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THE FINANCIAL LEVERAGE COEFFICIENT:
Macroeconomic Implications of Government Involvement in Intermediation

by

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1. INTRODUCTION

The slowdown (and occasionally turbulence) in many economies in the nineties – with economic systems as diverse as Japan, India and Turkey – has been co-terminous with problems in their respective financial sectors. Their banking systems are looking increasingly more fragile, resulting in a series of failures, with burgeoning disclosures of problems for a number of intermediaries. There is increasing evidence that banking activity is strongly correlated both with long-run real economic activity and over business cycles (see, for example, evidence presented in Bencivenga and Smith [1991], Greenwood and Smith [1997] and the literature cited by Levine [1997], Levine and Zervos [1998] and Levine, Loayza and Beck [2000]). Despite this large literature on links between economic growth and financial intermediation efficiency, there is still inadequate understanding of – let alone a consensus on – the propagation mechanism for shocks emanating from the financial sector. Although events in many emerging markets in the late eighties and early nineties did lead to the development of models of financial crises and their impact on output and investment, the focus remained on the early detection of these events rather than the transmission mechanisms to the real sector.

Another major strand has explored the link in terms of arguments of moral hazard and adverse selection emerging from the asymmetry of information between lenders and borrowers. This line of research, inspired by the seminal work of Stiglitz and Weiss [1981], sought to explain the effect on business cycles of changes in firm equity\(^1\) resulting from the asymmetry of information in bank lending decisions, with the consequent credit frictions postulated to lead to distortions in both the supply of and demand for credit, and ultimately investment and output. In this context, some authors have enquired into conditions in which bank bailout guarantees interact with borrowing constraints to induce endogenous volatility (see Bernanke and Gertler [1989], Krueger and Tornell [2000] and Schneider and Tornell [2000]).

\(^1\) The 1980s witnessed large increases in corporate debt and sustained asset price inflation, particularly commercial property prices, which then reversed significantly in many regions in the nineties.
A long-standing puzzle has been the observation that large fluctuations in aggregate economic activity sometimes arise from what appear to be relatively small impulses. Bernanke, Gertler and Gilchrist [1994] formulated the financial accelerator (FA), a financial propagation mechanism as a link between the real and financial sectors, to explain the amplification of shocks (through worsening credit market conditions) to the economy, in the process also providing one more possible transmission mechanism. Bernanke, Gertler and Gilchrist [1999] then embedded dynamic informational financial asymmetries in a general equilibrium macro model to address the importance of financial frictions through the FA. Their model implies that firms’ weak balance sheets can magnify shocks on their investment spending, by restricting their ability to access capital. Dekle and Kletzer [2001] used the FA to investigate the sequence of increasing fragility of the banking sector under imperfect prudential regulation.

Despite the institution of market reforms in most countries, government “interests” in the financial sector of many have not diminished commensurate to their withdrawal from most other aspects of economic activity. The continuing presence is often too large to be justified solely on considerations of containing systemic risk. This paper explores the consequences of the resultant distortions in the financial sectors of these economies on their respective prolonged and persisting slowdowns, using an analytical framework of a transmission mechanism for shocks between the real and financial sectors. The shocks are based on long-memory structural characteristics and hysteresis, rather than a conventional business-cycle downturn. The framework of the present paper diverges from existing models in two key respects: (i) generalising the notion of financial accelerator (so that it can take on a negative value); and (ii) drawing a distinction between effective and notional co-financing requirements.

The modification of the FA is via an endogenous structural parameter – government involvement in financial intermediation – that has the potential of converting the accelerator into a decelerator, and vice versa. This modified accelerator – what we call the financial leverage coefficient (FLC) – is a specific stochastic feedback mechanism incorporating financial sector weaknesses (or strengths) and economic activity. Although there are various ways of rationalising the FLC, we take a principal-
agent view of credit markets characterised by asymmetric information in interpreting the
dynamics of the coefficient, where the principal is the government (see Bhattacharya and
Patel [2001] for an elaboration of this rationale).

The key premise underlying the transmission mechanism is a distinction between
notional and effective co-financing, the outcome of a high “density” of government
involvement in financial intermediation, leading to a weakening of the profit maximising
motive for many institutions in the sector, thereby weakening the normal mechanisms
that mitigate moral hazard in agency situations. The impulses emanating from an increase
in this density are transmitted through an increasingly risky portfolio of assets
accumulated by intermediaries.

The paper stresses that the nature of this involvement is much wider than mere
ownership or the persisting management control of a large section of financial
intermediaries by the government. It also entails the appropriation of financial savings, as
well as influencing lending practices of all intermediaries and the investment stimuli of
private corporations. How do these practices contribute to the failure of risk mitigating
mechanisms? First, public ownership of intermediaries reduces the (profit-maximising)
incentive for requiring optimal co-financing (i.e., (equity) capital-at-risk) from
borrowers. Second, a virtual certainty of sustained bailouts by the government replaces a
policy of “constructive ambiguity” (Mishkin [1999]) by one of “destructive unambiguity”
(Mohanty and Patel [2000]). Third, there is a higher regulatory forbearance for bank
closure given their public sector ownership.

Certain structural characteristics and institutional rigidities of these economies
that deter prudent de-risking of portfolios further weaken these mechanisms. These
practices include treating banks as quasi-fiscal instruments, the consequent pre-emption
of resources through statutory requirements, directed lending, administered interest rates
applicable for selected savings instruments, encouraging imprudent practices like cross-

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2 In India, for instance, public issues of equity in the primary capital markets have been falling since the
middle of the post-reform period (in the nineties) implying decreasing levels of co-financing.
3 Our paper weakens this unambiguity by introducing a(n) (arbitrarily small) degree of uncertainty about
the government’s intervention in the event of a financial intermediary becoming insolvent.
holding of capital between intermediaries, continual bail-outs of troubled intermediaries, control and manipulation of smaller intermediaries like cooperative banks, weak regulatory and enforcement institutions, unwarranted levels of government controlled deposit insurance, etc. The absence of effective bankruptcy procedures leading to a lack of exit opportunities for both intermediaries and the firms that they lend to, force intermediaries to roll-over existing sub-standard debt or convert them into equity, thereby continually building up the riskiness of their asset portfolio and further diluting the (already weakened) notional co-financing norms. The use of intermediaries by the government in “diverting” funds, for purposes that are not entirely commercially motivated, reinforces the decline in the quality of assets. A prominent reason is an attempt by government to boost investment, both by direct spending and indirectly via credit enhancements, like guarantees, partially to counter low private investment. In combination with the peculiar “tunnelled” structure of many corporations, which facilitates connected lending and diversion of funds between group companies, institutional rigidities (especially weak foreclosure laws) and regulatory forbearance (including inadequate disclosure requirements of investments and other lending practices), the outcome is a disproportionate build up of the riskiness of intermediaries’ asset portfolios.

While the primary aim of this paper is to investigate the theoretical underpinnings of a transmission mechanism for shocks between the real and financial sectors, it also presents a set of indices to validate the formal constructs by applying them to India. The indices are also meant to serve as summary statistics to “quantify the rot” characterising certain segments of intermediation, while simultaneously providing a composite numerical yardstick for objective measurement of a phenomenon that has hitherto remained relatively unsubstantiated. For many economies, the extensive descriptions in the popular press, analysts’ reports and commentaries on this “rot” getting worse are usually founded on little more than anecdotes and the quantum of non performing assets that show up in official statistics. An extensive and detailed treatment of the financial sector in India, including pertinent stylised facts, that might be useful as a backdrop for these indices, is presented in Bhattacharya and Patel [2002]. Despite the India centricity, however, it should be pointed out that very similar qualitative situations prevail in respect
of government involvement in the financial sectors of economies as diverse as Japan and Turkey. A brief description of the degree and nature of involvement of governments in the financial sectors of these two countries is provided in Appendix 1.

The structure of the paper is as follows. Section 2 motivates the formal model by documenting the process of high and increasing degree of government involvement in the financial system in India. Section 3 presents a theoretical framework that isolates the key factors underlying the FLC and formalises the transmission mechanism. Section 4 constructs a set of formal indices that attempt to validate the assumptions underlying selected parameters of the model and their hypothesised dynamics, with an application to the Indian financial sector. Section 5 concludes and provides indications for further research.

2. THE FINANCIAL SECTOR IN INDIA

In this section, we impart a predominantly qualitative description of financial intermediation in India, with a view to both motivating the formal model and defining the environment for the indices quantifying the high involvement of government\(^4\) in intermediation and the resultant effects on investment efficiency. We concentrate on the lending aspects of the financial sector as the key link, rather than the capital markets, for two reasons\(^5\). First, many of the periodic episodes of securities markets turbulence have been linked to irregularities in procedures of banks and term lending development financial institutions. Second, the financial sector is still dominated to a much larger extent, compared to securities markets, by publicly owned institutions. Moreover, for the most part, funds (and hence liabilities) have not been a significant problems for banks\(^6\), it

\(^4\) Government is defined as the federal and state ministries and departments, as well as all the Undertakings, Enterprises, Boards, Trusts and Authorities under the administrative control of these ministries.

\(^5\) In India, moral hazard is also magnified by government ownership of intermediaries who are involved in capital markets, viz., Unit Trust of India (UTI, the largest mutual fund), Life Insurance Corp. of India (LIC, the largest insurance company), etc. These institutions have characteristics of both banks and securities institutions. For instance, until recently, UTI’s largest fund offered fixed rates of returns on its units, akin to bank deposits.

\(^6\) Development Financial Institutions (DFIs), however, have been experiencing difficulties recently.
is the asset side of the balance sheet that is cause for concern. The key numbers underlying the descriptive tone of this section are provided in the tables of Appendix 2.

After a spurt of 7 percent-plus rates in the mid-nineties, economic growth in India has slowed down considerably (Table A2.1 in Appendix 2). Forecasts of GDP growth for fiscal year 2002-03\(^7\) are down to 4.4 percent. The industry sector has been especially hard hit, with industrial growth declining from 5 percent in 2000-01 to 2.7 percent in 2001-02. Investment levels have been steadily falling since the mid-nineties. Public issues of equity, which indicate project sponsor co-financing, have diminished considerably in recent years, primarily through a loss of investor confidence following a series of scandals\(^8\). The borrowings of the public sector (federal and state governments and government-owned entities), on the other hand, have increased steadily\(^9\). The discrepancy between the savings and investment of the public sector is growing larger, and in 2001-02 the public sector utilised a fourth of domestic savings, while actually dis-saving 2.5 percent. The overall fiscal deficit rose from 8.3 percent of GDP in 1995-96 to over 12 percent of GDP in 2001-02\(^10\).

From independence to the end of the nineteen sixties, India’s banking system consisted of a mix of banks, some of which were government owned (the State Bank of India and its associate banks), some private and a few foreign. The political class felt that private banks, which concentrated mainly on high-income groups and whose lending was security rather than purpose oriented, were not sufficiently encouraging widening of the entrepreneurial base, thereby stifling economic growth (Ravikumar [2001]). Hence, it was decided to nationalise 20 large private banks in two phases, once in 1969 and again in 1980, with the objectives of promoting broader economic goals, better regional balance of economic activity, extending the geographic and demographic reach of banking services and the diffusion of economic power. Significant financial deepening has taken

\(^7\) The fiscal year in India runs from April 1 to March 31.
\(^8\) This loss of confidence is underscored by the low share of resources mobilised through the securities markets even in years associated with a global securities boom. The share of financial savings mobilised through securities markets in 1999-2000, for instance, was a mere 7 percent.
\(^9\) So have resources mobilised through (post-office) small savings instruments and provident funds.
\(^10\) See Buiter and Patel [1997] for a formal assessment of the sustainability of India’s fiscal stance.
place over the three decades since the seventies. The M3/GDP ratio has increased from 24 percent in 1970-71 to 69 percent at present, and the number of bank branches have increased eight fold over the same period, with much of the expansion in rural and semi-urban areas, which now account for over 70 percent of total branches.

Banking intermediaries continue to dominate financial intermediation (see Patel [2000] for a detailed exposition). Much of this segment is publicly owned and accounts for an overwhelming share of financial transactions, implying that they still continue to be Stackelberg leaders\(^\text{11}\). After a hiatus of over twenty years, private banks were allowed to be established in 1993, but their share in intermediation, albeit increasing, continues to be low. The largest growth in savings since 1997-98 has been in bank deposits, which now account for half of financial savings. Banks have repeatedly been used by the government as quasi-fiscal instruments, with the primary objective of raising resources (including de facto sovereign borrowings). Apart from direct appropriation, the government is also facilitating lending activity through credit enhancements and guarantees; despite awareness of the inherent dangers, government guarantees had actually increased, as a percentage of GDP, from 9.8 percent in 1996-97 to over 12 percent in 2000-2001.

Not only is the government appropriating an increasing share of financial savings for itself, it is increasingly influencing the process of intermediation itself. While restrictions on applicable interest rates (especially on the lending side) have been freed considerably, statutory pre-emptions\(^\text{12}\) (Statutory Liquidity Ratio (SLR) and Cash Reserve Ratio (CRR)) remain at very high levels by international standards, thereby distorting banks’ lending decisions. The share of priority sector loans (i.e., directed credit to targeted sectors) of public sector banks (PSBs) in their bank credit has consistently remained above those of private and foreign banks and, since 1995-96, has also been above the statutory floor.

\(^\text{11}\) In the sense that even the private and foreign banks continue to retain high lending rates and thereby maintain higher operating margins than the public sector banks.

\(^\text{12}\) Although milder restrictions exist in the banking systems of most countries for prudential reasons, the motivation for such pre-emption in India was primarily developmental.
The total non performing assets (NPAs) of banks is estimated to be over 10 percent of outstanding credit at end-March 2002\textsuperscript{13}. Furthermore, the credit-risk problem might be worse than it seems, since the accounting requirements are still less stringent than the Basle norms. Directed lending has also taken its toll: gross NPAs constitute 22.5 percent of priority sector advances of PSBs, compared to 12.4 percent in case of overall advances. The absence of effective foreclosure processes for both intermediaries and corporations is a strong incentive for the former to roll-over past-due loans, usually by swapping sub-standard debt for equity. In addition, a holding company (pyramid) structure of many Indian corporations, implying separation of ownership from control, creates strong incentives for diversion of funds among group companies (tunnelling).

Incremental regulatory prudential requirements, gradually converging towards Basle norms, have increased demands for capitalisation of these intermediaries. Besides fresh equity issues through the capital market, this requirement has been met by continual infusion of capital by the government, often through indirect methods, even when there was little danger of any systemic risk. There is also a trend, which has become more pronounced lately, of public sector banks and financial institutions subscribing to each others’ Tier-II capital, through cross-purchases of each others’ papers (the so-called “double gearing”). Although the government has been toying with the idea of statutorily reducing its mandated 51 percent shareholding in PSBs down to 33 percent, it wants to retain the “public sector character” of these banks by retaining the right to appoint the majority of the board of directors and restricting the voting rights of others.

3. A MODEL OF AN ENDOGENOUSLY SWITCHING FINANCIAL LEVERAGE COEFFICIENT

The model in this section formally establishes a link between the real and financial sectors through a financial leverage coefficient. This acts as a transmission channel for shocks between the two sectors, and is derived within an endogenous growth framework, explicitly incorporating increasing government involvement in the financial sector.

\textsuperscript{13} Unofficial estimates by various think tanks put this number at a much higher level.
The production function of a representative firm in the economy is given by:

\[ y(t) = \varphi(\alpha(t)) k(t), \quad \varphi' > 0, \quad \varphi'' \leq 0 \]  

(1)

where \( k(t) \) is the capital stock of the firm, which is predetermined by investment undertaken in period \((t-1)\). \( \varphi'(\alpha(t)) \) is the (stochastic) gross (marginal and average) productivity of capital\(^{14}\).

The firm’s capital stock evolves as follows:

\[ k(t+1) = \varphi(\alpha(t)) k(t) - (1 + r(t)) \ell(t) + \ell(t+1) \]  

(2)

where \( \{1 + r(t)\} \) is the gross interest charged on a period \( t \) loan, \( \ell(t) \), from a bank\(^{15}\). Let

\[ z(t) = \frac{k(t) - \ell(t)}{k(t)} \]  

(3)

be the (notional) co-financing requirement. \( (k - \ell) \equiv s \) is, therefore, the shareholder equity in the firm [Dekle and Kletzer, 2001]\(^{16}\). With \( 1 \geq z \geq 0 \), and the analytically simplifying assumption that shareholder consumption is zero, the lending decision rule of the bank, i.e., the maximum incremental loan amount, is given by:

\[ \ell(t+1) - \ell(t) = \left(\frac{1}{z(t)}\right) \left[ (\varphi(\alpha(t)) - 1)k(t) - r(t)\ell(t) \right] \]  

(4)

where the term inside the square parentheses on the right hand side in Eqn. (4) above is the net income for the firm. Since \( z(t) \) is the proportion of total capital required to be provided as equity by the firm for every unit of loan provided by the bank in each period, Eqn. (4) above says that the incremental lending by the bank, \( [\ell(t+1) - \ell(t)] \), will be \( z \) percent of \( [(\varphi(\alpha(t)) - 1)k(t) - r(t)\ell(t)] \), which is the maximum investible resource of the firm. \( \{z\ell(t+1)\} \) equals the gross output of the firm in period \( t \) minus the gross interest on

\(^{14}\) We use an affine transformation \( \varphi \) of \( \alpha(t) \) in Eqn. (1) as a means of imposing non-negativity restrictions on some of the other equations, which would otherwise have been violated upon the use of specific simplifying restrictions on \( \alpha(t) \) later. Note that this transformation is redundant if we understood the values of all the real variables to be relative to the value of output, \( y(t) \).

\(^{15}\) In this section, we use the term “bank” to denote all intermediaries.

\(^{16}\) An interior solution for \( z \) is derived in Bernanke and Gertler [1989], with a range of projects that are mean-preserving spreads/shrinks of each other.
its debt in period $t$, since $x = (1-z)k$ from the definition of $z$. Combining Eqns. (2) and (4), and using Eqn. (3), the expression determining the firm’s increase in capital stock is as follows:

$$k(t+1) - k(t) = \left[\frac{1+z(t)}{z(t)}\right] \left[\phi(\alpha(t)) - 1\right] k(t) - r(t) \lambda(t)$$

(5)

where $\left[\frac{1+z(t)}{z(t)}\right] = \omega(t)$ is a financial accelerator (FA)\textsuperscript{17}.

In our model, this accelerator is modified, with a probabilistic augmentation, to account for government involvement, and becomes time dependent. The divergence from the existing framework arises from the introduction of a distinction between the effective and notional co-financing requirements. The difference comes about from specific features that arise out of significant government involvement in financial intermediation, leading to a weakening of the profit maximising motive for many institutions in the sector, which is then aggravated by lack of exit opportunities for both intermediaries and the firms that they lend to.

We now introduce the concept of the effective co-financing requirement, $z^*(t)$.

**Definition 1**: Define $\mu$ as the effective co-financing factor.

The parameter $\mu$ is meant to differentiate the notional from the effective co-financing requirement.

**Definition 2**: Define the effective co-financing parameter, $z^*(t)$, as follows:

$$z^*(t) = \frac{k(t) - \mu(t) \lambda(t)}{k(t)} \quad ; \quad \mu \geq 1$$

(6)

$\mu(t)$ in Eqn. (6) above is a formal representation of a distortion of the nominal loan component given by the bank. Our restriction on $\mu$ implies that the “effective” loan is larger than the nominal credit facility\textsuperscript{18}.

\textsuperscript{17} See Bernanke, Gertler and Gilchrist [1999].

\textsuperscript{18} The effective loan may be larger than the nominal loan amount if the nominal amount, for instance, is sanctioned at a rate of interest lower than the one commensurate with the associated level of risk.
The effective co-financing requirement from firms against the backdrop of greater public ownership of intermediaries is less than the notional co-financing requirement under profit-maximising behaviour when these are privately owned. Under full private ownership of all intermediaries, the notional and effective co-financing requirements should be identical (i.e., the full profit maximising one). Therefore, with no government involvement in intermediation should be equal to one.

Lemma: $z^*(t) \leq z(t)$ for all $k(t)$ and $\ell(t)$.

Proof: See Appendix 3 (the proof, in fact, is obvious given the definition of $z^*(t)$ in Eqn. (6) above and the restriction on $\mu(t)$).

Let $\mu$ be represented as follows:

$$
\mu(t) = \theta\gamma(t) ; \quad 0 \leq \gamma \leq 1^{19}, \quad \theta > 1
$$

(7)

We model $\mu(t)$ as a function of two parameters, $\theta$ and $\gamma(t)$, and the latter is time varying. $\gamma$ represents the “density” of government involvement in the financial sector and is assumed to be an (endogenous) driver of the dynamics of the model. Note that the “density” of involvement is a broader concept than ownership: although government ownership of banks may be formally decreasing, its involvement may actually be on the rise$^{20}$.

$\theta$ is a measure of the aggravated moral hazard$^{21}$ that arises due to the involvement of government in intermediation and the consequent failure of banks to institute appropriate risk mitigation measures. $\theta$ is greater than one, which is a corollary of the paper’s contention that the effective co-financing requirement for borrowers is lower than the notional co-financing requirement.

$^{19}$ The lower bound, strictly speaking, should be an arbitrarily small number, which avoids issues of discontinuities as $\gamma \to 0$, and is congruent with the continued involvement of government in intermediation, even in cases where the financial sector is dominated by private players.

$^{20}$ As detailed in section 2 in the case of India.

$^{21}$ We distinguish the term “aggravated” from “enhanced”, considering the former as a parametric shift of the underlying variables as opposed to a functional dependence in the case of the latter. More explicitly, increasing moral hazard buttresses the incentives of banks to accumulate riskier portfolios, whereas an aggravated moral hazard results in a failure to initiate corrective steps to mitigate the increased hazard, for example, by increasing requirements of capital, proper risk weighting, project monitoring, etc.
As \( \gamma \to 0, \mu \to 1 \), i.e., the effective and notional co-financing requirements converge. This is the case where “pure” moral hazard dominates. This feature would make previous moral hazard models a nested one of our effective co-financing model.

As \( \gamma \to 1, \mu \to 0 \), which is greater than 1, making the effective co-financing requirement less than the notional. As \( \gamma \) increases to 1, the co-financing required decreases more than proportionately.

Using Eqns. (6) and (7),

\[
z^*(t) = \frac{k(t) - \theta \gamma(t) \iota(t)}{k(t)} = \left\{\frac{k(t) - \iota(t)}{k(t)}\right\} - \{\theta \gamma(t) - 1\} \frac{\iota(t)}{k(t)}
= z(t) - \beta(t)
\]

where \( \beta(t) \equiv z^*(t) - z(t) = (\theta \gamma(t) - 1) \frac{\iota(t)}{k(t)} \). Figure 1 below is a depiction of a representative divergence of the effective co-financing requirement from nominal one, as government involvement in the financial sector increases. \( \beta(t) \) is 0 when \( \gamma \to 0 \) and increases to \( \theta' \) (< 0) as \( \gamma \to 1 \).

**Figure 1: Characteristics of \((z - z^*)\) as a function of \( \gamma \)**

\[z^*(t), \text{ the effective co-financing requirement, is the basis of a financial leverage coefficient}^{22}.\]

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22 A microeconomic foundation of this is that government-owned financial intermediaries both lend to firms as well as invest in them. Even had these intermediaries not invested, the fact that they are less
Definition 3: Define $\omega^*(t)$ as the financial leverage coefficient (FLC); formally:

$$\omega^*(t) = (1 + z^*(t))/z^*(t)$$  \hspace{1cm} (9)

Substituting for $z^*(t)$, and with a little manipulation,

$$\omega^*(t) = 1 + [z(t) + (1 - \mu(t))(\iota(t)/k(t))]^{-1}$$  \hspace{1cm} (10)

**Proposition:** There exists a value of $\mu(t)$, $M$, such that $\omega^*(t) < 0$ for all $\mu(t) > M$ and $\omega^*(t) > 0$ for all $\mu(t) < M$. Given suitable restrictions on $\theta$, this value is unique.

**Corollary:** Given $\theta$, there exists a value of $\gamma(t)$, $\Gamma$, such that $\omega^*(t) < 0$ for all $\gamma(t) > \Gamma$ and $\omega^*(t) > 0$ for all $\gamma(t) < \Gamma$.

**Proof:** See Appendix 3.

Depending on the actual value of $\mu(t)$, the absolute value of the term in square brackets might become greater than one, and $\omega^*(t)$ then becomes negative (Figure 2 below). Denote $\Gamma$ as this threshold level of the density of government involvement in intermediaries, on reaching which a regime change is triggered in the co-financing requirement, and consequently in the FLC. Formally, $\Gamma$ is defined such that $\omega^*(t) = 0$.

**Figure 2: A representative characterisation of $\omega^*$ as a function of $\gamma$**

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Commercially oriented than private intermediaries also augments the financial decelerator, disregarding, for instance, sub-optimal debt-equity ratios compared to industry standards and norms.
\( \omega^*(t) \) is a generalisation of the FA, which, as noted earlier, was introduced to explain the amplification of adverse real shocks in the economy, arising endogenously from credit-market frictions and agency costs. The underlying notion is that of a leveraging parameter generated by co-financing of investment in the system. Our paper takes the argument a step forward by enabling the parameter to switch from positive to negative, thereby creating a “crisis” of the kind observed intermittently in many parts of the world. The model also makes the parameter time varying by incorporating a feedback mechanism for production and investment decisions of the economy.

An explanation for the evolution dynamics leading to low and negative values of the FLC is the observation that falling levels of investment in the private sector and a slowdown in economic growth usually elicit demands for increased public investment, provision of guarantees to boost private investment, etc., consequently resulting in lower effectiveness of marginal investment\(^{23}\). An implication is that financial capital is not deployed productively; investment efficiency is thereby compromised. In other words, capital is increasingly deployed in unproductive (and ultimately in negative value) economic activity (in both public and private domains), i.e., where the value of inputs is more than the value of output due to forbearance in closing down ailing firms\(^ {24}\). This is the intuition for growth to not only falter, but also turn negative. Note that in Eqn. (10) above, the sign of \( \omega^*(t) \) depends on the ratio \( \ell(t)/k(t) = (1- z(t)) \). For large \( \ell(t)/k(t) \), i.e., situations where the loan component to total investment is high, a smaller value of \( \theta \), an indicator of aggravated moral hazard, is sufficient to switch the leveraging coefficient. In other words, the more leveraged the system, the lower the threshold density required to switch to a decelerator.

\(^{23}\) An alternative explanation of the diminishing efficiency of investment might be the falling marginal productivity of capital (a lá efficiency wage units) with the consequent interpretation of the FLC as a “productivity efficiency” unit.

\(^{24}\) This diminishing efficiency of investment is accompanied by an increasing riskiness of the asset portfolio. Total capital-at-risk of a project can be decomposed into that of the sponsor (equity capital-at-risk) and of the lender (loan capital-at-risk). As a result of government influenced intermediation, the nominal co-financing brought in by sponsors is allowed by the lender to be diluted, thereby lowering effective co-financing.
Next, we need to incorporate a switching mechanism for the FLC. A simple specification is that $\omega^*(t)$ is a stochastic variable dependent on $\gamma(t)$. A possible behavioural specification for $\gamma(t)$ can be as follows:

$$\gamma(t) = E_{t-1} \gamma(t-1) + f(\varphi(a(t)) k(t)) + \epsilon(t) \quad (11)$$

There are two sources of the stochasticity in the above specification of $\gamma(t)$: one is an endogenous source of uncertainty, arising from the stochastic productivity of capital $\alpha(t)$. This specification incorporates a simple feedback mechanism from the production side of the economy. However, there is also an inherent degree of uncertainty, arising exogenously, from the policies and behaviour of the government itself\(^{25}\): the possibility and extent of government bailouts of financially insolvent intermediaries\(^{26}\). This uncertainty is captured as an independent and uncorrelated error term, $\epsilon(t)$. $\gamma(t)$ is thus the key transmission mechanism for propagation of shocks across the real and financial sectors.

The probabilistic specification of $\gamma(t)$ and $\alpha(t)$ facilitates the formal introduction of two key notions in the paper: hysteresis of government involvement and cascading moral hazard in the financial sector. To reiterate, the basis underlying the hypothesised link between the real and financial sectors is that government involvement weakens the mechanisms normally used for mitigating moral hazard.

Hysteresis of government involvement arises from a stickiness built into the evolution equation of $\gamma(t)$. The rationale is that, in good times (state 1), there is little incentive for the government to change the status quo. In bad times (state 0), due to deepening financial distress, the government institutes measures that increase its involvement, viz., higher public sector investment levels, government guarantees and even government financing to “jump-start” private capital formation, etc. Therefore, there is a systematic bias built into the movement of $\gamma(t)$, a component that has an expected

\(^{25}\) There is a growing body of literature on the institutional influences and political economy of the growth process and business cycles (Alessina and Perotti [1994]).
positive value. The other random component, with an expected value of zero, may lower the value of $\gamma(t)$ periodically (relative to the increasing trend), but has no systematic influence.

A “cascading” moral hazard, which is the driving mechanism for the switch of the leverage coefficient, $\omega^*(t)$, from an accelerator to a decelerator, arises from this hysteresis and introduces a dynamic component to the concept of aggravated moral hazard introduced earlier. In other words, the aggravation is systematically augmented through the increasing government involvement, gradually weakening the mechanisms normally used to mitigate moral hazard such as higher requirements of capital, proper risk weighting, project monitoring, etc. Already low levels of notional co-financing are made even more ineffective. A continued weakening causes an eventual regime change when the leverage coefficient switches endogenously\(^{27}\) from an accelerator to a decelerator, thereby bringing capital formation to a halt. An ancillary mechanism for the augmentation is the build-up of increasingly riskier portfolios through higher regulatory forbearance of closure of insolvent intermediaries that are publicly owned.

A simple mechanism to incorporate these concepts, drawing upon, among others, Hamilton’s [1989] analysis of unobserved structural “turning points”, is to postulate the following difference equation for the driving process of $\gamma(t)$ specified in Eqn. (11): that it follows a Markov Trend in levels,

$$
\gamma(t) = \gamma(t-1) + b (1 - \alpha(t)) k(t) + e(t)
$$

(12)

where $\alpha(t)$ can take on two values, 0 and 1, corresponding to the low and high state, respectively, of the system. In the high state, $\gamma(t)$ remains the same as before (except with uncorrelated random shocks, $e(t)$). If $\alpha(t) = 0$, there is an impact $bk(t)$ on $\gamma(t)$, which then feeds into $\gamma(t+1)$ through the auto-regressive component in Eqn. (12). This incorporates an element of hysteresis in the behaviour of the “density” parameter (Figure 3 below).

\(^{26}\) We have modified the notion of “destructive unambiguity” postulated by Mohanty and Patel [2000], replacing it with a limited extent of uncertainty.

\(^{27}\) In the sense that it is (partially) driven by the capital formation and production processes of the system.
The transition between the states is governed by a first-order Markov process:

\begin{align}
\text{Pr}[\alpha(t) = 1 | \alpha(t-1) = 1] &= p, \\
\text{Pr}[\alpha(t) = 0 | \alpha(t-1) = 1] &= 1 - p, \\
\text{Pr}[\alpha(t) = 0 | \alpha(t-1) = 0] &= q, \quad \text{and} \\
\text{Pr}[\alpha(t) = 1 | \alpha(t-1) = 0] &= 1 - q. 
\end{align}

The above transition structure, together with the equation of motion of $\gamma(t)$ implies

$$\alpha(t) = (1 - q) + \lambda \alpha(t-1) + \nu(t)$$  

(14)

where $\lambda = p + q - 1$;

and $\nu(t)$ has the properties that although it is uncorrelated with the lagged values of $\alpha(t)$, viz.,

$$E[\nu(t) | \alpha(t-1) = 0] = E[\nu(t) | \alpha(t-1) = 1] = 0,$$

it is not independent of the lagged values of $\alpha(t)$, i.e.,

$$E[\nu(t) | \alpha(t-1) = 0] = q(1 - q) \quad \text{and}$$

$$E[\nu(t) | \alpha(t-1) = 1] = p(1 - p).$$
In other words, the threshold is a structural event that is endogenous to the process of capital formation (and output) of the system. This is a technically and empirically a better characterisation of structural change than exogenously imposed "turning points".

The model presented in the paper also incorporates a mechanism to reconcile the curious discrepancy between the extensively held perception of government’s support to some financial intermediaries (given increasing evidence of the asset quality of their portfolios being far worse than is being officially reported) being the sole prop preventing them from collapse, and publicly available data not indicating signs of an imminent financial crisis. This absence of explicit danger signals is captured by the unobserved component, $e(t)$, of the driving mechanism for $\gamma(t)$ in Eqn. (12) above. The government might be taking steps, like sporadic dilutions in its holdings in intermediaries and occasional reductions in the amount of resources directly intermediated, that are transitory in nature (and illusory) and serve to reduce the observed level of government involvement below their true levels. In other words, these transient actions serve to mask the event of true levels of involvement having crossed the threshold level and that the economy might already be in the “collapse” state even while investment is still positive, though declining. The Index of Density of Government Involvement in the Financial Sector (IDGI-F), elaborated in the next section, attempts to make this (partially) observable.

4. AN INDEX OF EFFECTIVE CO-FINANCING

The formal model linked the interactions between key mechanisms driving the increasing fragility of the financial sector to the persisting economic slowdowns observed in diverse economic systems (summarised in a schematic representation in Figure 4 below).
Figure 4: Schematic diagram of transmission mechanism

Government involvement in financial intermediation

Cascading effect of moral hazard

Regulatory forbearance (due to government owned intermediaries)

Political forbearance (weak foreclosure laws, etc.)

Aggravates Moral Hazard

Nominal co-financing

Compromises effective co-financing (thereby undermining investment efficiency)

Low Financial Leverage Coefficient

Lower capital formation

Lower economic Growth

Legend:
- Primary Transmission channel
- Secondary Feedback channel
We now attempt to empirically validate the assumptions underlying the parameters of the model, using data from India. The paper constructs an Index of Effective Co-Financing (IEC-F, which is based on a transformation of $\mu$ in the model), comprising of two subsidiary measures: one, an aggravated moral hazard (represented as a function of $\theta$) and another, an Index of the Density of Government Involvement in the Financial Sector (IDGI-F, which mimics $\gamma$). We first explain the transformations of the model parameters used in the constructs of the IEC-F and then group time series of data into categories (or metrics), map these metrics to the model parameters and provide a graphical depiction of trends of the resultant indices.

4.1 Relation of selected Index components to model parameters

This sub-section maps the metrics underlying the Index of Effective Co-Financing (IEC-F) to the theoretical concepts of the model. The effective co-financing parameter is a combination of nominal co-financing (represented by $([k(t) - \iota(t)] / k(t))$) and the factor $\mu$. For any given level of $\iota(t)$ and $k(t)$, as $\mu(t)$ increases, $\{\mu(t) \cdot \iota(t)\}$ increases and $[k(t) - \mu(t) \cdot \iota(t)]$, i.e., effective co-financing falls. Similarly, for a fixed $\mu$, a falling $([k(t) - \iota(t)] / k(t)) = s(t) / k(t)$ also results in falling effective co-financing.

The choice of a proxy for effective co-financing then would be a quantifiable measure of either the effective co-financing parameter, $z^*$, or of its component $\mu$ (and, consequently, $\theta$). Given that $s(t)$ and $\iota(t)$ both vary over time, an attempt to measure $z^*$ might result in distorted outcomes. A more unambiguous result was considered likely by quantifying $\mu$ itself. The choice then was to devise a measure for $\theta$ (i.e., a representation of the proxy for aggravated moral hazard). Constrained to be based on observables, and to be greater than one, the three potential proxy candidates were $\{k(t) / \iota(t)\}$, $\{k(t) / s(t)\}$ and $\{\iota(t) / s(t)\}$. In the limiting case, with $\gamma(t) = 1$, the first option results in $z^*(t) = 0$ and is therefore unsuitable. While the second option has the advantage (relative to the third) of being greater than (or equal to) one by definition, an interpretation becomes problematic when substituted into the formula for $z^*$. The interpretation of $z^*$, upon substituting the third option in the formula, is the most intuitively appealing, since,
\[ z^*(t) = \frac{1}{s(t)} \left[ k(t) - \frac{(s(t))^2}{s(t)} \right] / k(t) = 1 - \frac{(s(t)/k(t))(s(t)/s(t))}{k(t)} \]

implying that falling nominal co-financing, after a threshold level of loan financing is reached, makes \( z^* \) negative\(^{28}\).

Overall, the most suitable quantifiable proxy for \( \theta \) that satisfies all its theoretical properties then appears to be \( \{ \ell(t) / s(t) \} \), given that the loans will be generally greater than the equity component of total investment. For ease of visual reference, congruence with an intuitive notion of co-financing and consistent with the restrictions on \( \theta \), we construct the Index of Effective Co-Financing (IEC-F) as the ratio of equity to loans (debt), i.e., \( \{s(t) / \ell(t)\} \), with the Index of Government Involvement in the Financial Sector (IDGI-F) as its exponent. Formally, with \( \Phi \) denoting the IEC-F (which is a representation of \( \mu \)):

\[ \Phi = \{\theta^{(-1)}\} \gamma(t) = \theta^{-\gamma(t)} \]

Given that \( \theta^{(-1)} < 1 \) and \( 0 \leq \gamma \leq 1 \), \( \Phi < 1 \).

**4.2 Trends in the Indices**

The set of indices attempts to replicate the key parameters of the model. Table 1 below is a mapping of aggregations of constituent time series of the variables into five broad classifications that serve as proxy metrics of the three measures: (i) “density” of government involvement (ii) aggravated moral hazard and (iii) effective (as opposed to notional) co-financing.

\(^{28}\) Note that this exercise is conducted at \( \gamma(t) = 1 \), and is different from the model where a changing \( \gamma(t) \) is the mechanism for switching the sign of \( z^* \).
### Table 1: Mapping of metrics to variables included in the financial leverage coefficient

<table>
<thead>
<tr>
<th></th>
<th>DENSITY OF GOVT. INVOLVEMENT</th>
<th>AGGRAVATION OF MORAL HAZARD</th>
<th>EFFECTIVENESS OF CO-FINANCING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Share of the public sector financial intermediaries in resource mobilisation</td>
<td>♦</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Lending practices of public intermediaries and lending restrictions</td>
<td></td>
<td>♦</td>
</tr>
<tr>
<td>3</td>
<td>Saving and investment behaviour of government and public enterprises</td>
<td>♦</td>
<td>♦</td>
</tr>
<tr>
<td>4</td>
<td>Equity as a proportion of total resource mobilisation</td>
<td>♦</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Relation of government with financial intermediaries (frequency and scope of bailouts), provision of guarantees, etc.</td>
<td>♦</td>
<td></td>
</tr>
</tbody>
</table>

Legend:
- ♦ Primary Effect
- • Secondary Effect
- • Tertiary Effect

Although the choice of metrics constituting the indices is intended to achieve a separation of different aspects of government involvement in intermediation, there remains a degree of artificiality in the separation. For instance, it is difficult to compartmentalise categories 2 and 5 in the table above. There is also an inevitable degree of overlap inherent not just in the separation of the metrics, but also in the nature of the variables used as constituents of the Index, for example, the use of the savings-investment gap of the public sector and the overall fiscal deficit.

The extent of government involvement in financial intermediation is evaluated through both the appropriation of financial savings as well as from the aspect of intermediation, including investment and lending practices. Most of the individual variables used in the indices show deterioration (in the sense of indicating aggravated moral hazard and increased government involvement) since the mid- or late-nineties. Consequently, the simplest aggregation of the indicators comprising each of the indices is an arithmetic mean. It can be argued that the deterioration of particular indicators might be more significant than that of others, in terms of their impact on the extent of government involvement. However, in the absence of quantitative measures of the
relative magnitudes of such impacts, the best (in the sense of least biased) weights may be uniform ones.

We present graphical representations of two indices, the Index of Effective Co-Financing (IEC-F) and its component index, the Index of Density of Government Involvement in the Financial Sector (IDGI-F). The detailed methodology for construction of the indices is provided in Appendix 4.

Figure 5: Index of Density of Government Involvement in the Financial Sector

As can be seen in Figure 5 above, the IDGI-F showed a marked improvement (i.e., a reduction in government involvement) in the early- and mid-nineties, before deteriorating in the latter half. The aberration in 1993-94, in comparison to the trend during the first half of the nineties, is an artefact of the index construction methodology, caused primarily by a large increase in the holding of government securities by financial intermediaries.\(^{29}\)

It might be contended that the paper ignores some variables which might actually indicate a reduction in government involvement in financial intermediaries and hence weaken its thesis. These developments include a gradual diminution of government ownership in some financial intermediaries, progressive reductions in reserve ratios and

\(^{29}\) The reason for the increased holding was the end of the IMF’s programme in India in 1993-94, which had led to “adjustments”, i.e., artificial compression of fiscal deficits in the two previous years.
even the gradually less stringent directed lending norms. A credible rebuttal is that some of these improvements are basically notional (or have not gone far enough), and maintain an effective status quo. For instance, no government owned bank has been privatised so far.

**Figure 6: Index of Effective Co-Financing**

The values of the IEC-F (Figure 6 above) are the respective outcomes of the interplay between the movements of its two constituent components: (i) the nominal co-financing levels (indicated by the ratio of equity (capital-at-risk) mobilised to total debt, both from domestic as well as foreign markets) and (ii) the degree of government involvement in the financial sector. If nominal co-financing is falling sharply, declining government involvement can be expected to diminish the fall in effectiveness of co-financing. Conversely, if nominal co-financing rises, but government involvement intensifies, effective co-financing could actually fall.

Note that the constituents of Indices are only those indicators that directly contribute to increasing the density of government involvement or to lowering effective co-financing. There are other factors that adversely impact these quantities, through degraded due diligence and a reduction in investment efficiency. These factors, for instance, include the lending, investment and recovery practices of intermediaries that are difficult to quantify (due to lax information disclosure norms and definitional ambiguities.
and institutional distortions like ineffective foreclosure laws and the peculiar “holding company” structure of corporations) or for which data does not exist, that also influence their magnitudes, e.g., moral suasion by government, the increasing magnitude of private placements relative to public issues (much of which has recently been subscribed by public sector institutions with a concomitant weakening of effective due diligence), etc. Consequently, the sponsor equity capital-at-risk measured here is only an upper bound.

While it may not be meaningful to attempt inferences of causation from the limited number of observations used in the two indices, as well as the inherent relationship between the two, the broad trends and co-movements provide pointers on their interplay. As may be observed from figures 5 and 6 above, there are two broadly distinct periods: an “improvement” in the first half of the nineties and a “deterioration” in the latter half. These trends are also broadly in line with the period of high economic growth in the period 1993-94 to 1996-97 and a persisting slowdown thereafter. It is also evident that effective co-financing broadly follows the trend predicted by the model dynamics following changes in the degree of government involvement in intermediation. To an extent, manifestly, the magnitude of the movement is the result of the index construction methodology, but the trend and direction is robust.

5. CONCLUSION

The paper formalised a mechanism for transmission of shocks between the financial and real sectors, emanating from declining investment efficiency generated by the increasing involvement of government in financial intermediation. The transmission mechanism, based on structural characteristics, is designed to explain persistent economic slowdown over the long run, not the conventional “boom-and-bust” swings in economic activity over the business cycle. The main result of the model is that a slowdown of the real economy and eventual collapse of investment and reversal of economic growth can arise from the financial sector through “aggravated” moral hazard. The channel for transmission of the shocks was through a financial leverage coefficient, which is postulated to switch endogenously from an accelerator to a decelerator.
The paper also constructed a set of indices, using Indian economic and financial data, to validate the mechanisms underlying the observed prolonged slowdown in growth. The indices specifically attempted to capture the extent of government involvement in the financial sector and its effect on the riskiness of financial portfolios, in other words, to “quantify the rot” that is increasingly evident.

The model attempted to capture a distinguishing characteristic of financial sectors in many, usually developing, countries that impacts economic growth by weakening the processes that generally mitigate moral hazard in agency situations, i.e., a high and increasing density of government involvement in financial intermediation. The key mechanism is the creation of an environment – through the absence of hard budget constraints, implicit bailout guarantees for intermediaries and regulatory forbearance for bank closure – where market discipline is perceptibly weak. This encourages management of intermediaries to build up riskier portfolios that are more susceptible to collapse. Coupled with institutional rigidities, in particular the absence of effective bankruptcy procedures and “tunneled” corporate structures, not to mention shortcomings in the decision-making, accounting and reporting practices of financial intermediaries, this further dilutes the already weakened nominal co-financing levels, without a commensurate increase in sponsor capital. These impulses also become progressively stronger as a deteriorating fiscal situation and other political imperatives gradually increase government involvement in the financial sector.

The most obvious means of reversing this situation is privatisation of intermediaries; the incentive structures under public-sector dominated intermediation are simply incompatible with commercial discipline. This, however, is a necessary, but not sufficient condition. Allowing more private banks and intermediaries, subject to their fulfilling prudential requirements, should help. Speeding up convergence to international prudential norms, particularly relating to risk management, is a \textit{sine qua non}. Subjecting domestic intermediaries to greater competition than that provided through the presence of foreign banks is likely to be engendered through capital account convertibility.
Although we have not studied other countries in detail, the experience of Japan and Turkey suggests that weakening of market discipline, even born of causes other than public ownership, can lead to problems emanating from cascading moral hazard. Japan’s particular “cooperative” style of banking has been singled out as a major cause of the decade long slowdown in its economic activity. There remain two directions of extension of the results of the paper. First, the set of indices that have been derived need further refinement. Although the indices have an inherently intuitive appeal, the use of appropriate proxies for some of the relevant variables that we have not included in the indices will enable a sharper definition of abstract concepts like “effective co-financing” and even of relatively more concrete ones like “density of government involvement”. Preliminary indications of these variables and their potential proxies are scattered through the paper. Second, the model might be made richer by the inclusion of an optimisation exercise based on the microeconomic foundations of (political) institutional dynamics that endogenously reinforce the intensity of government involvement and exacerbation of moral hazard. A formal inclusion of regulatory forbearance will also impart an even greater realism to the model.
REFERENCES


Doi, T. and T. Hoshi, 2002, “FILP: How much has been lost? How much more will be lost?”, Working Paper No. 2002-17, University of California, San Diego, (Revised) June.


APPENDIX 1

Japan

Japan, in large part due to its continuing weak real economic conditions, has been unable to restore stability in its financial sector, despite more than a decade having passed since the end of the bubble economy of the 1980s (Fukao [2002]). The average annual real growth rate between 1991 to 2001 has been only 0.8 percent. The banking sector has not been profitable since 1993, even when capital losses on stock and real estate portfolio are excluded from their accounts. Capital injection has not helped since banks cannot raise interest margins because of competition with government sponsored financial institutions (GSFIs) that receive subsidies, intense political pressure for new loans to small- and medium-sized companies (backed up by the Financial Services Agency (FSA)) and weakened existing borrowers.

There has been little progress in efforts to reform the two programs that constitute the bulk of government sponsored intermediation in Japan: the Postal Savings System (PSS) and the Fiscal Investment and Loan Program (FILP) (Cargill [2002]). FILP, managed by the Ministry of Finance (MoF) and with an average annual budget of around 10 percent of Japan’s GDP, finances government banks providing subsidised loans to targeted sectors and government entities. At end-March 2001, FILP loans outstanding were about 80 percent of GDP. Doi and Hoshi [2002], who provide a detailed account of FILP disbursement procedures, estimate that 75 percent of FILP loans are non-performing, with expected losses amounting to 16 percent of GDP. In 2001, PSS accounted for 35 percent of total household deposits, much of which had hitherto been statutorily used to fund FILP loans through the MoF Trust Fund Bureau. However, even now, PSS allocates 80 percent of its portfolio to “safe” assets such as government bonds, FILP bonds and FILP-agency securities.

Japanese banks have already lost 72 trillion Yen due to bad loans over the period 1992 - 2001, amounting to almost 14 percent of GDP in 2000. Moreover, it is estimated that Japanese banks still have more than 32 trillion Yen of undisclosed bad loans (or another 6 percent of GDP). According to a Bank of Japan sample study in 2001 of the actual loan loss figures of 18 banks, the three-year cumulative loss rates by category of classified loans were as follows: substandard - 16.7 percent and doubtful 75.3 percent. The estimated loss was (almost) 100 percent of loan assets rated by the Bank in 1993-94.

Japanese life insurance companies are also in serious difficulty, having promised high minimum yields to policyholders in the 1980s and early 90s. Although most policies were of very long duration, the life-insurance companies did not hedge their long-term liabilities with long-term fixed income investments. Under the zero-interest rate policy of the Bank of Japan, these companies are suffering from the consequent large negative yield gap in their balance sheets.
Complicating this dire picture is the “double gearing” (cross purchases of capital) among banks and life insurance companies. Weakened banks ask life insurance companies to provide equity capital and subordinated loans. In return, these insurance companies ask banks to subscribe to their surplus notes (similar to non-voting redeemable preferred shares) and subordinated debts. The consequences were demonstrated when Chiyoda Life failed in October 2000 and Tokai bank lost 74 billion yen. Shockingly, FSA actively encouraged these dangerous double gearings\(^{30}\).

**Turkey**

State-owned banks in Turkey have been intermediating an increasing quantum of deposits since the mid-seventies and their share of deposits has increased dramatically in the nineties (Denzier, et al. [2000], Table 5.3). The systemic risk from the long-standing inefficiencies of state banks and mismanagement of small banks, which had begun to seriously threaten economic stability, came to a head by 2000 (Akcay [2001]). The genesis of the problem reportedly lay in the lucrative government securities markets that had been created in an inflationary financial environment in the nineties. A secondary reason was a desire to pre-empt the crowding out of resources by banks by establishing a capital base through deposits. The large consequent appetite for bank licenses led to a rapid increase in the number of banks from both qualified and unqualified entities. From a macroeconomic point of view, banks and the private sector had all the incentives to lend to the government. There was little competition from foreign banks, who were deterred by political forbearance, an unstable economic environment and a lax and arbitrary regulatory regime\(^{31}\). The profitability of these banks (as measured by net income on average assets), however, has been consistently over 5 percent since the mid-nineties, as compared to the sub-one percent returns for state-owned banks.

There have been major regulatory problems as well. The regulatory structure could not enforce existing banking laws, and there was explicit and implicit support for the continuation of a bank-based system, to the detriment of capital markets. Poorly performing and failing banks were kept in the system and there were no incentives for large groups, which owned these banks, to go to the capital markets to raise funds. These actions were compounded by a 100 percent deposit insurance scheme, established after the 1994 crisis, which became a serious moral hazard factor. In effect, full coverage served to induce reckless behaviour by the troubled private and most state banks in the competition for deposits, possibly at the expense of the large banks that followed more prudent practices. This contributed to the December 2000 crisis, having eliminated the risk factor almost completely for the poorly managed banks.

\(^{30}\) Mr. Takagi, the Director of Supervision Department of FSA, stated that the double-gearing among financial institutions is highly beneficial to enhance public confidence (Nikkei Shinbun (Japan Economic Journal, Japanese edition), November 27, 2001).

\(^{31}\) The share of foreign banks in total assets and liabilities of the banking sector is less than 5 percent.
### APPENDIX 2

#### Table A2.1: Key ratios of the Indian economy (as percent of GDP)

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>GDP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public sector savings</td>
<td>21.8</td>
<td>22.5</td>
<td>24.8</td>
<td>25.1</td>
<td>23.2</td>
<td>23.1</td>
<td>21.5</td>
<td>24.1</td>
<td>23.4</td>
<td>24.0</td>
</tr>
<tr>
<td>Private corporations</td>
<td>2.7</td>
<td>3.5</td>
<td>3.5</td>
<td>4.9</td>
<td>4.5</td>
<td>4.2</td>
<td>3.7</td>
<td>4.4</td>
<td>4.1</td>
<td>4.0</td>
</tr>
<tr>
<td>Gross domestic savings</td>
<td>23.6</td>
<td>23.1</td>
<td>26.0</td>
<td>26.9</td>
<td>24.5</td>
<td>24.6</td>
<td>22.6</td>
<td>25.2</td>
<td>24.0</td>
<td>23.7</td>
</tr>
<tr>
<td>Gross capital formation (Investment)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Public sector</td>
<td>8.5</td>
<td>8.2</td>
<td>8.7</td>
<td>7.7</td>
<td>7.0</td>
<td>6.6</td>
<td>6.6</td>
<td>6.9</td>
<td>6.4</td>
<td>6.3</td>
</tr>
<tr>
<td>Private corporations</td>
<td>7.2</td>
<td>6.2</td>
<td>7.6</td>
<td>10.6</td>
<td>9.2</td>
<td>9.2</td>
<td>7.2</td>
<td>7.2</td>
<td>5.4</td>
<td>5.3</td>
</tr>
<tr>
<td>Public sector savings-investment gap</td>
<td>-6.9</td>
<td>-6.5</td>
<td>-7.0</td>
<td>-5.7</td>
<td>-5.3</td>
<td>-5.3</td>
<td>-7.6</td>
<td>-7.9</td>
<td>-8.7</td>
<td>-8.8</td>
</tr>
<tr>
<td>Overall fiscal gap / deficit</td>
<td>9.6</td>
<td>10.3</td>
<td>9.7</td>
<td>8.3</td>
<td>8.5</td>
<td>9.4</td>
<td>11.4</td>
<td>11.3</td>
<td>11.7</td>
<td>12.1*</td>
</tr>
</tbody>
</table>

Note: * Overall fiscal deficit number for 2000-01 is authors’ estimate.

#### Table A2.2: Decadal indicators of financial deepening

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>GDP</td>
<td>5.1</td>
<td>5.9</td>
<td>7.3</td>
<td>7.8</td>
</tr>
<tr>
<td>Index of Industrial Production (IIP)</td>
<td>2.7</td>
<td>6.0</td>
<td>9.4</td>
<td>12.1</td>
</tr>
<tr>
<td>of which Capital Goods sub-index</td>
<td>-0.1</td>
<td>-4.1</td>
<td>9.2</td>
<td>5.3</td>
</tr>
</tbody>
</table>

Source: CSO Estimates and Economic Survey 2002-03.

Note: The Capital Goods sub-Index accounts for 9.3% of the IIP.

#### Table A2.3a: Comparative size of financial intermediaries (as percent of GDP)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bank deposits outstanding</td>
<td>38.2</td>
<td>39.6</td>
<td>40.5</td>
<td>42.0</td>
<td>45.7</td>
<td>48.1</td>
</tr>
<tr>
<td>Small Savings deposits, PPFs, etc. (SS)</td>
<td>20.0</td>
<td>19.2</td>
<td>19.1</td>
<td>10.4</td>
<td>11.1</td>
<td>13.4</td>
</tr>
<tr>
<td>Mutual Funds (Assets under management)</td>
<td>4.7</td>
<td>5.6</td>
<td>3.9</td>
<td>5.6</td>
<td>4.3</td>
<td>4.4</td>
</tr>
<tr>
<td>NBFC Assets</td>
<td>4.7</td>
<td>5.6</td>
<td>3.9</td>
<td>5.6</td>
<td>4.3</td>
<td>4.4</td>
</tr>
<tr>
<td>Investible Resources of FIs (except UTI)</td>
<td>-</td>
<td>3.2</td>
<td>2.7</td>
<td>1.0</td>
<td>0.9</td>
<td>-</td>
</tr>
</tbody>
</table>

Memo item

| Market capitalisation of equity markets | 19.4 | 38.7 | 33.0 | 61.6 | 36.5 | 32.6 |

Note: * The figures for Small Savings since 1999-2000 relate to the centre’s small savings only and prior to this period, the figures represent both centre’s and states’ together.
Table A2.3b: Resource mobilisation by financial intermediaries (as % of financial savings)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Incr. Deposits of SCBs</td>
<td>31</td>
<td>40</td>
<td>48</td>
<td>38</td>
<td>58</td>
<td>48</td>
</tr>
<tr>
<td>Public Sector Banks</td>
<td>37</td>
<td>36</td>
<td>43</td>
<td>38</td>
<td>48</td>
<td>38</td>
</tr>
<tr>
<td>DFI Resource Mobilisation</td>
<td>--</td>
<td>8</td>
<td>12</td>
<td>6</td>
<td>7</td>
<td>--</td>
</tr>
<tr>
<td>Public issues of bonds</td>
<td>--</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>--</td>
</tr>
<tr>
<td>and debentures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private placement of</td>
<td>--</td>
<td>7</td>
<td>9</td>
<td>4</td>
<td>6</td>
<td>--</td>
</tr>
<tr>
<td>bonds and debentures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inflows into PSF Mutual</td>
<td>6</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>-2</td>
</tr>
<tr>
<td>Funds*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incremental inflows into</td>
<td>9</td>
<td>8</td>
<td>9</td>
<td>5</td>
<td>11</td>
<td>--</td>
</tr>
<tr>
<td>LIC schemes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: * Pertains to funds sponsored by PSBs (6), financial institutions (3) and UTI.

Table A2.4: Disbursement components of development financial institutions (Rs bn)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rupee loans</td>
<td>137.1</td>
<td>238.0</td>
<td>248.1</td>
</tr>
<tr>
<td>Foreign Currency loans</td>
<td>47.9</td>
<td>42.3</td>
<td>38.9</td>
</tr>
<tr>
<td>Direct subscriptions to equity</td>
<td>77.0</td>
<td>36.0</td>
<td>71.6</td>
</tr>
<tr>
<td>Guarantees</td>
<td>3.4</td>
<td>5.6</td>
<td>8.1</td>
</tr>
</tbody>
</table>

Table A2.5: Cost of banks’ rescue (Rs bn)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital infusion</td>
<td>57.0</td>
<td>52.9</td>
<td>8.5</td>
<td>15.1</td>
<td>27.0</td>
<td>4.0</td>
<td>18.0</td>
</tr>
<tr>
<td>Cumulative infusion</td>
<td>97.0*</td>
<td>149.9</td>
<td>158.4</td>
<td>173.5</td>
<td>200.5</td>
<td>204.5</td>
<td>222.5</td>
</tr>
</tbody>
</table>

Note: * Includes Rs 40 bn injected prior to 1993.

APPENDIX 3

Proofs.

Lemma:

\[ z^\bullet(t) = \frac{[k(t) - \mu(t) \ell(t)]}{k(t)} = \frac{[k(t) - \ell(t)]}{k(t)} - \frac{(\mu(t) - 1) \ell(t)}{k(t)} \]

\[ = z(t) - \beta(t) \]

where \( \beta(t) \equiv z^\bullet(t) - z(t) = (\mu(t) - 1) \frac{\ell(t)}{k(t)} \geq 0 \), since \( \mu \geq 1 \), by definition.

Proposition:

From Eqn. (10),

\[ \omega^\bullet(t) = 1 + [z(t) + \{(1 - \mu(t)) (\ell(t) / k(t))\}]^{-1} \]

\[ \omega^\bullet(t) = 0 \Rightarrow [z(t) + \{(1 - \mu(t)) (\ell(t) / k(t))\}] = -1 \quad \text{(A2.1)} \]

Using the specification of \( \mu(t) \) in Eqn. (7), and noting that \( (\ell(t) / k(t)) = (1 - z(t)) \), Eqn. (A2.1) can be re-written as

\[ 1 - \theta \Gamma(t) = (-1) [1 + z(t)][1 - z(t)]^{-1} \]

\[ \Rightarrow \theta \Gamma(t) = 2 [1 - z(t)]^{-1} \]

\[ \Rightarrow \Gamma(t) = \frac{\ln 2 - \ln [1 - z(t)]}{\ln (\theta)}. \quad \text{(A2.2)} \]

Existence of the solution, from Eqn. (A2.2) above, is ensured with a switch between a positive and a negative value of \( \omega^\bullet \) for some values of \( \gamma \) and the imposition of suitable restrictions on the values of \( \theta \) that ensure that \( \Gamma \) is between 0 and 1.

Note that, in the expression in square brackets on the right hand side of Eqn. (10), \( z(t) \) is positive and less than one and the multiplicative expression in curly brackets is less than or equal to zero. Therefore, given any particular level of \( \ell(t) \) and \( k(t) \), and assuming that the function in Eqn. (10) is continuous and differentiable, there exists a value of \( \mu(t) \) where \( \omega^\bullet(t) = 0 \).

As can be seen from expression (A2.2) above, the numerator consists of two expressions, both of which are negative. Given that \( z \) is less than 1, the absolute value of \( \ln(1 - z) \) is smaller than the absolute value of \( \ln 2 \), implying that the numerator is negative. For \( \Gamma \) to be positive, the denominator, i.e., \( \ln(\theta) \), has to be negative. For \( \Gamma \) to be less than 1, \( \ln(\theta) > \ln 2 - \ln [1 - z(t)] \).
Uniqueness of this solution requires appropriate constraints on the magnitudes of the parameters in the right hand side of Eqn. (10). The value of $\theta$ can be narrowed through a set of restriction on this solution that ensures existence and uniqueness as well as congruence with the postulated theoretical properties of parameters.

**Uniqueness** is ensured if $\omega^*$ is downward sloping throughout the relevant range. This will be ensured if $\theta$ is less than a number which is less than the value of the natural exponent, $e$, i.e., 2.718, as shown below.

Differentiating Eqn. (10) w.r.t. $\gamma$,
\[
\frac{d\omega^*}{d\gamma} = (-1)[z + \{(1 - \theta^\gamma)(\ell / k)\}]^{(2)} \{(-1)(\ell / k) \{d(\theta^\gamma) / d\gamma\}\}
\]
\[
= \{(\ell / k) [z + \{(1 - \theta^\gamma)(\ell / k)\}]^{(2)} \{d(\theta^\gamma) / d\gamma\} \}
\]
\[
d(\theta^\gamma) / d\gamma = \theta^\gamma \ln \theta
\]  

(A2.3a)

The expression in the first curly brackets in A2.3a is positive. For $(d\omega^*/d\gamma) < 0$, for all values of $\gamma$, $\theta$ has to be less than that value where $\ln \theta = 0$.

The curvature of the function depends on the second derivative of $\omega^*$. Differentiating Eqn. (A2.3a) again,
\[
\frac{d^2\omega^*}{d\gamma^2} = (-1)(\ell / k)(\ln\theta) \{[z + \{(1 - \theta^\gamma)(\ell / k)\}]^{(2)} \{d(\theta^\gamma) / d\gamma\} \}
\]
\[
+ 2\theta^\gamma(\ell / k) \{[z + \{(1 - \theta^\gamma)(\ell / k)\}]^{(3)} \{d(\theta^\gamma) / d\gamma\} \{d(\theta^\gamma) / d\gamma\}\}
\]
\[
= (-1) \{(\ell / k) \theta(\ln\theta)^2 \} \{[z + \{(1 - \theta^\gamma)(\ell / k)\}]^{(2)} \}
\]
\[
+ 2\theta^\gamma(\ell / k) \{z + \{(1 - \theta^\gamma)(\ell / k)\}\}^{(3)} \]

Substituting $(\ell / k) = (1-z)$ in the above expression,
\[
\frac{d^2\omega^*}{d\gamma^2} = (-1)\{(1 - z) \theta (\ln\theta)^2\} \{z + \{(1 - \theta^\gamma)(1 - z)\}\}^{(2)}
\]
\[
[1 + 2\theta^\gamma(1 - z)\{1 - \theta^\gamma (1 - z)\}]^{(1)} \]  

(A2.4)

The set of terms in the first two curly brackets are positive. The sign of the set of terms in the third curly brackets depends on the sign of $(1 – \theta^\gamma)$. This term can be simplified as follows:

$1 + 2\theta^\gamma(1 - z)\{1 - \theta^\gamma (1 - z)\}^{(1)} = \{1 + \theta^\gamma(1 - z)\} / \{1 - \theta^\gamma (1 - z)\}$

When $\theta = 1$, the RHS becomes $(2 - z) / z$, and expression (A2.4) becomes
\[
\left.\frac{d^2\omega^*}{d\gamma^2}\right|_{\theta = 1} = (-1)\{(1 - z)(\ln1)^2\} \{z\}^{(2)} \{(2 - z) / z\} < 0
\]
APPENDIX 4

METHODOLOGY OF THE INDEX OF EFFECTIVE CO-FINANCING (IEC-F).

This appendix is an enumeration of the constituent groupings of the Index of Effective Co-Financing (and of its underlying sub-index and measure) and an associated weighting system. As explained in section 4.2, the weights are uniform, and are simply +1 or –1 depending on the appropriate definition of the respective series vis-à-vis the paper’s definition of effective co-financing.

I. Index of Effective Co-Financing

The IEC-F, based on the constructs of the formal model in section 3, consists of two components: a measure of the density of government involvement in the financial sector (captured through the Index of Density of Government Involvement in the Financial Sector (IDGI-F)), and another of aggravated moral hazard (AMH). It is represented as the measure of AMH (constructed using the equity - debt ratio for ease of visual perception) with the IDGI-F as its exponent.

I.1 Methodology for construction of IEC-F

II. Index of Density of Government Involvement in the Financial Sector (IDGI-F)

II.1 Constituents

A. Trends in the government’s pre-emption of financial resources.

1. Share of public investment in overall investment (e.g., 7.7 percent of 26.8 percent in 1995-96 and 7.1 percent of 23.3 percent in 1999-2000).

2. Public sector saving - investment gap (as % of GDP).

3. Public sector fiscal / resource gap (a proxy for Public Sector Borrowing Requirement (PSBR), as % of GDP).

4. Outstanding explicit liabilities of the (central and state) governments (as % of GDP).

5. Outstanding contingent liabilities (guarantees and other off-balance sheet items) of the (central and state) governments (as % of GDP).

B. Share of public sector banks and financial institutions in total financial intermediation.

6. Share in resource mobilisation (as a sum of the following):

   a. Net domestic and time liabilities in public sector banks (as % of financial savings).

   b. Resources mobilised by FIs through bond issues (as % of financial savings).
c. Premia of LIC / Amounts mobilised by UTI (as % of financial savings)\textsuperscript{32}.

C. Lending practices and use of funds.

7. Investments in government securities by banks and financial institutions (as % of their incremental lendable resources).

8. Excess deposits deployed by PSBs in priority sectors (as % of Net Bank Credit, in excess of minimum prescribed norms).

II.2 Methodology for construction of the IDGI-F

The IDGI-F is a simple weighted average of the rates of change of “synthetic” (sub-index) constituent series. These synthetic sub-index series are constructed using the (observed) rates of change of the constituent variables (detailed above), with the values of variables of the individual series being normalised to 100 each in 1990-91.

III A measure of aggravated moral hazard

III.1 Constituents

A. Mobilisation through public equity issues (domestic issues plus Foreign Direct Investment (FDI) and American Depository Receipts (ADRs) / Global Depository Receipts (GDRs)) as percent of total debt (advances of banks and financial institutions and public long term debt issues, both domestic as well as through External Commercial Borrowings).

\textit{Diminishing notional co-financing}

It might be worthwhile to elaborate on the rationale of this proxy used for calibrating increasing moral hazard. We know of no study that has directly measured moral hazard\textsuperscript{33}: the measures are typically of variables that are employed to mitigate the consequences. The most widely used one is of co-financing, originating in the literature on insurance (deductibles) and used extensively in credit risk management. Decreasing levels of co-financing serves to increase moral hazard and thereby increase the risk profile of a portfolio or loan package.

\textsuperscript{32} Life Insurance Corporation of India (LIC, the largest insurance company which is publicly owned) and Unit Trust of India (UTI, the largest mutual fund, also publicly owned).

\textsuperscript{33} The closest that we have seen is a linear programming exercise for the study of lotteries [Prescott, 1998].