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Earnings quality and accrual mispricing: A country and firm-level investigation in the period surrounding SOX

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Abbreviations

AA – Accrual anomaly
ACC – Accruals
AIMR – Association for Investment Management and Research
AMEX – American Stock Exchange
CEO – Chief executive officer
CFO – Cash flow from operations
CFO – Chief financial officer
CRSP – Center for Research in Security Prices
EAR – Earnings
EQ – Earnings quality
GICS – Global Industry Classification System
HML – High minus low
IBES – Institutional Brokers' Estimate System
NASDAQ – National Association of Securities Dealers Automated Quotation
NYSE – New York Stock Exchange
OLS – Ordinary least squares
OTC – Over the counter
PCAOB – Public Company Accounting Oversight Board
SEC – U.S. Securities and Exchange Commission
SMB – Small minus big
SOX – Sarbanes–Oxley Act of 2002

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Statement of Authorship

Except where reference is made in the text of this thesis, no material published elsewhere by me, extracted in whole or in part, is from a thesis presented by me for another degree or diploma.

No other person's work has been used without due acknowledgment in the main text of this thesis. Fair acknowledgment has been given to those who have provided assistance during the course of this research.

This thesis has not been submitted for the award of any degree or diploma in any other tertiary institution

Signed,

Maria Strydom

Thesis-Related Research Outcomes

PhD colloquium presentations

2007 – Presented preliminary results from Chapter 3 (Earnings Quality and Accrual Mispricing) at the AsFA/FMA 2007 PhD Symposium, Hong Kong, July 4.

2007 – Presented preliminary Chapter 3 results (Earnings Quality and Accrual Mispricing) at the AFAANZ Doctoral Colloquium, Gold Coast, Australia, June 27–30.

2007 – Presented "Corporate Governance, Accruals Quality and Mispricing" (an earlier version of Chapter 3) at the Monash Business and Economics Faculty doctoral symposium, Marysville, Victoria, October 25–28. Winner of the Best Paper and Presentation Award.

2008 – Presented "Corporate Governance, Accruals Quality and Mispricing" (an earlier version of Chapter 3) at the Prato PhD Symposium, Prato, Italy, April 16–17. Winner of the Best Presentation Award.

Refereed conference presentations

Strydom, M., Navissi, F., Skully, M., and Veeraraghavan, M., 2008. The effect of corporate governance quality on accrual mispricing. The 16th annual conference on Pacific Basin Finance Economics Accounting Management 2008, Brisbane, Australia, July 2–4.

Navissi, F., Skully, M., Strydom, M., and Veeraraghavan, M., 2008. Corporate governance and the accrual anomaly. AFAANZ/IAAER Conference 2008, Sydney, Australia, July 6–8.

Strydom, M., Navissi, F., Skully, M., and Veeraraghavan, M., 2009. Corporate governance and information risk post-Sarbanes–Oxley. Asian Finance Association Conference 2009, Brisbane, Australia, June 30–July 3.

Strydom, M., Navissi, F., Skully, M., and Veeraraghavan, M., 2009. Corporate governance and information risk post-Sarbanes–Oxley. European Financial Management Association Annual Meeting 2009, Milan, Italy, June 24–27.

Workshop presentations

Strydom, M., Navissi, F., Skully, M., and Veeraraghavan, M., 2009. Earnings quality and accrual mispricing. Department of Accounting and Finance Brown Bag Series 2009, Monash University, Melbourne, Australia May 6th.

Abstract

This thesis investigates accrual mispricing through two related studies. The first examines the impact of earnings quality on accrual mispricing in the US and determines whether mispricing persists at the country level in the high earnings quality environment following the Sarbanes–Oxley Act (SOX) of 2002. The second study determines whether accruals are mispriced at the firm level and if such firm level mispricing persists so that profits can be generated by exploiting this trading strategy.

The motivation to investigate the impact of earnings quality on the mispricing of accruals stems from the substantive literature that documents the persistent accrual anomaly (Sloan, 1996; Xie, 2001; Mashruwala et al., 2006) but fails to find its cause. This thesis examines whether this persistent country-level mispricing stems from investors being misled by low earnings quality. When earnings quality is low, investors will not be able to accurately price accruals. Earnings quality could therefore explain the existence of the accrual anomaly. Since SOX improved earnings quality, accrual mispricing should be less in the post-SOX environment. This thesis therefore also examines the mispricing of accruals post-SOX to determine whether it persists.

This thesis' second study is motivated by the cross-country (Pincus et al., 2007), country-level (Sloan, 1996; Xie, 2001), and industry-level (Zhang, 2007; Trejo-Pech et al., 2009) evidence that shows differences in mispricing. While cross-country, country-level, and industry-level mispricing have been investigated, there is no evidence on whether a firm-level anomaly exists, and this study therefore attempts to fill that void. This study is also motivated by the findings of Fama and French (2008)

and Avramov et al. (2010). Fama and French (2008) investigate the pervasiveness of asset pricing anomalies and conclude that the accrual anomaly is one of few that persist in all size groups, cross sections, and sorts. Avramov et al. (2010) similarly investigate commonalities across asset pricing anomalies and conclude that whilst the majority of asset pricing anomalies are associated with downgrades in firm credit ratings, the accrual anomaly is an exception and remains unaccounted for and robust. Given the pervasiveness of this anomaly over time, this study investigates whether the firm-level accrual anomaly is similarly persistent.

Two accrual mispricing models (Mishkin, 1983; Kraft et al., 2007) are employed in the first study to investigate the impact of earnings quality on the accrual anomaly. These models are augmented by including earnings quality proxies to determine their impact on mispricing. Given that both yield identical results, the second study employs only the Mishkin (1983) model to estimate firm-level mispricing. The mispricing model is employed for each firm in each year to estimate firm-level accrual mispricing. Significantly over- and underpriced accrual firms are identified, and a trading strategy of buying underpriced accrual firms and selling overpriced ones is examined for abnormal returns.

The results from the first study indicate that earnings quality mitigates accrual mispricing. When investigated in the post-SOX environment, however, there is no evidence of mispricing. This is true even without considering earnings quality. These findings show that SOX have achieved its stated aim of improving disclosure quality so that investors are better able to estimate accrual persistence, mitigating the anomaly. The second study shows, however, that firm-level mispricing still exists. Specifically, it shows that both significantly over- and underpriced accrual firms

exist in the same post-SOX sample, whereas at the country level no anomaly was documented. As with the differences in accrual mispricing documented at the aggregate market (Hirshleifer et al., 2009) and industry levels (Trejo-Pech et al., 2009), firm-level mispricing also differs from the country-level anomaly. Further analyses of firm-level mispricing show abnormal returns are available from a strategy of selling overpriced accrual firms and buying underpriced accrual firms.

The first study contributes to the literature documenting the impact of earnings quality on accrual mispricing and thus provides evidence of the importance of good disclosure quality in ensuring efficient pricing. It also contributes by showing that SOX has achieved its stated aims of improving disclosure quality and has thus mitigated mispricing at the country level. A further contribution is the direct comparison of the accrual mispricing models of Mishkin (1983) and Kraft et al. (2007) and the evidence that they yield similar results.

The second study makes two main contributions: First, it documents that firm-level accrual mispricing exists, even in the absence of a country-level anomaly. Second, the study shows that at the firm level both significantly over- and underpriced accrual firms exist, and it establishes the persistence of this firm-level mispricing. It also documents that investors can profit from a firm-level accrual mispricing strategy.

Chapter 1 Introduction

1.1 Introduction

This thesis investigates whether earnings quality mitigates the accrual anomaly and whether firm-level accrual mispricing exists. The thesis comprises two studies: The first augments accrual mispricing models (Mishkin, 1983; Kraft et al., 2007) by including earnings quality proxies to determine whether they mitigate the accrual anomaly in the US environment. In doing so, the study first confirms the existence of the accrual anomaly (Sloan, 1996). Next, the study investigates mispricing in the post-Sarbanes–Oxley Act (SOX) of 2002 period to estimate whether it still exists in this improved disclosure quality environment. The second study employs the same mispricing models of Mishkin (1983) and Kraft et al. (2007) to establish whether accruals are mispriced at the firm level. It then establishes if firm-level mispricing persists long enough for investors to trade profitably on it.

The accrual anomaly was first documented by Sloan (1996), who shows that investors overestimate the persistence of the accrual component of earnings, causing mispricing. A strategy of selling high accrual firms and buying low accrual firms yields abnormal returns, inconsistent with the efficient market hypothesis (Fama, 1970). The accrual anomaly has not abated (Bushee and Raedy, 2005; Lev and Nissim, 2006; Mashruwala et al., 2006) and investigation into its existence therefore continues (Xie, 2001, Desai et al., 2004; Xu and Lacina, 2009).

Mispricing occurs when investors overestimate the persistence of accruals from financial statements (Sloan, 1996), and can therefore result from investors' inability to identify low-quality earnings. Evidence shows that analysts misprice accruals less

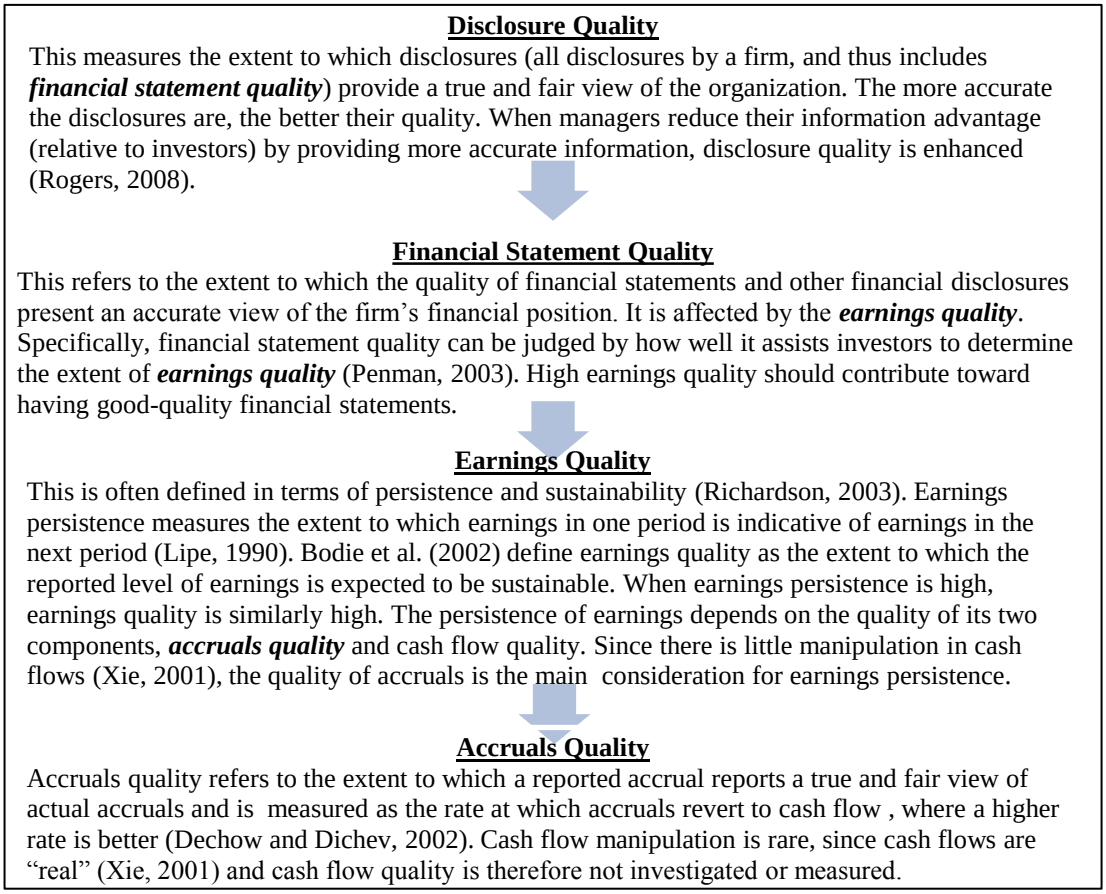
than other investors (Elgers et al., 2003), showing that investors' inability to consider the implications of low-quality earnings accurately in their valuation could be causing the anomaly. If so, investors will benefit from high earnings quality, since their valuation will be based on better-quality information and should therefore be more accurate. This provides motivation for this thesis to investigate the role of earnings quality in mitigating accrual mispricing and, specifically, whether the accrual anomaly still exists when earnings quality is considered. While this is the primary motivation for the first study, the investigation starts by first confirming the existence of the accrual anomaly in the sample period.[1]

An increased focus on the quality of financial disclosures ensued in the period following corporate failures in the early 2000s. In 2002, SOX was introduced, with several requirements (such as those in Sections 404 and 302; see Chapter 2) aimed specifically at improving disclosure quality (Diagram 1.1 explains the relation between earnings and disclosure quality). Since SOX compliance is mandatory, the quality of earnings should have improved, allowing investors to price accruals better and so reduce mispricing. It is possible that the improvement in earnings in the post-SOX period could mitigate the accrual anomaly completely for those firms subject to its requirements. While there is evidence documenting improved earnings quality in the post-SOX environment (Cohen et al., 2008), its impact on accrual mispricing is unknown.

[1] The anomaly is well documented by the Mishkin (1983) model; however, several studies propose that common mispricing methodology could give rise to it (Kraft et al., 2006, 2007; Leippold and Lohre, 2010) and is erroneous. Kraft et al. (2006) highlight the lack of robustness tests in Sloan (1996) and document that excluding variables from the Mishkin forecasting and valuation equations leads to an omitted variable problem and subsequent incorrect inferences about rational pricing (Kraft et al., 2007). An ordinary least squares accrual mispricing model, which allows for the inclusion of additional variables, is proposed by Kraft et al. (2007) to overcome some of these issues. The authors propose that their model yields similar results to those of Mishkin's (1983) model.

Diagram 1.1 Disclosure, financial statement, earnings, and accruals quality

This diagram explains the relation between disclosure, financial statement, earnings, and accrual quality. Disclosure quality encompasses these three concepts. Financial statement quality, in turn, includes earnings and accruals quality, and so forth.



The requirements of SOX are, however, not uniform for all firms. Small firms in particular had more time to adjust and fewer requirements. It is therefore likely that even if overall country-level mispricing is completely mitigated post-SOX, individual firms might still be mispriced. Employing pooled time-series, cross-sectional samples to estimate a single anomaly for a country over a period may, however, not detect this whilst a firm-level study employing a number of firm-years to estimate a firm-level accrual pricing variable might do so[2].

[2] Piotroski & Roulstone (2004) provide support for the premise that firm-level mispricing might exist in the absence of country-level mispricing. They investigate stock price synchronicity (the extent to which market and industry returns explain firm-level

Prior studies have investigated the anomaly at the country (Sloan, 1996), cross-country (Pincus et al., 2007), aggregate market (Hirshleifer et al., 2009), and industry levels (Zhang, 2007; Trejo-Pech et al., 2009), but no evidence has yet been reported at the firm level (Diagram 1.2 shows the differences between these levels).

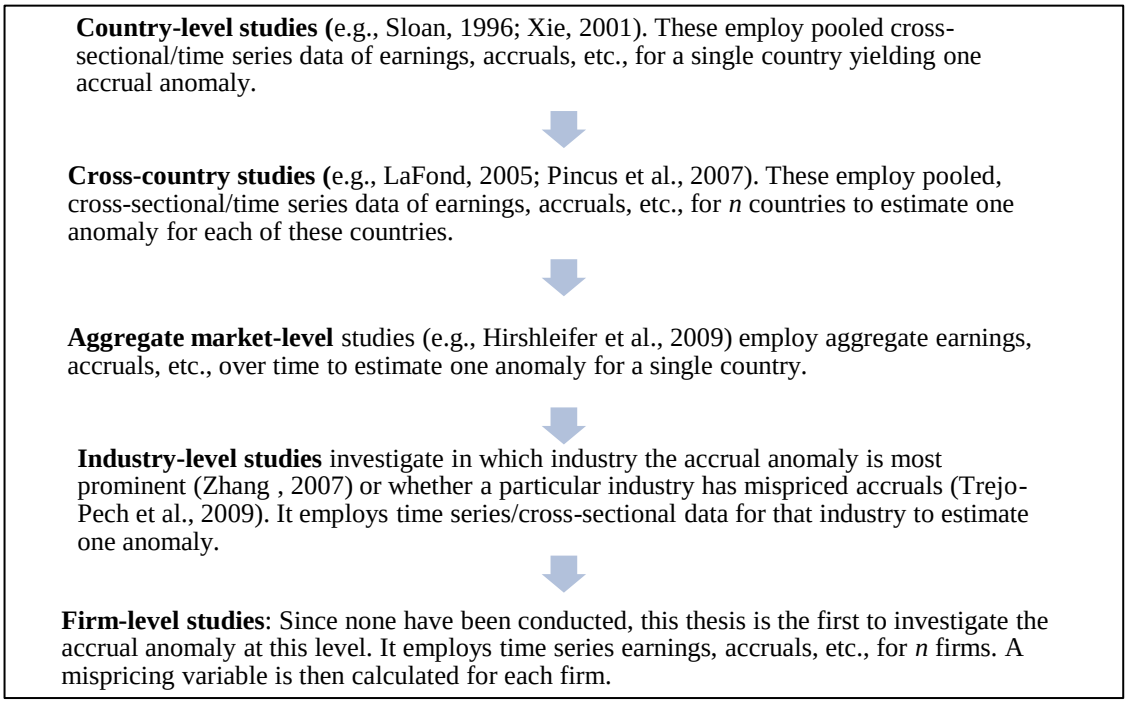
It is therefore important to address this gap in the literature, since firm-level accrual mispricing will likely differ from the country/cross-country results, given dissimilarities in firm lifecycle stages (Liu, 2008), levels of investment (Wu et al., 2010), and economic conditions (Martin, 2008). Firms in the growth phase of their lifecycle, for instance, typically raise large amounts of cash to increase their inventory and accounts receivables (Liu, 2008), lowering cash flows (Hribar, 2002). When discretionary accrual measures (such as the modified Jones model of Dechow et al., 1995) are employed however, such enhancements appear indicative of income-increasing earnings management. What appears to be income-increasing earnings management though is more likely a result of increases in inventories and accounts receivables that typically occur in the growth phase of the firm lifecycle and documented cases of earnings management could therefore be type 1 errors resulting from failure to consider the lifecycle stage of a firm instead (Liu, 2008). Wu et al. (2010), in turn, show that optimal adjustment of firm investments to changes in discount rates will result in accruals being positively associated with current returns and negatively associated with future returns. Differences in how investments adjust to changes in the discount rate could therefore also cause firm-level variations in accruals and their pricing, providing further support for a firm-level investigation. Additional support for a firm-level study stems from Martin

returns) in relation to country, industry and firm-level factors. They show that whilst country and industry-level factors impacts positively on synchronicity, firm-level factors affect it negatively. Relating this to the mispricing of accruals – whilst country and industry-level factors might result in no documented anomaly at the country-level, underlying firms could still be mispriced since other, firm-level factors might related differently to them.

(2008) who shows that accrual persistence varies as economic conditions change and that firm-level factors drive the cyclical differences in persistence. The second study in this thesis therefore investigates first if accrual mispricing exists at the firm level and, second, whether it is persistent. Prior literature shows that the extreme accruals[3] that drive the accrual anomaly are sticky (Zach, 2006) and therefore persist. While studies show that the country-level anomaly persists and that trading on it is profitable, there is no evidence on whether firm-level mispricing exists or persists long enough for investors to profit from trading on it.

Diagram 1.2 Accrual mispricing at the country, cross-country, aggregate market, industry, and firm levels

This diagram explains the relation between studies at the cross-country, country, aggregate market, industry, and firm levels.



This thesis's first study's findings indicate that while accruals are mispriced at the country level, the inclusion of an earnings quality proxy in the estimation of accrual mispricing mitigates it. In regard to the impact of SOX on mispricing, SOX has

[3] Extreme accruals are those accruals in the top and bottom deciles of the sample (Zach, 2006).

mitigated accrual mispricing with no country-level accrual anomaly documented post introduction. This thesis's second study shows that while there might be no country-level anomaly post-SOX (as documented in the first study), there certainly are several significantly mispriced firms. Much of this mispricing persists for more than a year, and a trading strategy based on this mispricing would yield abnormal returns.

The rest of this chapter is structured as follows: Section 1.2 presents the research objectives of this study, while Section 1.3 introduces the data and methodology. Next, Section 1.4 outlines the main findings, while the contributions and implications of this investigation are discussed in Section 1.5. Section 1.6 presents the organization of the thesis.

1.2 Research objectives

As mentioned earlier, this thesis is motivated by the existence and persistence of the accrual anomaly. It specifically aims to investigate five related research objectives through its two studies in Chapters 3 and 4. While the first three research objectives are achieved in Chapter 3, the main focus of the first study is an investigation of the impact of earnings quality on accrual mispricing (research objective 2). The study first, however, confirms (through research objective 1) that accrual mispricing exists—and that the accrual mispricing models of Mishkin (1983) (the Mishkin model) and Kraft et al. (2007) (the Kraft model) yield similar results—and then in the third research objective examines the extent of accrual mispricing post-SOX. The second study determines whether accruals are mispriced at the firm level (through the fourth research objective) and whether such mispricing persists and yields abnormal returns (research objective 5). Sections 1.2.1 to 1.2.5 formally establish

each of these five research objectives, while their related research questions are developed later, in Chapter 2. The five research objectives are summarized in Table 1.1.

Table 1.1 Research objectives

This table presents the research objectives of this study that will be achieved through an investigation of the research questions developed in Chapter 2.

Study	Research objective
Chapter 3: Earnings quality and the mispricing of accruals	1. Ascertain whether a significant accrual anomaly exists.
	2. Establish whether earnings quality mitigates accrual mispricing.
	3. Determine whether the introduction of SOX mitigates accrual mispricing.
Chapter 4: Firm-level mispricing of accruals	4. Ascertain whether firm-level accrual mispricing exists.
	5. Establish whether firm-level mispricing is persistent and whether abnormal returns can be generated by exploiting this trading strategy.

1.2.1 Existence of the accrual anomaly

The accrual anomaly, first documented by Sloan (1996), shows that investors persistently overprice the accrual component of earnings. Earnings consist of both an accrual and a cash component. The accrual component comprises a discretionary and a non-discretionary part. The discretionary part is subject to managerial manipulation (Cahan, 1992; Epps and Guthrie, 2010; Stubben, 2010) and errors such as managerial overoptimism (Bradshaw et al., 2001). This discretionary component (possibly containing errors, whether intentional or otherwise) therefore contributes less to earnings persistence, and investors should pay less attention to accruals and more to cash flows when valuing earnings.

Accrual mispricing occurs when investors overestimate the persistence of the accrual component, as opposed to the cash flow component, of earnings, termed the accrual anomaly by Sloan (1996).[4] Sloan (1996) shows that investors assign a higher value to high accrual firms and are subsequently surprised when these high accruals fail to revert to cash. A strategy of buying low accrual firms and shorting high accrual firms yields significant abnormal returns (Sloan, 1996). Evidence shows that the anomaly persists and is not arbitraged away (Bushee and Raedy, 2005; Lev and Nissim, 2006; Mashruwala et al., 2006).[5] While this anomaly has motivated much related research (Xie, 2001; Elgers et al., 2003; Desai et al., 2004; Xie and Lacina, 2009),[6] a well-accepted explanation for its existence is still forthcoming.

The anomaly is a global phenomenon (LaFond, 2005; Pincus et al., 2007) that is more prevalent in countries that extensively use accrual accounting and where the information asymmetry between managers and shareholders is greatest (common law countries). The accrual anomaly is also separate from the post-earnings announcement drift and value glamour anomalies (Collins and Hribar, 2000; Desai et al., 2004; Cheng and Thomas, 2006) and is driven specifically by abnormal accruals (DeFond and Park, 2001; Xie, 2001).

Certain studies (Kraft et al., 2006, 2007; Leippold and Lohre, 2010) question the rigor of the tests used in documenting the anomaly and, in particular, raise the potential of misspecified models, missing variables, and robustness tests as issues.

[4] Earnings persistence is affected by the quality of accruals. When accruals contain few errors or little manipulation, most of them will convert to cash flows in the next period and thus increase earnings persistence.

[5] Bushee and Raedy (2005) examine the implementability of asset mispricing anomalies when facing a number of restrictions (e.g., on short-selling). They conclude that the accrual anomaly remains profitable for most of these. Lev and Nissim (2006) show that the accrual anomaly has not declined in magnitude over time and that trading on it is very limited. They propose that large and individual investors may shy away from investing in extreme accrual firms due to their inherent risk. Mashruwala et al. (2006) show that the accrual anomaly is concentrated in firms with high idiosyncratic risk and are thus risky for investors to trade in. Their results suggest that transaction costs impose further barriers to arbitrage.

[6] Xie (2001) investigates which parts of accruals are mispriced. Elgers et al. (2003) examine whether analysts also misprice accruals. Desai et al. (2004) determine whether the accrual anomaly differs from the value–glamour anomaly. Xu and Lacina (2009) show that earnings news plays an important role in the abnormal returns associated with the anomaly.

Kraft et al. (2006) and Leippold and Lohre (2010) both show that previous accrual anomaly studies are hampered by a lack of robustness tests. Kraft et al. (2007) specifically argue that the Mishkin model is misspecified and propose an alternative ordinary least squares (OLS) regression model for estimating accrual mispricing. They propose that this model also overcomes the missing variable problem inherent to the Mishkin model, while yielding similar results. This study therefore employs the mispricing models of both Kraft and Mishkin to confirm that accruals are mispriced. This discussion establishes the first research objective.

Research objective 1: Ascertain whether a significant accrual anomaly exists.

1.2.2 Earnings quality and accrual mispricing

While Sloan (1996) proposes "earnings fixation" as a cause for the anomaly (based on investor's overvaluation of accrual persistence and the subsequent reversal of large abnormal accruals), this theory is not well received (Kraft et al., 2006; Zach, 2006; Dechow et al., 2008). Kraft et al. (2006) show that the inclusion of robustness tests when testing for the accrual anomaly reveals a U-shaped relation between buy-and-hold returns and total accruals that is inconsistent with earnings fixation. Zach (2006) specifically shows that firms with accruals in extreme deciles[7] tend to remain there for more than a year, a finding also inconsistent with fixation. Naïve fixation of earnings is similarly rejected by Dechow et al. (2008) as an explanation for the anomaly (the authors investigate the persistence and pricing of the cash component of earnings) and propose, instead, that it exists due to investors misunderstanding the diminishing returns inherent to new investments. Hafzalla et al. (2011) show, however, that an accrual based strategy based on "percent accruals" (accruals as a

[7] Firms with accruals in extreme deciles are those with the highest and lowest accruals (the top and bottom 10%). Accruals in the highest and lowest deciles (or extreme deciles) are therefore termed extreme accruals.

percentage of earnings as opposed to the top and bottom accrual deciles) yields even larger returns than Sloan (1996) while being consistent with the earnings fixation hypothesis. The evidence therefore remains mixed.

An alternative "limited attention" theory (Balsam et al., 2002; Hirshleifer et al., 2004; Ali and Gurun, 2009) proposes that investors are sophisticated but have "limited attention" and so only process information when it is easy to do so. The findings in Drake et al. (2009), that investors only understand the implications of financial statements fully when analysts rate a firm's disclosure to be of good quality, provides evidence to the contrary. Investors, on their own accord, are unable to distinguish between low and high earnings quality and therefore persist in mispricing accruals. The results of Penman and Zhang (2002) are consistent with those of Drake et al. (2009) and state that lower-quality earnings[8] (such as those under conservative accounting practices) are unlikely to be accurately priced. Valuations based on high-quality earnings should, in contrast, provide more accurate estimates. Earnings quality therefore plays an important role in reducing accrual mispricing, and firms with better earnings quality should have less accrual mispricing. This discussion leads to research objective 2.

Research objective 2: Establish whether earnings quality mitigates accrual mispricing.

[8] Earnings quality reflects the extent to which current earnings contain information about future earnings (Penman and Zhang, 2002) and depends largely on the quality of the underlying accrual and cash flow components. When components are of high quality, the accruals will be more related to cash flow realizations and earnings persistence and thus higher quality (Dechow and Dichev, 2002; Richardson et al., 2005).

1.2.3 SOX and accrual mispricing

SOX was introduced with the aim of improving earnings quality. Evidence shows it has been effective in achieving that aim with decreased manipulation of earnings (Lobo and Zhou, 2006; Cohen et al., 2008) and improved accrual reliability (Chambers and Payne, 2008) post-SOX. Investors should therefore have better-quality information on which to base valuation decisions in this period. With such higher-quality earnings, investors will (with less information asymmetry) price securities more accurately (Penman and Zhang, 2002). Therefore, SOX should have impacted on and mitigated (or reduced) the mispricing of accruals. This discussion leads to research objective 3.

Research objective 3: Determine whether the introduction of SOX mitigates accrual mispricing.

1.2.4 Firm-level mispricing of accruals

While the existence of the accrual anomaly has been investigated at the country (Sloan, 1996), cross-country (La Fond, 2005; Pincus et al., 2007), aggregate stock market (Hirshleifer et al., 2009), and industry levels (Zhang, 2007; Trejo-Pech et al., 2009), the individual firm level has not yet been examined (see Diagram 1.2 for an explanation of the differences between these levels). Firm-specific variables such as lifecycle stage (Liu, 2008) and the extent of investments and discount rates (Wu et al., 2010) do vary and can cause deviations in firm accruals. Liu (2008) specifically shows that firms in the growth phase of their lifecycle tend to raise larger amounts of cash to be employed in increased inventory and accounts receivable. This enlarges working capital and lowers cash flows (Hribar, 2002), which appears indicative of income-increasing earnings management in common discretionary accrual models

(and thus suggests low earnings quality). This increase, however, is more likely due to changes in inventories and accounts receivables than low earnings quality. Liu (2008) and Wu et al. (2010) therefore provide evidence that firm-level factors can cause variations in accruals that could influence investors' assessments of earnings quality. Evidence from mispricing studies at the cross-country, country, aggregate market, and industry levels similarly show that the accrual anomaly (overpricing of accruals) does not exist (as documented by Sloan, 1996) at all of these levels. Firm-level accrual mispricing should therefore exist but could differ from that documented at other levels. This discussion leads to the development of the fourth research objective.

Research objective 4: Ascertain whether firm-level accrual mispricing exists.

1.2.5 Persistence and profitability from trading on firm-level mispricing

The country-level accrual anomaly documented by Sloan (1996) is persistent. Several studies investigate this issue and conclude that the anomaly has not dissipated (Lev and Nissim, 2006; Mashruwala et al., 2006; Fama and French, 2008; Avramov et al., 2010). Investors can therefore profit from a strategy of buying low accrual firms and selling high accrual ones. As discussed earlier, however, firm-level accrual mispricing can differ from that at the country level, and so the question regarding the persistence of firm-level mispricing remains. Zach (2006) shows that the accrual anomaly is most commonly driven by extreme accruals[9] and that these extreme accruals tend to be sticky. Firms with mispriced accruals should therefore persist. Managerial manipulation of firm accrual figures (which causes low-quality earnings) also persists (Myers et al., 2007). Given these persistent factors, firm-level

[9] Zach (2006) shows that the returns to the accrual anomaly stem mainly from extreme accruals, which are in the top and bottom deciles of all accruals. Therefore firms with very high and very low accruals are, in essence, driving the accrual anomaly.

mispricing should continue and investors should profit from a trading strategy based on firm-level accrual mispricing similar to that implemented at the country level. These issues have not been addressed to date and are therefore investigated here. This discussion leads to the development of research objective 5.

Research objective 5: Establish whether firm-level mispricing is persistent and whether abnormal returns can be generated by exploiting this trading strategy.

The next section describes the data and methodology employed in this study to achieve these research objectives.

1.3 Data and methodology

Data for both studies in this thesis include firms listed on the New York Stock Exchange (NYSE), National Association of Securities Dealers Automated Quotation (NASDAQ), and American Stock Exchange (AMEX) and are obtained from the merged Compustat/Center for Research in Security Prices (CRSP) database for three periods (1996–2000, 2003–2007, and 1985–2008).[10] Each sample is limited to those companies covered by the Compustat/CRSP merged database. Data for the second study also include NYSE, NASDAQ and AMEX listed companies and are also from the merged Compustat/CRSP database, while additional analyst following data (employed to establish the characteristics of mispriced firms) are obtained from the Institutional Brokers' Estimate System (I/B/E/S) database.

The first two research objectives establish accrual mispricing in the pre-SOX period (1996–2000), while the third one addresses the post-SOX period (2003–2007). The

[10] The sample period employed to ascertain the first two research objectives covers 1996–2000 (the pre-SOX sample), while that for the third research objective spans 2003–2007 (the post-SOX sample). The fourth and fifth research objectives use a 1985–2008 sample to investigate firm-level mispricing persistence.

post-SOX sample is also employed to achieve the fourth research objective. The final research objective (five) utilizes data for the period 1985–2008 (and calculates firm-level mispricing for 1991–2008).

The methodology employed to investigate each of the objectives includes estimation of accrual mispricing models. The first study employs the Mishkin and Kraft accrual mispricing models to ensure that they yield comparable results. The second study only reports the results of the Mishkin model, since earlier findings show similar results when employing both models.

1.4 Main findings and implications

This thesis consists of two related studies. The first examines the impact of earnings quality on accrual mispricing pre- and post-SOX, while the second investigates firm-level accrual mispricing and determines its persistence and profitability.

1.4.1 Findings and implications from "Earnings quality and accrual mispricing" (the first study)

The results from the first study show that earnings quality mitigates accrual mispricing. The documented pre-SOX accrual anomaly is mitigated when earnings quality proxies are included in accrual mispricing models. In relation to the investigation of SOX and the anomaly, SOX has reduced accrual mispricing. In fact, when estimating accrual mispricing post-SOX, no accrual anomaly is documented.

These findings have implications for investors and regulators. Investors should benefit from the knowledge that high earnings quality firms have less accrual

mispricing, and can incorporate this information in their investment decisions. Regulators, in turn, can take note that the SOX reforms were effective at the country level and that disclosure quality has improved as a result. Documentation of the role of earnings quality in accrual mispricing should provide regulators, who have been criticized for strict regulatory changes, with further evidence supporting their position.

1.4.2 Findings and implications from "Firm-level mispricing" (the second study)

The second study's results indicate that, while there is no country-level accrual mispricing post-SOX, individual firm-level mispricing still exists. Consistent with other studies (Pincus et al., 2007) documenting differences between country and cross-country accrual mispricing, the firm-level accrual mispricing examined here also varies greatly from that at other levels. In contrast to other studies, firm-level mispricing consists of both under- and overpriced firms. As far as the persistence and profitability issue is concerned, many mispriced firms were found to remain so for at least one year after identification, while some were mispriced for more than four years. This study therefore documents that firm-level mispricing of accruals can be persistent. These results, which also reveal that a strategy of buying underpriced accrual firms and selling overpriced ones yields abnormal returns, show that it is not only the country-level anomaly (Sloan, 1996) that can be traded upon profitably.

These findings have implications for investors and firms. Investors should also be aware that some firms may be overvalued and lead to lower future returns, while others may be undervalued. Given the persistence of this firm-level mispricing, a trading strategy based on buying underpriced firms and selling overpriced firms should yield abnormal returns and thus provide an opportunity to trade profitably.

Firms can note that investors misprice individual securities regularly and so should reduce their information asymmetry problems in an effort to ensure accurate pricing. The next section presents the contributions of this thesis.

1.5 Contributions

This thesis makes several contributions to the literature through its two studies on earnings quality and accrual mispricing and firm-level accrual mispricing respectively.

1.5.1 Contributions of "Earnings quality and accrual mispricing" (the first study)

The first study investigates the impact of earnings quality on accrual mispricing and is the first to document that earnings quality mitigates accrual mispricing. It contributes further by investigating accrual mispricing in the post-SOX environment and finds no mispricing in this period, even without considering earnings quality. The work differs from previous accrual mispricing studies (such as Drake et al., 2009) in that it includes earnings quality directly in the Mishkin and Kraft accrual anomaly models and shows that this mitigates mispricing. Although Xie (2001) finds investors misprice the discretionary component of accruals,[11] this study concludes that this mispricing is mitigated when earnings quality is considered. While Cohen et al. (2008) show that accrual-based earnings management (which lowers earnings quality) has decreased post-SOX, this study extends their results by documenting that the improved disclosure environment post-SOX has mitigated the accrual anomaly.

[11] Subject to managerial manipulation (Xie, 2001).

1.5.2 Contributions of "firm-level mispricing" (the second study)

The second study contributes to the accrual mispricing literature by documenting the existence of firm-level mispricing and its persistence. Accrual mispricing is estimated at the firm level by using the Mishkin accrual mispricing model for each firm. Some firms are found to be overpriced, others are underpriced and still others are not mispriced at all. It documents that firm-level accrual mispricing is persistent, and that investors can profit from a strategy of selling overpriced firms and buying underpriced firms. While Liu (2008) and Wu et al. (2010) propose factors that could influence investor valuations of firm-level accruals, this study shows firm-level mispricing exists and differs from that at the country, industry, and aggregate market levels. While Pincus et al. 2007, Hirshleifer et al. (2009) and Trejo-Pech et al. (2009) examine mispricing at the aggregate, cross-country, and industry levels, the second study instead documents mispricing at the firm level. It therefore extends the country-level persistence examination of Lev and Nissim (2006) and shows that firm-level mispricing, like that at the country level, is also persistent.

1.6 Organization of the thesis

The remainder of this thesis is structured as follows. Chapter 2 presents the empirical background on accrual mispricing, earnings quality, regulatory reforms, and the extant literature showing that firm-level mispricing could exist and formally develops the five research questions of this thesis. Next, the first study is presented and documents the theoretical framework, hypothesis development, research design, and results for Chapter 3, which investigates the relation between earnings quality and accrual mispricing and explores mispricing post-SOX. The study specifically aims to examine research objectives 1, 2, and 3. The investigation of firm-level accrual mispricing follows next in Chapter 4 and similarly contains the theoretical

framework, hypothesis development, and results for the second study in this thesis. It also determines whether firm-level mispricing is persistent and the extent of (any) abnormal returns available to investors for trading on such mispriced firms. The study specifically aims to examine research objectives 4 and 5. The final chapter, Chapter 5, concludes and summarizes the entire thesis. Each research question is revisited and a synopsis of the methodology, hypotheses, and results is provided, explaining the interrelatedness among the findings and emphasizing their contributions and implications. Lastly, suggestions for future research are established.

Chapter 2 Literature Review

2.1 Introduction

This thesis investigates the mispricing of accruals through two individual studies. The first study (Chapter 3) examines the impact of earnings quality on accrual mispricing. It augments the accrual mispricing models of Mishkin (1983) and Kraft et al. (2007) to include earnings quality and determines whether it plays a mitigating role in the accrual anomaly. Given the improved earnings quality environment since the Sarbanes–Oxley Act (SOX) (Bedard, 2006; Lobo and Zhou, 2006; Cohen et al., 2008), the study also establishes whether accrual mispricing exists in this period. The second study (Chapter 4) investigates accrual mispricing at the firm level and seeks to establish whether the country-level accrual mispricing result exists at the firm level. It also examines whether firm-level accrual mispricing persists over time and its profit potential as a trading strategy. These two studies are discussed in detail in Chapters 3 and 4, together with their theoretical framework, hypothesis development, and results. This chapter provides a detailed theoretical discussion associated with the research objectives established in Chapter 1. It aims to introduce the literature underlying this study and to develop formally the research questions employed to help achieve these research objectives.

While the two studies in this thesis investigate different research objectives, a common theme among them is the mispricing of accruals. The first study's research objectives relate to establishing whether earnings quality mitigates country-level mispricing and whether such mispricing has abated post-SOX. The second study's research objectives, in turn, determine the existence and persistence of firm-level accrual mispricing. This chapter therefore first discusses the accrual anomaly and its

persistence, testing, and potential causes before turning to the related issues examined by the two studies.

This chapter is structured as follows: Accrual mispricing is introduced in Section 2.2, with particular attention given in Section 2.2.1 to those studies that document the accrual anomaly. Next, the empirical evidence on its persistence is presented in Section 2.2.2, while the methodological considerations in estimating the mispricing of accruals are detailed in Section 2.2.3. Section 2.3 discusses the literature on investor pricing of accruals that supports a role for disclosure quality (and earnings quality specifically) in accrual mispricing. Next, in Section 2.4, regulatory changes (and specifically SOX) are presented, with particular attention to the background of regulation (Section 2.4.1) and how changes in such regulation (SOX) could have influenced earnings quality (Section 2.4.2). Section 2.5 next presents those academic arguments that suggest that firm-level mispricing might differ from that at other levels. Section 2.5.4 specifically examines whether such firm-level mispricing is likely to persist. Lastly, Section 2.6 concludes the chapter with a summary of its aims.

2.2 Accrual mispricing

This section first presents the literature documenting the accrual anomaly and its persistence. Next, the focus shifts to the empirical evidence surrounding methodological errors as a potential cause of the anomaly. Lastly, those accrual mispricing theories relating to investor sophistication are discussed.

2.2.1 The accrual anomaly

Accrual mispricing exists when investors misestimate the persistence of the accrual component of earnings. The accrual anomaly is a specific type of mispricing where investors overestimate accrual persistence. Sloan (1996) first documented the anomaly and investigated whether stock prices correctly incorporate the information contained in the accrual and cash components of earnings. While this thesis's first study mainly aims to determine whether earnings quality mitigates accrual mispricing, it must first confirm the existence of the accrual anomaly in the period investigated. The literature pertaining to the accrual anomaly's existence and persistence is therefore presented here first and leads to the first research question related to research objective 1.

In an efficient market, investors seek new information and react to price-sensitive announcements when they are made (Fama, 1970). Investors should therefore incorporate the implications of new information released into security prices, and securities should trade at values that reflect all relevant publicly available information (Fama, 1970). If investors do not incorporate all available information into their valuation decisions or if this information is misleading, then the prices are unlikely to adjust correctly and mispricing will occur. Sloan (1996) investigates the efficiency with which the market values earnings components (accruals and cash flows) but finds evidence inconsistent with the efficient market hypothesis (Fama, 1970).

The overestimation of accrual persistence documented by Sloan (1996) indicates that investors fixate on earnings and do not correctly anticipate the persistence of its accrual and cash components. In fact, investors overestimate accrual persistence and

underestimate that of cash flows (Sloan, 1996). The cash component of earnings is subject to fewer misstatements (intentional or otherwise) than the accrual component, and thus contributes more to earnings persistence[12] (Xie, 2001). Accruals, in turn, can be separated into a non-discretionary and a discretionary component. The non-discretionary component exists due to normal accrual accounting transactions, such as credit sales, causing accruals. The discretionary component, however, is subject to managerial manipulation and therefore less likely to revert to cash flows in future periods. Future earnings performance attributable to the accrual component of earnings is therefore much less persistent than that of the cash component.

The accrual anomaly shows that investors overestimate accrual persistence in these valuations and therefore misprice share equity by attaching higher share values to firms with higher accruals. These investors thus incorrectly treat accruals as if they were the more persistent earnings component (Xie, 2001). Mispricing of accruals will therefore continue until future earnings surprise investors and the price adjusts accordingly. A negative relation therefore exists between accruals and future stock returns, and Sloan (1996) documents positive (negative) abnormal returns from buying (selling) low (high) accrual firms.

Sloan's (1996) findings contribute to the literature by advocating that stock prices reflect an investor's naïve expectations of future earnings (Ou and Penman, 1989; Bernard and Thomas, 1990). While there is substantive evidence documenting a relation between stock prices and earnings (Graham and Dodd, 1934; Ball and Brown, 1968), investors do not correctly incorporate the informational content of the earnings components when estimating future earnings (Bernard and Thomas, 1990; Maines and Hand, 1996) and thus misprice the securities. While some studies

[12] Earnings persistence depends on the speed with which current period components revert to future earnings.

suggest that the lower persistence of earnings' accrual component could be due to earnings management (following Dechow et al., 1995), an explanation for the anomaly is still forthcoming. Following Sloan (1996), many studies confirm the accrual anomaly exists and investigate its persistence over time. The next section provides an overview of these works.

2.2.2 Confirmation of the anomaly and continued persistence

Following its first documentation, many studies have attempted to verify the anomaly's existence. While the anomaly is a global phenomenon (LaFond, 2005; Pincus et al., 2007), it is more prevalent in common law countries and those allowing the extensive use of accrual accounting. As mentioned earlier, the accrual component of earnings can be separated into discretionary (abnormal) and non-discretionary (normal) components. The non-discretionary part exists because of events such as credit sales causing accruals, whereas the discretionary part stems from management actions. While this discretionary part may allow management to manipulate earnings, it is not necessarily indicative of earnings management. While there is evidence that investors are aware of the value implications of discretionary accruals (Subramanyam, 1996), this does not mean that their information is correctly incorporated in the security price. In fact, the evidence shows that the abnormal (or discretionary) component of accruals is substantially mispriced (DeFond and Park, 2001; Xie, 2001) and seems to drive the accrual anomaly. The discretionary component of accruals is subject to managerial manipulation (Xie, 2001), which lowers earnings quality. It is therefore possible that investors are misled by poor earnings quality and subsequently misprice accruals, which suggests a role for earnings quality in the accrual anomaly (discussed in greater detail in Section 2.3). When investigating this issue, Beneish and Vargus (2002) separate accruals into

income-increasing and income-decreasing accruals and conclude that the accrual anomaly is driven mainly by income-increasing accruals. These findings are consistent with two other studies that propose a role for opportunistic managerial behavior in the anomaly (Kothari et al., 2006; Richardson et al., 2006).

Following the anomaly's documentation, other works show that it persists, and so the question arises as to why, if investors know that abnormal and income-increasing accruals are overstated, they are not corrected. In an efficient market, investors would impose a trading strategy that arbitrages the anomaly and corrects prices. The accrual anomaly is, however, not arbitraged away until the end of year, when the actual financial results are released (Mashruwala et al., 2006). In fact, some studies show that accrual mispricing has not abated at all since it was first discovered (Collins et al., 2003; Bushee and Raedy, 2005; Lev and Nissim, 2006; Livnat and Santicchia, 2006). Others (Green et al., 2010; Richardson et al., 2010) show diminishing returns to the accrual anomaly over time. While Lev and Nissim (2006) conclude that certain active sophisticated institutional investors do exploit the anomaly, such trading is minimal. Mashruwala et al. (2006) propose that trading on the anomaly is risky, given that it is most prevalent in high idiosyncratic risk stocks and that such risk is not reconcilable with the average institutional investor. Transaction costs, in addition, impose further barriers to arbitrage, since the anomaly is concentrated in firms with low volume and low price (Mashruwala et al., 2006). Fama and French (2008) conclude that while many other asset pricing anomalies disappear over time, the accrual anomaly remains robust. Avramov et al. (2010) similarly provide further evidence of its continued persistence and show that, while most other asset pricing anomalies are associated with credit risk, the accruals

anomaly is robust in firms with different credit ratings and in varying credit conditions.

In contrast to the extensive literature showing that the country-level accrual anomaly persists, some studies do find evidence that it is waning. Green et al. (2010) investigate the raw and risk-adjusted hedge returns to an accrual anomaly trading strategy and conclude that they are almost non-existent, or even negative, after 2003. Richardson et al. (2010) study the returns for several accounting anomalies and show that the magnitude of returns to an anomaly-based strategy has diminished substantially in recent years. Conflicting evidence therefore exists as to the true persistence of the country-level anomaly.

Other studies also examine the similarities between the accrual and other asset pricing anomalies (Collins and Hribar, 2000; Desai et al., 2004). The accrual anomaly seems closely related to the post-earnings announcement drift (PEAD) anomaly where stock prices continue to drift following earnings announcements and the market underreacts to earnings surprises. Collins and Hribar (2000) investigate the similarities between these two anomalies and find abnormal returns in excess of those predicted by each anomaly (employing a hedge strategy to exploit both), confirming that the PEAD and accrual anomalies are distinct. Another long-standing anomaly, the value–glamour anomaly (first documented by Graham and Dodd, 1934) is the phenomenon where value firms (those with high ratios of fundamentals to price, such as book-to-market, earnings-to-price, and cash-to-price ratios, as well as low-growth stocks) outperform growth firms (those with low ratios of fundamentals to price and high growth). Firms with high sales growth are, however, likely to have large positive accruals (as with the accrual anomaly), given that these are positively

correlated. Desai et al. (2004) therefore investigate whether the accrual and value–glamour anomalies are really the same. When each of the four fundamental variables of interest in the value–glamour anomaly (book-to-market, earnings-to-price, and cash-to price ratios and sales growth) are controlled for, accruals are still related to future returns, indicating a separate accrual anomaly. Desai et al. (2004) therefore conclude that the accrual anomaly exists in its own right, distinct from any previously documented anomalies.

While most studies accept that the accrual anomaly exists and then attempt to explain it, others propose that the anomaly is a manifestation of methodological errors employed in testing for accrual mispricing. These views are discussed in the next section.

2.2.3 Methodological considerations in accrual mispricing

The accrual anomaly documented by Sloan (1996) employs the rational expectations model of Mishkin to determine the extent of mispricing. The Mishkin model employs an earnings forecasting model in conjunction with a valuation model and measures mispricing as the differences between the accrual and cash components in these equations. A significant variation between the coefficient of accruals and cash flow in the forecasting anf valuation equations is an indication of mispricing.Some studies propose that the lack of robustness tests or an erroneously specified mispricing methodology employed in common tests of mispricing itself has given rise to the accrual anomaly (Kraft et al., 2006, 2007; Leippold and Lohre, 2010). This implies the anomaly does not necessarily result from investors' inability to process information correctly but, rather, from the absence of robustness tests or incorrect model specifications.

A common robustness test employed in the accounting literature involves elimination of the top and bottom 1% of sample observations to ensure the results are not driven by outliers (Ashbaugh and Pincus, 2001; Cohen et al., 2008). When the top and bottom 1% of sample firms (outliers) are excluded, the results no longer support earning fixation as an explanation for the anomaly, as Sloan (1996) proposes. Kraft et al. (2006) therefore recommend that robustness tests be completed for all investigations of the accrual anomaly to eliminate any outlier-driven results.

A more rigorous examination of accrual mispricing methodology is undertaken by Kraft et al. (2007), who propose that the Mishkin model itself suffers from a missing variable problem. Kraft et al. (2007) examine the impact of including additional variables such as sales, changes in sales, capital expenditures, changes in capital expenditures, lagged accruals, lagged cash flows, lagged returns, net operating assets, size deciles, price deciles, and book-to-price deciles in mispricing models to establish whether omitted variables can mitigate the mispricing of accruals. Their year-by-year regression results indicate weaker (but still significant) evidence of accrual mispricing. After trimming the sample at the first and 99th percentiles, the authors report no evidence of accrual mispricing from the Mishkin model. Kraft et al. (2007) therefore propagate an ordinary least squares (OLS) model as an alternative to the Mishkin model, and document that the suggested OLS and Mishkin models generate virtually identical coefficient estimates and inferences in accounting settings. The Kraft model additionally overcomes the missing variable problem. Leippold and Lohre (2010) similarly propose the anomaly may have its origin in erroneous methodology and show that when multiple testing is employed, the accrual anomaly disappears in most markets.

Given the potential contribution of flawed methodologies to the existence of the anomaly, it is important to utilize both the Mishkin and Kraft models when estimating accrual mispricing. This study will therefore employ both of these models when confirming the existence of mispricing. It will employ the basic Kraft OLS model to establish the anomaly exists and that the Kraft and Mishkin models yield similar results. Instead of employing the 11 additional variables specified in the OLS model of Kraft, further investigation of the anomaly's cause in research question 2 will include earnings quality (as discussed next, in Section 2.3).

In summary, the accrual anomaly is well documented (Sloan, 1996; Xie, 2001) and persistent (Lev and Nissim, 2006; Mashruwala et al., 2006). Studies propose causes for its existence (Desai et al., 2004; Kraft et al., 2006) but a well-accepted explanation remains elusive. While this thesis is aimed mainly at investigating the impact of earnings quality on accrual mispricing (Chapter 3) and the existence of firm-level mispricing (Chapter 4), it must first establish, in research question 1 that accruals are mispriced in the period examined. This discussion leads to the first research question related to research objective 1 (from Chapter 1).

Research question 1: Are accruals significantly mispriced?

2.3 Investor pricing of accruals and the accrual anomaly

Sophisticated investors are those with superior knowledge and skills in financial analysis, that is, institutional investors (Elsharkawy and Garrod, 1996; Walther, 1997; Bartov et al., 2000). Analysts and institutional investors have superior analytical skills compared to most other investors that allow them to incorporate the

implication of current earnings for future earnings more accurately (Jiambalvo et al., 2002). As such, those investors who misprice accruals (or fixate on earnings) should be unsophisticated. While some studies show even sophisticated investors misprice accruals (Bradshaw et al., 2001; Xu, 2010), others conclude that only unsophisticated investors are unable to interpret correctly the information in earnings releases and thus misprice securities (Elsharkawy and Garrod, 1996; Walther, 1997; Bartov et al., 2000; Barone and Magilke, 2009).

Bradshaw et al. (2001) examine whether the published opinions of sell-side analysts and auditors (considered to be sophisticated investors) alert investors to the future implications of high accruals. They find that sell-side analyst forecasts are large and negative for firms with unusually high accruals, indicating these forecasts do not provide any indication of the lower future quality of earnings associated with such accruals. In regard to auditors, their results also show that auditors do not signal future problems associated with high accruals. Bradshaw et al. (2001) concede that this does not necessarily mean analysts and auditors are not aware of the implications of large abnormal accruals. It is possible, for instance, that analysts are aware of the long-term outlook for high accrual firms but collude with management to increase future earnings expectations. In addition, the authors conclude that while analysts provide investors with some information with regard to the implications of large accruals, these investors may not incorporate it into their valuation decisions correctly.

Corporate managers have superior private information about future earnings, given their role in their firms' operating and reporting processes. It is therefore reasonable (considering the evidence that analysts misprice accruals less) to expect that

corporate managers would also price accruals more accurately. In fact, this specific source of information advantage, knowledge of accruals quality, allows managers to earn excess returns (Hodgson and van Praag, 2006). Xu (2010) investigates whether managers' earnings forecasts incorporate information in accruals and concludes that, while specific forecasts are valued accurately, this is not so for longer-term forecasts. Xu (2010)'s results show that managers are also misled by accrual persistence when making their long-term range forecasts. This bias is somewhat offset in firms with high litigation risk, but likely stems from the inability of management to forecast earnings. Both Bradshaw et al. (2001) and Xu (2010) therefore indicate that investor sophistication cannot necessarily explain accrual mispricing.

Furthering the literature on analysts pricing accruals, Elgers et al. (2003) investigate the weights assigned to accruals by analysts as opposed to investors. The purpose of such a comparison is to determine whether the analysts' earnings forecast biases are similar in direction and magnitude to those of investors (as measured by delayed securities returns). They find that the overweighting of accruals is less than a third as large for analysts as what is implicit for security prices. This means that analysts misprice accruals less than a third as often as investors do (Elgers et al., 2003). This finding is similar to that of Balsam et al. (2002), who conclude that analysts are much quicker to incorporate 10-Q filings information relating to accruals in security prices.

In a study closely related to this thesis, Drake et al. (2009) investigate whether there is an association between the Association for Investment Management and Research (AIMR) corporate information committee report ratings of firm disclosure and accrual mispricing. They conclude that accruals are less mispriced for firms with

better AIMR disclosure ratings.[13] Their findings support a possible role of disclosure quality in accrual mispricing but are subject to limitations, including the fact that their AIMR disclosure ratings are issued by analysts and portray their opinion of disclosure quality. These ratings are, however, not freely available to ordinary, unsophisticated investors. The results of Drake et al. (2009) are therefore not substantially different from those of Elgers et al. (2003), who conclude that analysts' (sophisticated investors) pricing decisions are more accurate. Drake et al. (2009) really test whether analysts are aware of the implications of high abnormal accruals on future earnings. Their argument, that investors better understand the implications of financial statements when AIMR disclosure quality ratings are high, is unrealistic and would lead to no mispricing with low ratings. If investors realized, as Drake et al. (2009) propose, that disclosures are of high or low quality, they would be sophisticated enough to identify the quality of reported information and thus should not misprice securities, even when quality is low. In this case, they would recognize low-quality disclosures and would discount those securities for their inherent information risk, eliminating mispricing.

While most sophisticated investors (such as analysts and some institutional investors) are therefore aware that high accruals have implications for future earnings, they are unable to anticipate (and incorporate in their valuation) its full effect. Mispricing could therefore stem from investors failing to impound relevant earnings information into share prices fully. Investors are unsophisticated, in that while they have adequate information to price accruals and cash flows accurately, they do not. Analysts and managers, on the other hand, may understand and adjust their pricing for lower future accrual persistence but are still not entirely accurate. As long as investors therefore

[13] Drake et al. (2009) interpret this result as evidence that high disclosure quality enables investors to better understand the implications of reported figures (they thus assume investors are sophisticated enough to distinguish between high and low disclosure quality firms).

receive earnings of low quality, accrual mispricing will persist. Investors who are unable to identify low-quality earnings are unlikely to recognize their negative impact on future earnings, leading investors to treat the accruals as if they were more persistent. An important consideration in the mispricing of accruals is therefore earnings quality.

Earnings quality is measured as the extent to which current earnings contain information about future earnings (Penman and Zhang, 2002). Earnings comprise both an accrual and a cash flow component, and the quality of earnings therefore depends on the quality of these components. When accruals revert to cash quickly, they contribute positively to earnings persistence and quality (Dechow and Dichev, 2002; Richardson et al., 2005). While accruals are subject to managerial manipulation, the cash flow component is more certain (Xie, 2001). The quality of accruals therefore affects earnings quality.

Accruals are employed to recognize those revenues and expenses relevant to a specific period that may not yet have resulted in actual cash flows. Substantial estimation errors in accruals will result in a smaller percentage of accruals mapping into cash flow in the next financial period, lowering earnings persistence. Firms with more estimation errors in accruals are therefore seen as having lower-quality accruals and lower-quality earnings, which are less persistent (Richardson et al., 2005).

Financial statements of firms with high levels of discretionary accruals (perhaps but not necessarily due to earnings management) can therefore not be expected to provide an accurate view of their financial position. Such firms have low-quality earnings, since their earnings are inaccurate when based on inflated accrual figures

(Dechow and Dichev, 2002). It is, however, rare that all accruals from one period will become cash flows in the next. As a result, investors' judgment on the persistence of accruals significantly affects their pricing decisions.

The prior literature indicates that poor earnings quality weakens the mapping of accounting accruals into cash flows and hence increases information risk (Francis et al., 2005). Other studies provide evidence of an association between earnings quality and information asymmetry (Ecker et al., 2006), idiosyncratic risk (Rajgopal and Venkatachalam, 2008), cost of capital (Francis et al., 2008), and adverse selection risk and liquidity in the financial markets (Bhattacharya et al., 2008). Earnings quality is therefore an important consideration for investors and financial markets in pricing securities.

Prior studies (e.g., Jones, 1991; Dechow et al., 1996) provide evidence of a noise component in total accruals. Dechow and Dichev (2002) show that this noise could result from intentional and/or unintentional managerial actions. For example, overstatement (understatement) of credit sales (as intentional noise) and employment of an income-increasing (income-decreasing) accounting method that does not best fit the underlying business economics of a firm (as unintentional noise) can increase (decrease) the accruals, which will not be translated into cash at year-end.

Given the difficulty in disentangling these income-increasing (income-decreasing) activities from other genuine financial transactions, investor expectations of the end-of-year cash flow distribution may become biased upward (downward), leading to the overpricing (underpricing) of accruals. Francis et al. (2007) support this view and conclude that the market does not correctly react to earnings information when information asymmetry is high (and earnings quality is low). This is unlikely to

happen when disclosure quality is high so that investors base their pricing decisions on more accurate information. Investors in firms with high-quality earnings will also not need to seek additional information from other sources that could be more costly and less accurate in pricing stock. The role of earnings quality in accrual mispricing is therefore important.

In summary, investors misprice the discretionary component of accruals, resulting in the accrual anomaly. The discretionary component of accruals is subject to managerial manipulation, which causes earnings quality to be low. Such low-quality earnings results in increased information risk (Francis et al., 2005) and asymmetry (Ecker et al., 2006) that leave investors less able to accurately price securities. If earnings are of better quality, investors should make more accurate pricing decisions and accrual mispricing should be reduced or completely mitigated. The second research question in this study (relating to research objective 2 in Chapter 1) therefore investigates the role of earnings quality in accrual mispricing and is formally stated as follows.

Research question 2: Does earnings quality play a role in the mispricing of accruals?

Given the theoretical framework underlying research question 2, earnings quality plays a significant role in accrual mispricing. In fact, the only time unsophisticated investors will be able to price securities accurately is when high earnings quality provides them accurate information on the persistence of the accrual and cash components. Therefore, to facilitate efficient markets where securities are accurately priced, regulations to improve earnings quality would be beneficial. If such

requirements could enhance the quality of earnings, there should be less accrual mispricing. One such regulation introduced with the specific aim of improving disclosure quality is SOX.

SOX impose heightened accountability and stringent governance requirements focusing on the monitoring of management, increased disclosure, and certification. These increased requirements should improve the quality of reported earnings and accruals. Earnings quality will therefore depend (to some extent) on a firm's regulatory environment. As such, the next section investigates the US regulatory environment and the impact of SOX on earnings quality and mispricing.

2.4 Regulatory environment and SOX

This section discusses the regulatory environment in which US firms operate and how it affects their disclosure and earnings quality. Firstly background information on the US regulatory environment is presented, followed by a specific discussion of SOX, which leads to formulation of the third research question.

2.4.1 US regulatory background

State as well as federal law regulates US firms. Firms are governed by the state in which they are incorporated rather than that in which they operate. Firms can choose their state of incorporation and may select that which is most beneficial. Each of the 50 states (as well as the District of Columbia) has a different legal regime. This is due to diverse local firms and interest groups influencing state law (Daines, 2001). Over 50% of US firms incorporate in Delaware, which is generally seen as a corporate haven, since it allows corporate management significant discretion in running organizations. For example, under Delaware law, transfers of ownership

need not be filed or recorded. While some argue that incorporating in Delaware benefits firm value (Easterbrook and Fischel, 1991), others find no specific advantages (Black, 1990; Jiraporn and Gleason, 2007) and show that Delaware firms do not have more earnings management, and so earnings quality should be unaffected by the state of incorporation.

Federal law also regulates US firms, and securities legislation has historically been based on agency law aimed at facilitating contracting between managers, shareholders, analysts, and financial intermediaries (Mahoney, 2009). This is achieved through the provision of standardized laws and regulations and reducing transaction costs (La Porta et al., 2006). The contracting paradigm requires agents to disclose conflicts of interests stemming from agency problems where shareholder wealth maximization is no longer the goal of their actions (Mahoney, 2009). Prior to the initial Securities Law of 1933 and 1934, no formal provisions existed to curb managerial misappropriation and fraud, leaving investors with low disclosure quality and transparency (Mahoney, 2009). The fraud provisions eventually added specifically focused on mandatory disclosures and antifraud rules to improve investor protection, consistent with the contracting paradigm.

The US system has become more regulated over time, with the aim of restricting contracting, reflecting the view that the securities market is filled with irrational investors and market failures requiring strict regulation (Mahoney, 2009). The Investment Company Act of 1940 increased regulation (specifically of mutual funds) by limiting aggressive leverage and short-selling strategies, and, in 1964, US Congress made it more difficult for companies to opt out of these regulations. Additional steps were taken by Congress and the US Securities and Exchange

Commission (SEC) in 1970 to change the structure of capital markets and improve price discovery by introducing statutory and regulatory rules to increase disclosure and transparency. Management, however, retained discretion in deciding how much to spend on ensuring quality reports and strict monitoring. This changed following the significant governance scandals and bankruptcies in the early 2000s, which led to SOX legislation.

2.4.2 SOX

This section provides a general overview of SOX, while those parts specifically relevant to the relation between accrual mispricing and earnings quality are discussed in more detail in Chapter 3.

SOX is a US federal law introduced following several governance scandals and bankruptcies in the early 2000s. The quality of controls over financial reporting was particularly questioned following these failures, and the SOX response focused quite heavily on improving this aspect. At its core was the aim to enhance the role of auditors by enforcing laws against the fraud and theft of public companies. Table 2.1 shows the 11 titles included in SOX, which vary from auditor independence requirements (Title 2) to the certification of corporate tax returns (Title 10). Those sections of SOX that are particularly relevant to the investigation of research objective 3 in this thesis (investigation of the mispricing of accruals post-SOX) are discussed in Chapter 3.

Table 2.1 An overview of SOX

This table presents an overview of the 11 titles contained in SOX. While each title is only summarized here, those specifically relevant to this study are discussed in greater detail in Chapter 3, where the hypothesis investigating accrual mispricing post-SOX is developed.

Title	Aim
1	Title 1 (sections 101–109) requires the creation of the Public Company Accounting Oversight Board (PCAOB), tasked with overseeing and regulating the auditors of public companies. The creation of the PCAOB was aimed at improving the quality of company audits, which were lacking in many corporate scandals prior to SOX (Coates, 2007).
2	Title 2 (sections 201–209) relates to the audit function and prohibits additional services provided by audit firms beyond the audit function (section 201). It also requires auditor rotation every five years to ensure independence. This title should improve the quality of monitoring by auditors and audit committees and thus should contribute positively to improving earnings quality following the introduction of SOX.
3	Title 3 (sections 301–308) addresses corporate responsibility, with specific requirements that senior executives take personal responsibility for ensuring the accuracy (and thus quality) of financial statements. Section 302 specifically requires certification by top management (Chief Executive Officer and Chief Financial Officer) that financial statements are true and fair. In addition, section 301 specifies audit committee independence requirements to ensure that audit committees fulfill their role of monitoring the accuracy and completeness of disclosures.
4	Title 4 (sections 401–404) entails increased disclosure requirements for off-balance sheet transactions (section 401), having a financial expert on the audit committee (section 407), as well as requiring management reports on and audits of internal controls (section 404). This is one of the most studied sections of SOX (Ashbaugh-Skaife et al., 2007; Krishnan et al., 2008) and should improve earnings quality.
5	This title (section 501) focuses on reducing analyst conflicts of interest and restoring investor confidence.
6	Title 6 (sections 601–604) is aimed at improving investor confidence and defines the SEC's ability to prohibit offending individuals from acting as analysts in the future.
7	Title 7 requires that reports on the operation of security markets and the role of credit ratings be produced.
8	Title 8 (sections 801–807) introduces a new act within SOX, known as the Corporate and Criminal Fraud Accountability Act of 2002, and imposes severe penalties (including criminal penalties) for falsifying or destroying financial and audit records. It also provides some protection for whistleblowers.
9	Title 9 adds additional penalties for non-compliance with section 906, specifically imposing criminal punishment for corporate officers not certifying financial reports, or certifying them when aware of their inaccuracy.
10	Title 10 requires the CEO of a company to sign the company's federal tax return.
11	Title 11 adds further penalties for non-compliance with sections 1101–1107, clarifying the powers of the SEC to prohibit individuals from serving as corporate officers (section 1105) and introducing additional criminal penalties for non-compliance with the act in section 1106.

Many of SOX's titles aim to improve disclosure quality, and the post-SOX environment should therefore be characterized by heightened accountability, more transparency, and better earnings quality. Titles 3 and 4 (and specifically sections 302 and 404) should specifically improve the accuracy and reliability of financial disclosures and have therefore received the most attention (see Gordon et al., 2006) Such enhanced-quality disclosures should lead to a better mapping of accounting accruals into future cash flows, which can decrease the mispricing of accruals.

It seems that SOX has achieved its stated aims, with several studies reporting positive outcomes (Gordon et al., 2006; Lobo and Zhou, 2006; Beneish et al., 2008; Cohen et al., 2008; Collins et al., 2009). These studies show that SOX has had a positive impact on firms' voluntary disclosure of information security activities (Gordon et al., 2006), and that firms report lower discretionary accruals (which cause accrual mispricing) post-SOX (Lobo and Zhou, 2006). Similarly, Beneish et al. (2008) provide evidence that the market considers SOX section 302 disclosures as informative. In regard to SOX's impact on earnings management, a significant decrease in earnings management is documented post-SOX (Cohen et al., 2008), while Collins et al. (2009) show that the penalties for the CFOs of firms who have to restate financials (due to earnings management or other errors) have also increased significantly in this period. In a related study, Bhojraj et al. (2009) investigate whether accrual mispricing decreased following restructuring and regulatory changes (SOX). While they only examine 2001–2006, and thus mainly the post-SOX period, their results show a reduction in mispricing in this period.

In summary, the passage of SOX and its documented benefits should have improved earnings quality, allowing investors to better estimate accrual mispricing. This study

therefore investigates the impact of SOX on the mispricing of accruals through the following research question.

Research question 3: Has SOX reduced accrual mispricing?

2.5 Firm-level pricing of accruals and the persistence of the accrual anomaly

This section presents the literature supporting a firm-level investigation of accrual mispricing. First, the motivation for cross-country accrual anomaly studies is examined followed by that for investigations at the industry and aggregate market levels. Next, the literature proposing firm-level differences in accruals (that could lead to firm-level variation in accrual mispricing) is discussed and the implications for the persistence of such firm-level mispricing examined.

2.5.1 Cross-country accrual mispricing

While the existence of the accrual anomaly (and accrual mispricing) has been well documented at the country level in the US (Sloan, 1996; Collins and Hribar, 2000; Xie, 2001; Kothari et al., 2006; Livnat and Santicchia, 2006), there is less evidence of its pervasiveness in other environments. Few studies (LaFond, 2005; Pincus et al., 2007; Leippold and Lohre, 2010) investigate the accrual anomaly across countries to determine whether it exists outside of the US environment, in which it is so well documented.

A cross-country examination of accrual mispricing, including 17 countries, shows a significant accrual anomaly in 15 of them (LaFond, 2005). He investigates whether

the anomaly is driven by common underlying factors but concludes that the factors influential in the anomaly differ across markets. These differences are mainly due to managerial discretion, analyst following, and ownership structure. LaFond (2005) concludes that the anomaly is unlikely to be caused by one global systematic risk factor and, instead, is probably due to a number of underlying factors that vary between countries. Dechow et al. (2011) similarly conclude that the anomaly is not likely to be a result of rationally priced risk.

In a similar investigation, Pincus et al. (2007) examine accrual mispricing in 20 countries, motivated by country-level differences in business practices, legal environment, institutional and capital market structure, and accounting regimes. They find that the accrual anomaly (accrual overpricing) is concentrated in common law countries, where more extensive use of accrual accounting is permitted and where share ownership concentration is lower. Less emphasized is their result for four code law countries where the underpricing of accruals is significant. Accrual underpricing had not previously been documented, and this finding shows that while some countries have overpriced accruals, others have underpriced accruals. While LaFond (2005) and Pincus et al. (2007) investigate cross-country accrual mispricing for different periods, they include a number of the same countries. LaFond (2005) finds significant hedge portfolio returns for an accrual anomaly based strategy in certain countries (i.e., France, Hong Kong, Holland, Spain, and Sweden), whereas Pincus et al. (2007) produce no significant accrual anomaly for three of these countries (France, Hong Kong, or Holland) and, instead, document significant accrual underpricing for Spain and Sweden. The accrual anomaly, therefore, does not appear to persist over time, given the inconsistent results of LaFond (2005) and Pincus et al. (2007) for several countries.

Given these conflicting results, Leippold and Lohre (2010) investigate 29 developed equity markets and document accrual anomalies in eight of them. The authors argue that, since these results rely heavily on individual country-level tests, the results may be spurious, and they therefore employ multiple testing procedures to ensure robustness. They find that only five of the eight anomalies remain after this rigorous testing procedure, including three common law countries (US, the UK, and Australia) and two code law countries (Italy and Denmark). The overall results from cross-country studies (LaFond, 2005; Pincus et al., 2007; Leippold and Lohre, 2010) therefore show significant variation in accrual mispricing and provide evidence that the accrual anomaly is, first, not generalizable to all countries and, second, that it does not necessarily persist. The explanations of these differences in cross-country mispricing proposed in LaFond (2005), Pincus et al. (2007), and Leippold and Lohre (2010), that is, differences in accrual accounting, managerial discretion, and legal requirements, are, however, unlikely to vary only at this level. The implementation and interpretation of accrual accounting as well as the levels of managerial discretion will also differ between industries and at the aggregate and firm levels. The literature pertaining to industry- and aggregate-level accrual mispricing is therefore examined next.

2.5.2 Industry- and aggregate-level accrual mispricing

There is little evidence on the prevalence of accrual mispricing at the industry level. Only Zhang (2007) and Trejo-Pech et al. (2009) provide some insight on this issue. Zhang (2007) examines investment/growth and persistence as competing explanations for the accrual anomaly. He proposes that the investment information contained in accruals is dependent on a firm's production function and thus varies

across industries. His results show that the anomaly is much weaker in industries with low accrual and employee growth correlation (such as the services, mining, and agricultural production industries) than in those with high correlations (retailers, wholesalers, and manufacturers). Trejo-Pech et al. (2009), in turn, investigate accruals in the food supply chain industry (an industry characterized by low accruals, inventory, and accounts receivable), which traditionally has large cash flows and few growth opportunities (Jensen, 1986). Trejo-Pech et al. (2009) find that no abnormal returns are available from taking a long position in low accrual firms, and that the only part of the accrual anomaly strategy that holds in this industry is for high accrual firms. This finding provides evidence that the accrual anomaly cannot be generalized to all industries.

The accrual anomaly documented at the country level also does not exist at the aggregate market level. Hirshleifer et al. (2009) investigate whether aggregate accruals and cash flow predict aggregate returns and find that, at this aggregate level, accruals are a strong positive time series predictor of aggregate stock returns. They propose a possible risk-based explanation for their results, in that high accruals and low cash flow could simply be subject to higher levels of risk than that controlled for.[14] They also show that shifts in aggregate accruals and cash flow are associated with shifts in the market discount rate, and, more specifically, that changes in accruals are associated with higher future discount rates and lower contemporaneous stock market returns. This suggests expected future cash flow is discounted at a higher rate when accruals increase (or cash flow decreases). The reported negative association between changes in accruals and contemporaneous negative returns stems, therefore, primarily from surprises in the accrual component. Aggregate

[14] Dechow et al. (2011) conjecture, however, that it is doubtful that rationally priced risk could be driving the anomaly.

accruals and cash flows therefore appear to be correlated with shifts in the market discount rate.

These results therefore show that, similar to the cross-country and industry-level mispricing study findings, the aggregate-level results also differ from those documented by Sloan (1996). While some of the country-level phenomena (such as poor return performance after equity performance) do extend to the aggregate level (Baker and Wurgler, 2000), others become weaker, such as the PEAD (Kothari et al., 2006). Similar to the industry-level study, the accrual anomaly (that accruals are a negative cross-sectional predictor of abnormal stock returns) is also not generalizable to the aggregate level. Kang et al. (2010), however, show that this positive relation between aggregate accruals and the one-year-ahead market return is driven by discretionary accruals. They suggest that it reflects fluctuations in aggregate earnings management, a firm-level event, and thus provides further evidence that firm-level events drive the level of accruals, and therefore mispricing.

Whilst finding different results, a common conclusion from accrual mispricing studies (Xie, 2001; LaFond, 2005; Drake et al., 2009) is that it is driven by managerial discretion. Such discretion should differ from firm to firm, and it is therefore appropriate to investigate the mispricing of accruals at the individual firm level. While no study to date has identified whether accruals are, in fact, mispriced at the firm level, some do suggest that firm-level variables drive the accrual anomaly.

2.5.3 Firm-level accrual mispricing

While most studies focus on aggregate (Hirshleifer et al., 2009), cross-country (Pincus et al., 2007), or country-level (Xie, 2001) investigations, Gaio (2010)

specifically investigates the impact of firm characteristics on earnings quality. The results indicate that firm characteristics explain 31.3% of overall variation in firm earnings quality (compared to only 8.5% explained by country-level characteristics). Specifically, Gaio (2010) concludes that larger firms, with more investment opportunities and larger insider ownership, have better earnings quality. In contrast, those with greater sales volatility and longer operating cycles have lower quality. Burgstahler et al. (2006) provide further support for a firm-level investigation by documenting differences in earnings quality that are driven by such firm-level characteristics. Firm-level differences should therefore also exist in accrual mispricing.

Managerial skill is another factor that could cause firm-level differences in accrual mispricing. Those managers with superior business knowledge will have better judgment and better estimate their firms' future. Such managers will produce better-quality financial statements (Demerijian et al., 2010). Francis et al. (2008), who conclude that earnings quality is inversely related to CEO reputation, report similar results. Given that managerial ability fluctuates between firms, such variation will likely lead to differences in earnings quality, and therefore accrual mispricing.

Discretionary accrual estimates are positively biased by events that relate to the growth stage of a firm's lifecycle (Liu, 2008). Growing firms tend to raise cash and employ proceeds toward increasing their inventory and account receivables. This increased working capital is associated with a decrease in cash flows (Collins and Hribar, 2002) and appears as income-increasing earnings management in discretionary accrual models. Declining firms, in contrast, are more likely to shut down and liquidate assets, or at least reduce the value of their remaining assets. They

recognize write-downs and impairments and record large negative accruals (Dechow and Ge, 2006) that can appear as income-decreasing earnings management in models. Liu (2008) therefore investigates whether firm lifecycle stage consideration affects the recorded incidence of earnings management and finds that it leads to fewer false-positive results. The author's findings therefore have implications for the accrual anomaly. It provide evidence that firm-level factors, such as lifecycle stage, impact on accrual and earnings quality (and thus, potentially, investor ability to accurately price these), which will cause differences in the pricing of firm-level accruals.

According to Wu et al. (2010), firm-level adjustments in accruals (and thus working capital accruals) in reaction to changes in the discount rate may also be driving the accrual anomaly. They propose that a decrease in rates results in more projects being profitable (and thus being accepted), leading to higher accruals (and higher current returns from the associated higher stock prices). The expectations of future return would decrease in such circumstances, given lower discount rates. Thus accruals would be positively related to current returns and negatively related to future returns. Changes in discount rates therefore cause firm-level changes in accruals. Given that each firm's investment adjustments (because of changes in discount rates) will differ, differences in accruals (and their pricing) will exist at the firm level.

In summary, several factors cause firm-level differences in accruals, for example, lifecycle stage (Liu, 2008) and changes to levels of investment due to changes in the discount rate (Wu et al., 2010). Accrual mispricing studies at other levels also show that the anomaly differs across countries (Pincus et al., 2007) and is not the same in all industries (Trejo-Pech et al., 2009). This thesis therefore investigates firm-level

accrual mispricing to determine whether it exists and differs from the mispricing documented at other levels. This leads to research question 4 associated with research objective 4, established earlier in Chapter 1.

Research question 4: Does firm-level mispricing exist and does it differ from mispricing at the country level?

2.5.4 Persistence of firm-level accrual mispricing

Following Sloan's (1996) first documentation of the accrual anomaly, later studies (Lev and Nissim, 2006; Mashruwala et al., 2006) repeated this work to establish whether the anomaly has been arbitraged away, has abated over time, or persists. These studies show that the anomaly (estimated at the country level) has not abated over time (although they study very similar periods, from the 1960s to the late 1990s or early 2000s), at least in a US environment. This is, however, not the case for all countries.

While the accrual anomaly is documented in France, Hong Kong, Holland, Spain, and Sweden by LaFond (2005), Pincus et al. (2007) produce no significant accrual anomaly for the first three countries and document significant accrual underpricing for Spain and Sweden. These studies, with different sample periods, provide evidence that the pricing of accruals at the country level does vary. Martin (2008) investigates whether differential accrual persistence relative to cash flow persistence varies with the state of the economy and concludes that the differential persistence of accruals is greater during expansionary than during recessionary periods. These findings provide further support that the pricing of accruals varies, and that the consistent overpricing of accruals in the US could be merely due to chance.

The second study of this thesis (Chapter 4) is, however, more interested in firm-level accrual mispricing. Given the earlier review of studies (in Section 2.5.3) that provides evidence supporting the proposal that firm-level mispricing differs from that at the country level, the question arises as to whether firm-level accrual mispricing persists or abates.

Knez and Ready (1997) propose that their turtle egg hypothesis may explain the large abnormal returns available to smaller firms, and therefore investigate the drivers of return. Their hypothesis is derived from the fact that while sea turtles lay many eggs, only a few will hatch, and even fewer return to the ocean. So, like the turtle eggs, while a few firms "burst forward" each month, most languish and only a few small firms become large ones. Instead, most surviving small firms have been small for a long time and will remain so in future. If one restates this view for firm-level accrual mispricing, while not all firms are mispriced, those that have overpriced accruals will remain so, and only very few of such mispriced firms will burst forward and cease to be mispriced. Others may become underpriced, and still others will remain overpriced. The turtle egg hypothesis therefore supports the idea that some firms with mispriced accruals will persist and not change from period to period.

In an investigation of accrual fixation as an explanation for the accrual anomaly, Zach (2006) finds that the extreme accruals that drive the accrual anomaly are sticky. His results show that firms in these extreme accrual deciles tend to remain there for at least two consecutive years. This indicates that firms with mispriced accruals should persist as such for at least two periods, and should therefore be persistent. Avramov et al. (2010), in addition, show that while most capital market anomalies

are not robust to the consideration of credit quality, the accrual anomaly is. Fama and French (2008) similarly conclude (after an investigation of many capital market anomalies) that the accrual anomaly remains robust, while many other asset pricing anomalies do not.

In summary, the accruals that cause the accrual anomaly are sticky (Zach, 2006). Firms mispriced in one period should therefore remain so in the next, consistent with the findings with regard to the persistence of other asset pricing anomalies (Knez and Ready, 1997). Recent investigations of asset pricing anomalies show that the accrual anomaly (at the country level) is one of the few to remain robust (Fama and French, 2008; Avramov et al., 2010). Given that no evidence exists on the persistence of firm-level accrual mispricing, this thesis investigates this issue through research question 5 (related to research objective 5).

Research question 5: Is firm-level accrual mispricing persistent and can investors profit from a trading strategy based on it?

2.6 Conclusions

This chapter introduced the theoretical and empirical background for this thesis and provided an overview of the literature leading to the development of the five research questions to be addressed. It started with an overview of the accrual anomaly documented by Sloan (1996) and subsequent evidence confirming the anomaly's existence and persistence. Next, the possible methodological shortfalls of accrual mispricing models were discussed. While not the focus of this thesis, the first research question was then formulated: Are accruals significantly mispriced? Next, earnings quality was introduced to see if investors can make more accurate pricing

decisions when presented with better-quality information. This discussion led to the development of the second research question: Does earnings quality play a role in the mispricing of accruals? An overview of US regulatory changes (and specifically SOX) was presented next, since they specifically demand better-quality disclosures (and thus earnings quality). The introduction of SOX should therefore have reduced accrual mispricing, and this was formulated as research question 3: Has SOX reduced accrual mispricing?

Given the proposed relation between accruals and earnings quality (a variable determined at the firm level), this chapter then discussed the literature relating to the second study of this thesis (Chapter 4), documenting differences in the nature of accrual mispricing when investigated at the country, industry, and aggregate levels. Next, those studies documenting that firm-level variables causes variation in accruals were presented. These suggest that firm-level mispricing should exist, and differ from that at other levels. This discussion led to the formulation of the fourth research question: Does firm-level mispricing exist and does it differ from mispricing at the country level? The chapter next focused on the persistence of firm-level accrual mispricing, given the persistence of the accruals causing the anomaly (Zach, 2006), as well as the extant literature, which documents the persistence of other asset pricing anomalies (Knez and Ready, 1997). The final research question, research question 5, was then postulated: Is firm-level accrual mispricing persistent and can investors profit from a trading strategy based on it?

The next chapter presents the results from the first study which investigates the first three research objectives (and research questions) of this study.

Chapter 3 Earnings Quality and Accrual mispricing (First Study)

3.1 Introduction

This chapter investigates the impact of earnings quality on the mispricing of accruals and, more specifically, whether earnings quality reduces accrual mispricing. It does so through three related research questions. The first research question seeks to confirm the prior findings of Sloan (1996), that accruals are mispriced. The second considers whether earnings quality mitigates accrual mispricing, and the third determines whether the accrual anomaly persists in the post-Sarbanes–Oxley Act (SOX) period. This first section addresses the motivations behind these three research questions and then discusses how this research differs from previous work in the area. Next, the overall contribution to the literature is presented, along with its findings and practical implications. Finally, the structure of the remainder of the chapter is presented.

The motivations for this investigation stem from the substantial body of research that documents accrual mispricing but fails to explain its existence (Sloan, 1996; DeFond and Park, 2001; Xie, 2001; Beneish and Vargus, 2002; Drake et al., 2009). Prior literature recognizes that low-quality disclosures increase information asymmetry and risk (Diamond, 1985; Brown and Hillegeist, 2007; Drake et al., 2009), but does not investigate its role in accrual mispricing. Investors who receive low-quality disclosures have less accurate information on which to base their valuation and will therefore be more prone to misprice securities. This study therefore investigates this important issue through research question 2. A further motivation for this investigation stems from the introduction of the Sarbanes–Oxley Act (SOX). Since

SOX sought to improve disclosure quality, it should provide investors with more accurate information by which to price accruals. While SOX should have impacted on the extent of accrual mispricing, there is little empirical evidence to date, and research question 3 therefore addresses this issue. While this study mainly aims to investigate the impact of earnings quality on accrual mispricing, and SOX's impact on this, it starts by confirming (through research question 1) that accruals are, in fact, mispriced.

The accrual anomaly documents that investors are unable to estimate correctly the valuation implications of accrual and cash flow persistence (Sloan, 1996). Investors overestimate (underestimate) the contribution of accruals (cash flow) to earnings persistence and thus misprice securities. This behavior is not consistent with the efficient market hypothesis (Fama, 1970), which states that all value-relevant information is included in prices in an instantaneous and unbiased manner. While several explanations have been offered for the anomaly's existence (Xie, 2001; Fairfield et al., 2003; Desai et al., 2004; Khan, 2008; Drake et al., 2009), a widely accepted rationale has yet to be determined and therefore remains topical (Fama and French, 2008).

The anomaly is driven by discretionary accruals and may therefore exist due to the managerial manipulation of earnings (Xie, 2001). Such manipulation yields low-quality disclosures, information asymmetry, and risk (Diamond, 1985; Brown and Hillegeist, 2007; Drake et al., 2009). While analysts are mostly aware of the implications of large discretionary accruals (Elgers et al., 2003; Drake et al., 2009), this information is still not incorporated accurately by all investors (Bradshaw et al.,

2001; Xu, 2010). In fact, investors are unable to determine the true persistence (and implications for future persistence) of managed (low-quality) earnings, leading to accrual mispricing. If investors receive better-quality information, they should be able to estimate the persistence of the accrual and cash components of earnings more accurately, resulting in less accrual mispricing.

The quality of earnings should have improved following the introduction of SOX (Lobo and Zhou, 2006; Cohen et al., 2008; Jain et al., 2008). This act introduced significant reforms aimed specifically at improving disclosure quality and restoring investor confidence. Post-SOX studies show improved earnings quality (Lobo and Zhou, 2006), less accrual-based earnings management (Cohen et al., 2008), and increased investor confidence (Jain et al., 2008), indicating the success of SOX in achieving these goals. Improved earnings quality should provide more accurate information on the quality and persistence of accruals, allowing investors to price them accurately, and reducing mispricing.

This study makes several contributions to the literature. The main contribution is that this thesis shows earnings quality mitigates the mispricing of accruals. It therefore provides evidence of the importance of good disclosure quality in ensuring market efficiency and establishes a link between financial reporting quality and security pricing. Before doing so, however, it confirms the existence of the anomaly with the accrual mispricing models of both Mishkin and Kraft in research question 1 by showing that these two models yield similar results. The investigation of the impact of SOX on accrual mispricing further contributes by confirming the effectiveness of

SOX in achieving its stated aim of improving disclosure quality[15] (Akhigbe and Martin, 2006; Linck et al., 2009).

This study is similar to but also different from previous works, such as Sloan (1996), Xie (2001), and Richardson et al. (2006). Sloan (1996) investigates whether investors accurately price the accrual and cash components of earnings and shows that investors overestimate accrual persistence and misprice securities with the Mishkin model. In addressing the first research question, this study not only confirms the existence of accrual mispricing with the Mishkin model, but also simultaneously employs the ordinary least squares (OLS) regression model of Kraft and documents that the two models yield comparable results. It then goes further by investigating whether low-quality disclosures might drive the accrual anomaly. Xie (2001) proposes that managers increase earnings opportunistically through positive accruals, which could mislead investors when pricing securities. He then shows that investors misprice the discretionary component of accruals and suggests that the anomaly could therefore exist due to managerial manipulation of earnings. Richardson et al. (2006) similarly believe that managers' earnings manipulation contributes significantly to the lower persistence of accruals that cause the anomaly. While this study is similar to Xie (2001) and Richardson et al. (2006) in examining earnings manipulation and accrual mispricing, it differs by specifically determining whether earnings quality mitigates mispricing.

In addition, as far as the second research question is concerned, earnings manipulation results in the disclosure of accruals and cash flow figures that do not

[15] Disclosure quality was defined earlier, in Diagram 1.1 of Chapter 1, and it refers to the extent to which firm disclosures are accurate and present a true and fair view of the organization.

accurately portray future earnings. Such accruals and cash flows are of low persistence (Xie, 2001) and are recognizable as low-quality earnings disclosures.[16] Since disclosure quality is inversely related to information asymmetry (Frankel and Li, 2004; Brown and Hillegeist, 2007), investors in such firms with low-quality disclosure will therefore have less (accurate) information for their pricing decisions. Such investors are unlikely to anticipate accruals' future reversals accurately (DeFond and Park, 2001), and thus misprice securities. This study differs from prior research on the relation between disclosure quality and information asymmetry (Brown and Hillegeist, 2007) and on investors' ability to estimate the impact of earnings on accruals (DeFond and Park, 2001) by investigating whether earnings quality mitigates accrual mispricing.

In relation to the third research question, prior studies show decreased accrual-based earnings management (Cohen et al., 2008) and increased earnings quality (Lobo and Zhou, 2010; Kalelkar and Nwaeze, 2011) post-SOX. Earnings management occurs mainly through increased discretionary accruals (Xie, 2001), the component of accruals that investors misprice in the accrual anomaly. This study therefore extends the work of Cohen et al. (2008) by investigating whether the lower incidence of accrual-based earnings management documented post-SOX has also resulted in lower accrual mispricing. Chan et al. (2009) show for UK data that accrual mispricing was significantly reduced following the introduction of new regulation—Financial Reporting Standard No. 3 (FRS3)—aimed at reducing earnings manipulation. Since SOX has wider-ranging implications than FRS3, SOX should have had a significant impact. This current work differs from Cohen et al. (2008) and

[16] When the accrual component of earnings reverts to cash flow quickly, the quality of those accruals is higher (Dechow and Dichev, 2002). If earnings are manipulated (i.e., income-increasing accruals), the associated accruals will not revert to cash flow quickly, since they do not represent a true view of the firm's position.

Chan et al. (2009) by investigating the mispricing of accruals following significant regulatory reform, SOX, to determine whether it has mitigated such pricing inefficiencies.

The results confirm that accruals are significantly mispriced for the period 1996–2000 (research question 1). In regard to the second research question, whether earnings quality impacts on accrual mispricing, both accrual mispricing models employed indicate that the inclusion of earnings quality in mispricing models mitigates the accrual anomaly. The previously documented accrual overestimation is reduced to levels no longer considered significant. Lastly, results from the estimation of accrual mispricing post-SOX (2003–2007) indicate that no significant accrual anomaly is present in this period. The improved disclosure environment in the post-SOX period seems therefore to have mitigated accrual mispricing.

This study has implications for regulators and investors interested in security pricing, since they should note the potential market integrity benefits associated with better earnings quality. It seems that increased earnings quality reduces accrual mispricing, and thus improves market efficiency. The positive impact of SOX, in turn, shows that regulators were justified in implementing this often criticized (see, e.g., Ribstein, 2002) reform and that it achieved its objectives.

The remainder of this chapter is organized as follows. Section 3.2 provides a brief overview of the literature and theoretical background from which hypotheses are developed. Data and methodology are discussed in Section 3.3. The descriptive and empirical results are presented in Section 3.4, while Section 3.5 provides a summary of the main findings and conclusions.

3.2 Hypotheses development

This section presents the theoretical background and develops hypotheses to test the three research questions established earlier, in Chapter 2. The literature ascertaining the existence and persistence of accrual mispricing is examined first (in Section 3.2.1) and leads to hypothesis 1. Next, the focus shifts to causes of the accrual anomaly and, specifically, methodological shortfalls (Section 3.2.1.1), risk-based explanations (Section 3.2.1.2), and investor-based reasons (Section 3.2.1.3) for mispricing. Studies that support a role for earnings quality in accrual mispricing are then presented and hypothesis 2 is formally stated. Lastly, SOX is introduced and its potential impact on accrual mispricing discussed, which leads to hypothesis 3, associated with research question 3.

3.2.1 Accrual mispricing

Accrual mispricing occurs when investors incorrectly estimate the persistence of the accrual component of earnings. The accrual anomaly is one such mispricing event where investors overestimate the contribution of accruals to earnings persistence (Sloan, 1996). While current earnings comprise of accruals and cash flows, their contributions to earnings persistence differ. Accruals include a discretionary component that is subject to managerial discretion and thus affords the opportunity for intentional or unintentional estimation errors. Accruals therefore contribute less to earnings persistence. Cash flows, in contrast, are less subjective (no discretionary component) and should therefore contribute more to earnings persistence (Sloan, 1996). Investors should consequently treat cash flows as the more persistent

component of earnings; the accrual anomaly, however, shows that they do not, and accruals are thus mispriced.

Following Sloan's (1996) documentation of the anomaly, many studies have attempted to replicate the author's findings and confirm its existence (Collins and Hribar, 2000; Xie, 2001; Desai et al., 2004). This study investigates instead the impact of earnings quality on accrual mispricing. However, given the potential problems associated with the Mishkin model (see Section 3.2.1.1 below) and the alternative OLS model proposed by Kraft, this study, in doing so, first confirms that accruals are mispriced over the sample period and that these two models yield similar results. Given this discussion, the first hypothesis investigates whether accruals are mispriced and is formally stated as follows.

Hypothesis 1: There is accrual mispricing pre-SOX

Besides documenting and confirming the anomaly, the extant literature also investigates its possible causes (Xie, 2001; Mashruwala et al., 2006; Kraft et al., 2007; Leippold and Lohre, 2010). These studies can be broadly divided into three groups: The first of these proposes that the anomaly exists due to methodological shortfalls and would dissipate with more rigorous testing (Kraft et al., 2006; Leippold and Lohre, 2010), while the second examines risk-based reasons. The third suggests investor-based explanations for the anomaly. These three groups are discussed in the same order below.

3.2.1.1 Methodological shortfalls in estimating accrual mispricing

Some studies propose that the anomaly may be caused by erroneous methodology or testing procedures (Kothari et al., 2005; Kraft et al., 2007; Leippold and Lohre, 2010; Resutek, 2010). Kothari et al. (2005) highlight the lack of robustness checks in prior studies, while Leippold and Lohre (2010) advocate the use of multiple testing procedures after showing that many of the country-level accrual anomalies documented disappear when such procedures are employed. Resutek (2010) specifically compares the Mishkin model with a three-period log-linear model decomposed from a firm's book-to-market ratio and finds results contradicting those of Sloan (1996). Kraft et al. (2007) suggest the Mishkin model suffers from a missing variables problem. They state that accounting studies rarely include additional specifications or explanatory variables in the forecasting equation to address such missing variables. They develop an OLS regression model that allows for the inclusion of additional missing variables as an alternative to the Mishkin model. Its proposed benefits over the Mishkin model includes easier comparisons across accounting studies, the convenient addressing of econometrical issues (such as cross-sectional correlations), and the elimination of survivorship bias, while yielding similar results. This study therefore employs both the Mishkin and Kraft models to estimate mispricing when investigating the three research questions.

3.2.1.2 Risk-based explanations for accrual mispricing

Risk-based explanations for the accrual anomaly propose that abnormal returns from trading on the anomaly are simply those expected to compensate for higher risk (Butler et al., 2004; Ng, 2005; Khan, 2008). A few studies document that low accrual firms (which a trading strategy based on an accrual anomaly buys) have lower profits

and sales growth and higher distress risk (Ng, 2005; Dechow and Ge, 2006; Zach, 2006). The abnormal returns available to the accrual anomaly trading strategy (which buys low accrual firms and sells high accrual firms) are therefore seen as compensation for increased risk (Ng, 2005) and part of expected returns. A risk-based explanation is also favored by Khan (2008), who employs a four-factor intertemporal capital asset pricing model (including uncertainty in future returns and dividends in addition to SMB[17] and HML[18]) to establish the impact of risk on mispricing. He reports insignificant unexplained returns with this model and concludes that the unaccounted risk appears responsible for the accrual anomaly.

While these risk-based studies agree that low accrual firms (with lower profits and sales growth) face higher default risks and therefore require higher returns (as the anomaly predicts), others find conflicting results. Hirshleifer et al. (2010), for example, employ a factor-mimicking portfolio including an accrual factor and conclude that their findings do not support a rational risk-based explanation for the anomaly. Dechow et al. (2011) agree, stating that it is very unlikely that risk is driving the returns in the accrual anomaly. Xu and Lacina (2009) similarly document that firms with large accruals have higher expected returns inconsistent with the risk-based results of Ng (2005) and Khan (2008). They propose, instead, an investor-based explanation for the anomaly, concluding that (earnings) disclosures are needed to help investors better estimate future performance.

[17] SMB = small minus big market capitalization from Fama and French's (1992) three-factor model.
[18] HML = high minus low book-to-price ratio from the Fama and French's (1992) three-factor model.

3.2.1.3 Investor-based explanations for accrual mispricing

Investor-based explanations for the anomaly argue that market inefficiency, caused by irrational pricing, drives the mispricing. If the cash flow and accrual components of earnings are of low quality, rational investors in an efficient market should incorporate that information into their pricing (Fama, 1970). The accrual anomaly shows that this does not happen. It is possible that investors do not understand the importance of accrual and cash components with respect to future earnings (Richardson et al., 2010). Alternatively, they may not be able to identify and incorporate the implications of low-quality earnings (and components) in their pricing decisions.

While accruals include both a discretionary (abnormal) and a non-discretionary component, investors do not necessarily understand the difference. The abnormal (discretionary) component reflects managerial choice (and is subject to managerial discretion) and can therefore include both intentional and unintentional errors. In contrast, the non-discretionary component should be more accurate (or less manipulated), since it reflects the business conditions (e.g. length of the operating cycle) that naturally create accruals (Guay et al., 1996).

Evidence shows that it is the discretionary component of accruals, the component subject to managerial manipulation, that investors misprice (Xie, 2001). Since managerial manipulation lowers the accuracy of financial disclosures, earnings quality could play a role in accrual mispricing. While this narrows the source of mispricing, it does not explain why the anomaly is not arbitraged away (Lev and Nissim, 2006; Mashruwala et al., 2006). If firms with high discretionary accruals

drive the anomaly, investors should incorporate this information in their pricing decision and the mispricing should no longer exist. The assumption that investors differentiate between low- and high-quality accruals may therefore be inaccurate. It seems, instead, that investors are unable to identify high- versus low-quality earnings or do not understand their importance. Earnings quality should therefore be an important consideration in the mispricing of accruals.

3.2.2 Earnings quality and the mispricing of accruals

Earnings quality reflects the extent to which current earnings contain information about future earnings (Penman and Zhang, 2002) and depends largely on the quality of the underlying accrual and cash flow components. When those components are of high quality, accruals will map very closely to cash flow, and earnings persistence (and quality) will be high (Dechow and Dichev, 2002; Francis et al., 2005; Richardson et al., 2005). Prior literature concludes that low accrual quality weakens the mapping of accruals into cash flows and increases information risk (Francis et al., 2005), asymmetry (Ecker et al. 2006), and idiosyncratic (firm-specific) risk (Rajgopal and Venkatachalam, 2008). This would make the accurate pricing of earnings more difficult for investors.

If investors understood the importance of earnings quality and were able to distinguish correctly between low- and high-quality earnings, they would include these implications in their pricing decisions and securities would not be mispriced. The accrual anomaly, however, provides evidence that they, instead, overestimate low-quality accruals. Investors presented with low-quality earnings will therefore

continue to misprice accruals and cash flows. If investors received high-quality earnings instead, their decisions would be based on accrual and cash flow figures that are more precise (and less manipulated). Such better-quality accruals should revert to cash flow more quickly (Dechow and Dichev, 2002), and investors' valuation decisions (based on these higher-quality figures) should consequently be more accurate. The mispricing of accruals should therefore be less in firms with high earnings quality.

In summary, investors rely on financial information when making investment decisions and valuing securities. When presented with low-quality disclosures, they are unlikely to make accurate valuation decisions, given their inability to identify and distinguish correctly between high- and low-quality earnings and their implications for future earnings (Sloan, 1996). As such, when earnings quality is low, investors are likely to misprice securities. With high earnings quality (and higher earnings persistence), it does not matter if investors are unable to distinguish (or do not understand the importance of) earnings quality (since the information is more accurate). Such high-quality disclosures should allow them to price firm equity more accurately and thus reduce accrual mispricing. Earnings quality should therefore impact on accrual mispricing. This discussion leads to hypothesis 2, related to research question 2.

Hypothesis 2: Earnings quality mitigates accrual mispricing.

3.2.3 SOX and accrual mispricing

Following several accounting failures due to earnings management and low-quality financial reporting at prominent US firms in the early 2000s (Dey, 2010), SOX was introduced. The act required many improvements in firm accounting and management functions; sections 404 and 302, designed to improve the accuracy and reliability of financial disclosures and monitoring of management, respectively, have received the most attention (see Gordon et al., 2006). Section 302, titled "Corporate responsibility for financial reports," requires top management (the CEO and CFO) to take personal responsibility for internal control procedures. In addition, top management must certify that financial statements have been reviewed and include a true and fair view of the firm's financial condition. Section 404, titled "Management assessment of internal controls," requires that financial reports include an internal control report detailing management responsibility for establishing and maintaining internal control procedures. Management is, in addition, responsible for assessing these internal controls at the end of the financial year and for reporting on their efficiency.

Recent studies show voluntary disclosures of information have increased post-SOX (Gordon et al., 2006), while earnings management has declined (Cohen et al., 2008). In regard to earnings components, Lobo and Zhou (2006) report lower discretionary accruals following SOX, while Chambers and Payne (2008) show increased accrual reliability. Their comined findings indicate that earnings quality should be better post-SOX, but they do not investigate this issue. Given that it is the discretionary component of accruals that is mainly mispriced (Xie, 2001), this improved earnings quality should reduce the accrual anomaly post-SOX. While SOX must therefore

have impacted on the mispricing of accruals, there is little evidence in this regard. Dopuch et al. (2010) investigate the pricing of accruals for profit versus loss firms and conclude the mispricing of accruals is mainly confined to profit firms. They propose this is due to the fact that loss-making firms' earnings are less value relevant and thus less likely to be mispriced. They also propose that, given SOX's likely impact on earnings quality, it may have mitigated mispricing. While not directly estimating whether mispricing is reduced post-SOX, the show a decrease in hedge funds returns for a total accrual strategy in profit firms post-SOX (in fact, returns are half those pre-SOX), consistent with the notion that SOX has improved earnings quality and decreased the accrual anomaly. Bhojraj et al. (2009) investigate whether accrual mispricing decreased following restructuring and regulatory changes (SOX). While they only examine the post-SOX period (2001–2006), their results show a reduction in mispricing in this period.

This study therefore investigates whether accrual mispricing has been mitigated post-SOX. This discussion leads to hypothesis 3, related to research question 3.

Hypothesis 3: There is no accrual mispricing post-SOX.

3.3 Data and methodology

3.3.1 Data and sample

3.3.1.1 Data

The data required for calculating the accrual mispricing variables are obtained from the merged Compustat/Center for Research in Security Prices (CRSP) database.

These variables included earnings and its accrual and cash flow components, as well as buy and hold returns. Data required to calculate earnings quality proxies are also obtained from these sources. Each of these components is now discussed in the same order.

Earnings are measured as current period earnings (Compustat item #178) and are scaled by total assets (Compustat item #6). Accruals, in turn, are calculated with the Sloan (1996) balance sheet approach and are estimated as:

$$ACC_t = (\triangle CA - \triangle CASH) - (\triangle CL - \triangle STD - \triangle TP) - DEP_t \quad (1)$$

where ACC_t is current period accruals, ΔCA is change in current assets (change in Compustat item #4 from $period_{t-1}$ to $period_t$), $\Delta CASH$ is the change in cash and cash equivalents (change in Compustat item #1 from $period_{t-1}$ to $period_t$), ΔCL is change in current liabilities (change in Compustat item #5 from $period_{t-1}$ to $period_t$), ΔSTD is change in debt included in current liabilities (change in Compustat item #34 from the $period_{t-1}$ to $period_t$), ΔTP is change in income tax payable (change in Compustat item #71 from $period_{t-1}$ to $period_t$), and DEP_t is depreciation and amortization expenses (Compustat item #14). The calculated accruals value is scaled by total assets (Compustat item #6).

Cash flow is measured as the difference between the calculated earnings and accrual values, as per Sloan (1996):

$$CFO_t = EAR_t - ACC_t \quad (2)$$

where CFO_t is the cash flow component of earnings, EAR_t is current year earnings (Compustat item #178), and ACC_t is current period accruals as per equation (1).

Buy and hold returns are calculated from returns data starting four months after the end of the fiscal year from which the financial statements are gathered (Sloan, 1996). This is calculated as the percentage change in stock price from $period_t$ to $period_{t-1}$:

$$R_{it} = \frac{P_t - P_{t-1}}{P_{t-1}} \quad (3)$$

where R_{it} is shareholder return calculated as annual buy and hold returns estimated year by year from four months after financial year − end, P_t is the security price four months after the financial year − end, and P_{t-1} is the lagged security price.

Size-adjusted abnormal returns are estimated, following Sloan (1996) and Xie (2001) as the difference between a firm's annual buy and hold returns and the annual buy and hold returns for an identical 12-month period on the market capitalization based portfolio decile to which the firm belongs. It requires adjusting buy and hold returns for expected returns. The calculation process can be specified as:

$$(R_{t+1} - R_{t+1}|\varphi_t) = R_{it} - R_{smp}$$

Where $(R_{t+1} - R_{t+1}|\varphi_t)$ are abnormal returns. R_{it} is buy and hold (shareholder return) calculated as annual buy and hold returns estimated on a year-by-year basis starting 4 months after the end of a firm's financial year end and includes distributions. R_{smp} is a proxy for "expected returns" and is estimated as the annual buy and hold return for the same 12-month period on the market-capitalization-based portfolio decile (the size decile) to which the firm belongs. Total assets are employed to classify each firm into a size decile for each year.

In addition to the accrual, cash flow, and return variables required for accrual mispricing tests, an earnings quality proxy is also required to estimate its impact on accrual mispricing and answer research question 2. Two measures of accounting conservatism, those of Basu (1997) and Beaver and Ryan (2000), are employed here as a proxy for earnings quality. Their calculations require a number of accounting variables (earnings, price, book value of common equity, market value of common equity, and six years of lagged stock returns) that are also calculated from data obtained from the merged Compustat/CRSP database. The methodology employed to estimate the earnings quality proxies is presented later, in Section 3.3.2.5.

3.3.1.2 Sample

The sample was created from those US companies listed on the NYSE, NASDAQ, or AMEX available from the merged Compustat/CRSP combined database for 1996–2000 and 2003–2007. The first two hypotheses investigate accrual mispricing in the pre-SOX period (1996–2000), while the third hypothesis examines the post-SOX

period (2003–2007). These two samples (pre- and post-SOX) will therefore be discussed separately.

3.3.1.2.1 Sample for hypotheses 1 and 2 (1996–2000, pre-SOX)

The sample selection procedure begins by including all listed companies in the merged Compustat/CRSP database for the period 1996–2000, which yields 42,346 firm–year observations (11,691 firms). The sample selection procedure is presented in Panels A (Mishkin sample) and B (Kraft sample) of Table 3.1. Of these 42,346 firm-year observations, 10,925 are not listed on the NYSE/NASDAQ and AMEX exchanges (Compustat exchange codes #11, #12, and #14) and are thus excluded to be consistent with previous studies (Sloan, 1996; Xie, 2001). This leaves 31,421 firm–year observations (8,346 firms). Next, firms with missing observations for any of the variables required to calculate accruals, earnings, and total assets are excluded (Xie, 2001), leaving 22,485 firm–year observations (6,098 firms). In addition, following previous studies (Beneish and Vargus, 2002; Desai et al., 2004; Lev and Nissim, 2006; Mashruwala et al., 2006), all financial firms—according to the Global Industry Classification System (GICS) sectors—are excluded, leaving 22,129 firm–year observations (6,033 firms). There are 58 firm–year observations for which no price data are available for the required month, reducing the sample further to 22,071 firm–year observations (6,021 firms).

The next step requires the calculation of future stock returns and abnormal returns. The Mishkin model employs both of these variables, while that of Kraft uses only future stock returns. Some firm–years lack lag price data to calculate returns, resulting in the deletion of 218 firm–years, leaving 21,853 firm–year observations

(5,980 firms). Next, consistent with prior research (De Fond and Park, 2001; Kraft et al., 2006), the top and bottom 1% of values are eliminated from the sample to exclude the effects of extreme observations. The final sample for the accrual mispricing test of Kraft therefore includes 21,169 firm–year observations, or 5,841 firms (Panel B of Table 3.1). Since the Mishkin sample requires additional returns information to calculate its abnormal returns, a further 45 firms with missing data (218 firm–years) are excluded, leaving 21,004 firm–years (5,796 firms). This is the sample employed in Mishkin's test of hypothesis 1 (see Panel A of Table 3.1) to determine whether accruals are mispriced.

To investigate the impact of earnings quality on accrual mispricing in hypothesis 2, earnings quality proxies are then calculated with Basu's (1997) and Beaver and Ryan's (2000) measures of earnings conservatism. These require a number of accounting variables (price, earnings per share, returns, and book-to-market value of equity) for each of the 21,169 firm–year observations in the Kraft sample. Consistent with Beaver and Ryan (2000) and Billings and Morton (2001), the book-to-market values are winsorized at a value of zero and four respectively to mitigate the effects of extreme observations.

Table 3.1 Sample selection (hypotheses 1–3)

This table reports the sample selection procedure for the three hypotheses investigated in this chapter. The first column presents the sample procedure. The number of firm–year observations and number of firms is stated next. Panel A presents the sample for hypotheses 1 and 2 employing the Mishkin model. Panel B discusses the sample for hypotheses 1 and 2 with the model of Kraft. The sample period for Panels A and B is 1996–2000. Panels C and D represent the sample for hypothesis 3 employing the Mishkin and Kraft models. The sample period for hypothesis 3 is 2003–2007.

Panel A: Sample for hypotheses 1 and 2 employing the Mishkin model

	Mishkin sample	**Number of firms**
Compustat/CRSP database observations for the sample period	42,346	11,691
Less: Non-NYSE NASDAQ and AMEX firms	(10,925)	(3,345)
	31,421	8,346
Less: Missing accrual calculation variables or earnings figure	(8,936)	(2,248)
	22,485	6,098
Less: GICS financial firms	(356)	(65)
	22,129	6,033
Less: Firms with missing price data for sample period	(58)	(12)
	22,071	6,021
Less: Missing lag returns for returns	(218)	(41)
	21,853	5,980
Less: Top and bottom 1% of observations	(684)	(139)
	21,169	5,841
Less: Missing variables for abnormal return calculation	(218)	(45)
Final sample for hypothesis 1	**21,004**	**5,796**
Less: Truncation of book-to-market values at 0 and 4, as well as missing book-to-market values	(132)	(24)
	20,872	5,772
Less: Firm–years for which enough observations are not available to calculate a conservatism measure	(14,442)	(4,196)
	6,430	1,576
Less: Top and bottom 1% of observations	(152)	(47)
Final sample for hypothesis 2	**6,278**	**1,529**

Panel B: Sample for hypotheses 1 and 2 employing the Kraft model

	Kraft sample	Number of firms
Compustat/CRSP database observations for the sample period	42,346	11,691
Less: Non-NYSE NASDAQ and AMEX firms	(10,925)	(3,345)
	31,421	8,346
Less: Missing accrual calculation variables or earnings figures	(8,936)	(2,248)
	22,485	6,098
Less: GICS financial firms	(356)	(65)
	22,129	6,033
Less: Firms with missing price data for sample period	(58)	(12)
	22,071	6,021
Less: Missing lag returns	(218)	(41)
	21,853	5,980
Less: Top and bottom 1% of observations	(684)	(139)
Final sample for hypothesis 1	21,169	5,841
Less: Truncation of book-to-market values at 0 and 4, as well as missing book-to-market values	(161)	(39)
	21,008	5,802
Less: Firm–years for which enough observations are not available to calculate a conservatism measure	(12,475)	(4,226)
	6,430	1,576
Less: Top and bottom 1% of observations	(152)	(47)
Final sample for hypothesis 2	6,278	1,529

Panel C: Sample for hypothesis 3 (2003–2007) with the Mishkin model

	Mishkin sample	Number of firms
Compustat/CRSP database observations for the sample period	39,228	8,762
Less: Non-NYSE NASDAQ and AMEX firms	(1,608)	(441)
	37,620	8,321
Less: Missing accrual calculation variables or earnings figures	(19,318)	(3,689)
	18,302	4,632
Less: GICS financial firms	(405)	(115)
	17,897	4,517
Less: Missing lag returns	(87)	(81)
	17,810	4,436
Less: Top and bottom 1% of observations	(1,117)	(267)
	16,693	4,169
Less: Missing variables for abnormal return calculation	(133)	(76)
Final sample for hypothesis 3	**16,560**	**4,093**

Panel D: Sample for hypothesis 3 (2003–2007) with the model of Kraft

	Kraft sample	Number of firms
Compustat/CRSP database observations for the sample period	39,228	8,762
Less: Non-NYSE NASDAQ and AMEX firms	(1,608)	(441)
	37,620	8,321
Less: Missing accrual calculation variables or earnings figures	(19,318)	(3,689)
	18,302	4,632
Less: GICS financial firms	(405)	(115)
	17,897	4,517
Less: Missing lag returns	(87)	(81)
	17,810	4,436
Less: Top and bottom 1% of observations	(1,117)	(267)
Final sample for hypothesis 3	**16,693**	**4,169**

Firms with missing book-to-market value observations are also deleted, eliminating a further 161 observations from the Kraft sample (and 132 observations from the Mishkin sample, leaving 21,008 and 20,871 firm–year observations, respectively, for the Kraft and Mishkin model samples (see Panels A and B of Table 3.1). Returns data from 1989 are required to calculate the six lagged return values for the Beaver–Ryan (2000) model for 1996. Given the relatively small sample period (five years), complete data for each consecutive year in the sample period are needed to calculate these conservatism estimates without bias. There are 14,442 (12,475) firm–year observations in the Mishkin sample (Kraft sample) for which earnings conservatism measures cannot be calculated (due to missing data), leaving 6,430 firm–year observations for both samples with complete data. The extreme values (top and bottom 1%) for both the Basu (1997) and Beaver–Ryan (2000) measures are then eliminated, leaving 6,278 firm–year or 1,529 firm observations for both samples, with complete data for each variable employed, which is therefore the final sample for testing hypothesis 2.

3.3.1.2.2 Sample for hypotheses 3 (2003–2007)

The initial sample for the post-SOX period consists of all listed companies on the merged Compustat/CRSP database for the period 2003–2007 (39,228 firm–year observations for 8,762 firms) (see Panels C and D of Table 3.1). Of these, 1,608 firm-year observations (441 firms) are for firms not listed on one of the three major exchanges (NYSE, NASDAQ, AMEX; Compustat exchange codes #11, #12, and #14) and are removed to ensure consistency with previous studies (Sloan, 1996; Xie, 2001). This leaves 37,620 firm–year observations for 8,321 firms. There are 19,318 firm–years with missing variables required to calculate accruals, cash flow, earnings, and total assets (see Panel C of Table 3.1 for the Mishkin model sample and Panel D of Table 3.1 for the sample of Kraft). These are excluded from the sample, leaving 18,302 firm–year observations (4,632 firms). Next, financial firms (GICS sector code 40) are eliminated, leaving 17,897 firm–year observations.[19] In addition, price data are missing for 87 firm–years, and deletion of these leaves 17,810 firm–year observations.

Consistent with prior research (De Fond and Park, 2001; Kraft et al., 2006), the top and bottom 1% of values are then deleted from the sample to exclude the effects of extreme observations. This leaves 16,693 firm–year observations for the Kraft accrual mispricing calculation for hypothesis 3. Next, for the Mishkin model sample, abnormal returns are calculated and a further 133 observations excluded due to missing data, leaving 16,560 firm–year observations. The final Mishkin sample employed in hypothesis 3 therefore consists of 16,560 firm–year observations (4,093 firms).

[19] Financial firms are excluded from the sample due to difficulties in calculating accruals and their different nature (Beneish and Vargus, 2002; Desai et al. 2004; Mashruwala et al. 2006; Lev and Nissim, 2006).

3.3.2 Methodology

This section presents the methodology employed to test the hypotheses relating to the three research questions developed earlier, in Chapter 2. The two accrual mispricing models (Mishkin and Kraft) employed to test hypotheses 1 and 3, respectively, are presented first. The methodology employed to estimate the two earnings quality proxies, that of Basu (1997) and Beaver and Ryan (2000), is then discussed in section 3.3.2.5. Next, the accrual mispricing models are augmented by including each of these earnings quality proxies to determine whether earnings quality mitigates accrual mispricing (hypothesis 2).

3.3.2.1 Accrual mispricing: The Mishkin model

The Mishkin model is utilized to estimate accrual mispricing and was first applied by Sloan (1996) to document the accrual anomaly. It employs an earnings forecasting model in conjunction with a valuation model and measures mispricing as the difference between the accrual and cash components in these equations. A significant variation between the coefficient of accruals and cash flow in the forecasting and valuation equations is an indication of mispricing. Before accrual mispricing is measured, Sloan (1996) first establishes that earnings and its cash and accrual components are persistent. This study follows these same procedures and first estimates earnings persistence before the forecasting and valuation models are calculated and the mispricing established.

3.3.2.1.1 Earnings persistence

When the accrual component of earnings is expected to revert to cash flows in the next period (implying that the fleeting component of earnings is low), it is more

persistent and of higher quality (Richardson et al., 2006). Since such higher-quality accruals and earnings present useful information in pricing decisions, they provide a more accurate prediction of future earnings. If the contribution of the accrual and cash components to earnings persistence is not accurately included in the valuation decision, mispricing will occur (Sloan, 1996).

The extant literature (Freeman et al., 1982; Sloan, 1996) therefore employs the following model (earnings forecasting model) that expresses current earnings performance in relation to future earnings performance and estimates persistence:

$$EAR_{t+1} = \alpha_0 + \alpha_1 EAR_t + \varepsilon_{t+1} \quad (4)$$

where EAR_{t+1} is one − year − ahead earnings, measured as operating income scaled by total assets. α_0 is the intercept term, EAR_t is current year earnings, and ε_{t+1} is the stochastic error term.

In equation (4), α_0 is the intercept term from the regression and α_1, the coefficient for the current year's earnings, measures the persistence of earnings from one year to the next. When α_1 is high, earnings persistence (and quality) is high.

3.3.2.1.2 Accrual and cash flow persistence

Earnings consist of both an accrual and a cash component, and firms with larger accruals that are unrelated to cash flow realizations have lower accruals quality and earnings persistence (Dechow and Dichev, 2002). The cash flow component, while containing less information, is not subject to this problem and is considered more persistent (Xie, 2001). The earnings persistence equation (4) constrains the cash flow and accrual components to be equal (Sloan, 1996). The forecasting equation (5) relaxes this constraint and estimates the persistence of these accrual and cash components.

The forecasting equation is estimated as

$$EAR_{t+1} = \alpha_0 + \alpha_1 ACC_t + \alpha_2 CFO_t + \varepsilon_{t+1} \quad (5)$$

where EAR_{t+1} is one − year − ahead earnings, measured as operating income scaled by total assets. α_0 is the intercept term, ACC_t is current year accruals measured as per equation (1), CFO_t is cash flow in the current year as measured in equation (2), and ε_{t+1} is the stochastic error term.

In equation (5), α_0 is the intercept term, while α_1 is the coefficient of current period accruals and indicates the extent to which current period accruals contribute to future earnings persistence. The coefficient of cash flow, α_2, similarly measures the contribution of this component to the next period's earnings. Evidence shows that the cash flow component of earnings contributes more to earnings persistence (Xie, 2001). Investors are therefore expected to rely more heavily on the cash flow component of earnings when making their valuation decisions. To see how investors actually value the cash flow and accrual components, the valuation equation is estimated. It considers investors' actual pricing of the accrual and cash components. The valuation equation takes the following form:

$$(R_{t+1} - R_{t+1}|\varphi_t) = \beta_0(EAR_{t+1} - \alpha_0 - \alpha^*_1 ACC_t - \alpha^*_2 CFO_t) + \varepsilon_{t+1} \quad (6)$$

where $(R_{t+1} - R_{t+1}|\,\Phi_t)$is abnormal returns calculated as the return on holding a security during the $period_{t+1}$minus the expectation of the return from holding the security for the $period_{t+1}$. EAR_{t+1} is one year ahead earnings, measured as operating income scaled by total assets. ACC_t is current period accruals. CFO_t is current year cash − flow and ε_{t+1} is the stochastic error term.

The forecasting (5) and valuation (6) equations are estimated simultaneously to determine whether accruals are mispriced. If markets are efficient, investors should correctly value the persistence of the accrual and cash components of earnings so that their coefficients in the valuation equation (6) are not substantially different from that in the forecasting equation (5). The dual constraint posed by market

efficiency is therefore $\alpha_1=\alpha^*_1$ and $\alpha_2=\alpha^*_2$. This constraint is met when investors correctly incorporate the average persistence of earnings (and specifically the contribution of the accrual and cash components to the persistence of those earnings) into their pricing decisions. In this circumstance, neither the accrual nor the cash component will be mispriced. If, however, the coefficient of accruals (cash flows) in the forecasting and valuation equations vary significantly from each other, investors are not accurately valuing earnings components, and thus mispricing is present (Sloan, 1996). The difference in the coefficients of accruals from the forecasting and valuation equations will be employed to determine whether accruals are mispriced and thus test hypothesis 1.

Mispricing of earnings components (specifically, overestimation of accruals) is documented by Sloan (1996), with evidence that abnormal returns are available through a strategy of selling high accrual firms and buying low accrual ones. Following Sloan (1995), this study does not calculate these returns but, instead, the difference between the coefficients in the forecasting (α_1) and valuation equations (α^*_1). When there is no significant divergence between them, the earnings are not significantly mispriced. If, however, the accrual (cash flow) coefficient from the forecasting equation is significantly larger than that in the valuation equation, the accruals (cash flows) are underpriced, and vice versa.

3.3.2.2 Accrual mispricing: The Kraft model

The validity of inferences made from the Mishkin mispricing tests are questioned (Kraft et al., 2006, 2007; Leippold and Lohre, 2010). Kraft et al. (2007), for example, specifically argue that the coefficients in the forecasting and valuation equations of the Mishkin model are sensitive to the inclusion/exclusion of other

variables and may suffer from an omitted variables problem. They propose that while market efficiency can be accurately tested with this model, any inferences from those tests (such as accruals pricing) are less certain. As a better alternative, they use an OLS regression model to test accrual mispricing and show that this yields results similar to those of the Mishkin model. Their OLS model is easier to calculate and can include additional variables and thus address the missing variable problems associated with the Mishkin model. This OLS accrual mispricing model is therefore employed here to ensure the robustness of accrual mispricing results.

Whilst Kraft et al. (2007) include several additional variables (sales, change in sales, capital expenditure, change in capital expenditure, book-to-price ratio deciles and price deciles) in their extended mispricing model to demonstrate the effect of missing variables on accrual mispricing estimation. Whilst Kraft et al. (2007)'s extended model has not been employed in any of the subsequent accrual anomaly studies, a slightly extended Mishkin model (including one additional variable of interest to that study) have been employed by some (Drake et al., 2009; Dopuch et al., 2010) whilst others simply estimate returns to an accrual-based trading strategy (Ali et al., 2008; Hirshleifer et al., 2011). Dopuch et al. (2010) and Drake et al. (2009) both employ the traditional Mishkin model but include a dummy variable (which interacts with the cash flow and accrual variables) within the model. Dopuch et al. (2010) include a dummy for positive vs. negative earnings whilst Drake et al. (2009) include dummy variables for high vs. low quality disclosers. The exclusion of the extended Kraft et al. (2007) model in this study, in favour of a slightly adjusted original Mishkin and Kraft model, is therefore in line with other accrual anomaly studies that follow the same path (Drake et al., 2009; Dopuch et al., 2010)

The model regresses buy and hold returns (R_{t+1}) on the cash flow and accrual components of earnings. If the coefficients of accruals or cash flows from estimation of the OLS model are significantly different from zero, it is mispriced. This coefficient will therefore be employed to determine whether accruals are mispriced in hypothesis 1.

The model takes the following form:

$$R_{t+1} = \alpha_0 + \alpha_1 ACC_t + \alpha_2 CFO_t + \sum_{n}^{t} \alpha_{3-12} SIZEDEC_t + \varepsilon_t \quad (7)$$

where R_{t+1} is the buy and hold return from holding a security during period$_{t+1}$, ACC_t is current period accruals, CFO_t is current year cash flow, $SIZEDEC_t$ are 10 size dummy variables, and ε_t is the stochastic error term.

Size dummy deciles[20] are included in the Kraft OLS regression model, since it is a well-recognized predictor of future returns (Ou and Penman, 1989; Bernard and Thomas, 1990; Sloan, 1996). While this approach differs from that of the Mishkin model (where the dependent variable, buy and hold returns, is adjusted for size), it attains the same purpose.

3.3.2.3 The augmented Mishkin model

To investigate this study's second research question, whether earnings quality affects accrual mispricing, an earnings quality proxy is introduced in each of the forecasting and valuation equations of the Mishkin model. This estimation of the extent of accrual mispricing when earnings quality is considered allows the testing of hypothesis 2. As such, an augmented forecasting model is estimated by including an earnings quality (EQ) proxy as an independent variable in the original forecasting

[20] Sloan (1996) employs size-adjusted returns in estimating accrual mispricing to eliminate size as a cause for abnormal returns. In the Kraft model, returns are not adjusted for size in the OLS model but, rather, through inclusion of 10 size dummies (as independent variables). Firms are classified according to size into 10 deciles (as in Kraft et al., 2007) and receive a score of one in the decile dummy corresponding to their size, and a score of zero for the other nine dummies.

model (5) in addition to the cash flow and accrual variables. The coefficients of accruals, cash flow, and earnings quality from the augmented forecasting equation (8) estimate their contribution to earnings persistence. The model takes the following form:

$$EAR_{t+1} = \alpha_0 + \alpha_1 ACC_t + \alpha_2 CFO_t + \alpha_3 EQ_t + \varepsilon_t \quad (8)$$

where EAR_{t+1} is one − year − ahead earnings, measured as operating income scaled by total assets, α_0 is the intercept term, ACC_t is current year accruals measured as per equation (1), CFO_t is the current year cash flow as measured in equation (2), scaled, EQ_t is a proxy $_t$ for earnings quality, and ε_t is the stochastic error term.

Next, the valuation model is augmented by including an earnings quality variable as an independent variable. The augmented valuation model takes the following form:

$$(R_{t+1} - R_{t+1}|\varphi_t) = \beta_0(EAR_{t+1} - \alpha_0 - \alpha^*_1 ACC_t - \alpha^*_2 CFO_t - \alpha^*_3 EQ_t) + \varepsilon_{t+1} \quad (9)$$

where $(R_{t+1} - R_{t+1}|\phi_t)$is abnormal returns calculated as the return on holding a security during $period_{t+1}$minus the expectation of the return from holding that security for $period_{t+1}$, EAR_{t+1} is one − year − ahead earnings, measured as operating income scaled by total assets, α_0 is the intercept term, ACC_t is current period accruals, CFO_t is current year cash flow, EQ_t is a proxy for earnings quality, and ε_{t+1} is the stochastic error term.

If earnings quality mitigates the mispricing of accruals, as hypothesis 2 of this study predicts, the difference between the coefficients of accruals in the augmented forecasting and valuation equations should no longer be significant.

3.3.2.4 The augmented Kraft model

The augmented Kraft model is similarly established by including an earnings quality proxy as an independent variable in the OLS regression. The augmented model takes the following form:

$$R_{t+1} = \alpha_0 + \alpha_1 ACC_t + \alpha_2 CFO_t + \alpha_3 EQ_t + \sum_{n}^{t} \alpha_{3-12} SIZEDEC_t + \varepsilon_t \quad (10)$$

where R_{t+1} is the buy and hold return from holding a security during $period_{t+1}$, α_0 is the intercept term, ACC_t is current period accruals, CFO_t is current year cash flow, EQ_t is a proxy for earnings quality, $SIZEDEC_t$ are 10 size dummy variables, and ε_t is the stochastic error term.

If earnings quality mitigates the mispricing of accruals (as hypothesis 2 indicates), the coefficient of accruals in the augmented model will no longer be significant. The accrual coefficient from the augmented Kraft model will therefore be estimated to test hypothesis 2. The next section introduces the methodology employed to calculate the proxies for earnings quality.

3.3.2.5 Earnings quality

Earnings quality is measured as the extent to which reported current period earnings reasonably embody a true and fair view of actual earnings and serve as an indicator of future earnings (Penman and Zhang, 2002). Earnings quality is of interest to financial statement users, since it informs them of the accuracy of disclosures. When contracting decisions are based on low-quality earnings, unintended wealth transfers can occur.[21] Resource allocation could also be defective and thus lead investors to misprice securities due to inaccurate information. When earnings quality is high, investors should have information that is more accurate (and more relevant expectations of future earnings), allowing them to make more accurate pricing decisions.

Conditional accounting conservatism is the tendency of accountants to require a higher degree of verification to recognize good news as gains than to recognize bad news as losses (Basu, 1997). It helps prevent managers from being overly optimistic in reporting earnings and promotes stewardship (Bushman et al., 2000), and several studies have shown its benefits (Basu, 1997; Zhang, 2008). The asymmetrical verification of good and bad news (conservatism) manifests, however, as a persistent undervaluation of net assets in relation to their market value in financial statements

[21] An example of such unintended wealth transfers would be overstated earnings masking deteriorating financials, which leads to unserviceable debts being granted (Schipper and Vincent, 2003).

(Ahmed et al., 2002), and as such does little for their accuracy and quality. Several studies show that the increase in conservatism has resulted in a decline in the usefulness and persistence of earnings (Kim and Kross, 2005; Bandyopadhyay et al., 2010). Under accounting conservatism, current period earnings therefore contain less information about future period earnings, and earnings quality and persistence will be lower (Penman and Zhang, 2002).

Such conservatism has been shown to mislead analysts and result in inaccurate forecasts and therefore pricing (Li, 2008; Louis et al., 2008). Firms desperate to meet analyst expectations can manage earnings to avoid missing earnings announcement date expectations, the associated price reaction (Matsumoto, 2002) further lowering earnings quality. Substantial information asymmetry (Khan and Watts, 2009) and information uncertainty (Guay and Verrechhia, 2006) are therefore common in firms with higher conservatism. Given this negative relation between earnings quality and conservatism (Penman and Zhang, 2002), conservatism is employed here as a proxy for earnings quality. While many studies debate whether accounting conservatism is useful (Watts, 2003b), this study takes the view that while conservatism may have some benefits, it reduces earnings persistence and therefore the transparency, accuracy, and quality of earnings (Penman and Zhang, 2002; Kim and Kross, 2005; Bandyopadhyay et al., 2010). This study therefore employs conservatism as a proxy for earnings quality, where higher conservatism indicates lower earnings quality.[22] Two measures of earnings conservatism are employed as proxies for earnings quality - Basu (1997) and of Beaver and Ryan (2000).

[22] Whilst conservatism increases relevance in accounting earnings it reduces reliability (and thus earnings persistence) (Bandyopadhyay et al., 2010). This study therefore considers conservatism as having a negative impact on earnings quality in the sense that it decreases earnings persistence.

3.3.2.5.1 Basu's (1997) conservatism measure

The effects of conservatism on financial statements are investigated by Basu (1997). He measures conservatism as the asymmetric timeliness of earnings and investigates four predictions in regard to the good and bad news reactions to earnings.

The first of these predictions pertains to earnings being timelier in predicting bad news than good news. If true, then earnings at any given point will not provide accurate information, since good news is delayed, implying lower earnings persistence and quality. Basu (1997) finds support for this prediction, and this serves as the basis for employing conservatism to determine the impact of earnings quality on mispricing. Basu's (1997) second prediction is that the earnings return relation is stronger than the cash flow return relation for bad news (as opposed to good), since the timely recognition of bad news is achieved through accruals. Basu (1997) also finds support for this prediction, indicating that earnings are more indicative of future returns than cash flows.

Basu (1997)'s third prediction, that unexpected earnings increases should be more persistent than decreases due to asymmetric recognition, is also supported. This is expected, given that conservatism requires more stringent criteria for the recognition of good news. If bad news is incorporated into earnings sooner, such earnings will be more timely (but less persistent), while good news will be less timely but more persistent. The final prediction is that abnormal returns per dollar of unexpected earnings are lower for bad news than for good news. Since conservative accounting biases earnings, the market expects bad news, while good news remains a surprise. As such, the market reaction to unexpected earnings increases (which will be more

persistent, given the stringent criteria required for recognition) will be larger. Basu (1997) also supports this prediction.

The model employed by Basu (1997) to estimate conservatism is an OLS regression with earnings per share deflated by price to control for heteroskedasticity as the dependent variable. The independent variables include a dummy variable (DR_{it}) that equals one if returns are positive, and zero if negative, a return variable (R_{it}), and an interaction term[23] between the two (DR_{it}*R_{it}). The model measures the timeliness or speed with which earnings reflect bad news compared to good news, and takes the following form:

$$E_{it}/P_{it} = \alpha_0 + \alpha_1 DR_{it} + \alpha_2 R_{it} + \alpha_3 DR_{it} * R_{it} + \varepsilon_{i,t} \quad (11)$$

where E_{it} is earnings per share for firm i in fiscal year t, deflated by P_{it} (the price per share at the beginning of the fiscal year); DR_{it} is a dummy variable with a value of zero if returns are negative and a value of one if returns are positive; R_{it} is the buy and hold stock return for each firm and is calculated to three months after the end of the fiscal year, as in Basu (1997), to ensure that response to the previous year's earnings is excluded; $DR_{it} * R_{it}$ is the interaction term between the returns dummy and the return value; and ε_{it} is the stochastic error term.

The coefficient from the interaction term, α3, from equation (11) measures the difference in earnings sensitivity to negative and positive returns. The larger this coefficient, the more substantial is earnings conservatism (Basu, 1997) and the lower earnings quality. The coefficient, α3, from equation (11) will therefore be employed in the augmented accrual mispricing models in hypothesis 2 to determine whether mispricing is mitigated when earnings quality is considered.

[23] The coefficient of the interaction term, α_3 , from equation (11) measures the difference in earnings sensitivity to negative and positive returns. The larger this coefficient, the more substantial is earnings conservatism (Basu, 1997), and the lower earnings quality. The coefficient, α_3, from equation (11) will therefore be employed in the augmented accrual mispricing models in hypothesis 2 to determine whether mispricing is mitigated when earnings quality is considered.

While the Basu measure has been employed in many studies (Givoly and Hayn, 2000; Holthausen and Watts, 2001; Kwon et al., 2006; Krishnan, 2007), it has not been without criticism. Its use of aggregated measures of earnings and returns is identified as being especially problematic, along with measurement errors. Givoly et al. (2007), however, conclude that those studies comparing conservatism across countries are the most susceptible to such problems. Since this study calculates conservatism within one country only, it should not be affected. Roychowdhury and Watts (2007) investigate the relation between asymmetric timeliness (Basu's measure) and market-based measures of conservatism (such as that of Beaver and Ryan, 2000). They conclude that while both measures can result in errors when considering the market value of net assets, the asymmetric timeliness measure is unlikely to be affected, especially when estimated over a number of years. They also propose that more than one measure of accounting conservatism should be employed when determining its impact. This study therefore employs both an asymmetrical timeliness measure (that of Basu) and a market-based measure of conservatism. The market-based conservatism measure of Beaver and Ryan (2000) is discussed next.

3.3.2.5.2 Beaver and Ryan's (2000) conservatism measure

The market-based earnings conservatism measure of Beaver and Ryan (2000) identifies bias and lags in book value as two variations in the book-to-market ratio. Bias in book value refers to the book value being persistently overstated compared to the market value, while lags in book value refer to unexpected economic gains that are only recognized over time. They propose that these bias and lag components have negative implications for future book returns on equity. While the bias component's implications are permanent, those of the lags decrease over time. Beaver and Ryan

(2000) also expect the bias component to have a stronger association with terminal book-to-market value than the lag component. They find support for both views and conclude that the bias in book value results from conservatism, the use of historical costs, and economic conditions, while lags result from unrecognized economic gains and losses. Their model is based on the idea that firms using conservative accounting report lower net assets and book-to-market values (Watts, 2003b). Disclosures under such conservative accounting are therefore less informative and may, as such, lead investors to misprice securities. The market-based earnings conservatism measure of Beaver and Ryan is therefore employed as the second proxy for earnings quality in this study.

Conservatism is measured by regressing the book-to-market value of equity on lagged returns (for the previous six years). The book-to-market value is then decomposed into its bias and lag components via fixed effects estimation of the Beaver and Ryan model (see equation (12) below). The bias component (α_i) presents the fixed firm effect, while the lag component (α_t) characterize the time effect. These filter out any temporary effects due to economic factors. The fixed firm (bias) component (α_i) is commonly employed as a proxy for earnings conservatism (Ahmed et al., 2002; Hui et al., 2009) and measures the persistent portion of the difference between the firm's book and market values of equity (Watts, 2003b). A smaller value for the bias component (α_i) indicates higher conservatism and is therefore indicative of lower earnings quality. This fixed firm (bias) component (α_i) is therefore employed in hypothesis 2 to determine whether earnings quality mitigates accrual mispricing.

Beaver and Ryan's model takes the following form:

$$BTM_{it} = \alpha + \alpha_i + \alpha_t + R_{it} + R_{it-1} + R_{it-2} + R_{it-3} + R_{it-4} + R_{it-5} + R_{it-6} + \varepsilon_{it} \quad (12)$$

where BTM_{it} is the book value of common equity divided by the end of fiscal year marketvalue of common equity; α is the intercept term, α_{it} is the fixed firm effects (bias), while α_t captures the year − by − year variation in the BTM common to all sample firms' (time or lag)effects; R_{it} is the return on holding a security for period$_t$(buy and hold return), calculated as $\left[\left(\frac{R_t - R_{t-1}}{R_{t-1}}\right) - \text{buy and hold return}\right]$; R_{it-1} through R_{it-6} are lagged buy and hold return for year $_{t-1}$ through $_{t-6}$ respectively, and ε_{it} is the stochastic error term. '

The fixed effects approach first adjusts the dependent (book-to-market value of equity) and independent (deflated market value of equity changes for time$_t$ and six lagged periods) variables in equation (12) for mean time, firm, and overall effects. This involves removing the firm and time means and adding back the overall mean to center the data on zero. Pooled OLS is carried out on the centered data and the firm effect (α_i) is calculated as the difference between the mean firm book-to-market value and mean overall book-to-market values, subtracting the sum of changes in mean firm returns and mean overall returns for time *t* and six lagged periods.

The mean coefficient of the bias component is, by construction, zero so that the coefficient only estimates relative rather than aggregate conservatism (Watts, 2003b). The strength of this measure is that it reflects the cumulative effects of conservatism since the firm's inception (Ahmed and Duellman, 2007).[24] The next section presents the empirical results.

A summary of the econometric models employed in this study is presented in Diagram 3.1. The first column presents the two econometric models employed in seminal accrual anomaly research, with the coefficients obtained for the accrual and cash components presented in the second column. The third column summarizes the changes made to these seminal models when employed in the current study. It should

[24] While several other conservatism measures exist, this study employs these two following the recommendations of Roychowdhury and Watts (2007). Accrual-based conservatism measures are not employed, given their likely relation with the accrual anomaly.

be noted that all of these models are applied to cross-sectional, time-series data and that these models are run on a pooled sample, therefore yielding one set of parameter estimates for each model. These models have been employed in several related accrual anomaly studies. Specifically, Xie (2001) employs the Mishkin model as in Sloan (1996) but separates accruals into its non-discretionary and discretionary

Diagram 3.1 Accrual mispricing methodology employed	Coefficient obtained	Augmented model employed in this study
Sloan (1996): The forecasting equation is employed to estimate the contribution of the accrual and cash flow components to earnings persistence. The component is fleeting and subject to distortion (Bernstein, 1993) and cash flows are therefore expected to be the more persistent component of earnings: $$EAR_{t+1} = \alpha_0 + \alpha_1 ACC_t + \alpha_2 CFO_t + \varepsilon_{t+1}$$ where EAR_{t+1} is one − year − ahead earnings, measured as operating income scaled by total assets. α_0 is the intercept term, ACC_t is current year accruals measured as per equation (1), CFO_t is cash flow in the current year as measured in equation (2), and ε_{t+1} is the stochastic error term. To estimate how investors actually estimate the contribution of accruals and cash flows to earnings persistence, the valuation model is estimated: $$(R_{t+1} - R_{t+1}|\varphi_t) = \beta_0(EAR_{t+1} - \alpha_0 - \alpha^*_1 ACC_t - \alpha^*_2 CFO_t) + \varepsilon_{t+1}$$ where $(R_{t+1} - R_{t+1}|\varphi_t)$ is abnormal returns calculated as the return on holding a security during the $period_{t+1}$ minus the expectation of the return from holding the security for the $period_{t+1}$. EAR_{t+1} is one year ahead earnings, measured as operating income scaled by total assets. ACC_t is current period accruals. CFO_t is current year cash − flow and ε_{t+1} is the stochastic error term. These models are estimated via a single pooled regression. Sloan (1996) draws on Mishkin (1983)'s methods to test rational expectations hypotheses in macro-econometrics. These are based on market efficiency 's implication that abnormal returns should be available only when unexpected changes occur in the variables of interest (i.e. earnings / accruals). Drawing on Mishkin (1983) Sloan (1996) therefore concludes that if investors accurately anticipate the average persistence of the accrual and cash flow components of earnings, then estimated coefficients for the accrual (cash flow) component from the forecasting and valuation equations should not differ significantly (i.e. difference between α_1 and α^*_1 (α_2 and α^*_2) is equal to 0). If the differences are significantly different from zero, then accruals (cash flow) are mispriced and an accrual anomaly exists. This model employed by Sloan (1996) is commonly referred to as "the Mishkin model".	$\alpha_1 = 0.765$ $\alpha^*_1 = 0.911$ $\alpha_2 = 0.855$ $\alpha^*_2 = 0.747$ Maximum likelihood tests (MLT) reveal that differences are significantly different from zero at 0.01 levels.	Chapter 3 employs an accrual mispricing model similar to Sloan (1996) and includes an earnings quality proxy (EQ_t) in the forecasting and valuation equations. The augmented forecasting model is estimated as: $$EAR_{t+1} = \alpha_0 + \alpha_1 ACC_t + \alpha_2 CFO_t + \alpha_3 EQ_t + \varepsilon_t$$ where EAR_{t+1} is one − year − ahead earnings, measured as operating income scaled by total assets, α_0 is the intercept term, ACC_t is current year accruals measured as per equation (1), CFO_t is current year cash flow scaled as measured in equation (2), EQ_t is a proxy for earnings quality (either Basu, 1997 or Beaver & Ryan, 2000). ε_t is the stochastic error term. The augmented valuation model employed in this study takes the form: $$(R_{t+1} - R_{t+1}|\varphi_t) = \beta_0(EAR_{t+1} - \alpha_0 - \alpha^*_1 ACC_t - \alpha^*_2 CFO_t - \alpha^*_3 EQ_t) + \varepsilon_{t+1}$$ where $(R_{t+1} - R_{t+1}|\varphi_t)$ is abnormal returns calculated as the return on holding a security during $period_{t+1}$ minus the expectation of the return from holding that security for $period_{t+1}$, EAR_{t+1} is one − year − ahead earnings, measured as operating income scaled by assets, α_0 is the intercept term, ACC_t is current period accruals, CFO_t is current year cash flow, EQ_t is a proxy for earnings quality, (either Basu, 1997 or Beaver & *Ryan*, 2000. ε_{t+1} is the stochastic error term. Coefficients from this study including Basu (1997) earnings quality: $\alpha_1 = 0.724, \alpha^*_1 = 2.321;\ \alpha_2 = 0.777,\ \alpha^*_2 = 0.3696;$ $\alpha_3 = -0.002,\ \alpha^*_3 = 0.3696$ The inclusion of earnings quality in this model yields comparison of coefficients with previous models difficult as addition of a new independent variable will impact on the coefficient of other independent variables.
Kraft et al. (2007): Kraft et al. (2007) propose that the Mishkin model is no different to an OLS model (it is also subject to an omitted variable problem), but that such omitted variables will only cause misspecification problems if it is not rationally priced or represent a risk factor. They therefore suggest including "omitted" variables associated with accruals in the mispricing model to allow for accurate specification. They first repeat the Mishkin test, then specify their OLS model (suggested to be equivalent to the Mishkin model) and finally an extended Mishkin model including variables they believe to be "omitted" in the original model. Their basic OLS model is specified as: $$R_{t+1} = \alpha_0 + \alpha_1 ACC_t + \alpha_2 CFO_t + \sum_n^t \alpha_{3-12} SIZEDEC_t + \varepsilon_t$$ where R_{t+1} is the buy and hold return from holding a security during $period_{t+1}$, ACC_t is current period accruals, CFO_t is current year cash flow, $SIZEDEC_t$ are 10 size dummy variables, and ε_t is the stochastic error term. Kraft et al. (2007) concludes that when the coefficient of accruals or cash flow (α_1 or α_2) are significantly different from zero, rational pricing of accruals (or cash flow) is rejected. Their extended model includes variables in additional to that in their basic model in lagged returns (R_t), the level ($SALES_t$) and change in sales ($\Delta SALES_t$), the level ($CAPEX_t$) and change in capital expenditures ($\Delta CAPEX_t$), size ($SIZEDEC_t$), book-to-price value ($BPDEC_t$) and stock price ($PRICEDEC_t$) and is specified as: $$E_{t+1} = \alpha_0 + \alpha_1 ACC_t + \alpha_2 CFO_t + \alpha_3 R_t + \alpha_4 SALES_t + \alpha_5 \Delta SALES_t + \alpha_6 CAPEX_t + \alpha_7 \Delta CAPEX_t + \sum_n^t \alpha_{8-17} SIZEDEC_t + \sum_n^t \alpha_{18-27} BPDEC_t + \sum_n^t \alpha_{28-37} PRICEDEC_t + \varepsilon_{t+1}$$ $$R_{t+1} = \beta(E_{t+1} - \alpha_0 - \alpha^*_1 ACC_t - \alpha^*_2 CFO_t - \alpha^*_3 R_t - \alpha^*_4 SALES_t + \alpha^*_5 \Delta SALES_t + \alpha^*_6 CAPEX_t + \alpha^*_7 \Delta CAPEX_t + \sum_n^t \alpha_{8-17} * SIZEDEC_t + \sum_n^t \alpha_{18-27} * BPDEC_t + \sum_n^t \alpha_{28-37} * PRICEDEC_t + \varepsilon_{t+1}$$ Kraft et al. (2007) therefore shows that inclusion of 7 (2 of which include 10 dummy variables each) additional variables in the Mishkin model yield the accrual anomaly insignificant (whilst the cash flow anomaly remains).	Mishkin test: $\alpha_1 = 0.714$ $\alpha^*_1 = 0.799$ $\alpha_2 = 0.819$ $\alpha^*_2 = 0.701$ MLT reveals differences are significantly different from zero at 0.01 level. Basic OLS: $\alpha_1 = -0.132$ $\alpha_2 = 0.182$ All differences are significantly different from zero at 0.01 level. Extended model: $\alpha_1 = 0.53$ $\alpha^*_1 = 0.63$ $\alpha_2 = 0.62$ $\alpha^*_2 = 0.51$ Rational pricing of accruals **not** rejected (t = -1.86, p=0.10) whilst that of cash flows rejected (difference between α_2 and α^*_2 significantly different from 0).	This study builds on Kraft et al. (2007) by augmenting the basic Kraft OLS model (as Kraft had done with the Mishkin model) but instead of including 7 additional variables, this study includes only earnings quality, and argues that if considered it should reduce accrual mispricing. The augmented Kraft model employed is specified as: $$R_{t+1} = \alpha_0 + \alpha_1 ACC_t + \alpha_2 CFO_t + \alpha_3 EQ_t + \sum_n^t \alpha_{3-12} SIZEDEC_t + \varepsilon_t$$ where R_{t+1} is the buy and hold return from holding a security during $period_{t+1}$, α_0 is the intercept term, ACC_t is current period accruals, CFO_t is current year cash flow, EQ_t is a proxy for earnings quality (either the Basu, 1997 conservatism measure or the Beaver and Ryan (2000) consevatism measure). earnings quality, $SIZEDEC_t$ are 10 size dummy variables, and ε_t is the stochastic error term. Coefficients from this study including Basu (1997) in the augmented Kraft OLS model: $\alpha_1 = -0.1152$ $\alpha_2 = 0.0036$ $\alpha_3 = -0.0007$ The inclusion of earnings quality in the basic Kraft OLS model yields coefficients similar to that obtained by Kraft et al. (2007). Comparison of these coefficients to Kraft is difficult though as this study employs a different sample period, size and have included an additional independent variable in the OLS model which would likely impact on the coefficients of other independent variables.

components. The maximum likelihood tests therefore estimate the differences in three sets of coefficients (cash flow, non-discretionary accruals and discretionary accruals) and Xie (2001) concludes that each of these three components are significantly mispriced, with discretionary accruals being more significantly mispriced that its non-discretionary counterpart. Dopuch et al. (2010) and Drake et al. (2009) both employ the traditional Mishkin model but include a dummy variable (which interacts with the cash flow and accrual variables) within the model. Dopuch et al. (2010) include a dummy for positive vs. negative earnings whilst Drake et al. (2009) include dummy variables for high vs. low quality disclosers. Other accrual anomaly studies test a variety of issues by simply estimating whether the accrual anomaly trading strategy (buying low accrual firms and selling high accrual firms) yields abnormal returns and do not estimate a mispricing model as such (DeFond and Park, 2001; Kraft et al., 2006; Livnat and Santicchia, 2006; Mashruwala et al., 2006).

3.4 Empirical results

This section presents the results from testing the three hypotheses related to research questions 1 to 3 (raised in Chapter 2). The first research question seeks to determine whether accruals are mispriced, and this is investigated through hypothesis 1. The second research question aims to establish whether earnings quality mitigates accrual mispricing, which is examined through hypothesis 2. The final research question in this chapter, research question 3, focuses on post-SOX and establishes (through hypothesis 3) whether accruals are still mispriced in this period.

3.4.1 Descriptive statistics

The descriptive statistics for the variables used in the testing of hypotheses 1 and 2 are shown in Panel A of Table 3.2, while those for hypothesis 3 are presented in Panel B.

3.4.1.1 Descriptive statistics for the sample period 1996–2000 (hypotheses 1 and 2)

The descriptive statistics presented in Panel A of Table 3.2 are trimmed at the top and bottom 1% to exclude outliers.[25] The first three variables include earnings and its two components, accruals and cash flows. The mean accrual value for the sample is -0.032 (standard deviation = 0.102), indicating that the average firm in the sample has slightly negative accruals (Panel A of Table 3.2). The mean (median) cash flow value of 0.071 (0.099) and standard deviation of 21.3% show that cash flows are more dispersed than accruals. Earnings have a mean (median) value of 0.039 (0.072) and a similar distribution to cash flow. Buy and hold returns (R_{it}) have a mean of 0.094 and a median of zero, while abnormal returns $(R_{t+1} - R_{t+1}|\varphi_t)$ have a mean (median) value of -0.02 (-0.107). While the mean buy and hold returns are positive, abnormal returns are, on average, negative.

[25] The top and bottom 1% of values are eliminated from the sample to exclude the effects of extreme observations consistent with prior research (De Fond and Park, 2001; Kraft et al. 2006).

Table 3.2 Descriptive statistics (hypotheses 1–3)

This table presents the descriptive statistics for each of the three hypotheses tested in this study. Panel A presents them for the sample employed to determine whether accruals are mispriced (hypothesis 1) and if earnings quality mitigates accrual mispricing (hypothesis 2) for the period 1996–2000. Panel B documents the descriptive statistics for the post-SOX sample, employed in hypothesis 3, from 2003 to 2007.The variables are those used in the Mishkin and Kraft accrual mispricing models. Here ACC_t is current period accruals calculated as per the balance sheet method, $ACC_t = (\Delta CA - \Delta CASH) - (\Delta CL - \Delta STD - \Delta TP) - DEP_t$, where ΔCA is change in current assets (Compustat item #4); $\Delta CASH$ is change in cash/cash equivalents (Compustat item #1); ΔCL is change in current liabilities (Compustat item #5); ΔSTD is change in debt included in current liabilities (Compustat item #34); ΔTP is change in income tax payable (Compustat item #71); and DEP_t is depreciation and amortization expenses (Compustat item #14). The accruals value calculated is scaled by total assets (Compustat item #6); CFO_t is current year cash flow calculated as $EAR_t - ACC_t$ and scaled by total assets (Compustat item #6); EAR_{t+1} is one-year-ahead earnings (Compustat item #178) scaled by total assets (Compustat item #6); R_{it} is the buy and hold returns to a security over the year; $R_{t+1} - R_{t+1}|\varphi_t$ is returns above that expected for the firms given their size (size-adjusted or abnormal returns); *BASU* is the Basu measure of earnings conservatism, a proxy for earnings quality; and *BEAVER* is Beaver and Ryan's conservatism measure, employed as a proxy for earnings quality.

Panel A: Sample period 1996–2000

Variable	N	Mean	Median	Standard deviation	Minimum	Maximum	Skewness	Kurtosis
ACC_t	21,169	-0.032	-0.032	0.102	-0.594	0.599	-0.017	5.038
CFO_t	21,169	0.071	0.099	0.213	-1.283	5.259	0.897	54.52
EAR_{t+1}	21,169	0.039	0.072	0.210	-1.631	5.014	0.534	57.18
R_{it}	21,169	0.094	0.000	0.639	-0.983	4.000	2.079	6.753
$R_{t+1} - R_{t+1}\|\varphi_t$	21,004	-0.020	-0.107	0.632	-1.594	3.914	1.866	6.102
BASU	6,278	-0.001	0	0.871	-4.662	3.03	1.647	21.358
BEAVER	6,278	0.767	0.427	3.772	-24.42	28.86	1.013	17.019

Panel B: Sample period 2003–2007

Variable	N	Mean	Median	Standard deviation	Minimum	Maximum	Skewness	Kurtosis
ACC_t	16,693	-0.035	-0.033	0.062	-0.279	0.185	-0.179	1.631
CFO_t	16,693	0.076	0.102	0.159	-0.801	0.453	-1.847	5.437
EAR_{t+1}	16,693	0.041	0.070	0.155	-0.846	0.362	-2.165	6.624
R_{it}	16,693	0.222	0.101	0.637	-0.917	5.281	2.272	8.488
$R_{t+1} - R_{t+1}\|\varphi_t$	16,560	-0.129	-0.172	0.607	-1.829	3.703	1.256	5.141

The correlation matrix (see Table 3.3) shows no significant correlations between accruals and other variables. The highest value of -0.286 is between accruals and cash flow. Cash flow and earnings are positively correlated (0.914), as expected, given the significant contribution of the cash flow component to earnings persistence, as documented in previous studies (Sloan, 1996; Bradshaw et al., 2001; Pincus et al., 2007). Returns and abnormal returns are also highly positively

correlated (0.947) but do not present difficulties, since they are not employed in any model simultaneously.

Table 3.3 Correlation matrix for variables employed in accrual mispricing tests

This table presents a correlation matrix for variables included in the first study, these variables being those employed in the Mishkin and Kraft accrual mispricing models. Here ACC_t is current period accruals calculated as per the balance sheet method $ACC_t = (\Delta CA - \Delta CASH) - (\Delta CL - \Delta STD - \Delta TP) - DEP_t$, where ΔCA is change in current assets (Compustat item #4); $\Delta CASH$ is change in cash/cash equivalents (Compustat item #1); ΔCL is change in current liabilities (Compustat item #5); ΔSTD is change in debt included in current liabilities (Compustat item #34); ΔTP is change in income tax payable (Compustat item #71); and DEP_t is depreciation and amortization expenses (Compustat item #14). The accruals value calculated is scaled by total assets (Compustat item #6); CFO_t is current year cash flow, calculated as $EAR_t - ACC_t$ and scaled by total assets (Compustat item #6); EAR_{t+1} is one-year-ahead earnings (Compustat item #178) scaled by total assets (Compustat item #6); R_{it} is buy and hold returns to a security over the year; $R_{t+1} - R_{t+1}|\varphi_t$ is returns above that expected for the firms, given their size (size-adjusted or abnormal returns); *BASU* is the Basu measure of earnings conservatism, a proxy for earnings quality; and *BEAVER* is Beaver and Ryan's earnings conservatism measure, employed as a proxy for earnings quality.

Variable	$\mathbf{ACC_t}$	$\mathbf{CFO_t}$	$\mathbf{EAR_{t+1}}$	$\mathbf{R_{it}}$	$\mathbf{R_{t+1} - R_{t+1}|\varphi_t}$	**BASU**	**BEAVER**
ACC_t	1	-0.286	0.128	-0.229	-0.039	0.004	-0.015
CFO_t		1	0.914*	-0.001	0.028	-0.006	0.005
EAR_{t+1}			1	-0.011	0.012	-0.004	-0.001
R_{it}				1	0.947*	0.002	0.004
$R_{t+1} - R_{t+1}|\varphi_t$					1	0.004	0.002
BASU						1	-0.004
BEAVER							1

*While the correlation between buy and hold returns and abnormal returns is very high, at 0.947, this does not pose any problems for this study, since these two variables are not employed simultaneously in any model. The high correlation between earnings and cash flow (0.914) is expected, given that cash flow is a component of earnings.

The Basu earnings quality proxy (*BASU*) has a mean (median) of -0.001 (0) and a standard deviation of 0.871, while Beaver and Ryan's earnings quality proxy (*BEAVER*) has a mean (median) value of 0.767 (0.427) and a standard deviation of 3.772, which is much larger than the other variables. The correlation matrix (Table 3.3) shows that neither *BASU* nor *BEAVER* are significantly correlated with any other variables employed in the mispricing models.

3.4.1.2 Descriptive statistics for the sample period 2003–2007 (hypothesis 3)

The mean (median) accrual value for the sample is -0.035 (-0.033), with a standard deviation of 0.062 (see Panel B of Table 3.2). This is almost identical to the mean accruals value reported pre-SOX, while the cash flow mean (median) of 0.076 (0.102) is also similar to that pre-SOX. Earnings are distributed similarly to cash flows, with a mean (median) value of 0.041 (0.07) and a standard deviation of 0.155. Buy and hold returns (R_{it}) have a mean (median) of 0.222 (0.101) and a standard deviation of 0.637. The return component mean reported here is higher than that pre-SOX, indicating an increase in returns to shareholders post-SOX. Analysis of abnormal returns (R_{t+1} - $R_{t+1}|\phi_t$) shows a mean (median) value of -0.129 (-0.172) and a standard deviation of 0.607. The mean abnormal return figure is much smaller than that reported earlier for the pre-SOX sample.

3.4.2 Results from hypotheses testing

This section presents the results from the models employed to investigate the three hypotheses and related research questions raised in Chapter 2. The first hypothesis investigates whether accruals are mispriced, the second determines whether earnings quality mitigates accrual mispricing, and the third investigates the mispricing of accruals post-SOX.

3.4.2.1 Results for hypothesis 1

Hypothesis 1 investigates whether accruals are mispriced. It employs both the Mishkin and Kraft model for the period 1996–2000. Results for hypothesis 1 are discussed here, with the related tables presented in the Appendix of this chapter.

3.4.2.1.1 The Mishkin accrual mispricing model

Hypothesis 1, reaffirming that accruals are mispriced, is investigated by first employing the Mishkin model as employed by Sloan (1996). The first step is to establish earnings persistence and includes regressing current earnings performance on future earnings performance. The results from this earnings persistence test are presented in Panel A of Table A1 of the Appendix at the end of this chapter. The regression's intercept term is both positive (0.014) and significant (t-statistic = 9.96). There is substantial evidence that accounting rates of return are mean reverting, implying that the earnings coefficient (α_1) is less than one (Beaver, 1970; Freeman et al., 1982; Sloan, 1996). The reported coefficient of earnings from this study's Mishkin test is positive (0.545) and significant (t-statistic = 95.02),[26] indicating that earnings in the current period contribute significantly to earnings in the next period, and are thus persistent. The t-statistic of earnings (95.02) strongly rejects the notion that earnings performance is purely transitory. These findings, that earnings are persistent with a coefficient of 0.545, are similar to those in previous studies (Sloan, 1996, Xie, 2001).

The next step in estimating whether accruals are mispriced involves establishing whether a significant difference exists between the perceived and actual persistence of accruals and cash flows. This is achieved through the calculation of forecasting and valuation models, where the accrual coefficient from the forecasting model represents actual persistence and that from the valuation model the perceived value (investor valuation). Results from this test are reported in Panel B of Table A1 in the Appendix. They show that the intercept coefficient from the forecasting model is

[26] These large t-statistics are consistent with Sloan's (1996) findings, who documented the coefficient of earnings to be 0.841 with a t-statistic of 253.93.

positive (0.0019) but not significant. The coefficient of accruals (0.4251) is significantly positive (t-statistic = 33.82) but somewhat less than that of cash flow (0.5606, t-statistic = 92.62). This is therefore consistent with prior findings that cash flow contributes more to earnings persistence than accruals (Sloan, 1996; Xie, 2001).

Results from the valuation model (see Panel B of Table A1 in the Appendix) show that its intercept term is positive (0.3669) and significant (t-statistic = 5.44). The accrual coefficient (1.022, t-statistic = 3.27) is much larger than that of cash flow (0.130, t-statistic = 0.82). Since the valuation equation shows how investors price earnings components, they place more emphasis on accruals than cash flows, inconsistent with what the forecasting model predicts. This shows a significant accrual anomaly (t-statistic = 4.02, p-value = 0.045) for the period investigated in this study (1996–2000). In addition, cash flows are also mispriced (t-statistic = 9.04, p-value = 0.0026). This investigation therefore documents not only that accruals are overvalued, but also that cash flows are undervalued. The result is again consistent with Sloan (1996).

It is therefore evident that investors do not correctly anticipate the higher contribution of the cash flow component and the lower contribution of the accrual component to earnings persistence. Instead, they persistently overestimate the persistence of the accrual component of earnings and underestimate that of cash flows. Since market efficiency requires investors to incorporate information into prices quickly and accurately, these results challenge market efficiency.

3.4.2.1.2 The Kraft accrual mispricing model

The second accrual mispricing model employed in this study to determine whether accruals are mispriced (as predicted by hypothesis 1) is that of Kraft et al. (2007). The overall results (presented in Table A2 in the Appendix to this chapter) indicate that accruals are significantly mispriced. While the intercept coefficient is positive (0.0747) and significant (t-statistic = 4.92), the accrual coefficient is both negative (-0.1789) and significant (t-statistic = -3.66), providing evidence of accrual mispricing. This view is consistent with that reached earlier, in Section 3.4.2.1.1, where the alternative accrual mispricing model is employed. In contrast to this study's earlier findings, however, cash flows are not mispriced in the Kraft model. The coefficient of cash flow is negative (-0.0025) but not significant (t-statistic = -0.11). This is not an unusual finding, since Pincus et al. (2007) similarly conclude that cash flows are not underpriced. In addition, the adjustment of returns for size in the mispricing model (as discussed earlier, in Section 3.3.2.2) yields significant results, with several size deciles being significantly associated with buy and hold returns. This is consistent with prior studies that find size a predictor of future returns (Ou and Penman, 1989; Bernard and Thomas, 1990; Sloan, 1996; Palmon et al., 2008). Larger deciles (*SIZEDEC10* – *SIZEDEC8*) are negatively associated with returns, indicating that large firms have lower buy and hold returns than smaller deciles (*SIZEDEC1* and *SIZEDEC2*), which have a significantly positive association. This finding is consistent with the small firm anomaly documented by Banz (1981).

This section aims to reaffirm that accruals are mispriced as per Sloan (1996). The accrual mispricing models of both Mishkin and Kraft are estimated. The findings here are consistent with those of earlier studies (Sloan, 1996; LaFond, 2005; Livnat

and Santicchia, 2006; Pincus et al., 2007) that employ the Mishkin model and conclude that investors overestimate accrual persistence. This study's results also confirm that the mispricing of accruals has not abated since Sloan (1996), consistent with Lev and Nissim (2006). While Sloan (1996) and Xie (2001) also find an undervaluation of cash flows, Pincus et al. (2009) do not. The current work provides further evidence on these conflicting results by showing that while the Mishkin model results show underpricing of cash flows (consistent with Sloan, 1996, and Xie, 2001), the results of the Kraft model do not (consistent with Pincus et al., 2007). Whether cash flows are therefore actually undervalued remains an empirical question.

In summary, these findings provide support for hypothesis 1, and the answer to research question 1 is therefore yes, accruals are mispriced. Given that this study has documented mispriced accruals, the next section investigates whether earnings quality mitigates accrual mispricing.

3.4.2.2 Results for hypothesis 2

Hypothesis 2 investigates whether earnings quality mitigates accrual mispricing. This is investigated by employing earnings quality proxies in the accrual mispricing models of Mishkin and Kraft. Two earnings quality proxies are employed. Each of the augmented accrual mispricing models are therefore run twice (once with each earnings quality proxy). The results from the augmented Mishkin model are presented first, followed by those of the augmented Kraft model.

3.4.2.2.1 Augmented Mishkin mispricing model with Basu

This study includes an earnings quality proxy (Basu) in the Mishkin model to determine whether earnings quality mitigates accrual mispricing as predicted by hypothesis 2. Earnings persistence is established in Section 3.4.2.1.1 for the pre-SOX sample. The augmented mispricing model therefore only estimates the augmented forecasting and valuation models to examine the impact of earnings quality on mispricing. These models are estimated through a pooled regression.

The intercept coefficient from the forecasting model (Panel A of Table 3.4) is both positive (0.0249) and significant (t-statistic = 12.35). Accruals have a coefficient of 0.7244 (t-statistic = 35.90), while the coefficient of cash flow is 0.777 (t-statistic = 89.37).[27] This finding shows that while accruals contribute significantly to the persistence of earnings, the cash flow component contributes more, consistent with earlier studies (Sloan, 1996; Xie, 2001). The earnings quality proxy (*BASU*) does not provide any additional information (-0.0002, t-statistic = -0.54) about future earnings when considered simultaneously with accruals and cash flows. To determine whether accrual mispricing is still present when the Basu measure is included in the model, the valuation equation needs to be calculated.

The valuation equation shows an accrual coefficient (Panel A of Table 3.4) of 2.3215 (t-statistic = 1.28) that is much larger than that in the forecasting equation. The coefficient of cash flow is much smaller, at 0.3696 (t-statistic = 0.59). The earnings quality proxy (*BASU*) is not significant in explaining one-period-ahead abnormal returns (0.0092, t-statistic = 0.60), but does impact on the mispricing of accruals and

[27] Sloan (1996) similarly documents large t-statistics for the accrual (coefficient = 0.0765, t-statistic = 186.53) and cash (coefficient = 0.855, t-statistic = 304.56) components when regressed against earnings.

cash flow components. The t-test estimating the difference in the coefficients of accruals from the forecasting and valuation equations (Panel A of Table 3.4) is no longer significant (t-statistic= 1.65, p-value = 0.1984) when the earnings quality proxy is included. This indicates that accrual mispricing is mitigated when earnings quality is considered. The difference in the coefficients of cash flow from the forecasting and valuation models is also no longer significant, indicating that when earnings quality is considered, mispricing disappears.

This finding supports hypothesis 2 and shows that earnings quality mitigates accrual mispricing. This is consistent with the prediction that investors make more accurate valuation decisions when they receive good-quality financial disclosures. Next, results from the augmented Mishkin model with Beaver and Ryan's earnings quality proxy are presented.

3.4.2.2.2 Augmented Mishkin mispricing model with Beaver and Ryan's earnings quality measure

The augmented Mishkin mispricing model is estimated by including Beaver and Ryan's earnings quality proxy to confirm the earlier results and test this study's hypothesis 2. The findings are presented in Panel B of Table 3.4. The accrual coefficient from the augmented forecasting equation has a value of 0.7182 (t-statistic= 31.3), while that of cash flow is 0.7754 (t-statistic = 81).[28] Consistent with Sloan (1996), the cash flow component contributes more to earnings persistence than accruals. The earnings quality proxy in the forecasting equation is not significant (0.00001, t-statistic = 0.86) in explaining future earnings when considered simultaneously with cash flows and accruals.

The augmented valuation model is estimated next and the coefficient from accruals (cash flow) is positive, at 5.4226 (1.4081), but not significant, with a t-statistic of 0.52 (t-statistic = 0.72). The t-test determining whether the accrual coefficients inthe forecasting and valuation equations vary has a t-statistic of 1.86 (p-value 0.1729) and is thus not significant, showing no mispricing is present. This finding provides further evidence in support of hypothesis 2 and shows that earnings quality mitigates accrual mispricing. The t-test estimating the difference between the coefficients of cash flow in the forecasting and valuation equations provides a t-statistic of 0.19 (p-value 0.662) and accruals are thus no longer mispriced. The coefficient of the earnings quality proxy in the valuation equation is negative but not significant (t-statistic = -0.0126). While earnings quality therefore provides no significant additional information on future earnings (forecasting equation) or abnormal returns

[28] Sloan (1996) similarly documents large t-statistics for the accrual (coefficient = 0.0765, t-statistic = 186.53) and cash (coefficient = 0.855, t-statistic = 304.56) components of earnings in the forecasting model.

(valuation equation), it is effective in mitigating the mispricing of earnings components.[29]

Table 3.4 Augmented Mishkin model accrual mispricing results

This table presents the results from the augmented Mishkin model of accrual mispricing. Panel A contains the output from the augmented Mishkin model with Basu's (1997) earnings conservatism measure as a proxy for earnings quality, while Panel B contains Beaver and Ryan's (2000) measure results. Here EAR_{t+1} is next-period earnings; ACC_t is accruals; CFO_t is the cash flow component of earnings; $R_{(t+1)}$-$R_{(t+1)}\ |_{\varphi\_t}$ is returns above those expected for the firms, given their size (abnormal returns); EQ_t is an earnings quality proxy, either *BASU*, the earnings conservatism measure of Basu, or *BEAVER*, the earnings conservatism measure of Beaver and Ryan; and ε_{t+1} is the stochastic error term from the regression.
First, the coefficients of accruals and cash flows from the augmented forecasting model are determined:

$$EAR_{t+1} = \alpha_0 + \alpha_1 ACC_t + \alpha_2 CFO_t + \alpha_3 EQ_t + \varepsilon_{t+1}$$

The augmented valuation equation is also estimated:

$$(R_{t+1} - R_{t+1}|\varphi_t) = \beta_0(EAR_{t+1} - \alpha_0 - \alpha^*_1 ACC_t - \alpha^*_2 CFO_t - \alpha^*_3 EQ_t) + \varepsilon_{t+1}$$

The coefficients from the forecasting and valuation models are then compared. Any significant differences between these two are indicative of mispricing.

Panel A: Mishkin forecasting and pricing models with Basu's earnings quality measure

	Intercept	ACC_t	CFO_t	EQ_t
Pooled coefficient from forecasting model	0.0249	0.7244	0.777	-0.0002
(t-Stat)	(12.35)***	(35.90)***	(89.37)***	(-0.54)
Pooled coefficient from pricing model	0.7757	2.3215	0.3696	0.0092
(t-Stat)	(1.23)	(1.28)	(0.59)	(0.60)
Difference in coefficients of forecasting and pricing models		1.65	0.58	
(t-Stat)		(0.1984)	(0.4467)	
(p-Value)				
β = 0.058				
N (firm observations) = 6,278				

Panel B: Mishkin forecasting and pricing models with Beaver and Ryan's earnings quality measure

	Intercept	ACC_t	CFO_t	EQ_t
Pooled coefficient from forecasting model	0.0260	0.7182	0.7754	0.00001
(t-Stat)	(11.59)***	(31.30)***	(81.00)***	(0.86)
Pooled coefficient from pricing model	1.8419	5.4226	1.4081	-0.0126
(t-Stat)	(0.49)	(0.52)	(0.72)	(-0.45)
Difference in coefficients of forecasting and pricing models		1.86	0.19	
(t-Stat)		(0.1729)	(0.6620)	
(p-Value)				
β = 0.0222				
N (firm observations) = 6,278				

Note: *, **, and *** denote significance at the 10%, 5% and 1% level, respectively, based on a two-tailed test for the time series employed.

[29] Robustness tests confirm no biases are driving the results. White's heteroskedasticity tests for both the augmented Mishkin models do not reject homoskedasticity. Collinearity tests show no collinearity is present in these models.

The augmented Mishkin model results therefore support hypothesis 2, showing that earnings quality does mitigate accrual mispricing[30]. The mispricing of both accruals and cash flows is mitigated for all models employed, and the Basu and Beaver and Ryan earnings quality proxies therefore yield the same results. While investors may not be aware of the quality of financial information disclosed, their mispricing is mitigated when disclosures are of better quality. Next, these results are confirmed with the augmented Kraft model. The OLS regression results from including the Basu measure of earnings quality is presented first, followed by that with the Beaver and Ryan proxy.

3.4.2.2.3 The augmented Kraft model with Basu

The augmented Kraft model is also employed to establish whether earnings quality mitigates accrual mispricing and to answer research question 2, developed earlier. Results from the augmented model, including the Basu earnings quality proxy, are reported in Panel A of Table 3.5. The coefficient of accruals is negative (-0.1152) but not significant (t-statistic = -1.61), while that of cash flow is positive (0.0036) and not significant (t-statistic = 0.12). While Sloan (1996) also reports mispricing of the cash flow component, the results here show that the cash and accrual components are both accurately priced when earnings quality is considered. This finding provides additional support for the argument that investors price accruals more accurately when the quality of disclosed information is high. The earnings quality metric has a negative coefficient (-0.0007) and, similar to the findings in the augemented Mishkin model earlier, is not significant (t-statistic = -0.93).

[30] Prior to establishing whether Beaver and Ryan (2000) and Basu (1997) earnings quality proxies mitigate accrual mispricing, it was first established that accruals mispricing exists in each of these sub-samples. Coefficients were similar to that reported for the full sample in Table A1.

Table 3.5 Results from the augmented Kraft accrual mispricing model

This table presents results from the augmented Kraft accrual mispricing model. This model includes an earnings quality measure in the OLS regression to determine whether firms with better-quality earnings have less accrual mispricing. The model takes the following form:

$$R_{t+1} = \alpha_0 + \alpha_1 ACC_t + \alpha_2 CFO_t + \alpha_3 EQ_t + \sum_{n}^{t} \alpha_{4-13} SIZEDEC_t + \varepsilon_t$$

Panel A documents the results from including the Basu earnings quality proxy in the OLS regression, while Panel B includes that of the Beaver and Ryan measure. Here ACC_t = accruals, CFO_t = cash flows, EQ_t = earnings quality (either Basu or Beaver and Ryan), $SIZEDEC_t$ represents the size deciles in which each observation falls, and ε_t is the stochastic error term from the regression.

Panel A: Kraft model including the Basu earnings quality proxy

	Parameter estimate	Standard error	*t*-Statistic
Intercept	0.0598	0.0207	2.89***
ACC_t	-0.1152	0.0714	-1.61
CFO_t	0.0036	0.0309	0.12
EQ_t	-0.0007	0.0007	-0.93
SIZEDEC10	-0.0699	0.0256	-2.73***
SIZEDEC9	-0.0373	0.0267	-1.40
SIZEDEC8	-0.0121	0.0267	-0.45
SIZEDEC7	-0.0486	0.0276	-1.76*
SIZEDEC5	0.0176	0.0283	-0.62
SIZEDEC4	0.0021	0.0296	0.07
SIZEDEC3	-0.0119	0.0321	-0.37
SIZEDEC2	-0.0048	0.0290	-0.17
SIZEDEC1	0.0426	0.0276	1.54
N (firm observations) = 6,278			
F-Statistic = 2.83***			

Panel B: Kraft model including the Beaver and Ryan earnings quality proxy

	Parameter estimate	Standard error	*t*-Statistic
Intercept	0.0825	0.0212	3.88***
ACC_t	-0.1315	0.0753	-1.75*
CFO_t	-0.0261	0.0315	-0.83
EQ_t	0.0002	0.0002	1.10
SIZEDEC10	-0.0855	0.0259	-3.30***
SIZEDEC9	-0.0606	0.0269	-2.25**
SIZEDEC8	-0.0354	0.0272	-1.30
SIZEDEC7	-0.0641	0.0281	-2.28**
SIZEDEC5	-0.0354	0.0289	-1.23
SIZEDEC4	-0.0120	0.0305	-0.40
SIZEDEC3	-0.0247	0.0333	-0.74
SIZEDEC2	-0.0241	0.0298	-0.81
SIZEDEC1	0.0191	0.0287	0.67
N (firm observations) = 6,278			
F-Statistic = 2.60***			

Note: *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively, based on a two-tailed test for the time-series employed.

The Kraft model also includes several size dummies, given the previously documented relation between size and future returns (Ou and Penman, 1989; Bernard and Thomas, 1990; Sloan, 1996; Palmon et al., 2008). This investigation shows that the largest firms in the sample (located in deciles 9 and 10) are negatively related to returns (significant in the case of decile 10) in the OLS model. The larger firms have lower returns, and the smaller firms outperform, which is consistent with the small firm anomaly of Banz (1981). The overall findings from this Basu measure of earnings quality in the Kraft model are consistent with those of the earlier employed Mishkin model. Next, the Beaver and Ryan earnings quality proxy is introduced in the Kraft OLS model to ensure the robustness of the results.[31]

3.4.2.2.4 Augmented Kraft model with Beaver and Ryan

The augmented Kraft model is re-estimated with the Beaver and Ryan measure to establish whether the earlier finding, that earnings quality mitigates accrual mispricing, as hypothesis 2 predicts, is robust to the inclusion of an alternative earnings quality proxy. As presented in Panel B of Table 3.5, the accrual coefficient is negative (-0.1315) and significant only at the 10% level (t-statistic = -1.75). The cash flow coefficient from the OLS model is negative (-0.0261) but not significant (t-statistic = -0.83). While the accrual coefficient is still significant (at the 10% level), it represents a reduction in accrual mispricing to a level much lower than that reported without an earnings quality proxy. This is consistent with earlier findings, that earnings quality plays a mitigating role in accrual mispricing. Earnings quality therefore mitigates not only most accrual mispricing but also the mispricing of cash flows reported in earlier studies (Sloan, 1996). The large size deciles are all

[31] Robustness tests on the presence of multicollinearity for the Kraft model with the Basu earnings quality proxy indicate no multicorrelation problems. The lowest tolerance factor is well above 0.2 (0.43166 for *SIZEDEC1*), while the variance inflation factors are also above 5 for each variable. The Durbin–Watson test statistic is close to 2 (2.15), indicating no significant problems with autocorrelation.

significantly negatively associated with future returns, with both deciles 10 and 9 having significantly negative coefficients (coefficient = -0.0855, t-statistic = -3.30 for *SIZEDEC10*),[32] as is also found in the other augmented Kraft model with Basu earnings quality proxy.

In summary, this section presents the results from the testing of hypothesis 2 that aims to determine whether earnings quality mitigates accrual mispricing. Four augmented accrual mispricing models are estimated. For the Mishkin test, inclusion of both the Basu and Beaver and Ryan earnings quality proxies results in complete mitigation of accrual and cash flow mispricing. For the Kraft model, accruals and cash flow mispricing is mitigated entirely when the Basu earnings quality proxy is introduced into the model. When the Beaver and Ryan earnings quality proxy is introduced, accrual mispricing is only significant at the 10% level and thus, while not completely mitigated, still reduced. These findings therefore provide support for hypothesis 2 and answers in the affirmative to research question 2, which investigates whether earnings quality mitigates accrual mispricing. It also provides further evidence that the Mishkin and Kraft models yield very similar results and are therefore good substitutes.

This investigation differs from previous accrual mispricing studies by not just examining what causes the anomaly (Xie, 2001; Richardson et al., 2006), but also showing that earnings quality can mitigate it. While Drake et al. (2009) study the mispricing of high- and low-quality disclosure groups (based on analysts' opinion of quality), this study determines the impact of earnings quality on mispricing directly

[32] Robustness tests find no methodological biases. Multicollinearity tests ensure that two or more predictor variables in the OLS regression are not highly correlated. The lowest tolerance variable (0.411 for size decile 1) is still well above the level of 0.2, and so there are no tolerance problems. The variance inflation factors are all well below the rule of thumb, with the highest value being 2.428. Durbin–Watson tests for autocorrelations also reveals no problems (Durbin–Watson D = 2.169).

by including it in mispricing models. Instead of employing analysts' opinions of disclosures (Drake et al., 2009), accounting-based measures of earnings quality are used instead and therefore provide better insight into the relation between disclosure quality and accrual mispricing. The result that earnings quality mitigates accrual mispricing show that investors are better able to incorporate earnings information in their valuation decision when it is of high quality. Improving earnings quality should therefore be a priority to ensure mispricing is minimized.

Next, results from hypothesis 3, investigating accrual mispricing post-SOX, are presented.

3.4.2.3 Results from hypothesis 3

Hypothesis 3 investigates the mispricing of accruals post-SOX to help answer research question 3, raised earlier in Chapter 2. It employs a different sample (2003–2007) from the the first two hypotheses (1996–2000) discussed earlier. The accrual mispricing models of both Mishkin and Kraft are employed to determine whether accruals are mispriced post-SOX.

3.4.2.3.1 Accrual mispricing post-SOX: The Mishkin model

The Mishkin model is employed on the post-SOX sample to establish whether the accrual anomaly is mitigated in this period (answering research question 3). The model first determines whether earnings are persistent. The results (Panel A of Table 3.6) show the coefficient of earnings from the persistence equation is positive (0.621)

and significant (t-statistic =121.05).[33] This confirms that earnings are persistent post-SOX and is consistent with studies on the pre-SOX period (Sloan, 1996; Xie, 2001).

Table 3.6 Mishkin model accrual mispricing results post-SOX

This table presents the results from the Mishkin model of accrual mispricing as employed by Sloan (1996). Panel A presents the results from the earnings persistence model. Panel B includes results from the Mishkin accrual mispricing model. Here EAR_t is earnings; ACC_t is accruals; CFO_t is the cash flow component of earnings; $R_{t+1} - R_{t+1}|\varphi_t$ is returns above those expected for the firms, given their size (size-adjusted returns); and ε_{t+1} is the stochastic error term from the regression.
The first step is to confirm earnings persistence for the sample:

$$EAR_{t+1} = \alpha_0 + \alpha_1 EAR_t + \varepsilon_{t+1}$$

Next, the coefficients of accruals and cash flows from the forecasting model are determined:

$$EAR_{t+1} = \alpha_0 + \alpha_1 ACC_t + \alpha_2 CFO_t + \varepsilon_{t+1}$$

The valuation equation is also estimated:

$$(R_{t+1} - R_{t+1}|\varphi_t) = \beta_0(EAR_{t+1} - \alpha_0 - \alpha^*_1 ACC_t - \alpha^*_2 CFO_t) + \varepsilon_{t+1}$$

The coefficients from the forecasting and valuation models are then compared. Any significant differences between these two are indicative of mispricing.

Panel A: Mishkin earnings persistence model

	Intercept	$\boldsymbol{EAR_t}$
Pooled coefficient from persistence model	0.0188	0.621
(t-stat)	19.70***	121.05***
N (firm–year observations) = 16,560		
F-Stat = 14,652.4		

Panel B: Mishkin forecasting and pricing models

	Intercept	$\boldsymbol{ACC_t}$	$\boldsymbol{CFO_t}$
Pooled coefficient from forecasting model	0.0182	0.6036	0.6221
(*t*-Stat)	17.49***	53.06***	120.43***
Pooled coefficient from pricing model	0.171	0.707	0.594
(*t*-Stat)	17.49***	8.56***	15.87***
Difference in coefficients of forecasting and pricing models			
(t-Stat)		1.55	0.55
(p-value)		0.213	0.457
β = 0.679			
N (firm–year observations) = 16,560			

Note: *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively, based on a two-tailed test for the time-series employed.

[33] These high t-statistic values are consistent with those documented in Sloan (1996), where the earnings persistence coefficient = 0.841 with a t-statistic = 303.98.

The forecasting and valuation equations are estimated to determine whether accruals are mispriced, with the results reported in Panel B of Table 3.6. The coefficient of accruals from the forecasting equation is 0.6036. This is less than that of cash flow (0.6221) and confirms the conclusion from earlier studies, that accruals contribute less to earnings persistence than cash flows (Sloan, 1996; Xie, 2001). The valuation equation shows that the coefficient of accruals (0.707) is higher than that of cash flows (0.594). The difference between the coefficients of accruals in the forecasting (0.6036) and valuation (0.707) equations is, however, not significant (t-statistic = 1.55, p-value = 0.213). This indicates that accruals are not mispriced post-SOX. Similarly, comparing the coefficients of cash flow from the forecasting (0.6221) and valuation (0.55) equations reveals the cash flows are not mispriced (t-statistic = 0.55, p-value = 0.457).

This result differs from that of hypothesis 1 that showed significant mispricing of both the accrual and cash components pre-SOX. Therefore SOX seems to have achieved its goal of increasing earnings quality. This would allow investors to base their valuation decisions on more accurate information and reduce mispricing. To confirm this finding, the accrual mispricing model of Kraft is also estimated.

3.4.2.3.2 Accrual mispricing post-SOX: The Kraft model

The results from the investigation of accrual mispricing post-SOX are reported in Table 3.7. The accrual coefficient from the Kraft model is negative (-0.083) but not significant (t-statistic = -1.44). This confirms earlier findings (in Section 3.4.2.3.1) of no accrual mispricing post-SOX with the Mishkin model. The cash flow component from the Kraft model in Table 3.7 is similarly insignificant (coefficient = -0.007, t-

statistic = -0.29). Size is once again significant, with smaller firms reporting higher share returns (*SIZEDEC1* coefficient = 0.058, t-statistic = 2.24).

In summary, this section presents the results from the testing of hypothesis 3 related to research question 3, which seeks to determine whether accruals are mispriced post-SOX. The mispricing models of both Mishkin and Kraft are employed and document that accruals are not mispriced post-SOX. This finding supports hypothesis 3 and answers research question 3 in the affirmative.

Table 3.7 Results from the augmented Kraft accrual mispricing model post-SOX

This table presents results from the Kraft accrual mispricing model. This model investigates accrual mispricing post-SOX, 2003–2007. The model takes the following form:

$$R_{t+1} = \alpha_0 + \alpha_1 ACC_t + \alpha_2 CFO_t + \sum_{n}^{t} \alpha_{3-12} SIZEDEC_t + \varepsilon_t$$

where ACC_t = accruals, CFO_t = cash flows, $SIZEDEC_t$ represents the 10 size deciles in which each observation falls, and ε_t is the stochastic error term from the regression.

Kraft model for the post-SOX period			
	Parameter estimate	**Standard error**	**t-Statistic**
Intercept	0.2484	0.016	15.46***
ACC_t	-0.083	0.0575	-1.44
CFO_t	-0.007	0.025	-0.29
SIZEDEC10	-0.091	0.022	-4.23***
SIZEDEC9	-0.07	0.022	-3.26***
SIZEDEC8	-0.047	0.022	-2.16**
SIZEDEC7	-0.072	0.022	-3.26***
SIZEDEC5	-0.047	0.022	-2.15**
SIZEDEC4	-0.042	0.022	-1.93*
SIZEDEC3	0.039	0.022	1.81*
SIZEDEC2	0.028	0.023	1.22
SIZEDEC1	0.058	0.026	2.24**
N (firm observations) = 16,693			
F-Statistic = 8.72***			

Note: *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively, based on a two-tailed test for the time series employed.

The improved disclosure environment created by SOX therefore seems to have reduced information asymmetry to such a level that investors are consistently able to value securities accurately, eliminating accrual mispricing.This finding is consistent with prior studies that document increased information disclosures (Gordon et al., 2006) and a lower incidence of earnings management (Cohen et al., 2008) post-SOX. In their yearly analysis of raw and risk-adjusted hedge fund returns to trading based on the accrual anomaly, Green et al. (2010) show that returns to such a strategy are almost persistently negative after 2003, while Richardson et al. (2010) and Bhojraj et al. (2009) similarly conclude that the extent of the anomaly has diminished. However, they do not attribute this change to SOX. This study extends these studies by investigating whether the documented improved disclosure environment has mitigated accrual mispricing. Since results show no mispricing post-SOX, SOX has achieved its stated aim of improving disclosure quality and allows investors better-quality information on which to base their valuation decisions.

3.5 Conclusions

This chapter investigated three research questions related to the mispricing of accruals to achieve the three research objectives established earlier, in Chapter 1. The first research question addressed whether accruals are mispriced, while the second research question determined whether earnings quality mitigates accrual mispricing. The third research question examined accruals post-SOX to establish whether accruals are mispriced in this period.

The results from hypothesis 1 indicated that accruals are mispriced. This finding was consistent across both accrual mispricing models employed (Mishkin and Kraft) and

supports the findings of earlier studies (Sloan, 1996; Xie, 2001; LaFond, 2005). It therefore answered in the affirmative to research question 1. In regard to hypothesis 2, which investigated whether earnings quality mitigates accrual mispricing, overall results showed that the accrual anomaly is mitigated when earnings quality is introduced, supporting this hypothesis. This shows that earnings quality does play an important role in ensuring the accurate pricing of securities, consistent with Louis et al. (2008) and Drake et al. (2009), and affirmed research question 2. The third hypothesis's results indicated that accruals were no longer mispriced post-SOX. Both the accrual mispricing models employed showed no mispricing of the cash or accrual component post-SOX. This indicated that SOX had successfully improved disclosure quality, allowing investors better-quality financials on which to base valuation decisions, and affirmed research question 3.

This study makes three major contributions to the literature. It first estimates accrual mispricing in the presence of earnings quality. By including earnings quality proxies directly in the mispricing models, it provides evidence that earnings quality mitigates the accrual anomaly. This finding shows that investors are better able to value securities accurately when earnings are of high quality. To do so, the study makes a second contribution by documenting that accruals are mispriced pre-SOX and that the accrual mispricing models of Mishkin and Kraft produce comparable results. Third, it contributes by showing that SOX achieved its goals of improving disclosure quality and that accruals are no longer mispriced in this high-disclosure environment.

These findings have implications for regulators and investors. Regulators can take note that an improved disclosure environment is conducive to ensuring market

efficiency. The regulatory changes aimed at improving disclosures have also been effective. For investors, it is important to consider earnings quality when assessing potential investments, since this can impact on price. While this study provides evidence that mispricing is mitigated post-SOX, it does not explain why this might be so. The next chapter will therefore investigate the post-SOX period to determine why no accrual mispricing is found.

Chapter 3 Appendix: Accrual Mispricing in 1996–2000

This appendix presents the results from accrual mispricing tests for the period 1996–2000 in relation to hypothesis 1.

Table A1 Persistence tests and accrual mispricing results from the Mishkin model

This table shows the results from the Mishkin tests of accrual mispricing as employed by Sloan (1996) for the sample period 1996–2000. Panel A presents the earnings persistence tests using the following model:

$$EAR_{t+1} = \alpha_0 + \alpha_1 EAR_t + \varepsilon_{t+1}$$

Panel B presents the results from tests determining the contribution of the accrual and cash flow components to the persistence of accruals and employs the following model:

$$EAR_{t+1} = \alpha_0 + \alpha_1 ACC_t + \alpha_2 CFO_t + \varepsilon_{t+1}$$

Panel A presents the results from the earnings persistence model. Panel B includes results from the Mishkin model accrual mispricing model as employed by Sloan (1996). Here EAR_{t+1} = earnings, ACC_t is accruals, CFO_t is the cash flow component of earnings, and ε_{t+1} is the stochastic error term from the regression.All variables are winsorized at 99% to exclude outliers.

Panel A: Earnings persistence model, 1996–2000

	Intercept	$\boldsymbol{EAR_t}$
Pooled coefficient from the earnings persistence model	0.014	0.545
(t-Stat)	(9.96)***	(95.02)***
N = 21,004		

Panel B: Mishkin forecasting and valuation models

	Intercept	$\boldsymbol{ACC_t}$	$\boldsymbol{CFO_t}$
Pooled coefficient from forecasting model[34]	0.0019	0.4251	0.5606
(t-Stat)	(1.48)	(33.82)***	(92.62)***
Pooled coefficient from pricing model	0.3669	1.022	0.130
(*t*-Stat)	(5.44)***	(3.27)***	(0.82)
Difference in coefficients of forecasting and pricing models		4.02**	9.04***
(*t*-Stat)		(0.045)	(0.0026)
(p-Value)			
β = 0.164			
N (firm observations) = 21,004			

Note: *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively, based on a two-tailed test for the time series employed.

[34] An F-test rejects the hypothesis that the accrual and cash components in the forecasting model are equal at F = 109.56.

Table A2 Results from the Kraft accrual mispricing tests

This table presents results from the Kraft accrual mispricing test. The test determines whether the accrual and cash flow components of earnings are accurately priced and is modeled as

$$R_{t+1} = \alpha_0 + \alpha_1 ACC_t + \alpha_2 CFO_t + \sum_{n}^{t} \alpha_{3-12} SIZEDEC + \varepsilon_t$$

A significant coefficient of either accruals or cash flows would provide evidence that the component is mispriced. Here ACC_t is accruals, CFO_t is the cash flow component of earnings, R_{t+1} is returns to a security over the year, $SIZEDEC_t$ represents the size deciles in which each observation falls, and ε_t is the stochastic error term from the regression.

Variable	Parameter estimate	Standard error	t-Statistic
Intercept	0.0747	0.0152	4.92***
ACC_t	-0.1789	0.0489	-3.66***
CFO_t	-0.0025	0.0233	-0.11
SIZEDEC10	-0.0703	0.0199	-3.53***
SIZEDEC9	-0.0362	0.0204	-1.78*
SIZEDEC8	-0.0498	0.0205	-2.43**
SIZEDEC7	-0.0031	0.0208	-0.15
SIZEDEC5	0.0086	0.0214	0.40
SIZEDEC4	0.0238	0.0217	1.10
SIZEDEC3	0.0291	0.0215	1.35
SIZEDEC2	0.0671	0.0215	3.13***
SIZEDEC1	0.0571	0.2289	2.49**
N (firm observations) = 21,169			
F-Statistic = 9.03***			

Note: *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively, based on a two-tailed test for the time series employed.

The results obtained in this appendix, by replicating the Mishkin model (as employed in Sloan, 1996 and the basic OLS model (in Kraft et al., 2007), are similar to those obtained by Sloan (1996) and Kraft et al. (2007). This is true since the rational pricing of both accruals and cash flow (see Diagram 3.1 for coefficients) are rejected (the results from Table A1 document the same outcome). Whilst Kraft et al. (2007) reject the pricing of both accruals and cash flows; this study rejects only that of accruals whilst cash flows are priced. This finding is consistent with Pincus et al. (2007).

Chapter 4 Firm-Level Mispricing of Accruals (Second Study)

4.1 Introduction

This chapter investigates accrual mispricing and, more specifically, examines two related issues. The first determines whether accruals are mispriced at the firm level. The second establishes the persistence of such mispricing and ascertains whether investors can profit from it. While studies examine accrual mispricing at the country (Sloan, 1996; Xie, 2001), cross-country (Pincus et al., 2007), and aggregate stock market levels (Hirshleifer et al., 2009), little, if anything, has been published regarding the firm level.[35] It is important to address this gap, since firm-level accrual mispricing will differ from the country/cross-country results, given dissimilarities in firm lifecycle stages (Liu, 2008), levels of investment (Wu et al., 2010), and economic conditions (Martin, 2008). This study investigates first if accrual mispricing exists at the firm level and, second, whether it is persistent. Prior literature shows that the extreme accruals[36] that drive the accrual anomaly are sticky (Zach, 2006) and therefore persist. Whether firm-level accrual mispricing also persists is therefore the second empirical question. This chapter finally examines the exchange listing, size, industry classification, and analyst following of significantly mispriced firms to determine whether any of these factors help explain this mispricing and its persistence.

[35] Country-level accrual anomaly studies (such as Sloan, 1996, and Xie, 2001) employ a cross section of firms over a number of years to estimate whether a country has, overall, mispriced accruals. Cross-country studies (such as Pincus et al., 2007) implement a similar sample to studies but, instead, investigate more than one country and compare the mispricing across these. Accrual mispricing studies at the aggregate stock market level use value-weighted averages of earnings, accruals, cash flows, and returns from value-weighted market indices to estimate whether accruals are mispriced at the aggregate stock market level (e.g., Hirshleifer et al., 2009). The differences between accrual mispricing studies at the country, aggregate, and cross-country levels are therefore in the data employed. Country-level accrual anomaly studies investigate mispricing by employing time series cross-sectional data. Cross-country studies employ time series cross-sectional data for more than one country at a time. Studies at the aggregate market level employ aggregate accruals, cash flows, and returns to estimate mispricing. These are thus all testing the anomaly in different settings.

[36] Extreme accruals are those accruals in the top and bottom deciles of the sample (Zach, 2006).

The motivation to investigate accrual mispricing at the firm level stems from the substantial research on the anomaly's existence (Sloan, 1996; Xie, 2001) and persistence (Lev and Nissim, 2006; Mashruwala et al., 2006).[37] Studies at the aggregate, cross-country, and industry level (Pincus et al., 2007; Zhang, 2007; Hirshleifer et al., 2009; Trejo-Pech et al., 2009) indicate that the documented anomaly is not generalizable to all settings and thus provides evidence that the country-level results documented by Sloan (1996) can differ at the firm level. Motivation for a firm-level accrual mispricing study also stems from the Chapter 3 findings post-Sarbanes–Oxley Act (post-SOX), where no mispricing is detected, even without considering earnings quality. Introduced to improve the accuracy and reliability of financials, SOX helped improve the quality of disclosures (Cohen et al., 2008). Since Chapter 3 finds no mispricing post-SOX at the country level, it therefore contradicts findings from other mispricing studies and thus raises the question of whether there really is no mispricing at all (presumably due to SOX's effectiveness). Alternatively, this may simply be a country-level result that is not extendable to other settings such as the firm level.

There are several potential causes for firm-level mispricing offered in the literature. These include differences in lifecycle stage (Liu, 2008), inventory and capital investment levels (Wu et al., 2010), and accrual persistence (Martin, 2008; Demerjian et al., 2010). Firms in the growth phase of their lifecycle tend to raise large amounts of cash to increase their inventory and accounts receivables (Liu, 2008), and thus lower cash flows (Hribar, 2002). When common discretionary

[37] While Chapter 3 shows that the aggregate anomaly is mitigated post-SOX, this does not necessarily imply that mispricing is eliminated in entirety. It is possible that accruals are still mispriced in certain industries and/or firms.

accrual measures (such as the modified Jones model of Dechow et al., 1995) are used, such enhancements appear indicative of income-increasing earnings management. Liu (2008) shows, however, that what appears to be income-increasing earnings management is more likely a result of increases in inventories and accounts receivables that typically occur in certain parts of the firm lifecycle. Liu (2008) concludes that many documented cases of earnings management are therefore type 1 errors resulting from failure to consider the firm's lifecycle stage. This finding suggests that firm-level factors are important in assessing the extent and quality of individual firms' accruals. It also presents as additional motivation for an investigation of firm-level accrual mispricing. Differences in firm lifecycle stages are, however, not the only variable that can cause fluctuations in firm-level accruals pricing.

Firms also adjust their investment level in response to changes in the discount rate[38] (Tobin, 1969), and therefore any decreases in rates should result in increased accruals due to more profitable investments. Wu et al. (2010) conclude with their "discount rate hypothesis" that when a firm's capital investment adjusts optimally to changes in discount rates, its accruals should be positively associated with current returns and negatively associated with future returns. They document that high accrual firms have consistently lower ex ante discount rates than low accrual firms. Differences in how investments adjust to changes in the discount rate therefore cause firm-level variations in accruals and their pricing, providing further support for a firm-level investigation.

[38] The discount rate is the average cost of capital funds for a firm and thus the minimum required rate of return on any investments.

Variations in other firm variables, such as accrual persistence, can also result in firm-level accrual mispricing. Accrual persistence plays an important role in how investors price accruals, and this persistence is typically greater during periods of economic expansion (Martin, 2008) and where managerial abilities are superior (Demerjian et al., 2010). Martin (2008) investigates the impact of the business cycle on accruals and finds that the subcomponents of changes in accounts receivable, inventory, and depreciation specifically drive these cyclical differences in accrual persistence. Managerial abilities also vary between firms, and those firms with superior management skills have significantly better earnings (and accruals) quality (Demerjian et al., 2010) and thus persistence. It is argued that superior knowledge of the business environment and experience help better estimate the future and improve the quality and persistence of earnings. As shown in Chapter 3, earnings (and its accrual and cash component) quality and persistence play an important role in mitigating accrual mispricing at the country level. Factors that impact on this persistence (and therefore quality) at the firm level will therefore also affect a firm's mispricing.

The next question examined in this study (research question 5) determines whether firms with mispriced accruals in one period experience such mispricing in consecutive periods, or whether it abates. While no prior study has investigated this directly, the extant literature indicates that firm-level mispricing may be persistent. Zach (2006) examines the nature of accruals that cause the accrual anomaly and observes that these accruals tend to be in the extreme deciles (the accruals in the top and bottom deciles). He further concludes that firms with such extreme accruals are habitually extreme, with 25% of firms in this decile remaining so for more than one

year. Evidence from other asset pricing anomalies, such as the size anomaly (Banz, 1981), also suggests firm-level mispricing persistence is likely.[39] Knez and Ready (1997) propose, in regard to this size anomaly, that while a few small firms step forward each month and earn large positive returns, most fade away and thus ultimately very few ever become large firms. This so-called turtle egg hypothesis proposes that "mother sea turtles lays many eggs but few will hatch and fewer still will make it to the ocean" (Knez and Ready, 1997, p.1376). When applied to the accrual anomaly, it implies that mispriced firms will persist (at least for some time).

Further support for firm-level mispricing persistence stems from Fama and French (2008) and Avramov et al. (2010). Fama and French (2008) investigate the pervasiveness of asset pricing anomalies and conclude that, of all these anomalies, the accrual anomaly is one of few that remain persistent in all size groups, cross sections, and sorts. Avramov et al. (2010) similarly investigate commonalities across asset pricing anomalies and conclude that, while the majority of asset pricing anomalies are associated with downgrades in firm credit ratings, the accrual anomaly is an exception and remains robust and unaccounted for.

While both Fama and French (2008) and Avramov et al. (2010) provide evidence of the pervasive nature of the country-level accrual anomaly in earlier periods, Chapter 3 shows that country-level mispricing is no longer present post-SOX. The question is therefore whether that result (of no mispricing post-SOX) is a sample-specific, country level only occurrence or whether the post-SOX environment is so different that it has eliminated mispricing at all levels. This study therefore differs from Fama

[39] The size anomaly shows that small firms persistently outperform their large counterparts (even after controlling for risk) and was first documented by Banz (1981).

and French (2008) and Avramov et al. (2010) by also investigating accrual mispricing persistence at the firm level.

This study makes two significant contributions to the accrual anomaly literature. It first provides evidence that firm-level accrual mispricing exists (even in the absence of country-level mispricing) and, second, documents its persistence and profitability. It compares and contrasts to existing mispricing studies in the following ways: While Liu (2008) investigates the impact of firm lifecycle stage on discretionary accruals (where accrual mispricing, according to Xie, 2001, occurs), this study focuses on whether firm-level mispricing exists. Wu et al. (2010) investigate whether changes in capital investment due to variations in discount rates explain the accrual anomaly. This study furthers this idea that firm-level choices can influence accruals and employs it as motivation to examine firm-level accrual mispricing. While Pincus et al. (2007), Hirshleifer et al. (2009), and Trejo-Pech et al. (2009) propose reasons for cross-country and aggregate- and industry-level differences in accrual mispricing, the focus of this study is, instead, to determine whether firm-level mispricing exists.

This study's second main contribution is its focus on the persistence of firm-level mispricing. Lev and Nissim (2006) and Mashruwala et al. (2006) examine the persistence of the country-level accrual anomaly and conclude that it has not dissipated.[40] Fama and French (2008) and Avramov et al. (2010) document the robustness of the country-level accrual anomaly, while Zach (2006) shows that extreme accruals (where the accrual anomaly originates) are sticky. This study extends the country-level persistence analysis of Fama and French (2008) and Avramov et al. (2010) to the firm level to determine whether it also persists there. It

[40] These studies are both conducted on pre-SOX data.

also builds on Zach (2006) by examining whether his sticky extreme accruals translate into persistent firm-level accrual mispricing. This study not only documents that firm-level accrual mispricing is persistent, but also provides evidence of significant abnormal returns available from portfolio trading based on such mispricing.

This study's results indicate that firm-level mispricing exists, even in the period where country-level mispricing does not. For the same post-SOX period in which no country-level mispricing is found in Chapter 3, significant firm-level over- and underpricing of accruals are documented. The investigation of firm-level mispricing persistence shows that 38% of significantly over- and underpriced firms remain mispriced for more than one period, 16.04% for at least two years, and 6.89% for more than four years. Furthermore, a trading strategy of buying underpriced firms and shorting overpriced firms over the 12-year sample yields abnormal returns of 44.43%. Additional analysis also reveals that while there is a decrease in mispricing persistence in the year following SOX, an overall pre- and post-SOX period t-test is not significant. Instead, it seems that at the firm level the role of analysts in reducing accrual mispricing is much more significant. The findings from this chapter show that most increases in analyst coverage result in reduced mispricing persistence.

These findings have several implications for investors. The investigation of firm-level accrual mispricing (hypothesis 4) shows that while some firms have overpriced accruals, others have underpriced accruals. Investors should therefore pay close attention to ensure their investment choices consider these under-/overvaluations. It also indicates that returns to an accrual-based trading strategy may still be available

even when no country-level anomaly exists. In fact, investigation into the persistence of firm-level mispricing shows that 38% of these firms remain mispriced for more than one period, allowing investors who can identify them to profit over the long run.

The rest of this study is structured as follows: Next, in Section 4.2, the theoretical background relevant to the firm-level mispricing of accruals is presented and hypothesis 4 is developed. Then the data and methodology used to calculate firm-level accrual mispricing are discussed in Section 4.3, along with the associated sample selection procedures. Section 4.4 presents the results from testing the two hypotheses, while Section 4.5 concludes the chapter.

4.2 Background and hypotheses development

This section presents the background of this study and develops the hypotheses to investigate the issues raised earlier in this chapter's introduction. It starts with a brief overview of the well-documented country-level accrual anomaly and outlines those studies that investigate accrual mispricing across countries. Next, the focus shifts to accrual mispricing studies at the industry and aggregate stock market levels. While a firm-level accrual anomaly study has not been documented to date, several studies show firm-level factors that impact on accruals and thus their pricing. These factors (such as lifecycle stage, discount rate, and levels of discretionary accruals) that cause firm-level differences in accruals (Liu, 2008; Martin, 2008; Demerjian et al., 2010) provide further motivation for investigating the accrual anomaly at this level and leads to hypothesis 4. Next, the study draws on the literature documenting the robustness of the country-level accrual anomaly and those studies that provide evidence suggesting firm-level mispricing may be persistent to determine the

likelihood of firm-level accrual mispricing persisting. This discussion then leads to hypothesis 5.

The accrual anomaly literature documents abnormal returns from a strategy of selling high accrual firms and buying low accrual firms (Sloan, 1996) based on the premise that investors overestimate (underestimate) the persistence of the accrual (cash flow) component of earnings.

While country-level (Sloan, 1996; Xie, 2001) and cross-country (Pincus et al., 2007) investigations of accrual mispricing are well documented, the industry level has received little attention. Gaio (2010), however, stresses the important role that firm and industry characteristics play in determining firm-level earnings quality (and, as shown in Chapter 3, accrual mispricing) but stops short of investigating industry- or firm-level mispricing. Zhang (2007) provides insights into industry-level mispricing by examining investment and growth as an explanation for the accrual anomaly. He concludes that industries with high correlations between accruals and employee growth have significant accrual anomalies, while those with low correlations do not, and thus shows differences in mispricing exist intra-industry. The only other industry-level study, Trejo-Pech et al. (2009), examines the pricing of accruals in the food supply chain industry (an industry characterized by its low accruals, inventory, and accounts receivable). They find no abnormal returns from the accrual-based strategy proposed by Sloan (1996). The country-level accrual anomaly can therefore not necessarily be generalized to all industries and provides evidence of pricing differences in accruals between the country and industry levels.

Accrual mispricing has also been examined at the aggregate stock market level. Hirshleifer et al. (2009) investigate whether the accrual and cash effects documented by Sloan (1996) extend to this aggregate market level.[41] It is proposed that the accrual anomaly may extend to this level, given that investors and analysts devote substantial efforts to studying the whole market and that the cost of arbitrage and information is less. Hirshleifer et al. (2009) employ value-weighted averages of earnings, accruals, cash flows, and returns to estimate whether aggregate stock market level accruals are mispriced. Their results indicate at the pooled aggregate market level (in contrast to the country level) that accruals are, on average, a positive return predictor. This is so, however, only for certain industries; it is a significant negative return predictor for others. These results therefore provide further evidence of the differences in aggregate-, country-, and industry-level accrual mispricing.

The visible differences in accrual mispricing are not only present when comparing alternative levels of study; as mentioned earlier, the anomaly also appears to vary during firm lifecycle stages. Liu (2008) shows a mean positive bias in discretionary accruals for firms in their growth stage. Martin (2008) similarly concludes that the persistence of accruals is greater during economic expansion as opposed to recession. Martin (2008) shows that cyclical differences in persistence (which investors ultimately misprice) are driven mainly by depreciation and changes in accounts receivable, raw materials, and finished goods. The ability of management to fulfill their roles also affects firm-level accruals. Both Liu (2008) and Martin (2008) therefore provide evidence that firm-level factors impact on accruals.

[41] These employ aggregate accruals, earnings, and cash flow to estimate mispricing at the aggregate market level, as opposed to country-level studies that employ time series cross-sectional data for all firms in the market to establish one anomaly.

Demerjian et al. (2010) further propose that better managers are more knowledgeable in their roles and therefore make better judgments and estimates of future earnings, leading to better earnings quality (and therefore accruals quality). Francis et al. (2008) similarly conclude that earnings quality varies with CEO reputation. Managerial quality and CEO reputation are therefore additional firm-level factors that impact accruals.

In summary, variables such as lifecycle stage (Liu, 2008), economic cycle (Martin, 2008), managerial skill (Demerjian et al., 2010), and CEO reputation (Francis et al., 2008) all impact on firm-level accruals and mispricing, suggesting firm-level mispricing may differ from that at the aggregate, country, or industry level. While the earlier findings in Chapter 3 indicate no country-level accrual mispricing post-SOX, an investigation of firm-level accrual mispricing over this same post-SOX period is undertaken to determine whether the firm-level accrual mispricing deviates from that at the country level. This discussion leads to the fourth hypothesis.

Hypothesis 4: Accruals are mispriced at the firm level even when the country-level result is not significant.

Given the above discussion, accrual mispricing should exist at the firm level (regardless of the country-level result). There is, however, little evidence of whether this mispricing persists. Zach (2006) shows that firms with extreme accruals tend to be habitual in those extremes, thus indicating that firm-level mispricing persists. The turtle egg hypothesis (Knez and Ready, 1997), discussed earlier, in Section 4.1, applied to the accrual anomaly suggests that it is unlikely that firms with

significantly mispriced accruals in one period will subsequently correct. Firm-level mispricing should therefore persist.

While country-level mispricing studies such as Fama and French (2008) and Avramov et al. (2010) show that the accrual anomaly (at that level) is robust and persists even while most other asset pricing anomalies dissipate, they do not investigate the issue at the firm level. This study therefore extends the investigation of accrual mispricing persistence to the firm level. This discussion leads to the fifth hypothesis.

Hypothesis 5: Firm-level accrual mispricing persists over time.

4.3 Data and methodology

4.3.1 Data

The data required for calculating the accrual mispricing variables are obtained from the Compustat/Center for Research in Security Prices (CRSP) database. The variables for the mispricing tests are included in earnings (EAR_t) and its accrual (ACC_t) and cash flow (CFO_t) components, buy and hold returns (R_{it}), and size-adjusted (abnormal) returns ($R_{t+1} - R_{t+1}|\varphi_t$). The calculation of each of these is discussed below.

Earnings are measured as current period earnings (Compustat item #178). The Sloan (1996) balance sheet approach is employed to calculate accruals:

$$ACC_t = (\triangle CA - \triangle CASH) - (\triangle CL - \triangle STD - \triangle TP) - DEP_t \quad (1)$$

where ACC_t is current period accruals; ΔCA is change in current assets (change in Compustat

item #4 from period$_{t-1}$ to period$_t$); ΔCASH is the change in cash and cash equivalents (change in Compustat item #1 from period$_{t-1}$ to period$_t$); ΔCL is change in current liabilities (change in Compustat item #5 from period$_{t-1}$ to period$_t$); ΔSTD is change in debt included in current liabilities (change in Compustat item #34 from the period$_{t-1}$ to period$_t$), ; ΔTP is change in income tax payable (change in Compustat item #71 from period$_{t-1}$ to period$_t$); and DEP$_t$ is depreciation and amortization expenses (Compustat item #14). The calculated accruals value is scaled by total assets (Compustat item #6).

Cash flow is measured as the difference between the calculated earnings and accrual values, consistent with Sloan (1996):

$$CFO_t = EAR_t - ACC_t \quad (2)$$

where CFO$_t$is the cash flow component of earnings, EAR$_t$is current year earnings (Compustat item #178), and ACC$_t$ is current period accruals as per equation (1).

Buy and hold returns for the accrual mispricing calculation are obtained from return data for 12 months, starting four months after the end of the fiscal year from which the financial statements are gathered (Sloan, 1996). These are calculated as the percentage change in stock price from period$_t$ to period$_{t-1}$:

$$R_{it} = \frac{P_t - P_{t-1}}{P_{t-1}} \quad (3)$$

where R$_{it}$ is shareholder return calculated as annual buy and hold returns estimated year on year from four months after the financial year − end, P$_t$ is the security price four months after the financial year − end, and P$_{t-1}$ is the lagged security price.

Size-adjusted abnormal returns are estimated, following Sloan (1996) and Xie (2001) as the difference between a firm's annual buy and hold returns and the annual buy and hold returns for an identical 12-month period on the market capitalization based portfolio decile to which the firm belongs. It requires adjusting buy and hold returns for expected returns. The calculation process can be specified as:

$$(R_{t+1} - R_{t+1}|\varphi_t) = R_{it} - R_{smp}$$

Where $(R_{t+1} - R_{t+1}|\varphi_t)$ are abnormal returns. R$_{it}$ is buy and hold (shareholder return) calculated as annual buy and hold returns estimated on a year-by-year basis starting 4 months after the end of a firm's financial year end and includes distributions. R$_{smp}$ is a proxy for "expected returns" and is estimated as the annual buy and hold return for the same 12-month period on the market-

capitalization-based portfolio decile (the size decile) to which the firm belongs. Total assets are employed to classify each firm into a size decile for each year.

Additional firm variables are obtained to analyze the characteristics of significantly mispriced firms, including size and sector data, exchange listings, and analyst following. The size and sector data are obtained from the Compustat database for the period 1991–2007. Size is measured as the log of total assets (Compustat item #6). Sector data from Compustat are obtained for all NYSE/NASDAQ and AMEX firms in the Compustat universe. All firms are classified as either energy, materials, industrials, consumer discretionary, consumer staples, healthcare, information technology, telecommunications, or utilities, based on their two-digit Global Industry Classification System (GICS) code, to allow the sector analysis of mispriced firms.

Exchange listing information is obtained from the merged Compustat/CRSP database, while analyst following data are retrieved from the Institutional Brokers' Estimate System (I/B/E/S) database.[42] All analyst recommendations for sample firms are from the I/B/E/S for the period 1997–2007.[43]

4.3.2 Sample selection

This chapter investigates two hypotheses involving two different samples. The first (hypothesis 4) tests whether firm-level mispricing differs from country-level mispricing. It therefore employs the same post-SOX sample described earlier, in Chapter 3 (Section 3.3.1.2.2), for 2003–2007. The second hypothesis (hypothesis 5) investigates whether firm-level mispricing persists over time and employs a much longer sample period (1991–2007) than for hypothesis 4.

[42] I/B/E/S provides current and historical forecast data from analysts.
[43] Firms with one or more analyst recommendations in a given year are considered to be followed by analysts. The number of recommendations for each firm in each year employed is the measure of analyst coverage.

The sample selection procedure for hypothesis 4 (2003–2007) is presented first in Section 4.3.2.1, and that for hypothesis 5 (1991–2007) in Section 4.3.2.2.

4.3.2.1 Sample for hypothesis 4

The sample selection procedure for hypothesis 4 is the same as that presented earlier, in Panel C of Table 3.1 in Chapter 3, (see Section 3.3.1.1.1). A sample of 16,560 firm-year observations for 4,093 firms is available for the period 2003 – 2007 (as per Section 3.3.1.2.2). To estimate firm-level mispricing, each of these 16,560 observations is employed to estimate a Mishkin model mispricing variable for each firm. Firm-level mispricing variables are calculated employing data for each firm for 2003–2007. To estimate one firm mispricing variable, all five years of firm data (2003–2007) are required. If any of these five years of data are missing or incomplete, the firm is deleted from the sample. This process yields 1,247 firm-level mispricing variables for the period 2003–2007. The final sample employed in hypothesis 4 therefore consists of 1,247 firm-level mispricing variables.

Table 4.1 Sample selection procedure (hypothesis 4)

This table reports the sample selection procedure for hypothesis 4 employing the Mishkin accrual mispricing model to estimate firm-level accrual mispricing. It follows on from Table 3.1 presented earlier in Section 3.3.1.2.2). The sample period for this hypothesis is 2003–2007.

	Firm-years	**Number of firms**
Final Sample for period 2003 – 2007 from Table 3.1 (section 3.3.1.2.2)	16,560	4,093
	16,560	4,093
Less: Firms without five consecutive years of data	(10,325)	(2,846)
Final sample for hypothesis 4	**6,235**	**1,247**

4.3.2.2 Sample for hypothesis 5

The sample selection procedure for hypothesis 5 starts by obtaining data to calculate accruals, earnings, cash flow, and total assets from the merged Compustat/CRSP database for the period 1985–2007[44] (see Table 4.2). This yields 270,125 firm–year observations for 26,954 firms. All observations for companies not listed on one of the three main stock exchanges (NYSE, NASDAQ, and AMEX, or Compustat exchange codes #11, #12, and #14) are deleted. This leaves 153,176 observations for 13,335 firms. Next, firm–years with missing observations for total assets, earnings, accruals, or cash flows are deleted, leaving 131,460 observations for 12,258 firms.

Table 4.2 Sample selection procedure (hypothesis 5)

This table presents the sample selection procedure for and calculation of firm-level accrual mispricing variables employed to investigate the behavior of mispriced accrual firms over time. It presents the sample selection procedure for the firm-level observations used to estimate firm-level mispricing variables. To calculate accrual mispricing variables from 1991–2007 accruals, earnings, cash flows, returns, and abnormal returns, data are obtained for the period 1985–2007, since at least five years of data are required to calculate one accrual mispricing variable.

	Firm–years	**Number of firms**
Compustat/CRSP database observations for the sample period	270,125	26,954
Less: Non-NYSE NASDAQ and AMEX firms	(116,949)	(13,619)
	153,176	13,335
Less: Missing accrual calculation variables or earnings figure	(21,716)	(1,077)
	131,460	12,258
Less: Missing values for returns and abnormal returns	(20,076)	(2,826)
	111,384	9,432
Less: GICS financial firms	(14,251)	(1,575)
	97,133	7,857
Less: Firms with fewer than 15 observations	(40,202)	(2,411)
Final sample for hypothesis 5	**56,931**	**5,446**

[44] Data are collected for 1985–2007, since at least five years of data are required to calculate a firm–year accrual mispricing variable. Data from 1985–1990 are therefore employed to calculate a firm-level accrual mispricing variable for each firm in 1991. For 1992 firm-year accrual mispricing variables, data from 1986–1991 are employed, and so on. One-year-ahead returns are also required by the Mishkin model, so that while data from 1985–1990 yields a mispricing variable for 1991, the calculation employs lead returns, and therefore returns from 1991 as well.

The accrual mispricing model employed in this study require annual buy and hold returns to shareholders as well as abnormal returns for each firm–year observation. These data are obtained from the merged Compustat/CRSP database for the remaining firms in the sample. The deletion of all observations with missing returns or abnormal returns data leaves a sample of 111,384 observations for 9,432 firms. Financial firms (those with GICS sector code 40) are also deleted (14,251 firm–year observations for 1,575 firms), since the nature of their accruals is inherently different from other firms (Sloan, 1996) and for consistency with prior studies (Beneish and Vargus, 2002; Desai et al., 2004). Lastly, since hypothesis 5 investigates how firm-level mispricing changes over time, each firm requires at least 15 firm–year observations (allowing the calculation of 11 firm mispricing variables) to remain in the sample. The elimination of those with fewer than 15 observations results in a final sample for hypothesis 5 of 56,931 firm–year observations for 5,446 firms. This sample is employed to estimate whether firm-level accrual mispricing persists, as well as whether any common characteristics exist among persistently mispriced firms. The next section presents the methodology employed to test the two hypotheses developed earlier.

4.3.3 Methodology

This section presents the methodology employed to test hypotheses 4 and 5. Since both hypotheses investigate accrual mispricing at the firm level, the calculation of firm-level accrual mispricing is discussed first.[45]

[45] Given the similarity of results from the accrual mispricing methods of Mishkin and Kraft, as documented earlier in Chapter 3, only the results from the Mishkin model are presented here. Employing the Kraft model on firm-level data requires a larger number of observations for each firm given it entails 2 independent variables and 10 size dummy variables. The Kraft model is therefore not employed for hypotheses 4 and 5.

4.3.3.1 Firm-level accrual mispricing: The Mishkin model

The Mishkin model is employed to estimate firm-level accrual mispricing. This firm-level mispricing is calculated by estimating a forecasting and valuation equation for each firm. Accrual mispricing is then measured as the difference between the accrual component in the forecasting and valuation models. A significant discrepancy between the coefficients of accruals in the forecasting and valuation equations indicates mispricing. The forecasting and valuation models are discussed next.

The forecasting equation (4) estimates the persistence of the accrual and cash components of earnings. Earnings consist of an accrual and a cash component, and firms with larger accruals unrelated to cash flow realizations have lower accruals quality and earnings persistence (Dechow and Dichev, 2002). The forecasting equation is estimated as:

$$EAR_{i,t+1} = \alpha_0 + \alpha_1 ACC_{i,t} + \alpha_2 CFO_{i,t} + \varepsilon_{i,t+1} \quad (4)$$

where EAR_{t+1} is one − year − ahead earnings, measured as operating income scaled by total assets, α_0 is the intercept term, ACC_t is current year accruals, CFO_t is cash flow from operations in the current year, and ε_{t+1} is the stochastic error term.

In equation (4), α_0 is the intercept term, while α_1 is the coefficient of current period accruals and indicates the extent to which current period accruals contribute to future earnings persistence. The coefficient of cash flow, α_2, similarly measures the contribution of this component to next period earnings.

While the forecasting equation estimates the actual contribution of cash flow and accruals to earnings persistence, the valuation equation considers investors' pricing of firm accrual and cash components. The valuation equation takes the following form:

$$\left(R_{i,t+1} - R_{i,t+1}|\varphi_t\right) = \beta_0\left(EAR_{i,t+1} - \alpha_0 - \alpha^*_1 ACC_{i,t} - \alpha^*_2 CFO_{i,t}\right) + \varepsilon_{i,t+1} \quad (5)$$

where $(R_{t+1} - R_{t+1}|\,\Phi_t)$ is abnormal returns calculated as the return on holding a security during the $period_{t+1}$ minus the expectation of the return from holding the security for the $period_{t+1}$; EAR_{t+1} is one − year − ahead earnings, measured as operating income scaled by total assets; ACC_t is current period accruals; CFO_t is current year operating cash flow; and ε_{t+1} is the stohastic error term.

The forecasting and valuation equations (4) and (5), respectively, are estimated simultaneously to determine whether each firm in the sample has mispriced accruals. If markets are efficient, investors should correctly value the persistence of the earnings accrual and cash components so that their coefficients in the valuation equation (5) are not substantially different from those of the forecasting equation (4). If the coefficients of accruals (cash flows) in the forecasting and valuation equations vary significantly from each other, then investors are not accurately valuing earnings components and mispricing exists (Sloan, 1996). A significant negative difference between the forecasting and valuation equation coefficients would provide evidence of a firm with overpriced accruals (forecasting α_1 > valuation α_1), while a significant positive result would imply that accruals are underpriced.

4.3.3.2 Firm-level mispricing methodology

The two hypotheses investigated in this chapter aim first to determine whether accruals are mispriced at the firm level (hypothesis 4) and, second, whether such mispricing persists over time (hypothesis 5). Hypothesis 4 therefore employs data for the period 2003–2007 to estimate one accrual mispricing variable for each firm in the sample. Hypothesis 5 examines the firm-level mispricing of accruals in more detail and seeks to identify whether mispriced firms remain so over time. Annual firm-level accrual mispricing variables are therefore calculated with the Mishkin

model for each year in the period 1991–2007 (thus 17 firm–year anomalies for each firm employing data from 1985, as explained earlier). Firm-level accrual anomalies for 2007, for instance, are calculated with accruals, earnings, cash flow, and return data for 2001–2006. This yields 17 years for which firm–level accrual anomalies are calculated and allows for the behavior of mispriced firms to be investigated over time.

A thorough explanation of the econometric specification of accrual mispricing models employed in prior accrual anomaly studies was presented earlier in Chapter 3, Diagram 3.1, columns 1 and 2. Since this chapter is interested in estimating firm-level accrual mispricing and its persistence, it employs the same Mishkin model as Sloan (1996) and the basic mispricing OLS model of Kraft et al. (2007) to estimate firm-level mispricing. The extended model of Kraft et al. (2007) is not employed here as this study is simply interested in documenting whether firm-level mispricing exists. It therefore employs the same Mishkin model as Sloan (1996) and the basic Kraft et al. (2007) OLS model (which is equivalent to the Mishkin model), which is frequently employed in the extant literature, to do so. As noted earlier in section 3.3.2.2 no other accrual anomaly study has employed the full Kraft et al. (2007) model since its documentation and this study therefore follows the lead of other anomaly studies by simply including additional variables of interest (Drake et al., 2009; Dopuch et al., 2010). Instead of estimating firm-level mispricing models, as in country-level studies, on a pooled time-series, cross-sectional dataset, firm-level analysis instead requires that time-series observations for each firm be included in the model individually to estimate a yearly firm-level accrual anomaly. This methodology is explained in detail next in section 4.3.3.2.

4.3.3.3 Characteristics of mispriced firms

Once significantly mispriced firms are identified and their persistence established, their characteristics are studied for any commonalities. This study specifically determines whether such significantly mispriced firms are more common in certain sectors, whether analyst following has any association with mispriced firms, and whether any of the three major exchanges (NYSE, NASDAQ, and AMEX) have a more substantial distribution of mispriced firms. While the study does not empirically investigate the association between these characteristics and mispricing, it seems that, given the lack of prior studies, descriptive statistics on these characteristics in mispriced firms are still useful. The results are presented in Section 4.4.2.2.1.

4.4 Empirical results

This section reports on the testing of hypotheses 4 and 5 related to research questions 4 and 5 raised earlier, in Chapter 2. The fourth research question seeks to determine whether firm-level mispricing exists and differs from that at the country level. It does so through hypothesis 4. The fifth research question aims to establish whether firm-level mispricing is persistent and whether investors can profit by using it as a trading strategy. This research question is investigated through hypothesis 5. The result for hypothesis 4, which investigates whether accrual mispricing differs at the firm level, is discussed in Section 4.4.1. The finding from hypothesis 5, which investigates the persistence of firm-level accrual mispricing over time, is then presented in Section 4.4.2.

4.4.1 Results for hypothesis 4

This section documents the results from the investigation of firm-level mispricing. The hypothesis includes data from 2003–2007, the same post-SOX period employed earlier, in Chapter 3. Descriptive statistics for the sample are presented in Section 4.4.1.1, while the model's results are discussed in Section 4.4.1.2.

4.4.1.1 Descriptive statistics

The mean (median) accrual value for the sample is -0.037 (-0.038), while the standard deviation is 0.066 (see Table 4.3). The mean (median) value of earnings is 0.085 (0.093), while that of cash flow is 0.122 (0.131). These figures are very similar to those reported earlier, in Chapter 3. The distribution of the earnings and cash flow values around the mean are similar, with standard deviations (kurtosis) of 0.114 (11.82) and 0.124 (8.188), respectively. Buy and hold returns and abnormal returns have mean (median) values of 0.096 (0.000) and 0.001 (-0.064), respectively, indicating that returns are, on average, positive.

Table 4.3 Descriptive statistics (hypothesis 4)

This table presents the descriptive statistics for the sample employed to determine whether firm-level accrual mispricing differs from that at the country level. Here ACC_t is current period accruals calculated as per the balance sheet method, $ACC_t = (\Delta CA - \Delta CASH) - (\Delta CL - \Delta STD - \Delta TP) - DEP_t$, where ΔCA is change in current assets (Compustat item #4), $\Delta CASH$ is change in cash/cash equivalents (Compustat item #1), ΔCL is change in current liabilities (Compustat item #5), ΔSTD is change in debt included in current liabilities (Compustat item #34), ΔTP is change in income tax payable (Compustat item #71), and DEP_t is depreciation and amortization expenses (Compustat item #14). The accruals value calculated is scaled by total assets (Compustat item #6), CFO_t is current year operating cash flow calculated as $EAR_t - ACC_t$ and scaled by total assets (Compustat item #6), EAR_{t+1} is one-year-ahead earnings (Compustat item #178) scaled by total assets (Compustat item #6), R_{it} is the buy and hold returns to a security over the year, and $R_{t+1} - R_{t+1}|\varphi_t$ is returns above those expected for the firms, given their size (size-adjusted or abnormal returns).

Variable	N	Mean	Median	Standard deviation	Minimum	Maximum	Skewness	Kurtosis
ACC_t	6,235	-0.037	-0.038	0.066	-0.279	0.185	-0.022	1.302
CFO_t	6,235	0.122	0.131	0.124	-0.792	0.452	-1.792	8.188
EAR_{t+1}	6,235	0.085	0.093	0.114	-0.821	0.360	-2.382	11.82
R_{it}	6,235	0.096	0.000	0.542	-0.907	3.899	2.030	7.353
$R_{t+1} - R_{t+1}\|\varphi_t$	6,235	0.001	-0.064	0.538	-1.680	3.687	1.787	6.546

4.4.1.2 Model results

Hypothesis 4 investigates accrual mispricing at the firm level over 2003–2007. This period was selected because no accrual anomaly was found for this same time frame at the country level (see Chapter 3). The firm-level accrual mispricing values (see Table 4.4) reveal that, of the 1,247 firm–level anomalies calculated, 593 involve overpriced accrual firms, of which 168 have significant overpricing of accruals at the 10% level (at least)[46]. Of the 654 firms with underpriced accruals, 164 have significant accrual underpricing. Thus, 332 out of 1,247 firms, or 26% of sample firms, have significant over- or underpricing in the period investigated. There are similar numbers of significantly overpriced (168) and underpriced (164) accrual firms. The previously documented country-level result of no anomaly post-SOX (2003–2007) (in Chapter 3) therefore differs from these firm-level under- and overpriced accruals. This supports hypothesis 4, which predicts that firm-level mispricing exists and differs from that at the country level.

[46] The significantly under and overpriced accruals firms in Table 4.4 include all firms with accruals that are mispriced at at least the 10% level. Whilst some in the sample have more significant mispricing (i.e. at the 5% or 1% level) these firms are simply reported as significantly under or overpriced.

Table 4.4 Analyses of firm-level accrual mispricing for 2003–2007

This table presents results from the estimation of firm-level accrual mispricing values for the period 2003–2007 in relation to hypothesis 4. It specifically provides the average coefficient of accrual mispricing from the Mishkin model. This coefficient is obtained by obtaining the difference between the accrual coefficients in the forecasting and valuation equations. The forecasting equation is calculated first and takes the following form:

$$EAR_{t+1} = \alpha_0 + \alpha_1 ACC_t + \alpha_2 CFO_t + \varepsilon_{t+1}$$

The valuation equation is then estimated as

$$(R_{t+1} - R_{t+1}|\varphi_t) = \beta_0(EAR_{t+1} - \alpha_0 - \alpha^*_1 ACC_t - \alpha^*_2 CFO_t) + \varepsilon_{t+1}$$

The accruals coefficients from the forecasting and valuation models are then compared. Any significant differences between these two are indicative of mispricing. Here EAR_t is earnings, ACC_t is accruals, CFO_t is the cash flow component of earnings, $R_{t+1} - R_{t+1}|\varphi_t$ is returns above those expected for the firms, given their size (size-adjusted returns), and ε_{t+1} is the stochastic error term from the regression.
One mispricing variable is calculated for each firm in the sample, resulting in 1,247 firm-level anomalies over the period 2003–2007. The table provides the breakdown of these firm-level mispricing variables into over- and underpriced firms, as well as how many are significant.

	n	Average difference between forecasting and valuation equations	Average t-statistic for test whether difference in forecasting and valuation equations is different from zero
Overpriced accrual firms			
All overpriced firms	593	-1.536	-2.788***
Significantly overpriced	168	1.516	4.365***
Underpriced accrual firms			
All underpriced firms	654	1.560	2.899***
Significantly underpriced	164	1.439	4.460***
Total firms	1,247		

Note: Firms are considered to be significantly over or underpriced when their mispricing is significant at least at the 10% level.

The findings for hypothesis 5, which investigates firm-level mispricing of accruals over time, are presented next.

4.4.2 Results for hypothesis 5

This section investigates the persistence of firm-level accrual mispricing. Since persistence is estimated over a period, hypothesis 5 includes a larger sample and

calculates firm-level accrual mispricing variables from 1991 to 2007. Descriptive statistics for the sample are presented in Section 4.4.2.1 (Table 4.5), while the model results are given in Section 4.4.2.2.

4.4.2.1 Descriptive statistics

The mean (median) accrual and cash flow values for the sample employed in hypothesis 5 are -0.039 (-0.033) and 0.075 (0.087) respectively. Earnings have a mean (median) of 0.035 (0.052) whilst returns have a mean (median) of 0.025 (0.0274). Abnormal returns are, on average, positive with a mean (median) of 0.016 (0.001).

Table 4.5 Descriptive statistics (hypothesis 5)

This table presents the descriptive statistics for the sample employed to determine whether firm-level accrual mispricing differs over time. The sample includes data from 1985–2007. Here ACC_t is current period accruals calculated as per the balance sheet method, $ACC_t = (\Delta CA - \Delta CASH) - (\Delta CL - \Delta STD - \Delta TP) - DEP_t$, where ΔCA is change in current assets (Compustat item #4), $\Delta CASH$ is change in cash/cash equivalents (Compustat item #1), ΔCL is change in current liabilities (Compustat item #5), ΔSTD is change in debt included in current liabilities (Compustat item #34), ΔTP is change in income tax payable (Compustat item #71), and DEP_t is depreciation and amortization expenses (Compustat item #14). The accruals value calculated is scaled by total assets (Compustat item #6); CFO_t is current year operating cash flow, calculated as $EAR_t - ACC_t$ and scaled by total assets (Compustat item #6); EAR_{t+1} is one-year-ahead earnings (Compustat item #178) scaled by total assets (Compustat item #6); R_{it} is the buy and hold returns to a security over the year; and $R_{t+1} - R_{t+1}|\varphi_t$ is returns above those expected for the firms, given their size (size-adjusted or abnormal returns).

Variable	N	Mean	Median	Standard deviation	Minimum	Maximum	Skewness	Kurtosis
ACC_t	56,931	-0.039	-0.033	0.09	-0.929	0.903	-0.709	12.29
CFO_t	56,931	0.075	0.087	0.161	-0.946	0.953	-1.117	5.566
EAR_{t+1}	56,931	0.035	0.052	0.153	-0.898	0.951	-1.793	7.718
R_{it}	56,931	0.025	0.0274	0.816	-5.427	5.133	0.278	6.577
$R_{t+1} - R_{t+1}\|\varphi_t$	56,931	0.016	0.002	0.8377	-5.408	5.151	0.435	6.529

4.4.2.2 Model results

The calculation of firm–year values yields 17,542 firm–year accrual pricing variables. Of these, 3,851 firm–years (21.85% of the sample) are significantly

mispriced (see Table 4.6, Panel A). The persistence of these significantly mispriced firms is examined first in Section 4.4.2.2.1. Given the limited empirical evidence on firm-level mispricing, an investigation of significantly mispriced firms is undertaken next in Section 4.4.2.2.2 to determine whether any commonalities exist among their exchange listings, sizes, analyst followings, or industry sectors.

4.4.2.2.1 Persistence of mispriced accrual firms

Analyses of the firm-level mispricing results for the 17-year sample reveals that 21.85% of firms are, on average, significantly mispriced in any year (see Table 4.6, Panel B). Overall, slightly more firms are overpriced (12.03%) than underpriced (9.77%), but this relation varies between periods. Some years have a much larger percentage of overpriced firms (see, e.g., 2004, with 12.62%), while others have more underpriced accrual firms (e.g., 2006, with 13.23%).

Table 4.6 Firm-level accrual mispricing over time

This table presents the results from estimations of firm-level accrual mispricing over time. It shows the number of firms each year where significant accrual mispricing is present. It further investigates whether this constitutes over- or underpricing of accruals and examines the persistence of the mispricing. Panel A presents firm-level numbers while Panel B presents percentages.

Panel A: Firm-level pricing in numbers

Year	Number of firm mispricing variables	Number of significant mispricing events	Significantly underpriced accruals	Significantly overpriced accruals	Number of firms with persistent mispricing from year t - 1	Persist year t - 2	Persist for 4 or more years
1991	729	173	78	95	.	.	.
1992	749	145	59	86	43	.	.
1993	810	170	74	96	59	16	.
1994	853	176	74	102	68	27	.
1995	905	205	91	114	75	25	4
1996	994	207	81	126	88	31	8
1997	971	192	93	99	84	37	9
1998	1,182	230	91	139	90	55	16
1999	1,158	237	112	125	107	48	22
2000	1,253	268	129	139	111	57	28
2001	898	179	90	89	62	38	36
2002	1,093	254	107	147	33	9	9
2003	1,224	260	110	150	172	22	14
2004	1,181	254	94	149	101	66	8
2005	1,198	311	135	176	100	43	14
2006	1,217	307	161	146	137	55	21
2007	1,127	283	146	137	74	37	25
TOTAL	17,542	3,851	1,725	2,115	1,404	566	214

Panel B: Firm-level pricing in percentages

Year	Number of firm mispricing variables	% of significant mispricing events	% of significantly underpriced accruals	% of significantly overpriced accruals	% of mispriced firms that remain so for more than 1 year	% of mispriced firms that remain so for more than 2	% of mispriced firms that remain so for 4 or more
1991	729	23.73%	10.70%	13.03%	.	.	.
1992	749	19.36%	7.88%	11.48%	29.66%	.	.
1993	810	20.99%	9.14%	11.85%	34.71%	9.41%	.
1994	853	20.63%	8.68%	11.96%	38.64%	15.34%	.
1995	905	22.65%	10.06%	12.60%	36.59%	12.20%	1.95%
1996	994	20.82%	8.15%	12.68%	42.51%	14.98%	3.86%
1997	971	19.77%	9.58%	10.20%	43.75%	19.27%	4.69%
1998	1,182	19.46%	7.70%	11.76%	39.13%	23.91%	6.96%
1999	1,158	20.47%	9.67%	10.79%	45.15%	20.25%	9.28%
2000	1,253	21.39%	10.30%	11.09%	41.42%	21.27%	10.45%
2001	898	19.93%	10.02%	9.91%	34.64%	21.23%	20.11%
2002	1,093	23.24%	9.79%	13.45%	12.99%	3.54%	3.54%
2003	1,224	21.24%	8.99%	12.25%	66.15%	8.46%	5.38%
2004	1,181	21.51%	7.96%	12.62%	39.76%	25.98%	3.15%
2005	1,198	25.96%	11.27%	14.69%	32.15%	13.83%	4.50%
2006	1,217	25.23%	13.23%	12.00%	44.63%	17.92%	6.84%
2007	1,127	25.11%	12.95%	12.16%	26.15%	13.07%	8.83%
TOTAL	17,542	21.85%	9.77%	12.03%	38.00%	16.04%	6.89%

Note: Firms are considered to be significantly over or underpriced when their mispricing is significant at least at the 10% level.

The results show that, on average, 38% of significantly mispriced firms have mispriced accruals (either over or under) that persist for more than one year. Approximately 16.04% of these experience significant accrual mispricing for two or more consecutive years, and 6.89% persist for more than four years.

The number of firms that remain mispriced for at least one year drops in the year following SOX. Table 4.6, Panel B shows these percentages decrease from 66.15% (for 2003) to 39.76% in 2004. The percentage of firms still mispriced after two years also decreases (from 25.98% in 2004 to 13.83% for 2005).[47] When the pre- and post-SOX periods are compared, however, there is no significant decrease overall.[48] This effect is not visible when investigating firm-level mispricing four years after the mispricing event. The sample does include firms from three different exchanges, so individual exchange events (e.g., the 2003 NYSE and NASDAQ governance rule changes[49]) may also have reduced accrual mispricing persistence. The study therefore investigates the persistence of firm-level mispricing at each exchange (NYSE, NASDAQ, and AMEX) separately. Comparative t-tests between the mispricing and persistence of firms on these exchanges are also reported.

As evident from Table 4.7, the majority of significantly mispriced sample firms are listed on the NYSE (8,885 out of 17,542) and, on average, 22% of them are mispriced in any year. The percentage of NYSE firms that remain mispriced for at least one year then remains around 40% from 1992 to 1999. There are then two

[47] Firms with mispricing persistent for at least two years in 2004 were first mispriced in 2002, and so forth.
[48] An untabulated result. Available from the author on request. Here the pre-SOX period is 1991–2002 and post-SOX is 2003–2007.
[49] Following SOX, the NYSE and NASDAQ both introduced their own different governance rules. Since the listing and governance requirements for firms on each exchange differ, it is likely to also cause differences in investor security valuations.

substantial decreases: the first in 2000 (from 42.2% in 1999 to 25%) and the second in 2001 (to 18.56%), before a large increase in 2002 (to 71.3%).

The large increase in one-year mispricing persistence in 2002 (from 18.56% in 2001) may be a result from the instability and uncertainty in the market following the public accounting scandals of the early 2000s that eventually led to SOX. Firm-level mispricing decreases in the period immediately following SOX, with the one-year mispricing persistence decreasing from 71.3% to 37.31% from 2002 to 2003. A t-test comparing the overall pre- and post-SOX mispricing persistence for the NYSE does not, however, yield significant results.[50] A noticeable decrease in mispricing persistence is also visible when examining the two- and four-year persistence from 2002 (26.96% and 8.7%, respectively) to 2003 (14.18% and 4.48%, respectively). This suggests that the increased-disclosure environment post-SOX improved investor ability to price securities accurately, decreasing mispricing, similar to the findings in Chapter 3 for the country level.

[50] These are results from simple Student t-tests and are therefore not reported here.The results from these tests are available from the author upon request.

Table 4.7 NYSE firms' accrual mispricing over time

This table presents the results from estimations of firm-level accrual mispricing for NYSE firms over time. It shows the number of firms each year where significant accrual mispricing is present. It further investigates whether this constitutes over- or underpricing of accruals and examines the persistence of the mispricing. Panel A presents firm-level numbers while Panel B presents percentages.

Panel A: NYSE listed firms' mispricing in numbers

Year	Number of mispricing variables	Number of significant mispricing firms	Significantly underpriced firms	Significantly overpriced firms	Firms still mispriced t + 1	Firms still mispriced t + 2	Firms still mispriced t + 4
1991	408	90	37	53	27	9	4
1992	427	88	34	53	37	18	7
1993	461	95	39	56	38	14	2
1994	478	95	41	54	37	15	7
1995	497	113	51	62	53	24	15
1996	528	111	44	67	45	26	12
1997	485	105	54	51	42	23	15
1998	574	112	45	67	50	25	9
1999	560	109	53	56	46	19	6
2000	599	120	60	60	30	6	2
2001	446	97	51	46	18	13	2
2002	538	115	53	62	82	31	10
2003	601	134	58	76	50	19	6
2004	545	112	50	68	43	25	.
2005	598	138	49	89	62	21	.
2006	589	151	79	72	38	.	.
2007	551	146	82	64	.	.	.
Total	8,885	1,931	880	1,056	698	288	97

Panel B: NYSE listed firms' mispricing in percentages

Year	Number of firm mispricing variables	% of significant mispricing events	% of significantly underpriced firms	% of significantly overpriced firms	% of significantly mispriced firms still mispriced t + 1	% of significantly mispriced firms still mispriced t + 2	% of significantly mispriced firms still mispriced t + 4
1991	408	22.06%	9.07%	12.99%	30.00%	10.00%	4.44%
1992	427	20.61%	7.96%	12.41%	42.05%	20.45%	7.95%
1993	461	20.61%	8.46%	12.15%	40.00%	14.74%	2.11%
1994	478	19.87%	8.58%	11.30%	38.95%	15.79%	7.37%
1995	497	22.74%	10.26%	12.47%	46.90%	21.24%	13.27%
1996	528	21.02%	8.33%	12.69%	40.54%	23.42%	10.81%
1997	485	21.65%	11.13%	10.52%	40.00%	21.90%	14.29%
1998	574	19.51%	7.84%	11.67%	44.64%	22.32%	8.04%
1999	560	19.46%	9.46%	10.00%	42.20%	17.43%	5.50%
2000	599	20.03%	10.02%	10.02%	25.00%	5.00%	1.67%
2001	446	21.75%	11.43%	10.31%	18.56%	13.40%	2.06%
2002	538	21.38%	9.85%	11.52%	71.30%	26.96%	8.70%
2003	601	22.30%	9.65%	12.65%	37.31%	14.18%	4.48%
2004	545	20.55%	9.17%	12.48%	38.39%	22.32%	.
2005	598	23.08%	8.19%	14.88%	44.93%	15.22%	.
2006	589	25.64%	13.41%	12.22%	25.17%	.	.
2007	551	26.50%	14.88%	11.62%	.	.	.
Total	8,885	21.73%	9.90%	11.89%	36.15%	14.91%	5.02%

Note: Firms are considered to be significantly over or underpriced when their mispricing is significant at least at the 10% level.

While one would have expected to see a decrease in mispricing persistence following the introduction of the NYSE governance rules in late 2003 (given that improved governance decreases information asymmetry; Healy and Palepu, 2001), the mispricing from 2004 to 2005 instead increases. A decrease is visible, though, when examining four-year persistence (from 22.32% for 2004 firms to 15.22% for those mispriced in 2005). However, while mispricing persistence decreases in the period immediately following SOX, a t-test (untabulated) comparing the pre- and post-SOX periods does not yield significant results. Exchange-specific events can therefore explain some of the changes in firm-level mispricing, but not all of them. Several additional large increases and decreases in mispricing are not consistent with any significant exchange or regulation-related change.

The second largest group of mispriced firms are NASDAQ listed (7,631 out of the 17,542 mispricing events listed in Table 4.6, Panel A). As with the NYSE, the percentage of firms significantly mispriced in any given year remains around the mid 20% mark for NASDAQ listed firms. The persistence of firm-level mispricing is also similar to that for NYSE firms, with an average of 37.54% of firms being mispriced for more than one year and 15.22% still mispriced after two years.

The results in Table 4.8, Panel B reveal a decrease in the percentage of NASDAQ firms with persistent mispricing in the year following SOX.

Table 4.8 NASDAQ firms' accrual mispricing over time

This table presents the results from estimation of firm-level accrual mispricing for NASDAQ firms over time. It shows the number of firms each year where significant accrual mispricing is present. It further investigates whether this constitutes over- or underpricing of accruals and examines the persistence of the mispricing. Panel A presents firm-level numbers while Panel B presents percentages.

Panel A: NASDAQ listed firms' mispricing in numbers

Year	Number of firm mispricing variables	Number of significant mispricing events	Significantly underpriced firms	Significantly overpriced firms	Firms still mispriced t + 1	Firms still mispriced t + 2	Firms still mispriced t + 4
1991	265	72	34	38	13	6	1
1992	280	52	22	30	20	8	1
1993	299	65	27	38	28	11	2
1994	329	70	28	42	31	13	10
1995	362	78	32	46	29	12	5
1996	410	86	32	54	37	28	12
1997	426	79	35	44	44	23	13
1998	537	106	40	66	52	30	4
1999	542	117	55	62	61	18	1
2000	583	131	58	73	30	3	0
2001	398	72	36	36	11	6	2
2002	497	122	46	76	77	32	8
2003	554	111	45	66	48	25	8
2004	522	114	42	77	55	27	8
2005	543	153	74	79	65	15	.
2006	562	138	72	66	33	.	.
2007	522	123	54	69	.	.	.
Total	7,631	1,689	732	962	634	257	75

Panel B: NASDAQ listed firms' mispricing in percentages

Year	Number of firm mispricing variables	% of significant mispricing events	% of significantly underpriced firms	% of significantly overpriced firms	% of significantly mispriced firms still mispriced	% of significantly mispriced firms still mispriced	% of significantly mispriced firms still mispriced
1991	265	27.17%	12.83%	14.34%	18.06%	8.33%	1.39%
1992	280	18.57%	7.86%	10.71%	38.46%	15.38%	1.92%
1993	299	21.74%	9.03%	12.71%	43.08%	16.92%	3.08%
1994	329	21.28%	8.51%	12.77%	44.29%	18.57%	14.29%
1995	362	21.55%	8.84%	12.71%	37.18%	15.38%	6.41%
1996	410	20.98%	7.80%	13.17%	43.02%	32.56%	13.95%
1997	426	18.54%	8.22%	10.33%	55.70%	29.11%	16.46%
1998	537	19.74%	7.45%	12.29%	49.06%	28.30%	3.77%
1999	542	21.59%	10.15%	11.44%	52.14%	15.38%	0.85%
2000	583	22.47%	9.95%	12.52%	22.90%	2.29%	0.00%
2001	398	18.09%	9.05%	9.05%	15.28%	8.33%	2.78%
2002	497	24.55%	9.26%	15.29%	63.11%	26.23%	6.56%
2003	554	20.04%	8.12%	11.91%	43.24%	22.52%	7.21%
2004	522	21.84%	8.05%	14.75%	48.25%	23.68%	7.02%
2005	543	28.18%	13.63%	14.55%	42.48%	9.80%	.
2006	562	24.56%	12.81%	11.74%	23.91%	.	.
2007	522	23.56%	10.34%	13.22%	.	.	.
Total	7,631	22.13%	9.59%	12.61%	37.54%	15.22%	4.44%

Note: Firms are considered to be significantly over or underpriced when their mispricing is significant at least at the 10% level.

The percentage of firms still significantly mispriced one year after first documentation decreases from 63.11% in 2002 to 43.24% in 2003. A similar decrease is visible for two-year persistence, from 26.23% (2002) to 22.52% (2003). A further decrease in NASDAQ firm mispricing persistence is also evident following the introduction of the NASDAQ governance rules late in 2003. This shows good governance reduced information asymmetry (Healy and Palepu, 2001), allowing for more accurate pricing. Consistent with this premise, the one-year (two-year) persistence of mispricing decreases from 48.25% (23.68%) in 2004 to 42.48% (9.8%) in 2005.[51] While there is a decrease in the years immediately following SOX, t-tests find no significant decrease in mispricing persistence when comparing the overall pre- and post-SOX periods.[52] As with the NYSE, NASDAQ-specific and regulatory changes can again explain some of the deviations in mispricing persistence but fall short of explaining all movements.

A similar analysis is undertaken for AMEX firms, with the results presented in Table 4.9. The AMEX firms make up only 5.08% of the sample (892 out of 17,542 firms identified earlier in Table 4.6, Panel A). The results are, however, similar to those for the NASDAQ and NYSE, with 23.65% of firms (on average) mispriced in any given year and average one-year mispricing persistence at 36.49% (see Table 4.9, Panel B).

[51] The two-year persistence in 2004 is estimating the percentage of firms mispriced in 2002 that are still mispriced in 2004.
[52] The pre- and post-SOX periods are employed in the sample here as 1991–2002 and 2003–2007, respectively.

Table 4.9 AMEX firms' accrual mispricing over time

This table presents the results from estimation of firm-level accrual mispricing for AMEX firms over time. It shows the number of firms each year where significant accrual mispricing is present. It further investigates whether this constitutes over- or underpricing of accruals and examines the persistence of the mispricing. Panel A presents firm-level numbers while Panel B presents percentages.

Panel A: AMEX listed firms' mispricing in numbers

Year	Number of firm mispricing variables	Number of significant mispricing events	Significantly underpriced firms	Significantly overpriced firms	Firms still mispriced t + 1	Firms still mispriced t + 2	Firms still mispriced t + 4
1991	39	10	6	4	3	1	1
1992	35	6	3	3	2	1	0
1993	46	10	8	2	2	0	0
1994	45	11	5	6	7	3	3
1995	43	14	8	6	6	1	1
1996	53	10	5	5	2	1	1
1997	57	7	4	3	4	2	1
1998	67	12	6	6	4	2	1
1999	51	10	4	6	4	1	1
2000	65	14	8	6	2	0	0
2001	50	9	3	6	4	3	0
2002	56	17	8	9	13	3	1
2003	66	15	7	8	3	1	0
2004	58	16	5	11	8	5	.
2005	54	19	12	7	10	1	.
2006	61	18	10	8	3	.	.
2007	46	13	9	4	.	.	.
Total	892	211	111	100	77	25	10

Panel B: AMEX listed firms' mispricing in percentages

Year	Number of firm mispricing variables	% of significant mispricing events	% of significantly underpriced firms	% of significantly overpriced firms	% of significantly mispriced firms still mispriced t + 1	% of significantly mispriced firms still mispriced t + 2	% of significantly mispriced firms still mispriced t + 4
1991	39	25.64%	15.38%	10.26%	30.00%	10.00%	10.00%
1992	35	17.14%	8.57%	8.57%	33.33%	16.67%	0.00%
1993	46	21.74%	17.39%	4.35%	20.00%	0.00%	0.00%
1994	45	24.44%	11.11%	13.33%	63.64%	27.27%	27.27%
1995	43	32.56%	18.60%	13.95%	42.86%	7.14%	7.14%
1996	53	18.87%	9.43%	9.43%	20.00%	10.00%	10.00%
1997	57	12.28%	7.02%	5.26%	57.14%	28.57%	14.29%
1998	67	17.91%	8.96%	8.96%	33.33%	16.67%	8.33%
1999	51	19.61%	7.84%	11.76%	40.00%	10.00%	10.00%
2000	65	21.54%	12.31%	9.23%	14.29%	0.00%	0.00%
2001	50	18.00%	6.00%	12.00%	44.44%	33.33%	0.00%
2002	56	30.36%	14.29%	16.07%	76.47%	17.65%	5.88%
2003	66	22.73%	10.61%	12.12%	20.00%	6.67%	0.00%
2004	58	27.59%	8.62%	18.97%	50.00%	31.25%	.
2005	54	35.19%	22.22%	12.96%	52.63%	5.26%	.
2006	61	29.51%	16.39%	13.11%	16.67%	.	.
2007	46	28.26%	19.57%	8.70%	.	.	.
Total	892	23.65%	12.44%	11.21%	36.49%	11.85%	4.74%

Note: Firms are considered to be significantly over or underpriced when their mispricing is significant at least at the 10% level.

There is also a decrease observable in mispricing persistence for AMEX listed firms following SOX in 2002, with the percentage of firms with persistent mispricing for at least a year decreasing from 76.47% in 2002 to 20% in 2003. This decrease is also visible for two- and four-year mispricing persistence percentages, which decrease from 17.65% to 6.67% and from 5.88% to 0%, respectively. Similar to the NYSE and NASDAQ firms, however, there is no significant difference when comparing the overall pre- and post-SOX periods with a t-test, and thus the decrease in mispricing in the year post-SOX is temporary or insignificant.

The average mispricing and persistence of NYSE, NASDAQ, and AMEX firms are also compared by another t-test to determine if significant differences exist between them. There are no significant differences between them, apart from for significantly underpriced firms. Both the NYSE (9.9%) and NASDAQ (9.59%) have significantly fewer ($\alpha = 0.019$ and $\alpha = 0.011$) underpriced firms than the AMEX (12.44%). Firm-level mispricing and its persistence overall are therefore not substantially different between the three major exchanges.

Next, to determine whether investors can profit from a trading strategy based on significantly mispriced accrual firms, a portfolio with a strategy of buying $1 worth of underpriced accrual firms and shorting $1 of overpriced accrual firms is created. The abnormal returns (measured as the abnormal buy and hold returns for the year commencing the month after the end of the financial year in which the firm is identified as being mispriced) from investing in such a portfolio are presented in Table 4.10, which shows that $1 invested at the start of the 15-year sample yields an overall return of 44.43%. The abnormal returns are positive in 10 out of the 15 years,

and negative in three of those.[53] Firm-level mispricing is therefore not only persistent, but investors can also profit from trading on a strategy of selling all significantly overpriced firms and buying those that are significantly underpriced.

These findings support hypothesis 5, that accrual mispricing persists over time. Indeed, approximately 7% of significantly mispriced accrual firms remain mispriced for more than four years. This presents further evidence of market inefficiency, since investors are unable to identify such firms and correct their prices.

Next, analyses of the characteristics of significantly mispriced firms are undertaken to identify whether any commonalities exist.

[53] For two of these years, returns are very close to zero.

Table 4.10 Abnormal returns from a portfolio of all significantly mispriced shares

This table presents the returns for a strategy of longing significantly underpriced firms and shorting significantly overpriced firms for each year in the period 1991–2007, in relation to the investigation of persistence of firm-level accrual mispricing. The returns to the long/short strategy are calculated as industry-adjusted returns for a buy and hold strategy over each year. The overall yearly abnormal returns are the difference in the long/short strategy. The bottom row of the table presents the returns to a dollar invested in the $1 long/$1 short strategy cumulatively over the period investigated.

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
$1 long	-0.1192	-0.0447	0.0479	0.1226	0.0777	-0.0104	0.288	-0.0762	-0.0428	0.3369	0.1529	-0.0299	0.0418	0.1374	-0.2611	0.2777
$1 short	-0.0617	-0.0668	0.0254	0.0216	0.0442	0.1421	-0.0457	0.0531	-0.0841	0.2933	0.2424	-0.0284	0.079	-0.0429	-0.2804	0.1339
Abnormal return	-0.0575	0.0221	0.0226	0.1009	0.0336	-0.1525	0.3337	-0.1293	0.0414	0.0436	-0.0895	-0.0015	-0.0372	0.1804	0.0193	0.1438
Invest $1 in 1992	0.94	0.96	0.99	1.08	1.12	0.95	1.27	1.10	1.15	1.20	1.09	1.09	1.05	1.24	1.26	1.44
																44.43%

Note: Firms are considered to be significantly over or underpriced when their mispricing is significant at least at the 10% level.

4.4.2.2.2 Characteristics of significantly mispriced firms

An analysis of firms with significant mispricing is shown in Panel A of Table 4.11. It compares the sector breakdown of all firms in the market with those of firms that are significantly mispriced. It reveals a substantial difference between the percentage of industrial sector firms (21.85%) in the mispriced sample compared to those in the market overall (15.53%). Industrial sector firms are thus overrepresented among the significantly mispriced. The percentages of energy, materials, consumer discretionary, health care, information technology, and telecommunication services sector firms are very similar (but slightly less) to that of the overall market. Of the mispriced firms, only those in consumer staples and utilities are slightly higher.

Table 4.11 Characteristics of significantly mispriced firms

Panel A: Sector breakdown of significantly mispriced firms identified in hypothesis 5

This table presents the sector breakdown of significantly mispriced firms identified for the period 1991–2007. The percentage of firms listed in each sector investigated in this study is presented first, followed by the percentage of firms in that sector in the market. Financial firms are excluded from the analyses since they are not included in the accrual mispricing sample, as discussed earlier.

Sector	% of sample firms that are mispriced in each sector	Percentage of firms in the market in sector
Energy	6.78%	8.03%
Materials	7.60%	9.31%
Industrials	21.85%	15.53%
Consumer discretionary	20.46%	20.74%
Consumer staples	6.23%	5.24%
Health care	12.62%	13.18%
Information technology	18.03%	19.81%
Telecommunication services	1.05%	2.98%
Utilities	5.39%	4.18%
Total	**100%**	**100%**

Panel B: Size of significantly mispriced and non-significantly mispriced firms

This table presents the average size for both non-mispriced and mispriced firms for the period 1992–2007. Firms are previously identified as significantly mispriced or otherwise in Section 4.1. Firm size is measured as the log of total assets.

	Log of total assets	
Year	**Not significantly mispriced**	**Significantly mispriced firms**
1992	3.493	3.751
1993	3.490	3.641
1994	3.536	3.570
1995	3.493	3.806
1996	3.509	3.707
1997	3.538	3.629
1998	3.576	3.599
1999	3.670	3.538
2000	3.771	3.524
2001	3.707	3.945
2002	3.856	3.659
2003	3.857	3.720
2004	3.769	3.758
2005	3.932	3.720
2006	3.867	4.020
2007	4.032	3.867
Average	**3.693**	**3.716**

While most accrual mispricing studies control for size in estimating mispricing, Palmon et al. (2008) propose that firm size may nevertheless still play a role in the anomaly. The size of mispriced versus non-mispriced firms is therefore investigated next. As reported in Panel B of Table 4.11, there is little difference between the sizes (as measured by the log of total assets) of mispriced and non-mispriced firms. An analysis of individual years also reveals no significant differences.

As mentioned earlier, in Section 4.4.2.2.1, while exchange-specific and regulation changes (SOX) can explain some of the variation in firm-level accrual mispricing persistence, it is not able to do so for all changes. The country-level accrual anomaly literature, though, proposes a role for analysts in the existence (and persistence) of

accrual mispricing. As discussed earlier, in Section 2.3, while a couple of accrual mispricing studies argue that even analysts overprice accruals (Bradshaw et al., 2001; Xie, 2010), others show that analysts do reduce information asymmetry and pricing inefficiencies through their relations with firms and their superior analysis skills (Elsharkawy and Garrod, 1996; Walther, 1997; Barone and Magilke, 2009).

This study therefore examines the differences in analyst following for mispriced and non-mispriced firms to determine whether they play any role in firm-level mispricing. Specifically, it determines whether changes in the number of analysts following significantly mispriced firms can also change the percentage of firms that are (and remain) mispriced. Table 4.12 presents the data on analyst following for the NYSE firms in the sample, while that of NASDAQ firms is presented in Table 4.13.[54] The focus is mainly on the change in analyst following.

[54] As mentioned earlier, given that AMEX firms make up only 5% of the overall sample, their analysis of analyst following and mispricing is not presented here.

Table 4.12 Analyst recommendations for NYSE firms

This table presents analyst recommendation data for NYSE listed firms in the sample from 1993 to 2007. Panel A shows the annual number of recommendations of both non-mispriced and mispriced firms. Panel B presents the percentages of recommendations made for mispriced and non-mispriced firms, as well as any changes in analyst recommendations for these groups each year. The percentages in Panel B are calculated as the number of recommendations made for significantly mispriced (non-mispriced) firms as a percentage of the total recommendations made for all firms in the sample. The change column indicates the year-by-year change in analyst followings for both mispriced and non-mispriced firms.

Panel A: Analyst recommendations for NYSE firms by year

Year	Number of analyst recommendations made for significantly mispriced firms	Number of analyst recommendations made for non-mispriced firms	Total number of analyst recommendations
1993	541	1,956	**2,497**
1994	1,188	3,647	**4,835**
1995	1,109	3,352	**4,461**
1996	793	3,055	**3,848**
1997	765	2,574	**3,339**
1998	812	3,904	**4,716**
1999	902	3,718	**4,620**
2000	779	3,569	**4,348**
2001	781	2,694	**3,475**
2002	1,569	5,688	**7,257**
2003	1,287	4,885	**6,172**
2004	974	3,670	**4,644**
2005	1,007	3,484	**4,491**
2006	1,271	3,539	**4,810**
2007	1,172	3,513	**4,685**

Panel B: Percentage change in analyst recommendations for NYSE firms by year

Year	% of overall recommendations made for significantly mispriced firms	% of recommendations made for non-mispriced firms	Change in percentage of analyst recommendations for significantly mispriced firms from t to t + 1
1993	21.67%	78.33%	
1994	24.57%	75.43%	**2.90%**
1995	24.86%	75.14%	**0.29%**
1996	20.61%	79.39%	**-4.25%**
1997	22.91%	77.09%	**2.30%**
1998	17.22%	82.78%	**-5.69%**
1999	19.52%	80.48%	**2.31%**
2000	17.92%	82.08%	**-1.61%**
2001	22.47%	77.53%	**4.56%**
2002	21.62%	78.38%	**-0.85%**
2003	20.85%	79.15%	**-0.77%**
2004	20.97%	79.03%	**0.12%**
2005	22.42%	77.58%	**1.45%**
2006	26.42%	73.58%	**4.00%**
2007	25.02%	74.98%	**-1.41%**

Note: Firms are considered to be significantly over or underpriced when their mispricing is significant at least at the 10% level.

The first substantial increase in analyst recommendations (up 2.9%) occurs from 1993 to 1994 for significantly mispriced firms (see Panel B of Table 4.12). When comparing analyst recommendations with mispricing persistence documented for NYSE firms earlier in Table 4.7, a simultaneous decrease is observable for 1993–1994 in the one-year mispricing persistence (from 40% to 38.95%). A similar decrease in one-year mispricing persistence is observable with other increases in analyst coverage for 2000–2001 (25% to 18.56%) and 2005–2006 (44.93% to 25.17%). These findings provide support for analysts' ability to reduce information asymmetry and pricing inefficiencies (Elsharkawy and Garrod, 1996; Walther, 1997; Barone and Magilke, 2009).

The analysis of analyst coverage and mispricing persistence changes for NASDAQ firms (Table 4.13) yields similar results. For three out of four significant increases in analyst coverage, there is a corresponding decrease in one-year accrual mispricing persistence for 1994–1995 (44.29% to 37.18%), 1997–1998 (55.7% to 49.06%). and 2004–2005 (48.25% to 42.48%).[55]

[55] The increase in analyst coverage from 2001 to 2002 of 6.91% provides a conflicting result, with an increase in one-year mispricing persistence from 15.28% to 63.11%. This is considered an outlier because of the size of the change.

Table 4.13 Analyst recommendations for NASDAQ firms

This table presents analyst recommendation data for NASDAQ listed firms in the sample from 1993 to 2007. Panel A shows the annual number of recommendations of both non-mispriced and mispriced firms. Panel B presents the percentages of recommendations made for mispriced and non-mispriced firms, as well as any changes in analyst recommendations for these groups each year. The percentages in Panel B are calculated as the number of recommendations made for significantly mispriced (non-mispriced) firms as a percentage of the total recommendations made for all firms in the sample. The change column indicates the year-by-year change in analyst following for both mispriced and non-mispriced firms.

Panel A: Analyst recommendations for NASDAQ firms by year

Year	Number of analyst recommendations made for significantly mispriced firms	Number of analyst recommendations made for non-mispriced firms	Total number of analyst recommendations
1993	127	477	604
1994	202	1,110	1,312
1995	388	941	1,329
1996	306	1,206	1,512
1997	211	1,337	1,548
1998	350	1,600	1,950
1999	451	1,836	2,287
2000	396	1,761	2,157
2001	207	1,297	1,504
2002	680	2,610	3,290
2003	605	2,422	3,027
2004	559	2,473	3,032
2005	668	1,947	2,615
2006	666	2,272	2,938
2007	708	1,998	2,706

Panel B: Percentage change in analyst recommendations for NASDAQ firms by year

	% of overall recommendations made for significantly mispriced firms	% of recommendations made for non-mispriced firms	Change in percentage of analyst recommendations for significantly mispriced firms from t to t + 1
1993	21.03%	78.97%	
1994	15.40%	84.60%	-5.63%
1995	29.19%	70.81%	13.80%
1996	20.24%	79.76%	-8.96%
1997	13.63%	86.37%	-6.61%
1998	17.95%	82.05%	4.32%
1999	19.72%	80.28%	1.77%
2000	18.36%	81.64%	-1.36%
2001	13.76%	86.24%	-4.60%
2002	20.67%	79.33%	6.91%
2003	19.99%	80.01%	-0.68%
2004	18.44%	81.56%	-1.55%
2005	25.54%	74.46%	7.11%
2006	22.67%	77.33%	-2.88%
2007	26.16%	73.84%	3.50%

Note: Firms are considered to be significantly over or underpriced when their mispricing is significant at least at the 10% level.

The NASDAQ results therefore support that from NYSE firms in documenting that increases in analyst coverage reduces mispricing persistence. This is consistent with empirical findings (Walther, 1997; Bartov et al., 2000) that greater analyst following decreases information asymmetry and improves investors' persistence estimates and pricing of accruals.[56] Analyst following therefore seems to plays a role in accrual mispricing at the firm level.

4.5 Conclusions

This chapter investigated the mispricing of accruals at the firm level. It specifically examined whether firm-level accrual mispricing differs from country-level mispricing. Next, it considered the behavior of mispriced firms over time and, more specifically, whether firm-level mispricing persists. It also estimated whether any abnormal returns are available from a trading strategy based on buying underpriced firms and selling overpriced firms. Finally it examined the industry, firm size, analyst following, and exchange listing of significantly mispriced firms to determine whether any of these factors provide any further mispricing explanations.

The investigation of firm-level accrual mispricing revealed significant mispricing at this level. For the post-SOX period (2003–2007), 13.5% of firms were significantly overpriced while 13.2% were significantly underpriced. Thus, some 27% of firms experienced significant accrual mispricing in the period, supporting hypothesis 4. In regards to research question 4, whether firm-level mispricing exists, this study therefore answers yes. The results from the fifth hypothesis, which tested whether mispriced firms persist over time, showed that 38% of significantly mispriced firms

[56] Given that AMEX firms constitute less than 5% of the sample, an analysis of their analyst following was not conducted.

remained mispriced for more than one year. Furthermore, 16% remained mispriced for longer than two years, while 7% persisted for more than four years. Analysis of abnormal returns for a strategy based on buying significantly underpriced accrual firms and selling significantly overpriced accrual firms revealed substantial abnormal returns, supporting hypothesis 5. Firm-level mispricing therefore persists long enough for investors to profit from it, affirming research question 5. Lastly, analysis of significantly mispriced accrual firms revealed that a greater than expected representation of mispriced firms is from the industrial sector. No significant differences in the sizes or exchange listings of these mispriced firms were found compared to others. The results show, however, that changes in regulation and analyst following impacted on accrual mispricing persistence. Specifically, stricter regulation and greater analyst following decreased it.

This study contributes to accrual mispricing literature by first documenting that firm-level accrual mispricing differs from that at the country, industry, and aggregate levels. It is the first study to do so. It provides evidence that while a number of sample firms may be significantly over- or underpriced, the country-level result can still show no mispricing. It therefore establishes the importance of investigating the accrual anomaly at the firm-level, especially when attempting to determine its causes. Last, in regards to persistence, firm-level accrual mispricing persists long enough for investors to benefit from trading on it. A firm-level accruals-based trading strategy yields abnormal returns consistent with country-level accrual anomaly findings.

These findings have several implications for investors, firms, and regulators. While certain firms are overpriced, as the accrual anomaly predicts, others are underpriced, and investors should take note to identify the specific positions of potential investments in their pricing decisions. In addition, several of these mispriced firms (36.4%) remained mispriced for more than one period. Investors who can identify such mispriced firms could (in theory) profit from a strategy of buying underpriced firms and selling overpriced firms. For firms it is important to note that investors misprice individual securities. Firms therefore need to improve their disclosure quality to ensure that information asymmetry is reduced and thus pricing is more accurate. It also seems that while increased disclosure regulation at the country level reduces mispricing in that setting, mispricing at the firm level remains. Regulators may therefore need to implement further regulatory reforms to improve information disclosures to reduce such mispricing. The next chapter, Chapter 5, summarizes this thesis.

Chapter 5 Conclusions

5.1 Introduction

This thesis investigated the impact of earnings quality on accrual mispricing and then examined whether mispricing is also present at the firm level. The first study (Chapter 3) determined whether earnings quality can mitigate accrual mispricing by including earnings quality in the accrual mispricing models of Mishkin and Kraft. It then estimated whether accrual mispricing still exists (at the country level, as documented by Sloan, 1996) post-SOX. The second study (Chapter 4) investigated the firm-level pricing and persistence of accruals.

The results from the first study (Chapter 3) showed that earnings quality does play a mitigating role in country-level accrual mispricing, with the Mishkin and Kraft models yielding similar results. In addition, SOX has improved earnings quality, since mispricing is mitigated post-SOX. The second study (Chapter 4) concluded that firm-level accrual mispricing does exist, even when the country-level anomaly is not significant. This firm-level mispricing is also persistent, and abnormal returns are available through a strategy of selling overvalued accrual firms and buying undervalued accrual firms.

The rest of this chapter is structured as follows: Section 5.2 presents an overview of the findings from the two studies, while Section 5.3 discusses their contributions. Next, Section 5.4 presents the implications, Section 5.5 the limitations whilst Section 5.6 concludes, with suggestions for future research.

5.2 Overview of findings

Two main issues, the impact of earnings quality on accrual mispricing and the firm-level mispricing of accruals, were investigated in this thesis. The former was explored through three related research questions in Chapter 3. The first research question examined accrual mispricing methodology and whether alternative mispricing models yield similar results, the second question considered whether earnings quality mitigates accrual mispricing, and the third research question investigated whether mispricing persists post-SOX.

The second issue, firm-level mispricing of accruals, was addressed by two more related research questions: the first, whether accrual mispricing exists at the firm level, and the second, whether such firm-level mispricing is persistent (see Chapter 4). Each of these five research questions and their associated hypotheses were designed to achieve the research objectives identified in Chapter 1 and, together with their findings, they are summarized in Table 5.1.

The first research question investigated whether accruals are significantly mispriced and whether the two mispricing models (Mishkin and Kraft) yield similar results. It was specifically tested through hypothesis 1 which determined whether investors overestimate the persistence of accruals leading to mispricing.

Table 5.1 Research objectives, research questions, hypotheses, and associated outcomes

This table summarizes this thesis's research objectives, questions, hypotheses, and outcomes. The research objectives were raised in Chapter 1 and their outcome reported on in Chapter 5. The research questions were developed in Chapter 2 and answered in Chapters 3 and 4. The five hypotheses were tested in Chapters 3 and 4. The outcomes for each of these hypotheses are also stated.

Research objectives	**Research questions**	**Associated hypotheses**	**Hypothesis outcomes**
1. Ascertain whether a significant accrual anomaly exists.	1. Are accruals significantly mispriced?	*H1: Investors overestimate the persistence of accruals, leading to mispricing.*	Supported
2. Establish whether earnings quality mitigates accrual mispricing.	2. Does earnings quality play a role in the mispricing of accruals?	*H2: Earnings quality mitigates accrual mispricing.*	Supported
3. Determine whether the introduction of SOX mitigates accrual mispricing.	3. Has SOX reduced accrual mispricing?	*H3: There is no accrual mispricing post-SOX.*	Supported
4. Ascertain whether firm-level accrual mispricing exists.	4. Does firm-level mispricing exist and does it differ from mispricing at the country level?	*H4: Accruals are mispriced at the firm-level, even when the country-level result is not significant.*	Supported
5. Establish whether firm-level mispricing is persistent and whether abnormal returns can be generated by exploiting this trading strategy.	5. Is firm-level accrual mispricing persistent and can investors profit from a trading strategy based on it?	*H5: Firm-level accrual mispricing persists over time.*	Supported

The Mishkin and Kraft models both showed a significant overvaluation of accruals and thus confirmed the country-level accrual anomaly. While the Mishkin model also reported significantly mispriced (undervalued) cash flows, the Kraft model did not. This indicates that while accruals are significantly overvalued with both models, their cash flow valuation is less certain. So, in answer to research question 1, the answer is yes, accruals are significantly mispriced with both mispricing models.

The second research question considered whether earnings quality is an important factor in accrual mispricing. Two earnings quality proxies (Basu, 1997 and Beaver and Ryan, 2000 see section 3.3.2.5) were included in the mispricing models of Mishkin and Kraft to test hypothesis 2, earnings quality mitigates accrual mispricing. The results showed that accrual mispricing is significantly reduced if not completely mitigated. This provided evidence that earnings quality does play a significant role in mitigating accrual mispricing, and those firms with better earnings quality will therefore have less mispriced accruals. This thesis therefore concludes that earnings quality plays a significant role in mitigating accrual mispricing.

The third research question examined whether country-level accruals are still mispriced post-SOX. It tested hypothesis 3 that there are no accrual mispricing post-SOX in this regard. Given SOX's focus on improved disclosure quality, mispricing should have been reduced following its introduction. In fact, the findings showed that accrual mispricing is completely mitigated post-SOX. This indicates that SOX was successful in achieving better-quality disclosures and that these allow investors to price accruals more accurately. The answer to research question 3 is that SOX impacted on accrual mispricing.

The other main issue investigated (see Chapter 4) is the firm-level mispricing of accruals, and the first research question (research question 4) sought to establish whether such mispricing exists. Results from hypothesis 4 show that accruals are mispriced at the firm level even when the country-level result is not significant, showed that 20% of sample firms had significantly mispriced accruals and, in turn, were split almost equally between overpriced and underpriced accruals. This showed not only that firm-level accrual mispricing exists, even in the absence of country-level mispricing, but also that accruals can be both over- and underpriced. The answer to research question 4 is therefore yes, firm-level mispricing does exist and differs from mispricing at the country level.

The last research question, research question 5, investigated the persistence of firm-level accrual mispricing and whether investors are able to profit from a firm-level accrual mispricing trading strategy. It did so by testing hypothesis 5, firm-level accrual mispricing persists over time. Employing a much longer sample period (than in research question 4), 21.85% of the sample firms had significantly mispriced accruals. Of these, approximately 38% continued to be mispriced for more than one year, while 16.04% of significantly mispriced firms persisted for more than two years. This clearly shows that firm-level mispricing is persistent. A trading strategy of selling overpriced accrual firms and buying underpriced accrual firms was found to yield abnormal returns. Investors can therefore potentially profit from a trading strategy based on firm-level accrual mispricing. Thus, abnormal returns can be generated by employing a long-short strategy.

In summary, each of the five hypotheses tested in this thesis are supported.

5.3 Contributions

This thesis makes several contributions to the literature regarding the relationship between earnings quality and security pricing, the impact of SOX on such quality, and the existence and persistence of firm-level accrual mispricing. It also contributes to the accrual mispricing methodology.

In relation to financial reporting quality and security pricing and, more specifically, whether and to what extent, earnings quality mitigates accrual mispricing, the work confirms not only whether the anomaly exists but also, more importantly, what drives it. It shows that information asymmetry stemming from low-quality earnings disadvantages shareholders through subsequent mispricing. While Brown and Hillegeist (2007) propose low disclosure quality (and high information asymmetry) misleads investors, this study actually documents the impact of earnings quality. Although DeFond and Park (2001) demonstrate that information asymmetry leads to incorrect anticipation of accrual reversals, this research extends their work and directly examines how such information risk impacts investor ability to accurately price accruals.

A further contribution establishes the effectiveness of SOX in improving disclosure quality. Previous studies indicate that accrual-based earnings management decreases post-SOX (Cohen et al., 2008) and is managed mainly through increased discretionary accruals (Xie, 2001), but SOX and its required changes should have improved the quality of disclosures and information dissemination to investors. The focus here is, therefore, rather on establishing whether this documented reduction in

accrual-based earnings management has decreased accrual mispricing. The findings indicate that SOX has mitigated country-level accrual mispricing.

This work's documentation that firm-level accrual mispricing exists contributes to the accrual pricing literature by showing firm-level mispricing differs from that at other levels and may be under or over priced. So while Pincus et al. (2007), Hirshleifer et al. (2009), and Trejo-Pech et al. (2009) investigate mispricing at the aggregate, cross-country, and industry levels, this thesis establishes its existence at the firm level. While Gaio (2010) concludes that firm characteristics play an important role in explaining firm-level earnings quality, this thesis examines directly whether firm-level factors (such as analyst-following and stock exchange listing) impact on accrual mispricing.

The thesis contributes further by examining the persistence of firm-level mispricing and showing that firm-level accrual mispricing is persistent. Though Lev and Nissim (2006) and Mashruwala et al. (2006) establish the persistence of the country-level accrual anomaly, this thesis also examines this issue at the firm level and shows that investors can profit from a firm-level accrual mispricing trading strategy.

The traditional accrual anomaly methodology is also extended as an additional contribution by simultaneously employing the Mishkin and Kraft mispricing models to confirm that accrual mispricing exists and so shows these models yield similar results. While Sloan (1996) employs the Mishkin model to document that investors overestimate accrual persistence, this thesis confirms his results and extends them by showing the Kraft model yields similar results. Xie (2001) and Richardson et al.

(2006) examine the role of discretionary accruals/earnings management in accrual mispricing, but this thesis determines specifically that earnings quality mitigates it.

The next section discusses the implications of the findings from this investigation.

5.4 Implications

This study's findings have implications for firms, investors, and regulators. Firms should note that disclosure quality is an important consideration in establishing the accurate pricing of accruals. Mispriced securities leave management open to hostile takeover bids (underpriced) and legal action (overpricing) and thus should be avoided. High disclosure quality results in the better pricing of securities, and thus firms need appropriate controls to ensure this occurs.

For investors, the knowledge that firms with good earnings quality have less accrual mispricing will aid their valuation decisions. Since individual firms can have both over- and underpriced accruals, investors should identify these positions and trade appropriately. This thesis documents that investors can earn abnormal returns from selling overpriced accrual firms and buying underpriced accrual firms.

Lastly, regulators should note the potential market integrity benefits associated with better earnings quality. The finding that SOX is effective in mitigating accrual mispricing provides further evidence to regulators that it has achieved its stated goal of improving the quality and integrity of financial disclosures.

5.5 Limitations

This research is subject to several limitations in respect to restricted earnings quality proxies, data availability and generalizability of results. Two earnings quality proxies are employed to investigate its impact on accruals mispricing and both of these are measures of earnings conservatism. It is possible that estimation of an accrual-based measure of quality could yield different results. Such accrual-based measures of quality were excluded from this study, as it would likely be correlated with accrual mispricing, which would have introduced potential biased results. Limited data availability post-SOX (only 5-years from 2003 - 2008) limits the scope of this study, it is possible that the full effects of SOX will take longer to manifest. Given time constraints in completing this thesis, extending the post-SOX period when more data became available would cause significant delays. The generalizability of results from this study is limited given that it is confined to a single country (the US) and its specific market, accounting and regulatory conditions. It is therefore uncertain whether its findings could be extended to that of other countries with weaker regulation and lesser information dissemination. Data and time constraints limit the ability to calculate firm-level mispricing for most other countries.

5.6 Suggestions for future research

The findings documented in this study provide several suggestions for future research. For instance, additional measures of earnings quality (that are not accrual based) could be included in future accrual mispricing calculation studies to determine whether the documented relation with accrual mispricing persists. A larger post-SOX sample (when the data become available) to establish the full impact of SOX on accrual mispricing would also add robustness to these results. A further investigation

of firm-level factors that may drive mispricing would provide investors with greater information to price securities accurately and thus provide an interesting avenue for further research. There is little evidence on sector- or industry-level accrual mispricing, and this finding can therefore be investigated in greater depth. Finally, the extension of this work to other countries (given that this study only examines the US environment, with its strict regulation) would establish whether these results hold when little regulation exists, or where markets face more constraints in regard to the dissemination of information.

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