Housing, Monetary Transmission and the Financial Accelerator: the Importance of Institutional Differences

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"***Recent trends in the real estate market and its analysis***"

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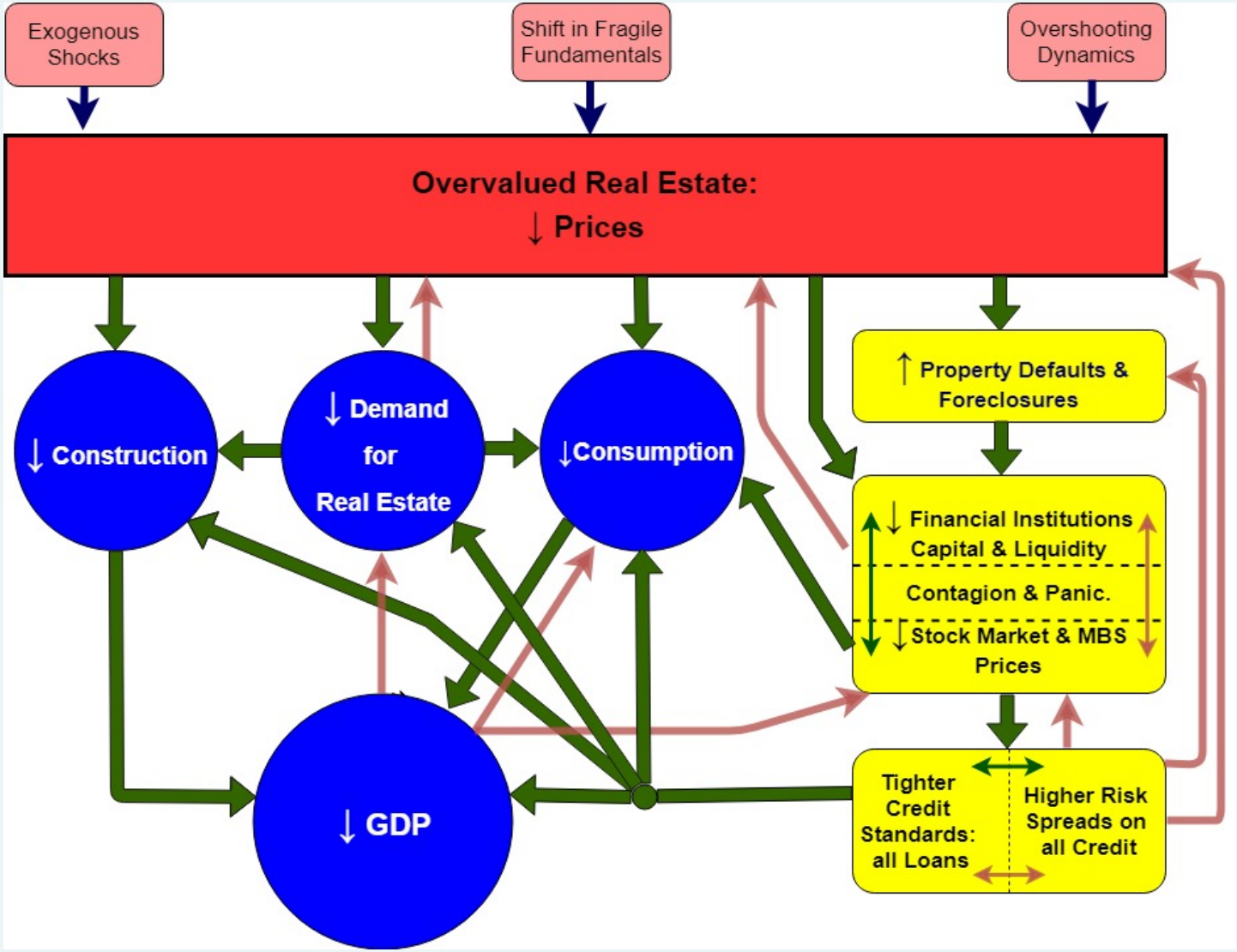
Outline

- The financial accelerator in the Global Financial Crisis.
- The importance of institutional differences for real estate.
- Comparing destabilising feedback loops in the financial accelerator and the global climate accelerator.
- Common modelling difficulties and failures.
- Real estate and climate risk.
- Real estate in the pandemic.
- Implications of institutional differences for monetary transmission through real estate.
- Some illustrations from South Africa: modelling house prices, mortgage debt, residential investment, consumption…. and loan-loss provisions.

Real estate and the financial accelerator



Transmission and amplification within the financial system (yellow RHS)

Strength of RHS transmission depends on:

- Leverage, interconnectedness and liquidity in financial system.
- Quality of prudential regulation, industry structure.
- Adrian, Covitz and Liang (2015) **define systemic risk** as:
  - *"the potential for widespread financial externalities—whether from corrections in asset valuations, asset fire sales, or other forms of contagion—to amplify financial shocks and in extreme cases disrupt financial intermediation."*

- **Primary vulnerabilities** in the financial system:
  - Leverage
  - Maturity transformation posing liquidity problems
  - Interconnectedness
  - Complexity
  - Mispricing of risk.

- These depend on quality of **prudential regulation** and financial sector structure.

Dangerous US deregulation

- 2000 Commodity Futures Modernization Act (CFMA) made derivatives enforceable throughout the U.S. with priority ahead of claims by others, e.g. workers, in bankruptcy.
- permitted derivative enhancements for private label mortgage backed securities (Lynn A. Stout, 2011).
- Deregulation of banks and investment banks: 2004 SEC decision to ease capital requirements on investment banks increased gearing to dangerous levels.
- See our 2021 JEL article What drives house price cycles?..., also for the accelerator figure.

- **Less focus in the literature** on *real economy-finance linkages.*
- *Note reversal of arrows in Figure for upswing –typically slower vs. sharp down-turns.*

- **Strength of LHS transmission** depends on:
  - Responsiveness of construction to higher real estate prices (land-use planning system, structure of building industry).
  - Responsiveness of real estate demand to expected returns: depends on gearing, tax system and degree to which investors *extrapolate* recent gains.
  - Gearing depends on regulation, tax incentives, perceived risk.
  - Responsiveness of consumption to higher house prices: depends on access to home equity loans, ease of refinancing and severity of down-payment constraint.
    - ➢ Muellbauer BIS (2010), Aron et al. (2012), Calza, Monacelli, Stracca (2013).

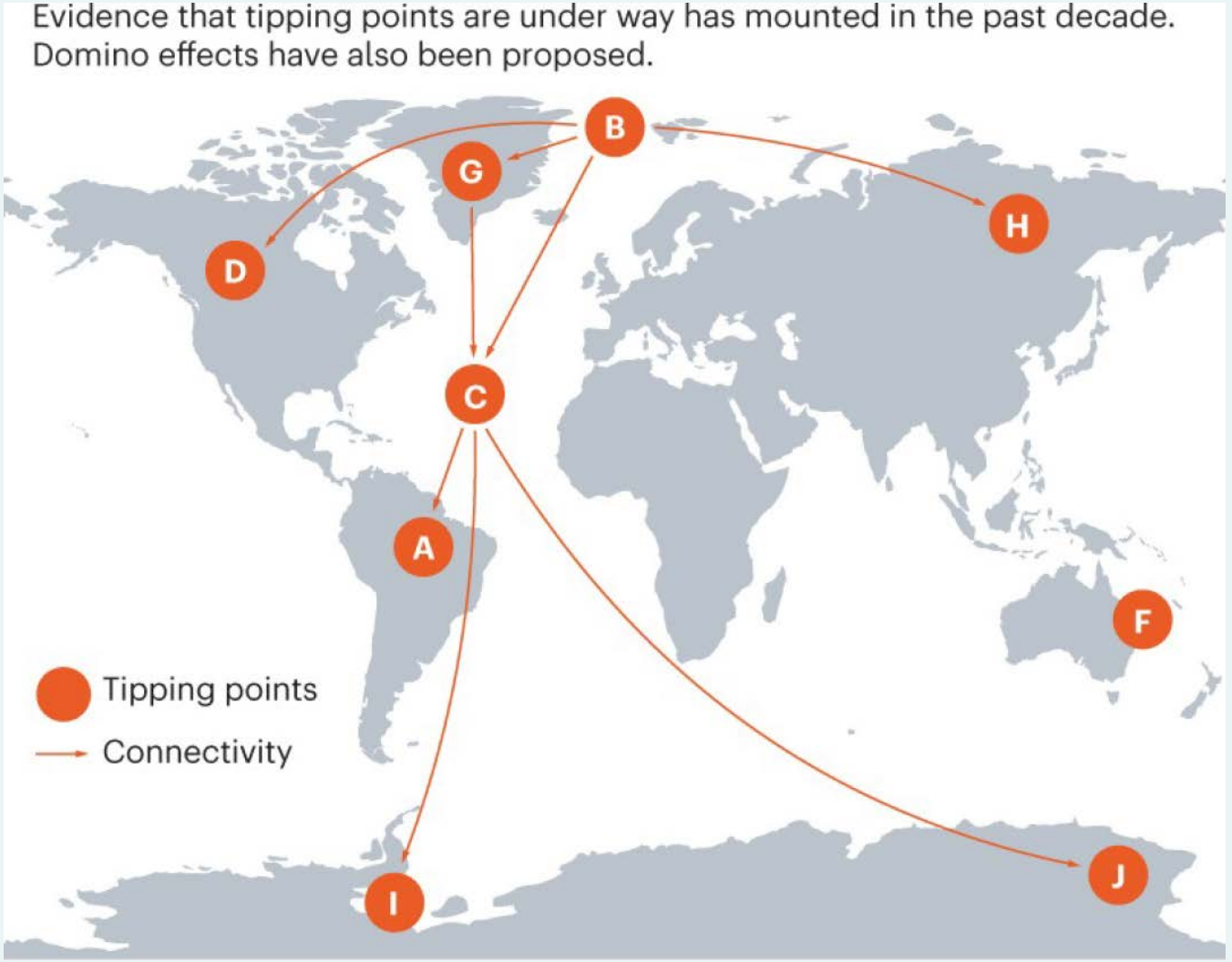
- **Micro-research on the so-called housing wealth effect on consumption** finds *in countries with home equity withdrawal options:*
  - this is much more of a *collateral effect* than a classical wealth effect:
    - Hurst & Stafford (2004), Mian et al. (2013), Browning et al. (2013), Windsor et al. (2015), Andersen et al. (2016), Berger et al. (2018).

- **Implies:**
  - housing wealth should be treated separately from other assets
  - the effect of housing wealth on consumption is *conditional on ease of access to credit and hence is time-varying*.
  - where home equity withdrawal is difficult and many are saving for large down-payments, higher house prices can *reduce* aggregate consumption:
    - e.g. Japan (Aron et al., 2012), Germany (Geiger et al., 2016), France (Chauvin & Muellbauer, 2018).

- In the absence of equity withdrawal and with cautious lending practices, higher house prices tend to reduce aggregate consumption.
- Build-up of household debt, other things equal, reduces consumption…. but high debt overhang deepens subsequent downturn.
- While higher house prices stimulate aggregate demand through residential investment, a higher housing stock (especially if built in the right places) tends to dampen house prices.
- However, in the booms in Ireland, Spain and the US, high rates of building in the boom led to an overhang of supply that deepened the downturn.
- Banking regulation limiting leverage, maturity mismatch, interconnectedness and mispricing of risk, and macro-prudential policy, dampen the financial accelerator within the financial system.
- Differences in institutions, regulation and in timing (e.g. gradual vs rapid financial liberalisation) between countries therefore matter greatly.

- Scientists fear approach of a catastrophic *tipping point* in the global climate:
  - "Climate tipping points — too risky to bet against" Lenton et al. 2019
  - Crushing climate impacts to hit sooner than feared: draft IPCC report
  - 2019 UN Emissions Gap Report
  - Interacting tipping elements increase risk of climate domino effects, Wunderling et al. 2021.
- *Amplifying feedback loops* increase the probability of mass species extinction, major sea-level rises and other disasters:
  - *Melting polar ice caps, Himalayan glaciers*: reduce reflection of sun's rays, increasing global warming.
  - *Melting permafrost in the Arctic tundra*: releases trapped methane, about 30 times more potent a greenhouse gas than CO_2 (in the short run).
  - *Tundra soil*: warming will release large amounts of buried carbon over a longer time scale.
  - *Rain forests*: when stressed by drought, they reverse the carbon cycle (incl. by wildfires) and release CO_2 instead of absorbing it.
  - *Oceans*: major absorbers of CO_2, but their warming reduces this stabilising capacity.

Climate tipping points, from Lenton et al. 2019



A. Amazon rainforest: frequent droughts, fires, reversal of carbon cycle.

B. Arctic sea ice: ice loss accelerating, reducing solar reflection.

C. Atlantic circulation: slowdown since the 1950s.

D. Boreal forests: fires and pests increasing, potential reversal of carbon cycle.

F. Coral reefs: large scale die offs.

G. Greenland ice sheet: ice loss accelerating.

H: permafrost thawing, releasing methane, Palaeoclimate evidence of vulnerable permafrost during times of low sea ice, Vaks, et al. 2020

I. West Antarctic ice sheet: ice loss accelerating.

J. Wilkes Basin in East Antarctic ice sheet: ice loss accelerating. Note sea-level rise from ice sheet losses.

Any stabilising mechanisms?

- Oceans provide temporary stabilisation by absorbing much of temperature rise.
- They release more water vapour, increasing cloud cover, potentially increasing solar reflectivity?
- But the opposite effect is more likely: increased cloud cover reduces radiation of heat during the night, so net effect is amplifying.
- As northern hemisphere warms, growing conditions there improve, increasing CO_2 absorption. But increased lightening storms increase the incidence of wild fires in the boreal forests.
- Uncertainty about the effects of decline in atlantic circulation "Atlantic Meridional Overturning Circulation" (AMOC): it lowers temperatures in the Northern Hemisphere, but raises them in the Southern. Most likely "acts as a mediator transmitting cascades", Wunderling et al. 2021
- Key point: **level** of CO_2 and other greenhouse gases is crucial, and this level decays very slowly. We need not just reduce emissions, but stabilise the level. The sixth Great Species Extinction would be irreversible.

Similarities:

- Highly non-linear feedback loops in both.
- Enormous spill-over effects.
- Negative externalities resulting from human behaviour.
- Special interests corrupted both financial regulation and climate regulation and spread distortions of facts.
- Poor people suffer disproportionately.

Differences:

- financial accelerator concentrated in key economies, with most severe impact on financialised affluent countries; the climate accelerator is global, with medium term impact on many of the poorest countries.
- Time scale very different: months for the financial accelerator, decades and eventually millennia for the climate accelerator.
- Myopia by policy makers is therefore even more disastrous for the climate accelerator than for the financial accelerator.

Links between the climate crisis and financial crises

- Before the GFC, in April 2008 the IMF World Economic Outlook wrote: “Climate change is a potentially catastrophic global externality and one of the world’s greatest collective action problems……The costs of policies to address climate change can be contained by ensuring that mitigation policies are well designed. It will be crucial to aim at a framework that is sustainable and provides incentives for a broad country participation.”
- The GFC and its aftermath deflected focus on mitigation policies, delaying necessary action on climate change.
- It reduced fiscal capacity that could have been used for ‘greening’.
- Climate change poses four major risks to financial stability, particularly via real estate:

- 1) The transition risk of large macroeconomic disruptions for economies with major fossil-fuel export sectors.
- 2) Large economic disruption through a global or regional climate shock such as a harvest failure following drought, a physical risk.
- 3)The potential damage to financial institutions lending to the real estate sector, for instance banks that are also invested in stranded assets (a transition risk) or insurance companies subject to sharply higher insurance claims (a physical risk). Amplification of such risks can occur through the financial accelerator.
- 4) The direct impact on real estate values. Global carbon pricing should lower prices of energy-inefficient real estate. Real estate values can be affected by rising sea levels, increased flooding & wildfires, heat extremes or drought making particular places ultimately even uninhabitable.
- The UN says: “Buildings and construction together account for 36% of global final energy use and 39% of energy-related CO_2 emissions when upstream power generation is included.”

Common modelling failures

- First, problems in economic policy models.
- Then, problems in Integrated Assessment Models in which economists have tried to integrate the economy and climate, e.g. for cost-benefit analysis.

NK Dynamic, Stochastic, GE: that would have been nice!

New Keynesian Dynamic Stochastic General Equilibrium models

- *Not new*, based on outdated ideas made redundant by the asymmetric information revolution of Stiglitz, Akerlof, Spence.
- *Not Keynesian*, ignoring co-ordination failures, especially between real economy and finance, hence limited for understanding financial stability.
- *Not dynamic* enough, misleading on real world lag structures.
- *Hardly stochastic* (statistical distributions), missing both radical uncertainty (time dimension) and heterogeneity (cross-section dimension) of distributions.
- *Hardly GE*, missing most of system feedbacks.
- Rational expectations and inter-temporal optimization need reformulation when structural breaks and radical uncertainty are endemic, Why DSGEs crash during crises, Hendry & Mizon, 2014.
- Linearisation around a stable long-run equilibrium excluded possibility of a financial crisis.

Current semi-structural policy models incl. FRB-US are still defective

- Impose net worth constraint as the only way asset prices, liquidity and credit shocks affect consumption, given income.
- Trivialise the role of debt relative to housing and stock market wealth.
- Ignore how shifts in credit constraints alter behaviour, so miss 'credit-driven household demand channel', Mian and Sufi, 2018.
- Lack good explanations for debt, house prices and residential construction.
- The result: cannot explain the financial accelerator and time and country variations in its impact.
- Miss major channels of monetary transmission.

Example: FRB-US model

Good on expectations, but fails in other ways:

- Amplifying feedback loops via financial system's ability to extend credit are missing, failing 2007 acid test of simulating consequences of house price fall, Mishkin (Housing and Monetary Transmission 2007 Jackson Hole).
- Unstable parameters: speed of adjustment for non-durables consumption 0.18 in 2009, 0.10 in 2015, 0.16 in 2018.
- House price equation excludes credit shifts – with weak long-run solution and very slow adjustment.
- Residential investment equation has hardly any response to house prices.
- Misrepresents lags in monetary transmission.
- Though claimed to be 'micro-founded', FRB-US is not a 'structural model' in the Cowles Commission sense.

Not easy to model finance-real economy transmission

- Need model for bank balance sheets, capital adequacy and other regulatory ratios, non-performing loans (NPLs) or loan-loss provisioning.
- Potentially need non-linearities and interaction effects to allow for possibility of bank runs & within finance spill-overs.
- The banking sector model needs to generate credit pricing, non-price credit conditions and bank lending.
- Need private sector equations for debt, asset prices & portfolio composition, given credit pricing and non-price credit conditions.
- Capturing the credit cycle is important both for macro-prudential and monetary policy:
- ***Need to capture two-way connection between credit conditions and NPLs: a period of easy credit conditions, resulting in lax lending criteria, tends to create financial vulnerability among borrowers and potentially among lenders, particularly if followed by an economic downturn.***
- ***Then, rising NPLs and loan-loss provisions result in a reduced ability and willingness of banks to extend credit, resulting in tighter credit conditions that amplify the downturn in the economy.***

- Some economists (e.g. Nordhaus), working with approx. linearised climate 'Integrated Assessment' models, proxy future impact of global warming by the relationship between temperature and GDP today & assume that climate tipping points have very low probability. They have argued that 3^0 C or even 3.5^0 C warming is optimal!

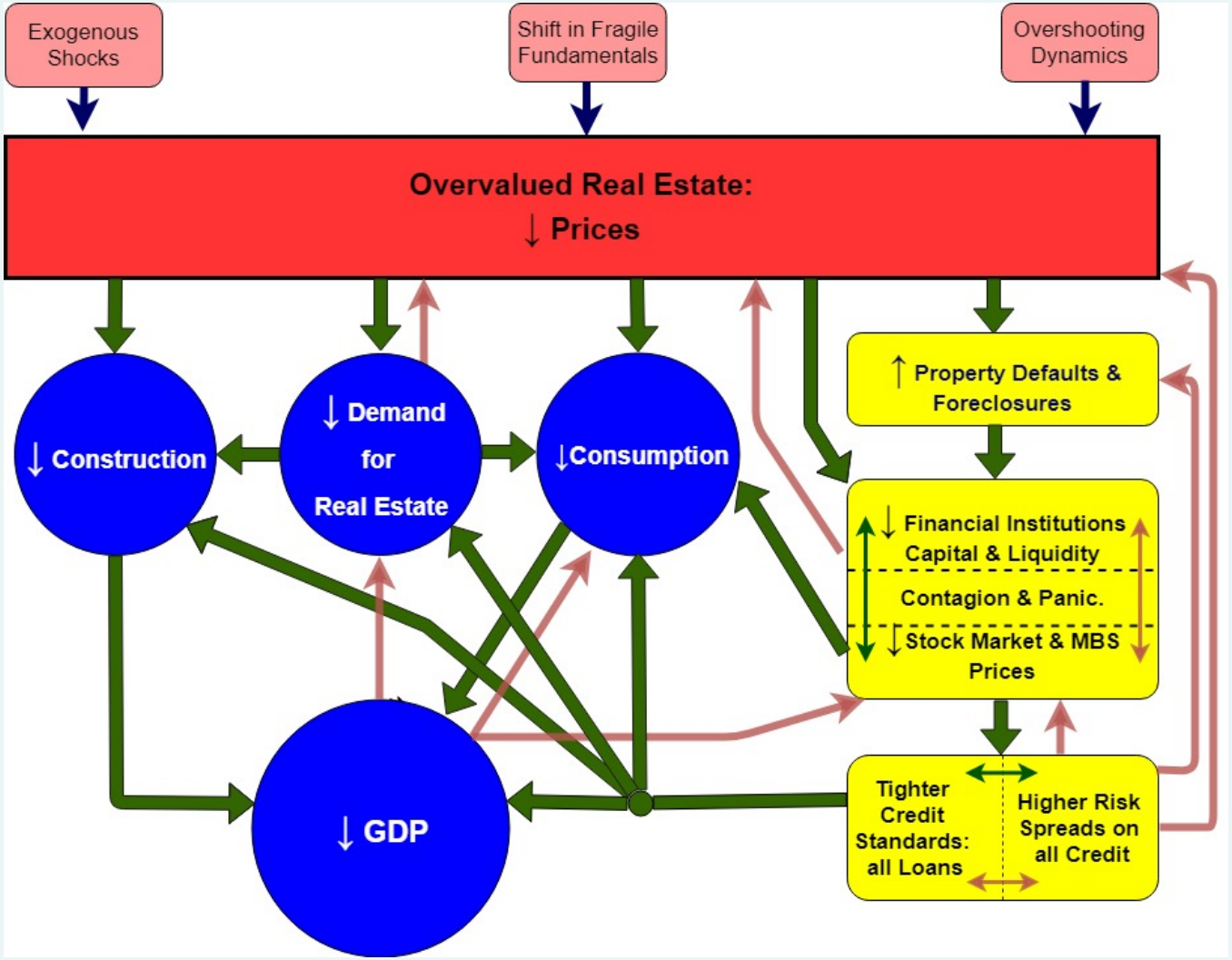
- Asefi-Najafabady et al. 2021 point out 6 failures in simpler integrated assessment models:
- The rational (model-consistent) expectations assumption.
- Omission of complexities, nonlinearities, non-convexities, tipping points, and uncertainties.
- IAMs Earth & Human Systems do not feedback on each other.
- The representative agent assumption in the economic model when heterogeneity rules.
- Using social discount rates based on individualistic consumer behaviour.
- Assumptions on production: exogenous technical progress – no adaptation to climate & no learning by doing; simple capital & labour production function with a penalty term to capture environmental degradation, typically underplaying risk.

Better climate models needed

- Current IPCC reports suggest that tipping points could occur at temperatures as low as 1.5^0C.
- Melting ice sheets are probably the most serious, and in interaction with other tipping points, can generate major instability, see Wunderling et al 2021.
- But Wunderling did not include melting permafrost, see Vaks et al. 2020, among their potential interactions, so under-estimate risks.
- Major model uncertainty about timing, particularly concerning how shifting AMOC interacts with other tipping points.
- Lenton et al. 2019 say:
- “To address these issues, we need models that capture a richer suite of couplings and feedbacks in the Earth system, and we need more data — present and past — and better ways to use them. Improving the ability of models to capture known past abrupt climate changes and ‘hothouse’ climate states should increase confidence in their ability to forecast these.”

- The initial shocks differed, the financial system was better capitalised, and most households were not overly indebted (unlike in US Great Recession).
- There was a very quick and broad set of economic policy responses.
- (a) use of unconventional and conventional monetary policy to lower long-term interest rates;
- (b) imposition of moratoria on foreclosures/home repossessions and renter evictions;
- (c) aggressive modification of mortgages to prevent defaults;
- (d) large transfer payments to households, the unemployed and furloughed workers, coupled with significant credit support to firms.
- Covid-related relative rise in the demand for detached housing (and space in general). Extrapolative expectations of house prices amplified rises.
- On the supply side, lockdowns, supply chain disruptions, and labour shortages reduced the supply of new housing.

Real estate and monetary transmission: adapt the picture for a monetary policy shock



Previous discussion about institutional differences applies

- **Strength of LHS transmission** depends on:
  - Responsiveness of construction to higher real estate prices (land-use planning system, structure of building industry).
  - Responsiveness of real estate demand to expected returns: depends on gearing, tax system and degree to which investors *extrapolate* recent gains.
  - Gearing depends on regulation, tax incentives, perceived risk.
  - Responsiveness of consumption to higher house prices: depends on access to home equity loans, ease of refinancing and severity of down-payment constraint
- In addition, need to consider direct (not mediated via real estate) effects of higher interest rates on aggregate demand: standard real interest rate effect plus cash-flow effect.
- Evidence mounts for a *cash flow channel*, Jackman & Sutton (1982): in floating interest rate environments, households with large mortgage debts increase their spending more strongly when rates fall, than savers cut their spending
  - micro in La Cava et al. (2016) on Australia, Cloyne et al. (2016) for UK; Crawley and Kuchler (2020) for Denmark; macro for UK in Aron et al. (2012).

- In the rent arbitrage model, the value of a home is merely the discounted present value of future rents, see Duca et al. 2021
- The theory is based on perfect arbitrage between rents and house prices, which, under strong assumptions, implies that the price-to-rent ratio moves one-for-one with the inverted user cost of housing.
- This implies that the log house price-to-rent ratio equals minus log user cost (tracked by an after-tax nominal mortgage rate minus a proxy for the expected rate of house price appreciation).

Why it fails:

- Owner-occupied properties, which dominate US house price indices, have more land per occupant than rentals, hence not perfect substitutes.

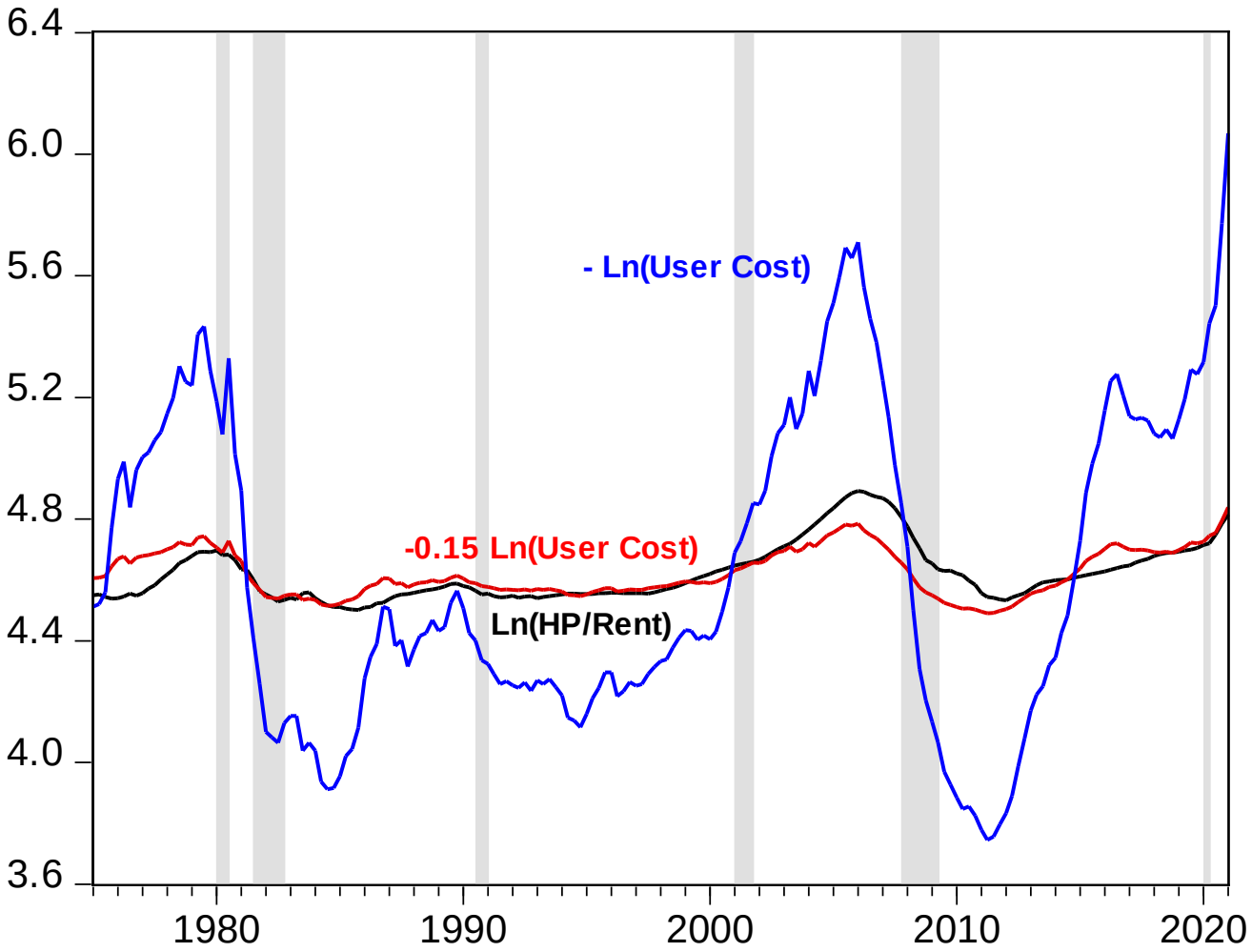
- Rents are far 'stickier' & less sensitive to highly cyclical land prices.

- Other factors include differences in the characteristics of renters, & the unobserved costs and benefits of owning versus renting.

- Large transaction costs, risk aversion, and the volatility of house prices make it hard to arbitrage between renting and buying.

- Credit constraints drive a wedge – the shadow price on the constraint- into arbitrage model. Implies that non-price credit conditions matter.

U.S. House Price-to-Rent Ratio Violates the Unit User Cost Elasticity of Rent- Arbitrage Model



Inverse demand model for hp in France

- Since housing stock adjusts very slowly, invert demand equation to find real house price index as function of demand shifters and lagged housing stock.
- Key factors in France, Chauvin and Muellbauer (2018), are log nominal mortgage rate, mortgage credit conditions, income per house, log user cost, momentum spill-over effects from other countries, and demography.
- Mortgage credit conditions are estimated as a latent variable in a 6-equation model for house prices, consumption, mortgage debt, non-mortgage debt, liquid assets and permanent income.
- Log user cost enters in interaction with mortgage credit conditions: higher gearing makes expectations of appreciation more relevant
- Since income elasticity of demand for housing is approx 1, elasticity of aggregate real hp w.r.t. income per house = -inverse of price elasticity, around 2 in France, near 1.2 in Germany.
- Previous aggregate house price models for France are hopeless: unstable and absurd parameter estimates.

- Contribute new equations for the core macro-econometric policy model for house prices, mortgage debt, residential construction and loan-loss provisions.
- Aron and Muellbauer (2013) estimated a credit-augmented consumption function for SA showing relevance of income, permanent/current income, credit conditions, disaggregated household balance sheets – liquid assets, debt, illiquid financial assets and housing wealth, interacting with credit conditions.
- This is consistent with a collateral interpretation of the housing wealth effect, important in SA where equity withdrawal is easy.
- This research helps to place SA on the spectrum of variations across countries in the role played by real estate in monetary transmission and analysis of financial stability -nearer the US and the UK than Germany or France.

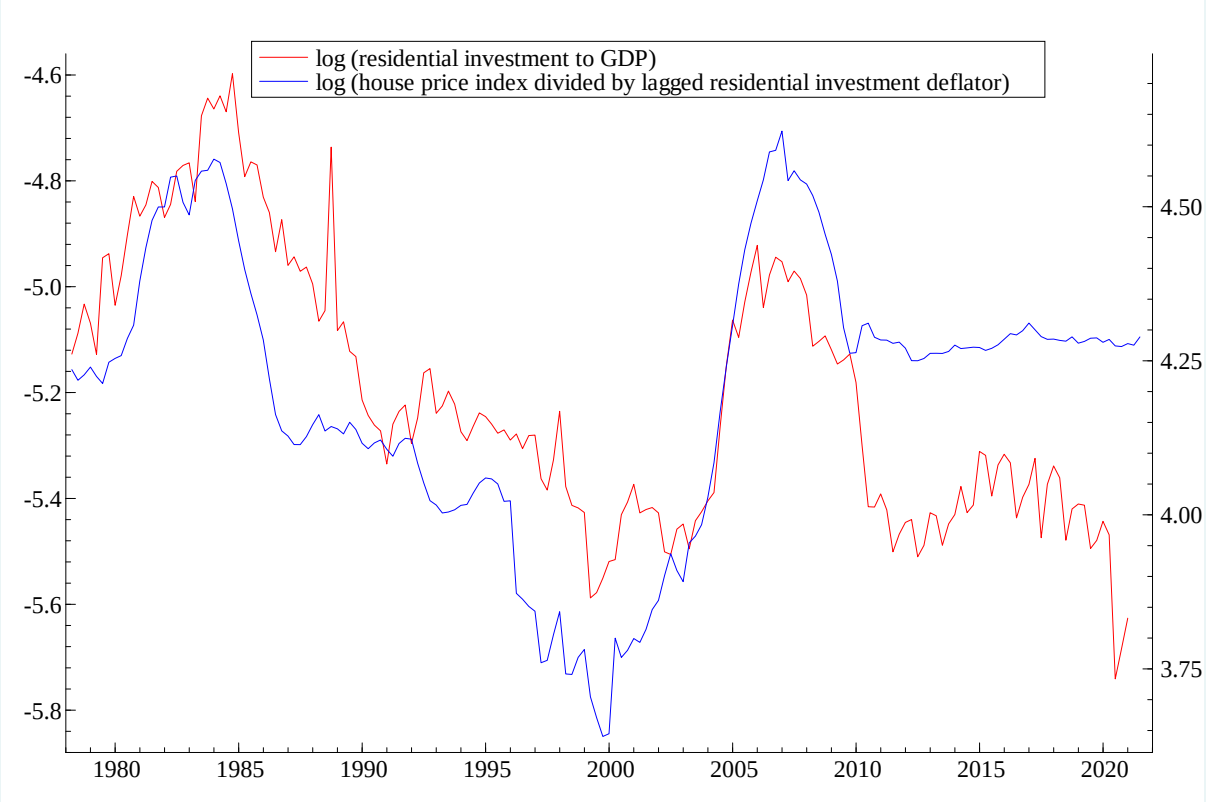
- SA has data back to around 2000 on the mortgage rate spread relative to the prime rate (which moves in step with the base rate), and the average loan-to-value.
- The mortgage rate spread is a good indicator of credit conditions and a major driver of house prices.
- Other determinants in the long-run solution are log income per house with elasticity of 1.6, log user cost and its interaction with the lagged LTV – the effect of gearing, and the log rate of property tax. The quarterly speed of adjustment is 0.17.
- House price expectations in user cost are given by the average annual appreciation over the last 4 years, as in Duca et al. (2016) for the US.
- Short-run dynamics include previous quarter's house price appreciation, lagged changes in nominal and real prime interest rate, lagged inflation, lagged exchange rate appreciation –possibly a sign of confidence or a proxy for capital inflows.

Mortgage debt equation

- Long run solution for log mortgage debt/income is driven by log hp/income (+), real prime rate (-1), log non-mortgage debt/income (-), lagged LTV (+).
- Speed of adjustment 0.055.
- Short-run dynamics includes rate of acceleration of population (+), real income growth rate (+), rate of inflation (-)
- But only one major turning point in mortgage debt/income in 2001-2020, so that robustness is an issue.
- General to specific model selection aided by priors based on previous research.

Residential investment equation

- Consistent with OECD paper by Cavalleri et al. (2019): key driver is ratio of house prices to construction costs.



Stable equation 1978Q1 -2020Q1

- Speed of adjustment 0.3 per quarter (t=8.5) in South Africa.
- Supply elasticity of residential investment w.r.t. ratio of house prices to construction costs= 0.95. Higher than most of Europe (Cavalleri et al. 2019), but lower than US.
- Short-run dynamics include population growth, real income growth and annual change in nominal prime rate of interest.
- The implication for monetary transmission: strong effects of interest rates and credit conditions on house prices in South Africa also transmit to this volatile element of aggregate demand.
- Moderation in residential investment as population growth fell with the AIDS epidemic.

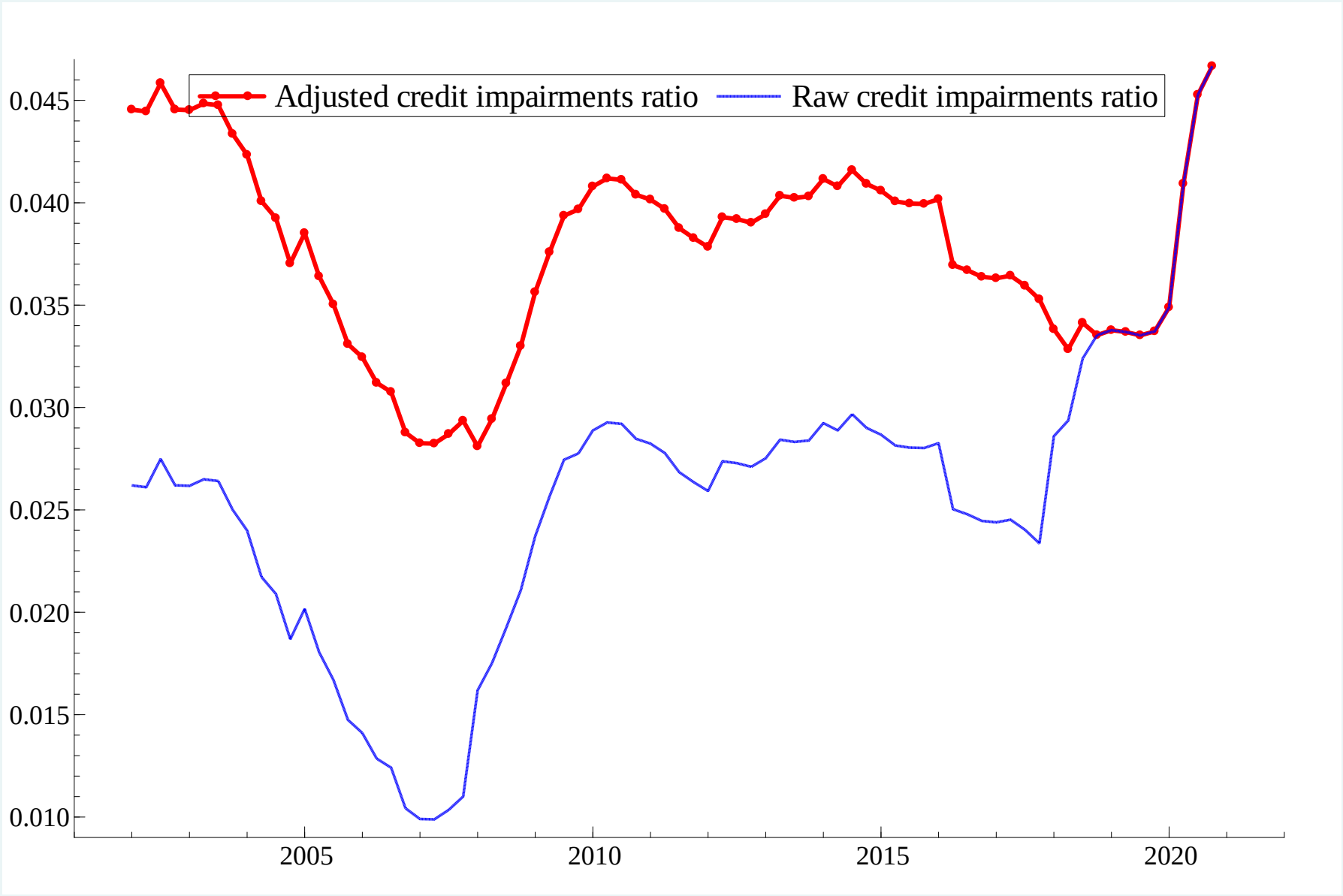
Two-way connection between credit conditions and NPLs or loss provisions

A period of easy credit conditions, resulting in lax lending criteria, tends to create financial vulnerability among borrowers and potentially among lenders, particularly if followed by an economic downturn.

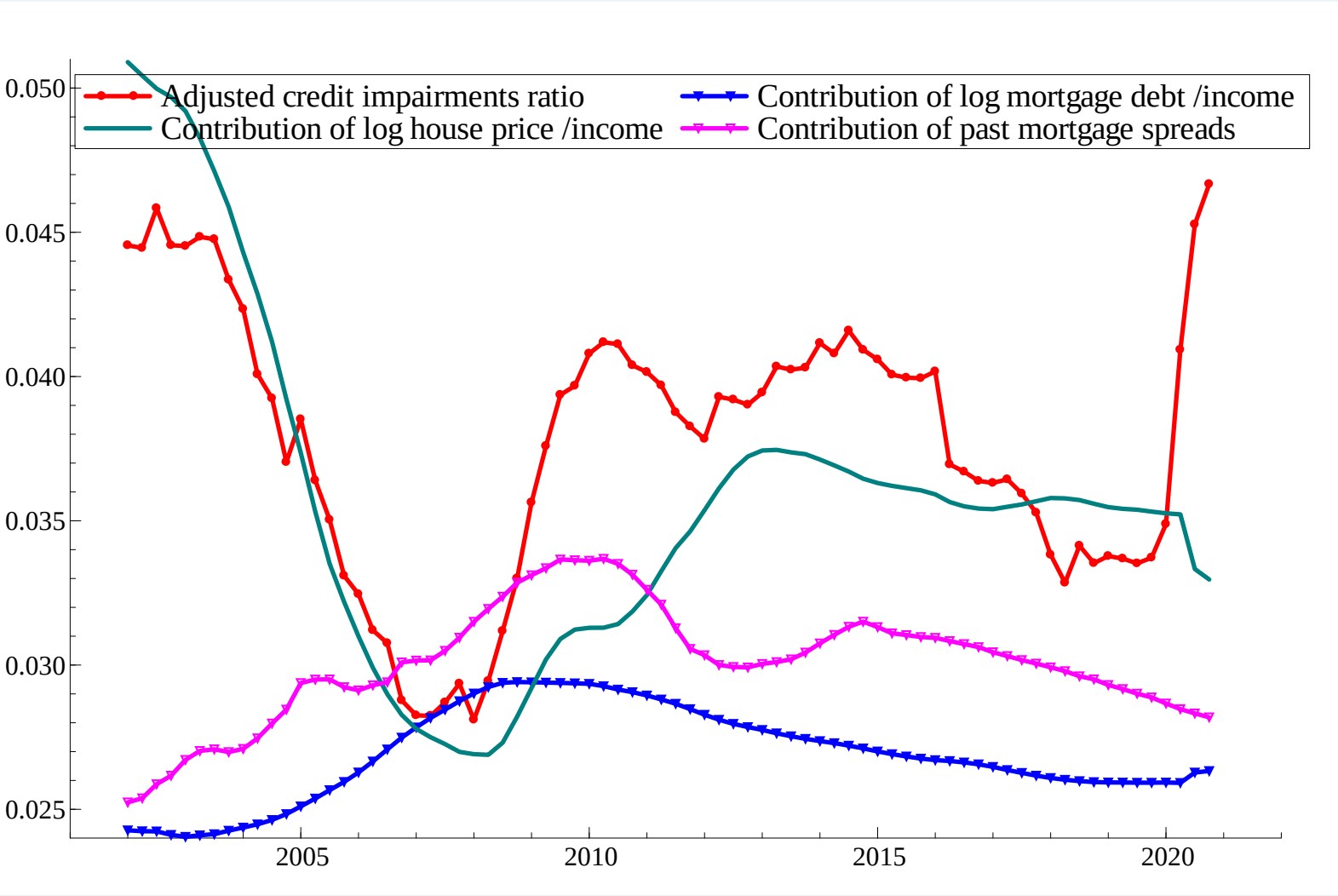
An equation for loan-loss provisions for 2002Q1 to 2020Q1.

- Shifts in loan-loss provisioning in 2008 with Basel II and in 2018 with the shift in accounting rules from IAS39 to IFRS9 were handled using step dummies.
- The long-run solution for credit impairments/gross loans and advances (CIR) is driven by three variables: log mortgage debt-to-income ratio , the log house price-to-income ratio and long lags in the proxy for mortgage credit conditions: moving averages of the mortgage interest spread.
- They suggest that lax lending criteria over the previous three years are a major cause of high levels of CIRs.
- The short-term dynamics include the growth rate of real GDP per head in the previous two years.

Credit impairments (provisions) ratio adjusted for Basel II shift in 2008 and IFSR9 in 2018

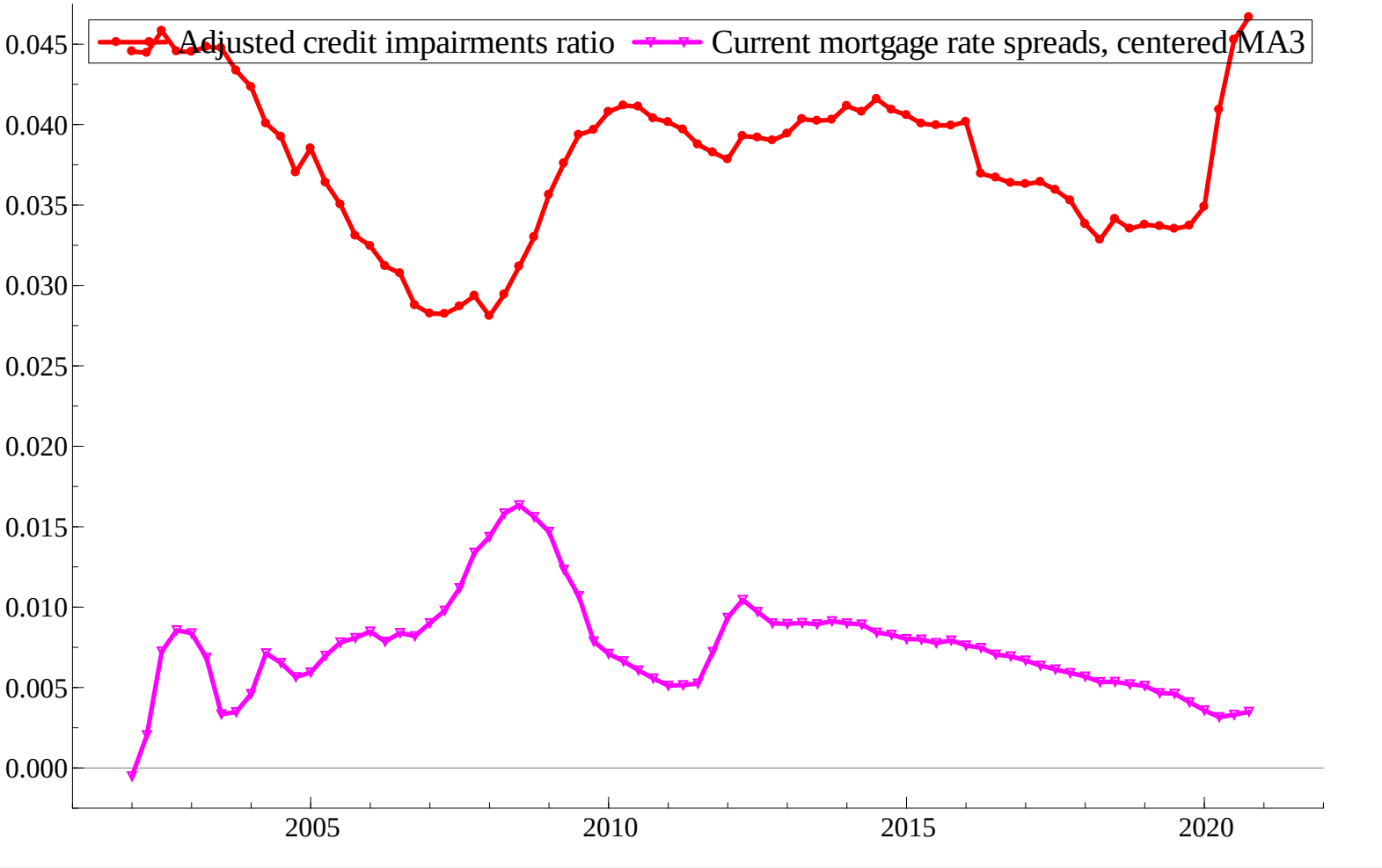


The credit impairment ratio and its drivers

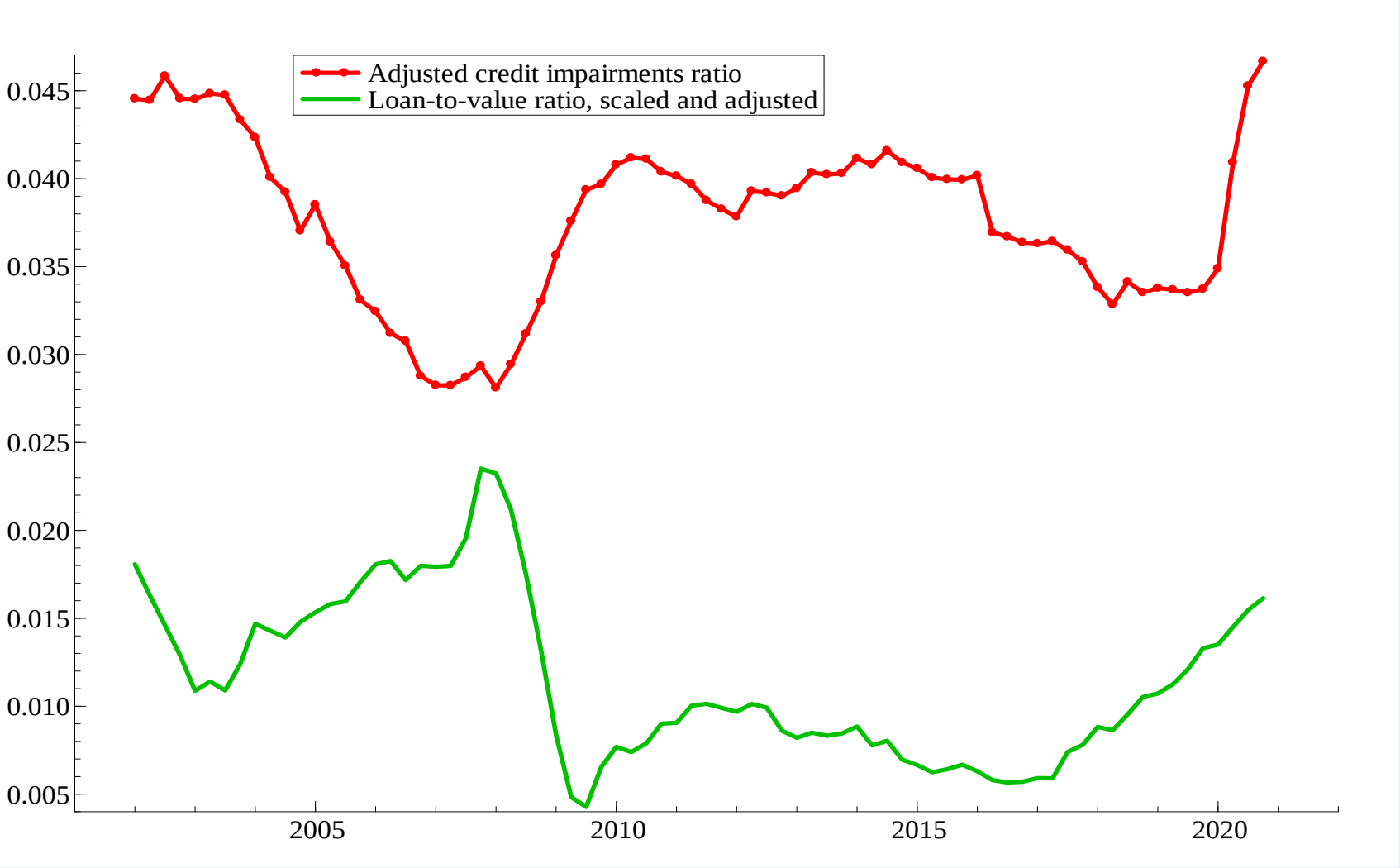


Rising NPLs and loan-loss provisioning result in a reduced ability and willingness of banks to extend credit, resulting in tighter credit conditions that amplify the downturn in the economy.

Mirror image from 2004-2014 between CIR and mortgage spread



Mirror image from 2004-2014 between CIR and LTV



- Even without a serious banking crisis (tough regulation, concentrated banking sector with high profit margins), real estate was deeply involved in a very pronounced credit cycle in SA.
- We locate South Africa closer to the US and the UK than Germany or France in the international spectrum of relevant institutional characteristics for the role of real estate in the financial accelerator and monetary transmission.
- Looking ahead, given potential transmission of climate risk to financial stability, in part via real estate, coal-dependent SA is especially vulnerable.