

Business Cycles, Credit Cycles and Bank Holdings of Sovereign Bonds: Historical Evidence for Italy 1861-2013

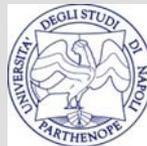
by

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Introduction:motivation

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- The financial crisis has prompted empirical and theoretical research aiming at capturing the interactions between the financial and the real side of the economy.
- The goal of our paper is to contribute to this literature, by investigating the empirical regularities of this interaction in a historical perspective in Italy.
- The relatively infrequent nature of major financial and credit distress events make a historical approach to these issues particularly useful.

Introduction: background

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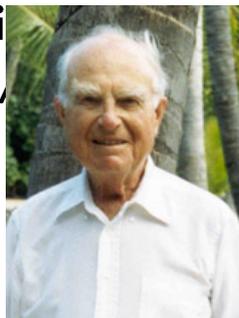
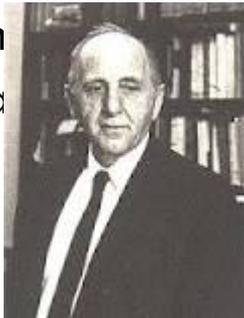
- A renewed interest in correlations between macro-variables across broad ranges of countries and time periods, as in Reinhart and Rogoff (2009) Claessens et al. (2011), Schularick and Taylor (2012).
- Our work is close to these papers, but greater attention is given to all business cycles, not just those associated with crises, giving a broader picture of the relations between financial and real variables.
- We look at one country only, so we are able to provide more details on the institutional and historical factors at work in the economy.

Longer than usual cycles

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- Historically, the study of the business cycle has focused on the behaviour of macroeconomic data with cycles lasting on average no more than eight years
- But the recent evidence tells us that real and financial variables interact at lower frequencies than those of the traditional business cycle (Aikman et al. 2014, Drehamnn et al. 2012).
- The idea of **long swings in economic activity** goes back to Kuznets, Abramovitz and Schumpeter

- an example of financial long swings (already discussed in a Minsky's (Minsky 1964))



Minsky's two cycles



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- Not only one of the fathers of the financial crises: (already in February 2008 New Yorker titled “The Minsky Moment” by John Cassidy), but also the theorist of two different business cycles:
- *The long-wave hypothesis cannot be distinguished from the hypothesis that there are **two types of business cycles**, mild and deep depression, and that the conditions which must be satisfied if a deep depression cycle is to take place are generated over a number of mild depression cycles (Minsky 1964).*
- changes in the structure of financial assets and liabilities occurring during mild depressions make the financial system less stable: (1) the rise of debts relative to income for the income producing sectors (2) the rise in price of stock market and real estate assets, and (3) the decrease in the relative size of ultimate liquidity.

The paper in 5 steps

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- Classical dating (turning point analysis) of business and financial cycles (SHORT and MEDIUM)
- Statistical analysis of their comovement
- Causality analysis
- Statistical significance of joint recessions
- Credit cycle and sovereign bonds in banks' balance sheets (*if there is time left*)

Data and sources

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A large set of historical statistics have recently built by BI and some Italian Institutions to celebrate the 150th anniversary of its unification.

- A) GDP - Baffigi(2013)
- B) Loans - De Bonis et al. (2012)
- C) Public bonds held by banks (Bank of Italy's Statistics Database)
- D) Bank claims on the economy $=A+B$

As consistent data are available for war years, we do not exclude these years from the analysis.

All series are deflated with GDP implicit deflator.

Classical turning point analysis

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- The classical definition dates **contractions** and **expansions** using the **level of the series**, rather than the detrended series (growth cycle)
- Thus, contractions correspond to sequences of absolute declines in a series, and not to periods of slow growth relative the trend.
- Burns and Mitchell (1946), used at NBER
- Dating algorithm to identify turning points
 - ▣ Bry and Boschan (1971)
 - ▣ Harding and Pagan (2002,2006)
- Main advantage: it is a “local” procedure

Short and Medium Cycles

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We adjust Harding and Pagan (2002) to yearly data.

- **Short cycle of Y_t (Watson 1994)**

- *Expansion* $\Delta Y_t > 0$
- *Recession* $\Delta Y_t < 0$
- Minimum length of each phase: 1 year

- **Medium cycle**

- peak in Y_t if $\Delta Y_t > 0$, $\Delta^2 Y_t > 0$ and $\Delta Y_{t+1} < 0$, $\Delta^2 Y_{t+2} < 0$
 - trough in Y_t if $\Delta Y_t < 0$, $\Delta^2 Y_t < 0$ and $\Delta Y_{t+1} > 0$, $\Delta^2 Y_{t+2} > 0$
 - Minimum length of each phase: 2 years
- The short cycle is the shortest with annual data and the medium cycle is the “next” in terms of (minimum) length

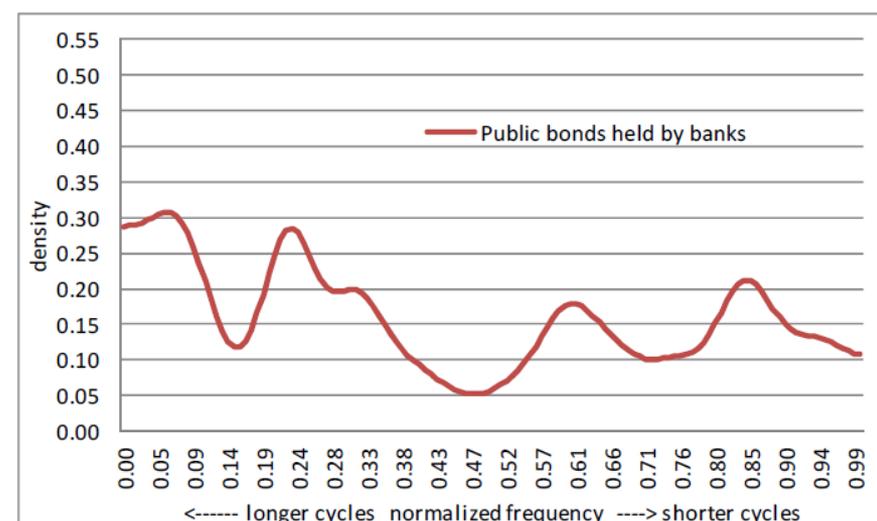
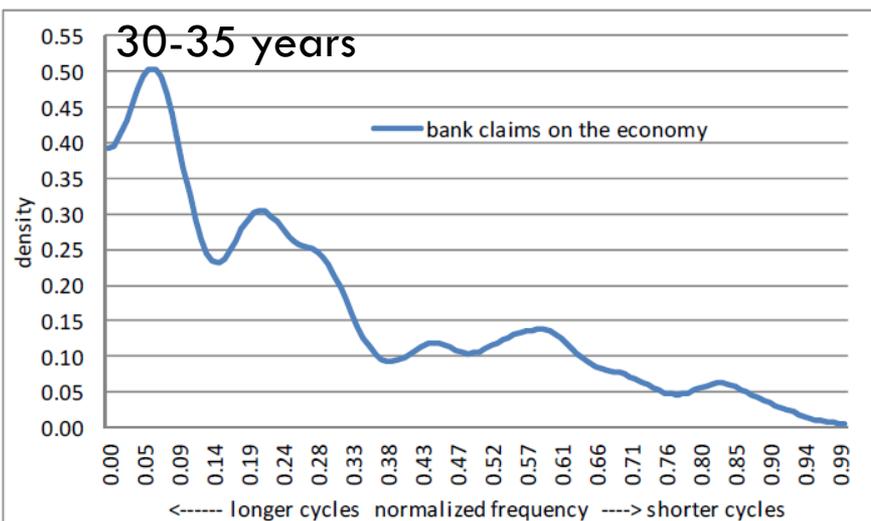
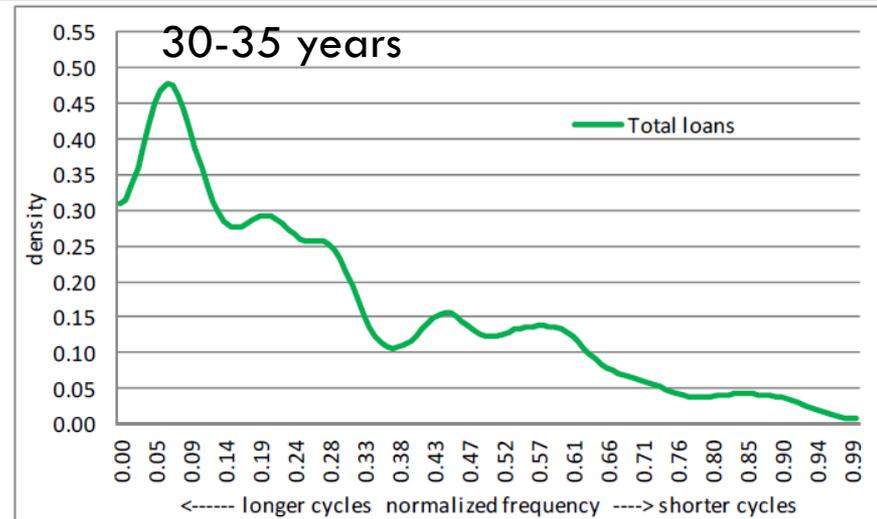
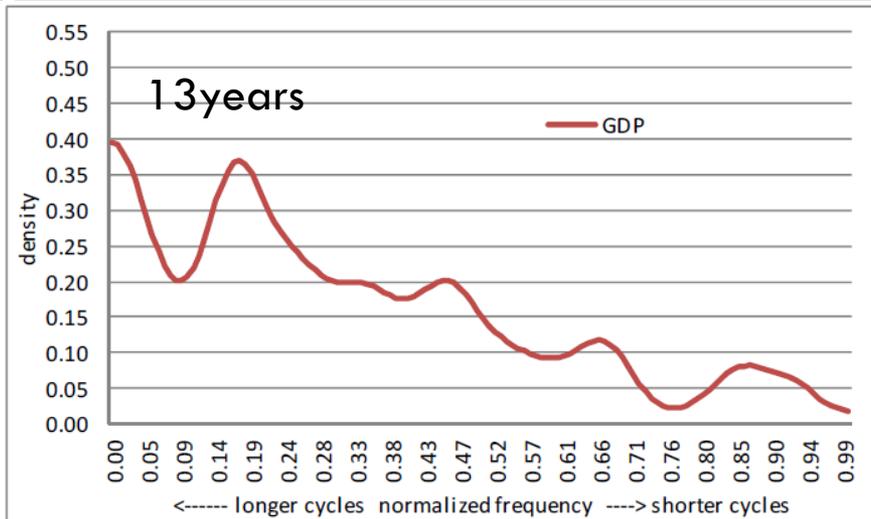
Why Medium cycle?

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- Comin and Gelter (1996) and Blanchard (1997): oscillations between phases of robust growth and relative stagnation, typically not considered in conventional business cycle analysis.
- Aikman et al. (2014): Fluctuations in credit to output operate over the medium term, that is beyond business cycle frequency, with peak-to-trough cycles completed over the course of a decade or more.
- Drehmann et al. (2012) have shown that the medium-term component of fluctuations is more important in (the joint behaviour of) credit and property prices than in GDP (and they use quarterly data!)

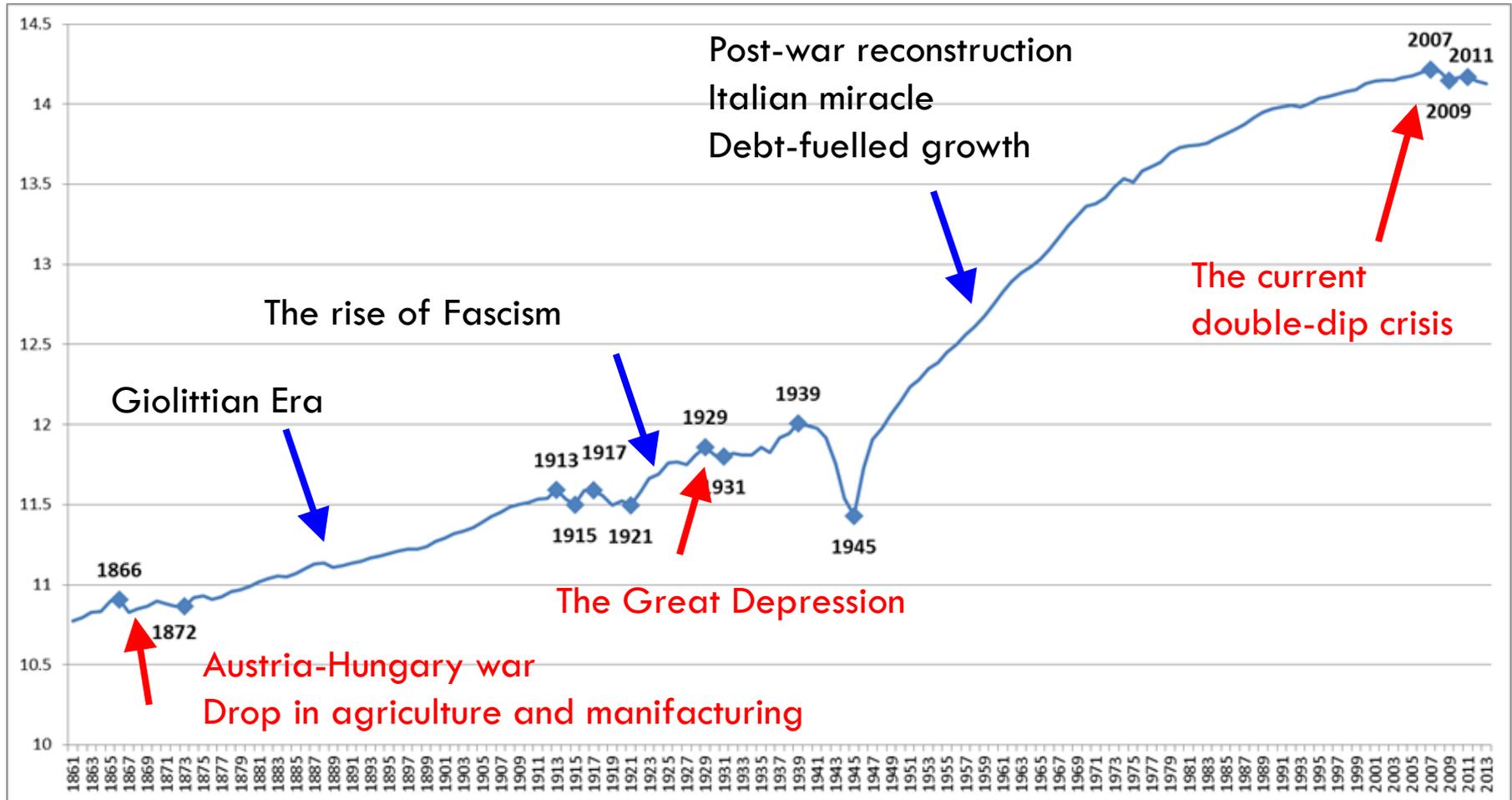
Medium cycles account for fluctuations

(spectral density of growth rates)



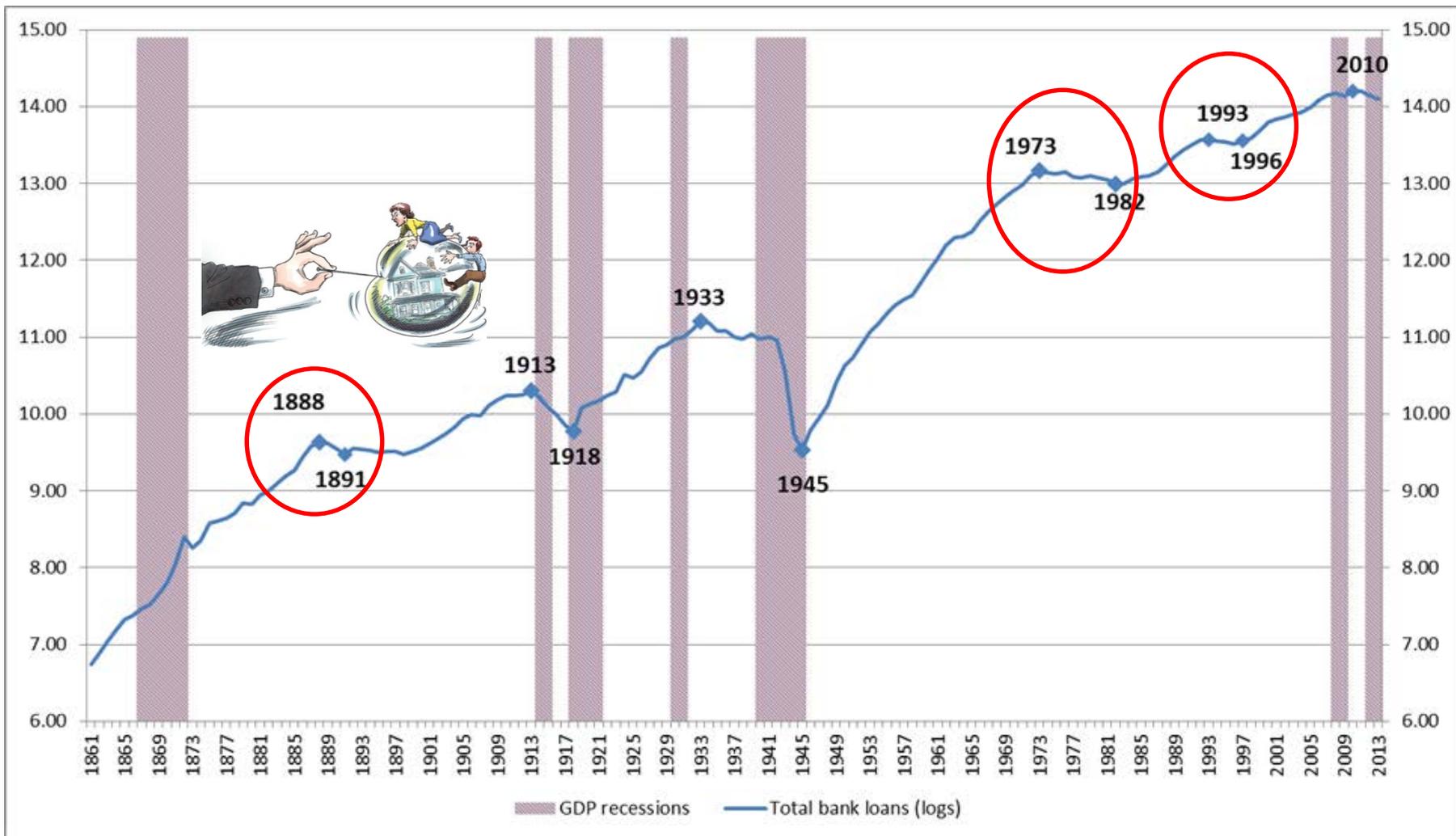
Medium cycles of GDP

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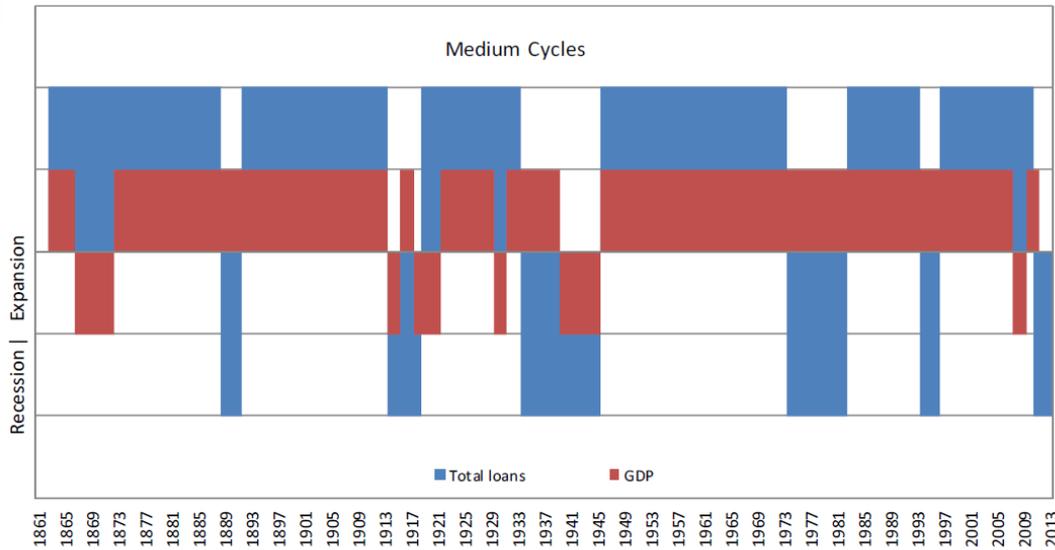
Medium cycles of loans and GDP recessions

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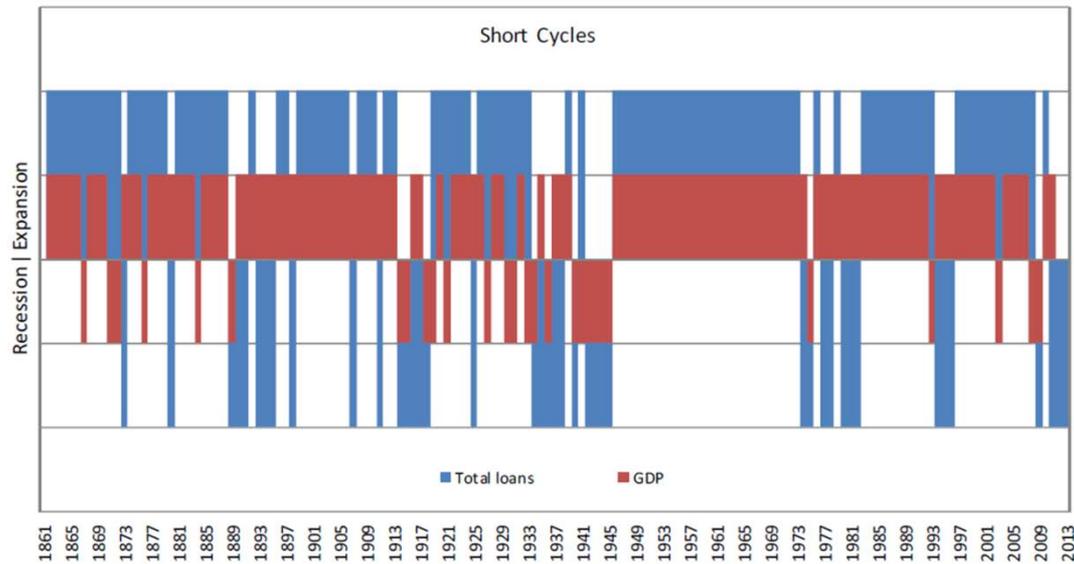
Synchronization at a glimpse

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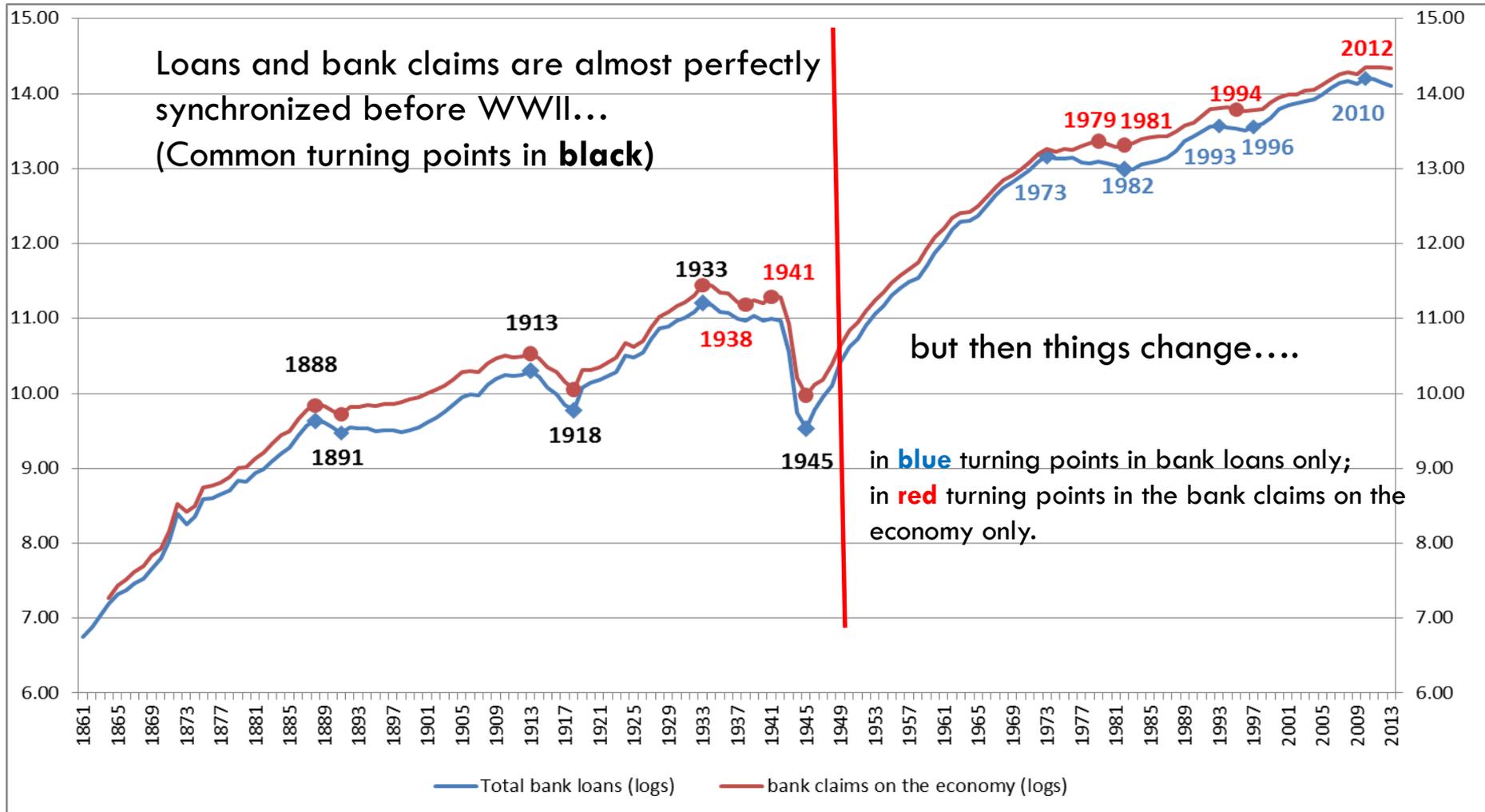
Turning points are weakly synchronized

More synchronization, especially in the post WWII period



Medium cycles of loans and bank claims on the economy

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Cycle Characteristics

(median)

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| Variable | Duration (years) | | | Amplitude (overall change %) | | Slope (average annual change %) | |
|----------|------------------|---------|-------|------------------------------|---------|---------------------------------|---------|
| | Downturns | Upturns | Cycle | Downturns | Upturns | Downturns | Upturns |

Medium Cycles

| | | | | | | | |
|----------------------------|-----|------|----------|-------|-------|------|------|
| GDP | 3.0 | 8.0 | { 11.0 } | -7.7 | 33.4 | -3.1 | 3.6 |
| Bank loans | 5.0 | 15.0 | { 20.0 } | -16.0 | 130.0 | -5.2 | 5.4 |
| Public bonds held by banks | 3.5 | 4.0 | 7.5 | -24.5 | 50.8 | -6.3 | 10.4 |
| Bank claims on the economy | 3.0 | 15.0 | { 18.0 } | -11.1 | 75.3 | -3.8 | 3.8 |

Short Cycles

| | | | | | | | |
|----------------------------|-----|-----|-----|-------|------|------|------|
| GDP | 1.0 | 3.0 | 5.0 | -2.9 | 9.5 | -2.5 | 2.4 |
| Bank loans | 2.0 | 3.0 | 6.0 | -5.5 | 30.2 | -3.3 | 6.7 |
| Public bonds held by banks | 1.0 | 2.0 | 5.0 | -14.2 | 39.1 | -7.4 | 11.6 |
| Bank claims on the economy | 1.0 | 3.0 | 6.0 | -3.6 | 24.5 | -3.6 | 6.0 |

Measure of Synchronization

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- Concordance index (Harding and Pagan, 2002):

$$CI_{xy} = \frac{1}{n} \left[\sum I(S_{y,t} = 1; S_{x,t} = 1) + \sum I(S_{y,t} = 0; S_{x,t} = 0) \right]$$

- 0=perfect anticyclicity
 - $CI = E(CI)$ under independence
 - 1 = perfectly procyclical
- Corrected contingency coefficient (Artis et al.1997):
 - 0=independence / 1 perfect association
 - Correlation

Synchronization: medium and short cycles

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CI > E(CI)
weak procyclicality

| Periods | a) 1861-2013 | |
|---|--------------|----------------------------|
| Measures of synchronization with GDP cycles | Total loans | Bank claims on the economy |

Correlation > 0
Significant in the short cycle only

| | <i>Medium cycle</i> | |
|------------------------|---------------------|-----------|
| CI | (0,75) | (0,80) |
| E(CI) | (0,68) | (0,74) |
| CC | 32.1*** | 31.9*** |
| Correlation | (0,20) | (0,23*) |
| Correlation at t-1 (1) | 0,21* | (0,14) |
| Correlation at t+1 (2) | 0,09 | (0,19) |

Comovement increases with the bank claims

| | <i>Short cycle</i> | |
|------------------------|--------------------|-------------|
| CI | (0,73) | (0,76) |
| E(CI) | (0,64) | (0,67) |
| CC | 35.2*** | 35.6*** |
| Correlation | (0,23**) | (0,25***) |
| Correlation at t-1 (1) | 0,10 | (0,18*) |
| Correlation at t+1 (2) | 0,20** | (0,33***) |

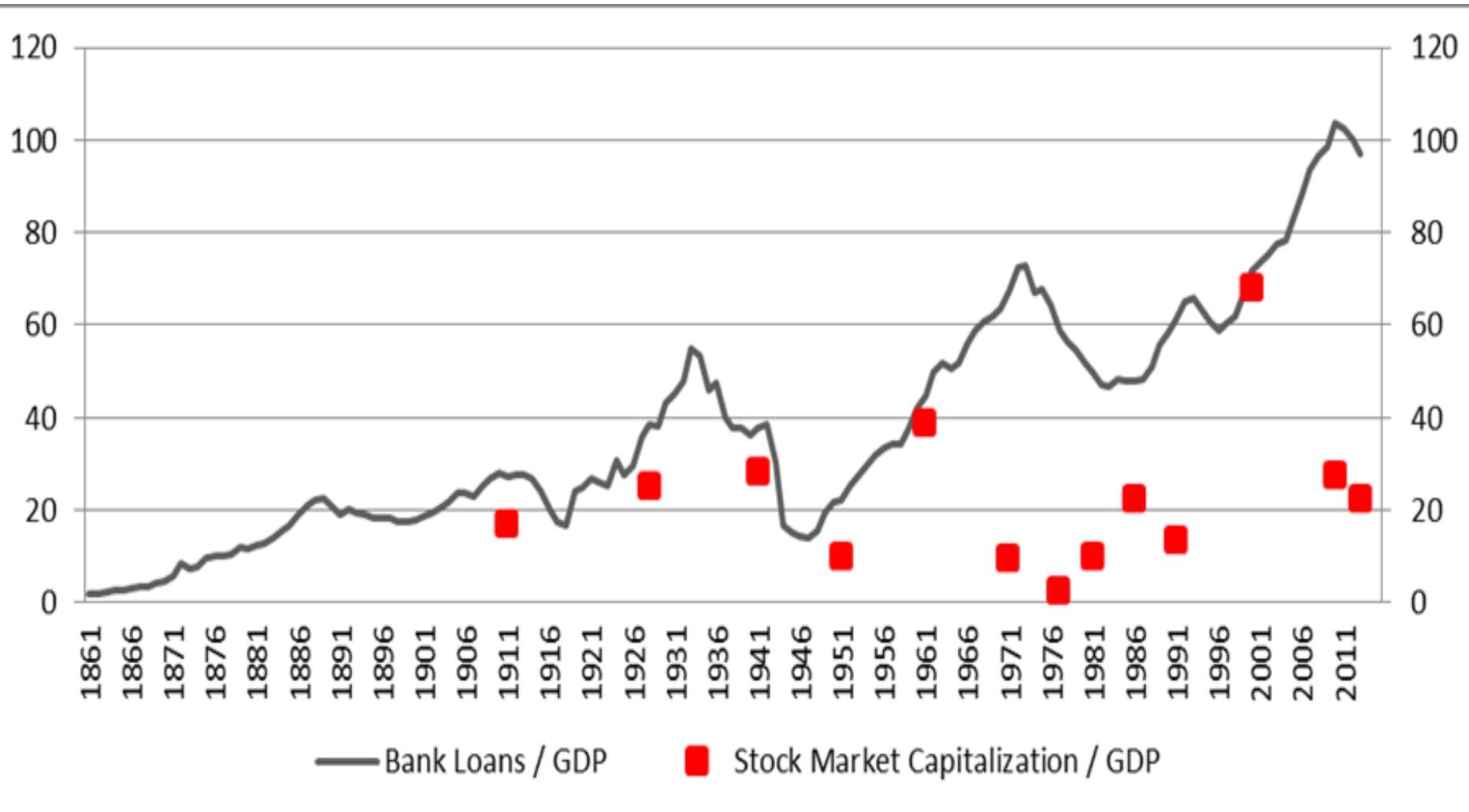
Synchronization: Pre-Post WWII

| Periods | | b) 1861-1939 | | c) 1939-2013 | |
|---|-------------|---------------------|----------------------------|---------------------|----------------------------|
| Measures of synchronization with GDP cycles | | Total loans | Bank claims on the economy | Total loans | Bank claims on the economy |
| Why this difference? | | | | | |
| | | <i>Medium cycle</i> | | <i>Medium cycle</i> | |
| Less-developped financial system | CI | 0,71 | 0,73 | 0,80 | 0,88 |
| | E(CI) | 0,70 | 0,71 | 0,66 | 0,78 |
| | CC | 5,6 | 8,1 | 58.3*** | 58.8*** |
| | Correlation | 0,03 | 0,05 | 0.34* | 0.47** |
| Measurement errors | | <i>Short cycle</i> | | <i>Short cycle</i> | |
| Sample size | CI | 0,65 | 0,69 | 0,81 | 0,82 |
| | E(CI) | 0,62 | 0,64 | 0,66 | 0,70 |
| | CC | 11,7 | 18,8 | 59.1*** | 53.8*** |
| | Correlation | 0,07 | 0,12 | 0.40** | 0.4** |

Credit aggregates and business cycles much more correlated and procyclical in the post-war period!

Does financial development make the difference?

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Granger causality: from Credit to GDP or the other way round?

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$$\text{logit GDP}_t = \zeta + \alpha \text{GDP}_{t-1} + \beta (\text{credit variable})_{t-1} + \varepsilon_t$$

$$\text{logit}(\text{credit variable})_t = \theta + \delta (\text{credit variable})_{t-1} + \gamma \text{GDP}_{t-1} + \varepsilon_t$$

| Cycle | Bank loans | Bank claims on the economy |
|-------|------------|----------------------------|
| | | |

From credit to GDP (β)

| | | |
|--------------|-------|-------|
| Medium cycle | 0.996 | 0.034 |
| Short cycle | 0.306 | 0.743 |

In the Medium Cycles
No Granger-causality

From GDP to credit (γ)

| | | |
|--------------|--------|-------|
| Medium cycle | -0,868 | 0,637 |
|--------------|--------|-------|

| | | |
|-------------|---------|----------|
| Short cycle | 0.829* | 1.596*** |
| ME | 0.26*** | 0.37*** |

In the Short Cycles

Credit is Granger caused by GDP
The broader the credit aggregate the larger the marginal effect

Granger causality in the short cycles: consequences

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- It is not surprising that causality relationships depend on the definition of cycle and on the frequency of fluctuations (Granger and Lin 1995)
- This evidence agrees with the earlier correlation analysis and other studies, according to which, especially in the post-WWII era, GDP leads bank credit (EBF 2011; ECB 2012), at least at the usual business cycle
- Episodes of financial distress have not shaped the Italian (medium) business cycle, but quite the opposite (financial accelerator scheme)

Does coincidence of recessions make recessions more intense? (1)

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| State of Financial Cycles | Medium Cycle | Short Cycle |
|---------------------------|--------------|-------------|
| | | |

a) Probability of GDP Recession

| | | |
|------------------------------|------|------|
| <u>Bank Loans recession</u> | 0.31 | 0.37 |
| Bank Loans expansion | 0.11 | 0.14 |
| <u>Bank claims recession</u> | 0.36 | 0.39 |
| Bank claims expansion | 0.12 | 0.14 |
| <u>Unconditional prob.</u> | 0.16 | 0.20 |



The probability of recession almost double both in SC and MC under credit recession or bank claims decline

Does coincidence of recessions make recessions more intense? (2)

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$$g_y = \alpha + \beta * D(GDP_{recession})$$

$$g_y = \alpha + \beta * D(GDP_{recession}) + \gamma D * (GDP_{recession \& \text{ financial recession}})$$

| Dep. Variable: GDP growth rate | Short cycle (1) | Medium cycle (2) | Short cycle (3) | Medium cycle (4) | Short cycle (5) | Medium cycle (6) |
|--|------------------|------------------|------------------|------------------|------------------|------------------|
| Const (a) | 3.9*** (0.6) | 3.5*** (0.5) | 3.9*** (0.6) | 3.5*** (0.5) | 3.9*** (0.6) | 3.5*** (0.5) |
| GDP recession (b) | -7.8*** (1.4) | -7.4*** (1.8) | -6.2*** (0.8) | -5.2*** (0.9) | -7.0*** (1.1) | -5.9*** (1.8) |
| GDP & Total loans recession (c) | | | -3.2 (1.9) | -4.7** (2.3) | | |
| GDP & Bank claims recession (c) | | | | | -1.6 (1.5) | -5.3** (2.3) |
| Average GDP growth in recession (a+b) | | | -3.9 | -3.9 | | |
| Average GDP growth in recession and credit expansion (a+b) | | | | | -2.3 | -1.7 |
| Average GDP growth in real and financial recession (a+b+c) | | | | | -5.5 | -6.4 |
| | | | | | | -4.7 |
| | | | | | | -7.7 |

Concluding remarks

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- Medium cycles are an important component of credit and business cycle fluctuations. Yet, their cycles prove to be weakly correlated. Comovement increases when the broader aggregate of bank claims on the economy are taken into account.
- Two cycles may be little synchronized and still influence each other: when their negative phases overlap, as in the recent crisis and in other few cases in the past, recession turns to be deeper.
- When we try to answer the question about what leads the cycle, we do not find evidence that credit leads the business cycle, both in the medium and in the short fluctuations. On the contrary, in the short cycle, we find some evidence that business cycle leads the credit one.

Bank holdings of public bonds and loans: is it crowding out?

- holdings of public bonds increase during credit recessions, especially in the post WWII era

| credit (total loans) recessions | Total loans | Public bonds held by banks | Bank financing to the economy |
|------------------------------------|-------------|-------------------------------|----------------------------------|
| 1888-1891 | -5.2 ↓ | 1.4 ↑ | -3.8 |
| 1913-1918 | -10.0 | -7.9 | -9.2 |
| 1933-1945 | -13.0 | -9.7 | -11.6 |
| 1973-1982 | -1.9 | 1.3 ↑ | 0.6 |
| 1993-1996 | -1.9 ↓ | 0.2 ↑ | -1.3 |
| 2010-2013 | -3.4 ↓ | 7.9 ↑ | -0.5 |

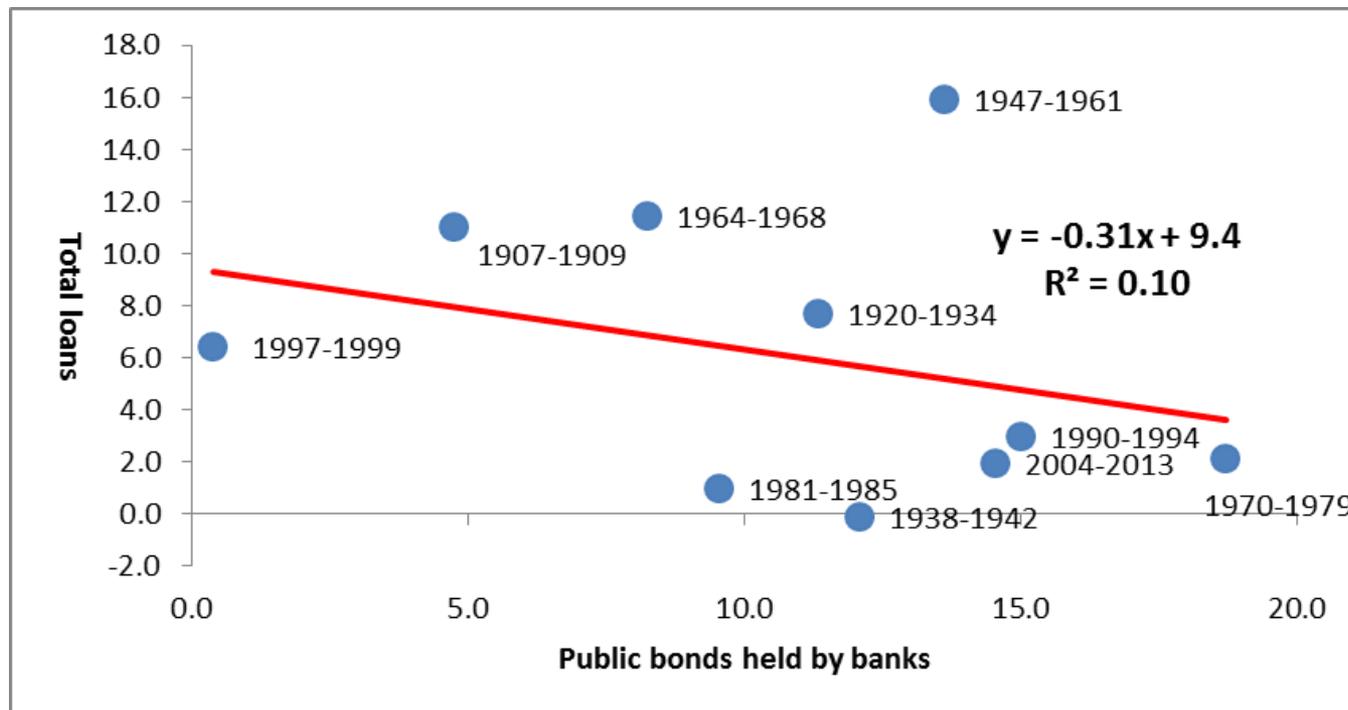
Bank holdings of public bonds and loans: is it crowding out? (2)

- Correlation of growth rates between loans and bonds is positive in the pre-WWII period
- strongly negative in the post-war era with an increasing trend.
- This result seems to suggest that crowding out is mainly a recent phenomenon.

| credit recessions | correlation |
|-------------------|-------------|
| <i>pre-WWII</i> | |
| 1889-1891 | 0,47 |
| 1914-1918 | 0,23 |
| 1934-1945 | 0,64 |
| <i>post-WWII</i> | |
| 1974-1982 | -0,56 |
| 1994-1996 | -0,62 |
| 2011-2013 | -0,73 |
| <i>overall</i> | |
| 1861-2013 | <u>0,28</u> |

Bank holdings of public bonds and loans: is it crowding out? (3)

- During a recession, crowding out could be the result of a “flight to quality”
- but maybe this is not the case if when holdings of public bonds increases, credit sector slows down, whichever is the credit cycle phase



And now...

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Questions
&
(hopefully)
Answers