FRAUDULENT ACTIVITY IN FINANCIAL INSTITUTIONS AND OPTIMAL INCENTIVE STRUCTURES FOR MANAGING OPERATIONAL RISK

Michael Bowe and Gregory Jobome*

Abstract. This paper is concerned with the design of an appropriate managerial framework to control operational risk. Our particular emphasis is fraudulent activity in the financial services industry, but the results have more general applicability. To ensure comparability, our focus is exclusively upon one type of fraud, namely unauthorised trading. Our sample consists of 37 such cases drawn from financial institutions in eight countries. The results suggest that internal controls present the primary defence against severe fraud losses. They also indicate that regulatory penalties imposed on senior supervisory management, in addition to the fraudster, are crucial in ensuring efficient fraud loss mitigation.

I. Introduction

The decisive contribution played by fraudulent activity in the failure of financial institutions is not a particularly recent phenomenon. One US study found that fraud was the single most important contributing factor in a quarter of bank insolvency’s over the period from 1960-77. Indeed, if one broadens the definition of fraud to include improper lending to institutions or individuals associated with the failed institution, then the percentage rises to over eighty. A similar study in the UK by the Bank of England (Jackson, 1996), found fraudulent concealment to be a contrib-
This paper is concerned with the implications of the nature and incidence of fraud for the design of optimal regulatory structures in the financial services industry. To facilitate comparability, our focus is exclusively upon one type of fraudulent activity by firm employees, namely unauthorised trading.\(^1\) Unauthorised trading can be defined for present purposes as the intentional violation of written policies and procedures by trading in excess of permitted financial limits, or outside of permitted product lines, or with unapproved counterparties.

The central objective of this paper is to identify the degree to which losses from this form of fraud can be identified with the breakdown of controls and constraints designed to mitigate losses from operational risk. These can be divided into two categories. Internal operational risk control systems within financial institutions (both those designed by the firm itself, and those mandated by third parties), and the disincentive effects attributed to the threat of externally imposed legal sanctions once the fraudulent activity has been identified.

We analyse thirty-seven cases of unauthorised trading, involving thirty-four financial institutions in eight countries over the period 1984-1999. Certain constraints are placed upon the selection of the cases studied. First, by the nature of the activity we are discussing, we are constrained to analyse cases for which there is a substantial amount of public information available. Second, our focus is upon fraudulent activity in which employees acted without the knowledge of the institution’s shareholders and senior management.

The development of the paper can be summarised as follows. Section 2 provides an overview of the theoretical issues, discussing the incentive effects of different forms of regulatory control and considering the existing state of the practical implementation of existing regulations.

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1. Thus, we ignore other forms of traditional financial services fraud such as bank lending fraud (spurious loans, the granting of loans at “non-market” rates of interest). These types of fraud have contributed, often significantly, to the failure of financial institutions, for example during the US Savings and Loan debacle of the 1980s, as documented by (Huntingdon and Davies (1995)).
Section 3 discusses the data sample. Empirical analysis is undertaken in Section 4, which also discusses the results. Brief conclusions follow in Section 5.

2. Regulating Fraudulent Activity

2.1 An Overview of the Theoretical Issues

This paper does not enter into a comprehensive discussion of the rationale for (either ex ante or ex post) regulatory intervention to discourage fraudulent behaviour. Clearly, regulatory action is justified because market forces alone are unable to provide the appropriate incentives to mitigate fraud. Such a position is usually founded on the basis of a real or alleged market failure in one of the following areas. First, fraudulent activity may impose significant costs on non-contracting third parties, and thereby it fails to be fully internalised by the owners of the institution where the fraud occurs. Second, operational risk arising from corporate control problems may preclude the firm’s owners from implementing the first best level of monitoring. Third, there exist oft-voiced concerns, however justifiable, that the failure of a large financial institution may lead to systemic problems and loss of confidence in the market for financial services.

While the preceding reasons are customarily used to justify ex ante regulation, attempting to enforce adequate levels of control within the firm, others focus upon the wide range of regulatory penalties, both civil and criminal, which may be applied after a fraud has been committed. Reputation is often cited to be a financial institution’s most valuable asset. Given the reputational effects of a revealed lapse of control may be very great (especially as the probability of loss recovery is small), financial institutions themselves are unlikely to be able to credibly

2. See Benston (1998) for a comprehensive summary and critique of the reasons proposed for regulating financial markets.

3. This is relevant in the context of evidence that fraud control environments are established by management, who may not possess the appropriate incentives to control the behaviour of their subordinates if their own pecuniary remuneration depends on the profits (real or apparent) generated by their subordinates. The revealed reluctance of management to introduce transparent audit trails for the activities of “star traders” is one example.
commit to the imposition of appropriate *ex post* penalties in the context of a revealed fraud. Such a commitment is more credibly signalled through penalties mandated by a third party, normally the authority responsible for financial market supervision, or the legal system of the jurisdiction involved. Moreover, internal penalties imposed on the management responsible for control breakdowns may be perceived as counterproductive if it imposes significant operational costs on the institution’s business activities.

A detailed theoretical discussion of the incentive effects of differing forms of regulatory control is outside the scope of this analysis. However, an overview of the existing theoretical literature reveals the following major conclusions have emerged. Market forces alone are unlikely to generate the optimal incentives to prevent fraud. *Ex ante* regulations are important, and at a minimum they should encourage institutions to improve their internal operational control environments and increase their monitoring of employees (BIS, 1998). Institutional heterogeneity, together with the informational requirements and associated costs of auditing internal procedures imply that *ex post* regulatory penalties must also play a significant role (Bowe and Hall, 1998). Finally, imposing penalties simply on the perpetrators of fraud does not necessarily lead to a reduction in the activity. Such penalties must be applied in conjunction with sanctions on management at different levels of the institutional hierarchy. Failure to do so is likely to lead to strong substitution effects. To clarify, penalising solely the employee engaged in fraud may simply lead to a concomitant reduction in the level of monitoring and enforcement of internal control systems, leaving the incidence of fraud itself unaffected (Instefjord *et al.*, 1998). Generating the correct incentives for those responsible for the monitoring process is of paramount importance. With this as the context, we now turn to consider the existing state of the regulation of fraudulent activity in financial services in a selection of countries.4

2.2 *Ex Ante* Regulation

*Ex ante* regulation takes the form of regulators attempting to mandate appropriate levels of operational risk control within firms in relation to

4. The material in the following two sections is largely based upon the extensive discussion in Instefjord *et al.* (1998) and Bowe and Jobome (2001).
the opportunity for fraudulent activity. These controls customarily take one or more of the following forms:

1. establishing guidelines as to operational risk control systems and procedures;
2. establishing monitoring procedures whereby regulators or independent third parties such as auditors, inspect operational risk control systems;
3. varying the level of capital requirements above the minimum mandated by the BIS, in order to induce firms to improve fraud risk controls.\(^5\)

Moreover, regulatory authorities are also endowed with the discretion to vary the intensity of any supervisory activity. This ability can be utilised in two ways. First, it can be designed as a mechanism to encourage management to improve their controls. The RATE system, currently evolving in the UK, is designed to be able to provide banking supervisors with an assessment of the risk profile of financial institutions which also incorporates an analysis of the adequacy of an institution’s risk control systems.\(^6\)

Second, supervision frequency and/or intensity can be increased in response to any revealed inadequacies of internal controls. While this discussion indicates that \textit{ex ante} regulation is important in dealing with fraudulent behaviour, the obstacles encountered in effectively and adequately monitoring an institution’s internal risk control arrangements implies that the imposition of \textit{ex post} penalties must play an important role in the regulatory process.

\subsection*{2.3 Ex Post Regulation}

Once fraud has been detected, \textit{ex post} regulatory penalties fall into one of three classes. First, penalties can be imposed on the employee who perpetrated the fraud. These include one or more of the following

\(^5\) The Securities and Futures Authority (SFA) in the UK recently introduced variable capital requirements for the credit exposures of securities firms enabling it to substantially increase capital requirements for those securities firms perceived as having poor risk management procedures.

\(^6\) The SFA, as well as the former fund management regulator, IMRO, and the retail conduct of business regulator, the PIA, had similar systems in the mid-1990s. However, the regulators in many other jurisdictions continue to be guided by an approach which is based upon an analysis of capital requirements and loan quality.
sanctions; the imposition of fines, the loss of professional status (loss of trading license, banning from the industry) and possible imprisonment. Second, penalties can fall upon the responsible management/supervisory team for their perceived recalcitrance in implementing the appropriate control systems and/or for their failure to monitor the fraudulent employee. Generally, these extend either to fines or banning from the industry. Finally, there are the penalties which can be levied upon the fraudulent institution itself. These may consist once again in fines, but can also involve costly and intensive investigations of the firms procedures, or may even extend to precluding the firm from undertaking a particular securities market activity.

Existing evidence reveals a substantial amount of variation in both the ability and also the willingness of banking and securities market regulators to impose ex post sanctions. A comparative analysis is revealing. One general principle which emerges is that banking supervisors hold management responsible for operational controls within their organisation. Examples of this are to be found in New Zealand and the UK, where senior managers are held responsible for risk control systems within their institution. This focus upon implementing changes in senior management structures and personnel in response to fraud may reflect a belief that penalties on senior management may encourage not only the development but also, perhaps more importantly, the effective implementation of control systems. One lesson of the “Barings” episode is that although institutions may appear from the outside to have effective systems in place, their implementation may be lax.

In contrast, the Office of the Comptroller of the Currency (OCC) in the US, and both the Italian and Spanish banking authorities have extensively fined individuals in banks. Italian authorities levied fines in an average of 80-85 cases in the three years from 1994-96, while the OCC levied a total of 614 fines, mainly against individuals in the six years from 1991-97. However, it is noteworthy to point out that while the majority of the banking supervisory authorities in the countries in the sample have the power to impose fines upon institutions, such action is rarely employed as a penalty. Moreover, what emerges is that the sanctions tend to fall upon individual employees rather than the owners of the institution, although clearly if systems failures lead to increased capital requirements then this will reduce shareholder’s returns.
A different tactic appears to have been adopted by securities market regulators, who appear to be much more willing than banking regulators to impose fines on institutions. The National Association of Securities Dealers (NASD) in the US takes an approach permitting senior management to delegate the responsibility for control of fraudulent activity. In general, NASD will refuse to penalize senior management if compliance and monitoring has been delegated to subordinates, although it actively imposes fines on the direct supervisor of an employee involved in unauthorised trading. The SFA in the UK regularly employs all of the three types of *ex post* sanctions we identified earlier. SFA notices indicate that between 1991 and March 1997, they imposed 129 penalties against individuals (generally senior management) of which 66 were fines, and 59 cases involved suspension from the industry. The fines usually arose from control failures while the bans were often linked to engaging in fraud. In the remaining 57 instances of SFA sanctions, the institution itself was fined. These instances usually involved breaching reporting requirements, exceeding dealing authority or placing misleading advertisements. We now proceed to discuss the nature of the dataset in more detail.

### 3. Data Description

#### 3.1 Data Sources

The source of fraud data originated published news reports obtained from local and national news papers, newsmagazines, commissioned reports, court papers, CD-ROMs, and the internet. To the best of our knowledge, only one other study (Summers and Sweeney, 1998) employs a database based on published secondary sources in a fraud related empirical context.

One may rightly question the reliability of publicly-sourced information for this kind of study? There is clearly an issue regarding the accuracy and reliability of the information. We take some confidence from the fact that several sources provide independent accounts of these frauds, and in the majority of them the significant details are identical. However, the data is subject to what Summers and Sweeney (1998) term a “newsworthiness bias” since aspects of the dataset is media-driven.
3.2 Data Characteristics

All the thirty-seven fraudsters in our dataset are male insiders employed in a trading function. For 54% of the “respondents”, direct financial gain seems to be the main behavioural motivation, while 46% sought to conceal trading losses. In about 20% of the cases, the fraudster is described in news reports as having a “whiz-kid”, maverick or risk-taker reputation within their institutions or among their peer group.

There are two broad classes of methods or modus operandi in each case. The first consist of the primary methods used in the violation of the trading rules. For example, secret/parallel dealing was employed in about half of the cases in the process of exceeding prescribed limits. The second are those methods applied by the fraudster in the concealment (or prolongation of detection) of the violation(s). The most commonly used methods here include the falsification or concealment of statements/trading records (55%). The precise method(s) adopted depends on the nature of controls prevalent in the relevant institution. For example, weak supervision, verification of actions, and non-separation of duties allowed Nick Leeson to exceed his limits, conceal trades and forge documents, during the Barings case.

The most common method of fraud detection is via third-party enquiries or complaints, initiated either by regulators or counterparties, which account for 48% of cases. Self-reporting (confessions) account for another 26%, while the banks’ internal control systems are responsible for detection in 17% of the cases. Furthermore, 62% of incidents took over a year to detect, and two of the largest frauds, Toshihide Iguchi’s at Daiwa Bank and Yasuo Hamanaka’s at Sumitomo Corporation took over a decade. In about 22% of the cases, there is sufficient information in the reports to imply that the fraudster’s supervisors or other responsible management, after receiving information about the fraud, failed to report it to the regulators and/or the police.

In the next section, we attempt to identify the degree to which losses from fraudulent activity can be identified with the breakdown of operational

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7. Obviously, indirect financial gain via promotions, bonuses, and so on remains a factor even for the concealment-only cases.
8. Even after a decade, it still took a confession for the Daiwa case to be detected.
risk controls. For empirical purposes, these are usefully divided into two categories. Internal operational risk control systems within financial institutions, and the threat of regulatory sanctions once the fraudulent activity has been identified.

4. The Empirical Model and Results

The hypotheses of interest relate the severity of unauthorised trading losses to three different sets of variables. The first set are the situational factors which are a reflection of the internal operational risk controls and other institutional factors which characterise the institution. We believe this study is the first to explicitly estimate the relationship between the control environment and fraudulent activity.

The second group is the regulatory sanctions which the fraudster, his supervisor and their institution can rationally expect to be imposed in the aftermath of a fraud. The model thus provides a platform to test the relative influence of the various regulatory instruments and sanctions on the severity of unauthorised trading losses. The third set of variables proxy for the institutional environment aspects of fraud, broadly defined. The estimated model is of the form given in Equation (1):

\[ F_i = \alpha_i + \beta_i M_i + \gamma_i C_i + \phi_i R_i + \mu_i \]  

(1)

where \( M_i, C_i, R_i \) represent the sets of motivational, control and regulatory factors, respectively, \( \alpha \) is the intercept, \( \beta, \gamma, \phi \), are vectors of estimated parameters, and \( \mu \) is an error term.

4.1 Definition of Variables

**Amount:** The dependent variable we utilise in this study is the dollar amount (in millions) of fraud losses (or amount at risk) due to unauthorised trading, as reported by the various published sources.\(^9\) We note that for a given level of fraudulent behaviour, the extent of trading losses also depend on the actual developments in the financial markets. In other words, a combination of unauthorised trading and “luck”. Ideally, the

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\(^9\) It ranges from $0 in Paul Mozer’s Salomon Brothers case, to $2.6 billion in Yasuo Hamanaka’s case relating to the Sumitomo Corporation.
dependent variable would more closely reflect the amount of unauthorised trading, rather than the losses ensuing therefrom. However, the intensity of unauthorised trading is inherently not quantifiable. The use of the amount of fraud losses as a dependent variable also has a clear precedent in the literature (see for example, Tillman and Pontell, 1995). The published reports do not always agree as to the exact amount lost. This may be due to the timing of the reports (especially in those cases where the amount at risk changes with market developments). Generally, we select the amount stated in the most recent reports available. In the few cases where there are zero losses, there have been trading rule and/or operational violations but no actual dollar loss reported. All losses are converted to US dollars, applying the exchange rate at the (approximate) date of the fraud.

Operational Controls: The operational control environment prevalent in the fraud-hit institutions is reflected in six variables. Essentially, we identify key areas of internal control, based both upon the generally accepted standards, referred to above. Variable definition is also influenced by the comprehensive list of best practice controls suggested by authorities, including the BIS (1998), and The London Code of Conduct for wholesale markets (Bank of England, 1995). These controls should underpin the internal operational risk control processes. They are deduced from the modus operandi, method(s), and other circumstances of each case, as detailed in the relevant reports.

The key question we ask is: which control(s), if it (they) had been in place, could have prevented this fraud from happening, reduced the exposure/amount lost, or hastened the fraud’s detection? Each incidence of fraud is scored 1 for each of the six controls that could potentially have reduced or eliminated the specific loss. That a case is scored 0 on a specific control does not necessarily mean that control was in place, merely that it would not have prevented or reduced the magnitude of the loss. It is expected that a negative relationship will exist between all the controls as defined, and the severity of fraud losses. We note that the values of control factors are thus not directly observed but inputted as scores based on the judgement of the researcher given the facts of the revealed fraud. The results of the model will therefore, also reflect the extent to which the researcher’s judgement is correct. The control variables and the control principles they encompass are as follows:
CONT1: Segregation of duties, especially between dealing, settlement and operations.
CONT2: Set and monitor dealing limits.
CONT3: Deal/pay-out verification by supervisor and/or internal auditors.
CONT4: Automatic enforcement (by computer or other systems) of authorisation, product and dealing limits.
CONT5: Application of real-time irreversible trading.
CONT6: Independent valuation of position or product.

Regulatory Action: Regulatory action is defined broadly in the empirical work. It includes actions by financial institutions, relevant professional bodies, central banks and courts. One might argue that regulatory actions tend to occur only after the fraud has been detected, and so may not be crucial in explaining fraud losses. We disagree with this position for the following reasons. First, there is an opportunity for potential fraudsters to both observe and learn from previous regulatory actions against individuals conducting unauthorised trading. If the penalties are efficiently and appropriately set, the threatened imposition of the penalty upon detection, causes the relevant parties (potential fraudsters, supervisory management) to internalise the expected social costs of their behaviour, and therefore to undertake the optimal precautions. Furthermore, regulatory actions and directives guide the efficient evolution of the institutional control variables described previously. In terms of model estimation we believe we are justified in treating regulatory actions as independent variables. The reported (ex post) regulatory action in each case forms the basis for the construction of these variables. Essentially they reflect the regulatory punishment that the fraudster, the fraudster’s supervisor and the financial institution can rationally expect to be imposed upon fraud detection. It is anticipated in this study that as defined, they will all have a negative influence on fraud losses. The seven regulatory variables employed in this study are summarised below. They are coded 1 for each instance in which they are employed.

RAF1: All cases where the fraudster is reprimanded, suspended from market or fined.
RAF2: All cases where the fraudster is banned from that market/market activity.
RAS1: Reprimand, suspension or fining of the supervisor.
RAS2: Banning of the supervisor from market/market activity.
RAB1: Reprimand, suspension or fining of the financial institution.
RAB2: Banning of the financial institution from market/market activity.
JAIL: The imposition of a jail term (irrespective of length) on the fraudster.

Finally, we incorporate other variables designed to reflect the institutional environment at the time the fraud is committed. The preceding discussion raised the issue that performance-based managerial compensation schemes which are linked to subordinate employee performance, may induce management to lower their monitoring intensity or misreport the deeds of employees, if it is perceived to be in the manager’s personal best interest to do so. To capture this we include the variable:

*Personal*: This variable is intended to reflect the personal characteristics of the fraudster. It is coded 1 for all cases where any of the case reports described the fraudster as ‘whiz-kid’, ‘maverick’ or ‘risk-taker’, for example, Nick Leeson of Barings and Joseph Jett of Kidder Peabody.

An alternative interpretation of this variable is that it reflects the extent to which banks and other financial institutions that suffered unauthorised trading losses, may have been led to rely on the ability and integrity of these financial ‘wizards’ at the expense of proper controls and supervision. Whatever the interpretation, we expect to see a positive relationship between this variable and the severity of unauthorised trading losses.

There is also a view that institutions trading in complex financial products (financial derivatives are often cited) stand a higher probability of not fully assessing the fraud risks they face. The thinking here is that because derivatives (for example) are relatively new and fairly complex products, supervisors that rose through the ranks prior to the emergence of such markets might not fully understand the nature of the products and so offer ineffective supervision. The same argument can be made for the operational units that process trades in these instruments. In cases such as Barings, both of these factors were highlighted.

Overall therefore, we believe that product complexity may exert a positive influence on the extent of the losses due to unauthorised trading, so we include the variable:
Prodcomp: This is coded 1 for all those cases involving complex products (mainly derivatives). Natwest Markets’ case involving Kyriacos Papouis and Jardine Flemings’ involving Colin Armstrong are among the examples.

Finally we incorporate a variable to proxy for the extent to which firms belong to multinational banking groups and have a significant number of operations located away from direct head office control and supervision. As such, they may be more susceptible to fraud. The variable attempts to capture the rules, procedures, hierarchies and other organisational structures governing the complex relationship between the subsidiaries and the head office. The variable is Multi:

Multi: A binary variable set equal to one where more than one-third of a group’s assets are located overseas relative to the group head-office. We expect a positive relationship between this variable and losses from fraud.

Before proceeding to the empirical work, we note the results must be interpreted in the context of the fact that only cases of revealed fraud are being examined. There is no control sample. For instance, this model may observe the fact that when the value of an explanatory variable is high, losses are high, concluding that there exists a significant positive relationship. But this conclusion is conditional upon the occurrence of a revealed fraud, and may be overturned if the same relationship is uncovered in the cases where there is no fraudulent activity. As such, until confirmed in a full blown study incorporating proper controls, the findings of this exploratory study should be regarded as preliminary.

4.2 The Empirical Results

Heteroscedasticity is a commonly cited problem with cross-sectional data. In our dataset, we suspect this might be exarcebated by the inclusion of data from different countries and at varying points in time, as well as the varying depth of coverage in the news media. All the reported regression results have, therefore, been corrected for heteroscedasticity using the Breusch – Pagan method.
Table 1
Least-Squares Regression Results – Unauthorised Trading Losses and Financial Institution Controls
(Dependent Variable – Unauthorised Trading Losses in US$m)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
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</thead>
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<td>835.31</td>
<td>812.75</td>
<td>802.72</td>
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<td></td>
<td>(1.69)</td>
<td>(2.35)</td>
<td>(2.35)</td>
<td>(2.54)</td>
</tr>
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<td>PERSONAL</td>
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<td>-</td>
</tr>
<tr>
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<td>(0.14)</td>
<td>(-0.07)</td>
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<td>PRODCOMP</td>
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<td>90.07</td>
<td>92.99</td>
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<tr>
<td></td>
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<td>(0.63)</td>
<td>(0.56)</td>
<td>(0.67)</td>
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<td>910.60</td>
<td>919.45</td>
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<td></td>
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<td>39.55</td>
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<td>-</td>
<td>-</td>
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<tr>
<td></td>
<td>(0.14)</td>
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</tr>
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<td>CONT2</td>
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<td></td>
<td>(-1.08)</td>
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<td>CONT3</td>
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<td></td>
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<td>CONT6</td>
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<td>(-2.97)</td>
<td>(-3.66)</td>
<td>(-3.54)</td>
<td>(-3.56)</td>
</tr>
</tbody>
</table>

Adjusted R-sq | 0.52 | 0.57 | 0.58 | 0.60 |
F[a, b]       | 4.02 | 5.74 | 6.67 | 8.42 |
DW Statistic  | 2.00 | 2.02 | 1.94 | 1.95 |

In the initial estimation, we regress the amount of fraud losses on the fraudsters’ personal characteristics, product complexity, multinational operations and the six control variables. Table 1 below summarises the results.

Model1 indicates that all the variables exhibit the expected signs, with the exception of CONT1 and CONT5, which are not significant. Neither
product complexity nor personal characteristics appear to be important in explaining the severity of fraud losses, though the estimated parameters are signed correctly. Aside from their imperfect measurement, it is possible that their influences may be manifested through other variables. For example, product complexity might be ameliorated by the presence of effective supervision. CONT3 (supervision or verification) and CONT6 (independent valuation of position or product) seem to exert significant negative impacts on the severity of unauthorised trading losses, as expected. MULTI is significantly and positively associated with loss severity, again as expected.

Between Model1 and Model4 we systematically drop the insignificant variables, in accordance with the general-to-specific framework. From Model2 onwards, CONT4 emerges as also significantly and negatively associated with the dependent variable, the earlier results remaining unchanged in terms of significance. Overall, it appears that, as measured, and in line with expectations, effective internal control measures should significantly reduce the extent of losses due to unauthorised trading in financial institutions. Thus, holding all other factors constant, the presence of effective supervision, automatic limit enforcement and independent valuation should lead to reductions of $596 million, $724 million and $628 million respectively, in the average amount lost to unauthorised trading.

The next issue we address is whether, having recognised and accounted for the importance of internal controls, there was an additional significant influence flowing from the sanctions applied by regulatory authorities. Thus, we regress the amount of unauthorised trading losses on the internal controls already identified as significant (from Model4) as well as various regulatory targets and instruments as defined earlier. In the light of data constraints and to preserve degrees of freedom we are unable to include all the regulatory action variables simultaneously. We test their relative impacts separately. Table 2 below summarises the results.

Generally, the introduction of the regulatory variables in Model5 through Model11 leaves the control variables unchanged in terms of their significance. The only exception being CONT3 (the supervision variable) which weakens with the introduction of regulatory action, even though it retains the right sign. This suggests that the regulatory actions are
## Table 2

Least-Squares Regression Results –
Unauthorised Trading Losses,
Financial Institution Controls and Regulatory Sanctions

(\textit{Dependent Variable – Unauthorised Trading Losses in US$m\)\}

<table>
<thead>
<tr>
<th>Model 5</th>
<th>Model 6</th>
<th>Model 7</th>
<th>Model 8</th>
<th>Model 9</th>
<th>Model 10</th>
<th>Model 11</th>
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<tr>
<td>CONS.</td>
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<td>632.69</td>
<td>632.22</td>
<td>437.40</td>
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<td>(1.89)</td>
<td>(2.25)</td>
<td>(1.96)</td>
<td>(1.96)</td>
<td>(1.99)</td>
<td>(1.86)</td>
</tr>
<tr>
<td>MUL TI</td>
<td>963.47</td>
<td>956.69</td>
<td>955.35</td>
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<td>1,067.12</td>
<td>957.49</td>
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<td></td>
<td>(5.06)</td>
<td>(4.90)</td>
<td>(5.01)</td>
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\textit{Adjusted R-sq.} 0.55 0.55 0.56 0.56 0.62 0.55 0.57

\textit{F [a, b]} 7.52 7.53 7.78 7.75 9.65 7.50 8.17

\textit{DW Statistic} 1.86 1.75 1.64 1.71 1.77 1.84 2.13

\textit{N} 28 28 28 28 28 28 28
already incorporated in the supervisory function. When internal controls are already accounted for, regulatory sanctioning appears to be a significant deterrent only where the fraudsters’ supervisors are the targets.

Targeting individual fraudsters and banks for regulatory punishment does not appear to be an effective deterrent. This holds true whichever instruments are applied by the regulators. Thus, fines and suspensions against supervisors (RAS1) as well as bannings (RAS2) yield similar deterrent effects on fraud losses, as Model7 and Model8 show. This may be due to potential model specification bias discussed above. This does not necessarily suggest that fraudsters and their institutions should not be punished, merely that such potential actions may already be internalised within the internal controls of the institutions and the decision-making process of the would-be fraudster. Action against fraudsters and banks tends to be the most commonly used regulatory punishments as described earlier on. Regulatory action against supervisors is less common, although the results of this study a shift of focus in this direction would seem to be the most effective way of ensuring that internal control measures are up to scratch.

Overall, the results confirm the intuition that the design, establishment, monitoring and reviewing of effective internal control measures in banks may be the primary defence against fraudulent activity. Specifically, for unauthorised trading, the importance of having some automatic limit enforcement system and independent valuation is highlighted. In terms of post-detection sanctioning, the results point to the need to provide more incentives for the supervisors to be more actively involved in, and responsible for, the monitoring of their subordinates.

5. Conclusion

The decision by a potential fraudster to engage in unauthorised trading is modelled as the outcome of the interaction of three sets of factors. First, the individual’s personal characteristics reflecting their motivation for fraud, as well as the amount of trust (degree of supervision) reposed in him by his employers. Second, even in the presence of positive motivation, there is the disincentive effect induced by internal control measures.
Finally, another set of disincentives is the threat of post-discovery sanction undertaken both by the employers as well as the regulators.

In this exploratory study, we have sought to estimate a model that incorporates all these factors, so as to provide a guide to the optimal response of regulators in influencing the establishment of effective controls in financial institutions. The study distinguishes different sets of internal control measures as well as different regulatory targets and instruments, employing an international dataset of unauthorized trading cases. The results point to the conclusion that the effectiveness of internal control measures represents the primary defence against severe fraud losses. Furthermore, following the theoretical arguments in Instefjord et al. (1998) they indicate that regulatory sanctioning of the fraudster’s supervisor (rather than just the fraudster and/or the institution) could be crucial in reducing losses to unauthorized trading.

References