ_{i,t-1} * AGE_{i,t} \\ & + \lambda_{2b} TIME_{i,t} * EQ_{i,t-1} * HITECH_{i,t} + \lambda_{2c} TIME_{i,t} * EQ_{i,t-1} * LOSS_{i,t} + \lambda_3 TIME_{i,t} * DISP_{i,t-1} \\ & + \lambda_{3a} TIME_{i,t} * DISP_{i,t-1} * AGE_{i,t} + \lambda_{3b} TIME_{i,t} * DISP_{i,t-1} * HITECH_{i,t} \\ & + \lambda_{3c} TIME_{i,t} * DISP_{i,t-1} * LOSS_{i,t} + \lambda_4 TIME_{i,t} * CFO_{i,t-1} + \lambda_5 TIME_{i,t} * VCFO_{i,t-1} + \lambda_6 EQ_{i,t-1} \\ & + \lambda_7 DISP_{i,t-1} + \lambda_8 CFO_{i,t-1} + \lambda_9 VCFO_{i,t-1} + \lambda_{10} BM_{i,t-1} + \lambda_{11} SIZE_{i,t-1} + \lambda_{12} LEV_{i,t-1} + \lambda_{13} RET_{i,t} + \varepsilon_{it} \end{aligned} \tag{7'}$$

	EQ = DD measure		EQ = |ABACC| measure	
	WITHOUT DISP	WITH DISP	WITHOUT DISP	WITH DISP
	(1)	(2)	(3)	(4)
Intercept	0.044	0.020	0.043	0.021
	(20.29)	(17.94)	(21.29)	(18.23)
TIME	0.001	0.001	0.002	0.001
	(16.35)	(19.55)	(26.98)	(21.93)
TIME*EQ	0.014	0.007	0.003	0.002
	(6.09)	(3.48)	(2.51)	(2.58)
TIME*EQ*AGE	-0.000	-0.000	-0.000	-0.000
	(-3.92)	(-8.40)	(-4.62)	(-7.63)
TIME*EQ*HITECH	-0.002	0.005	-0.000	0.004
	(-1.77)	(7.29)	(-0.28)	(7.15)
TIME*EQ*LOSS	0.014	0.004	0.009	0.002
	(15.91)	(4.14)	(14.94)	(4.04)
TIME*EQ* M&A	-0.005	0.001	-0.002	0.002
	(-4.24)	(0.91)	(-2.16)	(2.39)
TIME*EQ*ALTZ	-0.000	0.000	-0.000	0.000
	(-8.15)	(1.47)	(-6.75)	(3.78)
TIME*DISP		0.014		0.014
		(1.34)		(1.29)
TIME*DISP*AGE		-0.000		-0.000
		(-5.66)		(-6.71)
TIME*DISP*HITECH		0.000		0.000
		(1.35)		(2.42)
TIME*DISP*LOSS		-0.000		-0.000
		(-0.56)		(-0.07)
TIME*EQ* M&A		0.000		0.000
		(0.15)		(0.31)
TIME*DISP*ALTZ		0.000		-0.000
		(0.14)		(-0.11)
TIME*CFO	-0.003	-0.003	-0.004	-0.003
	(-7.26)	(-7.55)	(-9.32)	(-6.40)
TIME*VCFO	0.004	-0.001	0.005	0.002

Table 7 (continued)

	EQ = DD measure		EQ = |ABACC| measure	
	WITHOUT DISP	WITH DISP	WITHOUT DISP	WITH DISP
	(1)	(2)	(3)	(4)
	(4.62)	(-1.09)	(7.25)	(3.04)
EQ	-0.235	-0.100	-0.075	0.012
	(-4.87)	(-3.32)	(-3.44)	(1.30)
DISP		0.004		0.004
		(3.46)		(3.10)
CFO	0.051	0.028	0.066	0.023
	(5.54)	(5.15)	(6.30)	(4.06)
VCFO	-0.077	0.048	-0.107	0.007
	(-4.19)	(3.34)	(-6.06)	(0.62)
BM	-0.089	-0.017	-0.012	-0.026
	(-1.35)	(-0.85)	(-1.90)	(-1.35)
SIZE	-0.012	-0.003	-0.013	-0.004
	(-31.68)	(-27.53)	(-37.58)	(-27.78)
LEV	0.014	-0.001	0.016	-0.001
	(4.68)	(-0.81)	(4.88)	(-1.13)
RET	-0.004	-0.004	-0.004	-0.004
	(-2.27)	(-6.08)	(-2.91)	(-5.65)
R^2	10.65%	35.50%	10.34%	34.33%
N	95270	24477	103589	24245

The sample consists of 95270 (103589) observations for the DD and |ABACC| samples while the forecast dispersion sample has 24477 (24245) observations. VAR refers to the average monthly variance of market-adjusted returns for a fiscal year, where we measure market adjusted returns as the excess of daily firm stock return over the daily return on the value-weighted market portfolio. Monthly variance is computed as the sample variance within a month, multiplied by the number of trading days in the month. DD measure is calculated from the modified version of the Dechow and Dichev (2002) model. |ABACC| measure is the absolute value of abnormal accruals determined using Jones (1991) model. A detailed description of these two earnings quality measures is provided in section 3 of the text. DISP is analyst forecast dispersion measured as the standard deviation of analyst forecasts scaled by the absolute value of mean earnings forecasts. For this calculation, forecasts during the three months following the month after the end of the prior fiscal year are used. CFO is operating cash flows scaled by average total assets. VCFO is variance of operating cash flows scaled by average total assets over the trailing five years. BM is book-to-market ratio. SIZE is natural logarithm of market value of equity. Market value of equity is measured three months after the fiscal year end. LEV is financial leverage computed as the ratio of long-term debt to total assets. RET is annual buy-and-hold return. TIME is a time trend variable that takes on the value 1..N representing each of the years in the sample. AGE is defined as the number of years since the first day for which we can find a stock price in the CRSP tapes, HITECH is a dummy variable that is set to one (zero otherwise) if the firm-year belongs to the high technology SIC codes, LOSS is a dummy variable that is set to one (zero otherwise) if the firm-year reports negative earnings. M&A is a dummy variable that is set to one (zero otherwise) if firms have either experienced M&A transactions as reported in COMPUSTAT annual footnote code #1 or divestitures (COMPUSTAT data item 66) or foreign currency translations (COMPUSTAT data item 150). ALTZ is Altman Z score computed using COMPUSTAT data as follows: ALTZ = 1.2 * (data179/data6) + 1.4* (data36/data6) + 3.3 *(data18+data16+data15)/data6 + 0.6 * (data199*data25)/data181 +data12/data6. Coefficients BM and TIME*DISP has been multiplied by 100 for expositional convenience. T-statistics are presented in parentheses.

Table 8
Results from Regression of changes in Idiosyncratic Volatility on a Trend variables and Interactions of Trend with Proxies of Changes in Reporting Quality

$$\begin{aligned}\Delta VAR_{it} = {} & \lambda_0 + \lambda_1 TIME_{i,t} + \lambda_2 TIME_{i,t}*\Delta EQ_{i,t-1} + \lambda_3 TIME_{i,t}*\Delta DISP_{i,t-1} + \lambda_4 TIME_{i,t}*\Delta CFO_{i,t-1} \\ & + \lambda_5 TIME_{i,t}*\Delta VCFO_{i,t-1} + \lambda_6 \Delta EQ_{i,t-1} + \lambda_7 \Delta DISP_{i,t-1} + \lambda_8 \Delta CFO_{i,t-1} + \lambda_9 \Delta VCFO_{i,t-1} + \lambda_{10} \Delta BM_{i,t-1} \\ & + \lambda_{11} \Delta SIZE_{i,t-1} + \lambda_{12} \Delta LEV_{i,t-1} + \lambda_{13} \Delta RET_{i,t} + \varepsilon_{it}\end{aligned} \qquad (7)$$

	EQ = DD measure		EQ = |ABACC| measure	
	WITHOUT DISP	WITH DISP	WITHOUT DISP	WITH DISP
	(1)	(2)	(3)	(4)
Intercept	-0.007	0.000	-0.007	0.000
	(-9.18)	(0.94)	(-9.94)	(1.13)
TIME	0.002	0.001	0.002	0.001
	(43.17)	(40.94)	(44.28)	(40.69)
TIME*ΔEQ	0.006	0.002	0.003	0.001
	(6.49)	(1.51)	(5.84)	(1.44)
TIME*ΔDISP		0.006		0.004
		(1.68)		(1.46)
TIME*ΔCFO	-0.002	-0.001	-0.002	0.013
	(-9.82)	(-1.95)	(-10.10)	(1.59)
TIME*ΔVCFO	0.002	0.003	0.003	0.003
	(4.33)	(1.61)	(6.48)	(1.75)
ΔEQ	-0.072	-0.036	-0.057	-0.000
	(-2.77)	(-0.68)	(-4.93)	(-0.09)
ΔDISP		0.001		0.001
		(0.56)		(0.77)
ΔCFO	0.036	0.012	0.039	-0.001
	(6.69)	(1.71)	(6.85)	(-1.74)
ΔVCFO	-0.041	-0.018	-0.051	-0.009
	(-3.94)	(-0.66)	(-4.52)	(-0.35)
ΔBM	-0.036	0.184	-0.030	0.180
	(-1.33)	(1.72)	(-0.73)	(1.68)
ΔSIZE	-0.007	- 0.013	-0.007	-0.013
	(-27.90)	(-8.46)	(-30.93)	(-8.40)
ΔLEV	0.012	0.015	0.014	0.015
	(5.81)	(5.03)	(6.16)	(5.08)
ΔRET	-0.002	-0.006	-0.002	-0.006
	(-3.36)	(-6.65)	(-1.73)	(-6.51)
R^2	5.71%	16.72%	5.48%	16.38%
N	84403	19085	91347	18910

Table 8 (continued)

The sample consists of 84403 (91347) observations for the DD and |ABACC| samples while the forecast dispersion sample has 19085 (18910) observations. Δ is the change operator. VAR refers to the average monthly variance of market-adjusted returns for a fiscal year, where we measure market adjusted returns as the excess of daily firm stock return over the daily return on the value-weighted market portfolio. Monthly variance is computed as the sample variance within a month, multiplied by the number of trading days in the month. DD measure is calculated from the modified version of the Dechow and Dichev (2002) model. |ABACC| measure is the absolute value of abnormal accruals determined using Jones (1991) model. A detailed description of these two earnings quality measures is provided in section 3 of the text. DISP is analyst forecast dispersion measured as the standard deviation of analyst forecasts scaled by the absolute value of mean earnings forecasts. For this calculation, forecasts during the three months following the month after the end of the prior fiscal year are used. CFO is operating cash flows scaled by average total assets. VCFO is variance of operating cash flows scaled by average total assets over the trailing five years. BM is book-to-market ratio. SIZE is natural logarithm of market value of equity. Market value of equity is measured three months after the fiscal year end. LEV is financial leverage computed as the ratio of long-term debt to total assets. RET is annual buy-and-hold return. TIME is a time trend variable that takes on the value 1..N representing each of the years in the sample. Coefficients BM and TIME*DISP has been multiplied by 100 for expositional convenience. T-statistics are presented in parentheses.