

SURGES AND CRASHES

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*This paper draws on joint work with Jun I. Kim, Mahvash S. Qureshi, and Juan Zaldendo. The views expressed in this presentation are those of the presenter and do not necessarily represent those of the IMF or IMF policy.

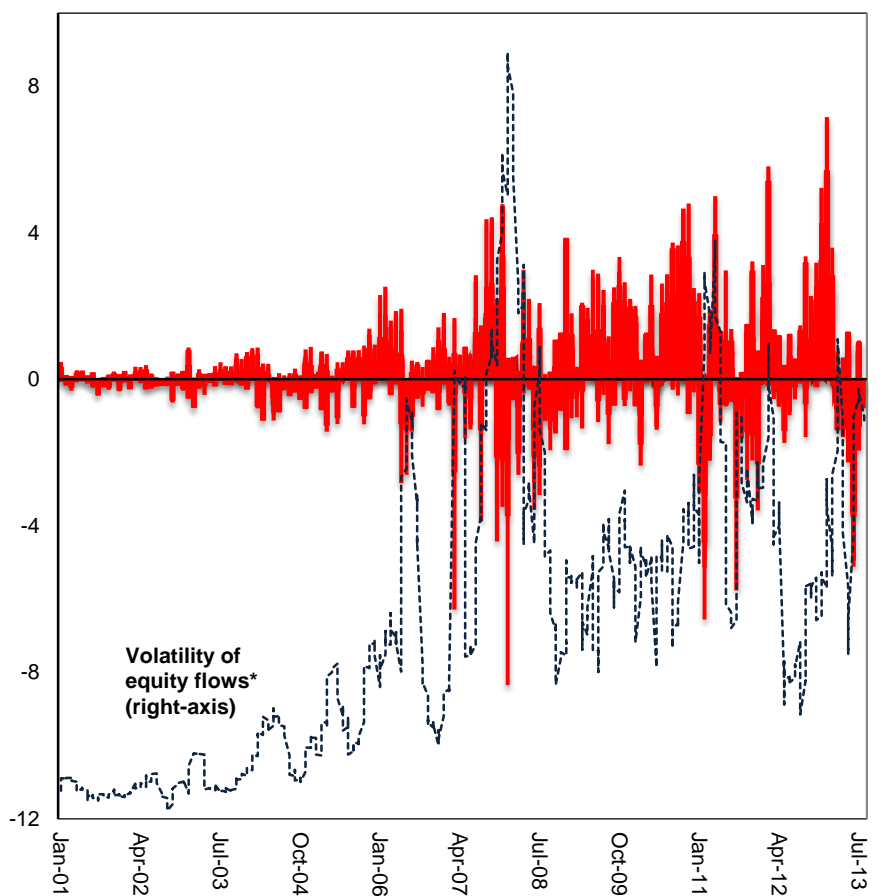


THE ISSUE...CAPITAL FLOWS

INCREASINGLY VOLATILE

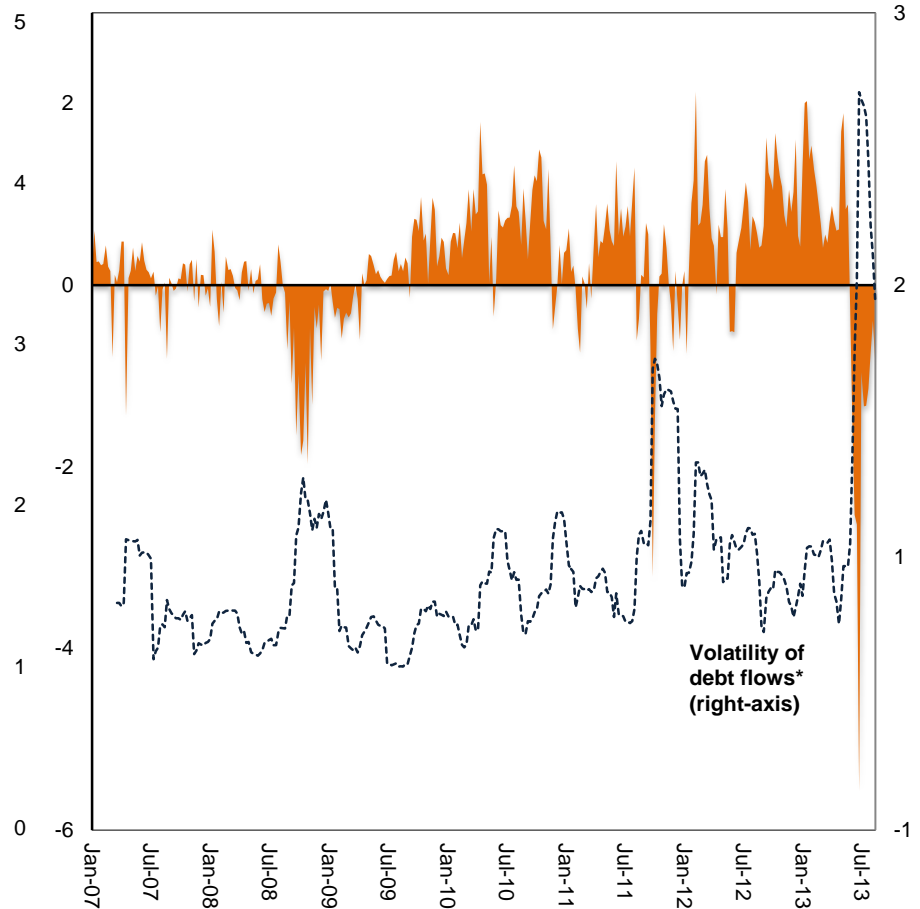
Equity Funds

(billions of US dollars; weekly flows)



Bond Funds

(billions of US dollars; weekly flows)

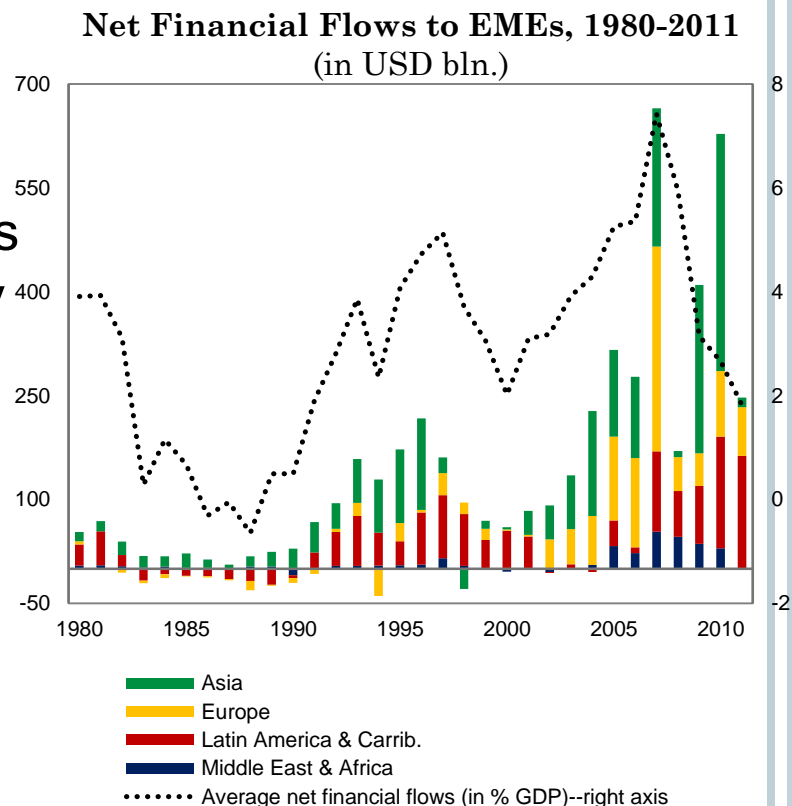


Source: EPFR.

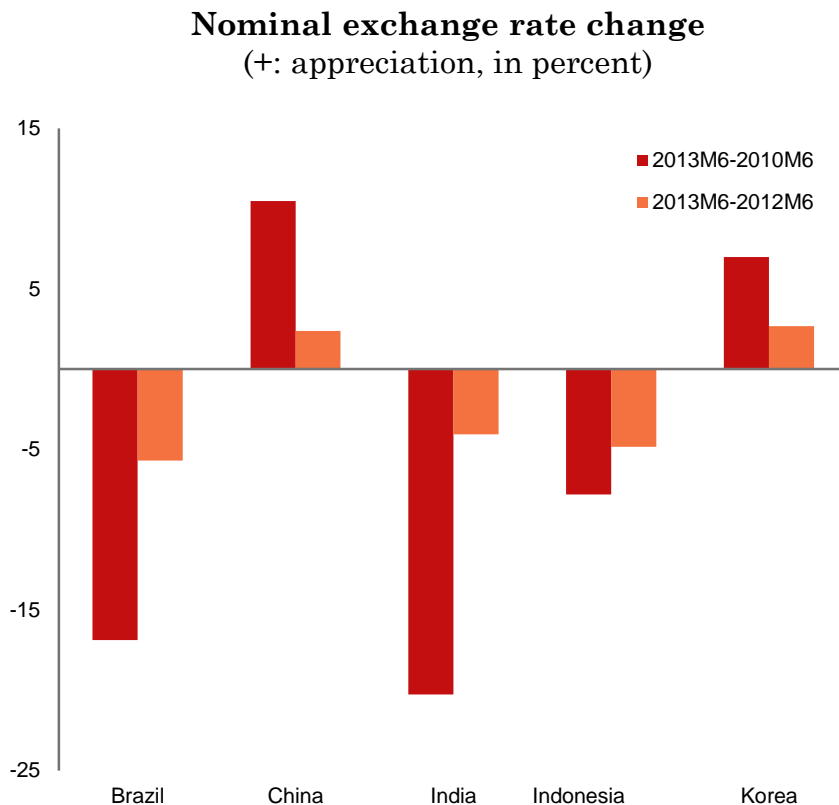
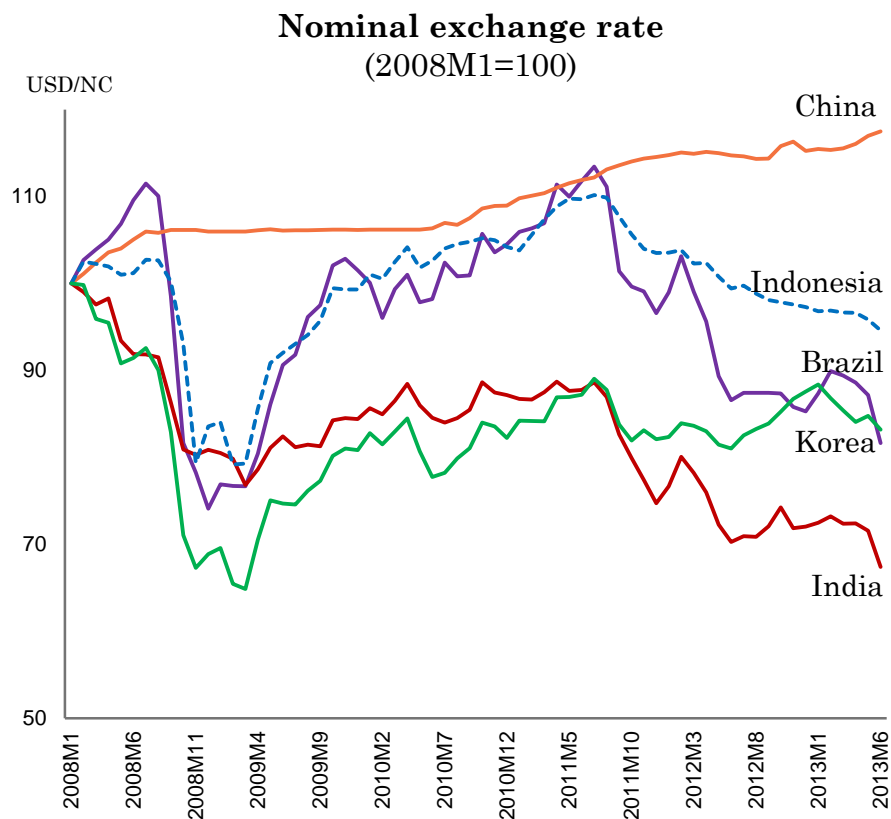
*Rolling standard deviation of flows over one quarter.

SURGES AND CRASHES MORE FREQUENT AND LARGER

- Surges in inflows to EMEs have been increasing in frequency and magnitude
- Regions that experience the largest surges are also generally those that subsequently experience the largest drop in net flows, heightening the challenge of managing volatility on the up- and downsides
 - Latin America prior to the 1980s debt crisis
 - Asia in the runup to the 1997-98 financial crisis
 - Emerging Europe prior to the 2008 global financial crisis



BUT NOT ALL COUNTRIES WITH A SURGE EXPERIENCE A CRASH...

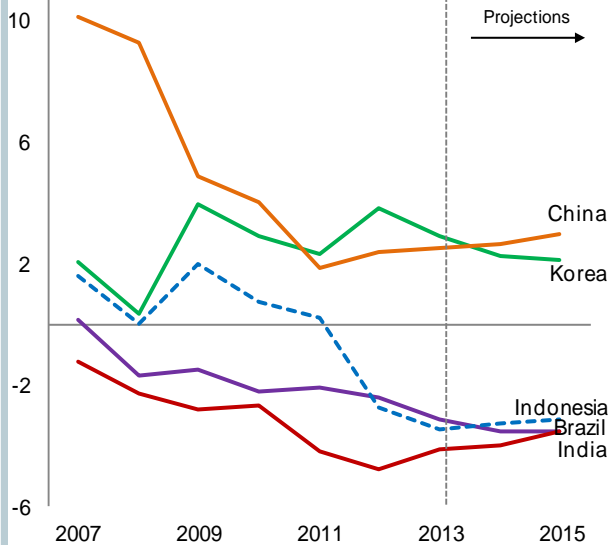


Source: IMF's INS database.

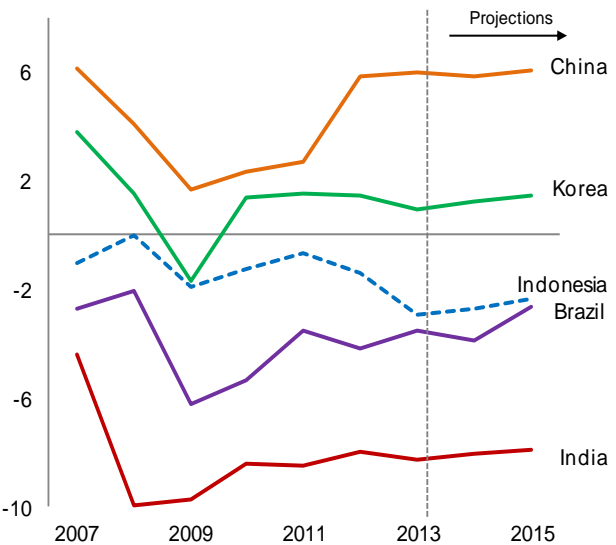
Note: Nominal exchange rate change is the cumulative change over the specified period.

SOME CORRELATION WITH MACRO INDICATORS

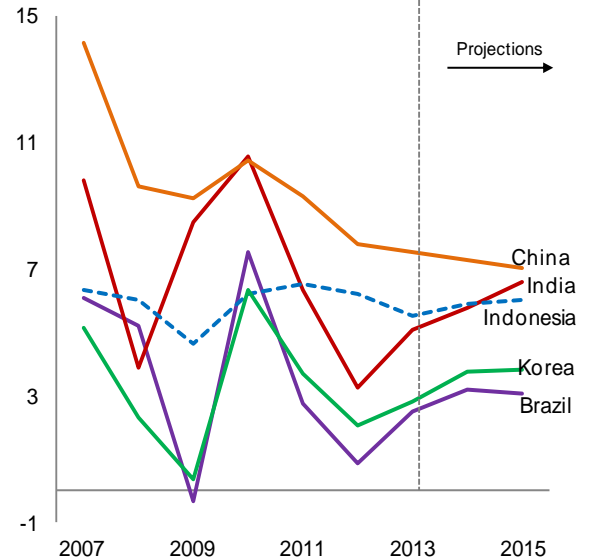
Current account balance (In percent of GDP)



Fiscal balance (In percent of GDP)



Real GDP growth (In percent)



Source: IMF's WEO database.

Note: General government fiscal balance reported for Brazil, India, Indonesia, and Korea. Central government fiscal balance reported for China.

QUESTIONS

- Why surges happen?
 - push or pull?
- What determines capital allocation across countries?
 - why net flows vary across countries in surges?
- What causes crashes?
 - why don't all countries face large outflows when surges end?

WHY SURGES HAPPEN?

THE LITERATURE

- Long tradition of push vs. pull factors...but, in equilibrium, flows must reflect confluence of both supply and demand
- Changes in flows—push factors (Calvo, 1993; Fernandez-Arias, 1996); push factors and domestic creditworthiness (Taylor and Sarno, 1997)
- Large changes (surges)—most studies (Reinhart & Reinhart, 2008; Cardarelli et al., 2009) look at stylized facts; Forbes & Warnock (2011) find global risk, and global and domestic real growth matter, but advanced economy interest rates do not

EMPIRICAL STRATEGY

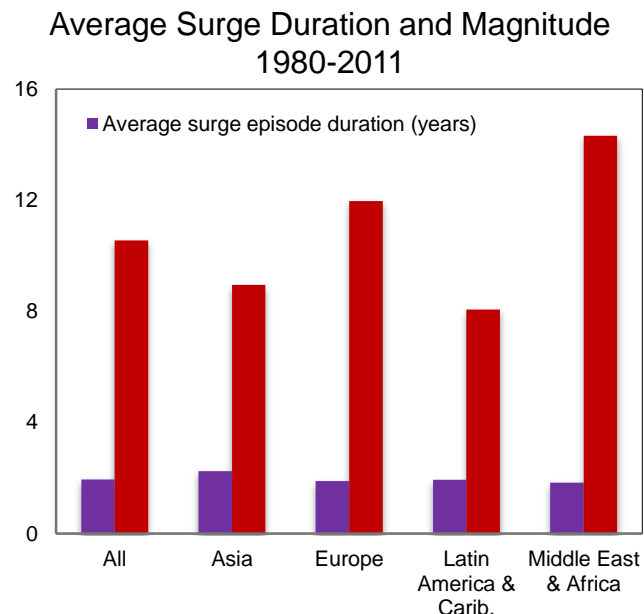
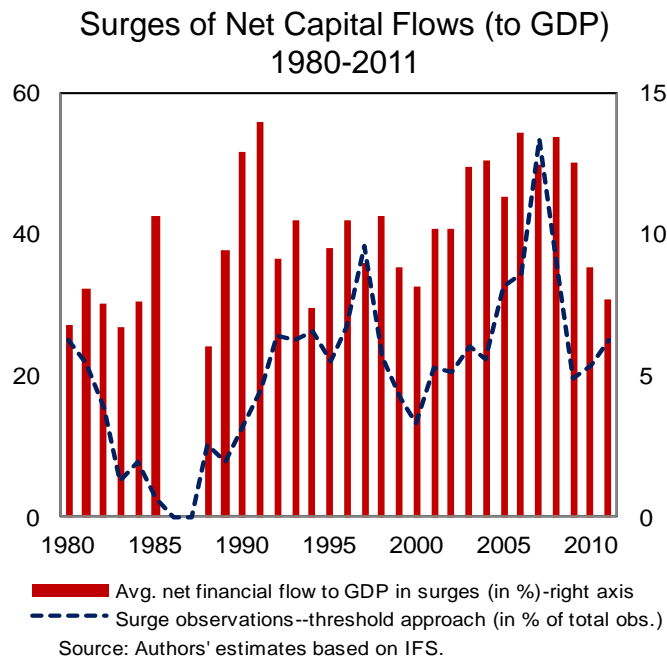
- Focus on EMEs; identify **net** inflow surges (and episodes):
 - **Threshold** (country's and full sample's top 30th percentile of capital flow/GDP)
 - **Clustering** into surge, normal, outflow
 - Classify net surges into **asset-** vs. **liability-**driven
- Model **probability** of surge, and **magnitude** of surge conditional on occurrence as functions of **global** (push), **domestic** (pull), and **contagion** factors
- Use binary recursive trees to characterize determinants of **asset-** vs. **liability-**driven surges

BUT FIRST...ARE LARGE FLOWS REALLY DIFFERENT?

- Quantile regressions show that the association of push and pull factors with net capital flows depends on the magnitude of the net flow
 - Among global factors, the coefficients on the real US interest rate, global risk aversion and commodity prices are significantly larger for net flows at the upper end of the distribution
 - Among domestic factors, the coefficients of the exchange rate regime, capital account openness and institutional quality are also larger
- Interquantile regressions confirm that capital flows behave qualitatively differently depending on the size of the net flow
- As such, OLS regressions on the full sample may not suffice, and large flows—surges—merit separate analysis

STYLIZED FACTS

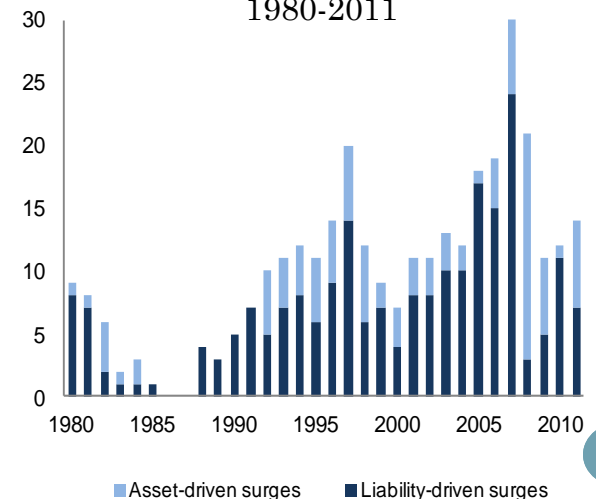
- Identify 326 surge observations (grouped into about 150 episodes) using two approaches (threshold and cluster)
- Surges have become more frequent—the share of surge observations increased from about 10 percent in the 1980s to over 30 percent in 2000s
- Average surge episode duration is 2 years; average surge magnitude is about 10 percent of GDP



STYLIZED FACTS

- Surges are synchronized internationally—suggesting that common factors are at play
- But even in times of global surges, not all EMEs are affected—so pull factors must also be relevant
- Considerable variation in the magnitude of flows in a surge—e.g. Asia experienced the largest surges (in percent of GDP) during the 1990s, but emerging Europe had the largest surges in 2000s
- Majority of surges are liability-driven (by an increase in residents' liabilities) rather than asset-driven (by a decline in the holdings of residents' assets abroad)
- Asset-driven surges outnumber liability-driven surges in crisis years (1982 & 2008)

Types of Surges (no. of observations)
1980-2011



STYLIZED FACTS AROUND SURGES

Table. Summary statistics across surge and non-surge observations

| | Surge | Non-surge |
|--|-----------------|--------------|
| Net capital flows to GDP (in %) | 10.60*** | 0.84 |
| Real US interest rate (in %) | 1.25*** | 0.83 |
| S&P 500 index returns volatility | 8.26*** | 9.45 |
| Real domestic interest rate (in %) | 2.23 | 1.82 |
| REER overvaluation (% deviation from trend) | 0.70** | -0.40 |
| Optimal current account (in %) | -2.60*** | 0.60 |
| Real GDP growth rate (in % per year) | 5.13*** | 3.62 |
| Trade openness (in %) | 84.69*** | 68.60 |
| Reserves to GDP (in %) | 16.81*** | 13.06 |
| Real GDP per capita (Log) | 7.89** | 7.76 |
| De facto exchange rate regime | 2.11* | 2.03 |
| Capital account openness index | 0.57*** | -0.08 |
| Financial interconnectedness | 8.16*** | 6.59 |
| Institutional quality index | 0.66*** | 0.61 |
| Number of observations | 271 | 928 |

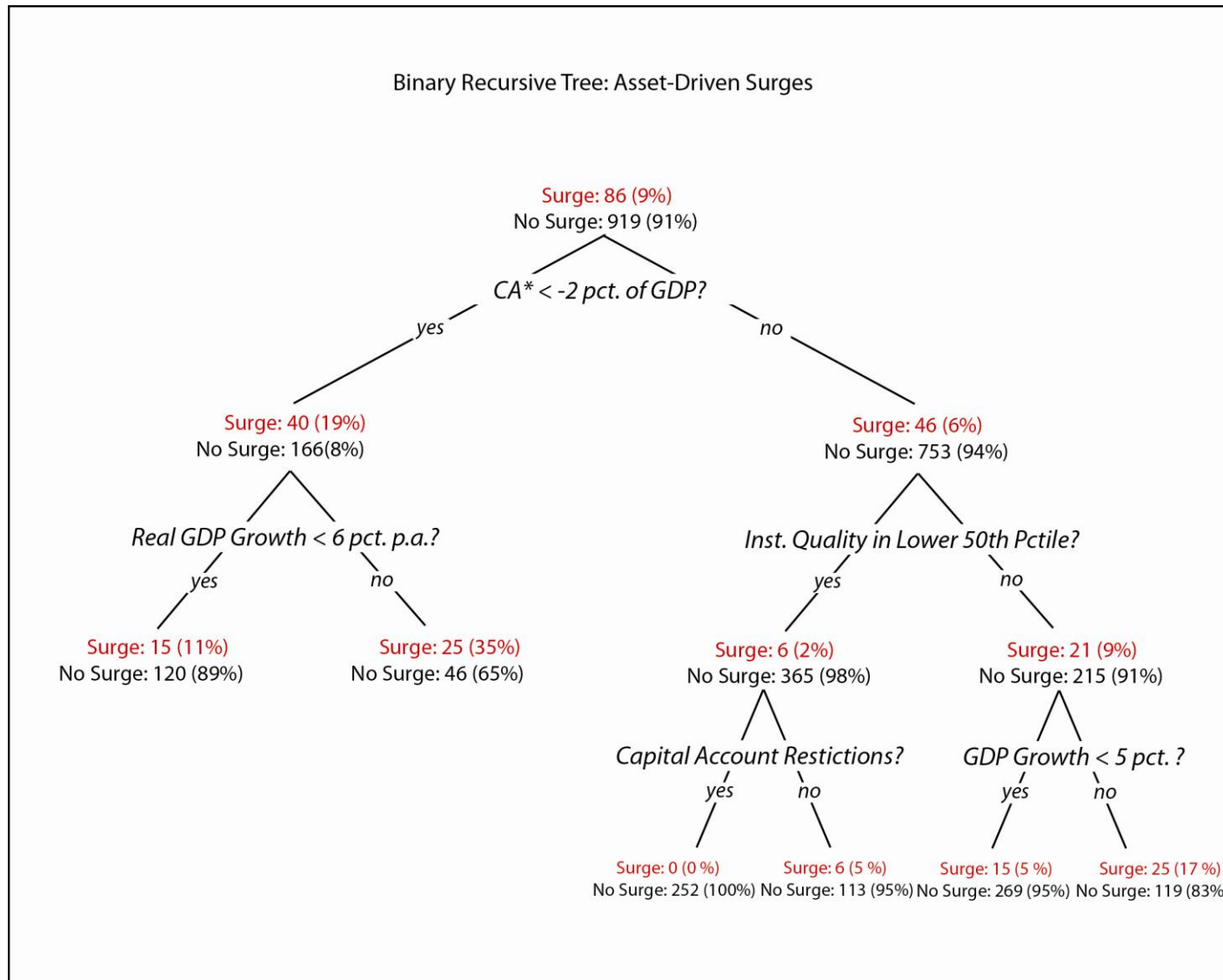
WHY SURGES HAPPEN? ECONOMETRIC ANALYSIS

- Unconditional probability of surge: 22%
- Push factors/interest rate differential
 - * US real interest rate: 100 b.p. lower rate–3 p.p. higher surge prob.
 - * S&P500 index vol: one s.d. higher vol–3 p.p. lower surge prob.
 - * Commodity price index: one s.d. higher–7 p.p. higher surge prob.
- Pull factors
 - * Real GDP growth: 1 p.p. higher growth–1 p.p. higher surge prob.
 - * Optimal CA: 1 pct. of GDP larger deficit–3 p.p. higher surge prob.
 - * Capital account: move from 50th to 75th–3 p.p. higher surge prob.
 - * Inst. quality: move from 50th to 75th–4 p.p. higher surge prob.
 - * Financial connectedness: one additional partner (over mean)–2p.p. higher surge prob.

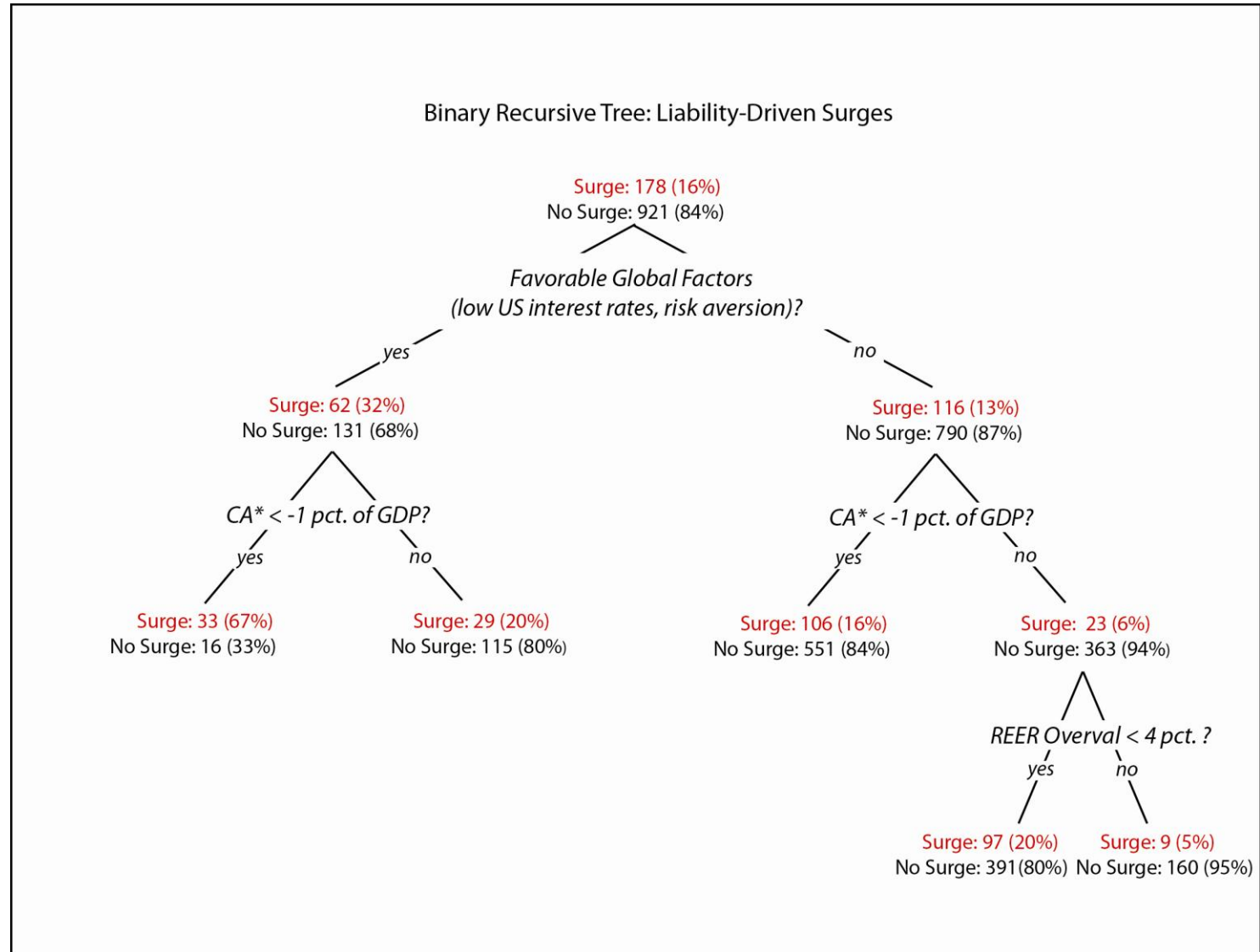
ASSET VS. LIABILITY-DRIVEN SURGES

- Lower US interest rates and lower S&P500 volatility encourage foreigners to invest more in EMEs, and domestic residents to invest less abroad
- But foreign investors (liability-driven surges) more sensitive to global factors, and are also more subject to regional contagion than domestic investors (asset-driven surges)

ASSET-DRIVEN SURGES



LIABILITY-DRIVEN SURGES



WHAT MATTERS FOR SURGE MAGNITUDE?

CONDITIONAL ON SURGE OCCURRENCE, PULL FACTORS ARE IMPORTANT...

- Exchange rate regime: Pegged exchange rates—3 pct. of GDP higher net flows
- REER overvaluation: 10pct. overvaluation—2 pct. of GDP lower net flows
- Capital account: move from 25th to 75th—1 pct. of GDP higher net flows
- Optimal CA: 10 pct. of GDP larger deficit—3 pct. of GDP higher net flows
- Larger surges in the region are associated with a smaller surge to the country
 - Hence, an increase in inflows to other countries implies less capital left to be allocated
- Global factors, particularly, global risk and commodity price booms have a weaker impact on magnitude—acting as “gatekeepers”
 - Capital surges toward EMEs when global market volatility is sufficiently low, but once this hurdle is passed, the volume of capital that flows is largely independent of market volatility

ROBUSTNESS TESTS

- Extended definition of surge (include year before and after)
- Cluster analysis definition of surges
- Alternate/additional regressors
 - 10-year US government yield (instead of 3 month), nominal interest rates
 - VIX/Credit Suisse risk appetite index instead of S&P volatility
 - Add: trade openness; reserves; stock market capitalization; financial soundness indicators; credit/GDP; trade links; country fixed effects
- Shorter sample (1990-2011) and different estimation methodology for surge likelihood (complementary log-log)
- Endogeneity
 - Instruments for macroeconomic variables (e.g., real GDP growth and REER overvaluation)—for which endogeneity concerns may be the most pertinent—constructed using *projections* made in year $t-2$ or earlier for year

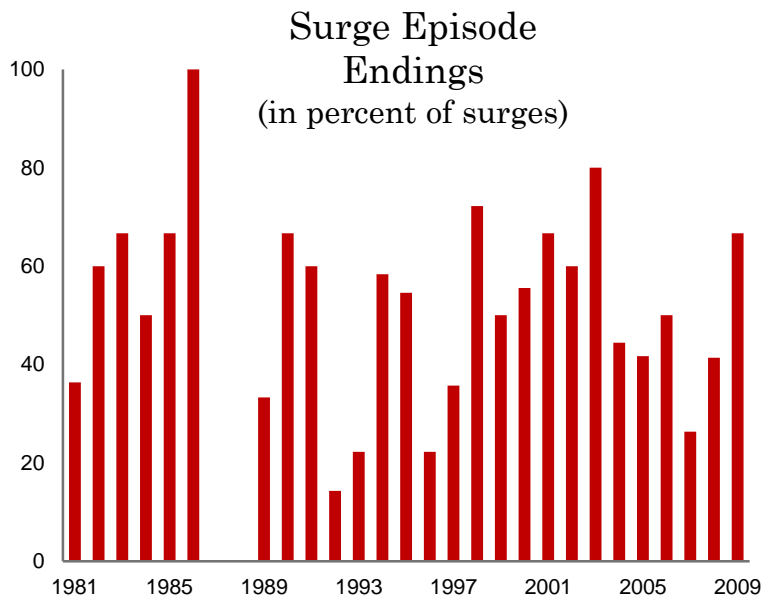
WHAT CAUSES CRASHES?

CRASHES GENERALLY DRIVEN BY PUSH FACTORS...

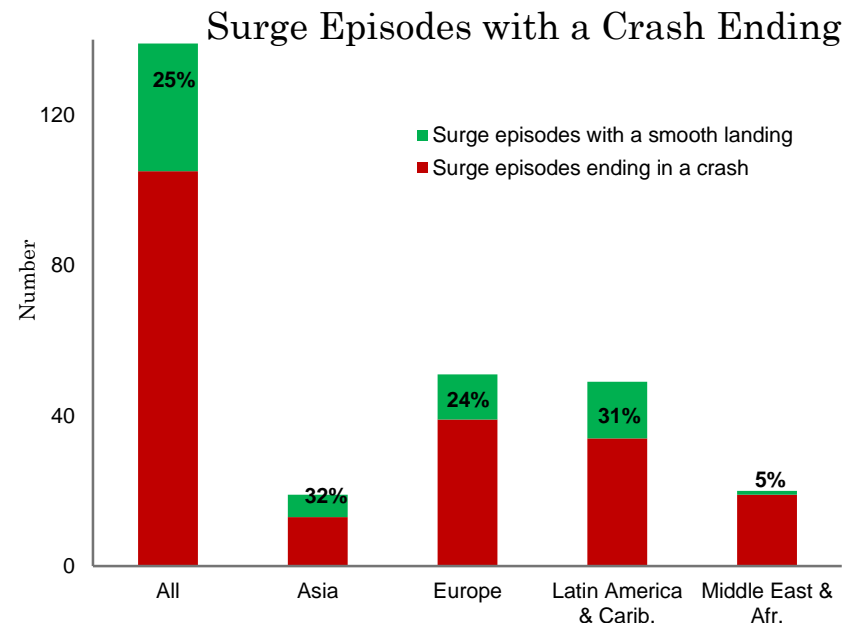
- Unconditional probability of crash: 23%
- Push factors/interest rate differential
 - * US real interest rate: 100 b.p. higher rate–2 p.p. higher crash prob.
 - * S&P500 index vol: one s.d. higher vol–3 p.p. higher crash prob.
 - * Commodity price index: one s.d. higher–5 p.p. lower crash prob.
- Pull factors
 - * Real interest rate: 100 b.p. higher rate–1 p.p. lower crash prob.
 - * Optimal CA: 1 pct. of GDP larger deficit–2 p.p. higher crash prob.
 - * Inst. quality: move from 50th to 75th–5 p.p. lower crash prob.
 - * Financial connectedness: one additional partner (over mean)–2 p.p. lower crash prob.

WHAT ABOUT CRASHES AFTER SURGE EPISODES?

- Crash endings of surge episodes are highly synchronized...
- About one-quarter of surge episodes over 1980-2011 ended in a crash (reversal of net flows)
- Asia and Latin America have the highest proportion of surge episodes ending in a crash



Note: Bars reflect the ratio of surge episodes that end to total surge episodes in previous year (in percent).

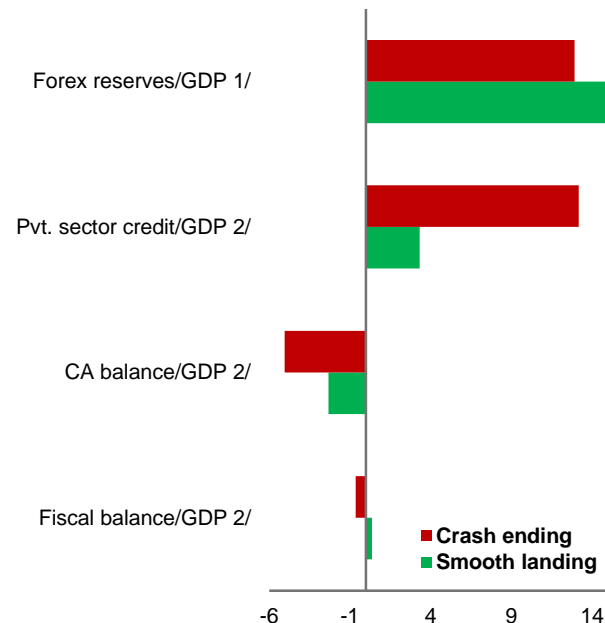


Note: Crash endings are identified by using a three-year window with a negative net flow larger than 1 percent of GDP occurring in the first, second or third year after the end of a surge episode. Percentages reflect the share of surge episodes in each region ending in a crash.

SUDDEN CRASH OR SOFT LANDING?

- Preliminary analysis reveals that changes in both global and domestic conditions are associated with how surge episodes end
- Rise in the real US interest rate and global risk, and a decline in commodity prices raise the likelihood of a crash ending (though the impact of global risk is insig.)
- Among pull factors, improvement in the current account balance (to GDP), and fiscal balance (to GDP) over the surge episode lowers the crash likelihood...
- While rapid private sector credit (to GDP) expansion strongly raises the likelihood of a crash ending
- Also, some evidence that improvement in institutional quality over the episode, and higher forex reserves to GDP are associated with a lower crash probability

Surge Episode Ending and Selected Macroeconomic Indicators



Note: Crash endings are defined as negative net flow larger than 1 percent of GDP in the 1st, 2nd, or 3rd year after the end of a surge episode. 1/ Ratio (in percent of GDP) in the last year of the episode. 2/ Change over surge episode (in percentage points).

IMPLICATIONS

- Global push factors, notably, real US interest rates and global risk are important determinants of surge and crash occurrence
 - Explain why surges and crashes are synchronized globally, and occur and recur
 - As global factors could reverse quickly, countercyclical policies and offsetting measures (such as prudential measures) are important
 - Need for greater policy coordination between source and recipient countries
- To the extent that domestic pull factors (including capital account openness) matter for surge occurrence, magnitude, and ending:
 - Policy and structural adjustments to better absorb capital inflows
 - Prudential policies/possible capital controls to prick incipient asset price bubbles
 - Avoid hard landing including by fiscal policy adjustment and avoiding credit booms
 - Need for coordination among recipient countries for no beggar-thy-neighbor policies
- While asset and liability-driven surges respond somewhat similarly to push and pull factors, policy response may need to be adjusted
 - For example, prudential measures more important for asset-driven surges while capital controls on inflows may be a viable option for liability-driven surges

Thank you