MONITORING FINANCIAL STABILITY

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Introduction

- Macroprudential surveillance is defined as monitoring of conjunctural and structural trends in financial markets so as to give warning of the approach and potential impact of financial instability
- Systemic risk, financial instability or disorder entails heightened risk of a financial crisis - “a major collapse of the financial system, entailing inability to provide payments services or to allocate credit”.

- Instability of institutions and markets tends to be a necessary but not sufficient condition for a financial crisis in this sense.
- Macroprudential analysis is of immense importance given the costs of crises - as much as 15% of GDP.
- Such work should be undertaken not only by international organisations but also domestic authorities and private financial institutions

Structure of lecture

1. Theoretical background
2. Experience of financial instability
3. Data needs for macroprudential surveillance
4. Overall considerations in macroprudential surveillance
5. A possible framework for macroprudential analysis
6. Stress Tests and their relation to VARs

Annex: Application to the Asian crisis

1 Theories of financial instability and related indicator variables

- Selective synthesis required of different theories
  - Financial fragility
  - Monetarist
  - Uncertainty
  - Disaster myopia
  - Asymmetric information and agency costs

- Bank runs and underlying risks – credit, liquidity and interest rate/market risk
- Herding
- Industrial
- Inadequacies in regulation
  - Moral hazard and guarantees
- International aspects of financial instability
  - Exchange rate policy
  - Institutional investors and herding
  - Foreign currency financing

- Indicator variables derived from theory
  - Specific set for each theory (e.g. financial fragility covers debt, asset prices, investment)
  - Some overlap – particular focus on credit market structure, competition, prices, quantities and exposures
  - Both macroeconomic and financial indicators are relevant

2 Deriving indicator variables from experience of financial instability

- Main types of financial instability
  - bank failures following loan or trading losses
  - systemic consequences of market price volatility after a shift in expectations
  - collapse of market liquidity and issuance

Table 1: Selected episodes of financial instability 1970-98

Date	Event	Main feature
1970	US Penn Central Bankruptcy	Collapse of market liquidity and issuance
1973	UK secondary banking	Bank failures following loan losses
1974	Herstatt (Germany)	Bank failure following trading losses
1982	Ldc debt crisis	Bank failures following loan losses
1984	Continental Illinois (US)	Bank failure following loan losses
1985	Canadian Regional Banks	Bank failures following loan losses
1986	FRN market	Collapse of market liquidity and issuance
1986	US thrifts	Bank failures following loan losses
1987	Stock market crash	Price volatility after shift in expectations
1989	Collapse of US junk bonds	Collapse of market liquidity and issuance
1989	Australian banking problems	Bank failures following loan losses
1990	Swedish commercial paper	Collapse of market liquidity and issuance
1990-1	Norwegian banking crisis	Bank failures following loan losses
1991-2	Finnish banking crisis	Bank failures following loan losses
1991-2	Swedish banking crisis	Bank failures following loan losses
1992-6	Japanese banking crisis	Bank failures following loan losses
1992	ECU bond market collapse	Collapse of market liquidity and issuance
1992-3	ERM crisis	Price volatility after shift in expectations
1994	Bond market reversal	Price volatility after shift in expectations
1995	Mexican crisis	Price volatility after shift in expectations
1997	Asian crisis	Price volatility following shift in expectations and bank failures following loan losses.
1998	Russian default and LTCM	Collapse of market liquidity and issuance

- Further distinctions
  - financial deregulation
  - disintermediation and reintermediation
  - failure of a single large institution
  - Commodities
  - property related lending and speculation
  - crises linked to international debt
  - crises with an equity market linkage
  - contagion between countries

- Data requirements for analysing risks to financial stability, derived from stylised patterns of actual crises
  - Regime shifts, first to laxity, later to rigour
  - Entry conditions to financial markets eased
  - Debt accumulation and asset price booms
  - Innovation in financial markets
  - Risk concentration and lower capital adequacy for banks

Table 2A: Features of selected episodes of financial instability (1933-85)

	USA Great Depression (1933)	USA Penn Central (1970)	UK Secondary Banks (1973)	Germany Herstatt (1974)	LDC debt crisis (1982)	USA Contl Illinois (1984)	Canada regional banks (1985)
Debt accumulation	●	●	●	●	●	●	●
Asset price boom	●		●				
Concentration of risk	●		●	●	●	●	●
Regime shift	●		●	●	●		
New entry of intermediaries	●		●	●	●		
Innovation	●	●	●				
Monetary tightening	●	●	●	●	●		
Declining capital adequacy of financial institutions	●		●	●	●	●	●
Credit rationing/liquidity failure/bank runs	●	●	●	●	●	●	●
Contagion between markets	●			●	●		
International transmission	●			●	●		
Action by the authorities		●	●	●	●	●	●
Severe macroeconomic impact	●				●		
Dysfunction of financial system/economic collapse	●						

- A cross check from econometric studies
  - Banking crises often accompany currency crises
  - Studies highlight indicators such as real exchange rate appreciation, credit expansion, high real interest rates, recession and stock market declines
  - Often highlight short term, quantitative indicators of the crisis itself rather than the preceding build up of vulnerability - most useful when give “early warning indicators”

3 Types of data required for macroprudential surveillance

- flow of funds data
- financial prices
- monetary data
- detailed data on banks
- qualitative data
- external data
- macroeconomic data

Flow-of-funds data

Measures of gearing

(Corporate and household deficits/GDP **+ -,** Corporate debt levels/income or GDP **+** , Corporate debt-equity ratios +, Household debt levels/income or GDP +, Measures of income gearing +)

Financing patterns

(Bank versus market financing of companies, Unusual growth of financial claims in a particular market +, Investment patterns of institutional investors, notably cross-border +)

Banking indicators derived from flow-of funds

(overall capital adequacy **-**, balance sheet expansion +).

Financial prices

Indicators of asset valuation

(Equity prices (overall and for financial institutions) +, Commercial and residential property prices (at national and regional level) +, Potential “bubbles” in terms of deviations of asset prices from past averages +)

Indicators of market views of credit risk

(Corporate bond spreads (for domestic and eurobonds) -+, Corporate loan spreads -+, Bank bond spreads -+, 3-month CD spreads -+, 3-month CP spreads -+, Prices of related futures and options, Maturity of debt +-)

Monetary data

Indicators of credit expansion

(Broad money growth +-, Total credit to the non-financial sector +, Velocity of money and credit +, Growth in bank assets (total and by subsector of banks) +)

Concentration of risk

Sectoral or regional loan concentration +

Indicators of monetary stance

(Official interest rates -+, Real short and long term interest rates -+, Current monetary regime and its sustainability -)

Banking/Financial structure

Indicators of banking performance

(Individual bank data showing averages, distributions and time series of capital adequacy -, margins -, liquidity -, wholesale + and retail - funding, profitability -, returns on equity -, non-performing loans for banks +, derivatives exposures for hedging + or speculation -, and where possible, corresponding data for investment banks and hedge funds)

Banking and financial structure indicators

(Change in number of banks +, Change in number of foreign banks +, New entry to markets +, Estimation of revenue functions to assess contestability +, Market maker structure and market liquidity indicators -)

Qualitative information

Indicators of potential laxity in risk assessment

(Easing of financial regulation +, Recent financial innovations +, Developments reducing entry barriers to markets (notably technological change) +, Coverage of the safety net + (especially deposit insurance or other implicit or explicit guarantees))

Indicators of contagion and herding

(Potential correlation of risks +, Structural and regulatory features limiting potential contagion –, Information gathered from operational activities regarding potential for “herding” and other risks)

External financial data

Indicators of sustainability of external position

(Current account deficit +, Foreign currency bank lending +, Real exchange rate/terms of trade +, Foreign exchange reserves -, Capital account flows in banking or portfolio form +, Short term debt in foreign currency relative to total domestic debt and to short term assets in foreign currency +)

Contagion indicators

(Direction of trade data – correlation with other countries at risk +)

Memo: macroeconomic data

Indicators of macroeconomic sustainability

(Economic growth at national and regional level +-, Investment +-, Inflation +, Corporate profitability -, Forecasts of these variables)

4 Overall considerations in macroprudential surveillance

- Taking a generic view of developments
- Conceptual framework derived from theory
- Focus on patterns which have preceded financial instability in the past
- Analysis of experience both at home and abroad; many mistakes have been made when assuming that countries are in some way unique. Globalisation of markets and institutions makes a narrow focus on individual countries less and less valid

- Distinguish shocks and propagation mechanisms
- The importance of economy in selecting data from MPI/FSI lists
- Qualitative and judgemental aspects
- The use of benchmarks and norms
- Drawing on supervisory information and market intelligence
- The use of econometrics/stress tests

5 A possible framework for macroprudential analysis

- Structural macroeconomic aspects (e.g. vulnerability to asymmetric shocks owing to industry/trade structure)
- Conjunctural macroeconomic aspects (sustainability of monetary and fiscal policy, growth and inflation)
- Non financial sectors (balance sheets, borrowing, asset prices)

- Financial sector - structural aspects (banking structure, entry, deregulation, safety net, quality of regulation, codes/standards)
- Financial sector – conjunctural aspects (banks' profitability, balance sheets)
- Risks arising from the above, seen in the light of theory, patterns preceding past crises, and norms for the economy
- Possible future threats
- Countervailing aspects of resilience
- Stress tests – qualitative or quantitative – derived from perceived risks
- Conclusions and policy issues

- Note – I utilised this structure in reporting on 5 EU countries for the Bank of England
- In preparing surveillance there is a need to consult all relevant economic and financial reports by national and international organisations, rating agencies and market commentators to get a view of possible risks
- Then gather qualitative information from all relevant players about the trends and potential risks (e.g. using a questionnaire) – central bank, ministry of finance, private bankers, banking associations, rating agencies, foreign bankers, international institutional investors

6 Stress tests and VARs

Stress tests for individual institutions

- Stress tests involve identification of consequences for portfolios of possible "worst cases" (using historical shocks, hypothetical changes or Monte Carlo tests – assessing a number of combinations)
- May be in terms of levels or volatilities of individual variables (sensitivity test) or for groups of risk factors (scenario analysis), possibly also with sharp changes in correlations
- Examples: policy regime shifts, deposit runs, collapses in market liquidity, counterparty failures, unprecedented shifts in interest rates, yield curve, exchange rates, equity or commodity prices

- Essential to begin by calibrating exposure to relevant risk, which may be indirect (via borrowers and other counterparties)
- Interest rate risk
  - Use of duration gap analysis for assets, liabilities and thus on equity – possibly also allowing for convexity, or if duration not available simple maturity gap
- Credit risk
  - Expected losses covered by pricing and provisioning – assess provisioning shortage by considering peer assessments; unexpected losses covered by capital – assess its adequacy by looking at macro determinants of NPL/assets
  - Assess capital adequacy in light of these

- Liquidity risk
  - Assess potential deposit withdrawals relative to assets, also judging which of latter could become illiquid
- Market risk
  - Impact on solvency of changes in asset prices using on and off balance sheet exposures both in underlying and derivatives, taking account of shifting correlations and impact on counterparties. Calibration issue, e.g. Derivatives Policy Group recommends 6% change in major currencies and 20% for others
- Country risk
  - Assess direct and indirect exposures to individual countries, which may be aggregated using appropriate weights e.g. based on ratings
- Individual stress tests also highlight data and institutional inadequacies. Should stress tests be standardised across banks with different portfolios?

Aggregate stress tests

- Go beyond tests for individual institutions to allow for externalities and market failures (contagion from institution failure, collapse of liquidity, flight to quality) in a group of institutions to a shock. Shocks must be standardised.
- Link to macro imbalances, look at system wide exposures and aggregate across products and intermediaries
  - simple tests via impact of FSIs (such as exchange rate, GDP, real interest rate, terms of trade, exchange rate and real estate prices) on credit risk and NPLs
  - complex tests on capital via NPLs, market, liquidity and interest rate risk, focusing e.g. on the correlation of liquidity shocks, asset price changes or changes in interest rates with exchange rate pressure

- Need to choose how many firms to include, how to treat foreign owned firms (stability of parent) Also how to aggregate; take individual firms' tests or supervisors undertake exercise themselves.Net versus gross problem e.g. in interbank market.

VaRs for individual institutions

- Value at risk is the total value of a potential loss in market value that the bank stands to lose from holding a market position in normal conditions
- VaR models seek to aggregate multiple market risks for the entire institution
- $VaRx = Vx * dV/dP * \Delta Pi$
  - (Vx is the market value of position x, dV/dP its sensitivity to price moves per $ market value and ΔPi is the adverse price movement over time)

- Assumptions are needed on distribution of price changes (e.g. normal), serial correlation, stability of volatility and covariances (usually based on past averages)
- Example, JP Morgan – random walk, normal, no serial correlation, standard deviations stable, interrelation of two price movements “joint normal”
- For derivatives, market risk calculated with portfolio approach, looking at net position after offsetting exposures. Underlying risk factors (e.g. convexity risk, basis risk, volatility risk) separately considered and aggregated in VaR

- VaRs are usually expressed in terms of 95% confidence interval over one day (Basel Committee – 99% and 10 days)
- Can be extended to credit risk, e.g. by assuming default probability of firms is related to the leverage and volatility of a firm's equity value
- Problems – "fat tails" mean gives little information on unlikely events such as 1987 crash – 20 standard deviations. Also hard to aggregate
- Even for "normal" use, assumptions may not be correct and future may not resemble past
- And as in Russia/LTCM, VARs may generate adverse market dynamics

Stress tests at macro level

- Quantitative assessment of wider effect of a given shock on the financial system
- For example asset price shock affects banks directly, via borrowers' financial condition and via macroeconomy
- Ideally requires macroeconometric model of the economy, linked directly to the state of banks' balance sheets and profit and loss

- Subject to standard difficulties of modelling and forecasting (simplification, structural change and lack of long data series for estimation)
- Non-linearities (e.g. contagion)
- More simply, may use logit model of the macroeconomic determinants of the probability of crisis
- Qualitative approach – or use of spreadsheets – can still be helpful

Conclusions

- Theory of financial instability as well as the experience of financial crises in the past enable meaningful use to be made of financial and macroeconomic data in macroprudential surveillance
- These data may be employed in a judgmental manner to provide grounds for vigilance on the part of central bankers and supervisors.
- There is a need for development of broad information on what constitutes normal conditions in an economy, as well as the patterns which have often preceded financial crises in the past.

- In our framework, analysis of experience both at home and abroad is essential; many mistakes have been made when assuming that countries are in some way unique (e.g. Norway/Sweden).
- Globalisation of the world financial system of course makes a narrow focus on individual countries also less and less valid
- Stress tests and econometric work are a useful complement but not a substitute for detailed qualitative analysis of the situation in a country in the light of experience

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See also http://www.geocities.com/e_philip_davis/fs_resources.htm

Annex: Application to the Asian crisis
(1) Events of the Asian crisis

- Viewed in the light of the analytical framework, some unique elements...
- ...but largely in line with theory
- and some warning signals were available, despite shortcomings in information, see data for Thailand on next slide

Table 4: Data availability for Thailand in June 1997

Sources: IMF (1997), BIS (1997a and b)

Flow of funds data	**Financial prices**	**Monetary data**	**Banking/Financial structure**
Maturity of (international banking) debt (end 1996) Unusual growth of financial claims in a particular market (foreign currency and domestic bank lending) (end 1996)	Equity prices (overall and for financial institutions) (Mid 1997) Eurobond spreads and maturities (end-1996) Corporate loan spreads (end 1994) 3-month CD spreads (September 1996) Evidence of potential "bubbles" in equity, bond, or foreign exchange markets in terms of deviations from past averages (mid-1997)	Broad money (end 1996) Total credit to the non-financial sector (end 1996) Velocity of money and credit (end 1996) Official interest rates (June 1997) Growth in bank assets (total and by subsector of banks) (end 1996)	New entry to markets

Qualitative information	**External financial data**	**Memo: macroeconomic data**
Easing of financial regulation Recent financial innovations Current monetary regime and its sustainability. Developments reducing entry barriers to markets (notably technological change) Coverage of the safety net (especially deposit insurance or other implicit or explicit guarantees) Potential correlation of risks Structural and regulatory features limiting potential contagion	Current account (end 1995) Foreign currency bank lending (end-1996) Real exchange rate/terms of trade (end-1996) Foreign exchange reserves (Jan 1997) Capital account flows in banking or portfolio form (end 1995) Short term debt in foreign currency relative to total domestic debt and to short term assets in foreign currency (end 1996) Direction of trade data – correlation with other countries at risk (end-1996)	Economic growth at national level (end 1995) Investment (end 1995) Inflation (end 1996)

Aspects of vulnerability

- Historically strong economic growth…
- …and high investment growth, with diminishing marginal returns
- Rapid build up of private debt by banks and companies….
- ….often in foreign currency…
- …accompanied sharply rising asset prices (but fiscal position strong)

- Regime shift from closed to open economy leading to underestimate of risk by inexperienced domestic bankers
- Attempts to penetrate market and loss lead by international banks, aided by implicit guarantees by governments
- Current account deficits and loss of real competitiveness threatened exchange rate pegs…
- …leading to rise in official rates
- International lenders ignored contagion potentially affecting regional lending

Shocks triggering crisis

- Cyclical weakening
- Falling share prices/property prices
- Exchange rate pressure
- Loss of currency pegs
- Monetary tightening to counteract inflation
- Unexpected contagion across countries (loss of real competitiveness, trade exposures)

Consequences

- Withdrawal of international bank lending
- Sharp recession in domestic economies – rise in private saving
- Bank failures
- Potential for systemic risk, forestalled by IMF packages

(2) Macroprudential surveillance of the Asian crisis

- The aim of this section is to draw out some of the aspects of the build-up to the Asian crisis that could have featured in a practical macroprudential surveillance exercise
- We follow the broad framework set out above, namely real economy – non financial sectors – financial sectors – risks - conclusions

- Consider structural aspects of the economy, in particular diversification and vulnerability to real shocks (export focus, electronics)
- Look for contagion risks (similar trade patterns), drawing on experience of earlier crises (e.g. Latin America in 1982)
- Assess macroeconomic policy (exchange rate pegs) and sustainability in the light of conjunctural trends (loss of competitiveness)

- Look for “displacements” that may have triggered credit cycle (deregulation, export boom)
- Observe trends in non financial sector indicators for abnormality – credit growth, asset prices, investment, foreign currency exposures, interest rate spreads, real exchange rates, sector balances (public, private, foreign)
- Examine flow of funds data for the household and corporate sectors (if available) for financial deficits and abnormal gearing - assess robustness to shocks (income, interest rates, asset prices)

- Consider the skills of domestic lenders and the information available to international ones in the light of structural changes such as deregulation/new entry. Also country risk of international lenders
- Other qualitative aspects of finance – easing of lending conditions, evidence of misallocation of investment financed by loans, moral hazard (safety net), quality of supervision
- Examine interbank exposures and linkages and potential dangers from foreign currency exposures/withdrawal of funding

- Assess robustness of banking system to shocks (capital adequacy, ROEs, margin trends, balance sheet trends, diversification)
- Stress tests and VARs for individual institutions and groups (see below), including foreign currency mismatch
- Assess concentration of risk domestically
- In assessing risks in the light of the above, again consider the history of financial instability in the country concerned, and patterns preceding crises elsewhere

- Assess current global macro forecasts for potential risks
- Undertake macro stress tests/scenario analyses on regime shifts in monetary policy, withdrawal of international lending, fall in asset prices both separately and together, global and regional recession, loss of competitiveness. These may be qualitative or quantitative
- Seek to arrive at overall view of vulnerability and consider how policy could reduce it