Long waves in external imbalances, credit growth and asset prices: an historical perspective on global financial crisis

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Financial stability and financial crisis

The problem of financial instability, especially that of financial and banking crises, and twin crises has been a major issue in recent decades.

- On the empirical side the attention is focussing on the issue of financial crises from an historical perspective through the comparative economic history approach.
- On the theoretical side we assist to a renewed interest in Minsky's (1977) financial instability hypothesis given the failure of the equilibrium approach of mainstream economics.

Macrofinancial history approach

Global financial crises are "rare events"

- New research on macroeconomic crisis uses an historical perspective:
  - - Reinhart and Rogoff (2009) have catalogued panel data on public debt and the link to economic performance. Examine association between housing booms, current account deficits, and financial crises
  - - Systematic study of financial instability in 14 advanced economies from 1870-2008 (Jord, Schularick, Taylor, 2011, 2013; Schularick and Taylor, 2012). Focus is on money vs credit and the interaction of private sector credit with the macroeconomy.

Empirical risis as "credit booms gone bust"

Main findings from research in macrofinancial history: acceleration of credit growth is the best early warning signal for crises, external imbalances/public debts are a distraction

- Past private credit growth does contain valuable predictive information about likelihood of a crisis - Schularick and Taylor (2012)
- the role of current account imbalances less clear cut - Jord, Schularick and Taylor (2013)
- "global financial cycle" in international financial markets between gross capital flows, credit growth and asset prices - Miranda-Agrippino and Rey (2012) and Rey (2013)

Summing up: wide consensus on the role of credit booms for financial crisis events, more debate on the role of global imbalances

Long swings and Minsky's FIH

- Financial crises are extreme manifestations reflecting endogenous changes in the stability of the financial system (Minsky, 1975, 1986, Kindleberger, 1978)
- Endogenous tendency of market deregulated economies to instability reflected in long-term swings in financial variables (Minsky, 1964, 1995, Ferri and Minsky, 1992)
- Financial instability generated by changes in financial fragility at systemic rather than individual level occurring during the expansion phase of a long swing with implications for the stability of the financial system

Aim of the paper

In this paper we aim to:

- - detect those changes that take place in key economic and financial variables over long-swing expansions and contractions
- - shed light on the role of external imbalances and credit growth at global level by identifying, if any, those regularities, in terms of sequence of events, in the run-up to global crisis episodes
- - provide an early warning signal of the risk of global crisis episodes

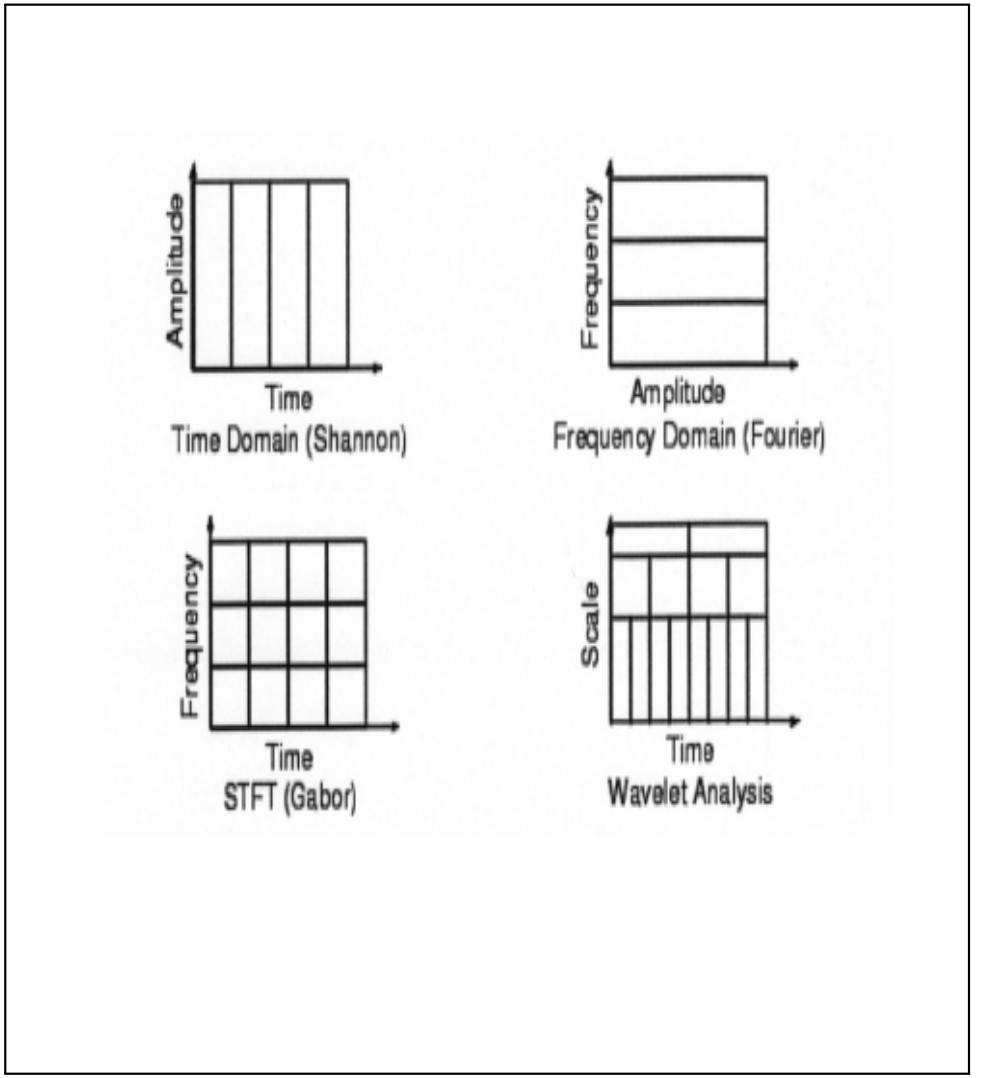
Detecting long waves in historical time series

- Structural breaks, in the form of abrupt changes, jumps, and volatility clustering, are an intrinsic feature of long-term historical data (several war episodes, especially the two WWs, and crisis periods)
- Corrections can be required for:

  - war periods, by interpolating series for the war years (Metz, 1992) or a priori elimination of the impact of the war periods (Korotayev and Tsirel, 2010), but we should avoid the practice of studying history by erasing part of the history (Freeman and Louca, 2001)
  - non-stationary series, by applying detrending methodologies, although one is in the realm of detrending methods

Detecting long waves in historical time series

- - Spectral analysis ..... but it needs to assume stationarity of the series
- Band-pass filtering methods (BK, CF, etc.): results depends on the assumption about the specific class of model
- wavelet multiresolution decomposiiton analysis.



Wavelets in brief: features and properties

- Wavelets are mathematical functions localized both in time and frequency that that are used to decompose a function $f(x)$ (a signal, a surface, a series, etc.) into different frequency components *each with a resolution matched to its scale*;
- They are small waves defined over a finite domain, as they begin at a finite point in time and die out at a later finite point in time;
- Local errors in computing the function determine only local errors in wavelets;
- May deal with both stationary and non-stationary data as well as with complex functions.

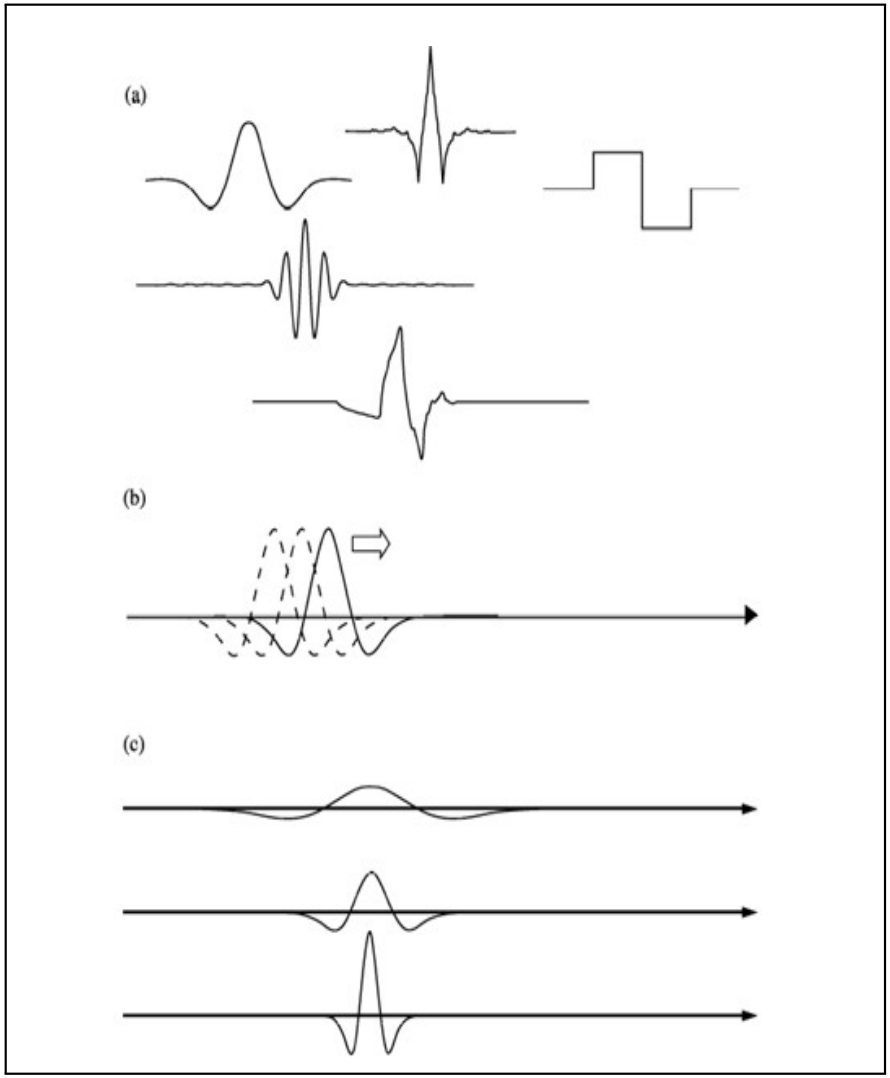
Wavelet transform: translation and dilation

The wavelet transform is the projection of a signal, $f(t)$, onto a wavelet basis function ψ (a) via

$$w(u,s) = \int_{-\infty}^{\infty} f(t)\psi_{(u,s)}(t)dt$$

$$\psi_{(u,s)}(t) = \frac{1}{\sqrt{s}}\psi(\frac{t-u}{s})$$

where the wavelet basis ψ is a functions of two parameters s and u, which are called the dilation (c) and the translation (b) parameters, respectively.



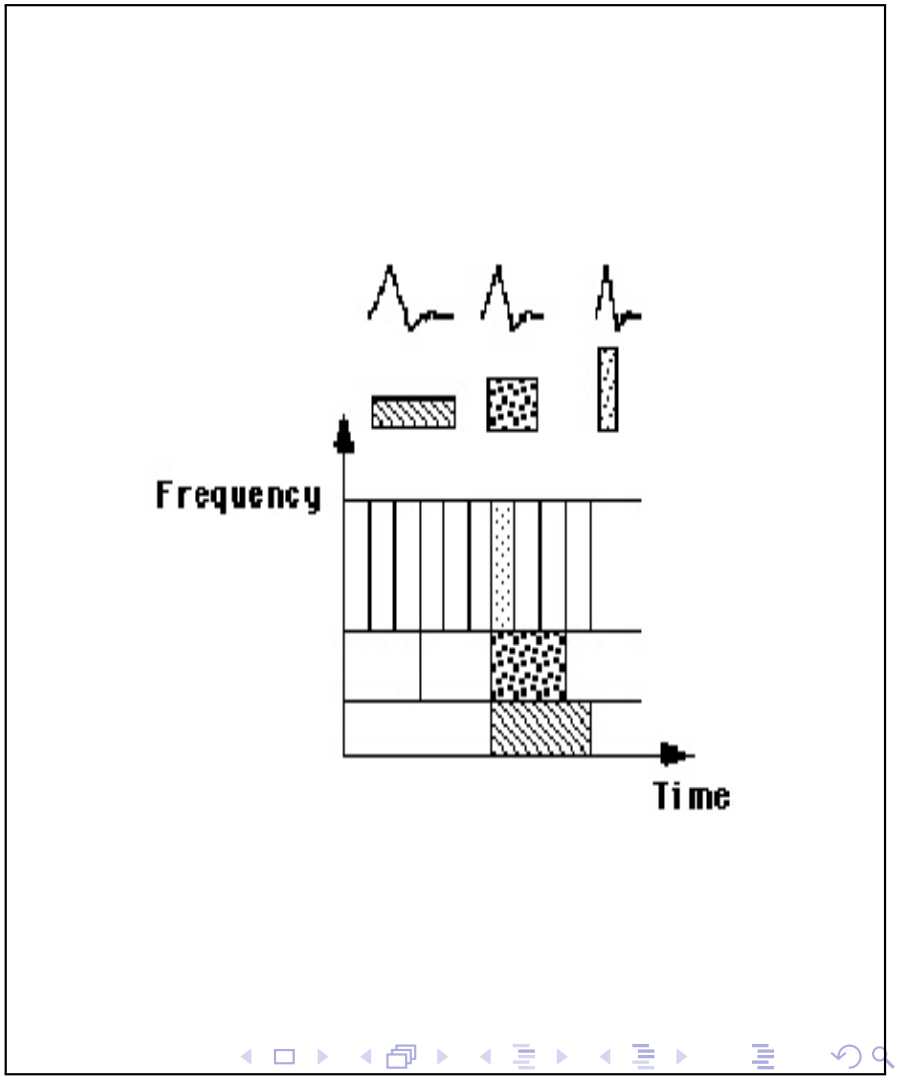
Multiresolution properties of wavelet decomposition analysis

Multiresolution approach uses

- short windows at high frequencies (good time resolution)
- long windows at low frequencies (good frequency resolution)

This means:

- at high frequencies focus on short-lived phenomena
- at low frequencies allows identifying long periodic behavior



Wavelet multiresolution decomposition analysis

The following equation indicates what is termed the multiresolution decomposition, MRD:

$$f(t) \approx S_J + D_J + D_{J-1} + ... + D_2 + D_1$$

where

$$D_j = \sum d_{j,k}\psi_{j,k}(t)$$
$$S_J = \sum s_{J,k}\phi_{J,k}(t)$$

S_J contains the "smooth component" of the signal, and the $D_j, j = 1, 2, ..J$, the detail signal components at ever increasing levels of detail

Frequency domain interpretation of MRD and long waves

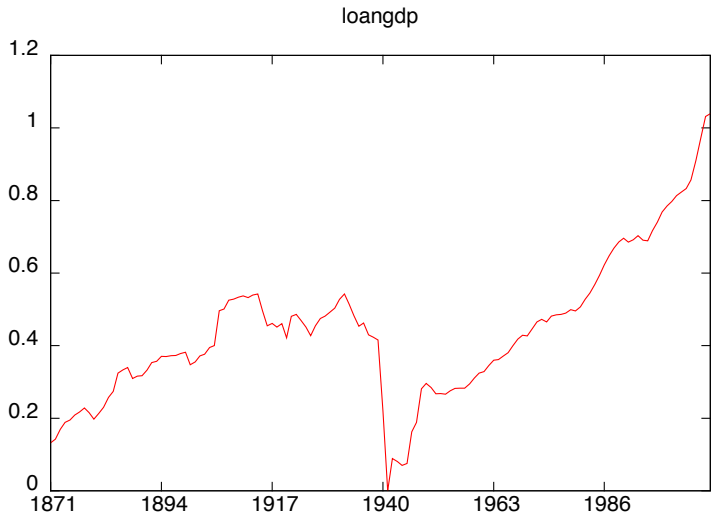
Scale level J	Detail level D_j	Annual frequency resolution	Average cycle length
1	D_1	2-4	3
2	D_2	4-8	6
3	D_3	8-16	12
4	D_4	16-32	24
5	D_5	32-64	48

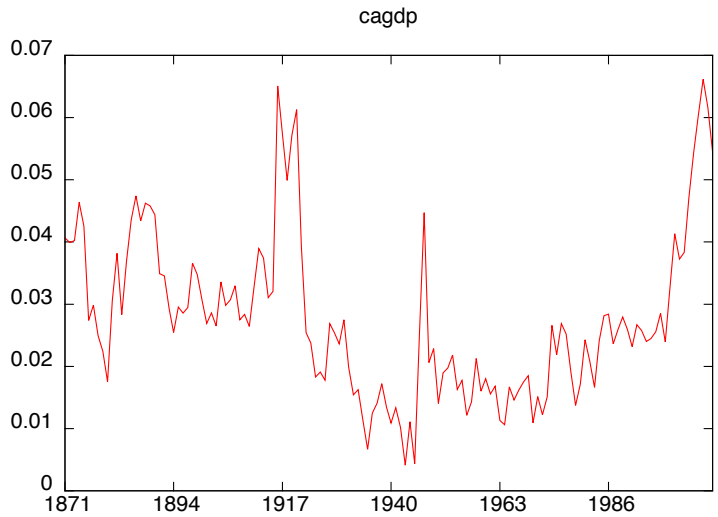
The time-frequency decomposition provided by the (discrete) wavelet transform decomposes a time series into different time scales, each associated to a specific frequency band. Long waves corresponds to D_5 detail components.

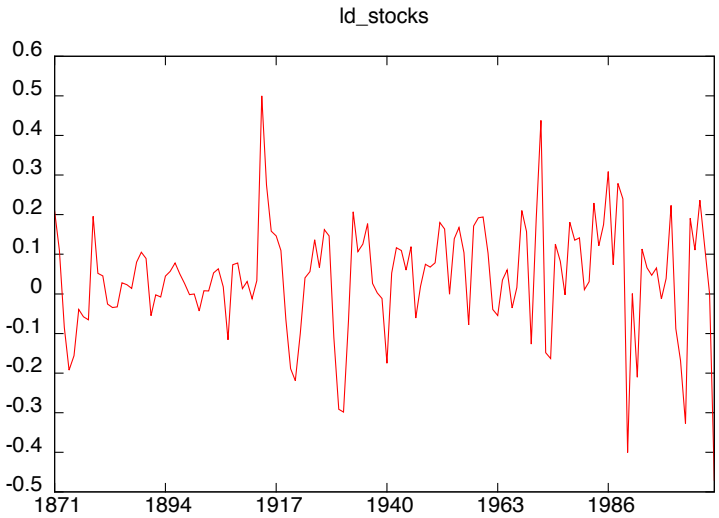
Dataset

- The dataset from Schularick and Taylor (2009) and Jorda et al. (2011) covers 14 countries over the years 1870-2008.
- The countries included are the United States, Canada, Australia, Denmark, France, Germany, Italy, Japan, the Netherlands, Norway, Spain, Sweden, Switzerland, and the United Kingdom
- Average values (mean absolute values for CA/GDP) of the following variables are examined: Total bank Loans/GDP, Current Account/GDP, Asset price returns
- Apply Maximal Overlap Discrete Wavelet Transform (MODWT) with a level of decomposition $J = 5$
- Restrict our analysis to the D_5 wavelet detail level because the frequency range we are interested in for the analysis of long wave cycles is between 32 and 64 years (average cycle is 48 years).

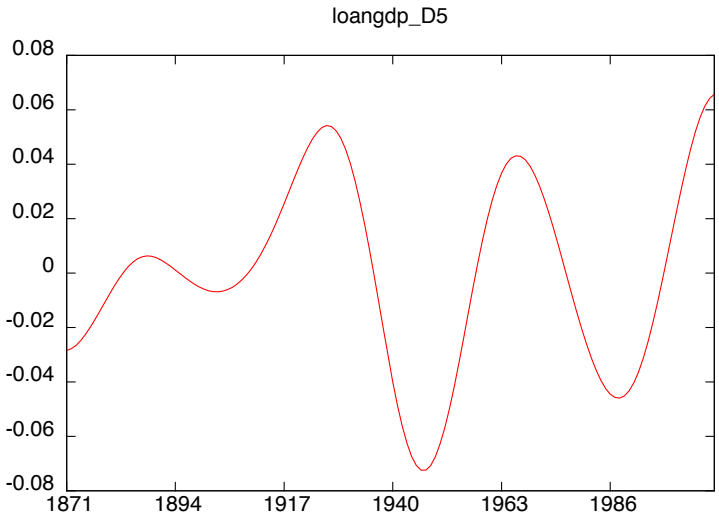
Average values for the 14 countries of the sample

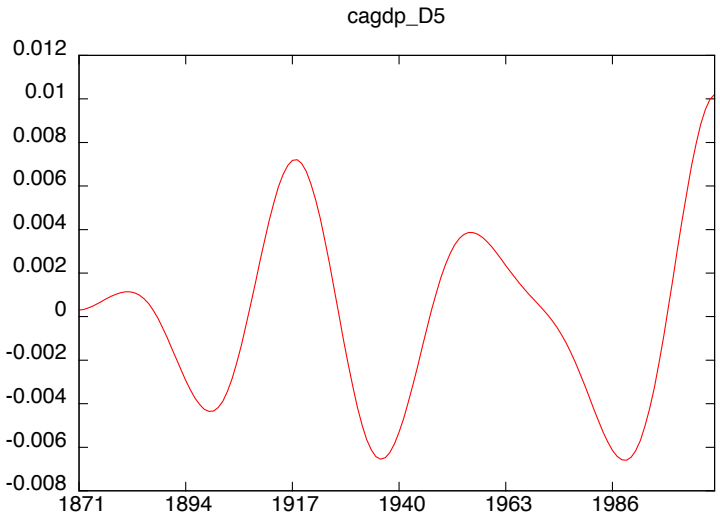


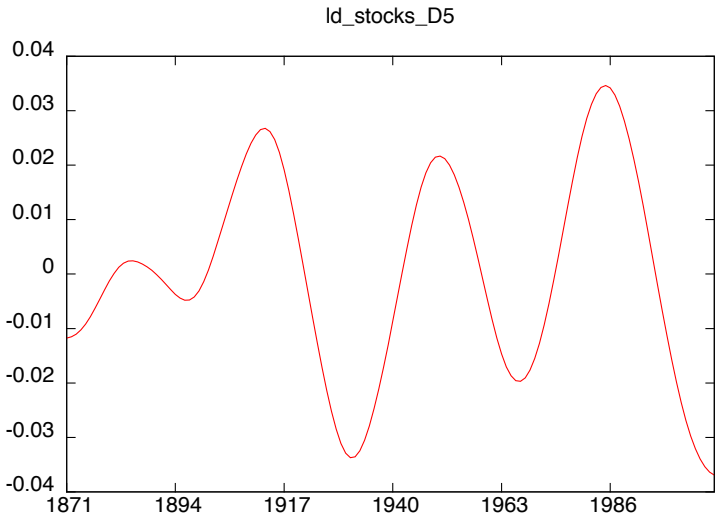




Long wave components







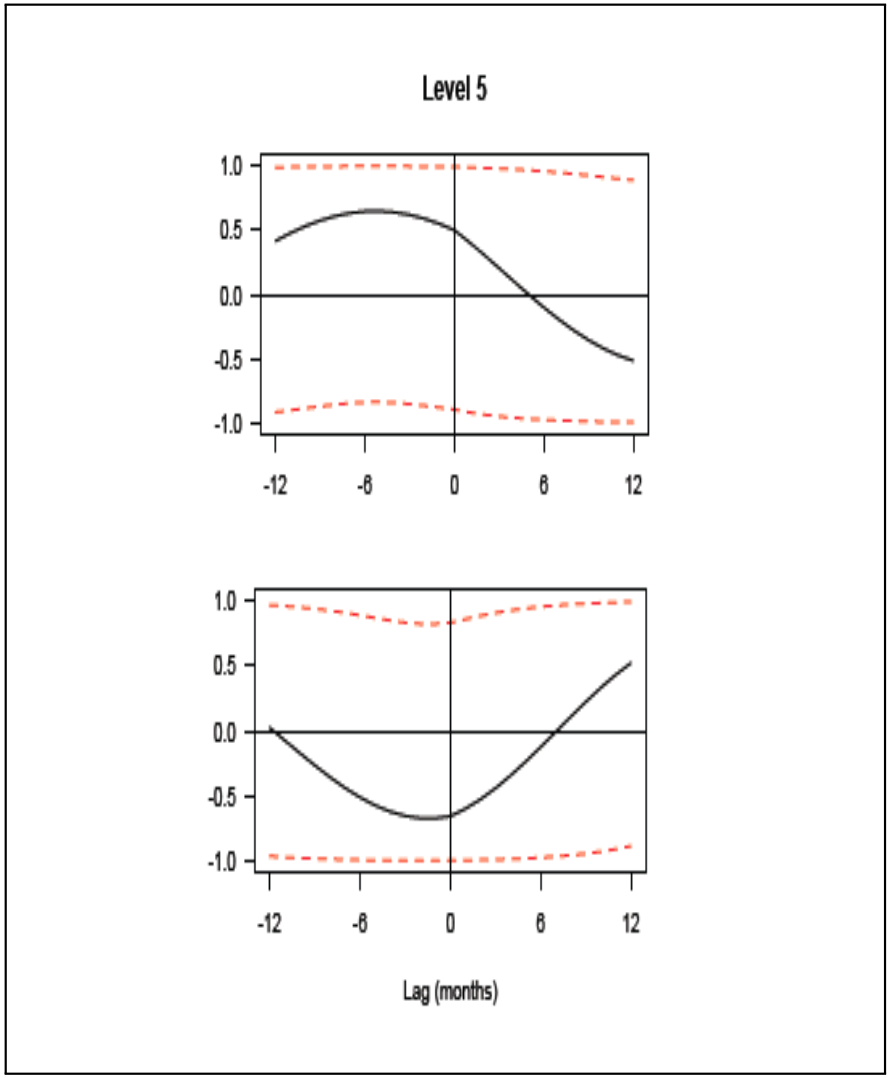
Long wave patterns: narrative chronology

- Widening imbalances and excessive variations tend to cluster around four periods: 1880s-1890s, 1920s-1930s, mid1950s-mid1960s and late 2000s.
- Close correspondence with the four historical episodes of global crisis identified at international level (Bordo, ..., Jord et al., 2013)):

- the Baring crisis, early 1890s;
- the Great Depression, late1920s-early 1930s;
- the collapse of the Bretton Woods system, late60s-early 1970s;
- the recent global financial crisis, late 2000s.

Long wave patterns: statistical regularities

- We investigate the statistical association between long-term components using wavelet cross-correlation analysis
- CA/GDP ratio and Credit/GDP ratio (top); Credit/GDP ratio and asset price returns (bottom)



Early warning composite indicator of global crisis

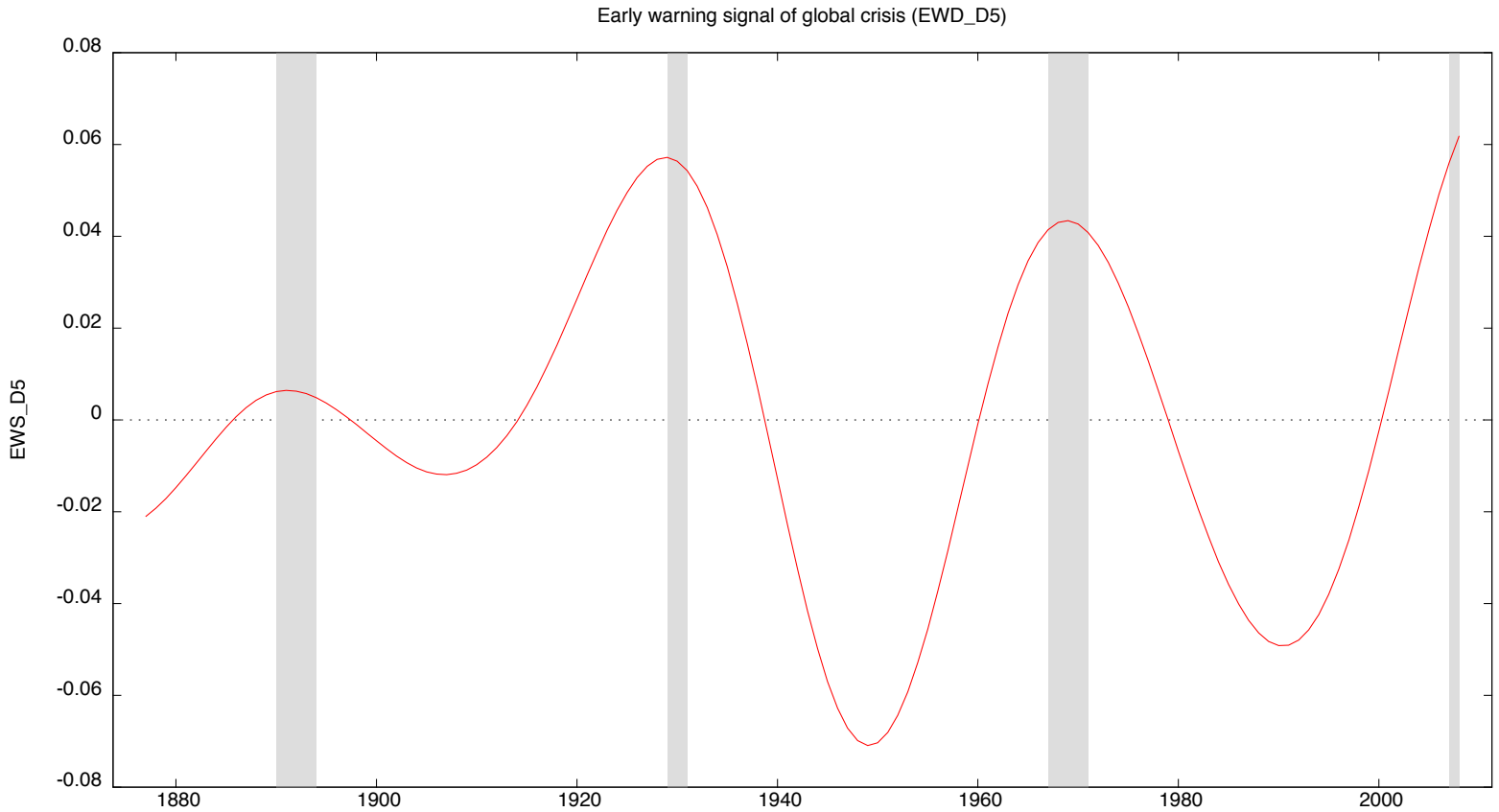


Figure: Components: credit/GDP ratio, CA/GDP ratio and asset price returns

Summary of the main findings

- We provide historical evidence of a recurring sequencing pattern among long wave components where credit booms are preceded by growing external imbalances, and crisis events occur at the low end of the contraction phase of asset price returns.
- A composite indicator based on the long-term components of external imbalances, credit growth and asset price returns is useful in providing early warning signals of rising financial instability at systemic level and approaching global crisis episodes

Implications for current controversies

- Controversy about the role global imbalances and lending booms: the phase shift between external imbalances and credit boom can explain, on the one hand, the greater significance of the credit boom with respect to external imbalances (Jorda et al., 2013) through an "attenuation effect", and, on the other hand, the usefulness of widening imbalances as early warning signals of rising financial instability risk (Reinhardt and Rogoff, 2009).
- "this time is different" syndrome: the recent crisis is different because of the tendency of excessive credit growth and widening external imbalance to go hand in hand. Thus, in a globalized world with free capital mobility the risk of financial instability is likely to be signaled by the "in-phase" rise of the indicators.

Policy implications

- Large and persistent current account imbalances deserve close monitoring by policymakers because, by providing liquidity to the system and fueling credit booms, they can be an indicator of troubles ahead
- The exception of Bretton Woods: the fixed exchange rate regime and the set of capital flows restrictions seems to have limited external imbalances and credit growth and preserved financial stability. Should we contrast financial deregulation and/or restrict capital movements in order to reduce the risk of major financial crisis?