An empirical analysis of the usefulness of the Basel II Pillar 3 disclosures on bank risk management to monitor bank performance and forecast bank profitability during periods of economic instability.

A thesis presented in partial fulfilment of the

requirements for the degree of

Master of Management

in

Banking

at Massey University, Manawatu,

New Zealand.

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2012

Abstract:

The third pillar of the Basel II capital adequacy framework requires banks to disclose risk information to the market to supplement regulators' monitoring. It is expected that this "allows market discipline to work earlier and more effectively" (BCBS, 1998, pp. 6). The expectation that the pillar 3 disclosures will lead to market discipline is supported in the theoretical literature but not demonstrated in the empirical literature. The purpose of this thesis is to determine if the information contained in banks' disclosures is useful to monitor bank performance and to explain bank profitability as this is a precondition for effective market disclosure. The usefulness of information in the pillar 3 disclosures was examined for twenty of the largest global banks from 2008 and 2009. It was found that pillar 3 disclosures are useful to analyse and monitor the performance of banks as the disclosures can be used to identify banks for which key risk metrics are inconsistent with other metrics. The pillar 3 variables did not however significantly improve the explanatory ability of earnings models over models containing only financial information, although this may be due to the small sample size. These results show that there is valuable information contained within pillar 3 disclosures which could be used by the market to provide market discipline as expected in the Basel II framework.

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1. Introduction

In June 2006 the Bank for International Settlements (BIS) published a set of standards for the measurement of bank capital called "International Convergence of Capital Measurement and Capital Standards: A Revised Framework" (hereafter referred to as Basel II). These standards were agreed between regulators belonging to the Basel Committee on Banking Supervision (BCBS). The goal of these rules is to "develop a framework that would further strengthen the soundness and stability of the international banking system while maintaining sufficient consistency that capital adequacy regulation will not be a significant source of competitive inequality among internationally active banks" (BCBS, 2006, pp. 2).

The Basel II capital standards seek to strengthen the soundness and stability of the banking system through three pillars. The first pillar sets a minimum ratio for capital relative to risk weighted assets and the method for calculating the minimum required capital ratio. The second pillar requires regulatory supervision of banks to ensure risks are prudently managed. The third pillar is the requirement for banks to disclose risk information to the market (including capital ratios) to enhance monitoring by regulators as it "allows market discipline to work earlier and more effectively" (BCBS, 1998, pp. 6).

The disclosure requirements in the third pillar of the Basel II accord (BCBS, 2006) provide a consistent set of principles and guidelines that regulators can use as the basis for bank disclosure requirements. The principles discussed include: encouraging market discipline by providing information to allow market participants to assess capital adequacy; consistency between the pillar 3 information and the information used for decision making by senior management and the board; and the use of discretion by management in determining the

information to be disclosed so that it includes all material risks (BCBS, 2006, pp. 225-228). Guidelines are provided for the qualitative and quantitative information required in the disclosures for the scope of application, capital and the risk exposure and assessment (BCBS, 2006, pp. 228-242). The risk exposure and assessment section covers the range of material risks for a bank and includes disclosures on policies and procedures, credit risk, market risk, operational risk, equity exposures and interest rate risk in the banking book. Of these risks the most important risk is credit risk, as most systemic banking crises have an element of credit risk (BCBS, 2004). The disclosures required for credit risk (shown in table 1, page 3) are therefore the focus of this thesis.

The Basel Committee on Banking Supervision states that it "believes that the rationale for Pillar 3 is sufficiently strong to warrant the introduction of disclosure requirements" (i.e. they think that market discipline is effective), although the evidence supporting this statement and the process by which market discipline occurs are not explained within the Basel II accord (BCBS, 2006, pp. 226). The theoretical literature supports this belief (for example Flannery, 2001; Mortlock, 2002; Llewellyn, 2005; and Stephanou, 2010), as it shows that disclosures are a key component for the market discipline to occur. The empirical literature does not however provide sufficient evidence to show that the belief of the Basel Committee on Banking Supervision is supported, as the literature does not provide evidence that all of the required components for effective market discipline exist.

Stephanou (2010) provides a framework for the market discipline process (see diagram 1, page 4), whereby information is analysed by market participants and used to change the market, which then changes the behaviour of the board and management. The necessary conditions for effective market discipline are therefore that: the disclosures are reliable; used by market participants to monitor the performance of the firm; market participants must change the market in

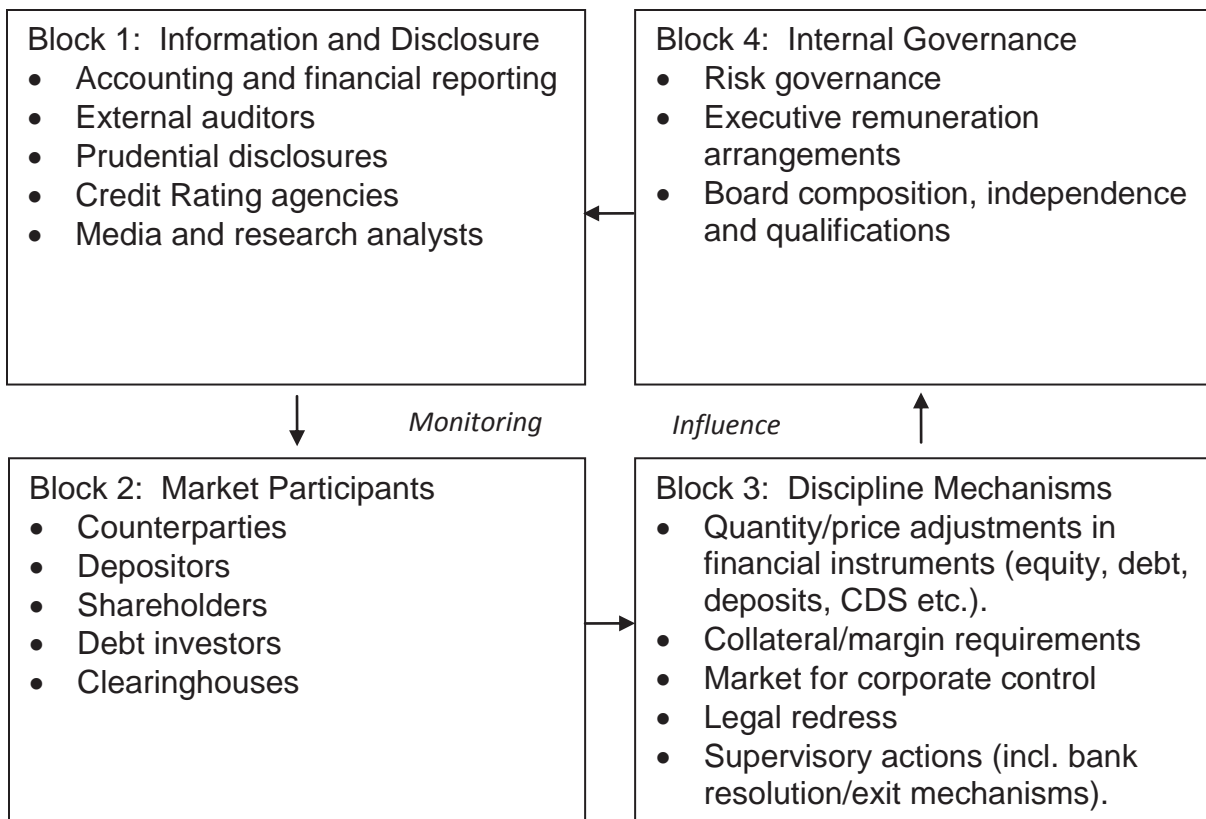*Table 1: General credit risk disclosure requirements from Basel II.*

Qualitative Disclosures	a)	The general qualitative disclosure requirement (paragraph 824) with respect to credit risk, including: • Definitions of past due and impaired (for accounting purposes); • Description of approaches followed for specific and general allowances and statistical methods; • Discussion of the bank's credit risk management policy; • For banks that have partly, but not fully adopted either the foundation IRB or the advanced IRB approach, a description of the nature of exposures within each portfolio that are subject to the 1) standardised, 2) foundation IRB, and 3) advanced IRB approaches and of management's plans and timing for migrating exposures to full implementation of the applicable approach.
Quantitative Disclosures	b)	Total gross credit risk exposures, plus average gross exposure over the period broken down by major types of credit exposure.
	c)	Geographic distribution of exposures, broken down in significant areas by major types of credit exposure.
	d)	Industry or counterparty type distribution of exposures, broken down by major types of credit exposure.
	e)	Residual contractual maturity breakdown of the whole portfolio, broken down by major types of credit exposure.
	f)	By major industry or counterparty type: • Amount of impaired loans and if available, past due loans, provided separately; • Specific and general allowances; and • Charges for specific allowances and charge-offs during the period.
	g)	Amount of impaired loans and, if available, past due loans provided separately broken down by significant geographic areas including, if practical, the amounts of specific and general allowances related to each geographical area.
	h)	Reconciliation of changes in the allowances for loan impairment.
	i)	For each portfolio, the amount of exposures (for IRB banks, drawn plus EAD on undrawn) subject to the 1) standardised, 2) foundation IRB, and 3) advanced IRB approaches.

This table is an excerpt from BCBS (2006), table 4, pp. 232-233.

response to the results of the monitoring; and the change in the market must influence the behaviour of the bank's management (Stephanou, 2010). For the effectiveness of market discipline to be demonstrated, all of these conditions therefore need to be supported by the empirical literature. The existing empirical literature provides evidence that disclosures are used by the market to monitor the firms and change the market for disclosures to price debt relative to the level of risk at issuance (Evanoff, Jagtiani and Nakata, 2011). The literature does not however demonstrate that disclosures are reliable, or that changes in the market influence the behaviour of the bank's management (Bliss and Flannery, 2002). The belief of the Basel Committee for Banking Supervision that there is a strong rationale for pillar 3 disclosures is therefore questionable. This thesis seeks to close this gap.

Diagram 1: The process by which market discipline occurs.

Block 1: Information and Disclosure	Block 4: Internal Governance
• Accounting and financial reporting • External auditors • Prudential disclosures • Credit Rating agencies • Media and research analysts	• Risk governance • Executive remuneration arrangements • Board composition, independence and qualifications

Monitoring   *Influence*

Block 2: Market Participants	Block 3: Discipline Mechanisms
• Counterparties • Depositors • Shareholders • Debt investors • Clearinghouses	• Quantity/price adjustments in financial instruments (equity, debt, deposits, CDS etc.). • Collateral/margin requirements • Market for corporate control • Legal redress • Supervisory actions (incl. bank resolution/exit mechanisms).

This diagram is from Stephanou (2010, pp. 6).

The standard approach in the empirical literature for examining market discipline assumes that the disclosure information is reliable and that management react to market prices. The effectiveness of market discipline is then demonstrated if the risk information from the disclosures is incorporated in market prices (e.g. equity or subordinated debt). This thesis takes an alternative approach to examine the effectiveness of market discipline, which avoids the need to assume that the disclosure information is reliable or that management react to market prices.

Disclosures are useful when they mitigate agency problems or reduce information asymmetry. For both of these roles the reliability of the information in the disclosures is important. The reliability of disclosures is examined by comparing key ratios from the pillar 3 disclosures with other ratios from the pillar 3 disclosures and financial statement information. These ratios are used to make qualitative comparisons of the relative risk of the banks in the sample. These comparisons of the relative risk of the banks contribute to the literature, by determining whether the pillar 3 disclosures contain information that can be used to assess the relative health of large banks.

The empirical literature shows that earnings can be an effective variable to use to assess the effectiveness of market discipline. Information on earnings is analysed by market participants, that information on earnings changes market prices and that management change their actions in response to earnings forecasts. The information in the pillar 3 disclosures will therefore lead to market discipline if it can be shown that the pillar 3 disclosures provide information on earnings forecasts that is not available in other disclosures. This thesis therefore examines whether the information from the pillar 3 disclosures improves earnings forecasts. This will contribute to the literature by providing a novel method for assessing the effectiveness of market discipline.

This thesis is divided into six chapters. The first chapter contains the introduction. The second chapter reviews the literature on disclosures, market discipline and bank earnings. The third chapter discusses the research methodology and the data used for this thesis. The fourth chapter provides the results of the analysis. The fifth chapter discusses the use of pillar 3 disclosures to analyse and monitor the performance of banks and to forecast earnings. The sixth and final chapter provides a conclusion.

2. Literature Review

The Basel Committee on Banking Supervision states in the Basel II accord that it "believes that the rationale for Pillar 3 is sufficiently strong to warrant the introduction of disclosure requirements" (BCBS, 2006, pp. 226), however they do not provide the supporting evidence for this rationale. In order to provide the supporting evidence for this rationale, the theoretical and empirical literature on the purpose of disclosures and their role in market discipline are reviewed. These literature strands provide the foundation for this thesis to determine whether the pillar 3 disclosures are useful and do meet the goal of the Basel Committee on Banking Supervision to allow "market discipline to work earlier and more effectively" (BCBS, 1998, pp. 6). Once the rationale for the pillar 3 disclosures is established, the literature which shows that earnings can be used to measure market discipline, and the literature on bank earnings are then reviewed to provide the justification for the method used in this thesis.

The literature chosen for inclusion in the literature review was selected for inclusion by the following criteria: the paper was written in English; from a peer reviewed journal or published by a reputable international organisation; is a foundation paper for the literature, provides a summary of the literature, represented a consensus view (with a high number of citations), provides an alternative perspective or provides information specific to the banking sector. The papers cited were identified through searches for key words (disclosure, market discipline, bank, earnings/profits) in Business Source Complete, Emerald, Google Scholar and Scopus. Further articles were also identified where they were referred to in the articles found in the databases. Searches were also conducted on the websites of key international bodies (Bank for International Settlements, International Monetary Fund, World Bank).

2.1   The Purpose of Disclosures

In order to understand the role that disclosures play in market discipline, it is necessary to first understand the purpose of disclosures and the reasons why disclosures exist. In this section the reasons for disclosures to exist are reviewed to understand why the BCBS recommend that all banks are required to provide pillar 3 disclosures.

The theoretical literature shows that disclosures exist to reduce information asymmetry and agency problems (Healy and Palepu, 2001; Beyer, Cohen, Lys, Walther, 2010). Information asymmetry occurs in all firms, as those involved in the management of the firm have more information than those outside the firm. This means that investors have less information than employees to distinguish between good and bad investments and correctly value the firm (Healy, and Palepu, 2001). Whilst it has been suggested that the difficulties with valuing bank assets mean that information asymmetry is greater for banks than for other firms (Flannery, 1998), however Flannery, Kwan and Nimalendran (2004) did not find evidence of this. Bank disclosures are therefore similar to all other disclosures, and are useful to the market to reduce the information asymmetry and allow efficient allocation of capital.

The effects of information asymmetry can be seen in the reactions of the market to reductions in information asymmetry. Ball and Shivakumar (2008) and Beyer, Cohen, Lys, and Walther (2010) both show that voluntary disclosures of management and analyst forecasts have a greater effect on the market than regulatory disclosures. Healy and Palepu (2001) and Poshakwale and Courtis (2005) both show that voluntary disclosures reduce the cost of capital for firms. Studies of the correlation between disclosure information and market prices also show that the market uses disclosure information (Beaver, Eger, Ryan and Wolfson, 1989; Blose, 2001; and Ahmed, Beatty and Bettinghaus, 2004).

Despite the benefits to investors from disclosures, investors cannot rely on voluntary disclosures to reduce information asymmetry. Darrough (1993) shows that voluntary disclosures only occur where the information provides no value to competitors, where the benefits outweigh the costs (such as providing positive signals about future earnings) or when non-disclosure is perceived negatively. Regulatory disclosures are therefore useful to the market to confirm the accuracy of voluntary disclosures such as management forecasts; and to ensure that competitive pressures, costs and the potential for information to be perceived negatively do not result in a suboptimal level of disclosures. The importance of complete disclosures is demonstrated by the findings of Flannery (1998), who finds that in the absence of adequate information, investors react to negative announcements by assuming that banks with similar characteristics will have similar problems. It is therefore necessary for the pillar 3 disclosures to be required by regulators to ensure a socially optimal level of disclosure.

Agency problems occur when managers of the firm have the ability to take actions that are not in the best interests of the providers of equity or debt, such as understating provisions to gain bonuses or excessive increases in salaries (Healy and Palepu, 2001). Disclosures on the financial position and risks faced by firms allow investors to monitor their investment, to ensure agency problems do not negatively affect the value of their investment (Verrecchia, 2001). Agency problems can mean that there are incentives for inaccurate or unreliable disclosures, such as management earnings forecasts, as management may provide inaccurate disclosures to benefit themselves (Gigler and Hemmer, 1998). Disclosures are therefore useful to the market if they contain meaningful and accurate information which allows investors to monitor the actions of management.

Agency problems can mean that the information in disclosures is inaccurate or misleading. This is particularly a problem for banks, as the literature demonstrates that banks manipulate earnings (Shen and Chih, 2005; Perez, Salas-Fumas and Saurina, 2008) and that impaired assets and provisions can be inaccurate during periods of economic stress (Beaver, Eger, Ryan and Wolfson, 1989; Lindgren, Balino, Enoch, Gulde, Quintyn, and Teo, 1999; and Arena, 2008). Perols and Lougee (2011) also show that disclosures are more likely to be fraudulent when there is earnings manipulation. These problems are mitigated through disclosures to the stock market (for listed firms), the requirement for the board to sign off on the disclosures and independent audits of the accuracy of the information in the disclosures (Healy and Palepu, 2001), however these actions are not always effective in preventing problems. The pillar 3 disclosures are therefore required by BCBS to reduce information asymmetry, allow the market to monitor the actions of management and assess whether the information provided is accurate and meaningful. This thesis will therefore use the pillar 3 disclosures to assess the accuracy of information disclosed on earnings, provisions and impaired assets.

2.2 The Process of Market Discipline in Banks

The Basel Committee on Banking Supervision does not define market discipline or outline the process by which they expect market discipline to work within the Basel II accord. In this section a definition is given for market discipline and the process for effective market discipline is outlined.

The literature on market discipline generally assumes that the concept of market discipline is understood so does not give a definition for market discipline and instead outlines the process by which market discipline occurs. The literature describes the market discipline process in similar ways although different papers emphasize different components of market discipline. Flannery (2001), Llewellyn

(2005), McIntyre, Tripe and Zhuang (2009) and Stephanou (2010) all provide similar descriptions for the market discipline process. This thesis will use the framework developed from the literature by Stephanou (2010), as it highlights the importance of the reliability of the disclosures and the response to changes in the market, which are not emphasised in other descriptions of the market discipline process (see diagram 1, page 4). I will use a definition for market discipline based on Stephanou's (2010) framework that:

> Market discipline is the negative impacts on a bank's operations
> that are generated in response to excessive risk taking that either
> change the actions of the bank's management or board or cause
> the avoidance of actions by the bank's management or board.

This definition is broader than the definitions implied in the literature, as it includes the actions that a bank's management or board take in order to avoid negative impacts. It is however more difficult to test the effectiveness of market discipline using this definition, as it is difficult to assess the actions taken or avoided by a bank's management or board. This thesis will therefore need to show that management and the board change their actions in order to demonstrate that the pillar 3 disclosures are effective to provide market discipline.

For market discipline to be effective, all of the components of Stephanou's (2010) framework need to function as expected. In the previous section on disclosures it was shown that information asymmetry and agency problems can and do lead to inaccurate or misleading bank disclosures, so the first component of the framework may not work. The pillar 3 disclosures may therefore not result in market discipline as expected by the BCBS if the disclosures are inaccurate or unreliable. The BCBS also state that the pillar 3 disclosures will "not be required to be audited by an external auditor" as "management should ensure that appropriate verification of the information takes place" (BCBS, 2006, pp. 241), which may increase the likelihood of inaccuracies in the disclosures. This means that for this thesis the accuracy of the pillar 3 disclosures must be verified where

possible and the information in the disclosures treated with caution where it is unable to be verified.

The second component of Stephanou's (2010) framework is the existence of market participants with incentives to analyse and monitor bank's performance. The literature shows that market participants do analyse and monitor the performance of banks. Beyer, Cohen, Lys and Walther (2010) find that the main causes of quarterly share price variation are financial announcements (28.4%) and management earnings forecasts (15.7%), which shows that investors change the market in response to disclosures. They also provide evidence for the importance of analysts as delegated monitors to supplement management forecasts, as a further 6.1% of quarterly share price variation is from analyst earnings forecasts.   Some of the literature however suggests that information is not correctly analysed by the market. Sloan (1996) finds that information in cash flows and accruals about future earnings is not fully reflected in stock prices until it impacts current earnings and Chiang and Mensah (2010) find that "in general, investors do not correctly anticipate future losses" (pp. 17). Beaver, Eger, Ryan and Wolfson (1989) show that supplemental disclosures explain differences between book values and market values, which implies that the market is analysing and utilising this information. Banks are also monitored by other banks and institutional depositors (Shin, 2009; and Hannan and Hanweck, 1988). The volatility seen in financial markets when bank supervisors release the results of bank stress tests also indicates that this data was used by the market. As the literature shows that disclosures are analysed and monitored by the market, this thesis will assume that market participants will use the pillar 3 disclosures to monitor and analyse bank performance. Confirmation that the pillar 3 disclosures are used by market participants is an avenue for future research, provided that it can be shown that the disclosures contain useful information.

The third component of Stephanou's (2010) framework is the existence of financial, legal and regulatory mechanisms which enable market participants to change the markets. The importance of regulatory structures for market discipline is shown by Goldberg and Hudgins (2002) and Flannery and Sorescu (1996), who both find that guarantees reduce the sensitivity of the market to increases in risk. Market disclosure can also be ineffective at constraining risk taking due to the inability of the market to understand the risks, explicit or implicit government guarantees (Avgouleas, 2009) and disaster myopia (Guttentag and Herring, 1986), however mitigating these problems is the responsibility of regulators (Clark, 2004) so systemic risks are not assessed in this thesis.

Mortlock (2002) lists the main financial channels by which market discipline can occur as: changes in the cost of funds because of a change in the bank specific risk premium; the costs for the bank to raise and service capital; and the risk of liquidity problems if the market loses confidence about the banks continuing solvency. The change in the cost of funds for deposits or subordinated debt is the most common channel assessed in the market discipline literature. The cost of funds is expected to lead to market discipline through its impact on earnings, however the literature is mixed on the link between changes in risk and changes in the cost of funds for banks. Goldberg and Hudgins (2002) and Hannan and Hanweck (1988) find evidence that changes occur in the volume or margin for large uninsured deposits as risk increases, while Shin (2009) and Wilson, Rose and Pinfold (2004) find no significant evidence of changes in volume or margin for retail deposits. For subordinated debt the evidence is also mixed, as studies by Morgan and Stiroh (2001) and Sironi (2003) demonstrate that new debt issues are sensitive to risk, but the secondary market is not (Flannery and Sorescu, 1996). Whilst large uninsured deposits and new issues of subordinated debt are sensitive to risk, they are not ideal for use in market discipline as banks can replace large uninsured deposits with retail deposits (Shin, 2009) and not all banks issue subordinated debt (Evanoff, Jagtiani and Nakata, 2011). These drawbacks mean that deposits and subordinated debt are not considered to be a

reliable channel to assess the effectiveness of market discipline, so they will not be used in this thesis.

There are a number of ways in which the cost of capital for a bank can be a channel for market discipline. The cost to raise new capital is not currently considered to be an effective channel for market discipline due to the infrequency with which banks raise capital (Evanoff, Jagtiani and Nakata, 2011). Avoidance of the need to raise capital in a stressed situation is an effective channel however this is not a useful channel to assess the effectiveness of market discipline, as it is difficult to measure the actions that may be taken to avoid this situation (Bliss and Flannery, 2002). The effectiveness of the cost of capital as a channel for market discipline can also be measured through credit default swaps or share market prices. Both of these measures are effective channels for market discipline, as market participants can change these markets (Evanoff, Jagtiani and Nakata, 2011; Kothari, 2001). Share prices are an ineffective channel for privately owned banks as they do not participate in the share markets, however as most large banks are publicly listed this channel is effective for large banks (Flannery, 1998). As credit default swaps are sensitive to default risk but not earnings risk, they are not as useful to the market as share prices. Credit default swap holders may also be protected against losses where a bank is too big to fail (Stephanou, 2010). This thesis will therefore focus on share market prices as the channel through which market discipline operates.

Liquidity problems do allow effective market discipline as banks face a rapid withdrawal of funds where the solvency of the bank is questionable (Mortlock, 2002), however the risk of liquidity problems is not a good channel to assess market discipline. There are two reasons for this. Liquidity risks are mitigated by central banks functioning as lenders of last resort, which decreases the sensitivity of banks to the risk of liquidity problems. The avoidance of liquidity problems (i.e. the level of excess liquidity) can also be difficult to meaningfully assess from

outside the bank, as the level of liquidity can change rapidly and liquidity may be held for other reasons (e.g. repaying subordinated debt or funding new lending). Liquidity problems will therefore not be used to assess the effectiveness of market discipline in this thesis.

The final requirement in Stephanou's (2010) framework for market discipline of incentives for the board and management to be responsive to changes in the market is the requirement least studied in the literature. The literature provides evidence that management are responsive to market signals for share prices, as management respond to share prices because of incentives (Mortlock, 2002) and senior management are concerned about the impact of adverse earnings on the share price (Graham, Harvey and Rajgopal, 2005). The literature also shows that management are not responsive to bond prices (Bliss and Flannery, 2002). The literature does not examine management responsiveness to other commonly used measures of market discipline such as credit default swap prices, deposit rates or volumes or subordinated debt prices, which may be because it is difficult for outsiders to determine whether the decisions of the board and management are influenced by these measures (Bliss and Flannery, 2002). For this thesis share prices will therefore be used to assess the effectiveness of the pillar 3 disclosures to allow market discipline, as the theoretical evidence of Mortlock (2002) and Graham, Harvey and Rajgopal (2005) together show that management are concerned about the impact of earnings on the share price because of their incentives.

2.3   Earnings as a Measure of Market Discipline

Share prices are an effective channel for market discipline as market participants can change share market prices, and management are responsive to changes in the share price (Mortlock, 2002 and Graham, Harvey and Rajgopal, 2005). It can however be difficult to assess the impact of market discipline on individual firms,

as it is difficult to separate the impact on share prices of firm specific, industry specific and general market factors. To avoid the impact of industry and general market factors, this thesis will use earnings, as it is the key firm specific driver of changes to share market prices. To show that future earnings are a valid measure of market discipline this section will provide evidence that earnings explain a large proportion of share market prices and that future earnings are more useful than current earnings. The literature on bank earnings will also be reviewed to provide a foundation for the research methodology for this thesis.

The link between disclosures, earnings, firm valuation and share market prices is examined in the value-relevance strand accounting literature (Holthausen and Watts, 2001).The consensus from the value-relevance literature is that earnings explain a large proportion of share price variation (see Kothari ,2001 for a summary). There is evidence that with changes in accounting standards the importance of earnings to explain share prices is declining in favour of book values (Bandyopadhyay, Chen, Huang, and Jha, 2010) however as one of the causes of this is increases in negative earnings (Collins, Maydew and Weiss, 1997), earnings remain important in firm valuation.

The three models which underlie most of the value-relevance research are the residual income model, dividend discount model and capital asset pricing model (Kothari, 2001), however only the residual income model explicitly incorporates earnings. The residual income model (Ohlson, 1995) states that:

$$SHP = BKE - rFBK + ERN$$

Where SHP = the current share price, BKE = the current book value of equity, ERN is the present value of expected future earnings, r is the risk adjusted return on equity required by investors and FBK is the expected future book value.   The empirical literature provides evidence that this model is preferable to the alternative models which exclude earnings. Jiang and Lee (2005) show that it

has better explanatory power for bank stock price volatility than the dividend discount model. Bettman (2007) provides evidence that the model is correctly specified as she shows that forecast earnings are more useful for explaining stock prices than current earnings. Holthausen and Watts (2001) caution that the residual income model excludes important information which may account for the market value of equity and may require assumptions that are not valid such as costless information, however the exclusion of these factors is not considered to materially affect the share price. The literature therefore shows that earnings are effective as a measure of market discipline, as the share price depends on the expected value of future earnings.

The importance of earnings for banks to the market is also supported within the banking literature. Marinkovic (2009) derives a theoretical model which shows that bank solvency relies on profitability:

$$\Delta ASS - \Delta LIA = PRO(1 - DPR)$$

Where ASS = total assets, LIA = total liabilities, PRO = Profits and DPR = the dividend pay-out ratio. This model is supported empirically by Gopalan (2010), who showed that earnings deteriorations are the earliest indicator of bank failure. This shows that monitoring of the profitability of banks is important as it is an indicator of potential insolvency problems. Stephanou (2010) shows that the market prices of equity and credit default swaps are more sensitive to reported declines in earnings than debt instruments, which shows that the market monitors earnings and changes the market in response to changes in earnings.

Moral hazard is given as a reason not to use earnings as a measure of market discipline as it may cause a misalignment of the interests of shareholders, bondholders and regulators, however Park and Peristiani (2007) found that this misalignment only occurs for the riskiest of banks. Earnings will therefore be used as a measure of market discipline in this thesis as market discipline is

expected to operate before banks become highly risky. A further drawback in using earnings to measure market discipline for banks is the propensity of banks to smooth their earnings through adjustments to provisions for loan losses (Robb, 1998; Graham, Harvey and Rajgopal, 2005; Shen and Chih, 2005; Liu and Ryan, 2006; and Anandarajan, Hasan, McCarthy, 2007). This thesis will therefore assess the accuracy of loan loss provisions to ensure that the forecasts of earnings for banks are reliable.

2.4   Bank Earnings

Earnings have been shown to meet three of Stephanou's (2010) four components for market discipline, as it has been shown that earnings are analysed by market participants, market participants change share prices in response to analysis of earnings information and the board and management react to changes in share prices. The goal of the BCBS (2006) to allow market discipline to occur through the publication of the pillar 3 disclosures can therefore be assessed by determining whether the information in the disclosures provides useful information on earnings. To identify the key information on earnings from the disclosures, the literature on bank earnings and the key drivers of profitability are reviewed. The literature on bank insolvency is also reviewed to ensure that all variables relevant to bank performance (including ongoing solvency) are captured. As the literature on future earnings for banks is limited, it is supplemented by the accounting literature on firm profitability.

Christian, Moffitt and Suberly (2008) provide the only bank specific paper found which examines the usefulness of disclosure information in explaining future earnings. Their study shows that earnings are statistically significant (at a 1% level) in explaining both share market returns and future earnings, however as their study does not report the explanatory power or model coefficients, the completeness and economic significance of the models used cannot be

assessed. The results of their study show that earnings components (net operating income, net interest income, the size of the loan loss allowance, the provision charge for loan losses) are statistically significant (at a 1% level), so should be included in the models used in this thesis for future earnings. They also showed that the net interest margin, the ratio of net operating income to average assets, the efficiency ratio, the change in total assets and the amount of tier 1 capital are statistically significant in an earnings forecasting model (at a 1% or 5% level). This thesis will therefore assess the usefulness of measures of the growth rate, asset quality, efficiency and capital levels.

The remainder of the literature on bank profitability examines the determinants of bank profitability without examining the usefulness of the information to assess future performance. Factors examined in these papers include the sources of a bank's income, competition and the macroeconomic environment. Bourke (1989) and Molyneux and Thornton (1992) both find that the level of competition is an important determinant of profitability, however Vennet (2002) finds that the measured effect of competition is the result of operational efficiency rather than a lack of competition. Stiroh (2004) examines the relative contributions of interest and non-interest income and finds that "greater reliance on noninterest income, particularly trading revenue, is associated with lower risk-adjusted profits and higher risk" (pp. 853). The findings of Lepetit, Nys, Rous and Tarazi (2008) contradict this, as they find that non-interest income leads to higher risk for small banks earning fee and commission income rather than trading income. It is therefore important for this thesis that interest income is separated from non-interest income to be able to assess the relative importance of these two sources of income. Athanasoglou, Brissimis, and Delis (2008) examine a more complete model than most studies, as they included macroeconomic, industry and bank specific factors in their model rather than just bank specific factors. They find that the macroeconomic and industry factors explain bank profitability, as economic output above its trend, inflation and industry concentration contribute to their

model. Differences in the macroeconomic environment and industry factors therefore need to be controlled for in this thesis.

As the literature on forecasting bank earnings is limited, the literature on bank insolvency will be used to ensure that ongoing solvency as well as profitability is captured within the earnings models. As was seen in the previous section of this chapter, earnings are a key driver of solvency (Marinkovic, 2009), so the literature on insolvency provides information relevant to assessing earnings. Similar to the literature on bank profitability, macroeconomic factors are important for solvency, with inflation, growth and interest rates (Demirguc-Kunt and Detragiache, 1998), asset price inflation (BCBS (2004), exchange rates, GDP growth rates and banking system liquidity (Arena, 2008) are all important in bank insolvency. Structural and regulatory factors are also important, with deposit insurance and law enforcement both statistically significant (Demirguc-Kunt and Detragiache, 1998, and Hutchison and McDill, 1999). As noted earlier in this chapter, market discipline relies on law enforcement mechanisms, so bank failures are more likely to occur where market discipline is weakened though poor quality disclosures. This thesis therefore needs to include an assessment of the quality of the disclosures and allow for macroeconomic, structural and regulatory differences.

Bank specific factors are also important in determining which banks fail within a given set of macroeconomic, regulatory and structural factors. Sinkey (1975) finds differences between banks that failed and banks that did not fail for key income statement variables. The differences are statistically significant for operating expenses to operating income, provisions to operating expenses and the proportion of revenue for expenses other than interest paid on deposits. Interest income and the net interest margin are also statistically significant in other studies (Canbas, Cabuk, Kilic, 2005; and Arena, 2008). Earnings, or lack thereof, are also a key indicator of insolvency, as Gopalan (2010) finds that

earnings deteriorations are the earliest warning sign of bank failure, occurring on average fourteen quarters prior to the bank failing. Deteriorations in earnings for banks are often caused by increases in impaired assets and provisions, as provisions are a key component of earning. Arena (2008) finds that increases in impaired assets and provisions are significant drivers of bank failure, with poor disclosure standards given as a rationale for impaired assets not being found to be significant in some countries. The importance of impaired assets is also supported by Jesswein (2009), who finds that the 'Texas Ratio' of impaired assets relative to capital, is indicative of bank failure. Variables which indicate increases in impaired assets such as loan arrears and uncollected income are also significant (Schaeck, 2008). The level of capitalisation is important in determining bank failure (Canbas, Cabuk, Kilic, 2005; and Gopalan, 2010), however this is contradicted by the findings of the BCBS (2004) and Schaeck (2008), who find that the level of capitalisation is indicative of the size of the loss rather than the likelihood of failure. The insolvency literature shows that similar variables are important in bank solvency as in bank earnings, with the split between interest and non-interest income, the net interest margin and operating efficiency are important within both strands of the literature. It adds to the earnings literature by suggesting that loan arrears, impaired assets and provisions are also important in assessing bank performance.

The value relevance strand of the accounting literature assesses the usefulness of accounting disclosures to forecast earnings or cash flows, or explain stock prices or investment returns (Holthausen and Watts, 2001; and Richardson, Tuna and Wysocki, 2010). The key findings from the literature that are relevant to this thesis are that earnings forecasts are improved by disaggregating earnings totals (for example Arthur, Cheng and Czernkowski, 2010) and that the usefulness of the disclosures depends on the distance into the future of the forecast (for example Lev, Li and Sougiannis, 2010). This provides the basis for the method used in this thesis to disaggregate the earnings totals. As it is not possible to

allow for different forecast periods in this thesis, this is an area for further research. As most of this literature uses ordinary least squares regressions to assess the relevance of the accounting disclosures, this thesis will also assess the relevance of the pillar three disclosures using ordinary least squares regressions.

2.5   Summary of the Literature Review

Disclosures are needed to reduce the information asymmetry between management and investors, so that investors are able to accurately estimate the value of the firm and efficiently allocate capital between investments. As voluntary disclosures are only made by firms when it is to their advantage, regulatory disclosures are preferred as it ensures that firms disclose negative information to the market. Regulatory disclosures also confirm the accuracy of voluntary disclosures, reducing agency problems. The criteria for determining whether the pillar 3 disclosures are useful is therefore whether they provide reliable information that can be used to mitigate agency problems, or that allows investors to estimate the value of the firm to reduce information asymmetry.

In order for market discipline to be effective, it requires disclosures to the market of relevant information (which is ensured by regulation); market participants with incentives to analyse and monitor the banks performance; financial, legal or regulatory mechanisms for discipline to occur; and incentives for management and the board to be responsive to market discipline (Stephanou, 2010). All of these criteria need to be met for market discipline to occur. As the literature shows that market participants monitor earnings, change the market in response to changes in earnings and management are responsive to the market, this thesis will examine the information in the pillar 3 disclosures to determine whether there

is useful information in the pillar 3 disclosures about earnings that would meant that market participants would spend the time necessary to use this information.

The next chapter combines the literature on market discipline and the roles of disclosures to construct a methodology for this thesis. In this chapter it was shown that one of the roles for disclosures is to mitigate any agency problems by confirming that other disclosures and management forecasts are correct. As the impaired assets, provision and earnings totals have been shown to be either understated or manipulated by banks, the reliability of these totals for individual banks is explored through qualitative comparisons with peer banks. Disclosures also play a role in reducing information asymmetry by providing investors with information to make investment decisions. As earnings have been shown to be important to the market, this thesis will determine whether the pillar 3 disclosures include information on bank risks which can be used to improve the ability of investors to forecast bank earnings. The variables used in the model for future earnings will be the variables found in the literature to be important to assess profitability or insolvency.

3. Research Methodology

This chapter utilises the findings of the literature review to construct a method which can be used to determine the usefulness of pillar 3 disclosures. There are two parts to the research method, the first part is a qualitative analysis of the usefulness of the pillar 3 disclosures to monitor and analyse bank performance while the second part is a quantitative analysis of the usefulness of disclosures in explaining variations in future earnings.

3.1 Qualitative Analysis – Comparisons of the Performance of Banks

Pillar 3 disclosures are useful to the market if they allow investors to reduce information asymmetry and efficiently allocate capital between firms. They are also useful to investors if they can be used to confirm the validity of other disclosures, particularly for impaired assets and provisions as it has been shown that banks manage their earnings using discretionary provisions and as some banks will understate their impaired assets or provisions when their performance deteriorates. Both of these uses of disclosures can be assessed by comparing the ratios of key metrics between banks as this will show which banks to invest in to receive the highest risk adjusted return. Comparisons of key metrics between banks will also show any banks for which key ratios are abnormal relative to their peers, which may be an indicator that the disclosures are not credible.

One of the key determinants of profitability in banks is the level of risk accepted by the bank to gain the achieved level of profitability. This trade off can be analysed using pillar 3 disclosures as the level of risk weighted assets measures the amount of risk that the bank has accepted relative to the profitability, with banks with higher risks expected to generate higher returns. In the pillar 3

disclosure the level of risk for the bank can be measured using the risk weighted assets, so risk weighted assets will be graphed against earnings to determine which banks provide the best risk adjusted returns.

Pillar 3 disclosure can also be used to assess the level of risk relative to return for the key activity of banks, credit intermediation. The level of risk associated with lending at each bank can be measured in the pillar 3 disclosures using credit risk weighted assets or the collective provisions. Credit risk weighted assets are calculated to measure unexpected losses in the lending book while the collective provision balance is held against expected losses, so both provide assessments of the level of risk for lending. The credit risk weighted assets and collective provision balance will both be graphed against net interest income, with higher risk lending expected to generate a higher level of net interest income.

Disclosures are also useful to the market to determine the reliability of the data in accounting disclosures. The literature review shows that banks manipulate provisions to smooth earnings through business cycles. It also shows that banks under pressure may delay the recognition of impaired assets and the requirement to raise appropriate individual provisions. Three different measures of the reliability of the impaired assets and provisions data will be used. The reliability of information on impaired assets will be compared to the level of individual provisions, with higher levels of provisions expected for banks with higher levels of impaired assets. The level of collective provisions will be compared with the credit risk weighted assets and the level of individual provisions one year into the future. The level of collective provisions should be proportional to credit risk weighted assets as both measure the amount of credit risk inherent in the lending assets. The collective provision balance should also be proportional to the level of individual provisions one year into the future as collective provisions are held against losses expected in the future.

The literature review also showed that the Texas Ratio ("the bank's non-performing assets (non-performing loans plus other real estate owned) by the sum of its tangible equity capital and loan loss reserves" (pp. 66, Jesswein, 2009)) can be used as an indicator of insolvency as banks that fail have a higher Texas Ratio. The Texas Ratio used by Jesswein (2009) was based on data from the United States of America so uses slightly different terminology from that used in the pillar 3 disclosures, for this thesis impaired assets will be used for non-performing loans, tier 1 capital (as per the definition in Basel II) will be used for tangible equity capital and the provision balance will be used for the loan loss reserves. The definition for impaired assets varies between countries, with loans ninety days past due included in some countries but not others (due to differences in interpreting definition of impairment from the IAS 39 i.e. whether loans ninety days past due lead to impairment losses). For the first version of the Texas Ratio, loans ninety days past due will be excluded (where not included in the impaired assets total) to examine the difference that excluding the ninety days past due makes.

As the pillar 3 disclosures contain further useful data a second version which uses this data will also be examined. The literature shows that loans more than ninety days past due in their scheduled payments (a standard industry measure of customers in distress) and uncollected income (which can be caused by restructured assets) are useful as an indicator of increases in impaired assets (Schaeck, 2008), so these will be included in the numerator. As noted above loans ninety days past due are not included in the total for impaired assets in some countries. It is considered important to include ninety days past due and restructured loans in the numerator as high levels of ninety days past due can result from a bank delaying recognition of impaired assets, and restructured loans are much more likely to default than other unimpaired assets and can be used to reduce high levels of impaired assets. This also aligns with the definition for non-performing loans used by Jesswein (2009) which includes the ninety days past due loans. The Texas ratio will be calculated for each bank with a ratio above

0.4547 used as an indicator of problems (as Jesswein (2009) found that this was the mean ratio for banks four quarters prior to failure (compared with 0.0885 for banks that did not fail). A higher ratio higher than 45% will be indicative of potential insolvency problems in the future.

3.2   Quantitative Analysis – A Model for Future Earnings

The second use of disclosures identified in the literature is in the valuation of the banks, which relies on the future earnings potential of the bank. It is expected that the information on the level of risk for the bank from the pillar 3 disclosures will provide an improvement in the explanatory ability of models for future earnings relative to models based on accounting disclosures.

3.2.1 Model Specification

To provide a base line against which the incremental value of the information in the pillar 3 disclosures for future earnings can be assessed, the explanatory ability of a model based on accounting variables will be determined. This method is similar to that followed by Sloan (1996) and Arthur, Cheng and Czernkowski (2010), who both examined the usefulness of different income statement components for forecasting earnings. A more complicated model is not used due to the small size of the dataset.

Following Sloan (1996) and Arthur et al. (2010) the first step is to determine the persistence in the level of earnings between time periods, which is an autoregressive model of order one (model 1a). As the structure of the balance sheet and macroeconomic factors have been shown in the literature review to be important in determining profitability and solvency, model 1b includes the effects

of the capital level (CAP) and the growth in gross domestic product (GDP). The inclusion of these variables ensures that the model is not biased by the exclusion of key explanatory variables and removes the possibility that the income statement variables are significant in the model only because of their correlation with the level of leverage or the level of economic growth.

Model 1:

(a) $ERN_{t+1} = \alpha_0 + \alpha_1 ERN_t + e_{t+1}$

(b) $ERN_{t+1} = \alpha_0 + \alpha_1 ERN_t + \alpha_2 CAP_t + \alpha_3 GDP_t + e_{t+1}$

Where t is the time period (year), ERN is the income before tax and e_{t+1} is an error term that is normally distributed with a mean of zero.

To improve the specification of the model, Sloan (1996) and Arthur et al. (2010) both subsequently disaggregated earnings into accruals and cash flow components. For this thesis rather than disaggregate earnings into accruals and cash flow, the disaggregation of earnings will follow the structure generally used for the income statement for bank. The income statement categories are net interest income (NII), operating revenue less operating expenses (OPRX) and provisions for lending losses (PRV). The current period earnings will therefore be replaced as shown:

$$ERN_t = NII_t + OPRX_t + PRV_t$$

These categories are more meaningful for banks than the disaggregated cash flow categories used in accounting studies as they show the key areas in which banks gain revenue and incur losses. The equation for earnings is then substituted into the models shown above:

Model 2:

   (a) $ERN_{t+1} = \alpha_0 + \alpha_1 NII_t + \alpha_2 OPRX_t + \alpha_3 PRV_t + e_{t+1}$

   (b) $ERN_{t+1} = \alpha_0 + \alpha_1 NII_t + \alpha_2 OPRX_t + \alpha_3 PRV_t + \alpha_4 CAP_t + \alpha_5 GDP_t + e_{t+1}$

The model with the best explanatory ability out of models 1 and 2 provides the base line comparison for a model which includes variables from the pillar 3 disclosures. The pillar 3 variables were selected from those shown in the literature review to be indicators of insolvency or important in determining earnings. To incorporate the variables from the pillar 3 disclosures into a model, the key variables useful for explaining each component of model 2 were determined (see appendix for details). These provided models which forecast net interest income (NII_{t+1}), operating revenue and expenses ($OPRX_{t+1}$) and provisions (PRV_{t+1}) using the individual provision charge (IPC), individual provision balance (IPB), collective provision balance (CPB), operational risk weighted assets (oRWA) and market risk weighted assets (mRWA) from the pillar 3 disclosures:

   $NII_{t+1} = \beta_0 + \beta_1 NII_t + \beta_2 IPB_t + \beta_3 CPB_t + \beta_4 GDP_t + e_{t+1}$

   $OPRX_{t+1} = \beta_0 + \beta_1 OPRX_t + \beta_2 oRWA_t + \beta_3 mRWA_t + e_{t+1}$

   $PRV_{t+1} = \beta_0 + \beta_1 IPC_t + \beta_2 CPB_t + \beta_3 GDP_t + + e_{t+1}$

These forecasts were then used in place of the current period values (model 3a). As each of these forecasts will have a forecast error, this may result in a large error term when all three forecasts are used in the model. To ensure that this does not occur, the reduced forms of the forecast equations were also used which incorporate the pillar 3 variables directly in the equations (model 3b) and simplified versions were also tested (model 3c and 3d):

Model 3:

    (a) $ERN_{t+1} = \gamma_0 + \gamma_1 NII_{t+1} + \gamma_2 OPRX_{t+1} + \gamma_3 PRV_{t+1} + e_{t+1}$

    (b) $ERN_{t+1} = \gamma_0 + \gamma_1 NII_t + \gamma_2 OPRX_t + \gamma_3 IPC_t + \gamma_4 IPB_t + \gamma_5 CPB_t + \gamma_6 oRWA_t +$
        $\gamma_7 mRWA_t + \gamma_8 GDP_t + e_{t+1}$

    (c) $ERN_{t+1} = \gamma_0 + \gamma_1 NII_t + \gamma_2 OPRX_t + \gamma_3 IPC_t + \gamma_4 IPB_t + e_{t+1}$

    (d) $ERN_{t+1} = \gamma_0 + \gamma_1 NII_t + \gamma_2 OPRX_t + \gamma_3 IPC_t + e_{t+1}$

This then gives a null hypothesis to be tested in this thesis of:

H_0: A model which includes earnings disaggregated into forecast income statement categories using income statement categories or using only aggregate earnings will have a higher explanatory power for future earnings than a model which includes information from the pillar 3 disclosures.

3.2.2 Statistical Methodology

Ordinary least squares (OLS) regressions were used to determine the coefficients and explanatory power of the models. This technique is considered to be appropriate as this is the technique most commonly used in the accounting literature for earnings models. The use of OLS instead of other techniques that could have been used was because of the limitations in the data available. Other techniques that were considered for use in this thesis were fixed effects or random effects (commonly used with panel data), first difference models (commonly used with panel data or time series data) and the generalised method of moments (GMM), however these were not used for a variety of reasons. As autoregressive models include any fixed effects through their impact in the previous period and as any differences in fixed effects between banks may be important to the models, a fixed effects model was not used (Wooldridge, 2006).

The random effects model requires the assumption that any unobserved effects are not correlated with the variables in the models which may not be true and is not able to be tested, so a random effects model was not used (Wooldridge, 2006). There are two reasons not to use a first difference model in this thesis. The first was that the interpretation of the models is much simpler and more useful for the market for OLS regressions. The second is that the dataset is relatively small so a further reduction in the available degrees of freedom could lead to the significance of the relationships in the data being overstated (Bourke, 1988). The GMM estimates were not used as this method allows for autoregression in the dependent variable, which is already explicitly included in the model (Maechler and McDill, 2006).

OLS estimators are unbiased and efficient when the required conditions are met, so these conditions were assessed to determine any bias or inefficiency in the OLS estimators. For the models above to be valid (and provide the best linear unbiased estimates) there are six conditions that need to be met. The required conditions are that the model is linear in nature, no perfect collinearity occurs in the data, the mean of the error term is zero for all time periods, the variance of the error term is constant for all time periods (no heteroskedasticity), the errors are not correlated between time periods and the errors are independently and identically normally distributed (Wooldridge, 2006).

The first of these conditions is met through the way that the models are specified. The use of a linear regression model is considered appropriate as the decomposition of earnings into net interest income, operating revenue and expenditure and provisions is a linear accounting identity.

Perfect collinearity is an issue if one variable is a linear combination of other variables so can be eliminated through careful specification of the models. In the

data collected there are a number of identities so it is not possible to model current earnings against the current earnings components or to include within the earnings models the provision charge with the individual provision charge and the collective provision charge or to include the total for risk weighted assets with credit, operational and market risk weighted assets.

The final four conditions relate to the errors for the models. These conditions were assessed for the final models using both a graphical representation of the residuals and statistical tests to test that the errors have a mean of zero and are normally distributed, and the significance of any autocorrelation in the errors between time periods.

As the data used is annual data it is expected that any autocorrelation in the data will be captured by the models. This is also supported by Athanasoglou, Brissimis and Delis (2008) who found no autocorrelation in their profitability model past one lag based on panel data over a longer time period (although this was based on data from only one country and is specified differently).

The final models were checked to ensure that heteroskedasticity was not creating bias in the regression coefficients by comparing the OLS estimates with the estimates from a robust regression technique (which is less efficient than OLS estimators if there is no heteroskedasticity) and there was no evidence found of bias.

In addition to the conditions for OLS regression to be valid there are a number of other potential problems which need to be assessed including misspecification of the model, multicollinearity, spurious regression, endogenous variables and the effect on the models of outliers. It is important that the models include all key variables that explain variability in earnings as otherwise they are likely to be

misspecified. It is important to assess model misspecification as it results in biased estimators of the regression coefficients which reduce the usefulness of the models. Misspecification of the models can be caused either where the relationship between the variables is not linear or by the exclusion from the models of key variables that explain earnings. As stated earlier the accounting identity underlying the models ensures that the relationship between future earnings and the earnings components is linear. Variables for time, size and the effect of government support will be assessed for inclusion in the model to ensure that the model is complete and the errors are not biased.

The models do not include any macroeconomic or country specific determinants of bank's earnings except for gross domestic product for three reasons. The first is that the most critical time to be able to determine a bank's profitability (and therefore also solvency) is during a time of economic downturn, however it can be difficult to determine in advance when a stress event will occur. It was therefore decided not to include macroeconomic or country specific determinants of bank earnings so that the model would rely on the information available at the time the forecast was being prepared and explain variations in bank earnings on the basis of the information available about that bank. The second reason for not including macroeconomic or country specific determinants of bank earnings is that the majority of the systemically important banks included in this thesis operate in multiple jurisdictions so the economic performance of one country is not relevant to most of the banks (although there are varying degrees of concentration of profitability within specific countries). The third reason is that the banks raise funding and capital in international markets, so are subject to similar market conditions. Therefore there would not be significant variability in the data for the model to capture other than that available over time (and time is not a significant variable except in the simplest models which are misspecified).

To assess the models for misspecification the residuals were plotted against the dependent variable and fitted values as any patterns in the residuals indicate that the model may be misspecified. The correlations between the residuals from the models and the variables not included in the models were also tested to ensure that variables with explanatory power for earnings are included in the models. No further explanatory variables were found.

Multicollinearity can be a problem in regressions as high levels of multicollinearity may cause the variance estimate to be inflated and result in the test statistics for the significance of the OLS estimates to decrease in significance. To determine if multicollinearity is an issue with the data the correlations between variables will be examined using Pearson correlation coefficients. The variance inflation factor (VIF) will also be assessed for each model. A VIF above 10 for any variable or an average VIF substantially greater than one will mean that the test statistics for the OLS estimates will need to be treated with caution (Bowerman, O'Connell and Koehler, 2005). To ensure that the models are not affected by multicollinearity any model with a VIF above 10 will be rejected.

Spurious regressions can result in high coefficients of determinations (R^2) for a regression where there is no relationship between two variables where they both are correlated with a third variable. To ensure that the coefficient of determination is not high from a spurious regression the variables in the model will be deflated by assets to remove any trends in the data from inflation and earnings will be tested for a unit root (Wooldridge, 2006).

The models are sensitive to outliers in the data and high leverage points that can have a large effect on the regression coefficients, particularly as the sample size is relatively small. Once a model has been fitted the data will be checked for outliers and high leverage points using a combination of Cooks D and the

predicted sum of squares (PRESS). A graph of the Cooks D will be used to assess if any individual points have high leverage and PRESS will be used to assess the fit of the model overall. As the purpose of this thesis is to test for the explanatory ability of the pillar 3 data any outliers or high leverage points will be removed from the data used to estimate the models.

Once all of the necessary conditions for OLS regressions have been met and the problems identified have been mitigated it means that the coefficients and statistics associated with the OLS regressions are unbiased and consistent. The coefficients in the model will be tested to determine whether they are significantly different from zero using t-tests. Where there are different specifications for the models the coefficient of determination (R^2) will be used to test the significance of the difference in the explanatory power of the models using a partial F test (Bowerman, O'Connell and Koehler, 2005). The five hypotheses specified earlier will then be statistically tested to determine whether the variables from the pillar 3 disclosures significantly improve the market's ability to explain future earnings.

3.3 Variables to be included in the data

The key variables used in the literature to measure risks for banks are commonly classified into six categories of asset quality, earnings, capital adequacy, management ability, liquidity and market risk (Berger, Davies, Flannery, 2000). Asset quality will be measured using impaired assets, individual provisions, collective provisions, loans ninety days past due and credit risk weighted assets. Capital adequacy is measured using risk weighted assets and tier 1 capital. Management ability and liquidity risk are not included in this thesis. It is not possible to measure management ability from the pillar 3 disclosures. Liquidity risk can be measured from the pillar 3 disclosures but is not included as there was no evidence found in the literature that liquidity impacts earnings. Market

risk will be measured using market risk weighted assets. The following variables will be collected from pillar 3 disclosures, with definitions as follows (to ensure consistency in the data where different jurisdictions use different definitions):

- Individual provisions (previously specific provisions) – provisions against impaired assets which can be either individually identified (non-retail assets) or assessed on a portfolio basis (retail assets). Both the individual provision charge for that year (IPC) and the individual provision balance (IPB) are included in the data.

- Collective provisions (previously general provisions) – provisions against unidentified losses incurred against loans not identified as impaired. Both the collective provision charge for that year (CPC) and the collective provision balance (CPB) are included in the data.

- Impaired assets (IMP) – lending assets where it has been identified that there is likely to be a shortfall in the amount repaid either individually using judgement (non-retail assets) or through past due status (retail loans). In some jurisdictions this may include past due loans where no shortfall is expected.

- Tier 1 capital (CAP) – as defined by the Basel II regulations. Included in this definition is share capital and retained earnings while subordinated debt is excluded (as it is tier 2 capital). Where the definitions used vary between jurisdictions the definition of tier 1 capital that applies to the banking group has been used, as this is the definition which determines the minimum capital requirement that is binding on the bank.

- Risk weighted assets– total risk weighted assets (RWA) including the breakdown into credit risk (cRWA), market risk (mRWA) and operational risk (oRWA) as calculated under the Basel II capital adequacy rules.

- 90 days past due (NTD) – lending assets identified by the reporting entity as being more than 90 days outside of scheduled arrangements. In some jurisdictions this will only include retail lending while in other jurisdictions

this will also include non-retail lending. The total can be nil for some jurisdictions when all loans 90 days past due are required to be classified as impaired assets.

Key data that will not be included:

- Data related to mortgage backed securities as the formats and content of data included (where included) is inconsistent. .

- Data related to sovereign exposures as the formats and content of data (where included) is inconsistent.

- Information on value at risk (VaR) to measure market risk. VaR is used to calculate market risk weighted assets so is already included within the dataset. The format and content of VaR data in the disclosures is also inconsistent (as otherwise it could have been used to validate the accuracy of the level of market risk weighted assets).

- Breakdowns of loans and advances, impaired assets or provisions into industry categories. Only some of the banks record the industry breakdowns of these categories and where a breakdown is given the industry categories are not consistent.

The following variables will be collected from accounting disclosures, with definitions as follows (to ensure consistency in the data where differing definitions are in use):

- Profit before income tax (ERN) – profit before income tax. Profit before income tax is used so that any changes in tax rates or changes in the amount of taxation because of improvements in tax efficiency do not distort the results. The exclusion of the impact of tax is also not

considered to impact the results of this thesis as it has no impact on the relationships between variables or the regression model.

- Net interest income (NII) – interest income less interest expense for banking operations.

- Operating revenue (OPR) – revenue from all sources other than interest income, including net income from fees and commissions, net trading income, and any income identified in the other income category in the profit and loss statement. Includes any income from insurance activities where applicable.

- Operating expenses (OPX) – operating expenses including depreciation, amortisation, staff expenses and other operating expenses but excluding interest expenses, provisions, fee and commission expenses and any other expenses included in operating revenue. Includes any expenses from insurance activities where applicable, and provisions not related to lending (see below).

- Provision charge (PRV) – the total loan loss provision charge (equal to the sum of the individual or collective provisions (see above)) as identified in the profit and loss statement. Includes new provisions raised, recoveries, exchange rate adjustments and any other charges included in the profit and loss charge. Any provisions not related to lending (such as for deferred employee benefits or operating losses) are included in operating expenses.

- Assets – total on balance sheet assets.

Operating revenue and operating expenses are combined to form a new variable called operating revenue and expenses (OPRX) which gives the net balance of operating revenue less operating expenses.

In addition to the bank specific variables, GDP growth (GDP) is included to measure economic activity. This is measured as the annual growth in world GDP as determined by the International Monetary Fund (IMF, 2011).

The variables used in the study will be converted into percentages to remove the effects of the differences in sizes and currencies between the various banks. Following Athanasoglou, Brissimis and Delis (2008), assets will be used as the deflator rather than capital to convert the metrics into percentages, as return on assets allows the effects of the different levels of leverage (tier 1 capital relative to total on balance sheet assets) and risk (measured by risk weighted assets to total on balance sheet assets) to be assessed.

3.4   Data Collection and Sample Selection

The focus for this thesis is systemically important banks in developed countries, so the initial sample was limited to the fifty largest banks in the world as measured by assets. The reasons for selecting these banks as the basis of this thesis are the importance of the performance of the largest banks to the economy (i.e. systemically important banks), the reliability of the data for these banks given the level of monitoring by regulators will be higher than for smaller banks and the increased likelihood that the largest banks are either listed on the stock market or issue debt so have earnings that are of interest to the market. For statistical purposes it would be better to have a larger dataset however as the data needed to be collated by hand from the financial statements the statistical benefits of a larger dataset were considered to be minimal relative to the time needed to meaningfully increase the size of the sample.

Following Bourke (1988) total assets were used to select the sample for this thesis. As noted by Bourke (1988) there are different definitions of assets that

can be used for this purpose, for this thesis the definition used is the IFRS definition of on balance sheet assets (including acceptances). This definition excludes off balance sheet assets (such as securitisation) which earn income for the bank, however the reporting of off balance sheet assets is not consistent enough to incorporate these totals. It is also noted that the effects of off balance sheet activities should be incorporated within operational or market risk weighted assets which are included.

This sample is not a random sample as only the largest banks with pillar 3 data available have been selected for this sample as these are the banks of interest to the market and regulators. It is not expected that the sample selection criteria will affect the results as the literature shows that there are no returns to scale for bank efficiency once banks pass a certain threshold (estimates for the level of asset for this threshold is somewhere between $500m (McAllister and McManus, 1993) , $10bn (Berger and Mester, 1997) or $100bn (Vennet, 2008), which is much less than the smallest bank included in the study.

The largest banks were selected from the list of the largest banks by total assets compiled by the Bankers Almanac (Bankers Almanac, 2011) using end of financial year data from 2010. To compare different countries the Bankers Almanac used total assets for each bank converted to United States dollars, so the list used for this study was converted using exchange rates as at the 18th of August 2011.

The requirements for pillar 3 disclosures are broadly set within the Basel II accord (BCBS, 2006) however the specific requirements for the disclosures are set by regulators in each country with reference to the broad requirements within the Basel II accord. This results in the content and frequency of the pillar 3 disclosures varying between quarterly, semi-annually and annually depending on

the country. Differences in the content of the data have been adjusted for by using standard definitions in collecting the data (see the previous section) and the data was collected for the complete financial year for each bank to remove the potential effects of any seasonal or other cyclical patterns which may exist in the data (for example increased retail lending over holiday periods). Differences in the balance sheet dates used should not affect the data analysis as earnings forecasts will be calculated using the data for that bank so the forecasts will be internally consistent. To graph the data, all banks with a balance sheet date during a particular year will be shown as occurring during that year, as there is a wide variation in the reporting months across the sample (March, June, September, October, December). Where any differences between the years are apparent in the graphs these will be tested for statistical significance taking the difference in the reporting month into account.

The data has been collected by hand from the annual reports, financial statements and pillar 3 disclosures of each bank which were obtained from the website of each bank. The data needed to be collected by hand as there is no database available that includes the pillar 3 data. The data is collected at the holding company level, so each record may include multiple banks where the banks are owned by the same holding company. The totals also include the impact of any other non-bank subsidiaries (typically insurance companies) that the holding company owns. The use of the holding company data rather than the bank data for this study was deemed appropriate as the failure of one part of the group can cause the failure of the entire group or conversely an unprofitable part of the group can be supported by the other profitable parts of the group.

Not all of the banks in the list of the largest banks have been included as it was considered important that the data used was consistent and reliable. The reasons for excluding the banks shown were (see table 2 on page 43-44):

- The United States of America does not require disclosure statements under Basel II rules so key information is calculated on a different basis, such as risk weighted assets.   It also uses a different set of accounting standards to the other banks included in the data. This caused four banks to be excluded. Also included in this category is one German bank which does not publish pillar 3 disclosures.

- Banks in China were excluded from the study as the central bank sets key banking sector metrics such as lending volumes and reserve ratio requirements which means that the operating environment of the banking sector differs significantly from other jurisdictions. This caused five banks to be excluded.

- There were a number of banks involved in acquisitions or mergers which were not included as the operational challenges of combining the banks represent a strategic risk rather than a credit risk which is not able to be assessed using the pillar 3 disclosures. This caused seven banks to be excluded.

- For some disclosures there were inconsistencies in the totals disclosed between different sections of the financial or pillar 3 disclosures which were excluded as it was not possible to determine which total was correct as there was no reconciliation of the differences between the disclosures (which are likely to be due to differences in definitions between accounting standards and regulatory requirements for reporting under pillar 3). This caused four banks to be excluded.

- The use of credit derivative hedging (through the use of credit default swaps (CDS) to mitigate credit risk changes the usefulness of the information in the provision disclosures. Where credit default swaps are used the credit risks for the bank are with the CDS counterparties rather than the bank's customers. They are also subject to market risk in addition to credit risk which makes it difficult to use the change in value of

the credit default swaps as an indicator of credit risk. This caused two
banks to be excluded.

- Some of the banks shown in the list were subsidiaries of banks already in
  the list. As these subsidiaries were included within the Group totals these
  were excluded. This caused five banks to be excluded.

The banks included in the raw data represent a number of countries, with a full
listing of the banks included and excluded shown in table 2.

Table 2: Banks included and excluded from the data

Banks included	Banks excluded
Australia	**Structural features of economy**
Australia and New Zealand Banking Group Limited , Australia	Agricultural Bank of China Limited, China
Commonwealth Bank of Australia, Australia	Bank of China Limited, China
National Australia Bank Ltd, Australia	Bank of Communications Co Ltd, China
Westpac Banking Corporation, Australia	China Construction Bank Corporation, China
Canada	Industrial & Commercial Bank of China Limited, China
Royal Bank of Canada, Canada	**Disclosures not available under Basel II**
The Bank of Nova Scotia, Canada	Bank of America NA , USA
The Toronto-Dominion Bank, Canada	Citibank NA , USA
Europe	JPMorgan Chase Bank National Association , USA
Banco Bilbao Vizcaya Argentaria SA, Spain	Kreditanstalt fur Wiederaufbau (KfW), Germany
Banco Santander SA, Spain	Wells Fargo Bank NA , USA
Barclays Bank PLC, UK	**Provisions data not available in format required or inconsistent**
Credit Suisse AG, Switzerland	Mizuho Bank Ltd , Japan
Danske Bank A/S, Denmark	Sumitomo Mitsui Banking Corporation , Japan
Deutsche Bank AG, Germany	The Norinchukin Bank , Japan
DZ BANK AG Deutsche Zentral-Genossenschaftsbank, Germany	UniCreditSpA, Italy

Banks included (continued)	Banks excluded (continued)
HSBC Bank plc, UK	**Significant change in scale through acquisitions or dispositions**
	BPCE, France
ING Bank NV, Netherlands	
	BNP Paribas SA, France
Intesa Sanpaolo SpA , Italy	
	Crédit Agricole Corporate and Investment Bank, France
Nordea Bank AB (publ), Sweden	
	Crédit Agricole SA, France
Rabobank Nederland, Netherlands	
	Commerzbank AG, Germany
Standard Chartered PLC, UK	
	Lloyds TSB Bank plc, UK
The Royal Bank of Scotland plc, UK	
	Natixis, France
Japan	
	Extensive use of credit derivatives to replace provisions
The Bank of Tokyo-Mitsubishi UFJ Ltd, Japan	Société Générale, France
	UBS AG , Switzerland
	Subsidiary of another bank on the list (the group is shown in brackets)
	Bank of Scotland Plc, UK (Lloyds)
	Credit Suisse International, UK (Credit Suisse)
	Mizuho Corporate Bank Ltd, Japan (Mizuho)
	National Westminster Bank Plc, UK (BoS)
	The Hong Kong and Shanghai Banking Corporation Limited, Hong Kong (HSBC)

3.5 Key Statistics in the Raw Data

Once the data was processed and allowances were made for the requirement to have forecast earnings for the next period available there were forty five data points available covering the years 2008, 2009 and one from 2010. Data for the remainder of the banks for 2010 was not available at the time of collection due to the time taken by banks to publish the data following year end. For consistency the one observation from 2010 was therefore excluded. The banks included in this thesis ranged in size from USD426bn to USD3,750bn.

Table 3: Summary Statistics

	n	Mean	Standard Deviation	Minimum	Median	Maximum
ERN_{t+1}	44	0.65	0.46	-0.91	0.63	1.31
ERN_t	44	0.48	0.61	-1.27	0.56	1.31
NII_t	44	1.35	0.55	0.56	1.36	2.59
$OPRX_t$	44	0.49	0.46	-0.16	0.37	1.93
PRV_t	44	0.38	0.24	0.05	0.32	1.02
IMP_t	44	1.00	0.93	0.14	0.74	4.89
IPC_t	44	0.33	0.25	0.04	0.26	1.29
IPB_t	44	0.41	0.45	0.05	0.28	2.24
CPC_t	44	0.04	0.09	-0.26	0.03	0.30
CPB_t	44	0.28	0.21	0.04	0.22	0.84
RWA_t	44	0.39	0.13	0.14	0.39	0.60
$cRWA_t$	44	0.34	0.13	0.11	0.35	0.62
$oRWA_t$	44	0.03	0.01	0.01	0.03	0.06
$mRWA_t$	44	0.02	0.01	0.00	0.02	0.06
CAP_t	44	3.74	1.09	1.41	3.85	5.63
ASS_t	44	1,091	808	427	714	3,750

All variables are deflated by assets to allow meaningful aggregation of the statistics (except assets which are shown in USDbn).

The summary statistics (table 3) show that the sizes of the banks are above the minimum threshold where efficiencies of scale occur. The size of the banks should therefore not be significant in the models. All of the other summary statistics from the income statement, balance sheet or pillar 3 disclosures show a good level of variability in the data to allow meaningful model construction, with the variables ranging between 0.91% and 5.63% of total assets. As the variables are all relative to total assets the effects of size on the variables have been negated, so the statistics are comparable between banks. The operating revenue and expenses and collective provision charge both have negative minimum values however this reflects the information as it was recorded by the bank in the financial statements or pillar 3 disclosures.

The Pearson correlation matrix (table 4) shows that there is a reasonable level of correlation between the variables to allow meaningful regression models. There are two high correlations (above 0.9) between variables, however in both instances one variable is a component of the other variable (the total provision charge and the individual provision (0.94), risk weighted assets and credit risk weighted assets (0.97)). These high correlations will not cause any problems with multicollinearity as the variables are components of the total that they are correlated with, so they will not be included in any model together. Three further correlations are above 0.8 so it will be necessary to assess the variance inflation factors for each model to ensure that there is no evidence of problems with multicollinearity.

Table 4: Pearson Correlation Coefficients

	ERN_{t+1}	ERN_t	NII_t	$OPRX_t$	PRV_t	IMP_t	IPC_t	IPB_t	CPC_t	CPB_t	RWA_t	$cRWA_t$	$oRWA_t$	$mRWA_t$	CAP_t
ERN_{t+1}	1														
ERN_t	0.6696*	1													
NII_t	0.6827*	0.6786*	1												
$OPRX_t$	-0.2258	-0.6807*	-0.0152	1											
PRV_t	0.2921	0.3139	0.5946*	-0.2222	1.										
IMP_t	-0.0137	0.054	0.3487	0.0146	0.6407*	1									
IPC_t	0.2051	0.2245	0.5443*	-0.1327	0.9402*	0.6758*	1								
IPB_t	-0.0074	0.0575	0.3284	0.0085	0.5966*	0.9699*	0.6317*	1							
CPC_t	0.2636	0.2478	0.1167	-0.2113	0.0417	-0.2016	-0.3071	-0.171	1						
CPB_t	0.5357*	0.5305*	0.8192*	-0.0449	0.6162*	0.3395	0.5122*	0.2728	0.2495	1					
RWA_t	0.4312	0.4843*	0.8155*	0.0727	0.4978*	0.4062	0.4509	0.3947	0.1142	0.7906*	1				
$cRWA_t$	0.2907	0.3706	0.7139*	0.1484	0.4087	0.3297	0.3717	0.3137	0.0935	0.7536*	0.9684*	1			
$oRWA_t$	0.5658*	0.5846*	0.848*	-0.0112	0.4773*	0.3358	0.4863*	0.3056	-0.0438	0.6258*	0.6403*	0.5183*	1		
$mRWA_t$	0.1687	-0.0295	-0.0275	-0.0596	0.1285	0.1783	0.1181	0.1975	0.0255	0.0126	-0.0336	-0.1659	0.0208	1	
CAP_t	0.4877*	0.5011*	0.7682*	-0.0157	0.5169*	0.3167	0.4676*	0.3314	0.1276	0.5604*	0.7946*	0.7251*	0.6523*	-0.0089	1

* Significant at the 5% level.

4.   Results

4.1   Qualitative Analysis – Comparisons of the Performance of Banks

The pillar 3 disclosures are useful if they reduce information asymmetry and allow efficient allocation of capital, provide credibility to other disclosures and provide information on the future performance of the banks. One of the key areas examined to determine the usefulness of the pillar 3 disclosures is the ability of the disclosures to separate banks with different risk and return trade offs.

Graph 1: Risk weighted assets versus earnings
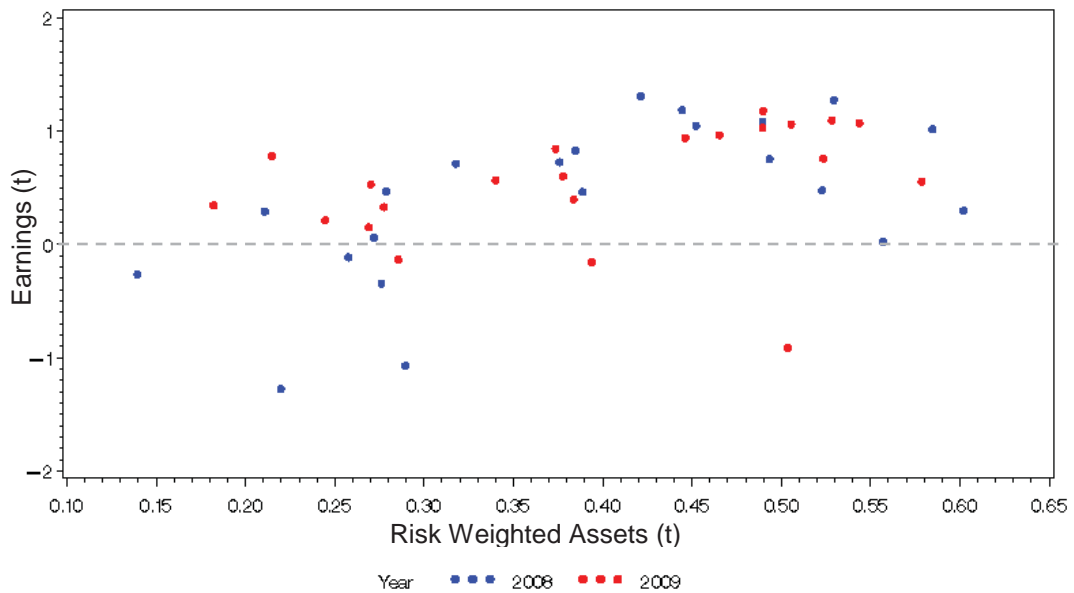
The graph of risk weighted assets against the contemporaneous earnings of the banks (graph 1) shows that the level of earnings is not highly correlated with the level of risk (as measured by risk weighted assets). This is reflected in the value for the coefficient of determination adjusted for the degrees of

freedom (R^2(adj)) which is 21.6%. The relationship seen is influenced by three outlying observations where large losses were made. Investigation of these three outliers shows that all three losses were as a result of a large drop in operating revenue driven by trading losses. It should also be noted that the outlying observation for 2009 (shown in red) is for the year to March 2009 so is contemporaneous with the two other outliers (which cover the year to December 2008) reflecting the turmoil in the financial markets during 2008.

Graph 2: Net interest income against credit risk weighted assets
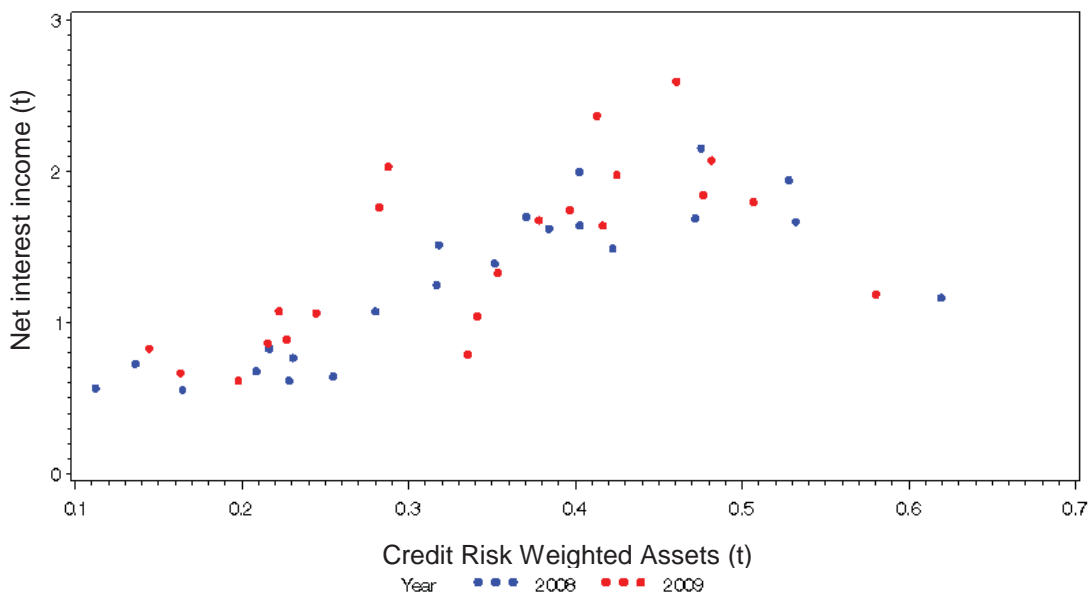
The relationship between risk and return is stronger when the lending book is examined (graph 2). The R^2(adj) is 49.8% indicating a relatively strong relationship. The two outliers with high risk weighted assets but relatively low net interest income are both the same bank, which is the only Japanese bank included in the sample. The relationship between net interest income and credit risk weighted assets is stronger without this bank with an R^2(adj) of 70.0%

The relationship between credit risk weighted assets and net interest income can also be used to ensure that the level of credit risk weighted assets is appropriate for the bank, as a bank that is earning a high level of net interest income without a high level of credit risk weighted assets may be understating its level of credit risk weighted assets (which reduces the required minimum level of capital).

Graph 3: Collective provisions against net interest income
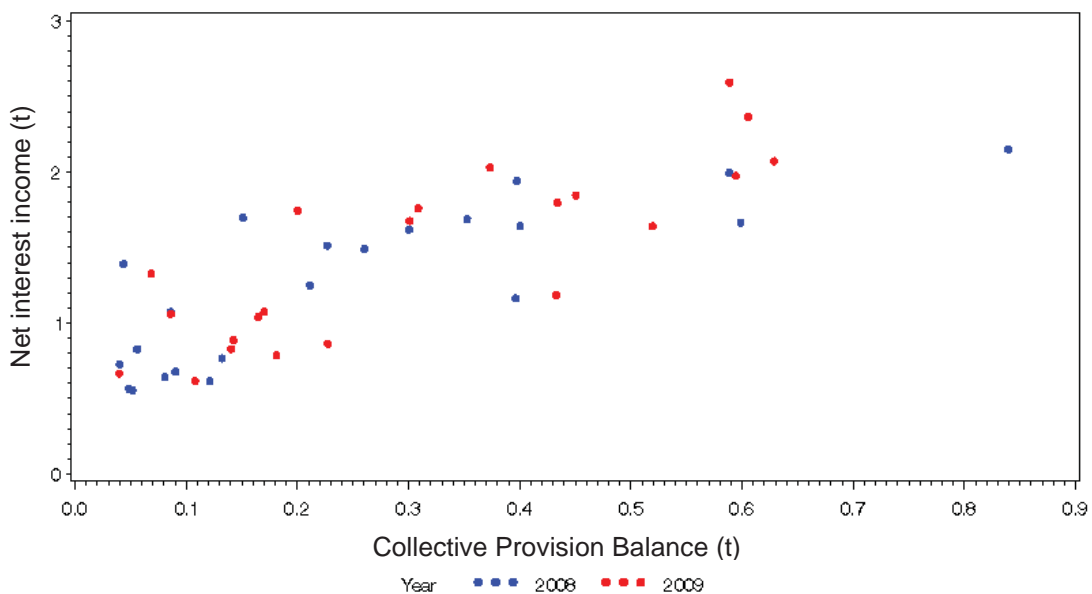
The graph of collective provisions against the net interest income (graph 3) shows a similar pattern to the previous graph with higher risks giving higher returns. As collective provisions measure expected loss instead of unexpected loss (which is credit risk weighted assets), there is a much stronger relationship between risk and return as measured by the R^2(adj) of 66.3%.Although the relationship between the variables is strong there is still a wide variation in the levels of the collective provisions between banks. The outlier on the right hand side of the graph is Banco Bilbao Vizcaya Argentaria SA, Spain. Although this bank is an outlier on this graph, the level of

collective provisions may be justified by losses in subsequent years (particularly as the Banco de España requires dynamic provisioning). This will be investigated in the subsequent graphs.

Graph 4: Collective provisions versus credit risk weighted assets
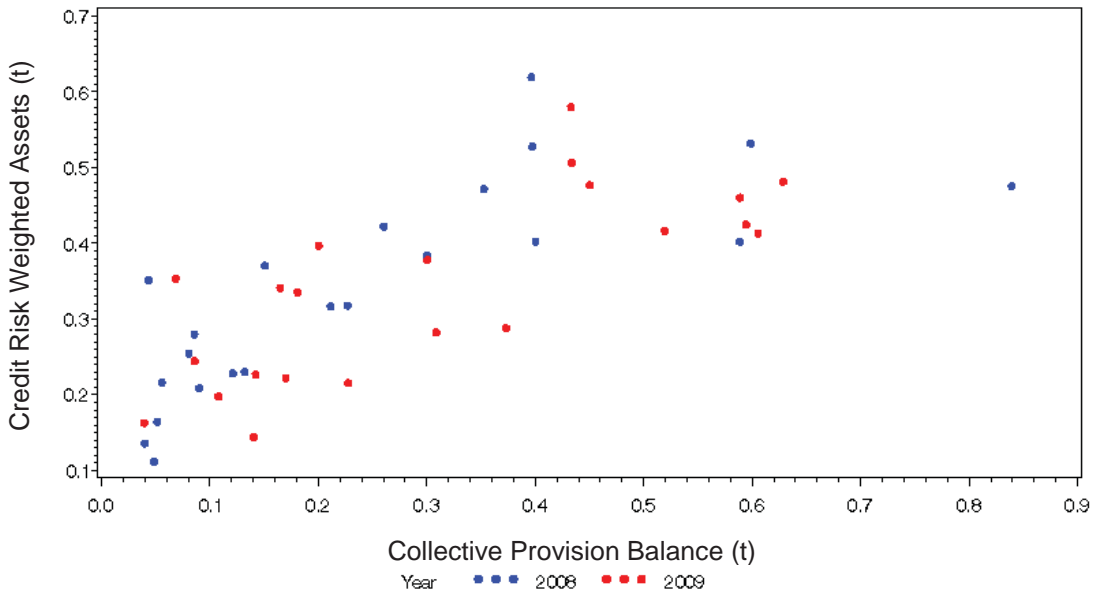

The relationship between the collective provisions and credit risk weighted assets (graph 5) is relatively weak, which is confirmed by the value for R^2(adj) of only 56.8%. The outlier on the right hand side with high levels of collective provision relative to credit risk weighted assets is Banco Bilbao Vizcaya Argentaria SA, Spain. The high level of collective provisions is therefore not consistent with the level of credit risk weighted assets, so further investigation is need to determine which measurement is incorrect.

To determine if the high levels of collective provisions for some banks are because of high risk in the portfolio or from income smoothing, a graph of the collective provisions against the next year's individual provision charge can be used (graph 5). If the collective provision balance is calculated correctly

then the current collective provisions should be representative of future losses (with the next year's individual provisions a proxy for this). The dashed line shows a one to one relationship where the level of collective provisions held is equivalent to the following year's individual provisions. The relationship between the collective provisions and the following years provision charge is not particularly strong with an R^2(adj) of 31.2%, so the collective provision balance is not a good indicator of future individual provisions. The graph does show that the outlier on the previous graphs, Banco Bilbao Vizcaya Argentaria SA, Spain, did have an appropriate level of collective provisions in 2008 as it correctly indicated a high level of individual provisions in 2009. On the graph there also appears to be a difference between 2008 and 2009 however this is not statistically significant once the differences in the end of the financial year between banks are taken into account.

Graph 5: Collective provisions versus next year's individual provisions
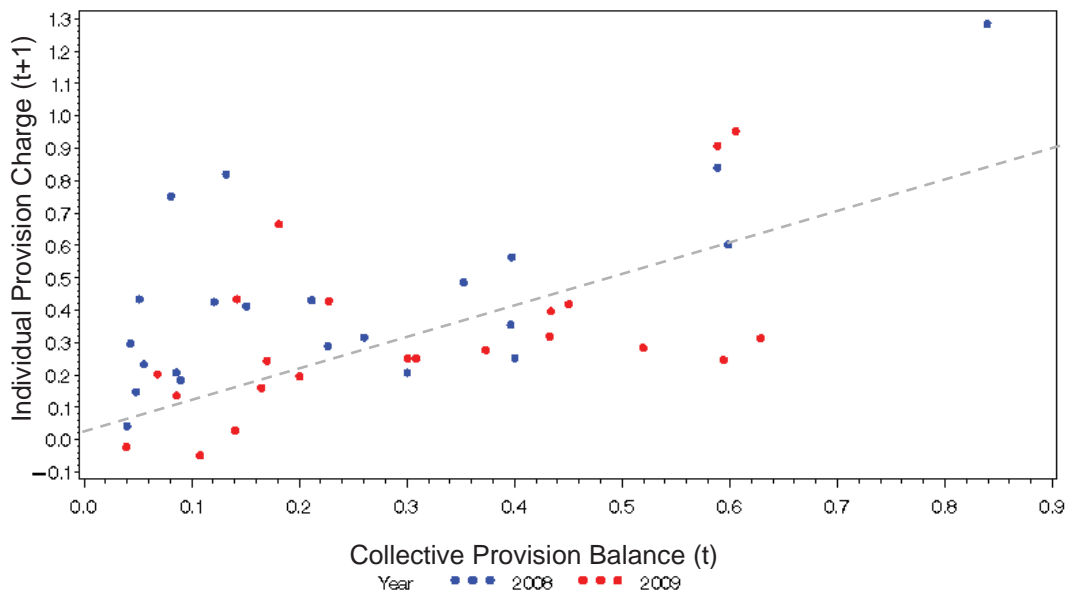
A further check of the appropriateness of the level of the individual provision balance is to compare it to the impaired asset balance (graph 6). The graph

shows that there is a strong correlation between individual provisions and impaired assets, with an R^2(adj) of 93.9%. The strength of the correlation is influenced by the banks with high levels of impaired assets and provisions with a greater level of variability seen in the individual provisions held for a given level of impaired assets at lower levels of impaired asset balances.

Graph 6: Individual provision balance against impaired assets
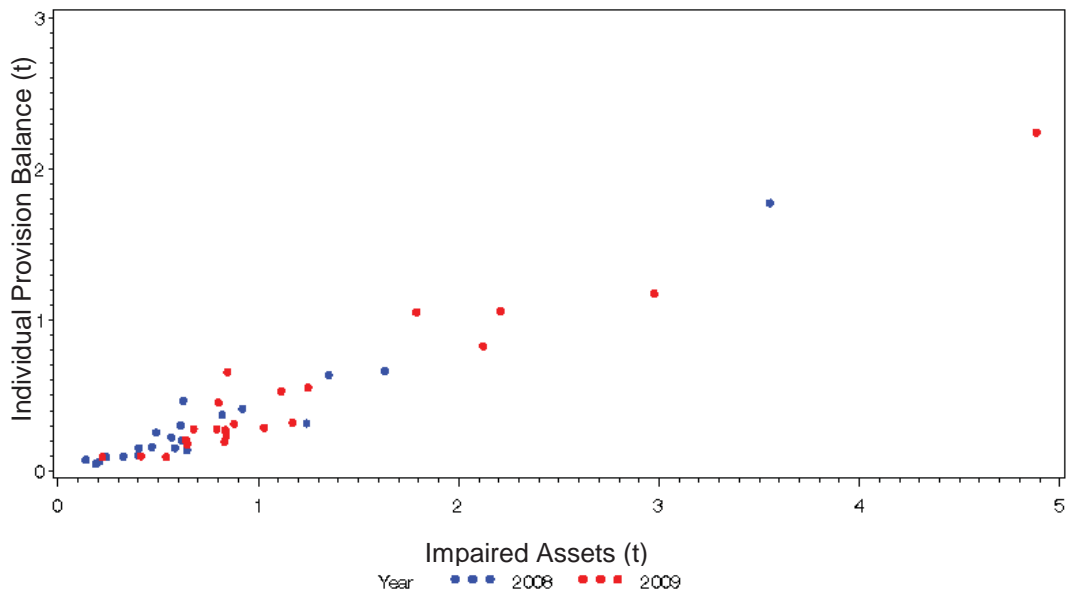
The two forms of the Texas Ratio, the original version of impaired assets divided by the sum of capital and provisions (Texas Ratio – version 1), and the modified version including loans that are either ninety days past due or restructured in the numerator (Texas Ratio – version 2), are shown in the graph (graph 7). As the paper by Jesswein (2009) showed that the mean Texas Ratio for banks that subsequently failed was 45%, a dashed line is shown on the graph at this level. It shows that there are two bank above the line for version 1, two of these points are the same bank, Intesa Sanpaolo SpA , Italy which is well above the 45% threshold. This indicates that this bank is at a high risk of failure. Another three banks are also close to this

mean so it would be prudent for investors to conduct further analysis of the state of these banks.

Graph 7: The Texas ratio version 1 versus the Texas Ratio version 2
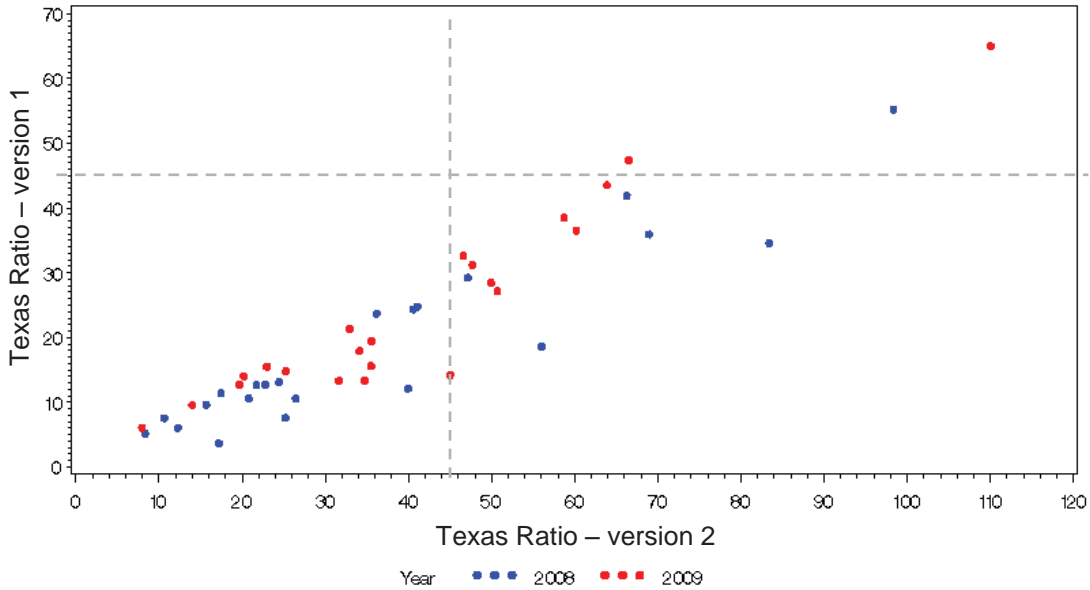
When the second version of the Texas Ratio is calculated, the ratio increases in size for most of the banks (some banks disclose nil balances for ninety days past due and restructure loans, as they are included in the impaired assets totals). As can be seen on the graph there are a number of banks that have a much higher ratio in the second version of the Texas Ratio, indicating that they are at a higher risk of failure than the other banks. The graph also shows that there was a deterioration in the ratios between years, with the ratios for 2009 on average 4.58% higher (p<0.01). This increase was as a result of increases in impaired assets and provisions, as although the amount of capital generally increased for the banks during the financial year, the amount of impaired assets (and loans more than ninety days past due) increased by a larger proportion.

4.2 Quantitative Analysis – A Model for Earnings

The hypothesis tested for the earnings models was that a model which includes earnings disaggregated into income statement categories will have higher explanatory power for future earnings than a model using only aggregate earnings. The first step to test this hypothesis was to determine which of the models using only financial variables had the highest explanatory power. The results (table 5) show that earnings for the current period are a good predictor of future earnings (model 1a), with current earnings explaining 80.5% of the variation in earnings for the next year. As the residuals from this model (graph 8 on page 67) show some evidence that the residuals are not normal, there is scope for improvement in this model. The addition of the capital levels and GDP to the model (model 1b) improved the explanatory power of the model to 82.1% however this improvement is not statistically significant (at a 5% level). The explanatory power of the model was improved when earnings were disaggregated into net interest income, operational revenue and expenses and provisions (model 2a) shown by a statistically significant (at a 5% level) increase in the explanatory power over the original model with the R^2 increasing from 80.5% to 85.1%. The residuals (graph 9 on page 68) also show that the model is a better fit than model 1a, as the residuals are more normal. Again the addition of the capital levels and GDP improved the explanatory power to 86.3% but not by a statistically significant amount (at a 5% level). Therefore the model with the highest explanatory power using only financial statement data is model 2a.

Four models were then calculated using the pillar 3 variables. The model (model 3a) which used forecasts of net interest income, operating revenue and expenses and provisions prepared from the pillar 3 variables (see appendix 2) had the lowest explanatory power of the four models at 86.4%. The variables found to be significant in the forecasts of the components for

Table 5: Regression model results for earnings

	Predicted sign	Model 1a	Model 1b	Model 2a	Model 2b	Model 3a	Model 3b	Model 3c	Model 3d
Intercept		**0.2804**	0.1065	**0.0655**	0.0820	-0.0678	-0.0249	0.0246	0.0200
		6.47	0.95	0.83	0.78	-0.86	-0.25	0.34	0.28
ERN_t	+	**0.7098**	**0.6382**						
		12.53	9.27						
NII_t	+			**0.7829**	**0.7872**		**0.7893**	**0.7703**	**0.7628**
				13.19	9.28		5.97	14.33	14.59
$OPRX_t$	-			**-0.5031**	**-0.4936**		**-0.3832**	**-0.4675**	**-0.4314**
				-6.25	-5.89		-4.47	-6.27	-5.76
PRV_t	-			**-0.6503**	**-0.6863**				
				-4.58	-4.38				
NII_{t+1}	+					**1.0117**			
						14.08			
$OPRX_{t+1}$	-					**-0.8750**			
						-4.95			
PRV_{t+1}	-					**-0.9700**			
						-5.5300			
IPC_t	-						**-0.4640**	**-0.6157**	**-0.4575**
							-3.00	-5.19	-3.17
IPB_t	-						**-0.1511**		-0.1271
							-2.04		-1.82
CPB_t	-						0.0805		
							0.34		
$oRWA_t$	+						2.7083		
							-0.67		
$mRWA_t$	+						3.0533		
							1.34		
CAP_t	-		0.0573		-0.0038				
			1.70		-0.09				
GDP_t	+		-0.0006		0.0038		0.0018		
			-0.10		0.63		0.33		
R²		80.52%	82.09%	85.07%	85.25%	86.42%	88.63%	87.66%	86.68%
R²(adj)		80.00%	80.60%	83.83%	83.08%	82.35%	85.70%	85.36%	86.24%
PRESS		1.5152	1.5538	1.2186	1.3389	1.1160	1.2321	1.1351	1.0298
n		40	40	40	40	40	40	40	40

Note: The table shows the coefficient for each variable at the top of the cell (to four decimal places) and the t-statistic for that coefficient below (to two decimal places). Coefficients in bold are significant at a 5% level. The outliers identified in the data in section 4.1 were excluded where they have high leverage, so that they do not affect the estimates for the coefficients. Once these two banks are excluded from the data set there were 40 observations used in the regression models. The results were calculated using SAS (v9.1).

model 3a were then used directly in the forecast models; with model 3b incorporating all of these variables while models 3c and 3d used a reduced number of variables. The results show that model 3d is the best of the four models using pillar 3 data. Model 3d has an explanatory power of 86.7% which is slightly lower than model 3c (this difference is not statistically significant) however the residuals are better (graph 10 on page 69) and the errors in the residuals for the model are lower than for the other models (as measured by the predicted sum of squares (PRESS)). As can be seen in the table the key difference between model 3c and 3d is the inclusion of the individual provision balance (IPB) which is not individually statistically significant, however the inclusion of this term improves the behaviour of the residuals without significantly decreasing the explanatory power.

To test the hypothesis, the best model using earnings (model 2a) was compared with the best model which incorporated pillar 3 variables (model 3d). The improvement in the explanatory power of the model from 85.1% to 86.7% is not statistically significant (at a 5% level). The hypothesis that a model which includes earnings disaggregated into forecast income statement categories using income statement categories or using only aggregate earnings will have a higher explanatory power for future earnings than a model which includes information from the pillar 3 disclosures is therefore not rejected.

5.   Discussion

The Basel Committee for Banking Supervision introduced pillar 3 disclosures in the Basel II accord (BCBS, 2006) to allow market discipline to work earlier and more effectively (BCBS, 1998), as market discipline complements the control over banks by regulators (Berger, Davies and Flannery, 2000). By providing the market with standardised information, it is expected that market discipline would assist regulators in ensuring that banks were prudently operated, as banks which are not prudently operated will be identified and sanctioned by the market through their stock prices and cost of funding (Mortlock, 2002).

The introduction of pillar 3 disclosures increased the amount of detailed information on risk available to the market however there is no evidence in the literature to show that pillar 3 disclosures provide market discipline, although there is evidence that risk data is incorporated within market prices (Evanoff, Jagtiani and Nakata, 2011). To assess whether the pillar 3 disclosures allow market discipline to occur this thesis examines whether the information contained in the disclosures is useful to the market in monitoring bank performance and allocating of capital (i.e. has value relevance). This is a prerequisite for the market participants to have sufficient incentives to spend the amount of time necessary to analyse bank performance (Darrough, 1993). This thesis therefore adds to the literature on market discipline as it contributes towards determining whether the pillar 3 disclosures are useful to the market and are therefore likely to provide market discipline.

The literature shows that disclosures are useful to the market if they reduce information asymmetry and allow monitoring of management, confirm

voluntary disclosures or provide credibility of other disclosures (such as financial statements) and assist investors to efficiently allocate capital between firms.

The qualitative analysis of the pillar 3 disclosures compared the risk return characteristics of the banks in the sample, to determine whether the pillar 3 disclosures reduce information asymmetry and can be used to monitor the actions of management. The graphs of risk against return (graphs 1-3) show that there are variances in the risk return trade off made by banks, similar to any other business. For banks this relationship is much more measurable than for other firms because the level of risk is required to be quantified under Basel II. These graphs of risk against return can be used by the market to identify outliers which are undesirable as they have high risks for low returns or which are desirable as they have low risks for high returns. If the pillar 3 disclosures are used by the market in this way, they will provide market discipline as intended by the Basel Committee for Banking Supervision.

Investors in a bank also face the risk that the bank will become insolvent and they will lose some or all of their capital, so information on the probability of insolvency allows investors to efficiently allocate capital. The graph which shows the Texas Ratio (graph 7) shows that there are a number of banks in the sample which have a much higher risk of insolvency than other banks. Investors can use this information to assess whether the likely return on their investment will be sufficient given the level of insolvency risk. It is likely that the actions taken by various governments during the Global Financial Crisis to bail out banks without penalising investors have increased the level of moral hazard for banks which are systemically important, either to a particular country or to the global economy (as all the banks in this sample

are), so insolvency may not be important to investors in the future unless actions are taken to reduce the level of moral hazard. Provided that the issue of moral hazard is addressed, the pillar 3 disclosures can be used to monitor insolvency risk, so will provide market discipline.

As literature shows that the information on risk and/or return may not always be credible, the graphs of risk against return and insolvency risk need to be interpreted with caution. The graphs which examined the credibility of the data (graphs 4-6) show that there are banks in the sample that do not appear to be managing their businesses prudently by holding adequate provisions against expected losses or and capital against unexpected losses. The pillar 3 data is therefore useful, as it allows the market to make a qualitative assessment about the credibility of disclosures by management. Should the disclosures not be found to be credible, then investors can take actions that would result in market discipline.

As the market commonly uses financial models to assist with investment decisions, a model was built to perform a quantitative assessment of the usefulness of disclosures in estimating future earnings. The results show that the model using pillar 3 data performs slightly better than the model built solely from financial statement data, although the improvement is not statistically significant (at a 5% level) with respective R^2 values of 86.7% and 85.1%. The explanatory power of the models is high relative to the levels seen in the accounting literature, although this literature is not directly comparable as financial institutions are generally excluded from the data (Anandarajan, Francis, Hasan, John, 2011). This may also be because of the limited time period covered by the data, as Arthur, Cheng and Czernkowski (2010) show that there is a significant level of variability (from an R^2 of 34.1% to an R^2 of 83.7%) in the explanatory power of financial

statements to forecast earnings over time. For the market the increase in the explanatory power of the model for earnings by using data from the pillar 3 disclosures is not considered to be economically significant as the increase in the variation explained by the model including pillar 3 data is only 1.6%, so the pillar 3 disclosures do not improve market discipline by allowing improved earnings models.

Because the link between risk and earnings is strong for banks it was expected that the model using the pillar 3 data would outperform the models from financial statement data. There are a number of possible causes: that the pillar 3 disclosures do not provide a complete view of the risks that impact the profitability of banks, that the disclosures are not accurate, banks using advanced methods for calculating their risk weighted assets are not consistent in their assessments of the level of risk, variances in the business environment between countries are impacting the consistency of the disclosures and that the Basel II accord (2006) has not resulted in the intended harmonisation of capital calculation methodology. Further analysis of the pillar 3 disclosures once a longer time series of data is available could clarify these issues.

The limited size of the dataset may have contributed to the lack of improvement for the earnings models, as the statistical power of the models is reduced by a small dataset. As Richardson, Tuna and Wysocki (2010) note one of the criteria for good empirical research is that the model must have good predictive power for data not used in the original model. As only a limited number of pillar 3 disclosures have been published it was not possible to determine the predictive power for data not used in the model, so the predictive power of models using data from the pillar 3 disclosures will need to be assessed once a larger dataset is available. A larger dataset

would also allow the use of more complicated models for earnings which would allow interactions between variables. Research by Kolari, Glennon, Shin and Caputo (2002) provide evidence of two and three way interactions between variables which could not be tested on the data available due to its small size.

It should also be noted that pillar 3 disclosures are a relatively new requirement and best practice on disclosures is still developing. There is latitude available within the pillar 3 requirements from the BCBS (2006) as they allow for bank management to make decisions about the depth of disclosures included. More prescriptive requirements may need to be developed in future to increase the frequency of reporting of ex-ante indicators of performance from semi-annually to quarterly and increase reporting of criteria listed in the pillar 3 standards but not currently included in reports. As noted in the literature review non-disclosure of key information cannot be taken to mean there is no material disclosure to be made, while disclosure of non-materiality confirms that no problem exists.

Further development of the disclosure requirements is likely to result from the on-going turmoil in the global financial markets as a result of the sovereign debt issues in Europe, as the inclusion of data showing the levels of sovereign debt exposures in recent pillar 3 disclosures has been voluntarily adopted in response to market requirements. The continued inclusion of disclosures on sovereign exposures is supported by Guttentag and Herring (1986). After studying the bank failures that occurred following sovereign debt problems in Latin America, they found that that the three required disclosures for banks should be country risk, loan loss reserves (depending on the availability of lending of last resort assistance) and the ability of the bank to obtain emergency liquidity assistance. The usefulness

of the pillar 3 disclosures will also change from the proposed enhancements made to the pillar 3 disclosures within Basel III (which will be implemented between 2013 and 2019), which will improve the scope, consistency and comparability of the data (BCBS, 2011).

This thesis assumed that the market would use the pillar 3 disclosures if they contain information that is useful in assisting investors to monitor the performance of banks and efficiently allocate capital. While this thesis has shown that the pillar 3 disclosures contain information that can be useful to investors, future research will be needed to show that key market participants do use the pillar 3 disclosures to inform their decision making.

6.   Conclusion

The purpose of the Basel II capital adequacy framework is to "strengthen the soundness and stability of the international banking system" (BCBS, 2006, pp. 2). Under this framework pillar 3 required banks to provide extensive disclosures as they allow "market discipline to work earlier and more effectively" (BCBS, 1998, pp. 6). The purpose of this thesis is to determine whether the pillar 3 disclosures meet the aims of the Basel Committee on Banking Supervision.

This thesis adds to the literature in a number of ways. The use of the pillar 3 disclosures to monitor and analyse bank performance adds the first analysis of the pillar 3 disclosures to the literature, as they are a new set of disclosures which have not been previously examined in the literature. The use of disclosures to explain future earnings provides an alternative method for assessments of the usefulness of disclosures than the standard method of using equity or debt prices. It also has the benefit of removing from the data any correlations in the movements of prices driven by broad market trends that are not captured in the disclosures. The design of the thesis also provides an alternative perspective to the existing literature on bank failure which focuses on factors that separate banks that failed from banks that did not fail and instead looks at earnings deteriorations as an early indicator of potential failures.

The usefulness of pillar 3 disclosures was examined using panel data from disclosures published during the Global Financial Crisis (2008 and 2009) for fifty of the largest global banks. The size of the dataset compiled from these disclosures was limited due to a number of factors: the disclosures have only been available since 2008; there are inconsistencies in the content of

the disclosures; and not all jurisdictions require pillar 3 disclosures. The results of this thesis therefore need to be interpreted with caution because the sample covers only a limited time and small number of banks.

The results show that there is valuable information contained within pillar 3 disclosures that can be used by the market. The pillar 3 disclosures are useful to monitor the actions of management, compare the performance of banks in different countries, as they allow investors to assess the trade off being made between risk and return, to detect whether banks have a higher probability of becoming insolvent. Investors can also assess whether the information contained within the accounting disclosures is credible.

The earnings models were not found to be improved significantly by the addition of information from the pillar 3 disclosures, either economically or statistically (at a 5% significance level), when compared with models containing only financial information. These results may have been affected by the time period used or other features of the data, so it would be worthwhile to re-examine these results in the future.

To determine whether this data does result in market discipline additional work will be needed to determine whether the market does analyse pillar 3 disclosures, makes decisions based on this data which change the markets and whether bank stakeholders react to changes in the markets. The results from this thesis will need to be revisited once a longer time series of data is available as the results in this thesis are affected by the short time period for which data is available. The usefulness of the pillar 3 disclosures will change from the proposed enhancements made to the pillar 3 disclosures within Basel III (which will be implemented between 2013 and 2019), which

will improve the scope, consistency and comparability of the data (BCBS, 2011).
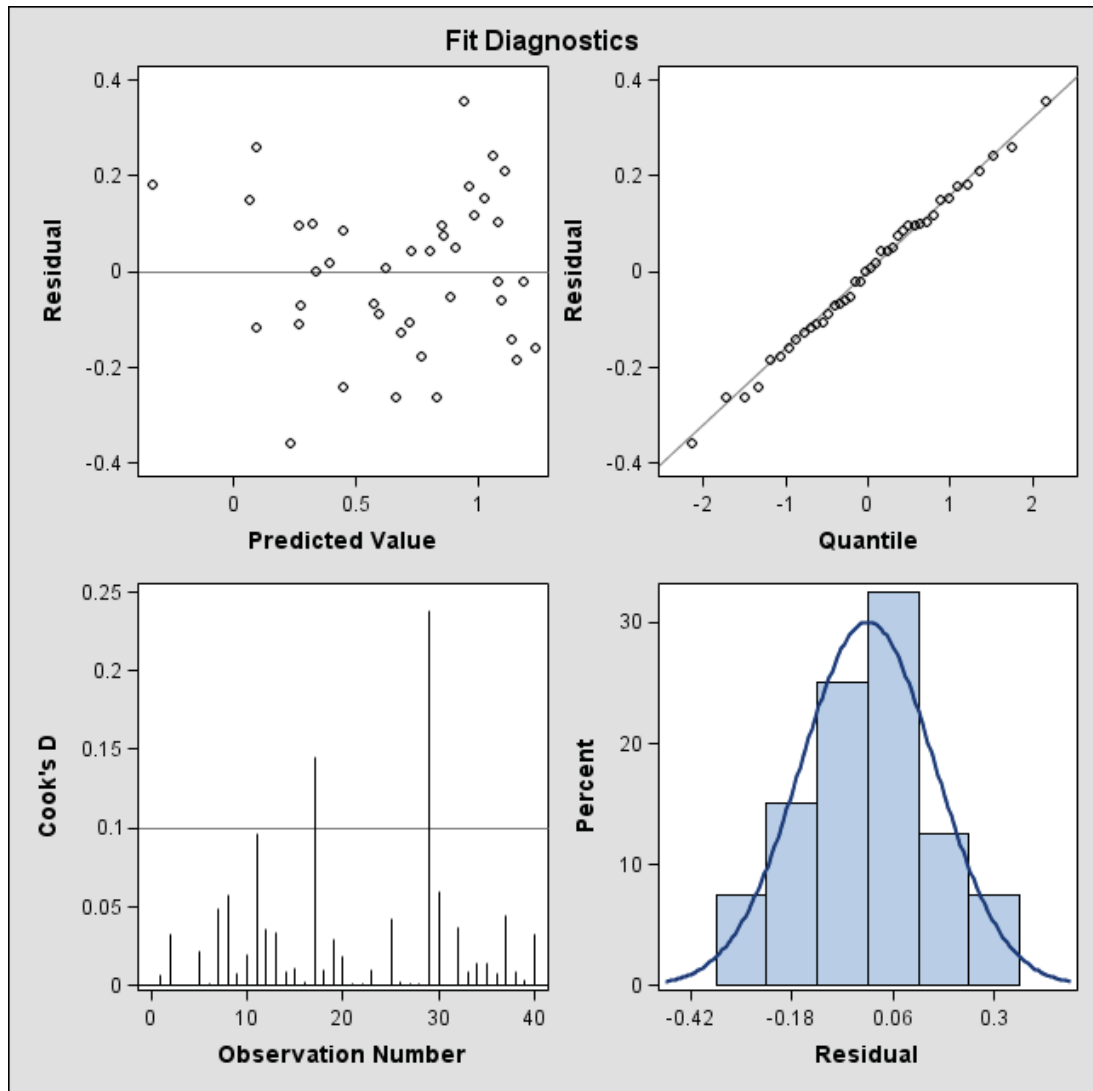
Appendix: The residuals from the earnings models
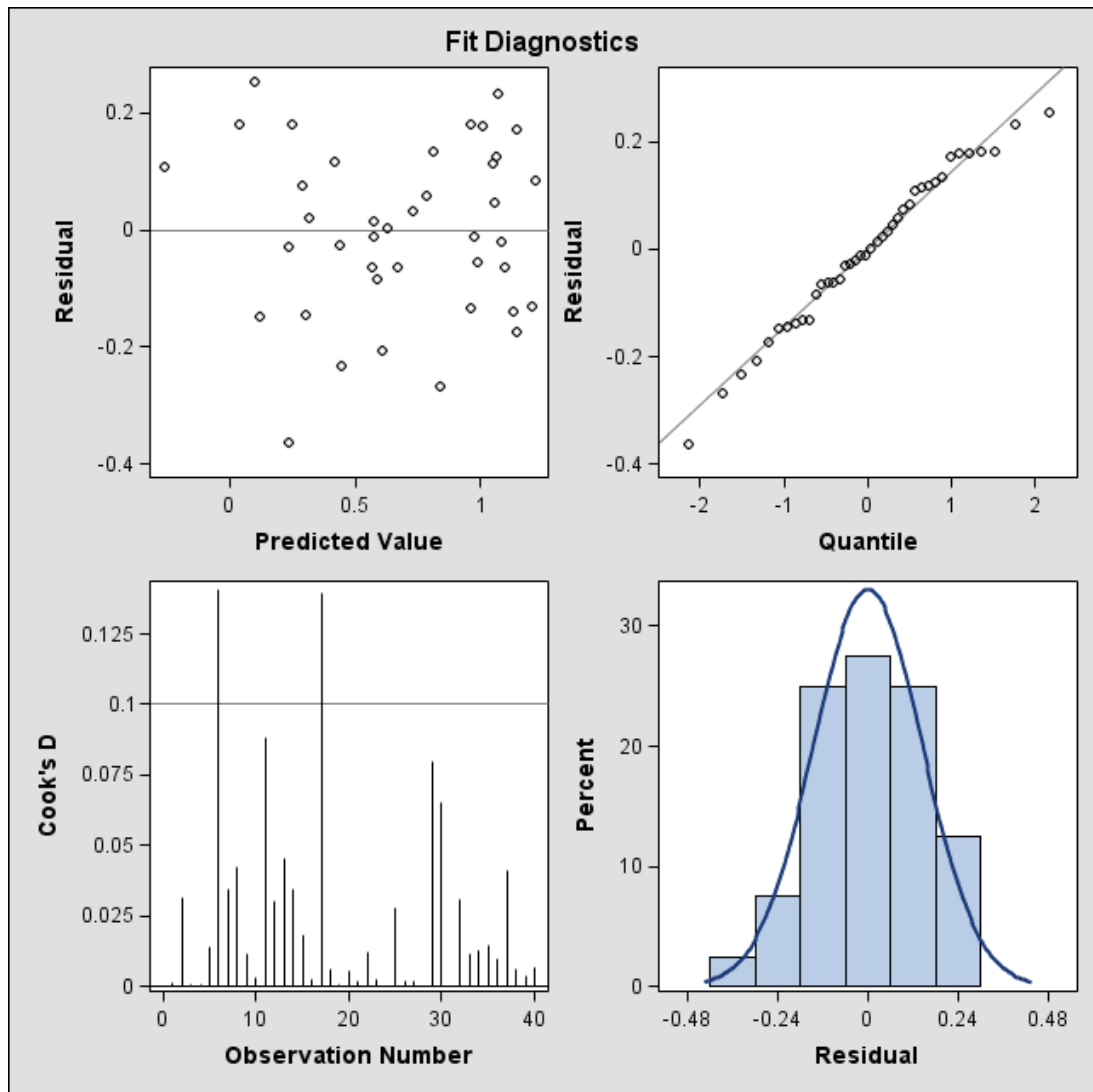
Graph 8: Residuals from Model 1a
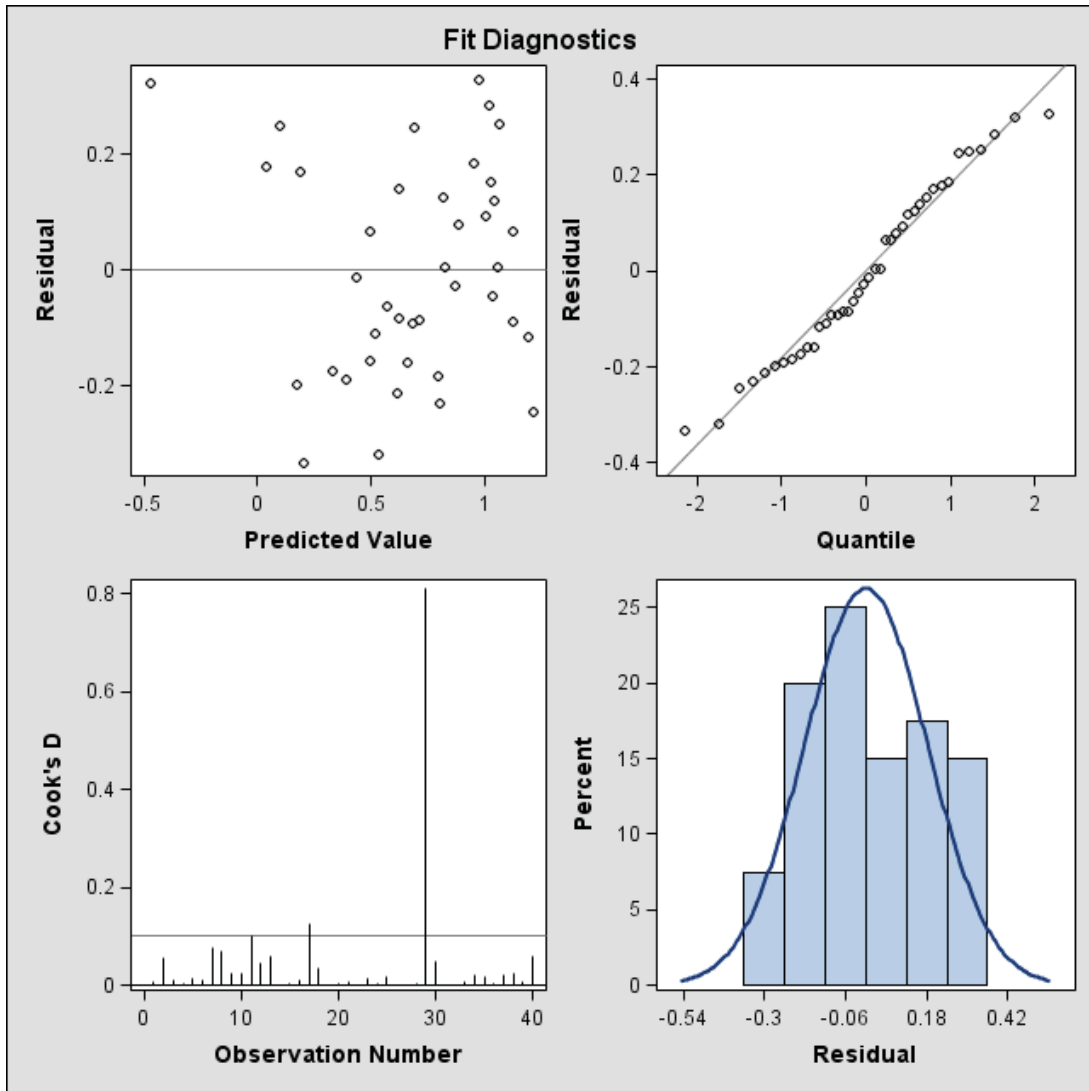
Graph 9: Residuals from Model 2a

Graph 10: Residuals from Model 3d

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