Market Risk Disclosures and Investment Efficiency: International Evidence from the Gulf Cooperation Council Financial Firms

Abstract: This study examines the association between market risk disclosures (MRDs) and the investment efficiency of financial firms from six emerging markets in the Gulf Cooperation Council (GCC) region. Based on a sample of 553 firm-year observations over the 2007–2011 period, we find that MRDs are significantly and negatively associated with both under- and over-investment, and that this association is more pronounced for larger firms. We also find that the association between MRDs and under-investment is moderated during periods of economic distress such as the Global Financial Crisis of 2008, and that the association between MRDs and over-investment is magnified during periods of reduced financial distress. Our results are consistent with the idea that MRDs reduce information asymmetry, which ultimately improves investment efficiency. We contribute to the literature in an emerging market context by providing empirical evidence on the association between MRDs and investment efficiency across six emerging GCC capital markets. This study also fills a gap in the literature by providing evidence on the factors affecting the investment efficiency of financial firms.

Keywords: Mandatory market risk disclosures (MRDs), Information asymmetry, Investment efficiency, Gulf Cooperation Council (GCC).

JEL classifications: G3, M40, M41.

1. Introduction

This study examines the association between market risk disclosures (MRDs) and the investment efficiency[1] of financial firms from six emerging markets in the Gulf Cooperation Council (GCC) region. Our study is primarily motivated by Campbell et al. (2014), who call for research on the influence of risk disclosures on firms' investment behavior. In addition, we are motivated by the desire of accounting policymakers and regulators for the development of detailed risk reporting requirements and common accounting risk standards (e.g., Ashbaugh 2001; Miihkinen 2012). The extant literature shows that there is a large information gap in terms of MRDs between firms and their stakeholders (e.g., Roulstone 1999; Linsley and Shrives 2006). In fact, the risk reporting literature suggests that investors benefit the most from disclosures concerning business risks and uncertainties (Campbell et al. 2014). MRDs assist investors to understand the risks associated with on- and off-balance sheet items, to forecast financial statement and cash flow effects, to improve transparency concerning risk exposures (Rajgopal 1999), to increase investors' confidence in financial statements (Dobler 2008), to

reduce the mispricing of risk and the misallocation of capital (Jorgensen and Kirschenheiter 2003), and to enhance investors' ability to provide market discipline on a timely basis (Jorion 2002).

We conjecture that the provision of risk information in a firm's annual report has implications for investment efficiency via the reduction of information asymmetry and agency problems. In particular, the disclosure of precise market information about risk exposures is likely to improve investment efficiency by reducing information asymmetry and moral hazard problems. One possible outcome is a reduction in both under- and over-investment. In the U.S. context, several studies find that MRDs are useful and informative (e.g., Thornton and Welker 2004; Campbell et al. 2014). However, Kravet and Muslu (2013) find that increased risk disclosures by U.S firms increase investors' risk regarding unknown contingencies and risk factors, and that such disclosures may not necessarily resolve risk-related issues for a firm.

In the European context, Miihkinen (2012) observes that the quality of risk disclosures made by Finnish firms has increased following regulatory interventions related to the introduction of new risk disclosure requirements. Miihkinen finds that firms reporting under the requirements of the SEC tend to disclose more quantitative risk information, and that such improvements in reporting quality persist in subsequent years. Furthermore, Miihkinen (2013) finds that the quality of Finnish firms' mandatory risk disclosures has a negative influence on the information asymmetry of stock markets in Finland, and that the usefulness of disclosures are affected by each firm's riskiness, investor interest and market conditions. Finally, Elshandidy and Neri (2015) show that corporate governance factors affect the extent of mandatory and voluntary risk disclosure in the U.K. and Italy.

However, far less research has examined the factors that drive MRDs in emerging market contexts, and thus we do not yet understand the drivers of risk disclosures in environments with generally weaker regulatory and governance structures. We also do not know whether such

information would be relevant and useful to investors. Al-Hadi et al. (2015) find that the provision of market risk information reduces information asymmetry and decreases the costs of equity capital for GCC firms. Similarly, Moumen et al. (2015) find a positive association between voluntary risk disclosures and the market's ability to anticipate two-year forward earnings changes among Middle Eastern and North African firms.

Although MRDs may reduce the problems arising from information asymmetry (Dobler 2008), little research has been done on this issue in the context of developing and emerging economies such as the GCC. Recently, international investors have shown a great deal of interest in GCC markets due to the strong equity returns and the tax planning opportunities in those particular markets (Bolbol and Omran 2005; Ariss et al. 2011; Bley and Saad 2012). Furthermore, the institutional setting and regulatory environment in the GCC differs from that of the typical well-established markets such as those in Europe or the U.S. For instance, the high-level of ownership concentration found in GCC firms could possibly restrict the dissemination of risk-related information in these markets (Al-Yahyaee et al. 2011). Moreover, the lack of credible media coverage and the lower levels of investor protection that are distinctive features of GCC markets make for a situation in which financial information is the primary type of data accessible to investors and other market participants (Abu-Nassar and Rutherford 1996; Al-Yahyaee et al. 2011). Given the generally lower level of information that is available to investors in GCC markets, it is likely that firm risk disclosures could limit the opportunistic behavior of firm managers in those markets. Finally, given the economic and political importance of the GCC, the value of the financial sector in those countries, and the interplay between market risk reporting and investment efficiency in determining business decisions, it is important to gain a thorough understanding of the association between MRDs and investment efficiency in the GCC.

Based on a sample of 553 firm-year observations over the 2007–2011 period, we find that MRDs are significantly and negatively associated with both under- and over-investment, and that this association is more distinct for larger firms. We also observe that the association between MRDs and under-investment is moderated during periods of economic distress such as the Global Financial Crisis (GFC) of 2008, whereas the association between MRDs and over-investment is magnified during periods of reduced financial distress. Our results are consistent with the theory that MRDs reduce information asymmetry and moral hazard problems, and therefore improve investment efficiency in due course.

This study makes several important contributions. First, it extends the financial disclosure literature by examining the effects of MRDs on investment efficiency. Although prior research investigates the association between financial reporting quality and investment efficiency (e.g., Biddle and Hilary 2006; Biddle et al. 2009; Chen et al. 2011a; Chen and Chen 2012; Chen et al. 2012; Cheng et al. 2013), to the best of our knowledge no prior study has examined the association between MRDs and investment efficiency. To summarize our main findings, we show that MRDs reduce uncertainty and improve managerial decision-making regarding investments. Second, although earlier studies provide some empirical evidence on investment efficiency in developed markets (e.g., the U.S.) and in Asian emerging markets such as China (e.g., Biddle and Hilary 2006; Chen et al. 2011b), little research to date specifically focuses on the GCC emerging markets. Third, past research has tended to examine MRDs in the context of a single country. Hence, we add to the cross-country literature on risk disclosures by providing empirical evidence on investment efficiency across six emerging GCC capital markets. Fourth, firms belonging to the financial sector are generally more prone to difficulties related to risk disclosure, as these firms are subject to greater regulatory constraints such as central bank regulation, Basel directives and International Financial Reporting Standards (IFRS). We therefore focus on the financial sector as the target for our key contribution in this

study. Financial firms in emerging markets such as the GCC are faced with multiple competing issues surrounding the need to disclose adequate information to a growing and increasingly internationalized investment community. The firms in these markets are dealing with such issues in the face of a rapidly evolving regulatory, political and corporate governance environment. Finally, the extant literature on the financial industry and on market risk reporting shows that financial firms disclose more risk-related information than other firms (e.g., Nier and Baumann 2006; Hirtle 2007; Pérignon and Smith 2010). Linsley and Shrives (2006) note that financial firms are highly risk-oriented institutions, and therefore risk disclosure by financial firms should be investigated separately from such disclosure by firms in other industrial sectors.

This study proceeds as follows. Section 2 discusses the institutional setting of the GCC and of MRDs in that economy. Section 3 considers the relevant theory and develops our hypothesis. Section 4 describes the research design, and Section 5 reports and discusses the empirical results. Finally, Section 6 offers the study's conclusions.

2. GCC institutional setting and MRDs

The GCC was established in 1981 as an economic alliance to strengthen the development of six countries, namely Bahrain, Kuwait, Oman, Qatar, Saudi Arabia (K.S.A) and the United Arab Emirates (U.A.E) in the Gulf region. The institutional setting of the GCC differs significantly from that of well-established markets such as the U.S. (Bley and Saad 2012). However, all financial firms in the GCC countries have adopted International Accounting Standards (IAS)/IFRS (Al-Shammari et al. 2008; International Finance Corporation (IFC)/Hawkamah 2008). The IFC/Hawkamah (2008) survey finds that 76% of banks and 69% of non-bank listed firms in the GCC do not adhere to best practice disclosure requirements, because they are not legally required to do so. However, the implementation of corporate governance best practice guidelines or recommendations, and the increased internationalization

of GCC capital markets places pressure on these firms' managers to consider both the nature and extent of risk disclosures. In fact, risk disclosure by banks is viewed as an effective tool for avoiding banking crises.

Corporate governance codes and regulations are now well established in all of the GCC countries. Firms in the region may now be held accountable for breaches of or non-compliance with regulations (Sharar 2011),[2] including breaches related to MRD requirements. Several of the GCC countries have also established corporate governance task forces to monitor firms' adherence to governance codes of conduct (Al-Hadi et al. 2015). Throughout the GCC, corporate governance codes require that an audit committee must review a firm's risk management systems and policies. Last, the adoption of IAS/IFRS is mandatory for all publicly listed firms in the GCC countries (Al-Shammari et al. 2008; IFC/Hawkamah 2008).

The recent evolution in governance systems throughout the GCC is likely to have an important effect on the disclosure of risk information. Elshandidy and Neri (2015) provide evidence showing that governance systems mainly influence voluntary disclosure of risk information by U.K. firms, and the disclosure of mandatory risk information by Italian firms in their respective annual reports. Furthermore, Campbell et al. (2014) observe that U.S. firms facing greater risks are inclined to disclose more risk information, and that this tendency is contingent upon the types of risk that firms face. Similarly, research by Hawkamah (2010) finds that managers of GCC firms may provide risk disclosures that meaningfully reflect the risks they face and show the effectiveness of their governance systems.

In all of the GCC countries (except for the K.S.A.), best practice corporate governance codes require that an audit committee must review a firm's risk management systems and policies (Hawkamah 2010). The K.S.A. code of corporate governance requires the board of directors to initiate and control the risk management process. The corporate governance code in Bahrain requires the internal auditor to review the adequacy and effectiveness of a firm's risk

management process. In Bahrain, Oman and Qatar, management discussion and analysis reports (or corporate governance reports) are required to disclose the firms' risk management policies, practices and systems (Hawkamah 2010). The Central Bank of Oman (CBO) was formed by Royal Decree to oversee the financial risk disclosures of banks in that country (Hussain et al. 2002). The CBO requires banks to have their annual reports audited by independent external auditors and to have their annual reports prepared according to IAS/IFRS requirements (Hussain et al. 2002). Likewise, in 2009, the Central Bank of Bahrain (CBB) introduced a code of corporate conduct that requires listed firms to explain their adherence to or departure from those principles (Sharar 2011). The central banks in the GCC countries require firms to explain any material differences between their accounting standards and the Basel regulations (CBO 2006). Overall, there is some evidence that the disclosure of risk information is important for enhancing firm value and maintaining shareholder relations in the GCC countries (Al-Hadi et al. 2016), and that the regulatory authorities have stepped-up their efforts to ensure that firms adequately disclose risk information (Hawkamah 2010).

The GCC region has seen a marked increase in foreign direct investment (FDI) in recent years (Mina 2007). Certainly the GCC as a whole has experienced unprecedented growth rates, with many firms engaging in trade with offshore firms and having subsidiaries incorporated in countries outside of the GCC (Lagoarde-Segot and Lucey 2007). This internationalization of GCC firms has exposed them to greater stakeholder scrutiny from regulators and international institutional investors, who have recently demanded more transparency, governance and accountability from those firms (Abu-Nassar and Rutherford 1996). Thus, internationalization is probably producing increased pressure for GCC firms to disclose risk-related information.

MRDs are important in the GCC region due to the surge in foreign currency trading and other services by banks and other financial institutions in recent years. In fact, investment in foreign exchange has become a key element in the portfolios of institutional investors. *Al*

Eqtisadiah (2008),[3] a daily newspaper in Saudi Arabia, reports that the daily foreign currency trades in the GCC are equivalent to US$3 trillion, which is more than 20 times the average daily trading volume on the New York Stock Exchange. Furthermore, investment in the GCC stock markets is extremely risky, as these markets are historically volatile in nature. For example, in 2005 the stock prices of firms listed on the K.S.A., Kuwait, Qatar, Muscat and Bahrain exchanges increased by 98%, 87%, 68%, 31% and 24%, respectively. However, significant reversals of stocks listed on these exchanges occurred toward the end of 2005 and through the first few months of 2006. This volatility highlights the risks involved in equity market investment in the GCC. Khan and Ahmed (2001) confirm that interest rate risk is the most significant risk for banks in the GCC. Hence, given the high risks related to foreign exchange, equity and interest rates in the GCC region, this study examines the association between MRDs and investment efficiency.

3. Theory and hypothesis development

3.1. Financial risk disclosures and information asymmetry

The IFRS 7 defines market risk as the degree of risk that the fair values or future cash flows of financial instruments will fluctuate because of changes in market prices. Market risk comprises currency risk, interest rate risk, and equity or other (e.g., commodity) price risks. Risk-related disclosure allows stakeholders to monitor the performance of senior managers (Eng and Mak 2003) and to evaluate future firm performance (Schrand and Elliott 1998; Hodder et al. 2006). The disclosure of risk-related information has been shown to improve the overall information environment, risk management, governance and oversight of firms (Jorion 2002; Campbell et al. 2014). Such disclosure can also reduce information asymmetry and the cost of capital (Solomon et al. 2000; Easley and O'Hara 2004). In addition, financial risk disclosures build the sense legitimacy, trust and respect between a firm and its various

stakeholders, because risk disclosures provide evidence of a firm's credible commitment to inform its stakeholders.

MRDs are of particular importance to firms operating in the financial sector. Linsmeier et al. (2002) find that MRDs reduce investor uncertainty and diversity of opinion arising from changes in interest rates, foreign exchange rates and commodity prices. Jorion (2002) and Lim and Tan (2007) show that value-at-risk (VaR) disclosures are informative, as they can predict the variability of trading revenues. Other studies by Diamond and Verrecchia (1991), Kim and Verrecchia (1994) and Verrecchia (2001) indicate that increased disclosure mitigates information asymmetry between traders, and thereby increases the amount of liquidity in a firm's stock by lowering transaction costs. Lim and Tan (2007) find that higher VaR estimates are associated with weaker return earnings and higher future stock return volatility. More recent studies in the U.S. on firms' mandatory overall risk reviews provide evidence showing that such disclosures are informative to investors, despite various reporting deficiencies (e.g., Campbell et al. 2014).

3.2. Investment efficiency theory

Theoretically, firms continuously invest in net present value (NPV) projects at positive rates of return until the marginal benefits of the investments equal the marginal costs (Chen et al. 2011b). Past research finds that capital-market imperfections, such as information asymmetry and agency problems, may lead firm managers to make inefficient investment decisions that result in either under-investment or over-investment (e.g., Jensen and Meckling 1976; Myers 1977; Myers and Majluf 1984; Jensen 1986). The theory of "under-investment" asserts that firm managers may forgo low-risk projects with a positive NPV when the investment is financed by shareholders. They tend to do so because equity holders bear the costs of investment, but the benefits of that investment flow to the bondholders (Stulz 1990). Therefore,

firm managers may pursue riskier projects that can provide greater benefits for shareholders, and in the event that large losses occur, these losses can be passed on to the bondholders (Jensen and Meckling, 1976). Alternatively, "over-investment" arises from misalignment between the interests of firm managers and shareholders. In the presence of free cash flows, firm managers have a propensity to expand their firms, even if that means undertaking investment projects with a negative NPV, and thus reducing shareholder value (Aivazian et al. 2005).

3.3. Hypothesis development

Outside investors may use risk disclosures to make stock investment decisions (Abraham and Cox 2007). Firm managers may use market risk information to evaluate alternative positive NPV projects. In addition, investors consider risk levels relative to their own or other clients' risks in making investment decisions (Markowitz 1991). Linsley and Shrives (2006) find that risk disclosure motivates the suppliers of capital to remove part of the risk premium, as they seek to compensate for the uncertainty of a firm's risk position, thereby reducing the cost of capital. Rajgopal (1999) observes that even in the presence of mandatory disclosure, there are sometimes major variations and deficits in each firm's levels of risk reporting. In fact, such variations are driven by the nature of risk reporting such as its subjectivity and its uncertainty over future earnings (Dobler 2008). Hence, MRDs have important implications for shareholders' investment decisions (Admati and Pfleiderer 2000).

In a perfect capital market, firms generally rely on internal funding for investments (Modigliani and Miller 1958), and they finance all of their projects with positive NPVs (Biddle and Hilary 2006). External funding for realizing positive NPV projects has two main drawbacks: (1) moral hazard (Ostberg 2006) and (2) adverse selection (Hoshi et al. 1991). Moral hazard arises from the possibility that a firm's managers may seek to maximize their own interests, so that they over-invest a firm's capital by not selecting projects that maximize shareholder wealth (Fama and Jensen 1985). Adverse selection theory contends that firm

managers, as insiders, possess private information regarding the ability of their firm's investments to generate future cash flows. Firm managers may then use this information to selectively enhance their own welfare through strategies such as choosing the most appropriate time to sell stocks, based on their firms' investment portfolios (Biddle et al. 2009). Firm managers may be inclined to over-invest if they perceive that this will enhance their own welfare regardless of the efficacy of those investments. However, investors and other capital market participants may recognize the firm managers' propensity to over-invest, and may thus limit the provision of capital to that firm, which in-turn may lead to an increase in its cost of capital (Biddle et al. 2009). Faced with a constrained ability to raise capital and a potentially higher cost of capital, the firm's managers may be forced to under-invest, even in the presence of positive NPV projects (Myers and Majluf 1984).

The role of risk-related information is important in decision making for at least three reasons. First, it provides relevant measures concerning the risk profile of a firm, which affects analysts' valuation estimates. Second, risk disclosure lowers the information risk for investors, especially when a firm provides high-quality risk information (Dobler 2008).[4] Moreover, according to signaling models, risk disclosures assist firm managers to assess profitable investment projects, which may act as signals of superior firm value. For example, Jorgensen and Kirschenheiter (2003) claim that firms have lower risk premiums if their managers disclose risk exposures. High-quality MRDs comprise quantitative and qualitative market risk information that is relevant and reliable. Such disclosures can be reasonably expected to include information on how the risk measures are calculated and the effects of risks on current and future business performance (Pérignon and Smith 2010). If firms disclose high-quality risk information, then that information becomes more precise and informative to investors (Einhorn 2005). Risk disclosures may then reduce the likelihood that information flows will be impaired and can therefore decrease the level of uncertainty over future earnings, which can enhance

corporate transparency. Third, as risk-related disclosures convey information about a firm's unfavorable exposures and uncertainties, the firm's managers may seek to avoid providing meaningful risk-related information (Campbell et al. 2014). Hence, the proprietary nature of risk-related information is also important, as that information can potentially affect expected future cash flows.

Past research suggests that the provision of qualitative information creates an environment that enables firms to credibly convey their value-relevant quantitative risk information (e.g., Sribunnak and Wong 2006; Miihkinen 2012; Elhandidy and Neri 2015). In this study, high-quality market risk information refers to the disclosure of the risk management objectives, policies, limitations or descriptions, and numbers (both qualitative and quantitative in nature) that are related to stress testing, sensitivity analysis and risk exposures. Collectively, these forms of disclosure assist a firm by providing information that is credible, relevant, reliable and comparable. Such disclosure validates the forms or levels and the management of identified risks, and it is consistent with the definition of quality given in studies of risk-related disclosure (e.g., Einhorn 2005; Miihkinen 2012).

In the U.S. context, several studies assert that MRDs are useful and informative (e.g., Thornton and Welker 2004). These studies also show that the extent and quality of market risk disclosure may affect investors in several ways. For instance, Lim and Tan (2007) find that when firms are exposed to substantial market risk, their investors perceive that the earnings of those firms will be less persistent. Investors then adjust the future abnormal earnings of firms faced with higher market risk exposure, which leads to lower expected rates of return for those firms. Similarly, Campbell et al. (2014) observe that firms facing greater levels of risk tend to disclose more risk factors, and the information contained in risk factor disclosures is revealed in terms of a firm's systematic risk, idiosyncratic risk, information asymmetry and market value. However, Kravet and Muslu (2013) find that risk disclosures made in 10-K annual

reports are associated with increased stock return volatility and more dispersed forecast revisions after the firms file those reports. Overall, these studies suggest that increased risk disclosures increase the investors' perceptions concerning unknown risk factors or contingencies, and that these disclosures may not necessarily resolve risk-related issues for the firms or for particular forecast events.

Past research also examines various determinants and consequences of MRDs in non-U.S. economies, which often face significantly different regulatory environments for corporate risk reporting (e.g., Solomon et al. 2000; Linsley and Shrives 2006; Miihkinen 2012; Al-Hadi et al. 2016). In the European context, Miihkinen (2012) finds that the release of a national disclosure standard increases the quality of firms' overall risk disclosures in Finland. He also shows that firm characteristics such as firm size, profitability and foreign listing status affect risk disclosure quality. Following changes in Finnish risk reporting practices, Miihkinen (2013) examines the consequences of risk disclosures, and finds that increased disclosures are more useful for firms that have higher inherent risks (i.e., small firms or high technology firms) or that have smaller investor followings. Elshandidy and Neri (2015) show that the effects of governance characteristics on risk disclosure practices vary in the U.K. and Italy, depending on the strength of the governance structure. Elhandidy et al. (2013) find that U.K. firms that are characterized by higher levels of systematic or financing risk and risk-adjusted returns, or by lower levels of stock return volatility, tend to exhibit higher levels of aggregated and voluntary risk disclosures. Elshandidy and Neri (2015) show that risk disclosures increase market liquidity, whereas Miihkinen (2013) provides evidence that risk disclosures reduce information asymmetry.

In an emerging market context, accounting disclosures may be of a lower quality (Ball et al. 2003), and hence the marginal benefits of disclosure in terms of reducing over- or under-investment may be greater (Al-Hadi et al. 2016). However, the less mature regulatory

frameworks in emerging markets might limit the ability of investors to benefit from firm-specific information, which would potentially make disclosures less effective. Furthermore, the highly concentrated ownership of firms that is typical in many emerging markets may cause investors to pay less attention to disclosed risk information. Concentrated ownership may also leave investors with less ability or incentive to capitalize on risk-related information. In the context of the GCC countries, the increasing development of governance structures and the internationalization of capital markets may lead to an increased level and quality of risk disclosures, with investors becoming better able to capitalize on firm-specific information.

In fact, the usefulness of corporate risk disclosures in emerging markets is found to be evident in several recent studies. For instance, Al-Hadi et al. (2016) observe that firms with a separate risk management committee disclose more risk-related information, and that this association is more pronounced for mature-stage firms. Al-Hadi et al. (2015) find that MRDs reduce the cost of equity capital for GCC financial firms. This reduction in the cost of equity is found to be more preannounced for firms that employ conservative auditors. In addition, Moumen et al. (2015) show that voluntary risk disclosures by Middle Eastern and North African firms enhance the market's ability to anticipate future earnings changes. John and Santhapparaj (2010) investigate the effects of risk reporting for Malaysian firms during the IPO period, and find that prospectuses with risk information reflect both the offer price and the initial market return data.

Based on the above review of the extant literature, we conjecture that if a firm discloses quality market risk information related to its exposures (including both qualitative and quantitative information), then such disclosures improve the level of investment efficiency by reducing the extent of information asymmetry. We thus develop the following (directional) hypothesis:

H1: All else being equal, MRDs are negatively associated with both under-investment and over-investment.

4. Research design

4.1. Data and sample

We draw our sample from the population of financial firms listed in the six GCC capital markets over the 2007–2011 period. Data on risk disclosures and corporate governance are hand-collected from annual reports, and data related to the other variables are gathered from Standard and Poor's (S&P) Capital IQ database. All of the continuous variables measured in this study are Winsorized at the first and ninety-ninth percentiles to mitigate the potential that outliers may severely affect our empirical results.

Table 1 (Panel A) shows that initially there are 1,375 firm-year observations in our sample. The exclusion of joint-listed firms (15 firm-years), firms without MRD items in their annual reports (670 firm-years), firms with missing values for the control variables (10 firm-years) and observations omitted due to the use of lagged values in our regression models (127 firm-years) yields a final sample of 553 firm-year observations. Table 1 (Panel B) reports that the U.A.E. represents the highest number of observations (136) in our sample, followed by Kuwait and Oman with 116 and 98 observations, respectively.

[Insert Table 1 Here]

4.2. Variable measurement

4.2.1. Dependent variable: Proxy for investment efficiency

We examine how MRDs in each current year affect investment efficiency in each subsequent year, and we measure the investment efficiency by using three models. In the first model, we follow the research of Biddle et al. (2009) and Chen et al. (2012) in using the average of cash and leverage to rank firms on their likelihood of over- or under-investment. Jensen

(1986) and Blanchard et al. (1994) assert that firms with higher free cash balances are likely to over-invest their cash, whereas highly leveraged firms are more likely to under-invest by giving-up projects with positive NPVs (see also Myers 1977). In the second model, we follow the research of Biddle et al. (2009) and use the residuals from parsimonious regression models to calculate over- and under-investment. Finally, in the third model, we use the absolute value of residuals from the second model as our proxy measure for investment efficiency. We explain each of our models in further detail in Section 4.2.4 of this study.

4.2.2. Independent variable: MRDs

We construct MRD indices based on disclosure type (i.e., quantitative or qualitative) and degree of coerciveness (i.e., mandatory or voluntary). The quantitative section of the indices covers five facets of value-at-risk (VaR) disclosures (i.e., VaR characteristics (four items), summary VaR statistics (five items), inter-temporal comparison (one item), back-testing (two items) and daily VaR figures (two items)), and three facets of sensitivity (Sen) disclosures (i.e., Sen characteristics (four items), summary Sen statistics (five items) and inter-temporal comparison (four items)). Sen is a disclosure format that measures the potential loss in future income, fair value and cash flow due to market risk exposures arising from hypothetical changes or reasonably possible changes over short time-frames. The VaR format measures the highest potential loss in future cash, earnings and fair value over a selected period with a likelihood of occurrence at the confidence level.

The qualitative section of the indices covers 14 mandatory and voluntary disclosure items (VaR and Sen) that are allowed under IFRS 7. Following research by Pérignon and Smith (2010), we allocate equal weight to each disclosure item. The disclosure indices are reported in Appendix A of this study.[5]

Past research on MRDs usually investigates single-risk exposures such as interest rate exposures (e.g., Ahmed et al. 2004), or uses a single-market risk format such as the tabular

format (e.g., Rajgopal 1999; Jorion 2002). However, we examine all of the risk exposures (e.g., interest rate, foreign currency and equity price risks), reporting effects (e.g., cash flow, fair value and earnings) and diverse market risk formats (Sen, VaR and Tabular) of GCC financial firms.

Furthermore, to improve the level of accuracy, validity and consistency of our indices, we consider several additional issues. First, we develop our indices based on past research (e.g., Hodder et al. 2001; Pérignon and Smith 2010). Second, consistent with research by Plumlee et al. (2015), we apply guidelines from professional bodies (e.g., BCBS 2002, 2003) to construct our indices. Third, we follow past studies in applying disclosure standards (e.g., IFRS 7, Basel II Pillar III) to increase the credibility of our scoring (e.g., Al-Hadi et al. 2015).

Disclosure by GCC firms provides evidence of firm managers' discretion in terms of how they assess, monitor and ultimately disclose risk information. This effect of disclosure is important, because most GCC firms have boards of directors that are recruited on the basis of seniority from fairly small circles of elites, and which are staffed with directors who often have little spare time and (despite having wide general experience) commonly have limited specialized expertise (Hertog 2012). In fact, Hertog (2012) cites several examples in which the directors of GCC firms are appointed on the basis of political connections, and other firms have directors who lack both independence and the technical or financial knowledge that is normally expected of someone working in that industry. Hence, there are a wide variety of factors that can incentivize firm managers to disclose risk information, such as information about the types of risk exposures and risk formats they face.

We construct MRD1 based on the risk disclosure constructs used by Beattie et al. (2004). This variable is calculated as the sum of the qualitative risk disclosure items, plus the sum of the quantitative risk disclosure items, divided by the number of risk exposures reported in the annual report. MRD1 is therefore a measure of risk coverage. Beattie et al. (2004) measures

the coverage of risk information provided by using a Herfindahl index to calculate the concentration of corporate disclosures across each risk category. Miihkinen (2012) uses a metric of the inverse value of a Herfindahl index to measure the concentration of corporate disclosures across risk topics. The Herfindahl index represents the proportion of disclosure words scaled by risk coverage group (e.g., strategic risk, operational risk, financial risk, damage risk and risk management). Our measure differs from the conventional Herfindahl index in that we use a weighted measure of disclosure, scaled by the risk type (e.g., interest rate, exchange rate and equity price risks) to which firms are exposed. Therefore, MRD1 is calculated in this study as follows:[6]

$$MRD1 = \sum_{t=1}^{n_{j1=14}} Qualitative\_Items\ X_{ij} + \sum_{t=1}^{n_{j2=14(3)+13(3)}} \frac{Quantitative\_Items\ X_{ij}}{No.of\ market\ risk\ exposure} \quad \text{Eq. (1)}$$

where X_{ij} = 1 if the i^{th} item is disclosed for the j^{th} firm; n_{j1} = the total score ($n_{j1} \leq 14$) from the qualitative disclosure for the j^{th} firm; and n_{j2} = the total score from the quantitative disclosure for the j^{th} firm.

For the VaR format, the score equals the number of quantitative risk disclosures multiplied by the maximum number of risk exposures disclosed. We follow the same process for the Sen format. Thereafter, the total score from the quantitative risk disclosures is calculated as the sum of the scores from the VaR and Sen formats, divided by the number of market risk exposures. Therefore, MRD1 is the sum of the total qualitative and quantitative MRDs. However, our measure differs from that used by Miihkinen (2012) in several respects. Specifically, Miihkinen (2012) uses the total number of disclosed items, scaled by the number of main risk categories. We code 14 items for VaR disclosure from 3 market risk exposure categories (i.e., interest rate risk, currency exchange risk and stock price risk). We also code 13 sensitivity risk items from the same 3 risk exposure types. For example, in terms of VaR, a firm may disclose 12 items from 2 risk exposure categories (i.e., interest risk and price risk). For the sensitivity analysis

method, a firm may disclose 16 items of 3 risk categories (i.e., interest risk, price risk and exchange currency). All of these categories give rise to our final calculation of 11.3 items (i.e., 12/2 + 16/3).

We also follow Miihkinen (2012) to calculate the extent of risk disclosure provided in annual reports. In particular, Miihkinen (2012) uses the number of risk disclosure words provided by the firm. However, instead of using the number of risk disclosure words, we use the number of risk items. We construct the MRD2 index based on the total score obtained from both the VaR and the Sen formats, divided by each format's maximum expected score. For the VaR format, the score equals the number of quantitative risk disclosures, multiplied by the maximum number of risk exposures disclosed. The same process is applied to the Sen format. Therefore, MRD2 is computed as follows:

$$MRD2 = \sum_{t=1}^{n_{i1=14}} \frac{Qualitative\_Items\ X_{ij}}{n_{e,j}} + \sum_{t=1}^{n_{i2=14(3)+13(3)}} \frac{Quantitative\_Items\ X_{ij}}{n_{e,j}} \qquad \text{Eq. (2)}$$

where X_{ij} = 1 if the i^{th} item is disclosed for the j^{th} firm; n_{ej} = the total maximum expected score for qualitative and quantitative disclosure for the j^{th} firm; n_{i1} = the total score ($n_{i1} \leq 14$) from qualitative disclosure for the j^{th} firm; and n_{i2} = the total score from the quantitative disclosure for the j^{th} firm.

In summary, MRD1 captures market risk coverage based on risk format (i.e., VaR and Sen), whereas MRD2 focuses on the total number of market risk exposures disclosed by a firm.

4.2.3. Control variables

In our regression model, we include several firm-level and country-level control variables that are likely to affect investment efficiency. Specifically, we control for firm profitability by using return on equity (ROE), which is measured as net income after tax divided by total equity (e.g., Lang and Lundholm 1993). We also include slack (measured as total cash balance divided by total assets) and leverage (measured as total short- and long-term liabilities divided by total assets) as control variables in our study. Furthermore, we consider that larger firms frequently

act to preserve their reputations and attempt to avoid government intervention in their business operations (Watts and Zimmerman 1990). In GCC countries, large financial firms are economically important and highly visible (Al-Shammari et al. 2008). Therefore, we control for firm size (Size), which is measured as the natural log of total assets. Consistent with past research, we also include firm age (Age) as a control variable, which is measured as the natural log of the difference between the current year and the year of incorporation (e.g., Biddle and Hilary 2006). We also control for McapDev (measured as market capitalization divided by country-level GDP in each year) to control for differences in economic output across the GCC countries (Pastor et al. 2008), and for Tab (measured as a dummy variable, scored as 1 if a firm discloses a tabular market risk format, and 0 otherwise). In fact, we include Tab as a control variable to determine whether this variable is in itself a substitute for or complementary to our market risk index (e.g., Rajgopal, 1999; Al-Hadi et al. 2015).

Research also shows that corporate governance may have a significant effect on firm-level investment efficiency (e.g., Biddle et al. 2009; Chen and Chen 2012). Therefore, we control for firm-level corporate governance structure by using an index of governance items. In particular, we follow Al-Hadi et al. (2015) to develop our firm-level corporate governance index (Firm_CG) that comprises 15 governance items, all of which are equally weighted. Finally, we control for country-level governance, which captures corruption (Kaufmann et al. 2009) and investor protection (La Porta et al. 2000) in each of the sample countries. Following previous studies, we also conduct principal component factor analyses of the aforementioned country-level governance variables (e.g., Hope 2003; Gul et al. 2013), and we include the factor value in our regression model.

4.2.4. Regression model

To examine whether MRDs are negatively associated with under-investment and over-investment (H1), we use the following OLS regression model with standard errors, adjusted for heteroskedasticity and within-firm clustering (e.g., Petersen 2009):

$$Investment_{i,t,}[Under] \; or \; [Over] = a_0 + a_1 MRD_{i,t-1} + a_2 ROE_{i,t-1} + a_3 Slack_{i,t-1} + a_4 Leverage_{i,t-1} + a_5 Size_{i,t-1} a_6 Age_{i,t-1} + a_7 Tab_{i,t-1} + a_8 McapDev_{i,t-1} + a_9 Firm\ CG_{i,t-1} + a_{10} Factor_{i,t-1} + Year\ Dummies + e_{i,t} \quad \text{Eq. (3)}$$

Using Eq. (3), we regress over- and under-investment on MRDs proxies (i.e., MRD1 or MRD2) and the control variables. Over- and under-investment is measured based on three models. In Model 1, following the research of Biddle et al. (2009) and Chen et al. (2012), we rank firms into deciles based on the firms' levels of cash balance (ranging from 0.1 at the lowest to 1.0 at the highest) and on leverage (ranging from 1 at the highest to 0.1 at the lowest). Thereafter, we obtain the averages of both deciles for each firm-year observation. Firms with less than the median decile value are likely to under-invest, whereas firms with more than the median decile value are likely to over-invest (Biddle et al. (2009).

In Model 2, we follow past research by Biddle and Hilary (2006), Richardson (2006), Biddle et al. (2009) and Chen et al. (2011a) by measuring investment efficiency based on how the investments deviate from an expected level. Specifically, we regress investment on revenue growth, and use the residuals as a firm-specific proxy for deviations from expected investment. Positive (negative) regression residuals from the regression model are used as a proxy for over-(under)-investment. Therefore, firms with residuals at or near zero reflect greater investment efficiency. We therefore apply the following regression model:

$$Investment_{i,t} = a_0 + a_1 RevGrowth\%_{i,t-1} + e_{i,t} \quad \text{Eq. (4)}$$

where $Investment_{i,t}$ is measured as the sum of a firm's new investment in *Machinery$_t$, Equipment$_t$, Vehicles$_t$, Land$_t$, Buildings$_t$,* less *Depreciation and Amortization$_t$* and sales of *Net*

PPE_t. Total investment in each year is divided by $Total\ Assets_{t-1}$, and $RevGrowth\%_{i,t-1}$ is a firm's sales growth at year $_{t-1}$, calculated as the difference between sales in year $_t$ and sales in year $_{t-1,}$ scaled by sales in year $_{t-1}$.

5. Empirical results and discussion

5.1. Descriptive statistics

The descriptive statistics are reported in Table 2. The mean (median) for over-investment and under-investment are 0.05 (0.01) and 0.04 (0.01), respectively. Moreover, the signed and unsigned mean (median) investment residuals are -0.00 (-0.02) and 0.05 (0.03), respectively. By construction, the maximum value of MRD1 can be 14, and that of MRD2 can be 1. However, the means (medians) for MRD1 and MRD2 are 7.61 (7.50) and 0.56 (0.55). These mean and median values suggest that although financial firms are more prone to risk, they disclose a moderate level of MRDs in their annual reports. Finally, the descriptive statistics for the control variables are also reported in Table 2.

[Insert Table 2 Here]

5.2. Correlation results

Table 3 presents the Pearson correlation results. As predicted, we find that both MRD1 and MRD2 are significantly and negatively associated with both over- and under-investment ($p <$ 0.05 or better). In terms of the control variables, we observe that several of the control variables are significantly and negatively (positively) associated with the proxies for investment efficiency such as ROE, Size, Leverage or McapDev (Firm_CG and Factor) ($p < 0.10$ or better). Finally, for the risk disclosure proxy variables (MRD1 and MRD2), we find that these variables are significantly and positively associated with each other ($p < 0.01$), as expected.

[Insert Table 3 Here]

5.3. Regression results

5.3.1. MRDs and investment efficiency

Our ordinary least squares (OLS) regression results are reported in Table 4. In particular, we test whether the investment efficiency of a firm is systematically associated with MRDs by using three models of investment efficiency. Table 4 (Panel A) shows that the regression coefficient for MRD1 is negative and statistically significant for all investment efficiency estimates ($p < 0.10$ or better), which provides support for H1. For example, the regression coefficients in Model 1 show that MRDs reduce the firms' under (over) investment by 0.0048 (0.0041), both of which are statistically significant ($p < 0.05$). We also obtain similar results for Model 2. When we use the absolute value of unexpected investment, the regression results in Model 3 show that MRD1 significantly reduces the unexpected investment of a firm ($p < 0.05$). Our findings are also economically significant. For instance, the regression coefficients in Model 1 indicate that a one standard deviation increase in MRD1 leads to a 1.80% and 1.54% decrease in under- and over-investment, respectively. Finally, regarding the control variables, we find that the regression coefficients for ROE, Slack, Leverage, Size, Tab, Firm_CG and Factor are all significantly associated with under- and over-investment in several of our regression model estimates, as is consistent with expectations ($p < 0.10$ or better).

To mitigate a potential concern that our regression results are specific to the MRD index used, we construct a second MRD index (i.e., MRD2) and use this as the independent variable in our OLS regression analysis. The additional regression results are presented in Table 4 (Panel B). Consistent with our previous findings, Table 4 (Panel B) shows that the regression coefficient for MRD2 is negative and statistically significant for all of the investment efficiency estimates ($p < 0.10$ or better), which provides further support for H1. Thus, these results suggest that MDR2 improves investment efficiency by reducing both over- and under-investment.

Finally, for the control variables, we observe that some of the regression coefficients (i.e., ROE, Slack, Leverage, Size, Tab, Firm_CG and Factor) are significantly associated with under- and over-investment in our regression model estimates ($p < 0.10$ or better), which is in line with expectations.

Overall, we find that our regression results are consistent with the idea that MRDs reduce information asymmetry and limit managerial opportunistic behavior related to value-destroying investment decision making. Accordingly, MRDs ultimately improve the level of investment efficiency of a firm.

[Insert Table 4 Here]

5.3.2 Additional analysis

5.3.2.1. Interaction effects: The moderating role of firm size and profitability

Past research shows that the main factor affecting the risk disclosure level is firm size (e.g., Solomon et al. 2000; Miihkinen 2012). In fact, Lang and Lundholm (1993) claim that "information provided by and about firms is increasing in firm size." Research by Al-Hadi et al. (2016) also shows that firms in their mature lifecycle stage disclose more risk-related information than firms in their young and declining lifecycle stages. A number of possible reasons for this finding are advanced in the literature. For instance, Salancik and Pfeffer (1978) claim that a firm relies on finite resources for its survival and growth, and competes with other firms to benefit from and control these resources. In line with this view, the resource bases and capabilities of large firms are diverse and rich, but those of small firms are limited and concentrated. Thus, large firms can use their resources to disclose more information to the market, and they can use such disclosure to attract cheaper capital (Mallin 2002), widen their customer bases and enhance their reputations (Linsley and Shrives 2006). Past studies also find that economies of scale in the production and storage of information allow large firms to

allocate relatively greater amounts of resources to the production and dissemination of information (e.g., Stigler 1961). Buzby (1975) argues that more disclosure places small firms at a competitive disadvantage compared to large firms in the same industry. In fact, our correlation results (see Table 3) report a significantly positive correlation between firm size and MRD (i.e., $\rho = 0.50$, $p < 0.001$ for MRD1 and $\rho = 0.49$, $p < 0.001$ for MRD2, respectively).

In the preceding section, we conjecture that MRDs improve the investment efficiency of a firm. Given that large firms disclose more risk-related information than small firms, we suggest that the association between MRDs and investment efficiency is more pronounced for large firms. The regression results for this conjecture are presented in Table 5. As expected, the regression coefficients of the interaction-term between risk disclosures and size (i.e., MRD1*SIZE and MRD2*SIZE) are negative and mostly significant statistically ($p < 0.10$ or better). These results show that the effects of MRDs in reducing under-investment and over-investment are more pronounced for large firms, because these particular firms disclose more risk-related information.

[Insert Table 5 Here]

Past research provides inconclusive evidence in terms of the association between profitability and disclosure. One stream of the literature claims that profitability motivates managers to disclose more information, as it increases investors' confidence, which in turn increases managers' compensation (e.g., Singhvi and Desai 1971). However, another stream of literature argues that profitability is likely to increase the level of disclosure only in the presence of a higher level of information asymmetry between the firm's managers and investors (e.g., Lang and Lundholm 1993). Empirical evidence also provides conflicting results. For instance, some studies find a significant positive association between profitability and disclosure (e.g., Singhvi 1968; Singhvi and Desai 1971; Wallace and Naser 1994; Iatridis

2008), and others find a negative association (e.g., Wallace and Naser 1996; Miihkinen 2012; Al-Hadi et al. 2016). Finally, some studies find no association between profitability and disclosure at all (e.g., McNally et al. 1982; Lau 1992; Ahmed and Courtis, 1999). If it is true that profitability and disclosure levels are positively associated, we conjecture that the interaction-term between profitability and MRDs should lead to a higher level of investment efficiency.

Our regression results are reported in Table 5. Model 1 indicates that the regression coefficients of the interaction term (MRD1 *X* ROE) is negative and statistically significant ($p < 0.05$). This result suggests that profitable firms disclose more market risk information, which leads to reductions in over-investment. However, this result should be interpreted with some caution, given that the interaction coefficients (i.e., MRD1*ROE and MRD2*ROE) in the remaining models are mostly negative but statistically insignificant. These results support past research showing that profitability does not affect disclosure, and thus the interaction term between MRDs and ROE does not yield any incremental effect on the level of investment efficiency in a firm.

5.3.2.2. Effect of the GFC of 2008 on the association between MRDs and investment efficiency

Recent studies examine the effect of the GFC of 2008 on firms' investment and financing decisions. In particular, these studies show that the GFC represented an exogenous shock to the supply of external finance, which significantly weakened firms' funding capabilities (e.g., Ivashina and Scharfstein 2010) and resulted in under-investment (e.g., Campello et al. 2010; Duchin et al. 2010). We conjecture that firms with more MRDs can overcome financing constraints during an economic crisis by reducing their levels of information asymmetry, thus allowing these firms to reduce any under-investment. Following other studies (e.g., Campello et al. 2010; Coulibaly et al. 2013), we consider 2008–2009 as the GFC period. Consistent with our expectation, the regression results presented in Table 6 show that MRDs reduced the levels

of under-investment during the GFC. Specifically, Table 6 (Panel A) Model 1 indicates that MRD1 was negative and statistically significant for under-investment during the GFC ($p < 0.05$). Also, Table 6 (Panel B) Model 1 indicates that MRD2 was negative and statistically significant for under-investment during the GFC ($p < 0.05$).

Our regression results also show that the role of MRDs in reducing over-investment is more pronounced during periods of reduced financial distress. In particular, Table 6 (Panel A) Models 1 and 3 show that MRD1 is negative and statistically significant for over-investment outside of the GFC ($p < 0.10$ or better), and Table 6 (Panel B) Models 1 and 3 indicate that MRD2 is negative and statistically significant for over-investment outside of the GFC period ($p < 0.10$). These results are consistent with the idea that the availability of funds during non-crisis periods allows firm managers to undertake value-destroying investment projects (e.g., Jensen 1986), which MRDs can help to mitigate. Finally, our results also support the claim made by Miihkinen (2013) that market conditions affect the relevance of risk disclosures.

[Insert Table 6 Here]

5.3.3. Sensitivity Analysis

5.3.3.1. Alternative regression specifications

Multinomial logistic regression

Earlier, we ran Eq. (4) for pooled data, and used the residuals from the regression model as our main proxy measure for investment efficiency. To mitigate potential measurement error concerns regarding this method, we follow Biddle et al. (2009) and re-run Eq. (4) for each industry and year. Thereafter, we estimate multinomial logistic regression models using the regression residuals, which test the likelihood that a firm might fall into the extreme investment residual quartiles as a function of MRDs. This particular regression specification considers the middle two quartiles as the benchmark. The untabulated multinomial logistic regression results show that the regression coefficients for MRD1 and MRD2 are negative and statistically

significant ($p < 0.10$ or better). Finally, consistent with past research (e.g., Chen et al. 2011), we also consider Eq. (4) in terms of each country and year, and we re-run the multinomial logistic regression models. The untabulated multinomial logistic regression results for this particular analysis also show that our results are not sensitive to particular estimations of the investment efficiency proxy measure used or the regression model applied.

Firm fixed effects

As previously mentioned, inferences about the association between MRDs and investment efficiency are based on a pooled sample and time-series regression analysis, where multiple annual observations for the same firm are used. Although the standard errors are adjusted for heteroskedasticity and the within-firm clustering (e.g., Petersen 2009) in our main regression models helps to alleviate this concern, we consider the robustness of our regression results by estimating a firm fixed-effects regression model version of Eq. (3), in which every firm and every year in the sample is assigned a dummy variable (e.g., Wooldridge 2010). Table 7 (Panel B) presents the firm fixed-effects regression model results. Our untabulated regression results indicate that the regression coefficients for MRD1 and MRD2 are both negative and statistically significant ($p < 0.05$ or better). Hence, these particular sets of regression results show that our main results are not necessarily driven by any omitted time-invariant firm characteristics (Wooldridge 2010).

Country fixed effects

In our main regression models (see Table 4), we use McapDev (i.e., market capitalization divided by country-level GDP) and country-level governance to control for country-specific effects. As a sensitivity analysis, we replace these variables with country-level dummy variables. Our untabulated regression results show that the signs and statistical significance of our main variables of interest remain unchanged.

5.3.3.2. Potential endogeneity between MRDs and investment efficiency

Although our OLS regression estimates show that MRDs reduce both under- and over-investment, the sign, magnitude and level of statistical significance of these estimates could be biased as a consequence of endogeneity (e.g., Wooldridge 2010). To address this particular concern, we adopt a two-stage least squares (2SLS) instrumental variable (IV) approach to re-examine the main regression results reported in Table 4.

Following past studies (e.g., Jha and Cox 2015; Hasan et al. 2015), we use industry-level mean MRDs in each year in a given country as our IV in the first-stage of the 2SLS regression analysis. It is reasonable to expect firm-level MRDs to be highly correlated with the MRDs of the industry in which each firm operates. Therefore, we expect both firm-level and industry-level MRDs to have a highly positive correlation. It is unlikely that the investment efficiency of a firm affects the industry-level MRDs, and it is also unlikely that the industry-level MRDs affect firm level investment efficiency other than through the MRDs of the firm. Thus, the essential requirements of the instruments should be satisfied.

The first-stage regression results are presented in Table 7 (Panel A). Consistent with our expectation, the regression coefficients of the IV are positive and statistically significant ($p < 0.01$). Thereafter, we also test the suitability of the IV by conducting the under-identification, weak-instrument and Hausman endogeneity tests (see Table 7, Panels A and B). Specifically, the under-identification test results (LM statistic) show that the excluded instruments are relevant. In addition, the weak-instrument test results indicate that the excluded IV is correlated with the endogenous regressors, as the Cragg-Donald Wald F statistic is greater than the Stock and Yogo (2005) critical value. These findings reflect the validity of the instruments used for the 2SLS regression analysis. Finally, the Hausman (1978) test rejects the exogeneity of the MRD proxies ($p < 0.10$ or less), indicating that the 2SLS regression estimates are preferable to the OLS regression estimates.

The second-stage regression results reported in Table 7 (Panel B) show that the regression coefficient for MRD1 is negative and statistically significant across all investment efficiency estimates ($p < 0.01$), which provides additional support for H1. Overall, the 2SLS regression analysis results indicate that the negative and statistically significant association between MRDs and investment efficiency remains robust even after accounting for the potential endogenous association between them. Finally, we re-run the 2SLS regression analysis for the alternative MRD2 proxy measure, and our untabulated results show that they are qualitatively similar in terms of predicted signs and levels of statistical significance.

[Insert Table 7 Here]

6. Conclusion

This study examines the association between MRDs and the investment efficiency of financial firms from six emerging markets in the GCC region. We find that MRDs are significantly and negatively associated with both under- and over-investment, and that this association is more pronounced for larger firms. We also observe that the association between MRDs and under-investment is moderated during periods of economic crises, such as the GFC of 2008, whereas the association between MRDs and over-investment is magnified during periods of reduced financial distress. Our results are consistent with the idea that MRDs reduce information asymmetry and moral hazard problems, thereby ultimately improving investment efficiency.

This study contributes to both the investment efficiency and the disclosure literature in several important ways. In particular, our study provides empirical evidence showing that MRDs improve investment efficiency by suppressing both under- and over-investment. Although a large body of literature shows that financial reporting quality improves investment efficiency (e.g., Biddle et al. 2009; Chen et al. 2011), no research specifically examines the

role of MRDs in improving investment efficiency. Furthermore, past studies explore the investment efficiency of non-financial firms (e.g., Biddle et al. 2009; Chen et al. 2011a, 2011b, 2012), but fail to gather empirical evidence on the investment efficiency of financial firms. Our study thus helps to fill this significant gap in the literature. Finally, we focus our attention on the association between MRDs and the investment efficiency of firms in the GCC emerging market, which has received relatively little attention in past research.

This study is subject to at least one limitation. Specifically, it relies on a limited sample size, because we hand-collected most of our data from the annual reports of financial firms in the GCC. Future research could be carried out to investigate the value relevance of MRDs in these particular markets. Finally, future research could also explore the association between MRDs and the cost of equity capital, stock price informativeness and firm-specific stock price crash risks in the GCC region.

Notes

[1] Investment efficiency refers to the propensity of a firm to undertake all projects with only positive NPVs. In this study, we define investment efficiency as a reduction in both under-investment and over-investment.

[2] Al-Shammari et al. (2008) cites two cases in Kuwait and four cases in Oman relating to breaches of regulations. In Kuwait during 2001, an auditor gave an unqualified audit report for a firm that had violated IAS requirements, and this auditor was cautioned by the national disciplinary committee. Also in Kuwait, the Surveillance Department of the Ministry of Commerce received a shareholder complaint which led to the dismissal of a firm's board of directors, general manager and external auditor. In Oman, between 1999 and 2003, two auditors were accused of failing to report violations of an accounting regulation, and they received formal warnings from the national disciplinary committee. The Oman securities regulator uncovered two cases of non-compliance with IAS.

[3] Further details are available at http://www.aleqt.com/2008/02/20/article_129493.html.

[4] As a validity check, two research assistants coded each index's items for every firm in the sample independently. There was no significant difference between the codes recorded by the two research assistants.

[5] The quantitative disclosure component is derived from the VaR and Sen formats. For both formats, the maximum number of risk exposures among the GCC financial firms is three. For example, if firm *j* discloses two risk exposures (e.g., interest rate risk and foreign currency risk) under the VaR format, the maximum quantitative VaR score would be 28 (14 items * 2 exposures). The same process is followed for the Sen format.

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Appendix A
List of Items included in the MRD Index

VaR Characteristics		**Sen Characteristics**	
a. Holding period under VaR (**M**)	IFRS: B20, Basel & FRR. 48 305(a)(1)(iii): C	a. Potential loss => 10% (**M**)	
b. Confidence level (e.g. 99%, 95%) (**M**)	IFRS: B20, Basel & FRR. 48 305(a)(1)(iii): C	b. Potential loss < 10% (**V**)	
c. Type of VaR model (**M**)	IFRS: B20	c. Economic justification for <10% (**V**)	IFRS 7: B19a, B18b & FRR. 48 305(a)(1)(ii)
d. Data time frame (**M**)	IFRS: B20, Basel & FRR. 48305 A (i),(i) a	d. Multiple scenarios (10% and 20%) or (100, 200 points) (**V**)	
VaR Statistics: Summary		**Sen Statistics: Summary**	
a. Annual average VaR (**V**)	FRR. 48 305 a 1(iii) (A)	a. Annual ave. Sen over the year (**V**)	
b. Minimum VaR over the year (**V**)	FRR. 48 305 a 1(iii) (A)	b. Minimum Sen over the year (**V**)	
c. Maximum VaR over the year (**V**)	FRR. 48 305 a 1(iii) (A)	c. Maximum Sen over the year (**V**)	
d. Year-end VaR (**M**)	IFRS: B20, FRR. 48 305 a 1(iii) (A)	d. Period indication for ave., max., and min. Sen (**M**)	IFRS 7 B19a+ B19b
e. Diversification effect (**V**)	FRR. 48: *305(a)*: 1 E	e. Individual exposure in the risk type (e.g., all currencies) (**V**)	
VaR Inter-temporal Comparison		**Sen Inter-temporal Comparison**	
a. Summary information about the previous years' VaR (**M**)	IFRS: B20, FRR. 48: 305 a 3 a (1) i	a. Summary information about the previous years' Sen (**M**)	
VaR Back-Testing		b & c. Change in Sen from % to point or point to %** (**V**)	
a. Number of exceptions (**V**)	Basel II	d. Justification for the change from % to point or vice versa (**V**)	IFRS 7 C9: 36A & Holder 2002
b. Explanation of exceptions (**V**)	Basel II		
Graphical Presentation of Daily VaR			
a & b. Histogram of daily VaRs and/or plot of daily VaRs* (**V**)	Basel II		
Quantitative Score: 14 points for each market risk exposure.		**Quantitative Score: 13 points for each market risk exposure**	
Value at Risk (VaR) Index: Qualitative Items	**Sources**	**Sensitivity Analysis (Sen): Qualitative Items**	**Sources**
a. Effect of VaR on cash flow/fair value/earning (**M**)	IFRS 7: Paragraph 18– 40a, FRR. 48:*305(a)*: 1F	a. Effect of Sen on cash flow/fair value/earning (**M**)	IFRS 7: Paragraph 18– 40a, FRR. 48:*305(a)*: 1F
b. Two or more VaR effects on cash flow/fair value/earning (**V**)	IFRS 7: Paragraph 18– 40a, FRR. 48:*305(a)*: 1F	b. Two or more Sen effects on cash flow/fair value/earning (**V**)	IFRS 7: Paragraph 18– 40a, FRR. 48:*305(a)*: 1F
c. Objective of risk management (**M**)	IFRS 7: Paragraph 18–40a	c. Objective of risk management (**M**)	IFRS 7: Paragraph 18–40a
d. Policies of risk management (**M**)	IFRS 7: Paragraph 33, FRR .48 305 (a)(1)	d. Policies of risk management (**M**)	IFRS 7: Paragraph 33, FRR .48 305 (a)(1)
e. Limitations of risk management (**M**)	IFRS 7: 41 C	e. Limitations of risk management (**M**)	IFRS 7: 41 C
f. Other risk exposure except for interest rate, currency, and price risk (**V**)		f. Other risk exposure except for interest rate, currency, and price risk (**V**)	
g. Disclosure of gain from VaR (**V**)	IFRS 7: Paragraph 25: B20	g. Disclosure of gain from Sen (**V**)	IFRS 7: Paragraph 25: B20
h. Non-trading market risk (**V**)	IFRS 7: Paragraph 20	h. Non-trading market risk (**V**)	IFRS 7: Paragraph 20
i. Immaterial market risk exposure (**V**)	IFRS 7: Paragraph 17–40a	i. Immaterial market risk exposure (**V**)	IFRS 7: Paragraph 17–40a
j. Risk target of the firm (**V**)	IFRS 7: Paragraph 40	j. Risk target of the firm (**V**)	IFRS 7: Paragraph 40
k. Other stress testing (**V**)	Basel II	k. Other stress testing (**V**)	Basel II
l. Qualitative description of the stress test (**V**)	IFRS 7: Paragraph 19– 20 & 19-a, FRR. 48: *305(a)*: 1 A–D & Basel II	l. Qualitative description of the stress test (**V**)	IFRS 7: Paragraph 19–20 & 19-a, FRR. 48: *305(a)*: 1 A–D & Basel II
m. Stress test result (**V**)	IFRS B19 B	m. Stress test result (**V**)	IFRS B19 B
n. Near-term risk exposure (**M**)	FRR. 48 305(a) 4.a and IFRS B19 B	n. Near-term risk exposure (**M**)	FRR. 48 305(a) 4.a and IFRS B19 B
Qualitative Score: 14 points		**Qualitative Score: 14 points**	
Total VaR Score: 28 Points		Total Sen Score: 27 points	
Quantitative Index for Each Interest Rate, Foreign Exchange, Equity Price, and Other Commodity Price		**Quantitative Index for Each Interest Rate, Foreign Exchange, Equity Price, and Other Commodity Price**	
M and V denote mandatory (based on IFRS 7) and voluntary disclosure, respectively.			

Notes:

(1): A firm is scored as 1 if the histogram of daily VaR is disclosed or scored as 2 if both the histogram and probability plots are disclosed.

(2): A firm is scored as 1 if it changes the Sen format from percentage to basis points or vice versa, or is scored as 2 if both percentage and basis point formats are disclosed.

Table 1
Sample Selection and Distribution

Panel A: Sample Selection

Number of observation available for financial firms in S&P Capital IQ for the GCC	1,375
Less:	
Joint listed firms	(15)
Firms with unavailable annual report for disclosure items	(670)
Firms with missing values in control variables	(10)
Observations omitted due to using lagged regression	(127)
Total firm year observations	553

Panel B: Sample Distribution based on Country and Type of Firm

Country	**Bank**	**Financial**	**Insurance**	**Investment**	**Total**
Bahrain	44	0	12	12	68
Saudi Arabia	36	0	7	26	69
Kuwait	40	60	12	4	116
Oman	23	52	8	15	98
Qatar	31	8	20	7	66
United Arab Emirates	64	20	52	0	136
Total	238	140	111	64	553

Table 2
Descriptive Statistics

Variable	Mean	Std. Dev.	0.25	Medium	0.75
Investment (Under)	0.05	0.16	0.01	0.01	0.03
Investment (Over)	0.04	0.11	0.00	0.01	0.02
Residual (U&O)	-0.00	0.08	-0.04	-0.02	-0.00
Residual (Under)	-0.03	0.03	-0.05	-0.02	-0.01
Residual (Over)	0.10	0.10	0.02	0.06	0.16
|Residual (U&O)|	0.05	0.06	0.01	0.03	0.06
$MRD1_{t-1}$	7.61	3.76	5.00	7.50	10.00
$MRD2_{t-1}$	0.56	0.28	0.37	0.55	0.74
ROE_{t-1}	9.29	15.94	3.20	12.00	18.10
$Slack_{t-1}$	0.12	0.12	0.03	0.09	0.18
$Leverage_{t-1}$	0.65	0.30	0.47	0.70	0.85
$Size_{t-1}$	7.10	1.99	5.49	6.90	8.52
Age_{t-1}	2.98	0.76	2.56	3.26	3.50
Tab_{t-1}	0.36	0.48	0.00	0.00	1.00
$McapDev_{t-1}$	75.89	37.84	36.90	78.40	96.20
$Firm\_CG_{t-1}$	7.17	6.38	1.00	7.00	12.00
$Factor_{t-1}$	0.04	1.02	-0.94	-0.11	1.21

Variable definitions: Investment (under) and investment (over) are estimated following prior research by Biddle et al. (2009) and Chen et al. (2012). Firms are grouped into deciles based on firm' cash balance 0.1 (lowest) to 1 (highest), and leverage 1 (highest) to 0.1 (lowest). Thereafter, firms with less than the median decile value are denoted as an under-investment group [Investment (under)], while firms with more than the median decile value are denoted as the over-investment group [Investment (Over)]; Residual (U&O) [under-investment (U) and over-investment (O)] are estimated based on Eq. (4), firm years with negative residuals are considered as under investment firms (Residual (Under)) and firm years with positive residuals are considered as over investment firms (Residual (Over). MRD1 and MRD2 are proxies for the MRDs; ROE is net income after tax divided by total equity; Slack is measured as total cash divided by lagged total assets; Leverage is total short- and long-term liabilities divided by total assets; Size is the natural log of total assets; Age is calculated as the natural log of the difference between current year and the year of establishment of the firm; Tab is a dummy variable that takes a value of 1 if the firm discloses a tabular format, 0 otherwise; McapDev is market development measured as total stock market capitalization of each country divided by total GDP in year t; Firm_CG is the firm-level corporate governance score which comprises fifteen governance items all of which are equally weighted (Al-Hadi et al 2015; 2016). The factor value is derived from a principal component factor analysis of the country level governance structure comprising corruption (Kaufmann et al. 2009) and investor protection (La Porta et al. 2000) in each of the sample countries.

Table 3
Pearson Correlation Results

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
1. Investment (Under)	–													
2. Investment (Over)	-0.019	–												
3. Residual (U&O)	0.067*	0.46***	–											
4. $MRD1_{t-1}$	-0.05***	-0.11***	-0.23***	–										
5. $MRD2_{t-1}$	-0.17***	-0.108**	-0.23***	0.97***	–									
6. ROE_{t-1}	-0.15***	-0.07	-0.14***	0.03	0.03	–								
7. $Slack_{t-1}$	-0.01	0.02	-0.01	-0.11***	-0.10**	0.07*	–							
8. $Leverage_{t-1}$	-0.07*	0.016	-0.26***	0.28***	0.29***	0.03	0.048	–						
9. $Size_{t-1}$	-0.11***	-0.16***	-0.26***	0.50***	0.49***	0.13***	-0.06*	0.09**	–					
10. Age_{t-1}	-0.06	-0.01	-0.02	0.29***	0.28***	0.05	-0.25***	0.06*	0.22***	–				
11. Tab_{t-1}	0.13**	-0.005	-0.19***	0.36***	0.36***	0.13***	0.07*	0.23***	0.37***	0.12***	–			
12. $McapDev_{t-1}$	-0.19***	-0.06	-0.02	-0.02	-0.02	0.07*	0.11***	-0.09**	0.09**	0.03	-0.03	–		
13. $Firm\_CG_{t-1}$	0.012	0.034	0.08**	-0.01	-0.01	-0.09**	-0.04	-0.06*	-0.07*	-0.12***	-0.04	-0.06*	–	
14. $Factor_{t-1}$	0.09**	0.02	-0.02	-0.01	-0.02	-0.18***	-0.20***	-0.06	0.22***	0.20***	0.03	0.22***	-0.01	–

Notes: See Table 2 for variable definitions.
***, **, and * denote significance at the 1%, 5% and 10% levels, respectively (two-tailed).

Table 4
Regression Results

Panel A: Association between MRD1 and Investment Efficiency

	Model 1		**Model 2**		**Model 3**
	Under-Investment	Over-Investment	Under-Investment	Over-Investment	|Investment|
$MRD1_{t-1}$	-0.0048**	-0.0041**	-0.0008**	-0.0042*	-0.0021**
	(-2.03)	(-2.17)	(-1.98)	(-1.67)	(-2.12)
ROE_{t-1}	-0.0012*	-0.0017*	-0.0001***	-0.0005	-0.0002
	(-1.79)	(-1.69)	(-2.59)	(-1.12)	(-0.78)
$Slack_{t-1}$	0.2419	0.0624	0.0399***	-0.0285	-0.0213
	(1.26)	(0.73)	(3.06)	(-0.40)	(-0.68)
$Leverage_{t-1}$	-0.0897**	-0.0693	-0.0060	-0.1027**	-0.0249**
	(-2.40)	(-1.37)	(-1.53)	(-2.23)	(-2.02)
$Size_{t-1}$	-0.0122	0.0017	0.0018***	-0.0204***	-0.0036*
	(-1.18)	(0.31)	(3.16)	(-2.94)	(-1.88)
Age_{t-1}	0.0009	0.0006	0.0021	-0.0011	0.0053
	(0.95)	(1.55)	(1.33)	(-0.10)	(1.28)
Tab_{t-1}	-0.0000	0.0003	-0.0003***	0.0003	0.0003***
	(-0.19)	(1.21)	(-6.81)	(1.15)	(2.85)
$McapDev_{t-1}$	-0.0037	-0.0103	-0.0028	-0.0150	-0.0041
	(-0.13)	(-0.93)	(-1.29)	(-0.66)	(-0.75)
$Firm\_CG_{t-1}$	0.0031	0.0024**	-0.0138***	0.0023**	0.0386***
	(1.48)	(2.52)	(-3.69)	(2.01)	(4.49)
$Factor_{t-1}$	0.0304*	0.0108	-0.0037***	0.0343***	0.0117***
	(1.70)	(1.13)	(-2.72)	(3.46)	(2.86)
Constant	0.2021***	0.0771**	-0.0289*	0.2736***	0.0654***
	(3.40)	(2.35)	(-1.90)	(4.93)	(3.49)
Year FE	Yes	Yes	Yes	Yes	Yes
No. of Obs. (N)	213	340	423	130	553
No. of Firms	79	108	122	55	141
Adj. R^2	0.0983	0.1107	0.3292	0.2861	0.1355
F-Value	3.06	2.41	9.36	7.61	6.62
p-Value	0.000	0.004	0.000	0.000	0.000

Panel B: Association between MRD2 and Investment Efficiency

	Model 1		Model 2		Model 3
	Under-Investment	Over-Investment	Under-Investment	Over-Investment	|Investment|
$MRD2_{t-1}$	-0.0746**	-0.0491**	-0.0119**	-0.0348	-0.0242*
	(-2.04)	(-1.98)	(-2.31)	(-1.00)	(-1.85)
ROE_{t-1}	-0.0012*	-0.0017*	-0.0001***	-0.0005	-0.0002
	(-1.76)	(-1.67)	(-2.59)	(-1.03)	(-0.77)
$Slack_{t-1}$	0.2414	0.0668	0.0398***	-0.0228	-0.0205
	(1.26)	(0.78)	(3.05)	(-0.31)	(-0.65)
$Leverage_{t-1}$	-0.0902**	-0.0701	-0.0057	-0.1027**	-0.0245**
	(-2.41)	(-1.39)	(-1.46)	(-2.21)	(-2.00)
$Size_{t-1}$	-0.0112	0.0014	0.0018***	-0.0213***	-0.0038**
	(-1.04)	(0.27)	(3.26)	(-3.06)	(-2.02)
Age_{t-1}	0.0009	0.0006	0.0020	-0.0034	0.0048
	(0.96)	(1.46)	(1.32)	(-0.30)	(1.19)
Tab_{t-1}	-0.0000	0.0003	-0.0003***	0.0003	0.0003***
	(-0.14)	(1.20)	(-6.79)	(1.16)	(2.82)
$McapDev_{t-1}$	-0.0032	-0.0104	-0.0027	-0.0179	-0.0045
	(-0.12)	(-0.93)	(-1.24)	(-0.80)	(-0.83)
$Firm\_CG_{t-1}$	0.0030	0.0024**	-0.0136***	0.0023**	0.0384***
	(1.47)	(2.50)	(-3.64)	(2.02)	(4.48)
$Factor_{t-1}$	0.0296*	0.0115	-0.0037***	0.0356***	0.0120***
	(1.66)	(1.20)	(-2.73)	(3.59)	(2.91)
Constant	0.1995***	0.0762**	-0.0289*	0.2791***	0.0665***
	(3.35)	(2.33)	(-1.91)	(4.97)	(3.55)
Year FE	Yes	Yes	Yes	Yes	Yes
No. of Obs. (N)	213	340	423	130	553
No. of Firms	79	108	122	55	141
Adj. R^2	0.0997	0.1085	0.3308	0.2763	0.1338
F-value	2.76	2.37	15.18	4.50	6.62
p-value	0.0012	0.0048	0.0000	0.0000	0.0000

Notes: See Table 2 for variable definitions.
***, **, and * denote significance at the 1%, 5% and 10% levels, respectively (two-tailed) with t-values in brackets.

Table 5
Regression Results – Interaction Effects

	Model 1		Model 2		Model 3		Model 4	
	Under-Investment	Over-Investment	Under-Investment	Over-Investment	Under-Investment	Over-Investment	Under-Investment	Over-Investment
$MRD1_{t-1}$	0.0162	0.0099	0.0018	0.0215	-	-	-	-
	(1.52)	(1.34)	(1.55)	(1.60)	-	-	-	-
$MRD1_{t-1}$ *X* $Size_{t-1}$	-0.0026*	-0.0004	-0.0003**	-0.0031*	-	-	-	-
	(-1.79)	(-0.52)	(-2.13)	(-1.69)	-	-	-	-
$MRD1_{t-1}$ *X* ROE_{t-1}	-0.0001	-0.0004**	-0.0000	-0.0000	-	-	-	-
	(-0.47)	(-2.41)	(-0.45)	(-0.15)	-	-	-	-
$MRD2_{t-1}$	-	-	-	-	0.2354	0.1665	0.0235	0.2196
	-	-	-	-	(1.63)	(1.41)	(1.55)	(1.25)
$MRD2_{t-1}$ *X* $Size_{t-1}$	-	-	-	-	-0.0403*	-0.0132	-0.0035**	-0.0352
	-	-	-	-	(-1.95)	(-1.11)	(-2.08)	(-1.50)
$MRD2_{t-1}$ *X* ROE_{t-1}	-	-	-	-	-0.0012	-0.0024	-0.0003	0.0030
	-	-	-	-	(-0.46)	(-0.55)	(-0.83)	(0.85)
ROE_{t-1}	0.0003	0.0022	-0.0001	-0.0005	0.0003	-0.0001	-0.0001	-0.0019
	(0.17)	(1.46)	(-0.67)	(-0.27)	(0.17)	(-0.03)	(-0.44)	(-1.39)
$Slack_{t-1}$	0.0457	0.0093	0.0092	0.0626	0.0533	-0.0050	0.0091	0.0669
	(0.79)	(0.14)	(1.39)	(0.53)	(0.94)	(-0.07)	(1.41)	(0.59)
$Leverage_{t-1}$	-0.0763*	-0.0626	-0.0003	-0.0692	-0.0798*	-0.0456	-0.0001	-0.0561
	(-1.73)	(-1.29)	(-0.14)	(-1.33)	(-1.76)	(-0.90)	(-0.05)	(-1.08)
$Size_{t-1}$	0.0318*	0.0018	0.0021**	-0.0046	0.0366**	0.0046	0.0021**	-0.0089
	(1.87)	(0.22)	(2.08)	(-0.28)	(2.07)	(0.54)	(2.11)	(-0.55)
Age_{t-1}	-0.0001	0.0002	0.0004	-0.0325*	-0.0002	0.0003	0.0004	-0.0333**
	(-0.10)	(0.54)	(0.35)	(-1.96)	(-0.12)	(0.66)	(0.42)	(-2.09)
Tab_{t-1}	-0.0002	0.0008	-0.0004***	0.0015	-0.0002	0.0008	-0.0004***	0.0012
	(-0.49)	(0.90)	(-4.59)	(1.13)	(-0.53)	(0.88)	(-4.61)	(0.89)
$McapDev_{t-1}$	-0.0193**	-0.0090	0.0012	-0.0202	-0.0190**	-0.0097	0.0013	-0.0246
	(-2.07)	(-0.71)	(0.69)	(-0.85)	(-2.04)	(-0.75)	(0.71)	(-1.05)
$Firm\_CG_{t-1}$	-0.0042*	-0.0005	0.0008	-0.0024	-0.0042*	-0.0009	0.0010	-0.0017
	(-1.76)	(-0.50)	(0.25)	(-1.38)	(-1.80)	(-0.76)	(0.34)	(-0.93)
$Factor_{t-1}$	-0.0146	-0.0202	0.0120***	-0.0870	-0.0128	-0.0306	0.0122***	-0.0758
	(-0.48)	(-0.46)	(2.84)	(-1.64)	(-0.41)	(-0.70)	(2.90)	(-1.42)
Intercept	-0.0500	-0.0232	-0.0488***	0.2242	-0.0665	-0.0209	-0.0493***	0.2587*
	(-0.47)	(-0.21)	(-3.18)	(1.59)	(-0.60)	(-0.16)	(-3.22)	(1.85)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

No. of Obs. (N)	213	340	423	130	213	340	423	130
Adj. R^2	0.1355	0.2165	0.7356	0.5000	0.1447	0.1795	0.7376	14.64
F-value	2.51	2.04	76.48	17.49	3.06	2.07	78.02	5.14
p-value	0.0001	0.005	0.000	0.000	0.000	0.005	0.000	0.000

Notes: See Table 2 for variable definitions.

***, **, and * denote significance at the 1%, 5% and 10% levels, respectively (two-tailed) with t-values in brackets.

Table 6
Regression Results – Effect of the GFC

Panel A: Effect of the GFC on the association between MRD1 and Investment Efficiency

	Model 1				**Model 2**				**Model 3**	
	Under-Investment		Over-Investment		Under-Investment		Over-Investment		|Investment|	
	GFC=1	GFC=0	GFC=1	GFC=0	GFC=1	GFC=0	GFC=1	GFC=0	GFC=1	GFC=0
$MRD1_{t-1}$	-0.0059**	-0.0055	-0.0034	-0.0047**	0.0002	-0.0002	-0.0040	-0.0069*	-0.0019	-0.0023*
	(-2.03)	(-1.42)	(-1.18)	(-1.98)	(0.41)	(-0.31)	(-0.72)	(-1.72)	(-1.35)	(-1.86)
ROE_{t-1}	-0.0002	-0.0012	-0.0023	-0.0020*	-0.0002**	-0.0002*	0.0004	-0.0016*	0.0001	-0.0006
	(-0.46)	(-1.44)	(-1.16)	(-1.83)	(-2.02)	(-1.69)	(0.54)	(-1.75)	(0.44)	(-1.28)
$Slack_{t-1}$	0.3235	0.1009	0.1029	0.0095	0.0460***	0.0470*	-0.0214	0.1729	-0.0053	-0.0241
	(1.15)	(0.67)	(0.81)	(0.10)	(3.23)	(1.92)	(-0.21)	(0.86)	(-0.15)	(-0.68)
$Leverage_{t-1}$	-0.1209*	-0.0818	-0.0598	-0.0918	-0.0143**	-0.0014	-0.1016	-0.0253	-0.0364*	(-1.92)
	(-1.67)	(-1.63)	(-0.89)	(-1.29)	(-2.22)	(-0.21)	(-0.94)	(-2.15)	(-1.46)	-0.0364
$Size_{t-1}$	-0.0074	-0.0081	0.0005	0.0055	0.0018	0.0019*	-0.0150	-0.0244*	-0.0037	(-1.92)
	(-0.85)	(-0.49)	(0.06)	(0.70)	(1.59)	(1.93)	(-1.20)	(-1.73)	(-1.23)	-0.0051**
Age_{t-1}	0.0017***	-0.0000	0.0004	0.0010*	0.0001	0.0021	0.0021	0.0032	0.0081	(-2.18)
	(2.87)	(-0.01)	(0.46)	(1.86)	(0.04)	(0.84)	(0.15)	(0.12)	(1.29)	0.0029
Tab_{t-1}	-0.0001	0.0001	0.0003	0.0002	-0.0003***	-0.0002***	0.0005	-0.0001	0.0004**	(0.41)
	(-0.44)	(0.21)	(0.70)	(1.12)	(-5.39)	(-2.90)	(1.14)	(-0.16)	(2.48)	0.0002
$McapDev_{t-1}$	-0.0257*	0.0216	-0.0085	-0.0047	-0.0051	-0.0000	-0.0237	0.0204	-0.0084	(1.15)
	(-1.85)	(0.34)	(-0.50)	(-0.35)	(-1.37)	(-0.00)	(-0.58)	(0.40)	(-0.86)	-0.0032
$Firm\_CG_{t-1}$	0.0051	0.0009	0.0028*	0.0021*	-0.0235***	-0.0069	0.0068**	0.0014	0.0430***	(-0.35)
	(1.36)	(0.41)	(1.88)	(1.78)	(-3.92)	(-1.11)	(2.12)	(0.82)	(2.78)	0.0023***
$Factor_{t-1}$	0.0275	0.0333	0.0191	0.0007	-0.0048**	-0.0082***	0.0521**	0.0469**	0.0124**	(4.18)
	(1.09)	(1.35)	(1.06)	(0.07)	(-2.32)	(-3.79)	(2.65)	(2.21)	(2.43)	0.0154***
Constant	0.1491**	0.1895***	0.0847	0.0396	-0.0116	-0.0403***	0.2005*	0.0464*	0.1026***	(2.95)
	(2.18)	(2.98)	(1.53)	(1.14)	(-1.17)	(-3.32)	(1.92)	(3.69)	(1.77)	(3.64)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of Obs. (N)	111	102	166	174	208	215	67	63	275	278
No. of firms	67	63	96	100	116	120	42	44	141	140
Adj. R^2	0.1996	0.0001	0.1026	0.1346	0.3002	0.1621	0.2073	0.3457	0.1205	0.1710
F-value	3.49	1.53	2.71	3.46	9.07	6.54	2.93	4.24	3.74	5.11
p-value	0.000	0.095	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Panel B: Effect of the GFC on the association between MRD2 and Investment Efficiency

	Model 1				Model 2				Model 3	
	Under-Investment		Over-Investment		Under-Investment		Over-Investment		|Investment|	
	GFC=1	GFC=0	GFC=1	GFC=0	GFC=1	GFC=0	GFC=1	GFC=0	GFC=1	GFC=0
$MRD2_{t-1}$	-0.0783**	-0.0904	-0.0399	-0.0572*	0.0038	-0.0034	-0.0252	-0.0681	-0.0199	-0.0282*
	(-1.98)	(-1.27)	(-1.09)	(-1.77)	(0.52)	(-0.34)	(-0.34)	(-1.20)	(-1.07)	(-1.68)
ROE_{t-1}	-0.0002	-0.0012	-0.0023	-0.0020*	-0.0002**	-0.0002*	0.0004	-0.0014	0.0001	-0.0006
	(-0.43)	(-1.47)	(-1.18)	(-1.79)	(-2.02)	(-1.68)	(0.58)	(-1.61)	(0.43)	(-1.26)
$Slack_{t-1}$	0.3201	0.1036	0.1061	0.0155	0.0463***	0.0470*	-0.0159	0.2123	-0.0042	-0.0228
	(1.13)	(0.68)	(0.84)	(0.16)	(3.24)	(1.92)	(-0.15)	(1.07)	(-0.12)	(-0.64)
$Leverage_{t-1}$	-0.1183	-0.0826	-0.0596	-0.0935	-0.0145**	-0.0014	-0.0960	-0.1655**	-0.0246	-0.0363*
	(-1.64)	(-1.65)	(-0.88)	(-1.32)	(-2.24)	(-0.20)	(-0.90)	(-2.12)	(-1.41)	(-1.92)
$Size_{t-1}$	-0.0078	-0.0061	0.0003	0.0052	0.0018	0.0019*	-0.0162	-0.0281**	-0.0041	-0.0053**
	(-0.90)	(-0.32)	(0.04)	(0.67)	(1.59)	(1.97)	(-1.28)	(-2.10)	(-1.36)	(-2.27)
Age_{t-1}	0.0017***	-0.0000	0.0004	0.0009*	0.0001	0.0021	-0.0002	0.0001	0.0076	0.0026
	(2.81)	(-0.00)	(0.44)	(1.76)	(0.03)	(0.86)	(-0.02)	(0.00)	(1.22)	(0.37)
Tab_{t-1}	-0.0001	0.0001	0.0002	0.0002	-0.0003***	-0.0002***	0.0005	-0.0001	0.0004**	0.0002
	(-0.41)	(0.20)	(0.68)	(1.12)	(-5.43)	(-2.87)	(1.14)	(-0.26)	(2.41)	(1.17)
$McapDev_{t-1}$	-0.0259*	0.0214	-0.0086	-0.0049	-0.0052	0.0000	-0.0269	0.0104	-0.0091	-0.0035
	(-1.87)	(0.34)	(-0.50)	(-0.36)	(-1.41)	(0.01)	(-0.66)	(0.22)	(-0.92)	(-0.38)
$Firm\_CG_{t-1}$	0.0051	0.0009	0.0028*	0.0021*	-0.0236***	-0.0068	0.0069**	0.0014	0.0427***	0.0024***
	(1.35)	(0.41)	(1.87)	(1.75)	(-3.94)	(-1.09)	(2.12)	(0.86)	(2.76)	(4.13)
$Factor_{t-1}$	0.0279	0.0315	0.0197	0.0017	-0.0047**	-0.0083***	0.0535***	0.0516***	0.0129**	0.0155***
	(1.11)	(1.26)	(1.11)	(0.17)	(-2.31)	(-3.92)	(2.76)	(2.76)	(2.53)	(2.95)
Constant	0.1506**	0.1867***	0.0842	0.0388	-0.0115	-0.0404***	0.1975*	0.3958***	0.0471*	0.1024***
	(2.20)	(2.95)	(1.53)	(1.12)	(-1.16)	(-3.36)	(1.90)	(3.95)	(1.80)	(3.64)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of Obs. (N)	111	102	166	174	208	215	67	63	275	278
No. of firms	67	63	96	100	116	120	44	42	141	140
Adj. R^2	0.1989	0.0014	0.1010	0.1309	0.3006	0.1622	0.1984	0.3754	0.1182	0.1698
F-value	3.48	2.02	2.72	3.46	9.09	6.48	3.63	4.26	4.34	5.97
p-value	0.0000	0.0065	0.0032	0.0002	0.0000	0.0000	0.0006	0.0000	0.0000	0.0000

Notes: See Table 2 for variable definitions.

***, **, and * denote significance at the 1%, 5% and 10% levels, respectively (two-tailed) with t-values in brackets.

Table 7
Regression Results – 2SLS Regression Analysis

Explanatory Variable					
Panel A: First-Stage Regressions					
	Model-1		**Model-2**		**Model-3**
Instruments	Under-Investment	Over-Investment	Under-Investment	Over-Investment	|Investment|
MRD1_IND	0.9831***	0.9383***	0.7639***	0.9485**	0.8885***
	(10.69)	(14.32)	(7.73)	(9.31)	(15.71)
Unreported Control Variables Included in Regression					
All Variables in Main Specification	Yes	Yes	Yes	Yes	Yes
Year FX	Yes	Yes	Yes	Yes	Yes
N	215	341	423	130	553
Under Identification test					
Kleibergen-Paap rk LM statistic	77.962	63.7	54.346	55.569	173.691
P-value	0.0000	0.0000	0.0000	0.0000	0.0000
Weak Identification test					
Kleibergen-Paap rk Wald F statistic	114.351	165.256	59.704	86.603	246.816
Stock-Yogo (2005) critical value	16.38	16.38	16.38	16.38	16.38
Panel B: Second-Stage Regressions					
Explanatory Variable					
Potentially Endogenous Instrumented Variable					
MRD1	**-0.0168*** **	**-0.0154*** **	**-0.0041*** **	**-0.0113** **	**-0.0080*** **
	(-2.68)	**(-3.03)**	**(-3.39)**	**(-2.33)**	**(-4.54)**
Unreported Control Variables Included in Regression					
All Variables in Main Specification	Yes	Yes	Yes	Yes	Yes
Year FX	Yes	Yes	Yes	Yes	Yes
N	215	341	423	130	553
Hausman Test for the Effect MRD1 (Coefficient 2SLS = Coefficient OLS)					
Cluster-robust F-statistic	3.329	7.201	9.532	3.46	17.846
p-value	0.0681	0.0073	0.002	0.0629	0.000

Notes: See Table 2 for variable definitions.
***, **, and * denote significance at the 1%, 5% and 10% levels, respectively (two-tailed) with t-values in brackets.