Accounting Values versus Market Values and Earnings Management in Banks

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Abstract

Banks worldwide are subject to increasing regulation and, simultaneously, find themselves under the close scrutiny of market analysts and screening of large institutional investors. Banks are required to maintain minimal equity relative to both total and risky assets, market analysts expect banks to grow at a certain rate and to show reasonable returns on assets and on equity.

Capital requirements imposed by central banks on commercial banks follow the guidelines of the BIS (Bank for International Settlement). These requirements are calculated and expressed in accounting terms, and not in terms of market value. The accounting literature is extensive on the issue of earnings management and there is substantial evidence that firms exploit different methods to smooth reported earnings and create hidden reserves that can later be translated into equity at some point in the future.

The question arises as to the extent capital adequacy regulations on the one hand, and expectations concerning banks' profits on the other, create incentives for banks to hide earnings in good times (by under-stating equity) and increase reported earnings in bad times. A model is developed mapping the optimal behavior of a bank operating in an uncertain environment that attempts to maintain capital requirements and meet target growth rates, while building a reservoir of hidden earnings for capitalization in future bad periods. It is shown that if banks are penalized for downward deviations from targets, while not being symmetrically rewarded for over-achieving, there will be incentives to create hidden reserves.

I. Introduction

Over the past two decades we have witnessed a phenomenon whereby: many banks have expended their investments in real activities and real assets, including privately-held companies. We have also seen complex financial arrangements with high tech start-ups in which the indirect objective of the lending bank is ownership of non-traded shares. Many banks have also made loans to real estate enterprises for which the major collateral is the real estate (i.e. non recourse loans). The common feature shared by these investments is their limited liquidity and lack of market prices.

This phenomenon deserves some explanation since in an efficient capital market there should be no clear economic reason for banks to acquire real assets, especially those lacking clearly evident market prices. Individual investors can diversify on his own and does not require the services of commercial banks for this purpose.

In this paper we examine this phenomenon and show that financial institutions can benefit from direct investment in real assets. The decision to undertake such investments, especially in assets lacking quoted market values, may be strongly motivated by **earnings management** considerations. According to accepted accounting principles, real assets are reported on historical value basis, which differ significantly from market values. When the market value of an asset is significantly higher than book value, there is a "hidden" store of value, which can be released once the asset is sold.[1]

Financial institutions are faced with the necessity to dynamically meet multiple, sometimes contradictory constraints**,** including: capital adequacy requirements,[2] investor expectations regarding return on capital and dividend policy, and internal managerial benchmarking. These requirements and measurements are expressed in accounting terms. Accordingly, banks have a major incentive to manage earnings to better deal with the demanding, dynamic environment in which they operate. Entities in the non-financial sector face similar constraints in cases where capital adequacy

[1] It should be emphasized that due to FASB standards 121 and 144 as well as international accounting standard 36, fixed assets can no longer be carried at values above the their recoverable amount, which serves as a proxy for their value. Note however that the reversal of an impairment is possible only according to IAS 36. Our paper can shed light on reversal strategy.

[2] See Crouhy, Galai, and Mark 2000, Chapter. 2 on the regulatory requirements imposed by the Bank for International Settlements (BIS) on banks worldwide.

requirements are replaced with loan covenants. However, these constraints are more binding and stringent in a regulated industry.

Let us start with the most important constraint facing a bank: the regulatory capital adequacy requirement. Failure of a bank to meet this requirement might simply drive it out of business. In some jurisdictions, delinquent banks are not allowed to create new loans. It is not surprising, therefore, that the capital adequacy requirement, by itself, generates incentives for earnings management. Research shows that banks that are close to the minimal capital requirements are actively engaged in earnings management (e.g. Moyer (1990), Scholes et al (1990), Collins et al (1995) and Beatty et al (1995)). Recent evidence demonstrates that banks and insurance companies, respectively, use loan loss provisions, and claim loss reserves as major tools in managing their earnings.

In this paper we develop a dynamic stochastic optimization model under constraints to show that for a bank facing an environment of **multiple constraints.** Since there is no analytical solution we illustrate the model with a two period binomial example. We show that strategically timing the liquidation of real assets can be an effective earnings management tool. This is in contrast to selective liquidation of financial assets or liabilities to satisfy constraints. Holding assets for earnings management purposes is not without cost. The model enables us to estimate the economic cost associated with holding of the real assets (part of it is the cost of regulation) and the related value of exercising the **"accounting option"** inherent in this activity. We also show implications for dividend policy and regulation.

We depart from the approach adopted by most papers on earnings management by presenting an optimal policy in a multi-period stochastic model for liquidation of real assets by financial institutions. We argue that strategically-timed investment and divestment of real assets enables banks to manage earnings in a multi-constraint environment: so as to adhere to capital adequacy requirements, to meet other profitability objectives and maintain dividend policy targets.[3] We explicitly account for the need to meet both investor expectations (such as earnings growth and return on equity[4]) and regulatory requirements as incentives to the earnings management. While

[3]It should be noted that regulators sometimes limit the bank's ability to distribute dividends to owners even when this practice is allowed by law.

[4] In the last few years the SEC has been conducting a campaign against the practice of earnings management. According to the retired SEC chairman, Arthur Levitt, who initiated that campaign:

this model is tailored for the financial services industry, it can be applied to firms in other industries facing similar sets of constraints.

Our premise is that earnings management is conducted through purely legal action, based on using accounting standards to reflect real activities. This can be distinguished from some techniques that can be construed as fraudulent financial reporting. The paper does not deal with practices such as "income smoothing" or the manipulation of accounting standards.

Schipper (1989) terms the timing of sales of assets as "real" earnings management, accomplished by timing investments or financial decisions to alter reported earnings or some subset of it**.** Bartov (1993) is among the few to discuss the timing of the liquidation of financial assets in a framework of earnings management. Hand (1989) examines the "real" management of debt-equity swaps. It should be emphasized that, in our framework, timing the sale of loan portfolios or other banking activity is not considered earnings management. We concern ourselves solely with transactions in real assets whose reported values are based on historical cost figures rather than market values. The practice of selectively timing real asset (or non-financial asset) liquidation is based on two foundations: a) historic cost is the principle upon which bank financial reporting systems are based, b) required minimal capital is denominated and measured in accounting rather than economic terms.

Generally Accepted Accounting Principles (GAAP) (with the exception of IAS 40 which allows for value appreciation in the case of investment property) require the recognition, measurement and representation of most fixed assets (except some traded securities and derivatives) at their historical cost, less depreciation and impairment charges, rather than at their market value or fair value if it exceeds the cost.[5] The

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"more than eighteen months ago, I came to NYU to speak about the state of financial reporting. I expressed my concern that corporate America's motivation to meet Wall Street earnings expectations could be overriding common sense business practices. The zeal to project smoother earnings from year to year cast a pall over the quality of the underlying numbers…" (Arthur Levitt, 2000. See also the Appendix A and a paper by Turner and Goodwin (1999).)

[5] Barniv, Stephens and Sulganik (1994) observed that the "financial reporting function" exhibits major discontinuities, which stem partly from the fact that accounting rules are contingent on numerical reservation values. Hence, an entire financial report can be dramatically altered by the slightest diversion of one of the decision variables. A recent example is the accounting treatment of special purpose entities where their consolidation is conditioned by U.S. GAAP on numerical reservation values, . These discontinuities create opportunities for earnings management and can lead to deviation from an economic optimum. We consider the timing of asset sales to be one technique by which regulatory inconsistencies are exploited.

historical cost principle relates, amongst others, to real estate, liquid investments, and even privately- traded securities and financial instruments (e.g. public deposits and loans). Value appreciation of these assets is reported only when sold, i.e. transaction based accounting. The principles of historical cost and transaction-based accounting enable the creation of "hidden reserves". These "assets" represent the difference between historical costs and economic value that is realized only when the real asset is liquidated. Profits from these sales accrue to the banks' equity. By selectively timing the acquisition and sale of assets with hidden values, banks are able to control reported earnings and equity by storing value in good years and releasing it (through the liquidation of real assets) in lean years.

Our model differs from models that view compensation as the major driver of asset liquidation. These models focus on incentives to expedite reported earnings to facilitate higher executive bonuses[6]. We claim that bank management does not necessarily realize profits immediately and may prefer to defer reported earnings to future periods, as long as current profitability is reasonable in terms of the multiple objectives and constraints facing the bank. Our model also predicts that banks will opt to sell assets whose market value exceeds book value in relatively bad times, to generate profits, rather than cash flow alone. Asset sale will be gradual, over time, rescinding as the situation worsens.

In Section II we review the literature on motivations for earnings management. In Section III a model for earnings management in a dynamic stochastic environment is outlined. A numerical example, for a three period, binomial distribution case is analyzed in Section IV. Summary, conclusions and implications for dividends are presented in Section V.

II. Motivations for Earnings Management by Banks and its Pattern

An abundant body of literature, by both academics and practitioners, documents and explains the phenomenon of earnings management.[7] Schipper (1989) provides a conceptual framework for analyzing earnings management from an informational perspective (see also Holthausen and Leftwich (1983)). Deangelo (1988) refers to

[6] See, for example, Bagnoli and Watts (2000) and Holthausen, Larcker and Sloan (1995)
[7] For a comprehensive review literature on earnings management see Healy and Whalen (1999), Beneish (2001) and Stolowy and Breton (2000).

earnings management in buyout cases. Teoh, Welch and Wong (1998a, 1998b) find that firms manage earnings prior to seasoned equity offers and IPO's. Burgstahler and Eames (1998) conclude that firms manage earnings to meet financial analysts' forecasts. Watts and Zimmerman (1978) suggest that earnings management can be explained from a contracting (with managers and/or lenders) point of view, since it is costly for relevant decision makers to "see through" the earnings management. It should be emphasized that the literature discusses earnings management mostly in terms of income smoothing techniques and is primarily focused on accruals. Dye (1988), and Verrechia (1986) propose analytic models of earnings management.

In their comprehensive survey, Healy and Whalen (1999) summarize the major motivations to manage earnings, as follows:

1. Public offerings: "Window dressing", or enhancing financial reports prior to an IPO or secondary equity offering to attract better valuations;
2. Executive compensation: Increasing reported earnings to increase executive bonuses;
3. Financial liabilities: Fulfilling financial requirements in loan covenants;
4. Regulation: Reducing regulation costs or enhancing regulatory benefits.

Beneish (2001) suggests that an insider trading can be added to this list of motives. Managers aware of mis-statement of profits can benefit by trading the securities. Stolowy and Breton (2000) suggest three broad objectives for earnings management: minimization of political costs; minimization of the cost of capital and maximization of managers' wealth.

These observed motivations can be easily applied to the banking industry. Moreover, the dialectic interplay between capital adequacy regulations and investor expectations, however, creates a series of constraints that augment incentives to adopt earnings management as an on-going strategy.

Banks operate in a multiple constraint environment. They are required to maintain minimum capital against risky positions. In most countries, banks are required to hold 8% equity against their consumer and corporate loan portfolios

according to BIS guidelines.[8] Banks can be severely penalized if they violate this requirement. They may even be required to curtail new lending activities as a result. In many economies, the banks will not even be granted a "grace period" to reconcile capital deficiency problems. At the same time, banks traded on public markets, are constantly monitored by financial analysts, the SEC, investors, other banking institutions (including foreign banks) and by other stakeholders, including current and potential customers. Market expectations are formed with respect to key ratios, such as price/earning ratios (P/E), market to book value of equity (M/B), return on assets (ROA), return on equity (ROE) (or return on investment (ROI)), and earnings growth (EG). Missing key targets can adversely affect stock prices.[9] Missing targets can also damage reputation and lead to a loss of business. In addition, dividend policy can be an issue. Banks often experience pressure to distribute dividends, especially in cases in which a bank has principal shareholders. The need to distribute and subsequently maintain dividends constitutes yet another limit on the bank's financial performance.

In our model, the various constraints are expressed as a series of thresholds. We draw on Degeorge et al. (1999) who claim that executives have a strong incentive to manage earnings since their performance is evaluated on the basis of reported earnings. They introduce **behavioral thresholds** for earnings management, based on empirical observations. Three important thresholds for earnings management are identified: report positive profits, sustain recent performance, and meet analysts' expectations. The authors go on to outline tactical methods of earnings management: "Within generally accepted accounting principles (GAAP), executives have considerable flexibility in the choice of inventory methods, allowance for bad debt, expensing of research and development, recognition of sales not yet shipped, estimation of pension liabilities, capitalization of leases and marketing expenses, delay in maintenance expenditures, and so on". In addition, their paper deals with strategic measures taken by management to affect the reported earnings figures by timing reported events to shift income between periods.

In our paper we adopt a similar approach, but examine the use of "hidden assets" and their impact on reported earnings and capital, as the primary means by which banks manage earnings.

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[8] See Crouhy, Galai and Mark (2000) for a detailed discussion of capital adequacy requirements.
[9] See e.g. Degeorge et al (1999) for a discussion on behavioral thresholds.

III. Modeling Earnings Management in a Dynamic Stochastic Environment

As in much of the earnings management literature, we assume asymmetry of information, and hence market imperfection. Management knows the true economic value of the non-traded, real asset while the market has access only to the aggregate book value. The market demands, therefore, a certain return on equity as a proxy to the true economic value. We also assume that decisions regarding the activities of the bank are undertaken by management rather than by owners. The CEO, who makes the investment/liquidation decisions, faces a utility function that is affected by a reward-penalty function for attaining or missing certain targets.

Our model presents the optimal decision mechanism for bank management, given an accounting-based profitability function that is subject to the constraints of capital adequacy and financial performance expectations. Accordingly, we derive values for the optimal quantity of real assets held and/or liquidated in a bank's asset portfolio for a given period.

Let us assume that bank management aspires to maximizing the market value of the bank subject to the regulatory constraints, namely the minimal required capital.

Max(Market Value)

s.t. Minimal Required Capital

We assume that the market value (MV) of the bank is based on its economic value (EV), (i.e., its discounted expected future net cashflow), and on the temporal effect of analyst expectations (AE), i.e. MV=EV+AE. Analysts' expectations are usually based on projected earnings, growth rate of earnings, the book –to- market ratio, price-earnings ratio and other parameters. It can be assumed that, given EV, the AE has zero mean over time.

The CEO, whose task is to maximize the market value of the bank, has an incentive to influence AE. The CEO may be penalized for missing targets set by analysts, and may be rewarded for outperforming analyst forecasts. The bank is assumed to posses a "hidden reserve" in the form of assets with market values that exceed their book values. These assets are available in limited quantities. Once such an asset is liquidated, it is withdrawn from the pool. Therefore, the CEO faces a multi-

period optimization problem: if and how much to liquidate at each point of time in order to create a balance between current and future rewards versus penalties:

$$\max E\left(\int_0^T \beta^{-t} V(RP)dt\right)$$

where β^{-t} is the risk- neutral discount rate, RP is the reward-penalty function to be specified later, and V is the utility function.[10]

To illustrate and analyze the multi-period optimization problem facing bank management, and its complexities, we construct a simple two-period, binomial model. We assume that the bank has to meet the capital adequacy constraint, which we denote by MRC (minimal required capital). We assume that analyst expectations are based on the accounting rate of return on equity (RET).[11]

Hence, the CEO must not only satisfy capital adequacy requirements, but faces a penalty when undershooting RET targets as well. The CEO may be rewarded for surpassing selected targets and for maintaining a consistent dividend policy. Reward and penalty coefficients are not necessarily symmetrical.

In our model, the bank is assumed to hold two kinds of assets: A is risky, and B is riskless. It is financed by deposits and equity. In the binomial model, the risky asset of the bank (say its loan portfolio) appreciates at the end of each period either by a factor U (e.g., 1.1) or by a factor D (e.g., 1.02), where U > D. It is also assumed that the risk-free factor R (e.g., 1.05) is such that U > R > D. Hence, if Asset A appreciates by only D, it may miss both the regulatory (capital adequacy) requirement and the performance (return on equity) target. The reason for this is that at the end of each period, the bank is required to pay interest on deposits (at a rate which is assumed to be equal to the risk-free rate R−1).

Asset B is a riskless and divisible asset. Asset B represents a "hidden asset", for which book value is lower than its economic value. The CEO can time the sale of units of asset B in order to capitalize its economic value. For simplicity of analysis, it is assumed that the proceeds from the liquidation of B are distributed as interest payments, dividends or are invested in asset A.

According to this model, in a good state (i.e., attainment of U), the bank can surpass both regulatory and performance thresholds and may be able to distribute

[10] For simplicity V is assumed to be defined over the reward-penalty space only.

dividends without liquidating units of B. In bad states (i.e., attainment of D) the bank may be forced to sell units of B in order to satisfy MRC and/or RET. The CEO must adopt a strategy that considers both current and future rewards and penalties. By liquidating too many units of B at time 1, he may face a greater shortage at time 2. It should be remembered that liquidation of units of B at time 1, increases equity and hence raises the threshold of expected earnings at time 2.

It is assumed that the binomial process is an equilibrium process, hence \$100 invested today will yield either 100·U or 100·D in the next period. All riskless assets and liabilities yield a riskless rate of R − 1. We use this binomial process to express the present value of the stochastic, periodic penalties (and rewards) assigned to the CEO.

We assume a steeper linear penalty function for missing targets, than that of the reward function for outperforming expectations.[12] Due to the complexity and disagreement in the literature, no explicit reward-penalty function is imposed on dividend policy.

IV. A Numerical Example

Since the problem presented involves many parameters and a simple analytical solution is unavailable, we use a numerical analysis, based on the binomial model for the risky asset. The numerical example is described in detail in Appendix B. This example helps us in understanding the relationship between the reward/penalty ratio and the incentive to liquidate the "hidden asset". In addition we show the interaction between the financial leverage, i.e. the amount of equity to debt, on the optimal liquidation policy.

The value of the reward-penalty function, takes the achievements of the CEO relative to targets into account, for both t=1 and t=2 across all states. The present value of the RP is based on the binomial process of asset A.

Figure 1 is based on the parameters described in Appendix B, it outlines the reward-penalty functions for ratios of reward to penalty, b_1/b_2 between 0.6 and 0.65.

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[11] In this paper we do not explicitly model the method by which analysts incorporate RET in corporate valuation.

[12] This assumption is consistent with Degeorge et at (1999) of differential level above and below the threshold.

The net reward in present value terms i.e. the reward minus penalty, is depicted as a function of the amount of the "hidden asset", INV, which is sold at time 1 in state D.[13] As can be seen the function is non-monotonic with multiple local maximum points.

Figure 1.

It can be seen that the optimal strategy is a function of the ratio b_1/b_2. For b_1/b_2=0.65 the optimal policy is realizing 3.587 units of INV at t=1, which is the minimal quantity required to achieve the minimal required capital MRC=8%. In this case the CEO incurs a relatively small penalty in order to avoid a potentially high penalty at t=2, if D reoccurs.

It is interesting to note that by realizing 5.616 units of INV at t=1, the reward-penalty is almost identical to the optimal policy. At 5.616 there is a local maximum reward. Obviously, for a reward-penalty ratio above 0.65, the optimal policy will be to realize the minimal quantity required to fulfill minimal capital adequacy requirements. The lower the relative reward, the greater the incentive for early liquidation of the invisible asset. For a reward-penalty ratio of 0.62 the optimal policy is to realize 5.616 units of INV, achieving a net reward of 1.826. For such relative rewards, the optimal solution is internal, not at the boundaries (see Figure 1).

The conclusion so far is that even in a simple, 2-period, binomial distribution, the optimal decision of the CEO is very complex. The values are non-monotonic, and are contingent on the shape of the reward-penalty function. Obviously, the CEO can benefit from having a "hidden asset" at his disposal, whose value is understated by accepted accounting principles.

This last point is highlighted when inefficiency is introduced into the system. Let us assume that the "hidden asset", B, yields less than the market rate of return for riskless assets. Figure 2 is similar to Figure 1 except that in calculating the reward-penalty and the optimal liquidation policy the rate of return on INV is 4% per annum (while the economic riskless rate remains 5%). From Figure 2 it is obvious that the CEO still has an incentive to hold INV and liquidate it incrementally based on the RP function even though this asset yields below the market rate. The value of this

[13] The reward-penalty function is expressed in terms of present value, taking into consideration the basic binomial distribution and the specific reward-penalty at each node.

function is somewhat lower for each ratio of b_1/b_2 than for the case depicted in Figure 1. The realized rate of return on equity is adversely affected by the lower yield on the invisible asset, which is taken into account in the PR function. However, the ability to smooth earnings, and avoid potentially sharp deviations from targets, has a value to the CEO. This can be referred to as an "accounting option", which allows the CEO to meet reporting targets by strategically exploiting the gap between the economic and book values of assets.

Figure 2.

An interesting question in our framework is to find the relationship between the leverage of the bank, and its propensity to liquidate the "hidden asset". On one hand, by increasing the amount of equity relative to debt (for the same total book value of equity and debt), the bank is moving away from the capital adequacy requirement constraint. On the other hand, the bank may find it more costly to achieve the minimal required yield on equity. In this case the solution to the optimal capital structure problem is endogenous.

In Figure 3 we show the relationship between the equity (in book value terms) and the optimal liquidating policy of the "hidden asset". If the bank starts with low level of equity, the bank will have to liquidate sufficient amount to achieve the minimal capital adequacy requirement. In our numerical example by increasing the equity between 9 and 11, (and thus reducing the leverage) the amount of "hidden asset" that will be liquidated at period 1 reduces from 7 units to zero. The amount of liquidated "hidden asset" is almost a linear function of the equity. The driver for liquidation up to equity level of 11 is the capital adequacy requirement. For equity between 11 and 13 no units of the "hidden asset" need to be sold. When equity is over 13 (and debt therefore is at most 97), liquidation jumps to over 10 units and it continues to increase at a very low pace. The trigger to liquidation in this range is due to requirement of minimal return on equity (in period 2).

Figure 3.

V. Summary and Conclusions

We have described a simple two-period binomial model of earnings management. With this model we are able to derive an optimal policy of liquidating real assets whose economic value exceeds book value. Strategic liquidation of these assets enable banks to capitalize profits and boost the book value of equity. Even with a simple reward-penalty function, the problem of optimal asset liquidation is both complex and dynamic. The CEO must consider the bank's ability to meet obligations not only at present, but also in the future, even in bad states of nature.

Optimal policy is a complicated function of the amount of INV (compared to risky asset, VIS), the b_1/b_2 ratio, as well as the risk of VIS (which also determines the present value of RP – the reward-penalty function).

When relative rewards on good performance are lower than penalties for missing targets, the penalties are critical in both state D at t=1 and at state DD at t=2. However, due to the present value function (which takes into account the risk-neutral probabilities of each state), penalties at D carry greater weight than at DD. This is illustrated in Figure 1B.

The problem of asset liquidation policy is one of resource management - determining optimal policy in an uncertain environment to manage a reservoir that can be depleted over time. The complexity of the problem results in non-monotonic and discontinuous functions that defy generalization. This is due to the introduction of discrete points at which targets are examined. This is true in reality, where banks and other financial institutions are examined on a periodic basis, and not monitored continuously.

The optimal decision of how much of the "hidden asset" to liquidate at any point in time is extremely sensitive to the value of the parameters. Even a small change of the parameters, can affect the optimal amount to be sold dramatically. Moreover, in a turbulent environment, liquidation policy may change frequently and management may find it very difficult to fine-tune policy. One result of our analysis is that is not always optimal to immediately liquidate a "hidden asset" to achieve short-term objectives. Liquidation policy must be assessed in a multi-period framework, if it is to be effective.

We have also shown that the CEO may have an incentive to acquire (or keep) assets that yield inferior rates of return, if this enhances the capacity for strategic earnings management. This is a well-observed phenomenon in banks that own real

assets, such as office buildings, even though, from a purely economic point of view, real estate investments may be inefficient. Banks sell these assets in bad times in order to boost equity and reported earnings. It is the hidden cost of regulation and accounting procedures that deviate from fair value accounting. This cost constitutes the cost of the "accounting option".

The "accounting option" may be important for regulated and/or public companies. A privately-held company, not subject to analysts' expectations, may adopt different policies. Also, the separation of ownership and control can introduce additional incentives to manage earnings and hold non-optimal asset portfolios.

We also show the relationship between the leverage of the bank and its policy to liquidate the hidden reserve. Banks with greater reserves may opt to increase leverage and use less equity initially, knowing that equity can be generated over time by liquidating more units of the "hidden asset".

Future research should also look at the issue of acquiring real assets in order to create a future "reservoir" of hidden values. In a complete model, both strategic acquisition and liquidation of assets must be considered.

Another important research option is to incorporate dividend policy into the optimization model, by extending the objective function to consider changes in the dividend payoff.

The model presented above can be used to analyze the relationship between earnings management and dividend policy. Due to legal constraints, dividends are routinely paid out of accounting earnings, i.e. the absence of accounting earnings may legally limit the amount of dividends paid, regardless of the firm's cash flow. Many firms prefer following a constant dividend policy over time and minimize the incidence of lowering dividends per share.[14]

When a company accumulates too much equity, (which necessitates higher profits to meet the RET targets), dividends can be distributed to reduce equity. However, distributing too many dividends can affect future equity reserves, which may be beneficial in bad times. Management has to optimize dividend policy, to attain long-term goals. The existence of assets (B) bearing lower book than market value, can serve management well in executing its dividend policy. Units of B can be

[14] It can be shown in our basic numerical example that at t=1 for state U, the bank can not distribute more than $4.92 in dividends in order to maintain the same dividend at t=2 in state D, and meet capital adequacy requirements, $MRC_{2,D} \geq 8\%$.

liquidated to supplement earnings from asset A. Once again, timing is critical and liquidating too many units of B, may create a larger shortage at a later period.

While there is a huge body of research on dividend policy, and on the firm's tendency to smooth dividends, there is no model that examines multi-period dividend paths that are subject to additional constraints, such as capital adequacy requirements, and investor expectations. Our framework can be expanded to accommodate cash dividends. Potential impacts on the reward-penalty function must be adjusted to incorporate deviations from target dividend policy. In the expanded model, the CEO will be penalized for reducing the dividend per share from the previous period level, or from a "target level", and will be rewarded for a permanent increase in the dividend per share.

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Appendix A: Methods for Managing Earnings

The phenomenon of earnings management is attracting significant attention by both academicians and regulators. Arthur Levitt, former Chairman of the SEC, called for action to limit this phenomenon, especially when its objective is to mislead investors. In a speech at NYU (later known as "The Numbers Game" Speech), Levitt criticized the practice of manipulating accounting principles in order to meet analysts' expectations, and claimed it can be disastrous to the accounting profession. In his words:

> *"While the problem of earnings management is not new, it has risen in a market unforgiving of companies that miss Wall Street's consensus estimates.... Sales and income are overstated by recognizing revenues for partially shipped, unshipped or even back-ordered equipment. Fiscal years are extended beyond 365 days to record extra sales – and even sales that the company knows don't conform to what a customer ordered..."*

Levitt identified five common ways to manage earnings:

(1) **Big Bath Charges**: Companies in the process of restructuring "hollow up" their balance sheets by writing-off assets and creating substantial liabilities and loss reserves. The rationale behind this practice is that the stock market ignores one-time substantial write-offs, and sometimes even regards it as a conservative policy. Exaggerated losses create a hidden pool for restating future profits, and narrow the capital base to enable the presentation of substantial growth rates in the future.

(2) **Creative Acquisition Accounting**: When acquiring a company at a cost substantially above its book value, the acquirer must amortize the remaining unallocated gap (i.e. goodwill) over an extended period of time in the future. This may hurt future profits. To avoid this, companies choose to classify part of the excess cost as "in process Research and

Development", and therefore claim, according to SFAS2 and FIN4, a one-time charge for these costs.

(3) **Cookie-Jar Reserves**: The idea is to overstate reserves (such as reserves for dubious debts, or bad debts, or reserves for product warranties, etc.) during periods of high profitability, when they are hardly noticeable. During bad times, the allocation to these reserves is greatly reduced to improve the profit numbers.

(4) **Materiality**: This is an important accounting rule, which is considered to imply that items that are immaterial can be disregarded. Companies misuse this concept to include many "immaterial" revenue items that help them improve their profit numbers, so as to hit a threshold. It should be noted that the SEC responded to this practice by publication of SAB 99.

(5) **Revenue Recognition**: This is the most popular method for managing earnings, though it sometimes borders on outright manipulation and unlawful reporting. The method is to prematurely register revenues and profits. The SEC responded to this phenomenon by imposing SAB-101.

Appendix B: Numerical Example

We present a numerical example of our model to illustrate the results:

1. The risky asset, A, is binomially distributed with U = 1.10 and D = 1.02. Its value is denoted by VIS.

2. The "hidden", riskless asset, B, has a constant return of 5% per period. The risk-free factor, therefore, is R = 1.05. The economic value of the asset B is denoted by INV and its book value by BVL.

3. The initial value of A is VIS = 100. The initial values of B are INV = 15 and BVL = 10.

4. The bank is financed by deposits, DEB = 100, and equity, EQT = 10. The interest rate on deposits is equal to the riskless rate, i.e. 5% per period.

5. The capital adequacy requirement is 8% , i.e.,

$MRC_t \equiv EQT_t / (EQT_t + DEB_t) \geq 8\%$.

6. The minimal rate of return on equity is 10%, i.e.,

$RET_t \equiv PROF_t/EQT_t > 10\%$, where PROF represents reported earnings.

7. The economic value of the bank is the sum of the economic values of the risky and riskless assets minus the interest payment on deposits:

$VIS_t + INV_t - 0.05 \cdot DEB_{t-1}$.

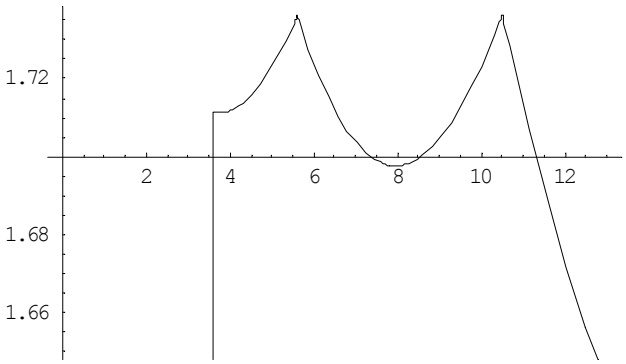
8. The reward-penalty function is assumed to take the following form:

$PR=b_1 \text{Max}(RET-10\%,0)+b_2 \text{Min}(RET-10\%,0)$, where $b_2>b_1>0$.

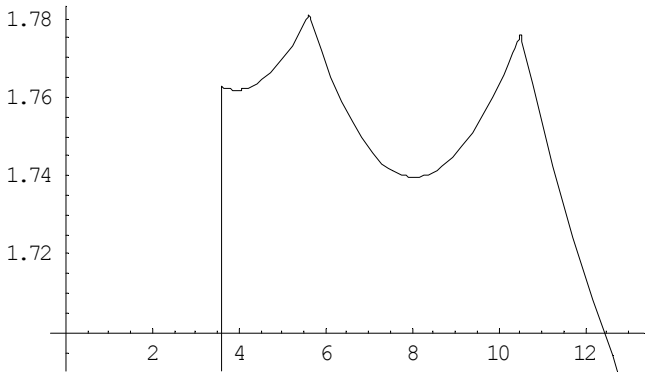
To summarize the notations: VIS means the value of the visible asset, INV – the economic value of the invisible, or hidden, asset, BVL – the book value of the hidden asset, DEB – debt (deposits), MRC – minimal required capital, EQT – equity, RET – return on equity, PROF – reported earnings, RP – the reward-penalty function. Superscripts U and D denote the state of nature at each time period.

Figure 1 illustrates the binomial tree. Block (1) denotes the initial state at t=0. At this state the book value of the bank is 110 while its economic value is 115. Equity relative to book value is 9.1%, which is above the minimal required capital of 8%.

Figure 1B.



b_1=6.0



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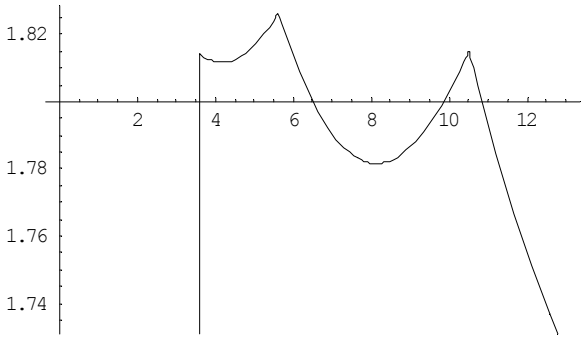
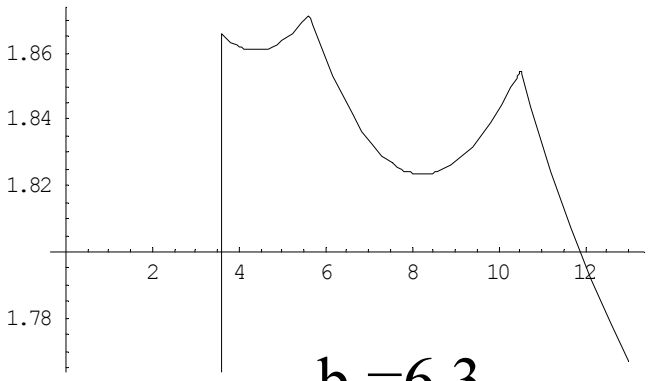
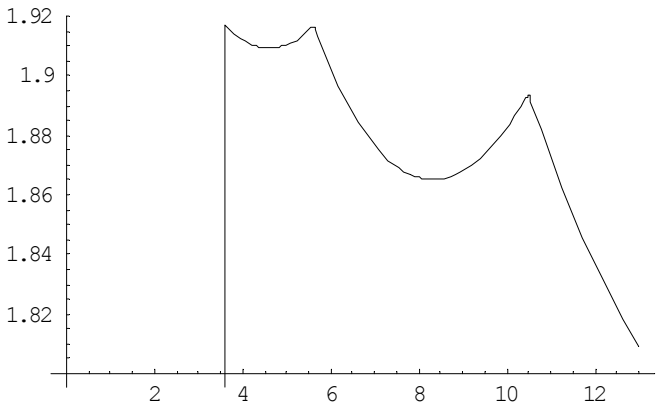


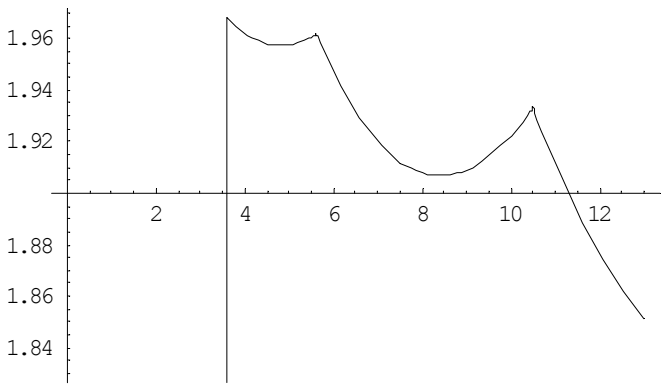
b_1=6.2



b_1=6.3

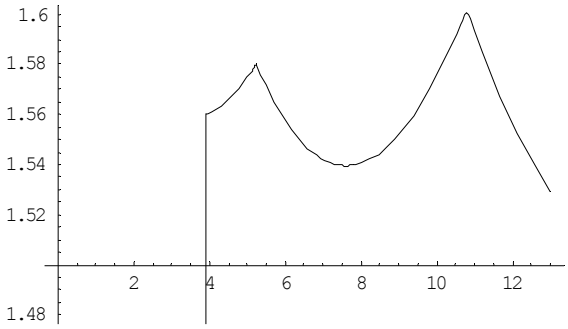


b_1=6.4

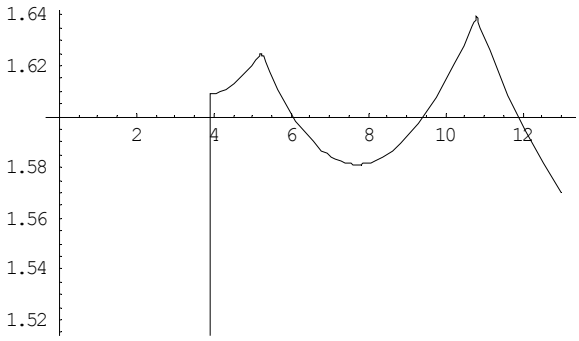


b_1=6.5

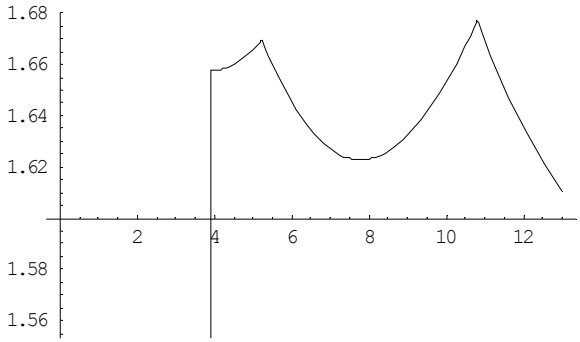
Figure 1. Reward/penalty function (vertical axis) for different levels of realization of invisible asset at t=1 (horizontal axis), for different ratios of reward b_1 to penalty b_2=10, when riskless rate of return on invisible asset is 5%.



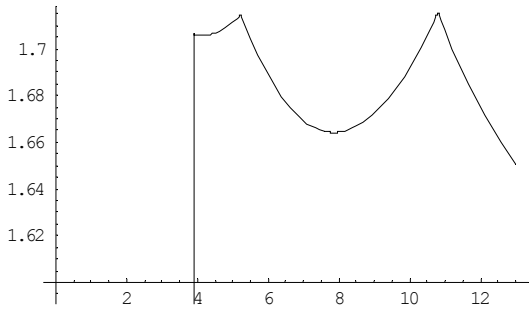
b_1=6.0



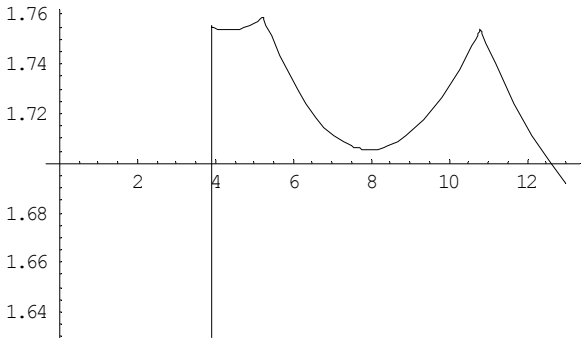
b_1=6.1



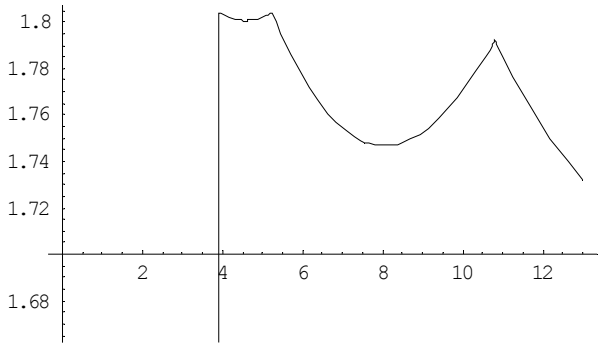
b_1=6.2



b_1=6.3



b_1=6.4



b_1=6.5

Figure 2. Reward/penalty function (vertical axis) for different levels of realization of invisible asset at t=1 (horizontal axis), for different ratios of reward b_1 to penalty b_2=10, when riskless rate of return on invisible asset is 4%.

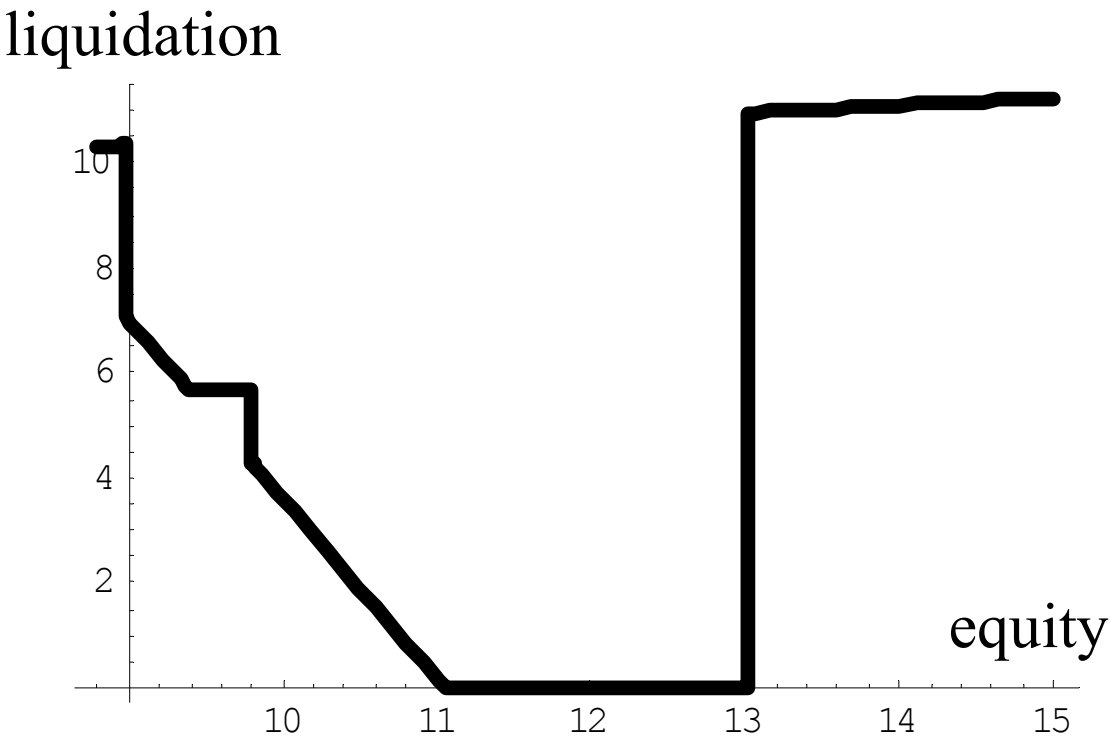


Figure 3. The optimal liquidation at period one of invisible asset as a function of bank's equity.

penalty b1*Max(ret-Eret,0)+b2*Min(ret-Eret,0)

b1	5	scaling factors
b2	10	

assumptions

up	1.10
down	1.02
rf	1.05
rInv	1.05
coupon	5%
MRC	8%
Eret	10%

(1)

vis0	100
inv0	15
bvl	10
ev	115
deb	100
eqt	10
mrc	9.1%

test	0
PV(penalty)	1.3431
pUp	0.35714
pDown	0.59524

(2)

vis	105		
inv	15.75	div	0
bvl	10.5	x=	0
vis cum	110	xMRC	0
deb	100		
eqt	15.5		
prof	5.5	penalty	
ret	55.0%		2.25
mrc	13.4%		

(3)

vis	97		
inv	15.75	div	0
bvl	10.5	x=	10.5
vis cum	102	xMRC	3.5870
deb	100		
eqt	7.5		
prof	-2.5	penalty	
ret	-25.0%		-3.5
mrc	7.0%		

(4)

vis	105		
inv	15.75		
bvl	10.5		
vis cum	110		
deb	100		
eqt	15.5		
prof	5.5	penalty	
ret	55.0%		2.25
mrc	13.4%		

(5)

vis	107.5		
inv	5.250003		
bvl	3.50		
vis cum	102		
deb	100		
eqt	11.00		
prof	1.00	penalty	
ret	10.0%		0.0000
mrc	9.9%		

(6)

vis	110.5		
inv	16.54	div	0
bvl	11.03	x=	16.54
vis cum	115.50	xMRC	0
deb	100		
eqt	21.53		
prof	6.025	penalty	
ret	38.9%		1.4435
mrc	17.7%		

(7)

vis	102.1		
inv	16.54	div	0
bvl	11.03	x=	16.54
vis cum	107.10	xMRC	0
deb	100		
eqt	13.13		
prof	-2.37	penalty	
ret	-15.3%		-2.5323
mrc	11.6%		

(8)

vis	113.25		
inv	5.512503	div	0
bvl	3.68	x=	5.5125
vis cum	118.25	xMRC	0
deb	100		
eqt	16.92		
prof	5.92	penalty	
ret	53.9%		2.1932
mrc	14.5%		

(9)

vis	104.65		
inv	5.512503	div	0
bvl	3.68	x=	5.5125
vis cum	109.65	xMRC	1.1120
deb	100		
eqt	8.32		
prof	-2.67	penalty	
ret	-24.3%		-3.4318
mrc	7.7%		

(10)

vis	127.0375		
inv	0.00		
bvl	0.00		
vis cum	115.50		
deb	100		
eqt	27.04		
prof	11.54	penalty	
ret	74.4%		3.2218
mrc	21.3%		

(11)

vis	118.6375		
inv	0.00		
bvl	0.00		
vis cum	107.10		
deb	100		
eqt	18.64		
prof	3.14	penalty	
ret	20.2%		0.5121
mrc	15.7%		

(12)

vis	118.7625		
inv	0		
bvl	0.00		
vis cum	118.25		
deb	100		
eqt	18.76		
prof	7.76	penalty	
ret	70.6%		3.0284
mrc	15.8%		

(13)

vis	110.1625		
inv	0		
bvl	0.00		
vis cum	109.65		
deb	100		
eqt	10.16		
prof	-0.84	penalty	
ret	-7.6%		-1.7614
mrc	9.2%		

Figure 1B