TOWARDS AN UNDERSTANDING OF ADEQUATE CAPITALISATION LEVELS FOR A BANK

Guy Ford
Macquarie Graduate School of Management

Mark Young
Macquarie Graduate School of Management

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Research Office
Macquarie Graduate School of Management
Macquarie University
Sydney NSW 2109
Australia

Tel  612 9850 7732
Fax  612 9850 9019
Email [research@mgsm.edu.au]
URL  http://www.mgsm.edu.au/research

Associate Dean of Research A/Professor Suresh Cuganesan
Research Administrator  Mrs Kerry Daniel

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* Corresponding Author
A/Professor Guy Ford
Macquarie Graduate School of Management
Macquarie University NSW 2109, Australia

Phone:  +61 2 9850 7813
Fax:     +61 2 9850 9019
Email:   Guy.Ford@mgsm.edu.au
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Guy Ford
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Mark Young
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ABSTRACT

This paper proposes that the risk preference function of the centre of the bank - which embodies the diverse interests of bank owners, depositors, debt holders and regulators - does not calibrate with the attitude to risk implicit in the measurement of total bank capital requirements, where capital is linked to a predetermined solvency standard. The risk preference function of the centre of the bank is one that is likely to demonstrate non-satiety, risk aversion and a preference for positive skewness in the distribution of bank returns. This is at odds with the attitude to risk implicit in a predetermined solvency standard, which is essentially one of risk neutrality. If banks adopt a policy of spreading their actual capital against risky positions taken by managers – a full capital allocation policy – then this imposes an internal risk standard that may lead managers to make portfolio decisions that are suboptimal for the bank. Goal alignment necessitates that the risk measure used for internal purposes diverge from that used for measuring the total capital requirements of the bank.
1. INTRODUCTION

The recent turmoil in world credit markets, changes in regulatory capital requirements\(^1\) and, until lately, the ready availability of hybrid instrument promising significant capital arbitrage\(^2\) have all brought into focus the question of the adequate level of capitalisation for a bank. Less obvious is the question of how the specific risk preference of a bank, and its effect on adequate capitalisation levels, expands beyond pure solvency for multiple bank stakeholders. Put differently, how does the risk preference function of a bank equate to positive shareholder value, fungible balance sheet structures and a meaningful and coherent linkage between bank capital, risk and profit?

A risk preference function determines the feasible set of portfolios for a bank and establishes the relevant risk measure for capital allocation, pricing and performance measurement. Determining an organisational risk preference function is complicated by the fact that the ‘centre’ of the bank itself is an agent representing multiple interests – those of bank owners, creditors, managers and regulators – each of whom carry potentially conflicting risk attitudes. As a case in point, in the event that the bank defaults on its debt, some stakeholders may be less concerned with the magnitude of losses than other stakeholders. We can consider that the economic impact of default on owners and managers will be largely invariant to the size of actual losses, with costs to these stakeholders a function of the event of default itself. Managers face loss of employment regardless of the size of default, while losses to owners are capped by the institution of limited liability.\(^3\) In contrast, the economic impact of default on regulators and creditors is more directly related to the size of losses in the event of default. This means risk measures based on the probability of default are likely to be of more relevance to managers and shareholders, while measures linked to losses in the event of default may be more relevant to regulators and creditors. This has implications for an incentive-compatible risk-adjusted performance measurement framework in the sense that the centre of the bank represents stakeholders who may carry different perspectives on risk or tolerance to unexpected losses. It places focus directly on the question of the appropriate risk preference function for the centre of the bank.

Directly related to the above is the capital attribution policy of the bank. While all banks must hold capital equal to the minimum regulatory requirement, actual capital held by banks is typically linked to a target credit rating, which is in turn determined by the probability of default. If actual (economic) capital held by the bank is allocated against the positions/portfolios held by managers, and performance measured against this capital base, it could be held that bank economic capital is driven more by external forces such as the views of ratings agencies, or the prerogative of senior executives in the bank, rather than a disciplined and consistent analysis of risk based

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\(^1\) Implementation of Basel II reforms in Europe, the UK and South-East Asia.

\(^2\) The arbitrage refers is of regulatory capital and benefits of off balance sheet instruments.

\(^3\) Managers and owners may be concerned with the size of losses if they are to influence the decision to liquidate versus restructure the bank. In the latter case, owners may be able to recover some proportion of their initial investment, and managers retain their employment, depending on the nature of the restructure and the subsequent fortunes of the bank.
on the full distribution of potential outcomes – both upside and downside. Subject to risk measurement methodologies and the structure of compensation packages used to remunerate employees within the bank, managers and traders may be incentivised to take on higher risk portfolios than deemed appropriate by the centre because a capital charge based on the actual capital held by the bank – in turn based on target credit rating – is based on default probability and hence invariant to the magnitude of potential losses. The basis upon which the risk measure is formulated is thus critical to aligning the interests of principals and agents within the bank. Incentive-compatibility may not be achieved if a bank mandates that risk-adjusted performance measures must be linked to actual capital held by the bank. In order to avoid perverse outcomes, it may be relevant to use a risk measure for performance evaluation that is different to that used as the basis for measuring the actual capital held by the bank. While this view appears to go against conventional thinking that the actual capital held by the bank must be allocated across all businesses and positions, it is based on recognition that the actual capital held by a bank is largely determined exogenously and may be misaligned with the actual risk in positions taken by agents within the bank.

The remainder of this paper is structured as follows. Section 2 reviews the theoretical foundation of risk preference and its interplays with bank capital reserving. Section 3 provides a description and comparison of the differing views of risk preference of a bank from the perspectives of the shareholder, bondholder, rating agency(s) and regulators, and discusses how the risk preference and in turn the adequate level of capitalisation for each of these stakeholders may be in some cases contradictory. Section 4 considers how franchise value in a bank may lead to the application of a concave risk preference function for bank stakeholders, which in turn, has implications for the adequate capitalisation level of a bank. Section 5 concludes the paper.

### 2. BANK RISK PREFERENCE FUNCTION

A risk preference function is a mathematical formulation that enables an investor to rank portfolios according to specific objectives. The most common form of risk preference functions are utility functions, which can be used to model the subjective preferences of investors. Utility functions typically capture the risk aversion of investors, where higher risk aversion implies that investors are more risk-averse and prefer portfolios with lower risk.

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4 This also has implications for the pricing of bank assets, to the extent that the bank prices to earn a minimum hurdle rate on allocated economic capital.

5 The actual capital held by the bank may not match capital allocated to business units due to diversification benefits across business lines, products or portfolios. This will particularly be the case where actual capital matches the regulatory requirement, because regulatory requirements do not capture diversification benefits across businesses. A bank may find that according to its internal models, economic capital may be less than regulatory capital due to diversification across the businesses. In this scenario, some capital may remain unallocated and the bank may be earning less than the hurdle rate while the business units are earning the hurdle rate on allocated capital. In any event, from a performance measurement perspective, managers should not be rewarded for diversification benefits in their businesses (through adjustments to capital charges) unless their actions can be directly attributed to the creation of these benefits. To the contrary, diversification benefits across businesses are more likely due to macroeconomic/global factors or the business mix determined at the centre of the bank, rather than at the level of divisions, business units or individual managers.
risk attitudes of individuals while satisfying various axioms regarding consistent and rational behaviour on the part of these individuals. Most of the literature on investment choice under uncertainty assumes that decision makers are risk-averse. In terms of utility theory, this implies that decision makers have a utility function that is uniformly concave. Extending this from the level of individuals to that of an organisation requires researchers to make the implicit assumption that the risk preferences of individual stakeholders can be aggregated into a relatively simple and unique organisational utility function. The question is can a risk preference function be derived for the centre of a banking organisation given the coalition of potentially conflicting interests – owners, creditors/ depositors, regulators, managers - that the centre is required to take into consideration when searching for an optimal balance of risk and return in bank assets? The risk preference function of the bank has to be determined against a backdrop of multi-dimensional information asymmetries: the private information of managers on the distribution of portfolio returns, and the potentially disparate risk incentives of owners, creditors, regulators and managers.

Papers that model the banking firm typically start with the assumption that the banking firm aims to maximise an objective function in terminal wealth, subject to regulatory constraints that restrict the bank’s opportunity set of assets and liabilities. From the first derivative of the objective function, more wealth is preferred to less. On this point, the literature is generally consistent. However, views tend to diverge with respect to the second derivative of the objective function. Some papers view the banking firm as an expected value/profit maximiser, consistent with a linear objective function in terminal wealth, while others view the bank as a risk-averse investor, consistent with a concave objective function in terminal wealth. This is overlaid with different views on the relationship between equity investors and bank management. Some papers view this relationship as unitary, where banks are owned and managed by the same agent. Risk aversion arises in this context because the owner-manager cannot completely diversify risk away. Other papers recognise a separation between owners and managers and conclude that limited liability leads to a risk-seeking preference on the part of owners, while at the same time managers may be considered risk-averse to the extent that their wealth is tied to bank-specific human capital. We evaluate these disparate views below. We also consider the objective function for bank regulators and bank creditors.

Those papers that employ a linear objective function for the bank do so under the assumption of frictionless and complete markets, under which investors and borrowers are able to perfectly diversify their risks and costlessly recapitalise the bank in the case of insolvency. Bank investors in their model are deemed to be risk-neutral, seeking to maximise the expected profits of the bank [Hester and Pierce (1975), Kareken and Wallace (1978) and Crouhy and Galai (1986)]. In this context, the opportunity set of the investor spans that of the bank, and in effect, the bank need not exist. Any portfolio that the bank selects can be replicated or hedged by the investor. Bank owners care only about the systematic component of total risk, which is appropriately priced in their required returns, since they can perfectly diversify their portfolios to compensate for business risk in the bank.

An alternative stream of papers remove the assumption of complete markets and view banks as risk-averse, expected utility maximisers. In these models, the objective function for the bank is concave. Papers by Kahane (1977), Koehn and Santomero
(1980), and Kim and Santomero (1988), which are typical of this approach, analyse risk-taking in banks as a portfolio management problem for a risk-averse owner-manager whose entire net worth is invested in bank. Risk aversion arises because the owner-manager cannot completely diversify his risk, and as such, is directly exposed to the asset portfolio risk and leverage of the bank. These papers find that the imposition of a fixed capital requirement by regulators forces the bank to reduce its leverage and reconfigure the composition of its asset portfolio towards riskier assets as owner-managers aim to compensate for the loss in utility arising from the reduction in bank leverage.

A bank, however, need not be operated by a single owner-manager for risk-aversion to be incorporated in the objective function. If there is a separation between bank owners and management, and the latter is responsible for decision making, the bank may act in a risk-averse manner to the extent that managers are unable to diversify their human capital. In an early paper, Shavell (1979) finds that if owners are risk neutral but managers are risk-averse, under a Pareto optimal incentive contract managers will not operate to maximise the profits of the firm. If the utility of managers is directly linked to the returns of the bank, the risk-taking incentives of managers will decrease and the optimal degree of risk taking is likely to be less than that desired by bank owners. Later papers by O’Hara (1983) and Benston et al (1986) show that the costs to managers associated with losing their employment can induce risk-averse decision-making. Managers seek to reduce the variability of the earnings stream of the firm to reduce the probability of bankruptcy or if their compensation is linked to the earnings of the firm (Holmstrom, 1979). Dewatripont and Tirole (1993) assert that bank management will act in a risk-averse manner in order to smooth bank earnings streams because this reduces the probability of interference by external parties such as creditors, owners and regulators. The basis of their argument is that managers dislike their projects disrupted or altered because they either enjoy private benefits whilst their projects are active, or they receive high monetary rewards if the projects they start are pursued. The latter arises because continuation of projects yields a fatter upper tail for the distribution of profits.

Empirical studies that attempt to measure the risk preference of bank stakeholders are not large in number. One study, however, does provide evidence that managers in banks are more risk-averse than owners. Saunders, Strock and Travlos (1990) examine the relationship between bank ownership structure and risk taking, hypothesising that managerially-controlled banks take less risk than stockholder-controlled banks, and that these differences become more pronounced during periods of financial deregulation. In a similar vein to previously discussed papers, they base their hypothesis on the proposition that managers will act on a risk-averse rather than a value-maximising manner to the extent that their wealth is largely in non-diversifiable human capital that is bank specific. Using capital market measures of bank risk and the proportion of stock owned by managers (as a proxy for ownership structure), they find empirical support for the hypothesis that stockholder controlled banks take more risk than manager-controlled banks. They conclude that regulators should allocate a greater proportion of their resources toward monitoring stockholder, rather than managerially-controlled banks – that is, ownership structure should be used as a criterion for determining examination frequency.
Besanko and Kanatas (1996) present a model of the banking firm where bank managers own only a fraction of the stock of the bank and take unobservable actions that maximise their own welfare but which may be against the interests of bank owners. They analyse the outcomes in a setting of more stringent risk-adjusted regulatory capital standards, and find that while managers may weight their asset portfolios towards lower risk-weighted assets (positive asset substitution) under such standards, they may, at the same time, provide less effort in the management of these portfolios. This effort-aversion moral hazard arises in their model because higher capital standards require the issue of new equity, which in turn dilutes the proportion of equity held by insiders (managers). They use this as a potential explanation for the decline in the stock price of banks when new equity issues are announced. Their findings support those of Saunders, Strock and Travlos (1990) in so far as banks with a lower proportion of managerial ownership may be riskier, but the distinguishing characteristic of their model is that managers provide less effort when their stake in the bank is diluted, and this in turn increases overall risk for the bank. They conclude that in certain cases this negative impact on the bank’s solvency arising from less effort on the part of managers outweighs the asset substitution effect arising from higher capital standards. The conclusion that managers reduce their effort when their stake in the bank is reduced, thereby increasing the probability of bank insolvency, runs counter to the previously discussed view that the costs to managers of losing their employment can induce risk-averse behaviour in banks.

Those papers that employ a concave bank objective function do view managers who make decisions within the bank to be risk-averse. The use of a concave objective function in models of the banking firm has been criticised by Keeley and Furlong (1990) and Rochet (1992) on the grounds that the limited liability option of bank owners should be incorporated into the objective function. Merton (1974) was the first to recognise that limited liability amounts to an option that allows the owners of a firm to put the assets of the firm to debtholders when the value of the debt exceeds that of assets. In addition, Merton (1977) shows that a system of fixed-price deposit insurance results in a put option subsidy to bank owners, the value of which increases with bank risk. If risk-insensitive deposit insurance exists or regulators are perceived to implicitly or explicitly guarantee the value of bank deposits, and limited liability means bank owners are indifferent to the distribution of losses beyond insolvency, then shareholder value is maximised by increasing the variance of returns in bank assets as much as possible. In this setting, the payoff to bank owners is a convex function of the return from investment, implying owners prefer that the bank acquire higher risk to lower risk assets. Indeed, Rochet (1992) shows that when the limited liability of owners is taken into account and bank capital requirements are set exogenously, the convexity of preferences due to limited liability may dominate risk aversion.

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6 In this context, effort is viewed by the Besanko and Kanatas in terms of the commitment of senior management in monitoring and supervising loan officers in their evaluation and screening of loan applicants and the termination of underperforming employees.

7 If managers reduce their effort when their stake in the bank is low, and increase the risk of bank insolvency in the process, then the current practice of including stock or stock options in the remuneration packages of managers and senior executives in banks may be justified.

8 The incentive for owners to increase the risk of the bank may also be driven by the realisation that debtholders and depositors can only monitor and control owner’s actions imperfectly. Indeed, if depositors believe they are protected by the regulator, they will have little incentive to monitor the actions of managers or bank owners.
3. CONFLICTING STAKEHOLDER OBJECTIVES AND BANK CAPITALISATION

Bank owners will as a minimum require as a necessary and sufficient condition that a bank is solvent. The risk preference and in turn the risk appetite of a bank typically tend to align with expectation set of owners. Those who consider bank shareholders to be risk neutral (linear objective function) assume that financial markets are frictionless and complete. While this may be a useful assumption for the purposes of theoretical modelling, it is not an accurate representation of the markets in which banks operate. When limited liability and the regulatory safety net are taken into consideration, bank owners may have a convex risk preference function and prefer higher variance in bank asset returns. If, however, a bank possesses franchise value, bank owners may prefer that managers act in a risk-averse manner with respect to their portfolio selection decisions in order to preserve the associated benefits. This is explored further in the next section.

The analysis of the risk preference of bank owners is complicated by recognising that there are different classes of bank owners with potentially different risk preference sets. **Institutional shareholders** are the most sophisticated in terms of articulation of their expectations on risk preferences and bank capital budgeting practices. These investors expect incremental growth in return on equity on a ‘risk-adjusted’ basis – such that returns are increasing without a significant change in the risk profile of the bank. **Retail Shareholders** tend to be characterised by their focus on dividend payout ratios and short-term earnings growth, with little consideration of concepts such as economic capital and risk-adjusted returns. **Arbitrageurs** look to exploit any market imperfection and price setting asymmetry to make short-term returns - risk preference and any indicator of performance and reserving are of little concern to this group.

Bondholders, along with corporate and retail shareholders, require as a necessary and sufficient condition that a bank is solvent. Bondholders are concerned not only with the probability of a bank defaulting on its debt obligations, but also the size of losses in the event of default. Ratings agencies, like bondholders, are concerned with both the probability of default and the size of losses in the event of default, and as such, will view the internal capital framework of a bank (economic capital) as the best indicator of the amount of capital that the bank must manage.

Bank regulators face a trade-off when the determining the optimal amount of capital a bank should hold. Too little capital impacts insolvency, and increases the value of the implicit call option held by shareholders over the bank’s assets. High regulatory capital requirements, however, impose costs inefficiencies on banks and provide incentives for bankers to arbitrage regulations in order to maximise returns on capital. In addition, Dimonson and Marsh (1995) note that high capital requirements may act as a barrier to entry in banking, restricting competition. A socially optimal default probability resolves the trade-off between protection against losses and the preservation of bank efficiency.

Daripa and Varotto (2004) argue that the objective function for the regulator needs to resolve the trade-off between safety loss and overprotection. There is a ‘loss of safety’
if the actual risk in bank assets exceeds the socially optimal level because the probability that the bank defaults exceeds the regulatory optimum. Alternatively, there is an ‘overprotection loss’ if the actual risk falls below the optimal risk. An overprotection loss principally penalises bank owners if their risk preference function is convex, while a safety loss penalises depositors and/or regulators, who carry a concave preference function. The authors propose that a regulatory objective function allows for the regulator to place different weights on the interests of shareholders and depositors, although they provide no empirical indication as to the potential size of these weights. Pointing to the free-rider problem with respect to monitoring banks that arises when banks have many small and dispersed depositors, Dewatripont and Tirole (1994) argue that protection against safety loss should be the main goal of bank regulation. These depositors do not have the information necessary to perform efficient monitoring. The presence of systemic risk from bank failure also supports that a greater weight be applied to protection against safety loss.

Jaschke (2002) argues that banking supervision should aim to minimise expected losses in the event of bankruptcy because depositors, contributors to deposit insurance, creditors and potentially tax payers are those who must bear the losses that exceed the capital base of a bank in the event of bankruptcy. In a similar vein, Guthoff, Pfingsten and Wolf (1998) argue that while it is difficult to derive a formal, operational objective function for bank regulators, it can be determined that there are some portfolios that will normatively never be preferred over others by bank regulators. Using the concept of efficient sets, they assert that a regulatory authority would always prefer a bank to invest in portfolios that have less weight in the left tail of the distribution of asset returns because these portfolios are less likely to expose the bank to large losses in the event of default. If the concern of regulators is severity of potential losses, a regulatory objective function based on a socially optimal probability of default – in the spirit Daripa and Varotto (2004) – may not be an appropriate representation of the risk preference function of regulators.

4. FRANCHISE VALUE AND RISK PREFERENCE

The risk preference function and capitalisation levels/reserving activities of a bank can be viewed two perspectives – the minimum regulatory requirement and the expectation of ratings agencies. Whilst the regulator’s viewpoint might be considered as being a hard constraint it is also function of the level of unexpected loss that as a banking system and a bank within it has experienced. The ability of bank owners to maximise the value of their limited liability option by increasing the variance of returns in bank assets depends on the risk preferences of bank managers and on the constraints imposed by regulators. While the focus of owners may be volatility risk in the bank, the focus of regulators and bank creditors is survival risk. If management and ownership are separate, owners must somehow force management (or the centre of the bank that sets incentive structures for managers) to operate the bank for their benefit. The question, then, for the centre of the bank is to what extent should attaining imposed regulatory constraints take precedence over the preferences of
owners?\(^9\) This is fundamental to determining the appropriate risk preference function for the bank.

If banks possess high franchise value, the benefits derived by owners and managers may provide sufficient incentive for bankers to hold capital above the regulatory minimum, and manage and diversify portfolio risk in order to reduce the probability of insolvency. This suggests that high franchise value would encourage risk-aversion on the part of owners and managers, and align their interests with those of regulators. This view is presented by Marcus (1984) and Keeley (1990), who argue that franchise value restrains moral hazard on the part of bank owners. Demsetz et al (1996) also observe a positive association between capitalisation (franchise value) and the propensity of the bank to take risks.

Franchise value is represented by the capitalised stream of above normal profits that may arise in banks from a number of sources, such as regulatory safety nets, oligopoly rents, strong customer bases, valuable lending relationships or efficiency gains harnessed from new technologies. If franchise value is high, banks may have little need for regulatory requirements to reduce the probability of insolvency. This would be the case if the value of the franchise to owners exceeds the put option value of limited liability and deposit insurance.

Milne and Whalley (2001) argue that the basic model of bank moral hazard emerges when bank franchise value (expected future income) is low. They find that bank behaviour depends upon the buffer of capital above the regulatory minimum, not the total level of capital. Banks with low franchise value have low expected earnings or growth opportunities to protect against a decline in earnings, and as such, have a high probability of failure. They assert that these banks have little incentive to hold adequate capitalisation, and are more inclined exploit moral hazard by investing in riskier bank assets. Conversely, banks with high franchise value have high expected future earnings and growth opportunities, and have an incentive to maintain substantial capital buffers to protect the value of the franchise should the bank be hit by large unexpected losses.

Bigg (2003) presents a contingent claims model of a bank that suggests a U-shaped relationship between charter (franchise) value and risk. The predictions mirror that of Milne and Whalley (2001) for low franchise value banks, where potential gains from exploiting the regulatory safety net outweigh the potential erosion of franchise value in the event of insolvency. As franchise value rises, banks have a greater incentive to preserve expected future rents by adopting lower risk strategies. However, Bigg predicts that highly capitalised banks with low risk of insolvency will not gain from reducing risk further and will more inclined to increase wealth by engaging in risk-shifting activities. Bigg tests the predictions of the contingent claims model using data of ten Australian banks over the period 1992-1997. Using Tobin’s q as a measure of franchise value and various measures of risk (share price volatility, leverage risk and portfolio risk), Bigg finds a negative relationship between franchise value and risk for the lower franchise value banks in the sample, although all banks exhibit strong positive franchise value over the period of the sample. However, at very high

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\(^9\) In a complete markets setting, it could be argued that the price of bank equity would perfectly incorporate imposed regulatory constraints. It appears that researchers have not attempted to measure the premium, if it exists, that regulatory constraints place on the required return for bank equity.
franchise value banks, which are also more highly capitalised, franchise value is found to be ineffective in eliminating risk-shifting. These empirical findings support the hypothesis that the relationship between franchise value and bank risk is U-shaped.

If managers and owners derive equal benefits by preserving or improving the franchise value of a bank, then there should be incentive compatibility between risk preferences of owners and the decisions made by managers with respect to the risk in bank assets. Managers may derive benefits from well-remunerated careers and job security and as discussed earlier, act in a risk-averse manner. However, if there are agency conflicts between owners and managers, the latter may still make decisions that maximise their private benefits (utility) at the expense of bank owners. For example, managers may lower the price of bank products or services in an attempt to increase the market share of the bank in order to increase their budgets or perquisites, while not pricing to adequately cover for risk. Managers may also appropriate part of the profits of the bank by paying themselves high salaries, recruiting excessive staff, or by failing to adequately monitor changes in the risk profile of the bank. Credit officers, for example, may face incentives to refinance delinquent loans or capitalise unpaid loan balances in order to present a more favourable picture of performance. Further, managers may become excessively risk-averse when performing above some predetermined benchmark or target in order to preserve bonuses, while at the same time becoming risk-seeking when performing below target in order to avoid reporting losses or missing on bonuses (gambling for resurrection). This changing risk appetite may be driven by the structure of compensation contracts presented to managers and employees.

5. CONCLUSION

If there is contention in the literature, it revolves in the main around the risk preference of bank owners. Those who consider bank shareholders to be risk neutral (linear objective function) assume that financial markets are frictionless and complete. While this may be a useful assumption for the purposes of theoretical modelling, it is not an accurate representation of the markets in which banks operate. When limited liability and the regulatory safety net are taken into consideration, bank owners may have a convex risk preference function and prefer higher variance in bank asset returns. However if the bank possesses franchise value, being the present value of expected future above normal profits, bank owners may prefer that the bank acts in a risk-averse manner in order to preserve the associated benefits. In this case the objective function for the bank would be concave. Much comes down to the extent to which the value of the bank franchise exceeds the combined put option value of limited liability, deposit insurance and/or the regulatory safety net. If the value of the franchise to bank owners exceeds the value of the put option, we can conclude that owners will be risk averse and a concave preference function applies.\(^{10}\)

\(^{10}\) Longley-Cooke (1998) asserts that for incorporating risk into the measurement of the financial performance of a publicly traded financial institution it is reasonable to use the risk aversion of its shareholders. He shows that analysis of total returns on large company stocks compared to yields on one year Treasury bills, from 1950 to 1995, produces a risk aversion parameter of 5.7 (p.92). Bodie et al (1996) cite that a broad range of studies place the degree of risk aversion of the representative investor in the range of 2 to 4 (p.187).
From the perspective of bank regulators and creditors (depositors and debt-holders), we conclude that a concave risk preference function also applies. We determine that regulators and creditors are concerned not with the probability of default when assessing risk, but rather, expected losses in the event of bank insolvency. This is because the economic impact of default on regulators and creditors is linked to the size of losses. At the same time the impact of insolvency on bank owners and managers is less sensitive to the size of losses because the value of equity should already be minimal upon insolvency and managers are likely to have lost their employment. Bank owners and managers are thus more likely to be concerned with unexpected losses up to the predetermined target solvency standard.

This has implications for determining the appropriate level of capitalisation for a bank. If the economic capital of bank is measured on the basis of a predetermined solvency standard, then there is a disjuncture between the risk preference function of creditors and regulators (and potentially owners if a bank has franchise value) and the risk attitude implicit in the calculation of the economic capital for a bank. The risk preference function of the centre of the bank is one that is likely to demonstrate non-satiety, risk aversion and a preference for positive skewness in the distribution of bank returns – a concave function in which stakeholders are concerned with the size of losses in the event of default. This is at odds with the attitude to risk implicit in a predetermined solvency standard, which is essentially one of risk neutrality. If banks adopt a policy of spreading their actual capital against risky positions taken by managers – a full capital allocation policy – then this imposes an internal risk standard that may lead managers to make portfolio decisions that are suboptimal for the bank. Goal alignment necessitates that the risk measure used for internal purposes diverge from that used for measuring the total capital requirements of the bank.
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