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Rupinder Singh

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All opinions expressed are those of the author and do not necessarily reflect the views of the Bank of Finland.

Rupinder Singh¹

Bank Regulation, Compliance and Enforcement

Abstract

A model is presented where the question of bank regulation is developed under a principal-agent scenario in a regime where the regulator has limited resources and banks may have an incentive to act ultra virus the regulatory standards. If banks are subject to random audit, then compliance is achieved through a system of fines determined according to the extent of non-compliance. The model shows that the choice of internal monitoring of risk is driven by each bank's choice of the wage contract for its compliance officer who works for the bank for a wage. The officer's incentive for effective monitoring is heightened by the threat of an internal fine from the bank for any contravention of regulations. Moreover, either a fine on the bank or a fine on the compliance officer alone is sufficient to ensure that efficiency is achieved. The model is useful for the bank regulator in a market economy and in transition economies, where the effective constraint on regulatory capacity is addressed using market-based incentives to ensure prudent regulation and effective supervision, and thereby limit the danger of bank failure and contagion.

Keywords: banking, regulation, supervision, enforcement, transition economies

JEL Classification Numbers: E5, G0, P2, P3

1 Introduction

Banking systems in transition countries have moved from inherited systems of the planned model where banks played a passive role in financing an economic plan towards provision of financial intermediation within a market setting. Simultaneously, economic reforms have reduced and refocused the role of the state and separated monetary and fiscal spheres. The goal of macroeconomic stability has led to the adoption, on the whole, of sustainable monetary-fiscal mixes and elimination of subsidised and directed credits to favoured industrial sectors or constituencies.

The change in the role of banks and the central bank as the regulator and supervisor of the banking system is another outcome of transition. In the extensive literature on bank regulation and supervision,² we note that the key concerns for bank regulators are first, prevention of bank failure and reduction of systemic risk to the banking system as whole, and second, once bank failure occurs, making sure appropriate curative measures are in place. The internationalisation of economic and financial ties has led to harmonisation of standards. This is exemplified in the Basle Capital Adequacy Regulations, whereby banks are required to maintain adequate capital in relation to the risk-composition of their assets.

Those reforming banking sectors in transition countries face the twin challenges of commercialising, cleaning up and reforming their banking systems and introducing refinements that meet international guidelines. In practice, this challenge has proven difficult to execute. One reason has been a lack of sufficient regulatory and supervisory capacity to implement guidelines. The issue therefore coincides with the standard regulatory and supervisory concerns of banking literature, where the role of bank regulation has come to encompass the entire financial sector. In a world where financial deregulation, globalisation and ever-improving technology are leading to greater cross-border activities and financial innovation, financial regulators find themselves “behind the curve” of development.³ At the very least, this means that regulatory and supervisory regimes have limited capacities in terms of know-how and personnel.⁴

Recent examples in 1998 include the extent and composition of bank lending to high-risk hedge funds. The reversal in sentiment towards emerging-market risk led to the collapse of several hedge funds and impacted well-known US

banks. In transition countries, a number of banks – particularly in Russia, but also in Belarus, Ukraine and the Baltics – had investments in Russian domestic debt. The moratorium severely affected their balance sheets, leading those with heavy exposures to bank closure.

Regulatory regimes, based on *ex-ante* systems may therefore prove ineffective if banks are able to undertake riskier financial activities outside existing regulatory safety nets. Faced with the limited regulatory constraint, what can and should bank regulators do?

One option is stricter controls upon banks and financial activity. An alternative approach, pursued most extensively in the New Zealand model, acknowledges the limited regulatory constraint and instead introduces a system which relies mainly on incentives for self-monitoring and penalties.⁵ In the extreme, the latter model does not require deposit insurance.

In this paper, a model on bank regulation is developed, which explicitly recognises the existence of the regulatory constraint. The regulator, given limited resources, cannot inspect banks. Instead, it relies upon self-reporting from banks but undertakes random audits with a given probability. The regulator is therefore able to allocate scarce resources on careful audits and associated penalties on non-compliant banks.

The approach taken in this model is similar to models in law enforcement literature. In Franzoni (1999), a model on law enforcement is derived in which indicted offenders and the regulator can negotiate prior to the completion of the case.⁶ However, financial systems are marked by possibilities of contagion, and for emerging banking systems, the need to raise the savings rate, reduce dollarisation and transform banks into true financial intermediaries. This strengthens the case for strong supervisory capacity and a regulatory function that limits the possibility of wrong-doing. As shown by banking and financial crises in both developed and transition countries (most recently the Russian crisis in 1998), the choice of audit and penalty by the regulator may be necessary, but insufficient, to ensure adequate compliance from banks.

Responsibility for a bank's actions essentially lies with its management. Thus, while market reports and analysis coupled with regular accountancy audits reduce the risk of malpractice, "the buck stops with the Board." Incentive compatibility to regulations is therefore raised and compliance costs internalised. In the model, a second separate relation predicates this through the bank via its board setting up a compliance department and designation of a compliance officer to undertake the function.

The stylistic model is developed using principal-agent theory and a simple two-stage game. In the model of the relationship between the regulator and the bank, the bank aims to maximise total assets with market risk subject to the costs of compliance with existing banking and capital adequacy standards. The regulator seeks to minimise the total cost of bank failure due to non-compliance of standards. To ensure compliance, the bank's board has a bank-specific contract with the compliance officer. The key link is the wage rate chosen. A bank chooses the wage rate of the compliance officer such that the constraint that the employee's financial return from employment equals his opportunity cost.

The regulator chooses to audit a bank with a given probability. At the second stage, a bank may pass or fail the audit. If it fails, a fine including withdrawal of banking license are possible sanctions. The stylistic model predicts that either a fine on the bank or the finance officer is sufficient for efficient monitoring of banking standards.

In section 2, a model is set out, where there is one regulator and i banks and each bank is obliged to have a compliance officer for complying with legal codes. The goals of the regulator are to limit the likelihood of bank failure and bank contagion. To achieve these goals, the regulator designs a contract with each bank. Section 3 outlines the efficient outcomes and 4 the solution. Each of the i banks, in turn, design a contract with the compliance officer and the bank's choice of the wage contract is given in 5, and its choice of optimal internal monitoring in 6. The results and conclusion round off the paper.

2 The Model

Let

$m(\sigma)$ = the level of internal monitoring and compliance taken by a bank, under the auspices of the compliance officer, and where optimal monitoring given by m^* and market risk is σ

$A(\sigma)$ = total assets with market risk σ

$V(A)$ = market value of bank assets

$C(A)$ = cost of compliance for bank with total assets $A(\sigma)$, inclusive of relevant capital provisions tied to σ

W = direct monetary payment to the compliance officer at bank

$T(A,m)$ = total potential cost to the regulator of bank failure as a direct consequence of any bank non-complying with disclosure regulations, i.e., with $m < m^*$

$D(m)$ = disutility of monitoring for compliance officer $D_m > 0$

U = opportunity cost for compliance officer working for bank

q = probability of non-compliance by bank ($m < m^*$), which leads to bank failure, where q can be bank-specific⁷

The regulator relies upon disclosure by banks. Banks may undertake alternative risky ventures, but must:

- (i) ensure that periodic, say quarterly disclosure statement, is signed by the bank directors, and complies with regulatory requirements;
- (ii) ensure that the composition of risk, σ , is adequately derived and is declared by bank directors, and;
- (iii) that the bank has put into place adequate controls to monitor risk, $m(\sigma)$ and that the level of compliance undertaken is in accordance with the level and mix of risk i.e., $m \geq m^*$.

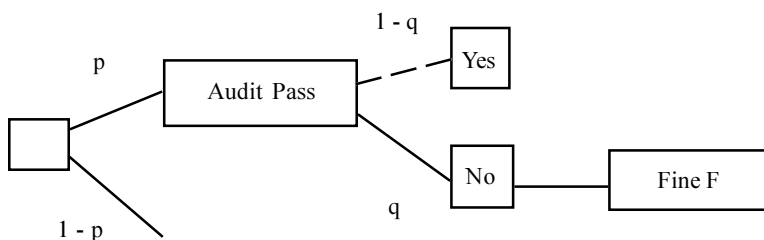


Figure 1: Compliance and Enforcement Dependent Probability of Bank Audit in Any Period

The regulator relies upon the bank's release of quarterly disclosure statement for providing investors and savers with information about the bank's financial health and risk-return mix. If banks are assumed to provide complete information or if the information is ex post public information, then the two scenarios are equivalent since false declaration is punishable. Assume, however, that either one or both of these conditions do not hold. The regulator undertakes random audits per quarter on a sample of i banks.⁸ The probability of any bank being audited per quarter is given by p . Thus the chance of bank audit remains constant and is independent of any earlier audits.

A bank found to be in breach of its declaration, given by conditions (i) through (iii) is subject to a fine $F[m(\sigma)]$, which is based on the deviation of the level of monitoring and compliance from the optimal level m^* . The breach can be either due to false reporting, miscalculation of risk and/or inadequate system of monitoring to the level or mix of risk.

If a bank is audited within a period and found to be in breach of one of the three conditions, the bank is fined in proportion to the level of non-compliance. However, in the present set-up, the probability of audit in any period is independent of the result of any earlier audits.

$T(A, m)$ measures the potential or actual cost to the regulator of a bank which whilst claiming compliance, may in fact not be. T captures therefore the present value cost of possible bank failure and contagion, including spillovers to interbank and other financial markets and to payment systems – the latter is particularly significant for financial systems in transition financial systems.

3 Efficient Outcomes

In this model, T depends on both A , the size of the loan book, and m , the level of internal monitoring as well as compliance with reporting requirements, capital adequacy requirements relating to the choice of (A, σ) and the level of m undertaken corresponding to this choice.

The socially efficient choice involves selecting those values of A^* and m^* that maximise:⁹

$$p[V(A) - C(A)] - D[m(\sigma)] - qT[A, m(\sigma)] \quad (1)$$

First Order Conditions

$$p[V_A^* - C_A^*] - qT_A(A^*, m^*) = 0 \quad (2)$$

$$D_m m_\sigma(m^*) - qT_m m_\sigma(A^*, m^*) = 0 \quad (3)$$

Equation (2) says that a bank's loan book should be increased to the point where the marginal change in expected revenue equals the marginal change in expected cost, including associated change to the expected cost to the regulator. Equation (3) reads that monitoring by the bank/compliance officer should be raised to the point where the marginal cost of the action equates with the marginal decrease in expected potential cost of bank failure and where both terms incorporate the link between monitoring and risk.

A question arises as to whether some system of penalties can be designed to ensure that the private choice of A and m are socially efficient and endogenise incentive-compatibility such that the bank choice of (A, σ) and the appropriate choice of m does not deviate as shown in Figure 2.

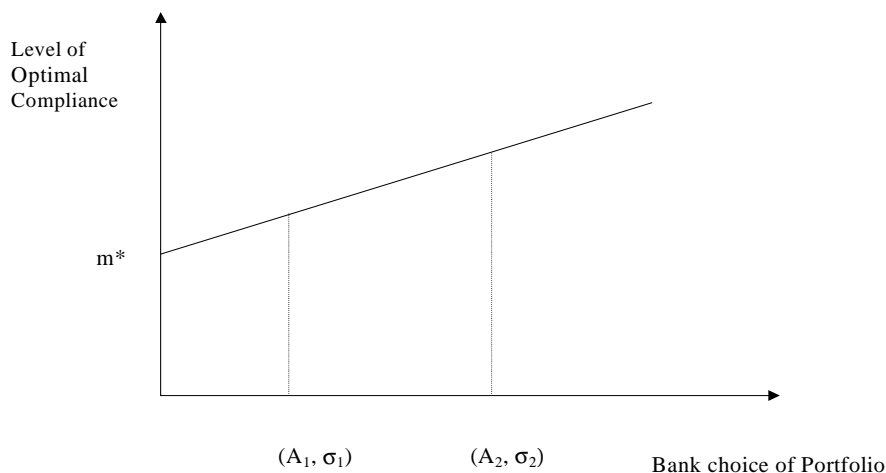


Figure 2: Level of Optimal Compliance, m^* corresponding¹⁰ to bank choice of (A, σ)

Consider fine F to be imposed on a bank that is found, upon an audit, to be in breach of compliance requirements. The level of fine is based on $(m_i - m^*)$ for bank i , i.e., the deviation of internal monitoring and compliance with the level of m required for the bank's private choice of expanding its loan book and the constituent risk of the portfolio. It is assumed that the fine F will be large enough to wipe out any gains from non-compliance through misappropriation and/or capital flight to areas outside the regulator's jurisdiction, fortified by the sanction of unlimited personal liability for directors. Let $F = F(T)$.

Consider fine G as one which the bank internally levies on the compliance officer.¹¹ The level of fine will be based on the fine faced by the bank from the regulator in the event of a random audit finding either of the conditions (i) through (iii) broken. Let $G = G(T)$. Again it is assumed that the potential cost or damage of non-compliance can be measured ex-post with certainty and be punished. The reason, given this certainty, is that a bank may choose $m < m^*$ because the probability of being audited is $p < 1$, whilst $q < p$ since q is a conditional probability.¹² The gains from not undertaking sufficient internal monitoring (increase in utility for compliance officer) may exceed the cost of

future fines, F , or that of further punishment should failure to monitor be held to have led directly to bank activity that caused a bank to become insolvent.

What weaves together the interests of the bank and that of the compliance officer? In this model the contractual relationship between the two parties is through the bank-specific employment constraint between the bank and the compliance officer. The key link is the wage rate chosen, i.e., the parameter that brings mutual incentive compatibility in adequate internal bank compliance. For simplicity, suppose that the compliance officer faces a fixed opportunity cost of working for the bank, U . Thus, the bank chooses the wage of the employee, subject to the constraint that the employee's financial return from the employment just equals his opportunity cost.

4 The Solution

The compliance officer's wage varies with his choice of m . We further assume that the wage contract is performance-based, i.e., it depends on A . Thus, the employment contract takes the form $W = W[A, m(\sigma)]$, and does not depend explicitly on the probability of bank failure, but rather on the employee's choice of m , itself functional upon the risk composition of the bank's portfolio.

Faced with a fine F , the bank chooses A and W so as to maximise its expected profit, which is given by the following equation:

$$p[V(A) - C(A)] - W[A, m(\sigma)] - qF[T(A, m(\sigma))], \quad (4)$$

subject to m being chosen by the compliance officer, to maximise:

$$W[A, m(\sigma)] - D[m(\sigma)] - qG[T(A, m(\sigma))], \text{ and} \quad (5)$$

$$W(A, m) - D(m) - qG[T(A, m)] = U. \quad (6)$$

Constraint (6) says that given his choice of m and his wage contract, the compliance officer's expected return from his job equals his opportunity cost. Moreover, the specification presumes the existence of a combination of A and m for $W(A, m)$ such that equations (5) and (6) are satisfied and that is

superior than $p[V(A) - C(A)] - W(A,m) - qF[T(A,0)]$. In other words, it must be the case that the decision to hire the compliance officer is warranted for the level of m that he chooses, and which accords with the satisfaction of equation (5).

5 The Bank's Choice of W

The bank wishes to minimise $W(A,m) + pF[T(A,m)]$, which is the sum of wages and expected fine resulting from any audit which finds evidence on non-compliance with level of standard m^* . It would like the compliance officer to choose m so as to minimise this expression.

The compliance officer chooses the level of m that maximises equation (5) and, which also satisfies (6). Adding $qF[T(A,m)]$ to both sides of (6) gives:

$$W[A, m(\sigma)] + qF[T(A, m(\sigma))] = U + D[m(\sigma)] + qG[T(A, m(\sigma))] + qF[T(A, m(\sigma))] \quad (7)$$

The LHS of (7) represents the function the bank wishes to minimise. Thus, the minimum of equation of (7) yields conditions for the level of m that minimise the bank's costs – the level the bank would like to see the employee choose. We can derive this by minimising the RHS of equation (7). The FOC of the RHS is given by:

$$D_m m_\sigma + qG'(T)T_m m_\sigma + qF'(T)T_m m_\sigma = 0 \quad (8)$$

Assume that the second-order conditions are satisfied.

Now, the compliance officer will choose the level of m to maximise his return, given in equation (5),

$$W[A, m(\sigma)] - D[m(\sigma)] - qG[T(A, m(\sigma))] \quad (5)$$

and which is defined by:

$$W_m m_\sigma - D_m m_\sigma - qG'(T)T_m m_\sigma = 0 \quad (9)$$

Equations (8) and (9) together define and determine the optimal choice of m for both bank and the compliance officer. The link is the employment contract. Thus, if the compliance officer chooses the level of m that minimises equation (7), he will choose the wage function:

$$W_m = -qF'(T)T_m \quad (10)$$

which is derived by adding equations (8) and (9). Integrating (10) with respect to m gives:

$$W(A,m) = -qF[T(A,m)] + k(A) \quad (11)$$

where $k(A)$ is independent of the compliance officer's choice of m . The officer will now seek to choose the level of m that maximises (11) and simultaneously minimises the bank's costs for any given level of m . Substituting (6) into (11) gives:

$$k(A) = U + D(m_e) + qG[T(A,m_e)] + qF[T(A,m_e)] \quad (12)$$

where m_e is the equilibrium value of m .

6 The Bank's Choice of m

The bank's objective function, given in equation (4), can be re-written using (11) and (12):

$$\begin{aligned} & p[V(A) - C(A)] - W(A,m) - qF[T(A,m)] \\ & = p[V(A) - C(A)] - D(m_e) - qG[T(A,m_e)] - qF[T(A,m_e)] \end{aligned} \quad (13)$$

subject to m being chosen by the compliance officer to maximise:

$$W(A,m) - D(m) - qG[T(A,m)] , \text{ and} \quad (5)$$

$$W(A,m) - D(m) - qG[T(A,m)] = U \quad (6)$$

First Order Conditions

$$p[V_A - C_A] = q[G'(T)T_A + F'(T)T_A] \quad (14)$$

$$D_m + q[F'(T)T_m + G'(T)T_m] = 0 \quad (15)$$

Equation (14) reads that as A is increased, there is a rise in T , and higher possible fines on both the bank and the compliance officer. In choosing A , the bank considers the impact of the choice on the wage it must pay. The employee will require compensation for his higher possible fine through an increase in his wage. Thus, the wage contract between the bank and the compliance officer can affect the performance of the bank, given the reliance put on his assessment of risk σ . Moreover, a market-based basis to regulation is shown to be a credible approach for attaining the twin goals of limiting individual bank failure and limiting systemic risk.

The wage contract also provides a means to shift the bank's fines onto the employee and thus affect the incentive to monitor efficiently the risk the bank is carrying and to report risk factor σ accurately.¹³

Equation (15) is identical to equation (8). Thus, the compliance officer considers the effect of his choice of m on the basis of the bank's expected fine. The higher the expected fine for the bank, the lower the remuneration it will pay to compliance officer.

Comparing equations (2) and (3), the socially efficient choice of A and m , with the private choice given by equations (14) and (15) implies that they are equivalent if:

$$F = T(A,m) \text{ and } G = 0, \quad \text{or} \quad (16)$$

$$F = 0 \text{ and } G = T(A,m) \quad (17)$$

The results suggest that either a fine on the bank alone or a fine on the compliance officer alone is sufficient to ensure that efficiency is achieved. Thus, given that $W = W(A,m)$, F and G are perfect substitutes.

7 Conclusions

The efficiency of using F alone is consistent with the standard results of Principal-Agent models such as Shavell (1979), where, under risk neutrality, efficient incentives result from a payoff scheme that transfers the full payoff of the principal to the agent (plus or minus a constant for the principal). In the present model, the use of individual fines leads to the efficient choice of A and m . The link between the bank and the employee is the wage contract.

The imposition of the requirement that each bank keep to a standard $m \geq m^*$ captures the relationship between the regulator and the bank. The requirement that there be a compliance officer responsible for ensuring this allows the bank to internalise this condition through the wage contract, thus allowing the bank to satisfy the constraint it faces.

To reiterate, there is an unsatisfactory consideration of the role of the regulator monitoring banks' balance sheets and reliance is given to banks' self-reported risk measurements. The possibility of inaccurate reporting may place the whole of the banking sector in danger of systemic collapse, since the information value of the regulator's announcements at the beginning of each period would carry less credibility. In the present extension, the regulator can get around this problem by auditing each bank with a certain probability and fining each bank according to a measure that takes account of the banks' internal systems and monitoring capacities. An alternative variation is for the regulator to set target bands. Banks found in violation are placed in an appropriate band representing a percentile spread of non-compliance below m^* . The regulator could then use its scarce regulatory resources by allocation greater resources to lower bands and adjusting the probabilities of random audit accordingly.

Even with a system in place, the banking system is not entirely safe. Banks can still fail because of bad business decisions. Moreover, confidence is a very important ingredient in the integration of the banking system. Anything that preserves the confidence of depositors in the banking system, even with an occasional bank failure, is justified.

Some caveats should be mentioned here. Can banks actually get close to setting wages in the manner implied in the model? It is common practice for banks in market economies to link pay to performance for their workers, but the focus of our attention is not on normal bank employees carrying out various banking duties, but on those responsible for the risk carried on the

consolidated balance sheet for the bank. For this specific set of employees, a bank should be able to scrutinise performance and set wages accordingly.

Although not specific to banks in transition economies, the motivation for the model have been the existing practical constraints for both commercial and central banks in central and Eastern Europe. The result that the regulator can induce commercial banks to undertake some notional socially efficient level of monitoring of portfolio risk through a mixture of auditing and fines using a contract between the bank and its compliance officer which solves the principal-agent problem is valid for all banking systems and therefore an original result in the banking literature. The model is highly relevant for transition banking systems given the limited monetary, intellectual and manpower resources in relation to those within the commercial banking sector. It could therefore serve as a useful tool in the design of the regulatory function that allows banks to act as independent financial intermediaries, but not violate risk levels determined by the central bank.

Principal-agent contracts can be open to questions of moral hazard. The moral hazard herein is the misrepresentation of market risk σ .

The model is useful in that it both adds to the literature in the sphere of the banking literature, and secondly, it is directly relevant in the financial restructuring of banking systems in the formerly planned economies of central and eastern Europe. The implementation of an incentive-based compliance and enforcement regulatory regime can be regarded as an optimal response that gives banks the room to function as profit-centred financial firms, but that does so recognising the limited resources of the regulator.

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Notes

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² See for instance Chant (1987), Miles (1987) and Mayes D (1998) for coverage of the main issues.

³ Baltingsperger (1980) and Bhattacharya and Thakor (1993) provide a summary of the alternative approaches to the theory of banking. Davis (1993), Diamond (1984), Fama (1980, 1985), Hellwig (1990) focus upon financial intermediation *per se* and the advantages for banks to undertake this process within the world of finance. Another strand of the literature focuses upon related issues such as deposit insurance (Archarya and Dreyfus 1989, Chan *et. al* 1992) and bank runs (Bryan 1980, Diamond and Dybvig 1983, Engineer 1989) and bankruptcy reform and design of contracts (Aghion *et. al* 1992, Bolton 1992, Saunders *et. al* 1990).

⁴ The transformation of the banking systems in eastern Europe and the related problems of debt overhangs, creditor passivity and at best opaque regulatory regimes have been addressed by a number of authors, including Begg and Portes (1992), Blanchard *et. al* (1994), Lampe (1992) and McKinnon (1991) and EBRD Annual Reports (1997 and 1998).

⁵ Mayes (1998) discusses the practical application to the New Zealand model. See White (1991) for the case for free banking through the British experience in the 19th century and the evidence of greater scrutiny or incentive compatibility of fully liable bank owners in conducting bank business.

⁶ The Franzoni model reveals that in equilibrium a certain amount of crime occurs. Innocent victims may reject settlement offers, as may guilty parties-with the risk of subsequently being found guilty.

⁷ For simplicity assume q to be constant here. However, q will be bank-specific since the probability of non-compliance will depend on bank risk preference, lack of adequate systems and monitoring or mis-calculation or mis-reporting or some combination thereof.

⁸ In the case of a broad banking system, the principle could be extended to subsamples of alternative groups of banks according to pre-defined criteria such as areas of operation.

⁹ Social efficiency here is taken to imply the efficiency of the whole of the banking sector. A question of interest in the agency literature on compliance and regulation concerns the question of whether violation of standards should be included in the calculation of social efficiency. According to Lewin and Trumbull (1990), while criminal activities should not be included, the benefit of activities such as civil violations should.

¹⁰ The positive relationship between the variables is assumed to be linear for ease of exposition. The use of non-linear relationship does not change the results.

¹¹ The contract between the bank and the compliance officer can be amended to one with a compliance department.

¹² It is feasible that the bank may choose caution and highlight to the public in its disclosures the fact that it is subject to independent quarterly or periodic audits by private-sector agencies such as auditing firms. In this case, the bank may choose to internally fine the compliance officer for any breach of his contract.

¹³ In the event of bank failure where responsibility is attached to failure to maintain adequate internal monitoring, the compliance officer is, as stated earlier, deemed to be punishable *ex-post*.

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