# STRESSING TO BREAKING POINT: INTERPRETING STRESS TEST RESULTS


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### *ABSTRACT*

*This paper illustrates how stress tests of banking systems may be designed to evaluate banks' reaction to shocks of increasing intensity, up to the point where regulatory norms are breached, or banks become insolvent. This approach offers additional insight and guidance for regulatory policy and intervention beyond what is usually provided, using existing methodology and data. The illustrations presented in this paper are a small sample of the wide variety of shocks, scenarios, and assumptions to which this approach may be applied.*



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## 1.0 Introduction

Stress testing has become an essential part of the toolkit for financial risk assessment in the climate of intensified international scrutiny of financial stability that has followed the financial crises of the mid-1990s. The present paper argues in favour of an approach to stress testing that starts with relatively benign changes, and observes the behaviour of target financial soundness indicators as the severity of the stress is increased. The approach may be applied to a wide variety of shocks and calamitous scenarios, and the main burden of this paper consists of illustrations of a selection of possible applications in the area of financial risk assessment.[1] The paper focuses on the impact of shocks and adverse scenarios on the capital adequacy of banks and the banking system, and in particular how quickly the risk weighted capital adequacy ratio (CAR) falls to the statutory minimum required by the regulatory authority, and further to the point of insolvency.

This approach highlights a neglected dimension of stress tests—i.e., the speed with which capital is eroded as stresses intensify. This may help in setting priorities for action to fortify the financial system and increase resilience. It is to be expected that the factors which cause the most rapid erosion of capital as stress intensifies, are the ones which will yield the greatest gain in resilience from remedial action. The approach also facilitates the setting of benchmarks against which financial market developments may be assessed, thereby augmenting the information content of early warning signals. As will be illustrated in this paper, it can be seen what magnitude of shock puts the system on a trajectory to reach breaking point, well in advance of that eventuality.

The approach may serve to inform judgmental choices in the parameterisation of stress tests and stress scenarios, perhaps the most contentious issue in the practical application of this methodology. The frequently recommended guideline of choosing "plausible but

[1] The approach is also applicable to other scenario writing exercises, such as those frequently conducted for debt and current account sustainability analysis. My thanks to Winston Moore of the University of the West Indies for this observation.

improbable" events includes an impractically large number of possibilities. Perhaps because of this, it is often difficult to publicise the results of stress tests without adversely affecting confidence levels in financial markets. Market participants wonder why particular selections are made from the many possible "plausible but improbable" eventualities, and conclude that the events chosen for scrutiny are judged to have higher probability than others. The approach recommended in our paper offers a way around this dilemma.

It is also possible to test the system's sensitivity to assumptions, using the recommended approach. In writing stressful scenarios, it is often necessary to make arbitrary assumptions about unknown parameters of the economic and financial structure, such as the impact of foreign currency transactions on interest and exchange rates. This paper presents an illustration of the way in which the sensitivity of the results to the choice of assumption may be evaluated. The suggested approach builds on methodology employed in IMF (2003), and elsewhere.

This paper shows how simulations may be conducted of the way that banks and financial systems react as they are stressed to breaking point. We conduct progressive stress tests for credit quality, the impact of interest and exchange rate changes, the implications of rapid credit growth, and the possible consequences of large foreign exchange inflows on the capital account, followed after some interval by a sudden reversal. The illustrations all use hypothetical data, for a banking system constructed of six individual banks, with made-up balance sheets, capital adequacy, liquidity, and credit profiles. Although fictional, the banks were modeled on arbitrarily selected real entities drawn from small open economies, to ensure plausible results. The tests were conducted using standard methodology, as described for example in IMF and World Bank (2005).[2]

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[2] IMF and World Bank (2005), *FSAP Handbook*, Appendix on stress testing.

## 2.0 Background and Literature Review

Conventional approaches to the stress testing of financial institutions invariably involve the calibration of the size of the stress to be imposed on the system (See Austrian National Bank, 1999, BIS, Committee on the Global Financial System, 2005, Goodhart, 2006, and IMF and World Bank, 2005). In a majority of cases the magnitude of the shock that is imposed on the system is arbitrarily chosen, on the basis of the best judgement of persons conducting the stress test, using guidelines such as historical precedent, comparisons with the experiences of similar countries, simulations of events that are "plausible but improbable" , or similar concepts (Aragonés, Blanco and David, 2001, Cihak, 2007, Sundararajan et al, 2002, and the Financial Sector Stability Assessments, FSSAs, published for its member countries by the IMF, www.imf.org). Some stress testing calibrates shocks based on forecasts of financial indicators and the estimated probability of extreme values, using forecasting models, estimates of value at risk and other techniques (Blaschke, Jones, Majnoni and Peria, 2001, Chan Lau, 2006, Chase, Greenidge, Moore and Worrell, 2006, Froyland and Larsen, 2002, Jokivuolle, Virolainen, and Vähämaa, 2008, and Worrell, 2006).[3]

The calibration process is a major weakness of conventional approaches to stress testing, and it is one that cannot be completely eliminated. The shocks that have the potential to destabilise financial and economic systems most profoundly are always without recent precedent, as exemplified by the current world economic crisis. The technologies of information and communications have changed the international financial landscape so radically in recent decades that earlier precedents are unlikely to yield useable insights. An approach to stress testing which does not involve choosing the magnitude of shock to impose therefore seems

[3] In Worrell (2006) I distinguish between stress tests and early warning systems (EWSs) and other quantitative techniques of financial risk analysis. That distinction is maintained in this paper, which is not concerned with EWSs, financial forecasts or other methods of estimating the probability of financial loss. The stress tests described in this paper would be used jointly with these other methodologies, as recommended in Worrell (2006).

preferable. This paper outlines such an approach, and applies it to a number of commonly used stress tests and scenarios. The methodology which simulates situations of gradually increasing stress, observing how financial systems weaken in this process, eliminates the choice of the magnitude of shock to be imposed on the system. However, it does not entirely remove the need for informed judgement. It remains necessary for financial policy makers to ensure that the range of vulnerabilities tested for is appropriate and comprehensive for the circumstances of the financial system under test.

The simulations which are described in this paper were conducted using entirely conventional stress testing methodologies, indicators and data, as described in IMF and World Bank (2005), Cihak (2007) and Worrell (2006).4 The techniques are those commonly used in the FSSAs for IMF member countries, and in most financial stability reports now published by central banks around the world, including Jamaica (www.boj.org.jm) and Trinidad and Tobago (www.central-bank.org.tt). The innovation of this paper's approach is that, whereas the usual analysis looks only at the financial system outcome after the selected shock has been imposed, we observe the system as it buckles under increasing pressure. The "speed" (size of each increment of additional pressure) with which the system approaches a crisis under the simulated stress provides the policy maker with valuable information towards strengthening areas of especial vulnerability, information which is ignored in the usual analysis, which focuses only on the endpoint, not on the process.

[4] The paper makes no claims for new indicator variables or weighting systems to be used in the stress tests. Nor is there any suggestion that different variables than those commonly employed should be used in particular cases. The methodology of the simulations would be familiar to anyone who uses the *FSSA*. As a result, I did not need to specify the economic characteristics of the imagined country which the hypothetical banking system serves. Also, it is unnecessary to specify whether banks are owned domestically, only to note that their capital adequacy within the country is essential to their solvency.

## 3.0 Methodology and Data

This paper is concerned with stress tests strictly defined, and does not cover early warning systems, financial forecasts and other financial risk analysis techniques or financial soundness indicators (FSIs). The term "stress test" is commonly employed to cover all types of financial risk analysis, but techniques such as early warning estimators, financial forecasts and evaluation of FSIs typically do not impose shocks on the financial system, and do not test for the impact of stresses on the financial system. The usual practice is to use stress tests to complement these other techniques of financial risk analysis. In an earlier study published in this journal (Worrell, 2006) I proposed an integrated methodology for combining all available techniques and data to provide a fully informed picture of financial system stability. The stress simulations described in the present study would therefore be used to complement other financial risk assessment methodologies, such as EWSs and financial forecasts.

The simulations reported in this study use standard stress testing methodology as described for example in Cihak (2007).[5] Credit risk is calculated using what Cihak refers to as the "mechanical" approach, and by simulating a wide range of assumptions with respect to credit default probabilities. Using the mechanical approach, rather than assume a discrete loss on the credit portfolio (the standard procedure), we simulate the magnitude of losses as the percentage of nonperforming loans increases. In similar fashion, the impact of increasing credit default probabilities is simulated. Interest rate simulations are derived from calculations of the gains or losses from mismatches between the maturities of assets and liabilities, where rates are not immediately flexible, using procedures described by Cihak. The foreign exchange simulations measure only the solvency implications of the banks' net foreign exposures, and do not include possible liquidity effects. We also simulate indirect effects, via the exchange rate impact on banks' asset portfolios. The relative lack of methodological sophistication in our simulations is deliberate, because our purpose is to demonstrate that it is possible to

[5] A comprehensive survey of these techniques is to be found in BIS (2005)

derive greater insight for policy from even the least sophisticated methodologies of financial risk analysis.

The banks whose performance under stress is simulated in this study do not exist. Their balance sheets and prudential indicators are constructed on the basis of data from actual banks in four countries and regions in Asia, Europe and the Americas, for time periods which do not match and in currencies which are not converted to any common denomination. Therefore, while the banks will behave like actual banks, the comparisons between them are for illustrative purposes only, and no inferences can be made about the "financial system" to which they belong, which is fictitious.

## 4.0 Credit Risk Assessment

The most straightforward credit risk assessment procedure measures the impact on the CAR of a substantial increase in impaired credit as the impaired portfolio grows by increasing percentages. Figure 1 illustrates the risk exposure of the mortgage portfolio of our hypothetical banking system, and three of the six banks that make up the system. The chart shows that the banking system remains well capitalized even if 50 percent of the total mortgage portfolio were written off. Banks B and C are affected only mildly, but bank A clearly has a much larger proportion of mortgages than the other banks, and its CAR falls below the Basel eight percent norm if its mortgage losses reach 45 percent of the mortgage portfolio.

**Figure 1. The CAR after Losses on Mortgages**

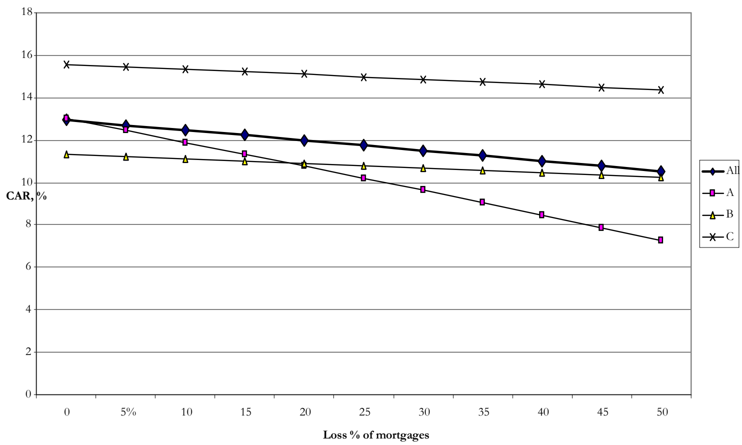
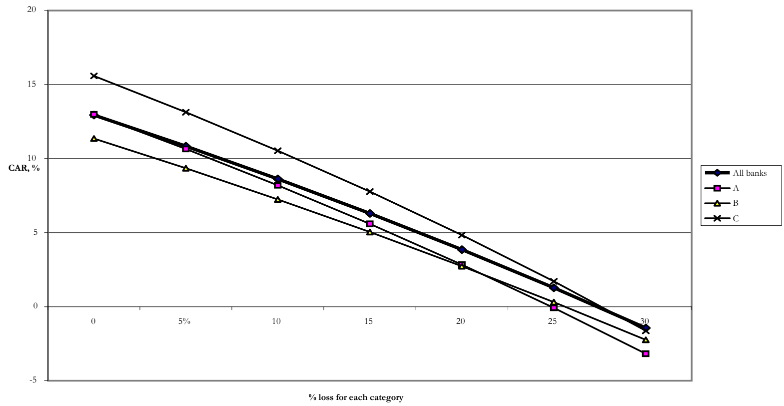



Figure 2 takes the risk assessment a step further by considering shocks that impact three categories of credit simultaneously—mortgages, loans to households, and loans to exporters. A uniform loss of a little over 10 percent of the loans in these three categories is sufficient to depress the CAR to eight percent, and at a uniform loss of about 27 percent the banking system becomes insolvent. Bank C, with the highest CAR, is the worst affected; and Bank B, with the lowest CAR, is the least affected, but the difference between banks is not great.

**Figure 2**
**The CAR after Losses on Mortgages, and Export and Personal Loans**




We may simulate the impact on the CAR of migration of loans from a better to a worse loan quality classification. Bank regulators use five classes to describe the quality of bank loans—loans which are current and fully documented are classified as "pass"; current loans about which the regulator has some concern, perhaps because minor documentation is incomplete, may be classified as "other loans especially mentioned" (OLEM); and there are three categories of loans which are not current — "substandard", "doubtful", and "loss". The probability of loss increases with each category, up to 100 percent in category 5. To reflect this, regulators require banks to set aside provisions, which are higher for each successive category, and which we assume, in line with standard stress test practice, are deducted from capital.[6] The regulators in the hypothetical banking system require provisions of one percent, three percent, 20 percent, 50 percent, and 100 percent for the five categories of loan, in that order.

[6] i.e., no account is taken of the possible impact of current period net earnings which, if positive, could cushion the impact on the CAR.

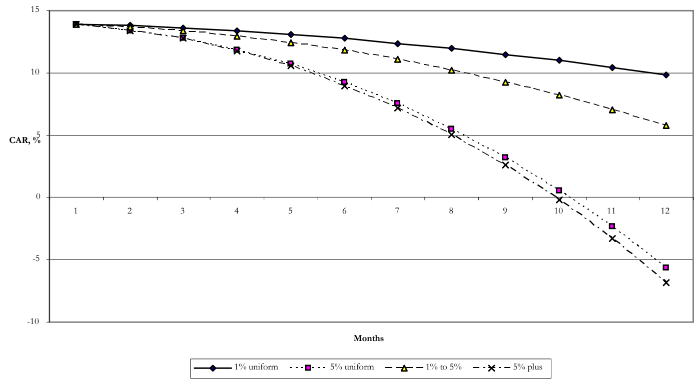
Consider the loan migration pattern presented in Table 1, which shows the proportion of loans in the category from the left hand column that migrates to the category in the top row. The cell *A2*, for example, is the proportion of pass loans that migrate to OLEM. The table shows a simple matrix where loans migrate only to the next worse category, but it is possible to introduce any desired degree of complexity.

**Table 1: NPL Migration Matrix**

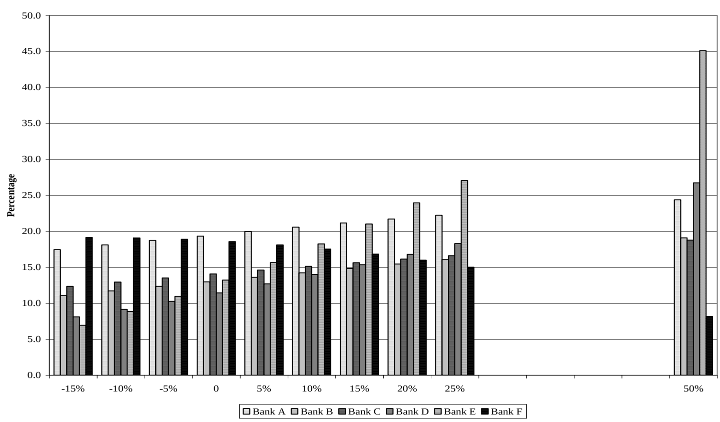
| | Pass | OLEM | Substandard | Doubtful | Loss |
|---|---|---|---|---|---|
| Pass | | 0.01 | 0.00 | 0.00 | 0.00 |
| OLEM | | | 0.01 | 0.00 | 0.00 |
| Substandard | | | | 0.01 | 0.00 |
| Doubtful | | | | | 0.01 |

Figure 3 shows the evolution of the CAR for the banking system over a 12-month period, if the loan migration each month follows the pattern of Table 1, with migration coefficients only on the matrix diagonal. A one percent monthly migration rate, as represented in the table, results in a fall of the CAR from 14 percent to 10 percent in 12 months. If the migration rates range between one and five percent, the CAR falls below eight percent in 11 months. If migration rates between the categories are a uniform five percent, the CAR falls below eight percent in seven months, and equity becomes negative in the eleventh month.

## Figure 3: The CAR with Different Migration Patterns




## Figure 4: The Effect of Exchange Rate Changes on the CAR



### *Exchange Rate Risk*

Figure 4 shows the direct effect of exchange rate changes on each of the six banks in the system. Bank F is the only one with a large net foreign liability position, and it is therefore the only one to suffer a deterioration of its CAR as a result of exchange rate depreciation, and the only one to benefit from exchange rate appreciation. A depreciation of 50 percent reduces its CAR from 18.6 percent to a level just above the statutory eight percent minimum. Banks A, B, and C have balanced external positions, and are largely unaffected by exchange rate changes. Banks D and E stand to make large gains from their positive net foreign asset positions in case of a devaluation, and are therefore vulnerable in case of an exchange rate appreciation.

Figure 5 shows the impact of exchange rate changes on the banking system when we take account of possible indirect effects through the impairment of credits to firms and households that make losses as a result of the exchange rate change. The chart compares the total impact with the direct impact (the sum of the changes shown for individual banks in Figure 4) for each exchange rate change. There is some loss from indirect effects, that reduces the total direct gain from any percentage devaluation, but the effect is very small. This results from the fact that foreign currency loans to residents in the hypothetical banking system are a small proportion of the total, and it is plausible to assume that these are the credits that are adversely affected by an exchange rate depreciation.

**Figure 5: Banking System CAR, Devaluation Effects**

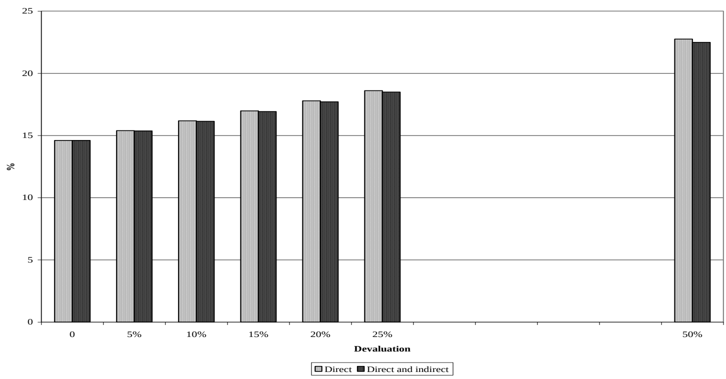
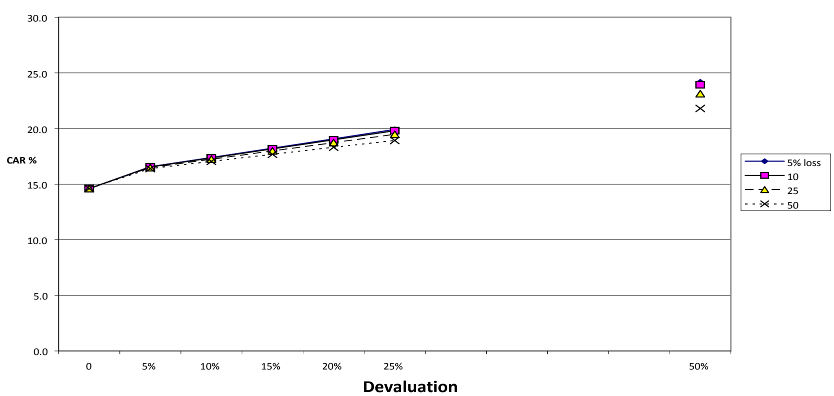



Figure 6 reinforces the conclusion that indirect foreign exchange risk is not significant in this banking system, by showing how losses increase as the proportion of impaired foreign currency loans to residents increase. Even if the losses on such loans are as high as 50 percent, the diminution of capital gains from devaluation is minor.

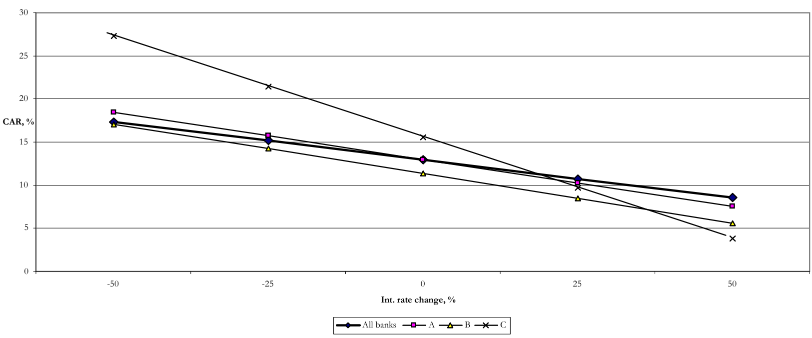
**Figure 6: Total Devaluation Effects, Different Losses on FC Loans**



### *Interest Rate Changes*

Banks all have net liability positions in the short term maturity "buckets"—they gain when the interest rates fall and lose when they increase. In Figure 7, a 50 percent increase in interest rates leaves the CAR of the banking system a little above eight percent, but Bank B's CAR falls below eight percent when interest increases by 25 percent, and Bank C falls below the norm at a somewhat higher percentage increase. However, no bank is susceptible to modest increases in interest rates.

**Figure 7: The CAR after Interest Rate Shocks**




### *Credit Growth*

The impact of credit growth on the CAR depends on the rate of growth of credit, the initial nonperforming loans (NPL) ratio, and the NPL migration matrix. Figure 8 shows how the CAR is affected by different rates of credit growth, starting with the actual NPL of the hypothetical banking system, and the one percent diagonal migration matrix shown in Table 1. With a five percent monthly credit growth rate, after 12 months the CAR would have fallen to almost eight percent, compared with the 10 percent CAR with zero growth that appeared in Figure 3. If credit were to grow at the monthly rate of five percent the CAR would fall to eight percent in the eleventh month, and if the monthly growth rate reached 25 percent the CAR would fall to eight percent in the eighth month, all with the uniform one percent migration pattern.

**Figure 8: The CAR with Various Rates of Credit Growth**

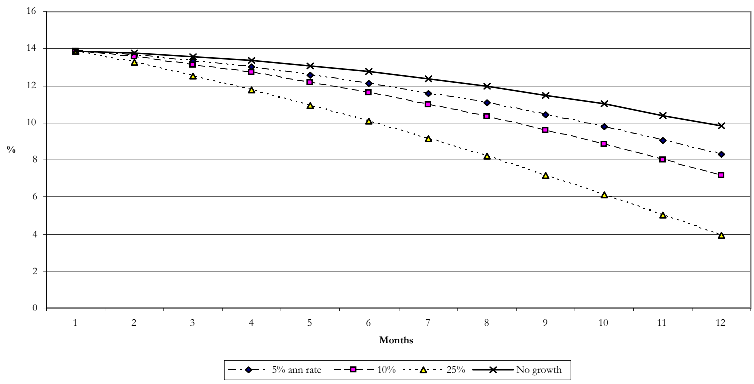
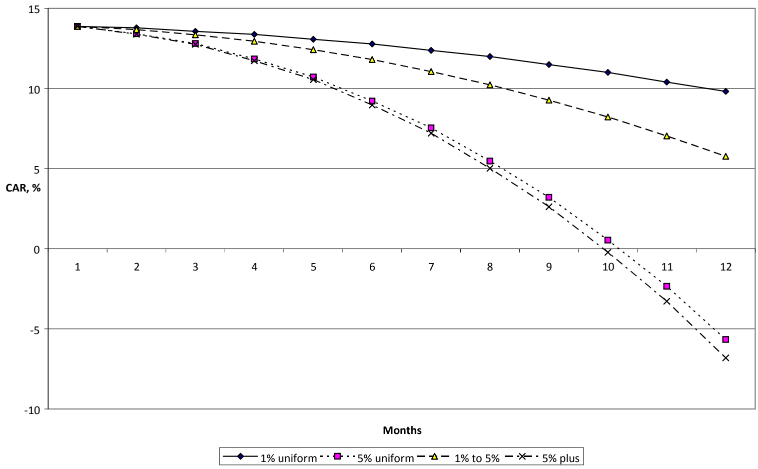


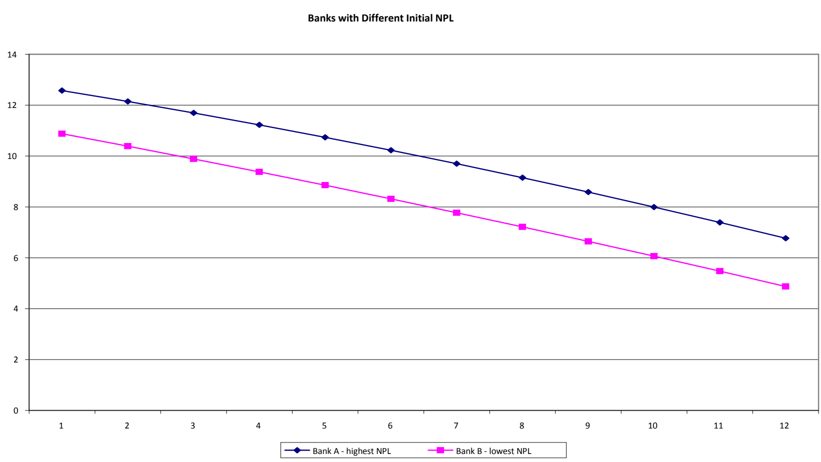

Figure 9 shows how the system behaves with different NPL migration patterns, with the same (five percent monthly) credit growth rate. If NPL migration rates range between one and five percent, as compared with the uniform one percent of Figure 8, the CAR falls to eight percent by the seventh month, and after 12 months the banking system's equity is exhausted. If there is a uniform five percent migration pattern, these effects take place one month earlier.

Figure 10 compares the impact, on banks with the highest and lowest NPL ratios, of the five percent monthly growth rate and the one percent NPL migration. The difference in NPL ratios does not affect the rate at which the CAR declines. Bank A, with an initial NPL ratio of 19 percent (the highest for the banking system), suffers a CAR decline of six percentage points, about the same as for Bank B, which has the lowest initial NPL ratio (six percent of loans).

## Figure 9: The CAR with Various Loan Migration Rates




## Figure 10: Banks with Different Initial NPLs



### *Combined Scenario*

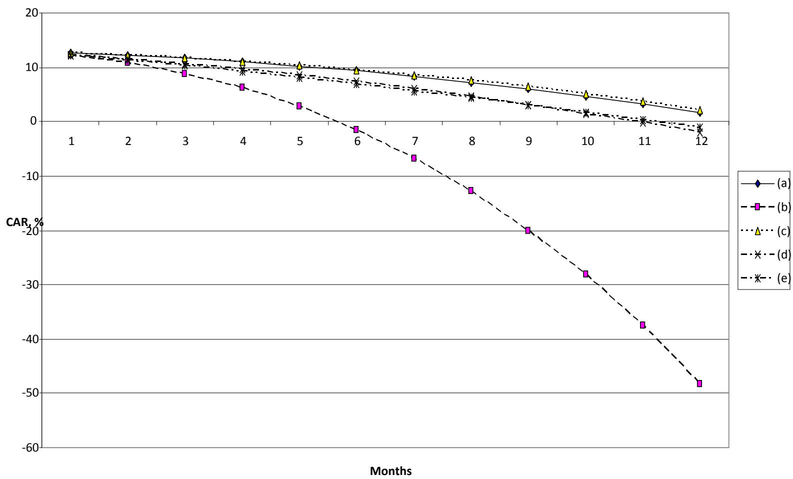
Figure 11 illustrates the first steps in developing a scenario that combines all the elements discussed so far—the impact on the CAR of credit growth, an exchange rate change, NPL migration, and an interest rate change. Four alternative scenarios ((b) – (e)) are shown in Table 2, each one of which alters just one parameter from a rate of one percent per month, to five percent per month, compared to the base scenario (a).

**Table 2: Parameters of Combined Scenario**

| | Credit growth | ER change | NPL migration | Int. rate change |
|---|---|---|---|---|
| (a) | 1%/mo. | 1%/mo. | 1%/mo. | 1%/mo. |
| (b) | 1%/mo. | 1%/mo. | *5%/mo.* | 1%/mo. |
| (c) | 1%/mo. | *5%/mo.* | 1%/mo. | 1%/mo. |
| (d) | 1%/mo. | 1%/mo. | 1%/mo. | *5%/mo.* |
| (e) | *5%/mo.* | 1%/mo. | 1%/mo. | 1%/mo. |

With credit growth of five percent per month and all other parameters set to one percent per month, the CAR falls below eight percent in the eighth month, and ends at less than two percent in the twelfth month. With a uniform NPL migration rate of five percent per month the CAR falls below eight percent in the fourth month, and banks' net worth would become negative by the sixth month. Increasing the exchange rate deterioration and interest rate by five percent is relatively innocuous (See Figure 11).

**Figure 11: Credit Growth, Devaluation, NPL Increase, Interest Rate Fall**




Although it is not illustrated in this paper, it would be informative to use each one of these scenarios as a point of departure for a family of scenarios, with increasing intensity of one parameter, holding all others unchanged. This might then be extended to combinations of these changes, in what might become a dense map of possibilities for the evolution of the CAR. This could provide a rich template against which to evaluate the actual experience of the banking system as it evolves over time, possibly serving to sharpen early warning signals.

### *Capital Inflow and Reversal*

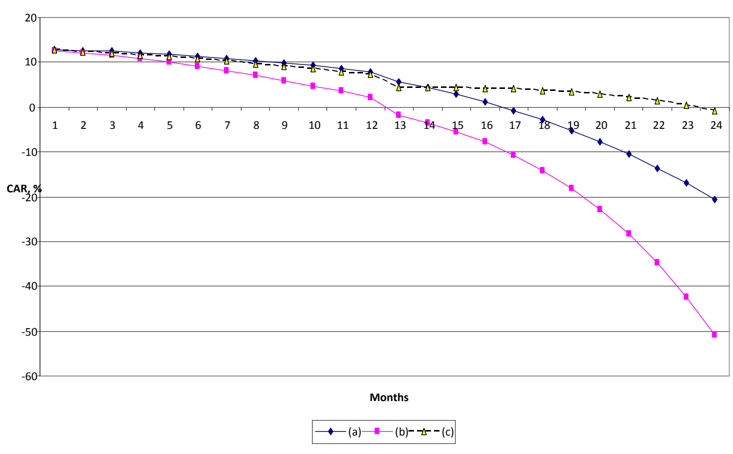
Table 3 illustrates how the approach of stress intensification may be applied in writing complex scenarios, involving many assumptions. The scenario represents a foreign capital inflow for 12 months, which triggers a constant monthly rate of exchange rate appreciation, monthly reductions in interest rates, and monthly NPL migration. There is a sudden reversal in the thirteenth month, which causes a depreciation of the exchange rate, a rise in interest rates as the monetary authorities attempt to slow the outflow, and a further deterioration of NPLs.

**Table 3: Parameters for the Capital Flow Scenario**

| | Credit growth | ER change | Int. rate change | NPL migration |
|---|---|---|---|---|
| (a) inflow | 1%/mo. | -1%/mo. | -1%/mo. | 0.1%/mo. |
| (a) outflow | -2%/mo. | 2%/mo | 2%/mo. | 0.5%/mo. |
| (b) inflow | 1%/mo. | -1%/mo. | -1%/mo. | 0.5%/mo. |
| (b) outflow | -2%/mo. | 2%/mo | 2%/mo. | 1%/mo. |
| (c) inflow | 5%/mo. | -5%/mo. | -5%/mo. | 1%/mo. |
| (c) outflow | -10%/mo. | 10%/mo. | 10%/mo. | 2%/mo. |

The impact of the three scenarios listed here—(*a*), (*b*) and (*c*)—on the CAR of the banking system is shown in Figure 12. In Scenario (b) credit growth, the exchange rate changes and the interest rate changes are all the same as for Scenario (a), but there is a significant increase in the rate of credit migration. Scenario (c) is much more severe, with much larger changes in all the variables. In Scenario (a), CAR falls to eight percent by the 12th month, and equity is exhausted in the 23rd month. In Scenarion (b), equity becomes negative in the 17th month. In the third, more severe, scenario the CAR falls below eight percent in the eighth month, and below zero by the 13th month.

**Figure 12: Capital Inflow and Reversal**



## 5.0 Summary

Using a hypothetical but realistic system of six banks, we demonstrated how the approach of stressing to failure may be applied to evaluate financial system exposure to a number of risks of common concern. This hypothetical system is especially sensitive to credit quality, both the original level of NPLs and NPL migration. The impacts of exchange rate and interest rate changes are mild in comparison. The risk exposures as a result of rapid credit growth, and capital inflow and sudden reversal, therefore depend on their impact on NPLs. If they cause a rapid build-up of NPLs, banks may become insolvent in a relatively short time, but if credit quality remains high, the system remains well capitalised even with severe shocks.

The approach better arms financial policy makers to take action to increase financial system resilience in critical areas, using available methodologies and information. In a volatile real estate market, special attention must be given to the performance of Bank A. In all circumstances a close watch should be kept on the patterns of loan migration, with swift remedial action whenever migration rates tend to increase, because higher migration rates have a potential for driving the system rapidly towards insolvency. Financial policy makers are also provided with scenarios against which they may evaluate capital inflows and outflows. If the evolving pattern that is actually observed is that exchange rate, interest rate and credit quality changes resemble those of Scenario (a) of Figure 12, financial policy makers may wish to avoid precipitate action, while monitoring the situation for signs of more rapid deterioration. However, if the changes are of the magnitude of Scenario (c), swift and decisive action is needed to shore up the resilience of the financial system. In this way, measuring the way the system weakens as stresses increase, helps in interpreting and evaluating early warning signals, and provides regulators with information for making timely responses.

This approach to the use of stress tests makes use of commonly available tools, data and analytical techniques, and is therefore within the capability of financial policy makers who do not have access to the data and skills needed to build sophisticated Monte Carlo models or conduct appropriately specified value at risk models. The approach may also be used to supplement such models for sectors where micro data may not be available and for the analysis of extended time periods.

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# *APPENDIX I*
## *Tables*

### Table A1. Capital Adequacy, $ million

| Bank | Capital | Tier 1 | RWA | CAR, % |
|---|---|---|---|---|
| A | 110.8 | 106.8 | 853.4 | 13.0 |
| B | 68.1 | 65.6 | 599.6 | 11.4 |
| C | 113.3 | 96.7 | 727.0 | 15.6 |
| D | 83.8 | 148.3 | 670.8 | 12.5 |
| E | 108.6 | 102.1 | 868.8 | 12.5 |
| F | 74.6 | 66.6 | 601.8 | 12.4 |
| **Total** | **559.2** | **586.1** | **4,321.4** | **12.9** |

### Table A2. Loan Distribution, $ million

| Bank | Construction & land development | Tourism | Personal | Grand Total |
|---|---|---|---|---|
| A | 105.2 | 34.7 | 305.7 | 894.2 |
| B | 14.7 | 21.0 | 230.0 | 529.1 |
| C | 20.4 | 26.2 | 363.7 | 634.5 |
| D | **26.5** | 16.9 | 165.9 | 622.0 |
| E | 57.6 | 70.2 | 313.4 | 784.3 |
| F | 9.2 | 27.5 | 233.2 | 474.3 |
| **Total** | **233.7** | **196.5** | **1611.8** | **3938.3** |

**Table A3. Loan Quality, $ million**

| Bank | pass | olem | sub | dbt | loss | NPL% |
|---|---|---|---|---|---|---|
| A | 564.5 | 158.3 | 144.3 | 24.2 | 2.9 | 19.2 |
| B | 456.7 | 38.8 | 21.2 | 9.5 | 2.9 | 6.4 |
| C | 553.5 | 31.1 | 25.4 | 13.4 | 11.1 | 7.9 |
| D | 161.0 | 409.3 | 17.0 | 11.9 | 22.8 | 8.3 |
| E | 468.0 | 174.3 | 96.3 | 36.8 | 8.9 | 18.1 |
| F | 426.1 | 12.5 | 25.1 | 4.9 | 5.8 | 7.5 |
| **Total** | **2,629.8** | **824.3** | **329.3** | **100.8** | **54.3** | **12.3** |

**Table A4. Foreign Assets and Liabilities, $ million**
**(a) Assets**

| Banks | FC Cash | Bals due | Foreign investments | Loans denominated in FC |
|---|---|---|---|---|
| A | 7.661 | 127.226 | 208.665 | 422.158 |
| B | 3.203 | 42.817 | 0 | 0.004 |
| C | 3.848 | 35.23 | 89.213 | 16.159 |
| D | 4.35 | 46.04 | 114.842 | 13.526 |
| E | 1.277 | 170.572 | 110.934 | 3.793 |
| F | 2.436 | 11.081 | 31.204 | 15.224 |
| System | 22.775 | 432.966 | 554.858 | 470.864 |

**(b) Liabilities and Net Assets**

| Bank | Other foreign assets | Total | Balances due | Foreign currency deposits | Other foreign liab | Other foreign liabilities | Total | Net assets denominated in FC |
|---|---|---|---|---|---|---|---|---|
| A | 16.156 | 781.866 | 70.271 | 724.284 | 10.152 | 10.152 | 814.859 | -32.993 |
| B | 0.808 | 46.832 | 2.607 | 48.208 | 0.219 | 0.219 | 51.253 | -4.421 |
| C | 7.446 | 151.896 | 15.115 | 134.118 | 4.446 | 4.446 | 158.125 | -6.229 |
| D | 0.879 | 179.637 | 3.574 | 81.667 | 0.887 | 0.887 | 87.015 | 92.622 |
| E | 1.741 | 288.317 | 9.256 | 185.419 | 1.606 | 1.606 | 197.887 | 90.43 |
| F | 0 | 59.945 | 0.314 | 6.418 | 79.359 | 79.359 | 165.45 | 105.505 |
| System | 27.03 | 1508.493 | 101.137 | 1180.114 | 96.669 | 96.669 | 1474.589 | 33.904 |