The Global Financial Cycle and capital flow episodes: A wobbly link?*

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Key contributions of our work

- New measure of the global financial cycle (GFC) obtained from a simple factor model
  - Price-based and quantity-based versions
- Compare our measure with existing estimates of the GFC, to understand how robust and consistent the available estimates are, also before and after the global financial crisis
- Impact of the GFC on different types of capital flows *episodes* (sudden stops, surges, retrenchments, flights and currency crises), looking at *extreme* rather than *normal* movements in capital flows

Key questions addressed

Five key questions:

- How consistent and reliable is the measurement of the GFC?
- Are the GFC measures important drivers of capital flow episodes?
- Is the relationship robust over time?
- Do some GFC measures have a broader effect across the various types of episodes?
- Does the relationship exhibit non-linearities, e.g. due to occasionally binding constraints?

Preview of main results

- Overall, the nexus between the GFC and capital flows is not very wobbly
- GFC measures are strongly positively correlated, with the expected signs, and correlations are relatively stable; the GFC measures are counter-cyclical in terms of US growth and oil prices
- However the VIX somewhat less correlated with other GFC measures post crisis, and also with capital flow episodes
- The Asian crisis, the global financial crisis, the China shock of 2015 and the Covid-19 crisis stand out as episodes of large global financial tightening
- GFC (most measures) is a significant driver of capital flow episodes, more mixed for currency crises
- Results are mixed on linearity and stability (more on this later)

Literature: the global financial cycle (GFC)

- Concept of GFC (e.g. Rey [2013] and Passari and Rey [2015])
- Domestic and global financial cycles (Aldasoro et al. [2020])
- Drivers of the GFC (Habib and Venditti [2019] - global risk shocks are the main driver)
- Theory of the GFC: role of intermediaries in core economies (Devereux and Yetman [2010], Kollmann et al. [2011], Bruno and Shin [2015]; Cesa-Bianchi et al. [2018])
- Measures based on a common component of risky assets (Miranda-Agrippino and Rey [2015], Habib and Venditti [2019]) correlated with common component in capital flows
- Price vs quantities for financial integration (Lane and Milesi-Ferretti [2001], Dedola and Lombardo [2012])

Literature: the GFC and capital flows

- Drivers of capital flows (Koepke [2015]) important role for push factors (GFC)
- Scepticism on the dominant role of the GFC (Choi et al. [2017], Cerutti et al. [2017])
- Capital flow episodes (Ghosh et al. [2012], Forbes and Warnock [2012])
- Analysis of the impact on the tails of the distributions of capital flows (Adrian et al. [2019], Chari et al. [2020])
- Time-varying influence of push factors (Amiti et al. [2017], Avdjiev et al. [2020], Forbes and Warnock [2020]; from a longer perspective, Kaminsky et al. [2020])

Data

- Quarterly data for 189 countries, 1990-2020
- Conversion of annual data for some variables
- Our capital flow episodes builds on Forbes and Warnock [2012] and Ghosh et al. [2012], but based on an estimate of private flows (Scheubel and Stracca [2019])
- Currency crises from (update of) Laeven and Valencia [2012]

Our measures of the global financial cycle

$$x_t = \alpha + \beta F_t + \epsilon_t \tag{1}$$

- The x variables cover several measures of prices and quantities pertaining to financial integration
- Note that in the baseline measure we do not include the VIX (see e.g. Forbes and Warnock [2020]) - measures with and without
- We include the USD nominal effective exchange rate in the x vector (Bruno and Shin [2015], Hofmann et al. [2016] and Avdjiev et al. [2019]; financial channel of the exchange rate)
- Quantities: (i) share of private credit to GDP in the G7 (proxying for credit overall in advanced economies), (ii) leverage of broker-dealers (Bruno and Shin [2015]), and (iii) total portfolio flows to EME

Main findings of the descriptive analysis

- The GFC measures are strongly positively correlated, with the expected signs
- The correlations are relatively stable across sub-sample (pre and post crisis) with the VIX somewhat less correlated with other GFC measures post crisis
- The GFC measures are counter-cyclical in terms of US growth and oil prices
- The Asian crisis, the global financial crisis, the China shock of 2015 and the Covid-19 crisis stand out as episodes of large global financial tightening

Variables used for the GFC measures

US shadow rate

Excess bond premium

World equity price

World relative equity price banks

USD nominal effective exchange rate

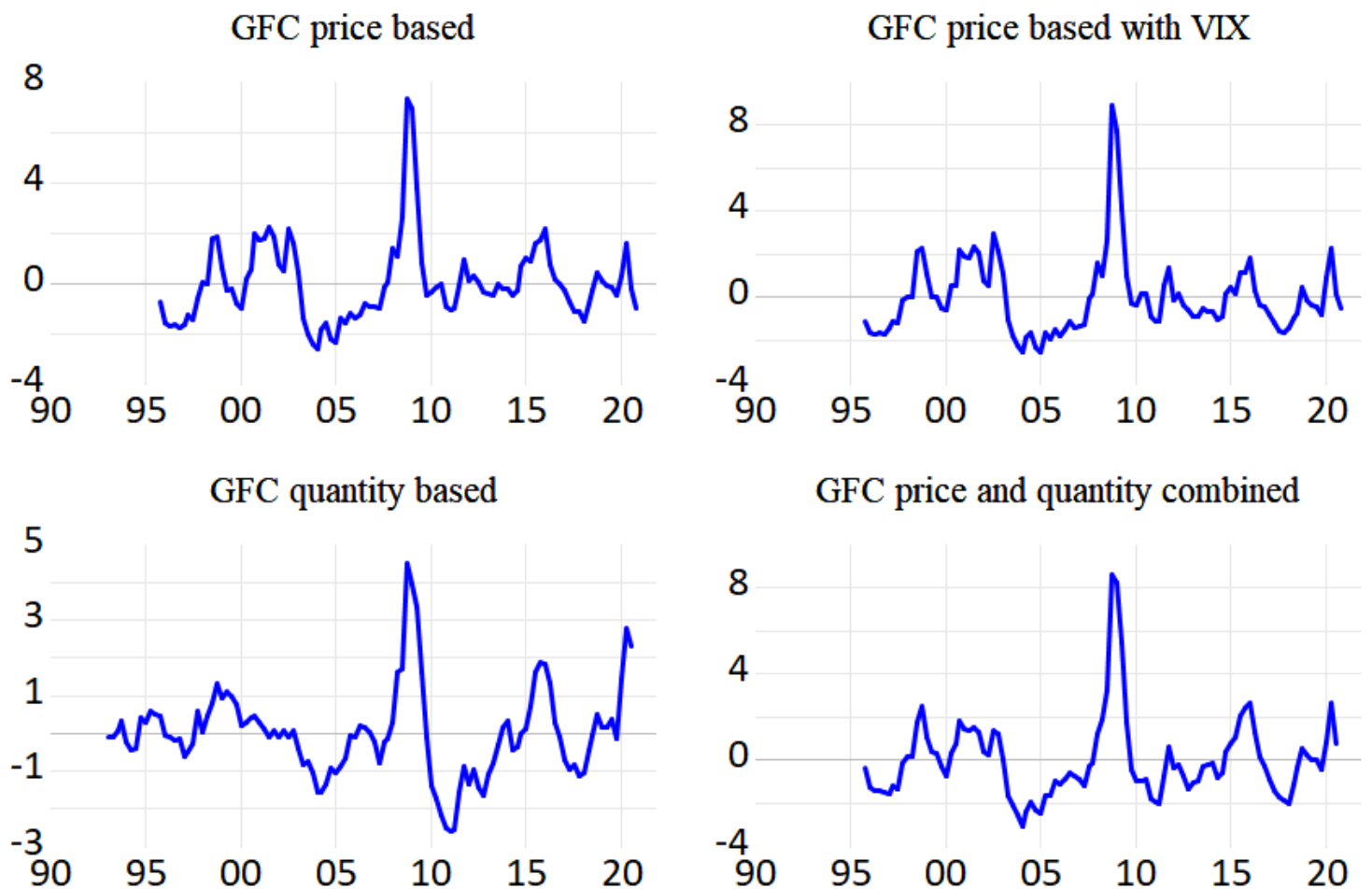
EMBI

G7 Credit/GDP

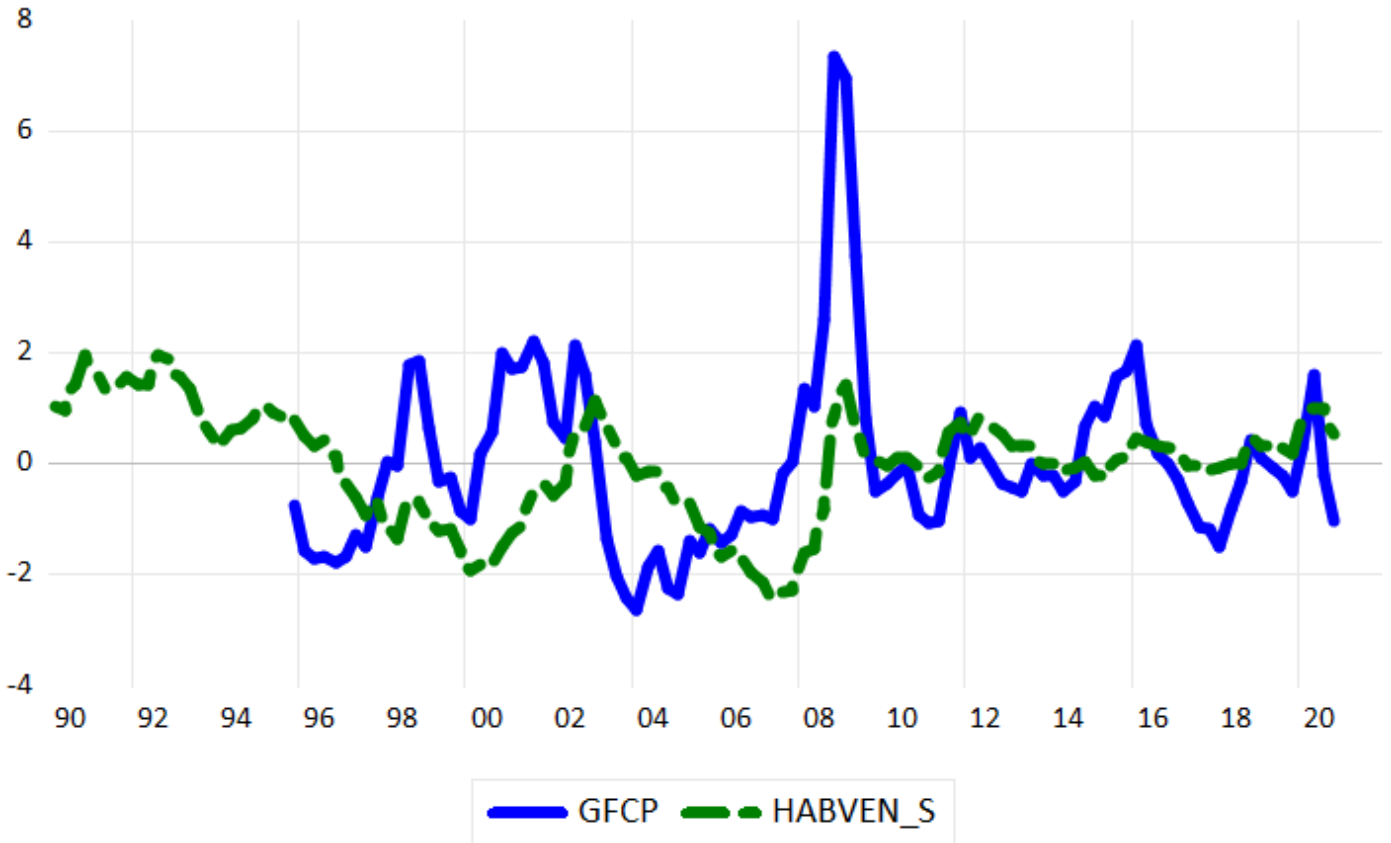
Leverage broker-dealers

EME portfolio flows

Factor-based measures of the GFC



Price-based measure of the GFC (solid blue line) vs. global stock market factor (dashed green line)



Correlations between different GFC measures, 1990-2020

	(1)								
	GFC price	GFC price with VIX	GFC quantity	GFC combined	EBP	GSMF	USD NEER	VIX	EME portfolio flows
GFC price	1								
GFC price with VIX	0.98***	1							
	(0.000)								
GFC quantity	0.71***	0.71***	1						
	(0.000)	(0.000)							
GFC combined	0.97***	0.95***	0.86***	1					
	(0.000)	(0.000)	(0.000)						
EBP	0.90***	0.92***	0.62***	0.87***	1				
	(0.000)	(0.000)	(0.000)	(0.000)					
GSMF	0.21***	0.20***	0.066***	0.17***	0.13***	1			
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)				
USD NEER	0.57***	0.48***	0.45***	0.58***	0.30***	0.22***	1		
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)			
VIX	0.75***	0.86***	0.55***	0.74***	0.76***	0.20***	0.23***	1	
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)		
EME portfolio flows	-0.66***	-0.63***	-0.74***	-0.74***	-0.56***	-0.24***	-0.52***	-0.47***	1
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	

p-values in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Correlations between GFC measures and selected macro variables, 1990-2020).

(1)

	GFC price	GFC quantity	GFC combined	US real GDP growth	Oil price growth	US shadow rate	US long term rate	G7
GFC price	1							
GFC quantity	0.77*** (0.000)	1						
GFC combined	0.97*** (0.000)	0.89*** (0.000)	1					
US real GDP growth	-0.68*** (0.000)	-0.48*** (0.000)	-0.65*** (0.000)	1				
Oil price growth	-0.49*** (0.000)	-0.36*** (0.000)	-0.45*** (0.000)	0.41*** (0.000)	1			
US shadow rate	-0.12*** (0.000)	0.16*** (0.000)	-0.033*** (0.000)	0.070*** (0.000)	0.17*** (0.000)	1		
US long term rate	-0.097*** (0.000)	0.042*** (0.000)	-0.052*** (0.000)	0.10*** (0.000)	0.21*** (0.000)	0.76*** (0.000)	1	
G7 CB balance sheet/GDP	0.57*** (0.000)	0.47*** (0.000)	0.58*** (0.000)	-0.45*** (0.000)	-0.23*** (0.000)	-0.17*** (0.000)	-0.054*** (0.000)	

p-values in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 1:

Global prevalence of sudden stops and currency crises and the GFC

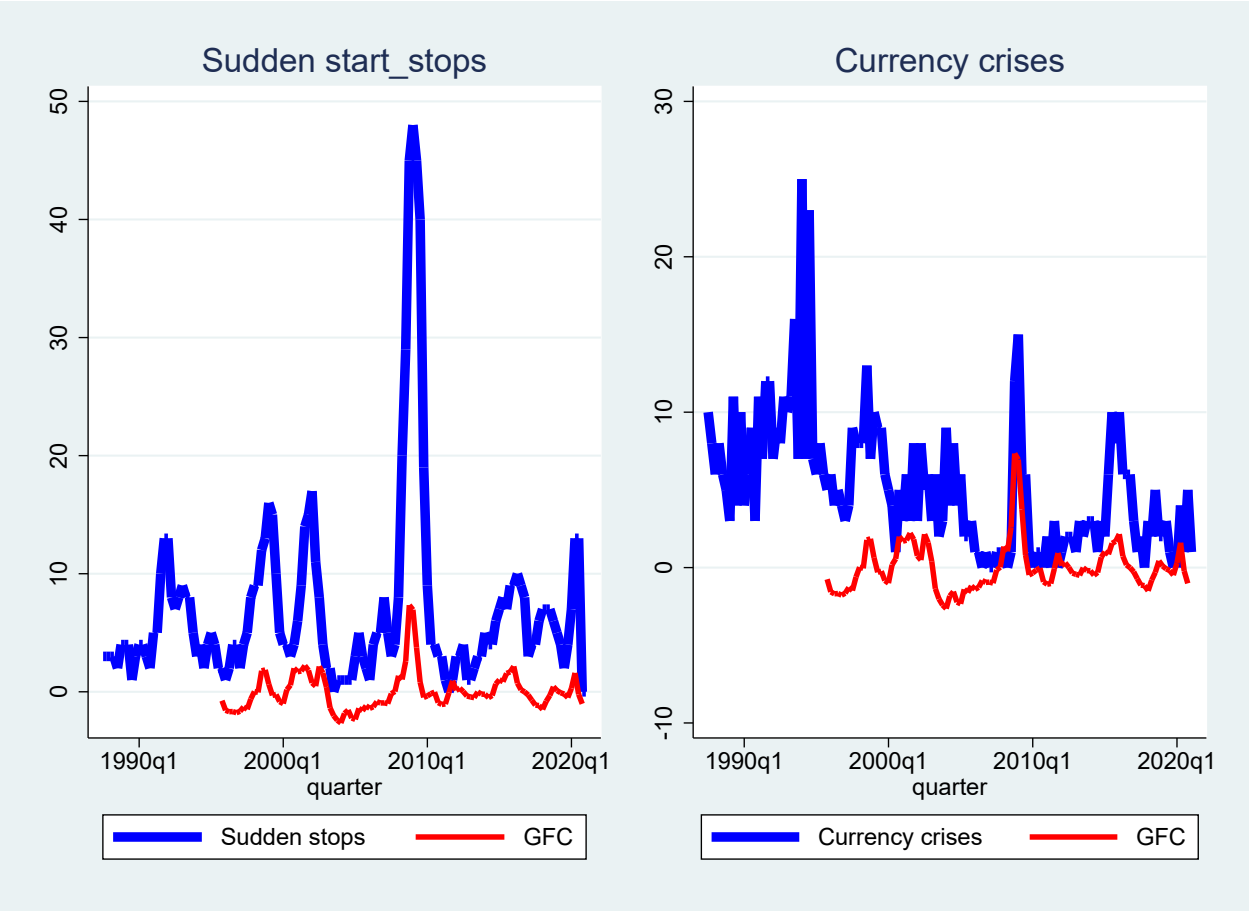


Figure 1:

The GFC and capital flow episodes

$$Pr(EPISODE_{it} = 1) = k_i + \beta GFC_t + \gamma X_{i,t-1} + \epsilon_{i,t} \qquad (2)$$

where $X_{i,t-1}$ is a vector of country-specific controls, which includes an external vulnerability index, financial openness, the quality of institutions, currency arrangement, and other variables.

Stability and linearity

$$Pr(EPISODE_{it} = 1) = k + \beta GFC_t + \gamma X_{i,t-1} + \delta GFC_t Z_t + \epsilon_{i,t} \quad (3)$$

where Z_t is a vector of variables including (i) the GFC itself (quadratic term); (ii) a dummy for the global financial crisis (2008-09); and (iii) a dummy for the post-2009 sample; plus a dummy when $GFC > 1$

- This allows us to test for non-linearities as well as possible variation over time
- Departure from linearity can be motivated by occasionally binding constraints (Devereux and Yu [2014], Mendoza [2010], Akinci and Chahrour [2015])

Adding global controls

$$Pr(EPISODE_{it} = 1) = k + \beta GFC_t + \gamma X_{i,t-1} + \eta X_t + \epsilon_{i,t} \quad (4)$$

- Is the effect of the GFC mediated by US growth, monetary policy and oil prices?

Summary of findings from the regressions

- GFC consistently associated to all capital flow episodes, with the expected sign, with the exception of flights
- Results are more mixed for currency crises: for these, only the quantity based measures of the GFC and the VIX show up as statistically significant predictors of crises
- The effect of some possible GFC measures, including ours, the VIX and the US dollar, appears to have become weaker post crisis for sudden stops
- By contrast the USD, while insignificant for currency crises in the whole sample, becomes strongly significant post crisis
- For currency crises, we find some evidence of convexity (loosely consistent with the idea of occasionally binding constraints) using our GFC measure, but not the VIX

GFC effect on the probability of a sudden stop

	(1) GFC price	(2) GFC price no controls	(3) GFC quantity	(4) GFC combined	(5) EBP	(6) GSMF	(7) VIX	(8) USD
GFC	0.395***	0.498***	0.593***	0.343***	0.477***	0.444***	0.478***	0.619***
	(0.044)	(0.024)	(0.068)	(0.038)	(0.057)	(0.108)	(0.056)	(0.095)
Chinn-Ito index, t-4	-0.101		-0.103	-0.103	-0.142	-0.102	-0.151*	-0.081
	(0.097)		(0.093)	(0.097)	(0.088)	(0.085)	(0.088)	(0.090)
External vulnerability index, t-4	3.278**		2.747**	2.991**	3.340***	3.611***	3.297***	4.021***
	(1.379)		(1.244)	(1.386)	(1.105)	(1.057)	(1.102)	(1.192)
Peg (Klein and Shambaugh), t-4	0.039		0.011	0.019	0.282	0.274	0.327	-0.035
	(0.249)		(0.235)	(0.250)	(0.213)	(0.203)	(0.215)	(0.227)
Composite risk rating, t-1	-0.011		-0.008	-0.011	0.002	0.005	0.001	-0.003
	(0.017)		(0.015)	(0.017)	(0.014)	(0.014)	(0.014)	(0.015)
Current account/GDP, t-1	-0.003		-0.002	-0.003	-0.002	-0.003	-0.001	-0.002
	(0.005)		(0.003)	(0.005)	(0.002)	(0.002)	(0.002)	(0.003)
Foreign currency debt/GDP, t-1	0.000		0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Inflation, 3-quarter average, t-1	-1.287		-0.000	-1.385	-0.003	-0.042	0.009	-0.013
	(1.130)		(0.084)	(1.156)	(0.075)	(0.076)	(0.076)	(0.090)
IMF Access, t-4	-0.018		-0.032	-0.010	-0.086**	-0.064*	-0.080**	0.003
	(0.040)		(0.036)	(0.040)	(0.040)	(0.039)	(0.038)	(0.035)
Foreign exchange reserves/GDP, t-1	-0.000		-0.000	-0.000	-0.000	-0.001	-0.000	-0.001
	(0.001)		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Observations	973	5,635	1,025	973	1,077	1,077	1,077	1,025
Pseudo-R2	0.150	0.117	0.134	0.152	0.115	0.0540	0.121	0.0828

GFC (combined definition) effect on the probability of a sudden stop: Linearity and stability over time

	(1) Baseline	(2) Adding global controls	(3) Emerging and developing economies	(4) Linear relationship I?	(5) Linear relationship II?	(6) Driven by crisis?	(7) Different post crisis?
GFC combined	0.343***	0.375***	0.555***	0.343***	0.271*	0.351***	0.439***
	(0.038)	(0.096)	(0.149)	(0.105)	(0.163)	(0.102)	(0.101)
Chinn-Ito index, t-4	-0.103	-0.103	0.001	-0.105	-0.105	-0.104	-0.107
	(0.097)	(0.096)	(0.116)	(0.096)	(0.097)	(0.096)	(0.097)
External vulnerability index, t-4	2.991**	2.917**	0.861	2.819**	2.869**	2.825**	2.861**
	(1.386)	(1.389)	(1.890)	(1.396)	(1.394)	(1.395)	(1.393)
Peg (Klein and Shambaugh), t-4	0.019	0.016	0.302	0.024	0.020	0.025	0.065
	(0.250)	(0.250)	(0.401)	(0.251)	(0.251)	(0.251)	(0.254)
Composite risk rating, t-1	-0.011	-0.013	-0.037	-0.013	-0.013	-0.013	-0.014
	(0.017)	(0.017)	(0.028)	(0.017)	(0.017)	(0.017)	(0.017)
Current account/GDP, t-1	-0.003	-0.003	-0.037	-0.003	-0.003	-0.003	-0.003
	(0.005)	(0.005)	(0.025)	(0.005)	(0.005)	(0.005)	(0.005)
Foreign currency debt/GDP, t-1	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Inflation, 3-quarter average, t-1	-1.385	-1.530	-2.170	-1.514	-1.543	-1.514	-1.597
	(1.156)	(1.205)	(1.477)	(1.204)	(1.210)	(1.204)	(1.241)
IMF Access, t-4	-0.010	-0.010	-0.013	-0.009	-0.010	-0.008	-0.015
	(0.040)	(0.041)	(0.054)	(0.041)	(0.041)	(0.041)	(0.042)
Foreign exchange reserves/GDP, t-1	-0.000	-0.000	-0.001	-0.000	-0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
US real GDP growth		0.150	0.302	0.256	0.235	0.258	0.293
		(0.230)	(0.327)	(0.272)	(0.255)	(0.280)	(0.234)
US shadow rate		0.050	-0.030	0.033	0.024	0.033	0.022
		(0.134)	(0.199)	(0.136)	(0.140)	(0.136)	(0.136)
Oil price growth (USD)		-0.002	0.021	-0.000	-0.001	-0.000	-0.002
		(0.011)	(0.017)	(0.011)	(0.011)	(0.011)	(0.011)
GFC squared				0.011			
				(0.015)			
GFC¿1					0.149		
					(0.195)		
GFC*dummy for 2008-2009						0.081	
						(0.121)	
GFC*dummy for 2010-2020							-0.322**
							(0.148)
Observations	973	973	476	973	973	973	973
Pseudo-R2	0.152	0.153	0.144	0.154	0.154	0.154	0.160

Main findings again

- Overall, the nexus between the GFC and capital flows is not very wobbly
- GFC measures are strongly positively correlated, with the expected signs, and correlations are relatively stable; the GFC measures are counter-cyclical in terms of US growth and oil prices
- However the VIX somewhat less correlated with other GFC measures post crisis, and also with capital flow episodes
- The Asian crisis, the global financial crisis, the China shock of 2015 and the Covid-19 crisis stand out as episodes of large global financial tightening
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- Results are mixed on linearity and stability

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