Financial Cycles in Credit, Housing and Capital Markets: Estimation, Dynamics and Interactions

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Overview

Introduction

- The recent global economic crisis has revealed major weaknesses in the modern macroeconomic paradigm and stressed the need to enhance our understanding of economic growth and business cycles.
- The study estimates segment-specific (credit, equity, bond and housing markets) and aggregate financial cycle indicators for the systemically important countries—the USA, the UK, Germany and Japan—over the period of 1960–2015 using dynamic factor models and the Kalman filter.
- Analysis of their cyclical properties reveals a persistent and recurring nature of financial cycles reflecting the build-up of financial imbalances in each segment with an estimated average duration of 10 years.
- Significant co-movements and spillovers among segment-specific cycles are found in the USA and, to a lesser extent, in the UK—the countries with deeper capital markets, in contrast to Germany and Japan, where the banking sector dominates.

Related literature

- **Finance-growth nexus:** Beck and Levine (2004), Beck et al. (2000), Bernanke and Gertler (1989), Bernanke et al. (1999), Christiano et al. (2005), Demetriades and Hussein (1996), King and Levine (1993), Kiyotaki and Moore (1997), Levine (1997), Levine and Zervos (1998), Rousseau and Wachtel (2011).
- **Empirical financial and credit cycle literature:** Aikman et al, (2015), Borio (2013, 2014), Borio et al. (2013, 2014), Cerutti et al. (2017), Claessens et al. (2011, 2012), Drehmann et al. (2012), Miranda-Agrippino and Rey (2015), Schüler et al. (2015), Schularick and Taylor (2012).
- **Financial instability:** Minsky (1978, 1982) and Kindleberger (1978).
- **Financial structure:** Boyd and Smith (1998), Demirgüç-Kunt and Levine (1999), Demirgüç-Kunt et al. (2013), Langfield and Pagano (2015), Levine (2002), Tadesse (2002).

Contributions

1 Identification of segment-specific and aggregate financial cycles.

2 Estimation of financial cycles is based on extraction of an unobserved common factor from a large number of relevant variables (structured into *"Price"*, *"Quantity"* and *"Risk"*) categories via dynamic factor models / Kalman filter.

3 No *a priori* assumptions on the frequency and length of cycles; stationary and non-stationary financial cycle indicators are estimated.

4 Additional empirical evidence on the relative merits of bank-based versus market-based financial systems.

Proposed definition of financial cycles

Financial cycles – cyclical movements of activity in financial markets around respective long-run equilibrium trends, which are associated with the build-up of imbalances followed by corrections to equilibrium levels. The accumulation of imbalances manifests itself as excessive risk-taking behavior and related continued increase in market activity and prices beyond sustainable levels.

Widely cited Borio (2012) definition: "self reinforcing interactions between perceptions of value and risk, attitudes towards risk and financing constraints, which translate into booms followed by busts".

Taxonomy

- **Credit market cycle** $FC_{CR}^{(v)}$**:** captures activity in the banking sector and overall monetary conditions.
- **Housing market cycle** $FC_{H}^{(v)}$**:** reflects residential property price and mortgage dynamics.
- **Bond market cycle** $FC_{B}^{(v)}$**:** reflects general dynamics in national debt securities markets.
- **Equity market cycle** $FC_{EQ}^{(v)}$**:** captures broad equity market conditions.
- **Aggregate financial cycle** $FC_{AG}^{(v)}$**:** a broad-based index reflecting overall dynamics of national financial markets based on common variation across the four financial segments.

Market attributes

Price

variables capturing price dynamics (interest rate in the case of credit markets) in absolute or relative terms (e.g. price-to-income ratios in the housing market) or returns on a particular asset class.

Quantity

nominal measures of the overall volume of market activity in the segment, e.g. amounts outstanding of securities (year-on-year growth rate or in relative terms, e.g. as a share of GDP), market capitalization, turnover, claims on the private sector by banks, etc.

Risk

variables conveying the perceptions of risk and volatility, e.g. interest rate spreads, volatility of returns.

Data

Sources:

1. BIS financial and housing market databases
2. IMF International Financial Statistics (IFS)
3. OECD Main Economic Indicators and Housing Statistics
4. Federal Reserve Economic Data database (FRED)
5. World Bank's Global Financial Development Database (GFDD)
6. Investing.com or Yahoo Finance
7. National sources

Sample: the USA, the UK, Germany and Japan; 1960Q1–2015Q4.

Benchmark stock market indexes: USA S&P500, GBR FTSE100, DEU DAX, JPN NIKKEI225.

Breaks in the series are addressed (IMF IFS, euro-fixed series).

Real interest rates are computed using GDP deflators.

All variables are converted to quarterly frequency and standardized.

Dynamic factor model and Kalman filter

The vector of observable (signal) financial market variables $\mathbf{y}_t = [y_{1t} \dots y_{Nt}]'$, for $t = 1 \dots T$, is modeled as the sum of k $(k < N)$ unobservable common factors $\mathbf{f}_t$ and idiosyncratic shocks:

$$\begin{cases} \mathbf{f}_t = \mathbf{A}\mathbf{f}_{t-1} + \mathbf{e_t} \\ \mathbf{y}_t = \mathbf{B}\mathbf{f}_t + \mathbf{v_t} \end{cases} \tag{1}$$

- $\mathbf{f}_t$ follows a dynamic process determined by the $k \times k$ matrix $\mathbf{A}$;
- $\mathbf{B}$ is the $N \times k$ observation matrix summarizing factor loadings;
- $\mathbf{e_t}$ and $\mathbf{v_t}$ are the i.i.d. disturbance vectors with the covariance matrices $cov(\mathbf{e_t}) = \mathbf{Q}$; $cov(\mathbf{v_t}) = \mathbf{R}$; $cov(\mathbf{e_t}, \mathbf{v_t}) = 0$.
- Financial cycles are extracted as the first latent common factor, assumed to follow an AR(1) process.
- Reference variables: private credit growth for $FC_{CR}^{(v)}$ and $FC_{AG}^{(v)}$; real house price growth for $FC_{H}^{(v)}$; yields on s-t government securities for $FC_{B}^{(v)}$; stock market index returns for $FC_{EQ}^{(v)}$.

Factor loadings and autoregressive coefficients: USA

Note: Factor loadings (vector B). **Attr.** indicates the market attribute. **Trans.** transformations applied to the input variables: *std*—standardization, Δyoy—year-on-year difference, $std\%\Delta yoy$—year-on-year percent change.

$FC^{(1)}_{CR}$	Attr.	Trans.	A/B
f_{t-1}			0.93
Private credit by banks, % GDP	Q	$std\Delta yoy$	0.26
Private credit by banks, LCU	Q	$std\%\Delta yoy$	0.33
Monetary Base, LCU	Q	*std*	-0.16
Lending interest rate, % pa	P	$std\Delta yoy$	0.13
Money market interest rate, % pa	P	$std\Delta yoy$	0.16
Spread between lending interest rate and Federal funds rate	R	*std*	-0.25
Spread between lending interest rate and government bond rate	R	*std*	-0.22

$FC^{(2)}_{CR}$	Attr.	Trans.	A/B
f_{t-1}			0.97
Private credit by banks, % GDP	Q	*std*	0.01
Private credit by banks, LCU	Q	$std\%\Delta yoy$	0.15
Monetary Base, LCU	Q	*std*	-0.06
Lending interest rate, % pa	P	*std*	-0.11
Money market interest rate, % pa	P	*std*	-0.02
Spread between lending interest rate and Federal funds rate	R	*std*	-0.17
Spread between lending interest rate and government bond rate	R	*std*	-0.19

Factor loadings and autoregressive coefficients: USA (cont.)

$FC_{CR}^{(3)}$	Attr.	Trans.	A/B
f_{t-1}			0.96
Private credit by banks, % GDP	Q	$std\Delta yoy$	0.22
Financial system deposits, % GDP	Q	$std\Delta yoy$	0.07
Deposit money banks' assets, % GDP	Q	$std\Delta yoy$	0.19
Private credit by banks, LCU	Q	$std\%\Delta yoy$	0.25
Financial system deposits, LCU	Q	$std\%\Delta yoy$	0.19
Deposit money banks' assets, LCU	Q	$std\%\Delta yoy$	0.25
Lending interest rate, % pa	P	$std\Delta yoy$	0.06
Money market interest rate, % pa	P	$std\Delta yoy$	0.07
Spread between lending interest rate and government bond rate	R	std	-0.10
Spread between lending interest rate and Federal funds rate	R	std	-0.13
Bank credit to bank deposits (%)	Q	$std\Delta yoy$	0.15
Total credit to Households & NPISHs, % of GDP	Q	$std\Delta yoy$	0.14
Total credit to Households & NPISHs, LCU	Q	$std\%\Delta yoy$	0.22
Total credit to NFCs, % of GDP	Q	$std\Delta yoy$	0.17
Total credit to NFCs, LCU	Q	$std\%\Delta yoy$	0.23
Total credit to private non-financial sector, % of GDP	Q	$std\Delta yoy$	0.20
Total credit to private non-financial sector, LCU	Q	$std\%\Delta yoy$	0.25
Monetary Base, LCU	Q	std	-0.11
Ratio of Monetary Base to Broad Money, %	Q	$std\Delta yoy$	-0.16
M2	Q	$std\%\Delta yoy$	0.11
M1	Q	$std\%\Delta yoy$	-0.10
Broad Money Liabilities, LCU	Q	$std\%\Delta yoy$	-0.01

Factor loadings and autoregressive coefficients: USA (cont.)

$FC_{CR}^{(4)}$	Attr.	Trans.	A/B
f_{t-1}			0.98
Private credit by banks, % GDP	Q	*std*	0.03
Financial system deposits, % GDP	Q	*std*	-0.09
Deposit money banks' assets, % GDP	Q	*std*	0.09
Private credit by banks, LCU	Q	$std\%\Delta yoy$	0.15
Financial system deposits, LCU	Q	$std\%\Delta yoy$	0.12
Deposit money banks' assets, LCU	Q	$std\%\Delta yoy$	0.15
Lending interest rate, % pa	P	*std*	0.03
Money market interest rate, % pa	P	*std*	0.08
Spread between lending interest rate and government bond rate	R	*std*	-0.09
Spread between lending interest rate and Federal funds rate	R	*std*	-0.12
Bank credit to bank deposits (%)	Q	*std*	0.12
Total credit to Households & NPISHs, % of GDP	Q	*std*	-0.14
Total credit to Households & NPISHs, LCU	Q	$std\%\Delta yoy$	0.14
Total credit to NFCs, % of GDP	Q	*std*	-0.12
Total credit to NFCs, LCU	Q	$std\%\Delta yoy$	0.15
Total credit to private non-financial sector, % of GDP	Q	*std*	-0.14
Total credit to private non-financial sector, LCU	Q	$std\%\Delta yoy$	0.17
Monetary Base, LCU	Q	*std*	-0.08
Ratio of Monetary Base to Broad Money, %	Q	*std*	-0.08
M2	Q	$std\%\Delta yoy$	0.08
M1	Q	$std\%\Delta yoy$	-0.05
Broad Money Liabilities, LCU	Q	$std\%\Delta yoy$	0.00

Dissecting financial cycles into gaps and trends

Financial cycle indexes are smoothed/decomposed into cycle and long-run trend components via Hodrick-Prescott filter:

$$\min_{\eta} L = \sum_{t=1}^{T} \left[\frac{(FC_t - \eta_t)^2}{\sigma_0^2} + \frac{(\Delta\eta_{t+1} - \Delta\eta_t)^2}{\sigma_1^2} \right], \text{ where } \lambda = \sigma_0^2/\sigma_1^2 = \begin{cases} \text{(a) } 1600 & \text{for medium-term cycle} \\ \text{(b) } 400000 & \text{for long-term trend} \end{cases} \tag{2}$$

- HP λ=1600: "smoothed medium-term" cycles $FC_i^{*(v)}$.
- HP λ=400000: "long-run trends" $\overline{FC_i}^{(v)}$, $i = CR, EQ, B, H, AG$.
- The "gap" versions of financial cycles:
  - $\widehat{FC}_i^{(v)} = FC_i^{(v)} - \overline{FC_i}^{(v)}$
  - $\widehat{FC}_i^{*(v)} = FC_i^{*(v)} - \overline{FC_i}^{(v)}$

Turning point identification

Turning points and phases are identified via the BBQ algorithm (Harding and Pagan (2002), Bry and Boschan (1971)):

$$\text{peak} = 1 \text{ at } t = \tilde{t} \text{ if: } \begin{cases} \Delta FC_{\tilde{t}} > 0; \Delta FC_{\tilde{t}-1} > 0; \Delta FC_{\tilde{t}-2} > 0 \\ \Delta FC_{\tilde{t}+1} < 0; \Delta FC_{\tilde{t}+2} < 0; \Delta FC_{\tilde{t}+3} < 0 \\ \min \left| \tilde{t}_{peak} - t_{trough} \right| \geqslant 3 \text{ quarters} \end{cases} \tag{3}$$

$$\text{trough} = 1 \text{ at } t = \tilde{t} \text{ if: } \begin{cases} \Delta FC_{\tilde{t}} < 0; \Delta FC_{\tilde{t}-1} < 0; \Delta FC_{\tilde{t}-2} < 0 \\ \Delta FC_{\tilde{t}+1} > 0; \Delta FC_{\tilde{t}+2} > 0; \Delta FC_{\tilde{t}+3} > 0 \\ \min \left| \tilde{t}_{peak} - t_{trough} \right| \geqslant 3 \text{ quarters} \end{cases} \tag{4}$$

Concordance index

A binary phase indicator $\phi_{FC_i,t}$ and $\phi_{FC_j,t}$ for financial cycles i and j is defined as:

$$\phi_{FC_i,t} \text{ (or } \phi_{FC_j,t}) = \begin{cases} 1 \text{ if } FC_i \text{ (or } FC_j) \text{ is in expansion at period } t \\ 0 \text{ if } FC_i \text{ (or } FC_j) \text{ is in contraction at period } t \end{cases} \tag{5}$$

The bilateral phase concordance index for cycles i and j is then calculated as:

$$CI_{ij} = \frac{1}{T}\sum_{t=1}^{T}\left[\phi_{FC_i,t}\phi_{FC_j,t} + (1-\phi_{FC_i,t})(1-\phi_{FC_j,t})\right], \tag{6}$$

VAR analysis of spillovers

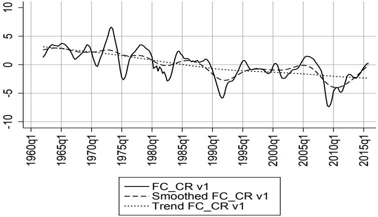
Country-specific VAR models per each segment and aggregate cycle expressed in terms of gaps ($\widehat{FC}_{i,t}$) and first-differences ($\Delta FC_{i,t}$):

$$\begin{bmatrix} \widehat{FC}_{CR,t} \\ \widehat{FC}_{H,t} \\ \widehat{FC}_{B,t} \\ \widehat{FC}_{EQ,t} \end{bmatrix} = \begin{bmatrix} c_1 \\ c_2 \\ c_3 \\ c_4 \end{bmatrix} + \begin{bmatrix} b_{11}^k & b_{12}^k & b_{13}^k & b_{14}^k \\ b_{21}^k & b_{22}^k & b_{23}^k & b_{24}^k \\ b_{31}^k & b_{32}^k & b_{33}^k & b_{34}^k \\ b_{41}^k & b_{42}^k & b_{43}^k & b_{44}^k \end{bmatrix} \begin{bmatrix} \widehat{FC}_{CR,t-k} \\ \widehat{FC}_{H,t-k} \\ \widehat{FC}_{B,t-k} \\ \widehat{FC}_{EQ,t-k} \end{bmatrix} + \begin{bmatrix} \epsilon_{1,t} \\ \epsilon_{2,t} \\ \epsilon_{3,t} \\ \epsilon_{4,t} \end{bmatrix} \tag{7}$$

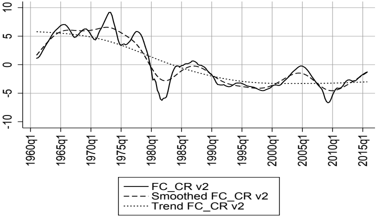
where $k = 1...K$, the lag order K is selected based on the Hannan-Quinn and the Schwarz information criteria. VAR estimation is followed by identification of orthogonal IRFs is based on the Cholesky decomposition (ordering: CR, H, B, EQ) and Granger causality tests.

Estimated financial cycles: USA, credit cycle

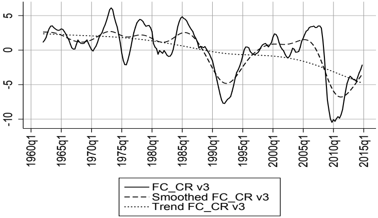
(a) $FC_{CR}^{(1)}$: 7-var. stationary



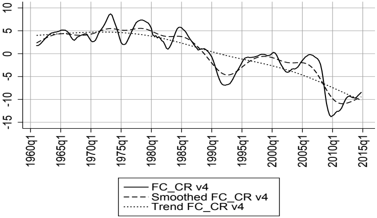
(b) $FC_{CR}^{(2)}$: 7-var. non-stationary



(c) $FC_{CR}^{(3)}$: 22-var. stationary

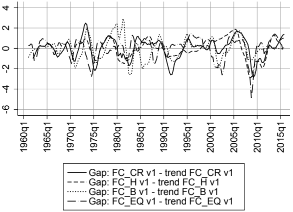


(d) $FC_{CR}^{(4)}$: 22-var. non-stationary

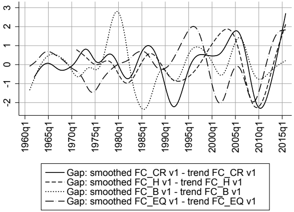


Estimated financial cycles

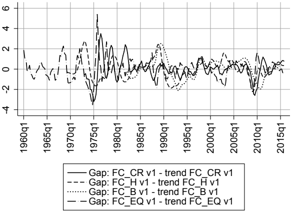
(a) USA $\widehat{FC}_i^{(1)}$



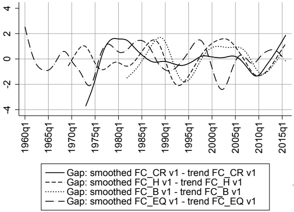
(b) USA $\widehat{FC}_i^{*(1)}$



(c) GBR $\widehat{FC}_i^{(1)}$

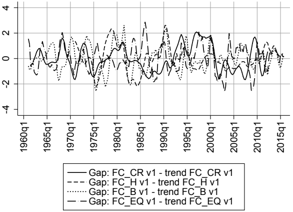


(d) GBR $\widehat{FC}_i^{(1)}$

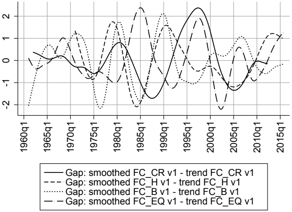


Estimated financial cycles (cont.)

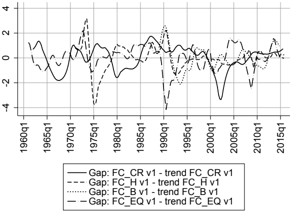
(a) DEU $\widehat{FC}_i^{(1)}$



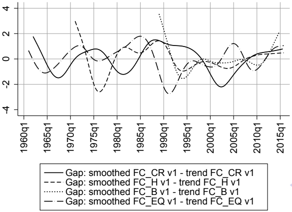
(b) DEU $\widehat{FC}_i^{*(1)}$



(c) JPN $\widehat{FC}_i^{(1)}$

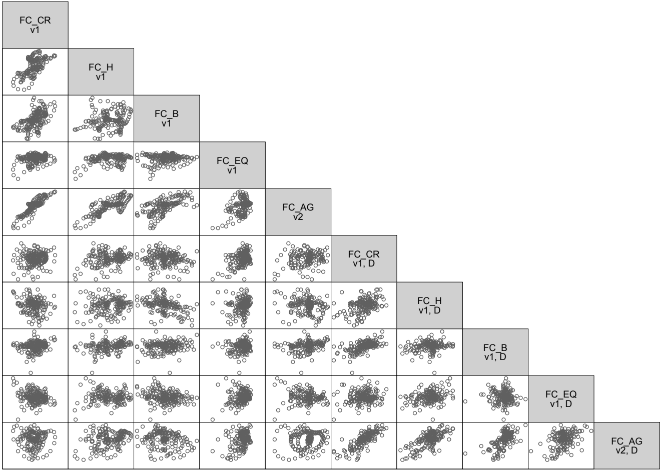


(d) JPN $\widehat{FC}_i^{(1)}$

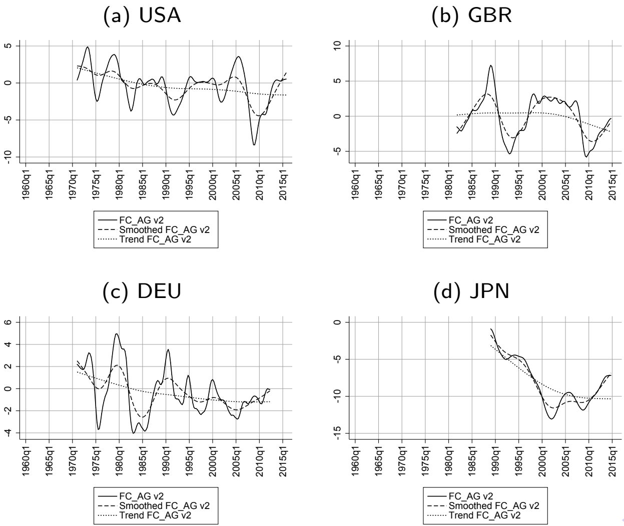


Scatterplot matrix for benchmark financial cycles: USA

in levels and first differences (D)



Aggregate financial cycles



Average phase and cycle duration of financial cycles, years

	USA				GBR				DEU			
	FC		$\widehat{FC}^*$		*FC*		$\widehat{FC}^*$		*FC*		$\widehat{FC}^*$	
	τ_{phase}	τ_{cycle}	τ_{phase}	τ_{cycle}	τ_{phase}	τ_{cycle}	τ_{phase}	τ_{cycle}	τ_{phase}	τ_{cycle}	τ_{phase}	τ_{cycle}
CR	4	8	4	8	3	7	6	10	4	7	6	14
H	6	12	6	12	5	11	5	11	5	10	5	10
B	4	7	5	10	4	9	7	14	4	7	5	11
EQ	4	8	6	12	3	6	4	9	4	9	5	9
AG	4	9	4	9	7	13	7	15	5	10	5	10

	JPN				Average			
	FC		$\widehat{FC}^*$		*FC*		$\widehat{FC}^*$	
	τ_{phase}	τ_{cycle}	τ_{phase}	τ_{cycle}	τ_{phase}	τ_{cycle}	τ_{phase}	τ_{cycle}
CR	5	10	9	16	**4**	**8**	**6**	**12**
H	5	11	5	9	**5**	**11**	**5**	**10**
B	3	6	4	8	**4**	**7**	**5**	**11**
EQ	4	9	6	11	**4**	**8**	**5**	**10**
AG	3	7	5	10	**5**	**10**	**5**	**11**

Concordance index

USA	$FC_{CR}^{(1)}$	$FC_{H}^{(1)}$	$FC_{B}^{(1)}$	$FC_{EQ}^{(1)}$
$FC_{H}^{(1)}$	0.63			
$FC_{B}^{(1)}$	0.69	0.55		
$FC_{EQ}^{(1)}$	0.67	0.52	0.46	
$FC_{AG}^{(2)}$	0.76	0.63	0.82	0.61

GBR	$FC_{CR}^{(1)}$	$FC_{H}^{(1)}$	$FC_{B}^{(1)}$	$FC_{EQ}^{(1)}$
$FC_{H}^{(1)}$	0.35			
$FC_{B}^{(1)}$	0.5	0.44		
$FC_{EQ}^{(1)}$	0.58	0.47	0.38	
$FC_{AG}^{(2)}$	0.44	0.62	0.6	0.25

DEU	$FC_{CR}^{(1)}$	$FC_{H}^{(1)}$	$FC_{B}^{(1)}$	$FC_{EQ}^{(1)}$
$FC_{H}^{(1)}$	0.4			
$FC_{B}^{(1)}$	0.51	0.52		
$FC_{EQ}^{(1)}$	0.53	0.34	0.4	
$FC_{AG}^{(2)}$	0.57	0.77	0.67	0.28

JPN	$FC_{CR}^{(1)}$	$FC_{H}^{(1)}$	$FC_{B}^{(1)}$	$FC_{EQ}^{(1)}$
$FC_{H}^{(1)}$	0.32			
$FC_{B}^{(1)}$	0.45	0.62		
$FC_{EQ}^{(1)}$	0.53	0.47	0.55	
$FC_{AG}^{(2)}$	0.6	0.59	0.56	0.82

Correlation index

USA	$FC^{(1)}_{CR}$	$FC^{(1)}_{H}$	$FC^{(1)}_{B}$	$FC^{(1)}_{EQ}$
$FC^{(1)}_{H}$	0.6			
$FC^{(1)}_{B}$	0.55	0.19		
$FC^{(1)}_{EQ}$	0.29	0.24	0.09	
$FC^{(2)}_{AG}$	0.89	0.78	0.61	0.44

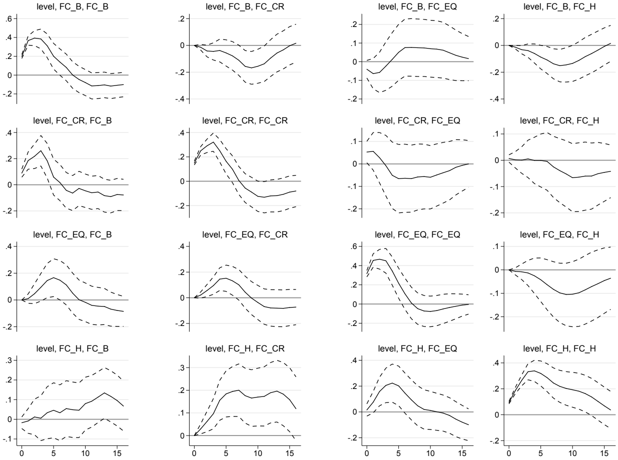
GBR	$FC^{(1)}_{CR}$	$FC^{(1)}_{H}$	$FC^{(1)}_{B}$	$FC^{(1)}_{EQ}$
$FC^{(1)}_{H}$	0.09			
$FC^{(1)}_{B}$	0.33	0.54		
$FC^{(1)}_{EQ}$	0.25	-0.06	-0.04	
$FC^{(2)}_{AG}$	0.35	0.81	0.92	0.02

DEU	$FC^{(1)}_{CR}$	$FC^{(1)}_{H}$	$FC^{(1)}_{B}$	$FC^{(1)}_{EQ}$
$FC^{(1)}_{H}$	-0.01			
$FC^{(1)}_{B}$	0.14	0.31		
$FC^{(1)}_{EQ}$	0.04	-0.13	-0.13	
$FC^{(2)}_{AG}$	0.33	0.8	0.72	-0.34

JPN	$FC^{(1)}_{CR}$	$FC^{(1)}_{H}$	$FC^{(1)}_{B}$	$FC^{(1)}_{EQ}$
$FC^{(1)}_{H}$	0.17			
$FC^{(1)}_{B}$	-0.08	0.8		
$FC^{(1)}_{EQ}$	0.37	0.22	-0.06	
$FC^{(2)}_{AG}$	0.87	0.29	0.2	-0.16

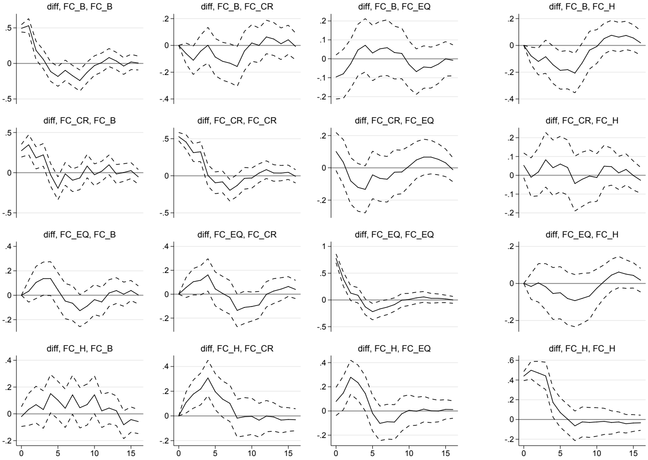
IRF analysis: USA

VAR(K) in levels, $K = 6$. Dashed lines show the 95% confidence bands.



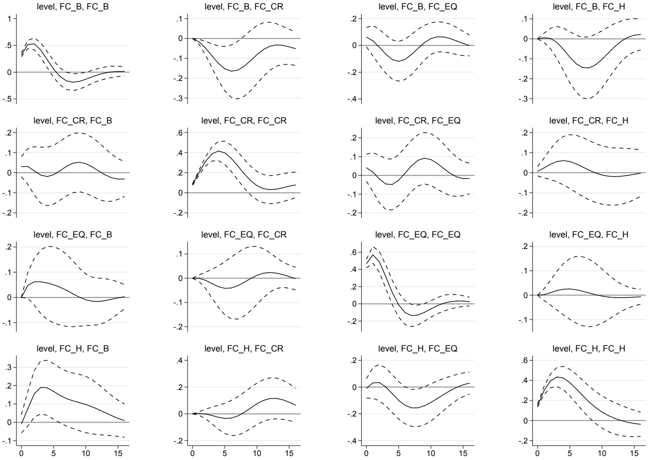
IRF analysis: USA

VAR(K) in first-differences, $K = 6$. Dashed lines show the 95% confidence bands.



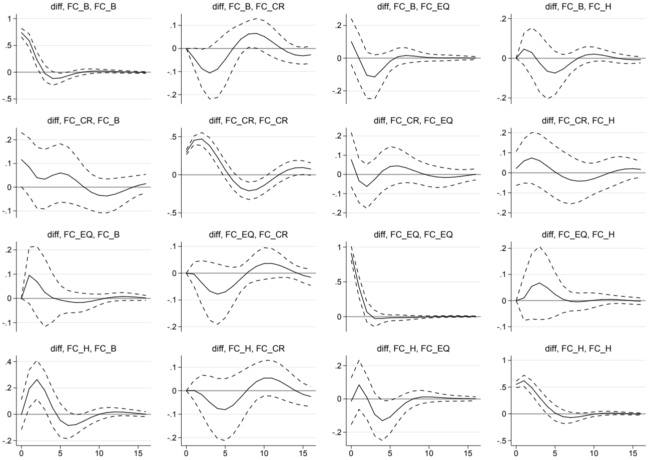
IRF analysis: DEU

VAR(K) in levels, $K = 3$. Dashed lines show the 95% confidence bands.



IRF analysis: DEU

VAR(K) in first-differences, $K = 2$. Dashed lines show the 95% confidence bands.



Granger causality results

Note: Pairwise (CR, H, B, EQ) and joint (ALL) Granger causality test results. Dependent variables (dep. var.) are in the first column. 1, 5, 10 indicate the level of statistical significance; "-" indicates the variable is not found to Granger cause the dependent variable. (gap) denotes results for the VAR models in levels; (diff) denotes results for the VAR models in first-differences.

USA

	(gap)	**CR**	**H**	**B**	**EQ**	**ALL**
dep. var.	**CR**		1	5	5	1
dep. var.	**H**	-		1	-	5
dep. var.	**B**	1	-		-	1
dep. var.	**EQ**	-	10	-		-

	(diff)	**CR**	**H**	**B**	**EQ**	**ALL**
dep. var.	**CR**		5	5	-	1
dep. var.	**H**	-		1	-	5
dep. var.	**B**	1	5		-	1
dep. var.	**EQ**	5	1	-		10

GBR

	(gap)	**CR**	**H**	**B**	**EQ**	**ALL**
dep. var.	**CR**		10	1	1	1
dep. var.	**H**	1		5	5	1
dep. var.	**B**	10	1		1	1
dep. var.	**EQ**	-	-	-		-

	(diff)	**CR**	**H**	**B**	**EQ**	**ALL**
dep. var.	**CR**		1	1	5	1
dep. var.	**H**	1		1	5	1
dep. var.	**B**	-	-		-	-
dep. var.	**EQ**	-	-	-		-

USA

	(gap)	CR	H	B	EQ	ALL
dep. var.	CR		1	5	5	1
dep. var.	H	-		1	-	5
dep. var.	B	1	-		-	1
dep. var.	EQ	-	10	-		-

	(diff)	CR	H	B	EQ	ALL
dep. var.	CR		5	5	-	1
dep. var.	H	-		1	-	5
dep. var.	B	1	5		-	1
dep. var.	EQ	5	1	-		10

GBR

	(gap)	CR	H	B	EQ	ALL
dep. var.	CR		10	1	1	1
dep. var.	H	1		5	5	1
dep. var.	B	10	1		1	1
dep. var.	EQ	-	-	-		-

	(diff)	CR	H	B	EQ	ALL
dep. var.	CR		1	1	5	1
dep. var.	H	1		1	5	1
dep. var.	B	-	-		-	-
dep. var.	EQ	-	-	-		-

DEU

	(gap)	CR	H	B	EQ	ALL
dep. var.	CR		-	5	-	-
dep. var.	H	-		-	-	-
dep. var.	B	-	1		-	5
dep. var.	EQ	-	-	-		-

	(diff)	CR	H	B	EQ	ALL
dep. var.	CR		-	-	-	-
dep. var.	H	-		-	-	-
dep. var.	B	-	1		-	1
dep. var.	EQ	-	-	-		-

JPN

	(gap)	CR	H	B	EQ	ALL
dep. var.	CR		-	-	-	-
dep. var.	H	-		5	-	-
dep. var.	B	-	-		10	-
dep. var.	EQ	5	-	10		10

	(diff)	CR	H	B	EQ	ALL
dep. var.	CR		-	-	-	-
dep. var.	H	-		5	-	10
dep. var.	B	-	-		-	-
dep. var.	EQ	-	-	-		-

Conclusion

- **Summary:**
  - Flexible framework to estimate financial cycles. Possible bubbles in the USA equity market, housing markets in Germany, the UK, Japan.
  - Highly persistent (autoreg. coef. > 0.7) and recurring (avg cycle $= 10$ years) nature of financial cycles.
  - Co-movements and potentially self-reinforcing spillovers between segment-specific cycles in market-based systemic economies.
- **Policy implications:**
  - Monitoring of unsustainable dynamics across financial market segments.
  - Monetary and macroprudential policies to tackle the build-up of financial imbalances and shock transmission channels.
  - Data constraints need to be addressed.
  - Systemic risks associated with deep capital markets.
- **Further research:**
  - global sample and cross-country spillovers.
  - implications for macroeconomic imbalances and output gaps.
  - drivers of financial cycles and theoretical framework.

Thank you

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