Framework for monitoring financial stability

Presentation to FSOC meeting.

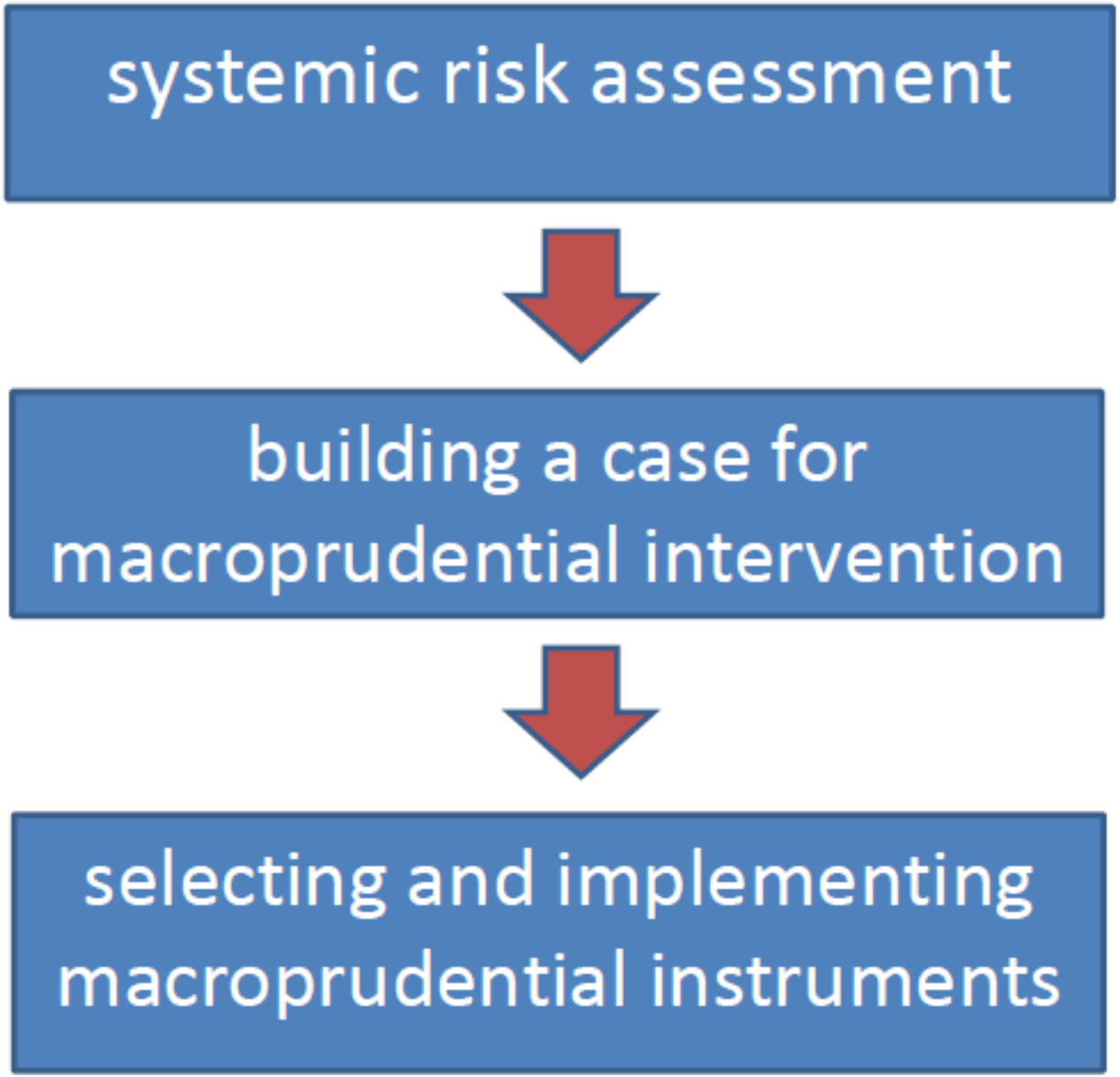
South African Reserve Bank

31 August 2018

Introduction

- The presentation outlines the SARB's framework for monitoring financial stability in the South African financial system.
- Background: Formal review of the SA financial regulatory system launched in 2007, culminating in the Financial Sector Regulation Act (FSR Act).
- The FSR Act assigns an explicit responsibility to the SARB to monitor and enhance financial stability, and seeks to ensure cooperation between regulators in pursuing the stability of the financial system.
- The monitoring framework is part of this wider policy framework, and is a key input determining the structure and activities of the Financial Stability Department.

A framework for macroprudential policy decision-making



The monitoring framework

- Objectives of the monitoring framework:
  - provides for a systemic risk assessment that forms the basis for macroprudential policymaking.
  - key indicators (complemented by judgement) can form input to 'guided discretion' decisions on specific instruments
- The SARB's monitoring framework is broadly based on the IMF and the Fed programmes.
- Focus on systemic vulnerabilities that propagate adverse shocks, rather than the shocks themselves (Adrian et al, 2015; Bernanke, 2013).

The monitoring framework . . .

- Compiling and monitoring a set of time-varying and cross-sectional indicators that allow a focus on tail risks that manifest only in certain states when adverse shocks impact the system.
- Making the monitoring framework relevant for South Africa - manifestations of systemic risk will depend on country characteristics and vary over time.
- Operationalising the indicators for policymaking

Current SARB monitoring framework

Financial stability developments and trends:

- Global developments
- Asset markets
- Systemically important financial institutions and markets (SIFIs)
- Shadow banking
- Non-financial sector
- Other (generally composite measures or input on specific instruments)

A systemic risk assessment is presented to the FSC each quarter, and many of the indicators are published in the Financial Stability Review.

Current SARB monitoring framework

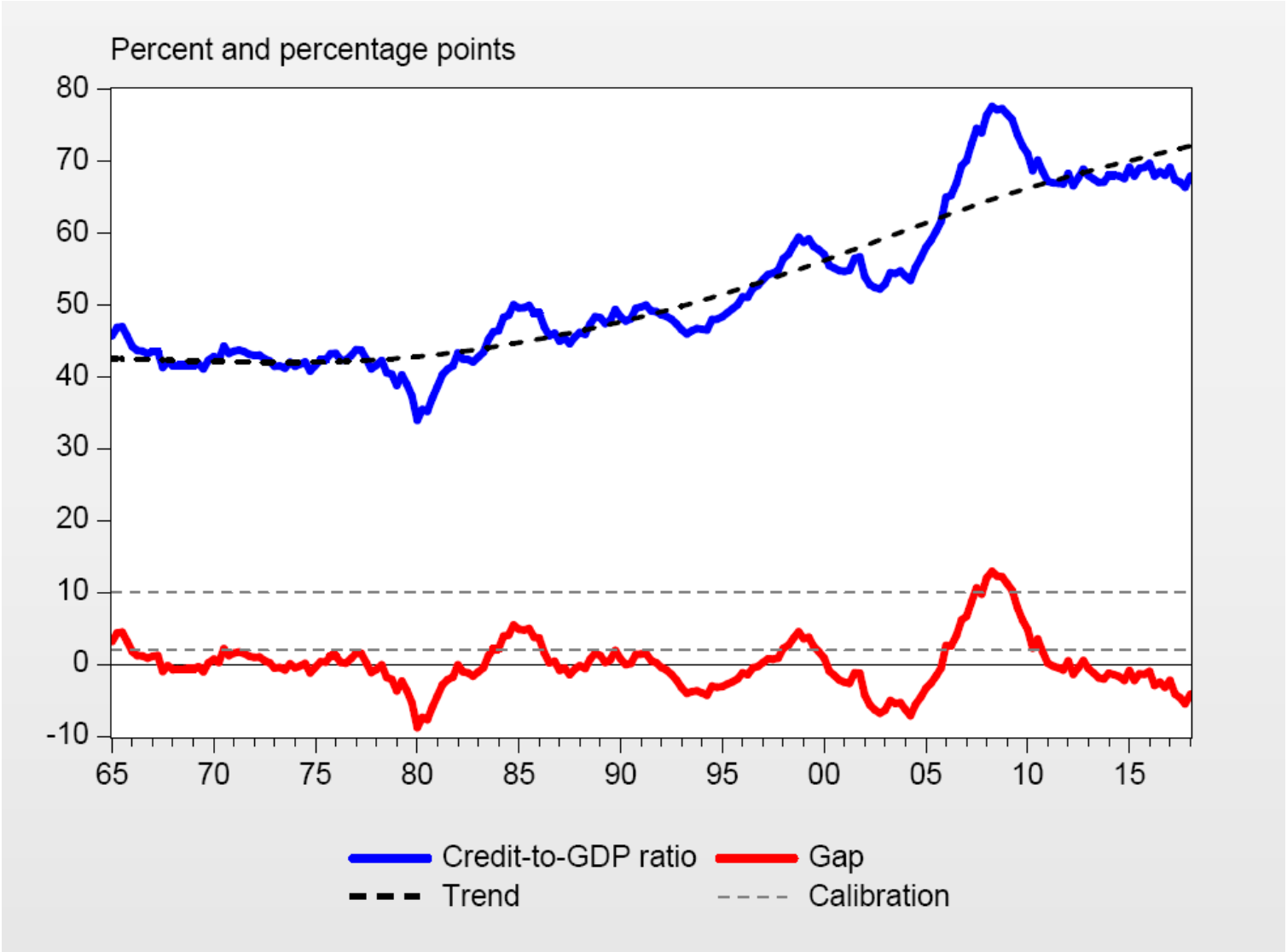
Monitoring area	Example of Entities or Activities	Indicators
Global developments	Monetary and fiscal policy changes in advanced economies, political developments	
Asset markets	Equity prices and volatility, interest rates and interest rate volatility (domestic and foreign), credit markets, real estate markets, commodities, exchange rates, and capital flows	Equity premia, new practices that could lead to a buildup of vulnerabilities, treasury valuations, CIS holdings, term structure of corporate bond spreads, residential real-estate prices
SIFIs	Systemically important banking institutions, Insurance companies and Pension funds	Financial market-based systemic risk measures - SRISK, CoVAR, network measures, concentration of exposures, common exposure analyses, supervisory stress tests
Shadow banks	Shadow banking activities. Focus on Collective Investment Schemes (CISs) securitisation, credit insurance, broker-dealers	Wholesale short term funding markets, securitisation and new financial products, Distribution of assets among financial intermediaries, Size of the shadow banking sector, Interconnectedness among financial intermediaries (Banks and non-banks), CISs portfolio analyses
Non-financial sector	Households and Consumers, Corporates, Government	LTV ratios, DTI ratios, interest-coverage ratios, debt-to-GDP, reliance on short-term debt, govt guarantees to parastatals, real estate prices
Other	CCyB analysis, Heatmap, Financial Cycle, Financial Conditions Index, Financial System Resilience Index (FSRI)	

Source: SARB

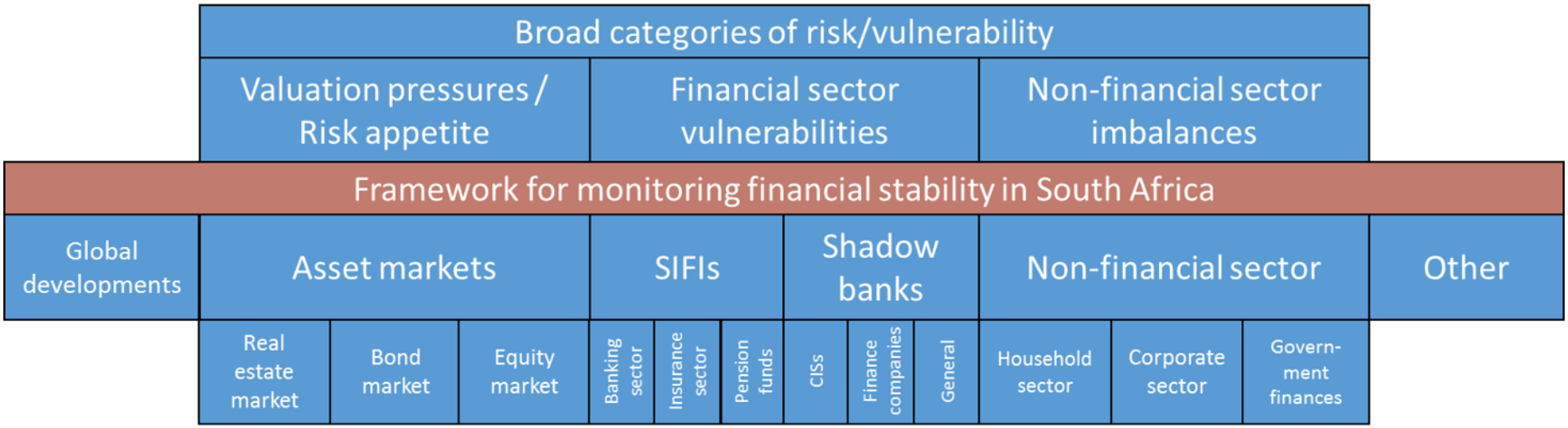
Examples

- Countercyclical capital buffer (CCyB) analysis: Credit-to-GDP gap
- Heat map
- Estimates of the financial cycle
- Financial conditions index (FCI)
- Risk assessment matrix (RAM) to summarise and highlight the potential threats to financial stability.

Countercyclical capital buffer analysis: Credit-to-GDP gap

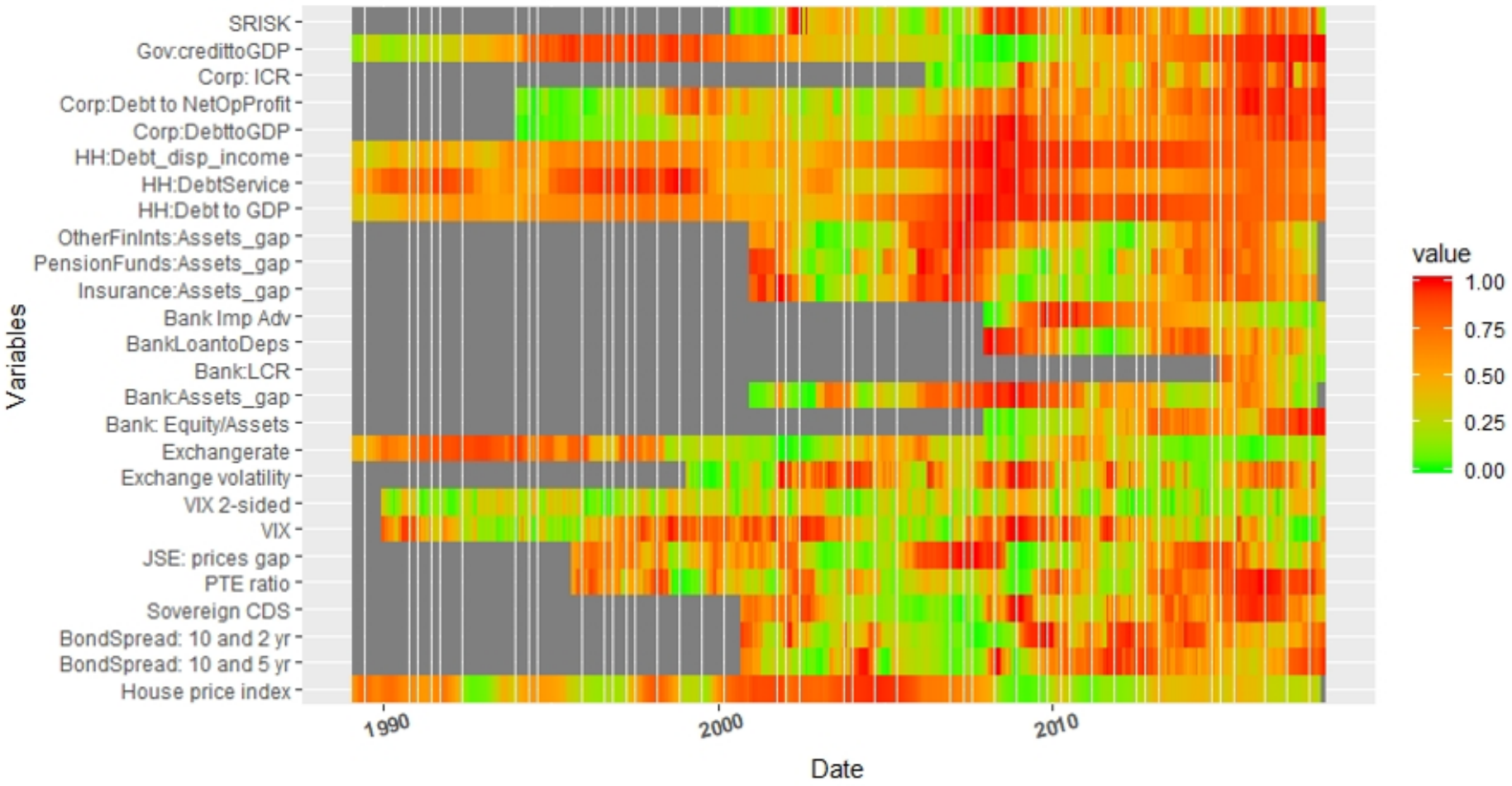


Heat map



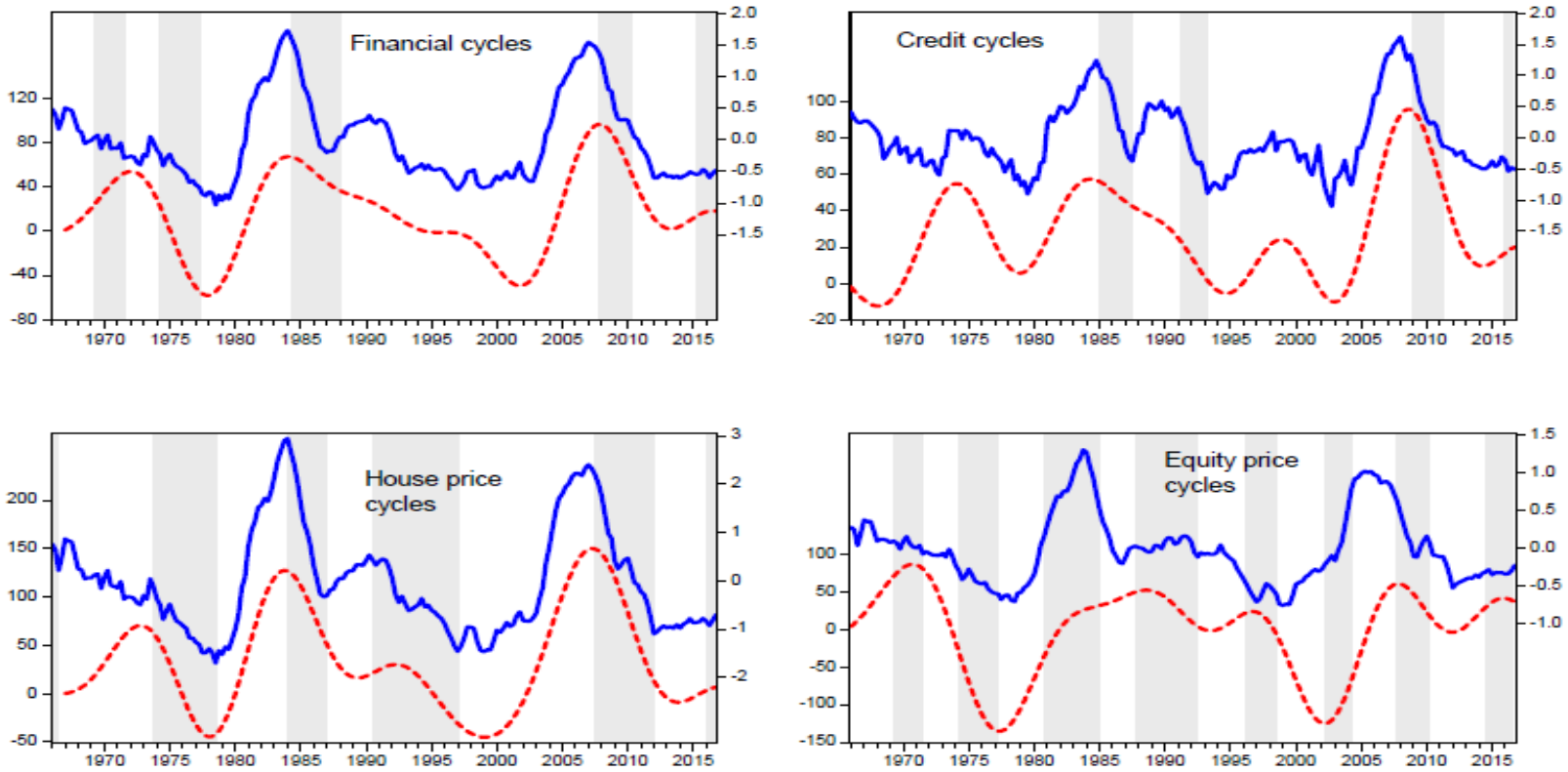
Source: van der Linde (2018)

Heat map



Source: van der Linde (2018)

The financial cycle in South Africa



— Unobserved components model (right-hand axis, log levels)
--- CF filter (left-hand axis: cumulated percentage changes)
Shaded areas are BBQ turning point dated downswings

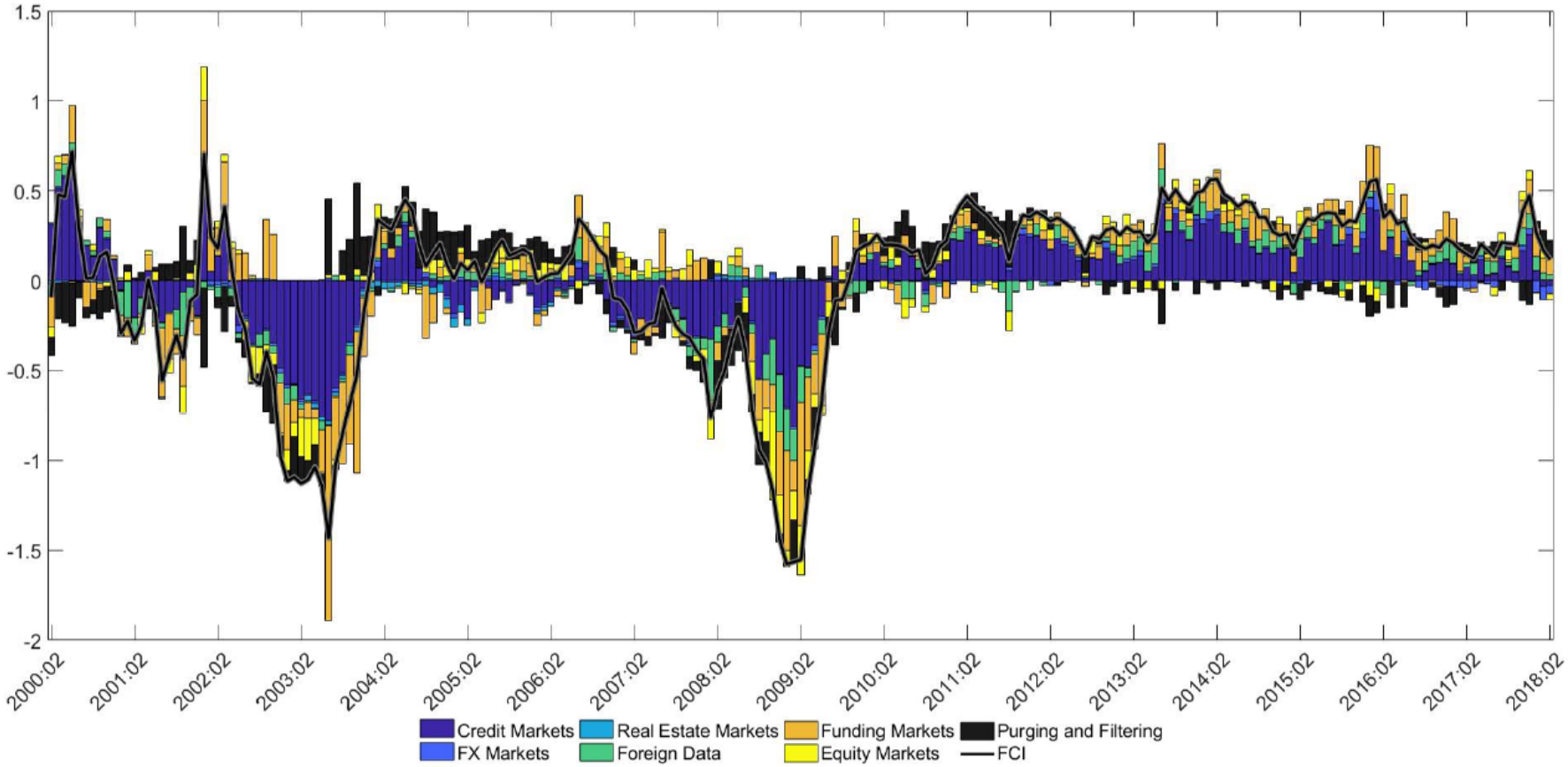
Source: Farrell and Kemp (2018)

Financial Conditions Index: Variables included

No.	Description	Tcode	Source
	Credit Markets		
1	All monetary institutions : Credit extended to the domestic private sector: Total loans and advances	5	S
2	R186 10.5% (2026) - Government stock	2	S
3	Spread: Yield Market: Eskom bonds - daily (ES33) and 91 day treasury bill	1	S
4	Spread: Yield Market: 0-3 year government bond - daily (R203) and 91 day treasury bill	1	S
5	Spread: Yield Market: 3-5 year government bond - daily (R207) and 91 day treasury bill	1	S
6	Spread: Yield Market: 5-10 year government bond - daily (R2023) and 91 day treasury bill	1	S
7	Spread: Yield Market: Long-term government bond - daily (R186) and 91 day treasury bill	1	S
8	Secondary Market: JSE All Bond yield - daily	2	S
9	Differential between repurchase rate and 91 day treasury bill rate	1	S
10	Margin between prime rate and 3-months NCD's	1	S
11	Margin between 3-months NCD's and Reserve Bank debentures	1	S
	FX Markets		
12	S.A. rand against U.S. dollar (ZAR)	5	S
13	Nominal effective exchange rate of the rand - 20 trading partners: Effective Jan. 2010 - Trade in manufactured goods	5	S
14	Fx crash	1	A*
	Real Estate Markets		
15	South Africa: ABSA House Price Index (S.A., 2000=100)	5	S
16	South Africa: FNB Average House Prices	5	S
	Foreign Data		
17	3m LIBOR (U.S.)	2	B
18	90 day T-bill rate (U.S.)	2	B
19	TED (U.S.)	1	A*
20	VIX - last price	1	B
21	S&P500 stock in gold index	5	B
22	Oil price - U.S. dollar (Brent crude)	5	S
23	Gold price - London (U.S. dollar)	5	S
24	Global Total Return index	5	B
	Funding Markets		
25	Negotiable certificates of deposits (NCDs): 3 months	2	S
26	Negotiable certificates of deposits (NCDs): 6 months	2	S
27	Negotiable certificates of deposits (NCDs): 12 months	2	S
28	Spread: Prime overdraft rate and 91 day treasury bill	1	S
29	Spread: Inter-bank funds rate and 91 day treasury bill	1	S
30	Bankrate and average/fixed repo rate	2	S
31	TED (S.A.)	1	A*
32	beta_fin1yr	1	A*
33	beta_bank1yr	1	A*
	Equity Markets		
34	Stock crash	1	A*
35	All share (J203) Price index	5	S
36	Financials (J580) Price index	5	S
37	Banks (J835) Price index	5	S
38	All share total return (J203T) Price index	5	S
39	General Mining (J154) Price index	5	S

Source: Sing (2018), Kabundi and Mbelu (2017)

Financial Conditions Index: Decomposition



Source: Sing (2018)

Process to arrive at a Risk Assessment Matrix

Risk Assessment Matrix

Source of risk	Expected impact on financial stability	Policy responses/ Mitigating factors
Significant slowdown in global economic growth		
Likelihood: Medium • Uneven global growth recovery • Interrupted recovery in the US and a slowdown in the euro area • Brexit issues • EMEs faced with higher oil prices, higher bond yields in the US and dollar appreciation • Escalating trade tensions • Turmoil in Turkey spreads to other EMs	**Impact: High** • Lower external demand for SA exports • Lower domestic economic growth • Weak fundamentals weigh on sovereign and corporate credit ratings • Higher unemployment hamper debt servicing, increasing funding costs and credit risk of financial and non-financial sectors	• Structural reforms to support economic growth (NT) • Policies to: accelerate infrastructure investment; improve competition; raise education standards; and encourage investment (NT) • Fiscal austerity measures to stabilise public finances and debt sustainability (NT)
Faster than expected tightening of global financial conditions		
Likelihood: Medium • Unanticipated tightening in US monetary policy and accelerated unwinding of its balance sheet • Further US tax cuts • Misalignment between US fiscal and monetary policies • Appreciating US dollar • US dollar liquidity shortages • Contagion effects of turmoil in Turkey	**Impact: High** • Repricing of risk • Capital outflows increase • Exchange rate depreciation, lower investment and domestic growth, slowing credit growth, increasing unemployment, rising debt levels and deteriorating asset quality of banks	• Increase policy rate if exchange rate depreciation leads to rising inflation expectations (SARB) • Provide FX liquidity to curb US dollar shortages (SARB) • Tighten fiscal policy if funding becomes problematic (NT) • Conduct sensitivity analysis and stress tests (SARB)

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Risk Assessment Matrix . . .

Source of risk	Expected impact on financial stability	Policy responses/ Mitigating factors
Lower domestic economic growth		
Likelihood: High • Weak global economic recovery • Uncertainty about land expropriation raises uncertainty about property rights – could affect investor sentiment • Governance issues in SOEs and possible bail-outs exacerbate fiscal financial burden • Consumption expenditure constrained by VAT increase	**Impact: Medium** • Protracted period of low economic growth, deteriorating fiscal position, rising debt levels, ratings downgrade triggering capital outflows, financial institutions could lose collateral, deteriorating asset quality in banks, lower private sector credit extension	• Accelerated implementation of structural reforms (NT) • Continuation of structural measures to strengthen governance in both SOEs and the private sector (NT) • Further analysis of impact of land expropriation; initiate debate with stakeholders (SARB and NT)
Cyber security risks		
Likelihood: Medium • Disruptive impact of breaches that relate to ransomware • Targeting of critical infrastructure and strategic industries • Leaks of confidential market relevant information • Increasing world interconnectedness elevates vulnerability	**Impact: High** • Corporate security breaches and disruption of business operating systems, work stoppages, large ransoms • Crash of crucial financial infrastructure e.g. financial market trading platforms • High replacement costs, falling profitability, negative impact on balance sheets of financial institutions	• Prioritise recruitment, training and re-training of network experts (Financial sector) • Participate in international conventions and engage with international stakeholders (SARB and NT) • Set up structures to ensure prevention, timely detection, response and recovery (SARB)

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Final comments: The way forward

- The framework will continue to evolve as it is regularly reviewed and updated.
- We will seek to incorporate improvements suggested by experience with the framework, as well as new developments that arise.
- We will seek to identify and fill gaps in our data collection and monitoring.
- Communication of the results of the monitoring exercise to policymakers and the general public will be an important focus area in the coming months.

References

1. Tobias Adrian, Daniel Covitz, and Nellie Liang (2015) "Financial Stability Monitoring", Annual Review of Financial Economics, 7, 357–95.
2. Ben Bernanke (2013) "Monitoring the financial system". Speech at the 49th Annual Conference on "Bank structure and competition", 10 May 2013.
3. Nicolas Blancher, Srobona Mitra, Hanan Morsy, Akira Otani, Tiago Severo, and Laura Valderrama (2013) "Systemic Risk Monitoring (SysMod) Toolkit — A User Guide", IMF Working Paper WP/13/168, July.
4. Greg Farrell and Esti Kemp (2018) "Measuring the Financial Cycle in South Africa", Macroprudential Analysis & Information Division, Financial Stability Department, South African Reserve Bank.
5. Alain Kabundi and Asi Mbelu (2017) "Estimating a time-varying financial conditions index for South Africa", Working Paper WP/17/02, South African Reserve Bank, September.

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6. Marea Sing (2018) "Decomposing and Operationalising the Financial Conditions Index", Macroprudential Analysis & Information Division, Financial Stability Department, South African Reserve Bank.
7. Mia van der Linde (2018) "A heatmap for the South African financial system", Macroprudential Analysis & Information Division, Financial Stability Department, South African Reserve Bank.

Extras

Monitoring vulnerabilities

Table 1 Monitoring vulnerabilities in different sectors

	Price of risk	Leverage	Maturity and liquidity transformation	Interconnections and complexity
Asset markets	Asset valuations in equities, rates, credit, real estate	Investor leverage	Carry trades Mutual funds ETFs Dealer-based finance	Derivatives and counterparties
Banking	Risk taking in credit and rates Underwriting standards SLOOS	Regulatory capital ratios; banks and broker-dealers Market measures of risk Stress test capital	Financial firm liabilities and maturities Secured and unsecured	Systemic risk measures Intrafinancial assets and liabilities
Nonbanks, shadow banks, and financial markets	Securities issuance Underwriting standards SCOOS	Securitization tranches New financial products Regulatory capital arbitrage Hedge funds	Agency real estate investment trusts ABCP conduits Repo markets Sec lending MMFs Short-term investment funds	CCPs
Nonfinancial sector	Underwriting standards (LTV ratios, DTI ratios)	Debt-to-GDP Households, business, and government leverage	Reliance on short-term debt	ND

Abbreviations: ABCP, asset-backed commercial paper; CCP, central counterparty; DTI, debt-to-income; ETF, exchange-traded fund; LTV, loan-to-value; MMF, money market fund; ND, not determined; SCOOS, Senior Credit Officer Opinion Survey; SLOOS, Senior Loan Officer Opinion Survey.

Basel III implementation timeline for South Africa[1]

Per cent

	Basel III	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Common equity tier 1 (CET 1) requirements											
Minimum CET 1 ratio (per Basel III)	4,5	3,5	4,0	4,5	4,5	4,5	4,5	4,5			
Pillar 2A for CET 1		1,0	1,5	2,0	1,75	1,50	1,0	0,5			
Minimum CET 1 plus Pillar 2A		4,5	5,5	6,5	6,25	6,0	5,5	5,0			
Phasing in of D-SIB requirements at CET 1 level[1]					25	50	75	100			
Capital conservation buffer[2]	2,5				0,625	1,25	1,875	2,5			
Countercyclical buffer (maximum per cent, imposed)[2]	2,5				0,625	1,25	1,875	2,5			
Tier 1 requirements											
Minimum tier 1 ratio (per Basel III)	6,0	4,5	5,5	6,0	6,0	6,0	6,0	6,0			
Pillar 2A for tier 1		1,5	1,5	2,0	1,5	1,25	1,0	0,75			
Minimum tier 1 plus Pillar 2A		6,0	7,0	8,0	7,5	7,25	7,0	6,75			
Phasing in of D-SIB requirements at tier 1 level[1]					25	50	75	100			
Total capital requirements											
Minimum total capital ratio (per Basel III)	8,0	8,0	8,0	8,0	8,0	8,0	8,0	8,0			
Pillar 2A for total capital (maximum 2,0 per cent)		1,5	2,0	2,0	1,75	1,50	1,25	1,0			
Minimum total capital plus Pillar 2A		9,5	10,0	10,0	9,75	9,5	9,25	9,0			
Phasing in of specified D-SIB requirements at total capital level[1]					25	50	75	100			
Capital instruments that no longer qualify as additional tier 1 or tier 2 capital[2]	Phased out over a ten-year time horizon beginning in 2013										

Shading indicates transition periods. All dates are as of 1 January.

[1] The capital conservation buffer together with the countercyclical buffer will be applied at CET1 level and will also be required to be met at both a Tier 1 and Total capital level.

Benefits of macroprudential policy frameworks: Archer (2016)

- plenty of evidence of the costs of disruption to the system of monetary exchange.
- Central banks were born to play core roles in creating reliable systems of monetary exchange.
- We tend to believe, genuinely, that we can use these regulatory powers to good effect.
- Waiting until we can prove the case and fully articulate the tradeoffs is a counsel of perfection, where perfection really is the enemy of the good.
- In any case, those who could have acted, but did not, will be held to account when things go wrong.

Examples of monitoring frameworks

Monitoring frameworks can be structured in various ways:

- IMF Systemic Risk Monitoring Toolkit (SysMo, 2013): 6 key questions
  - Is potentially excessive risk building up in financial institutions?
  - Are asset prices growing too fast?
  - How much is sovereign risk a source of systemic risk?
  - What are the amplification channels among sectors and through the broader domestic economy?
  - What are the amplification channels through cross-border spillovers?
  - What is the probability of a systemic crisis?

Examples of monitoring frameworks . . .

- Bank of England: Core indicators to guide decision making
  - "The FPC has identified relatively short lists of core financial and economic indicators for the CCB and SCRs that it will routinely review in conjunction with analysis on the drivers of movements in them." (BOE, 2014: 23)
  - Core sets of indicators serve two purposes:
    - ★ Internally - Starting point for analysis, consistency.
    - ★ Externally - Transparency, accountability, predictability, communication (signalling channel).
  - Also: Guided discretion, rules and the 'inaction bias' (ESRB, 2014). Triggering automatic policy actions if a single indicator or a set of indicators breaches identified thresholds.
  - Not meant as a substitute for judgement
  - Which indicators?
    - ★ Complements to the credit/GDP gap
    - ★ Simple, high level, understandable
    - ★ Categorisation: bank balance sheet stretch, borrower stretch, terms and conditions in financial markets

Examples of monitoring frameworks . . .

- The Federal Reserve's financial stability monitoring program (Adrian et al, 2013; Bernanke, 2013): focus on vulnerabilities
  - broad and forward-looking monitoring programme
  - "Systemic vulnerabilities arise from market failures that can lead to excessive leverage, maturity transformation, interconnectedness, and complexity. These vulnerabilities, when hit by adverse shocks, can lead to fire sale dynamics, negative feedback loops, and inefficient contractions in the supply of credit. We present a framework that centers on the vulnerabilities that propagate adverse shocks, rather than shocks themselves, which are difficult to predict". (Adrian et al, 2013)
  - Broad areas where vulnerabilities can emerge:
    - ★ systemically important financial institutions (SIFIs)
    - ★ shadow banking
    - ★ asset markets
    - ★ the nonfinancial sector

Macroprudential monitoring: SIFIs

- SARB monitors standard indicators, and also undertakes risk-based supervision and imposes systemic capital surcharges based on an assessment of the degree of systemic significance.
- Requires comprehensive recovery plans.
- Stress testing forms an important complement to this information.

Macroprudential monitoring: shadow banking

- FSB (2011) proposes stylised steps for monitoring drawing on different types of information and analytical methods from both the macro (system-wide) and micro (entity/activity-based) perspectives. National flow of funds and sector balance sheet data are particularly important.
- Three steps:
  1. Scanning and mapping of the overall shadow banking system
  2. Identification of the aspects of the shadow banking system posing systemic risk or regulatory arbitrage concerns
  3. Detailed assessment of systemic risk and/or regulatory arbitrage concerns

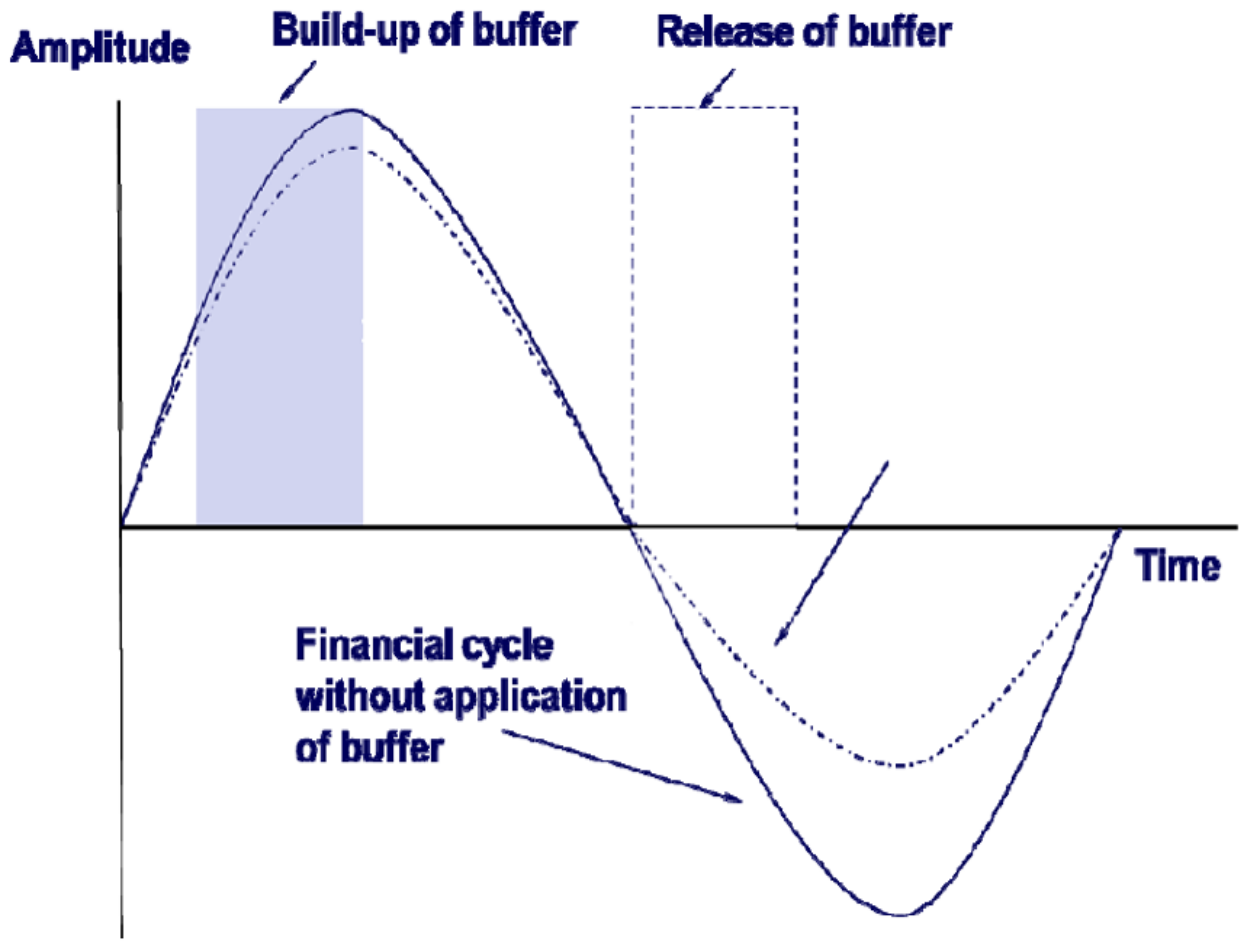
Macroprudential monitoring: asset markets

- Monitor developments in markets for a range of assets, including public and private fixed-income instruments, equities, real estate, commodities, and structured credit products.
- Foreign as well as domestic markets, as well as global linkages are important
- Try to identify unusual patterns in valuations, such as historically high or low ratios of prices to earnings in equity markets (however detecting asset price bubbles econometrically is difficult).
- Also consider factors such as the leverage and degree of maturity mismatch, liquidity, and the sensitivity of the asset's value to changes in broad financial conditions.

Macroprudential monitoring: nonfinancial sector

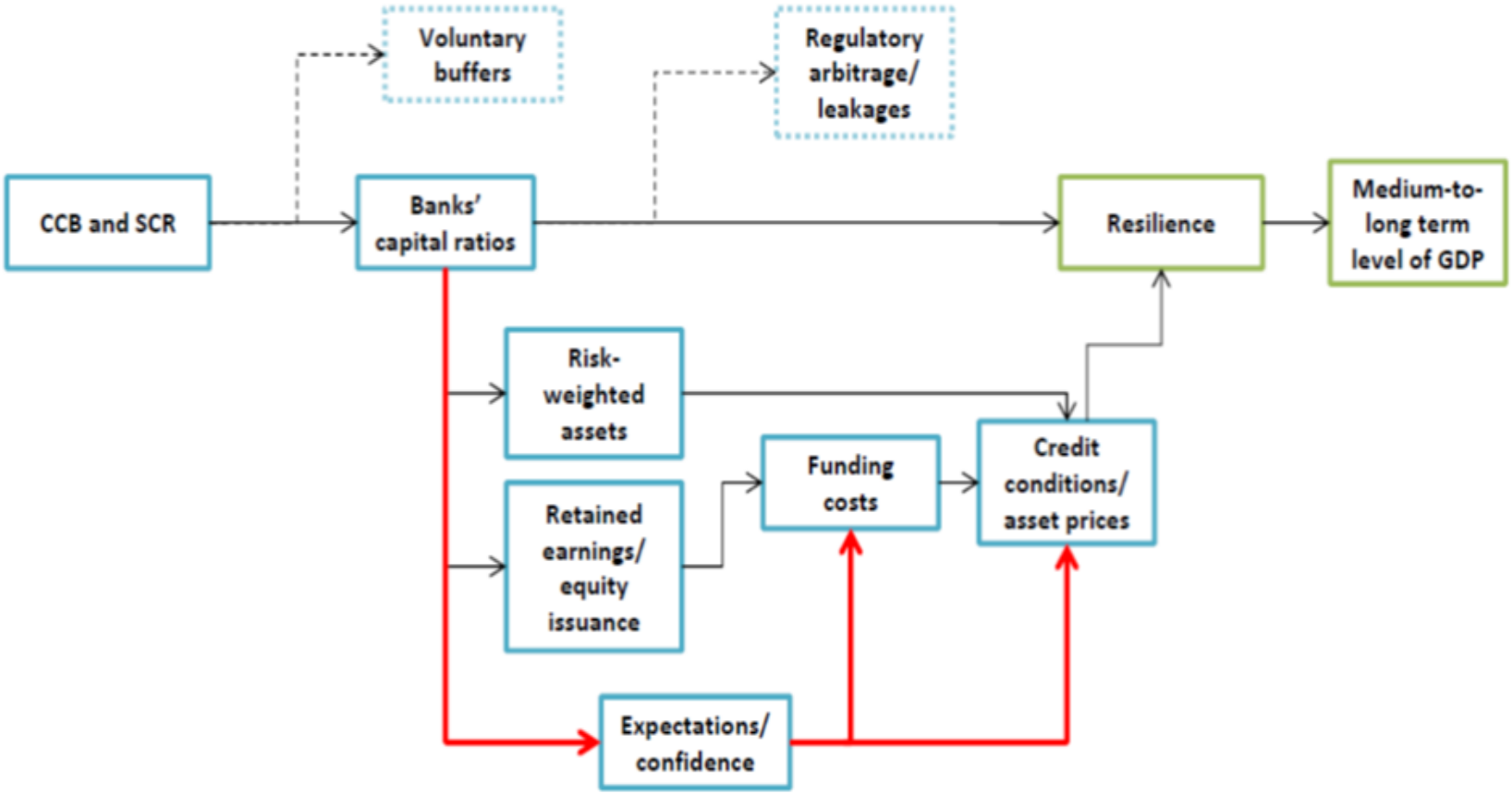
- Measures of vulnerabilities in the nonfinancial sector include leverage and debt service burdens. Also indicators of credit availability, such as underwriting standards.
- Credit-to-GDP ratios and gaps. Issues with these for SA, and monitoring an extended set of indicators.
- Data on balance sheets and income statements for individual firms can provide valuable information about weaknesses.
- Similarly, obtaining disaggregated data for households regarding debt-to-asset ratios and debt service burdens is a priority.

CCyB and the financial cycle



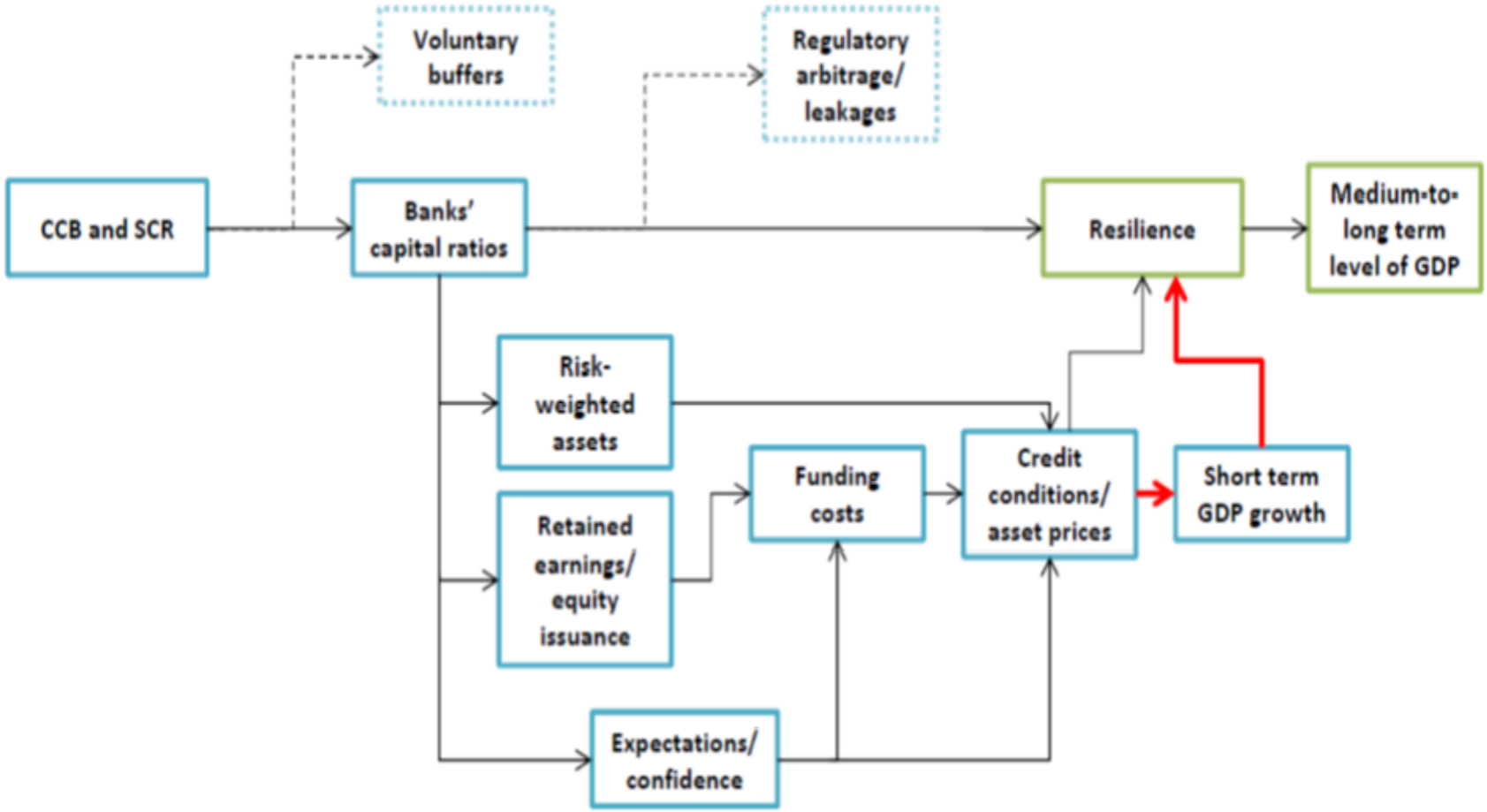
Source: European Systemic Risk Board (2014) Flagship Report on Macro-prudential Policy in the Banking Sector; Fell 2015.

CCyB and resilience



Source: Aikman (2013)

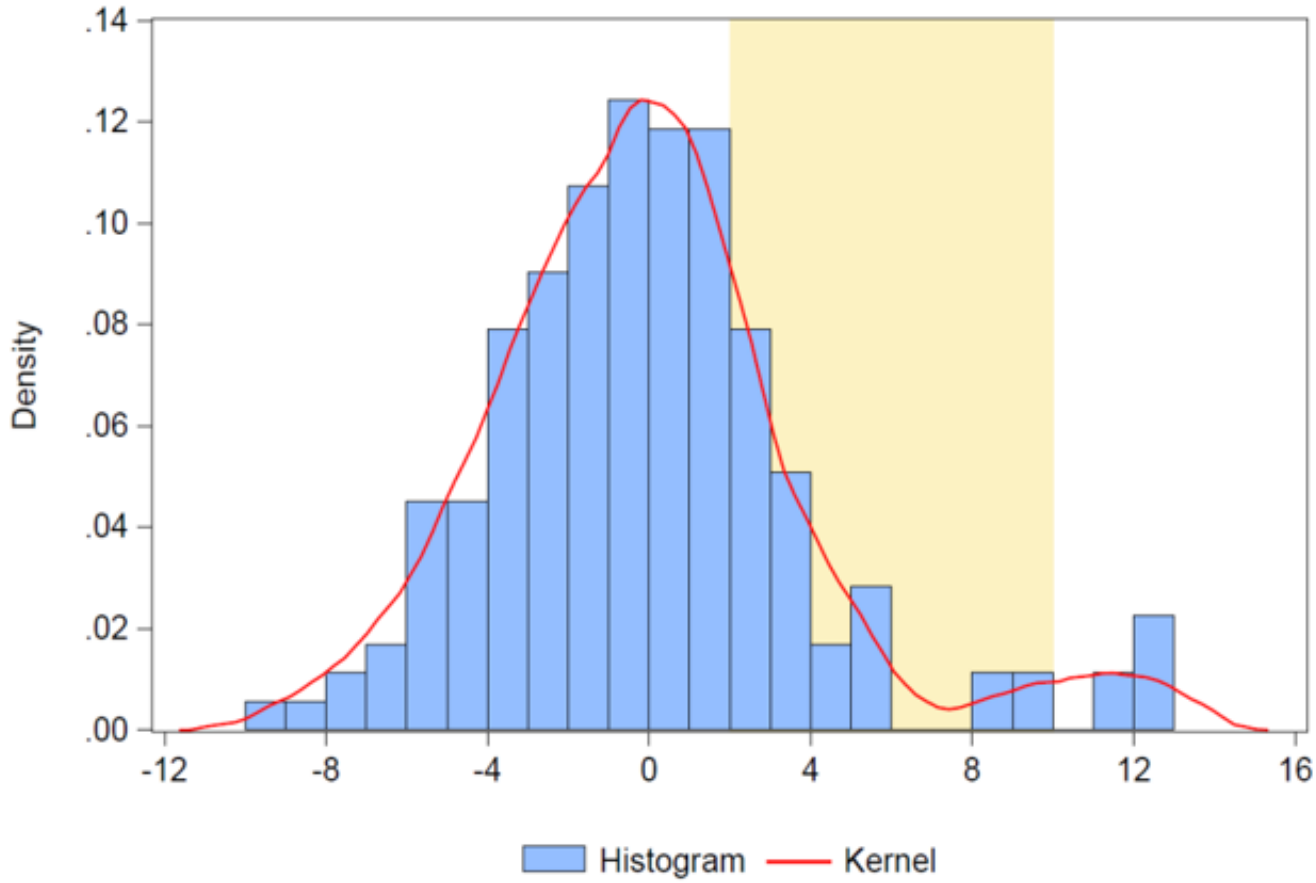
CCyB and growth



Source: Aikman (2013)

Calibrating the countercyclical capital buffer

(Final credit gap estimates: 1970Q1-2014Q1, 177 observations)



Source: Farrell (2014)

Calibrating the countercyclical capital buffer

(Final credit gap estimates: 1970Q1-2014Q1, 177 observations)

Tabulation of FL_GAP

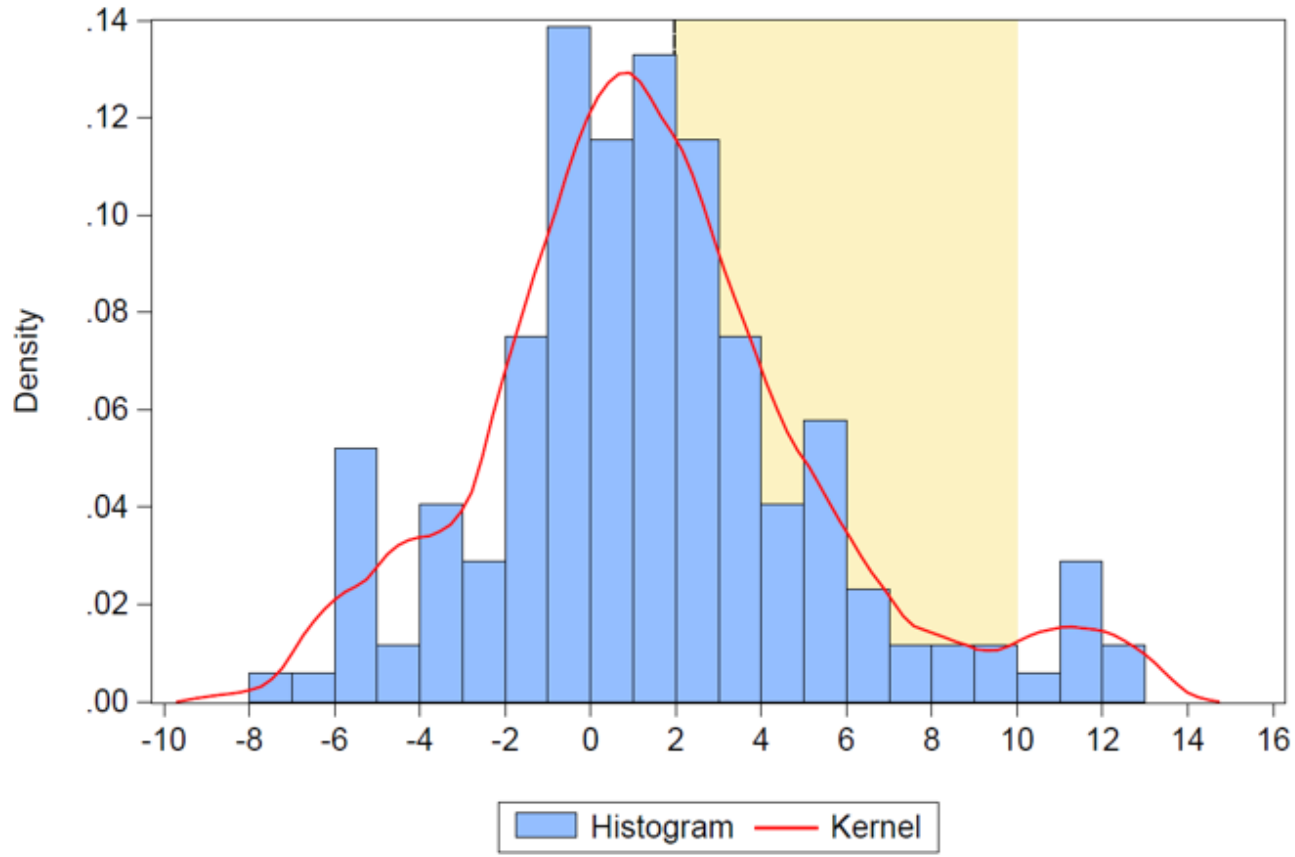
Sample: 1970Q1 2014Q1
Included observations: 177

Value	Count	Percent	Cumulative Count	Cumulative Percent
[-10, -8)	2	1.13	2	1.13
[-8, -6)	5	2.82	7	3.95
[-6, -4)	16	9.04	23	12.99
[-4, -2)	30	16.95	53	29.94
[-2, 0)	41	23.16	94	53.11
[0, 2)	42	23.73	136	76.84
[2, 4)	23	12.99	159	89.83
[4, 6)	8	4.52	167	94.35
[8, 10)	4	2.26	171	96.61
[10, 12)	2	1.13	173	97.74
[12, 14)	4	2.26	177	100.00
Total	177	100.00	177	100.00

Source: Farrell (2014)

Calibrating the countercyclical capital buffer

(Quasi-real credit gap estimates: 1970Q1-2014Q1, 177 observations)



Source: Farrell (2014)

Calibrating the countercyclical capital buffer

(Quasi-real credit gap estimates: 1970Q1-2014Q1, 177 observations)

Tabulation of QR_GAP
Date: 06/23/14 Time: 14:25
Included observations: 177

Value	Count	Percent	Cumulative Count	Cumulative Percent
[-8, -6)	2	1.13	2	1.13
[-6, -4)	16	9.04	18	10.17
[-4, -2)	11	6.21	29	16.38
[-2, 0)	37	20.90	66	37.29
[0, 2)	44	24.86	110	62.15
[2, 4)	32	18.08	142	80.23
[4, 6)	17	9.60	159	89.83
[6, 8)	6	3.39	165	93.22
[8, 10)	4	2.26	169	95.48
[10, 12)	6	3.39	175	98.87
[12, 14)	2	1.13	177	100.00
Total	177	100.00	177	100.00

Source: Farrell (2014)

Institutional structure

For the purposes of the FSR Act (9/2017), 'financial stability' means that:

1. financial institutions generally provide financial products and financial services, and market infrastructures generally perform their functions and duties in terms of financial sector laws, without interruption;
2. financial institutions are capable of continuing to provide financial products and financial services, and market infrastructures are capable of continuing to perform their functions and duties in terms of financial sector laws, without interruption despite changes in economic circumstances; and
3. there is general confidence in the ability of financial institutions to continue to provide financial products and financial services, and in the ability of market infrastructures to continue to perform their functions and duties in terms of financial sector laws, without interruption despite changes in economic circumstances.

Institutional structure . . .

In terms of the FSR Act (9/2017), the SARB is tasked with:

- monitoring the financial system for potential systemic risks.
- taking steps to mitigate risks to financial stability
- maintaining and restoring stability if a systemic event is imminent or has occurred.
- publishing and tabling in Parliament a financial stability review (at least every six months)