Measuring Macroprudential Risk: Financial Fragility Indexes

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Financial Fragility, Financial Instability

- Dodd-Frank: Financial Stability Oversight Council is in charge of "identifying threats to the financial stability of the United States"
- Financial fragility:
  - Micro:
    - the liability and/or asset side of the balance sheet (on- and off-balance) are highly sensitive to changes in interest rate, income, amortization rate, etc.
    - high expected reliance on refinancing sources (high refinancing risk) and/or asset liquidation at rising prices (high liquidity risk)
  - Macro: risk of financial instability
- Financial instability:
  - an economic state in which financial problems tend to affect employment and price stability.
  - Ultimately financial instability manifests itself through debt-deflation processes

Conceptualizing Financial Fragility

- Evolutionary View: Financial fragility emerges during long periods of economic stability (possibly recording minor recessions).
- Imperfection View: Financial fragility is due to market imperfections and individual imperfections.

Imperfection View: Implications for Empirical Analysis

- Detect the occurrence of financial crises by using leading indicators that are supposed to reflect fragility:
  - Rising default rates
  - Rapid growth of credit
  - Decline in GDP growth
  - Rising real interest rate
  - Growing government deficit
  - Decline in business profit

Problem: up to the Great recession default rate were low, profit and net worth were rising.

Evolutionary View: Implications for Empirical Analysis

- Evolutionary view: Detecting change in funding practices and asset positions is important. The quality of indebtedness matters. What does it entail?
  - Checking underwriting procedures: collateral-based vs. income-based lending
  - Checking amount of refinancing, especially cash-out refinance
  - Checking cash-flow: operational net cash inflows relative to cash outflows induced by (on- and off-) balance sheet liabilities

Evolutionary View: Implications for Empirical Analysis

- Evolutionary view: Detecting changes in funding practices and asset positions is crucial. This is different from:
  - Detecting bubbles: Emergence of dangerous funding practices may become apparent independently (and usually before) bubbles (prime mortgage finance since 2001 at least)
  - Detecting financial crises: Financial fragility emerges long before crises occur
  - Detecting fraud: Perfectly legal funding processes may be highly dangerous (especially if fully collateral based).
  - Detecting if a business is profitable: highly profitable businesses involved in Ponzi finance are extremely fragile.

⇒ Rising profits of firms, rising net wealth of households, and declining default rates are not necessarily signs of strength.

⇒ Government deficit is not necessarily a weakness.

Theoretical foundation: Minsky's Hedge, Speculative, Ponzi finance

- Hedge:
  - Cash flow aspect: E(income) > E(debt service)
  - Balance sheet aspect: No expected position-making operations (refinancing, asset liquidation) to generate cash inflow.
- Speculative
  - Cash flow aspect: E(income) > E(interest service)
  - Balance sheet aspect: expect position-making operations to be stable relative to outstanding debt
- Ponzi:
  - Cash flow aspect: E(income) < E(debt service)
  - Balance sheet aspect: expected position-making operations to grow relative to outstanding debt

$$E(CF_{PM}) = \Delta L_R + \Delta P_A Q_A > 0 \text{ and } \Delta(E(CF_{PM})/L) > 0$$

Bubble and Financial Fragility

- Ponzi finance is different from bubble: no assumption is made about the correctness of the valuation of assets, just need rising asset prices (net worth)
- The concept of bubble is a complementary element to judge the risk of financial instability:
  - Bubbles funded through Ponzi finance: will create a lot of financial instability
  - Bubbles not funded through Ponzi finance: not too much of a worry (when asset prices go down there is a limited risk of debt deflation).

However, the concept of bubble is of limited usefulness because financial instability may rise and be high without any bubble: central concern is funding methods.

Financial Stability Index

- Datasets:
  - BEA: National Product and Income Accounts:
    - Net operating surplus of corporations
    - Interest receipts of corporations
    - Interest payments of corporations
  - Federal Reserve Board:
    - Flow of Funds Accounts:
      - Outstanding total liabilities
      - Amount of short-term liabilities
      - Amount cash and liquid assets
      - Net worth
    - Household Finance
      - Mortgage financial obligation ratio
      - Debt service ratio
      - Consumer credit (total and revolving)
  - Federal Housing Finance Agency
    - Proportion of cash-out refinancing loans amount refinance loans.
  - Standard and Poors
    - S&P/Case-Shiller Home Price Indices

Household Financial Fragility

- Two indexes:
  - Overall household sector
  - Funding of homeownership

<u>Overall Index</u> is constructed as followed:

$$I_H = 0.1D_L + 0.1D_{NW} + 0.25D_{DSR} + 0.25D_{MLR} + 0.15D_{COR} + 0.15D_{RCD}$$

L: Total outstanding liabilities

NW: net worth

DSR: debt service ratio

MLR: monetary instruments relative to outstanding liabilities

COR: proportion of cash-out refinancing mortgage loans in mortgage refinancing loans

Household Financial Fragility

- With $I_H \in [0, 1]$ and D_X a dummy variable for variable X defined as followed for all variables except MLR:

$$D_X = \begin{cases} 1 & \text{if } g_{X_t} > g_{X_{t-1}} > 0 \\ 0.9 & \text{if } g_{X_t} > 0 \\ 0 & \text{if } g_{X_t} = 0 \\ -0.9 & \text{if } g_{X_t} < 0 \\ -1 & \text{if } g_{X_t} < g_{X_{t-1}} < 0 \end{cases}$$

- For MLR we have:

$$D_{MLR} = \begin{cases} 1 & \text{if } g_{MLR_t} < g_{MLR_{t-1}} < 0 \\ 0.9 & \text{if } g_{MLR_t} < 0 \\ 0 & \text{if } g_{MLR_t} = 0 \\ -0.9 & \text{if } g_{MLR_t} > 0 \\ -1 & \text{if } g_{MLR_t} > g_{MLR_{t-1}} > 0 \end{cases}$$

Household Financial Fragility

For housing finance financial fragility index we have:

$$I_{HHF} = 0.1D_L + 0.1D_P + 0.2D_{COR} + 0.3D_{MOR} + 0.3D_{MMR}$$

L: Home mortgage of households,

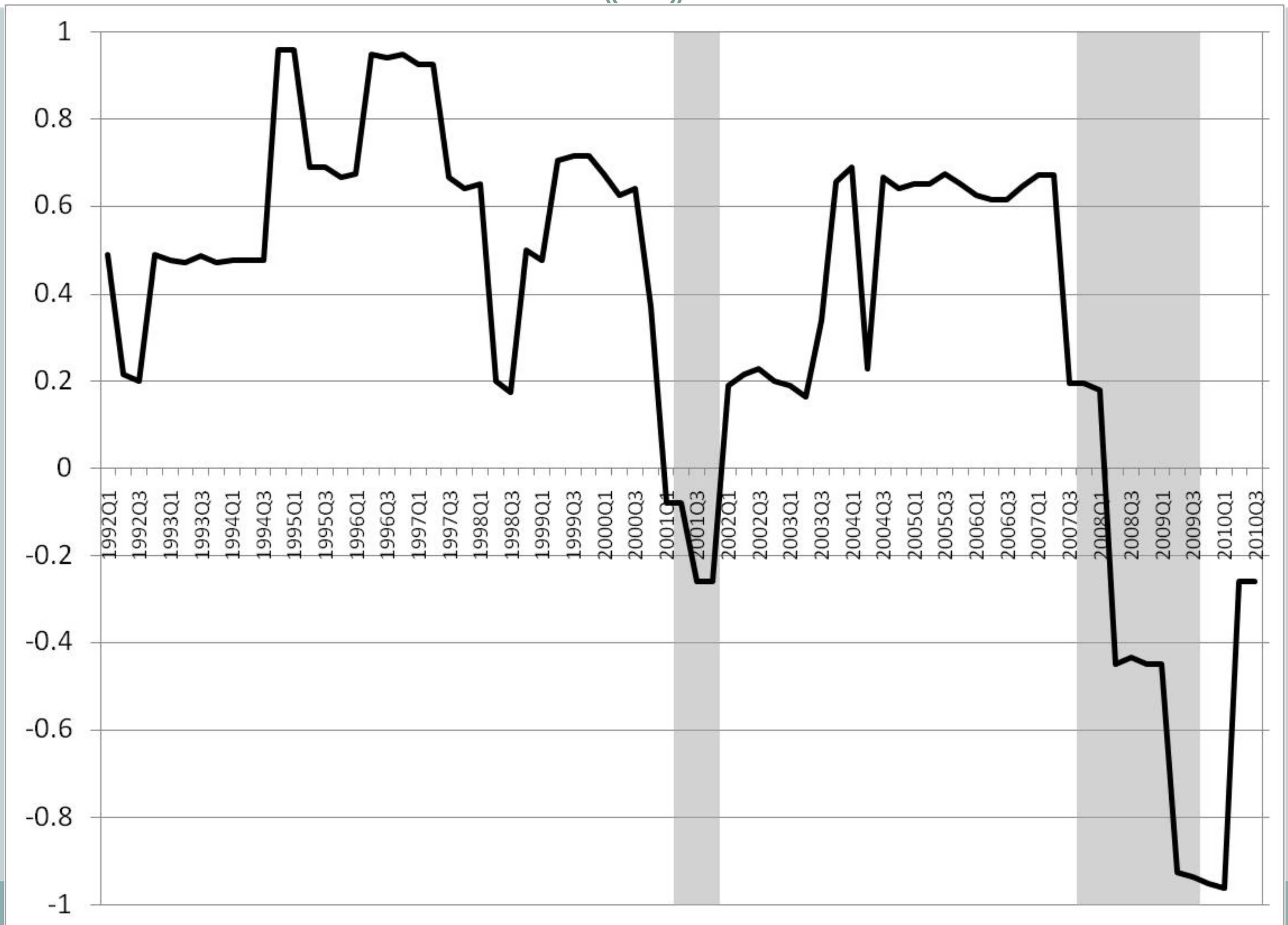
P: home price index

COR: proportion of cash out refinance

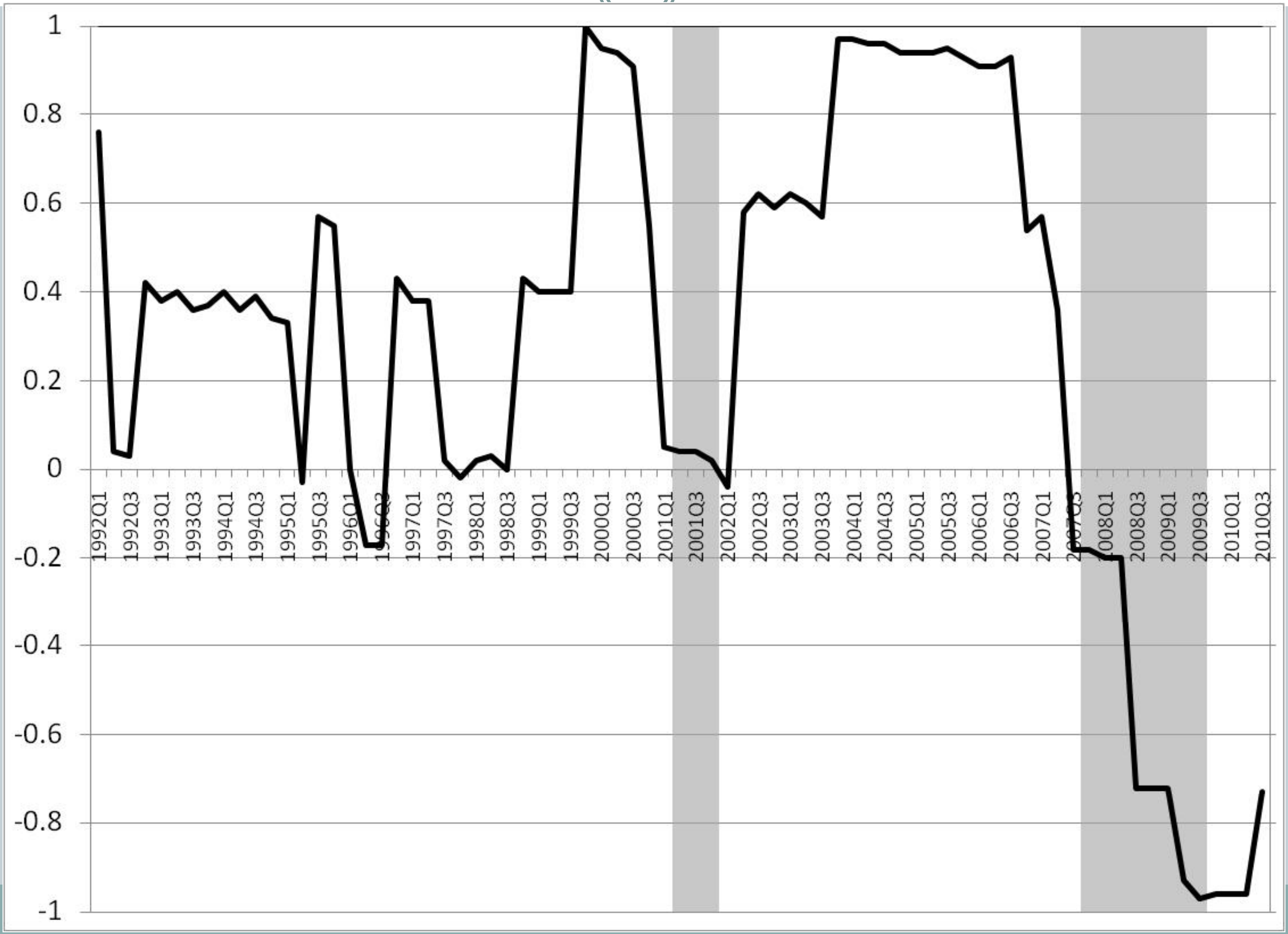
MOR: mortgage financial obligation ratio

MMR: the ratio of monetary assets to mortgage debt

OVERALL HOUSEHOLD FINANCIAL FRAGILITY INDEX



Homeownership Financial Fragility Index



Index for business sector

- The same index is used for the financial and nonfinancial sector

$$I = 0.125D_L + 0.125D_{NW} + 0.3D_{ISR} + 0.3D_{MLR} + 0.15D_{ST}$$

L: Total outstanding liabilities

NW: net worth

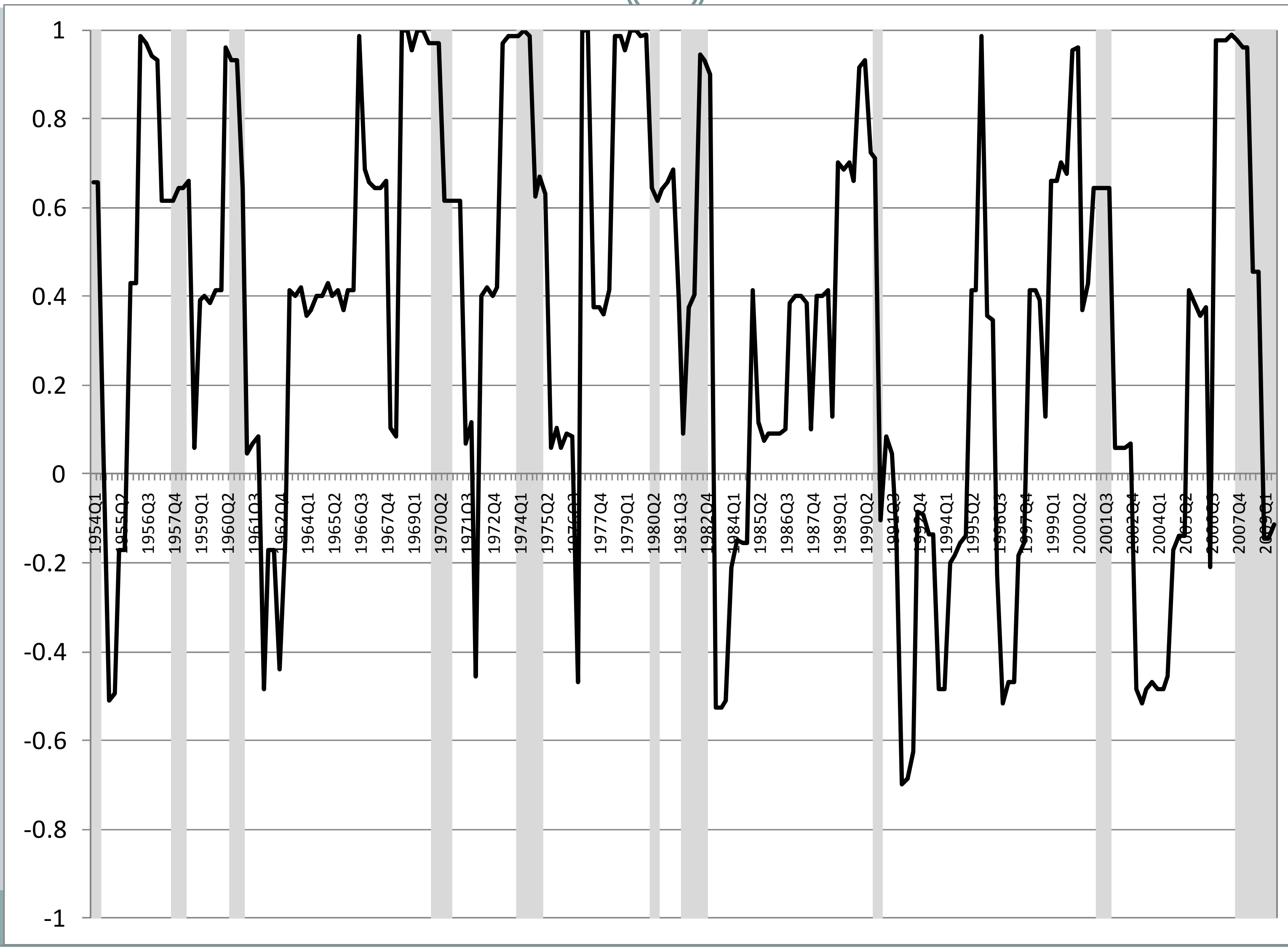
ISR: interest service ratio (lacking principal servicing data)

MLR: monetary instruments relative to outstanding liabilities

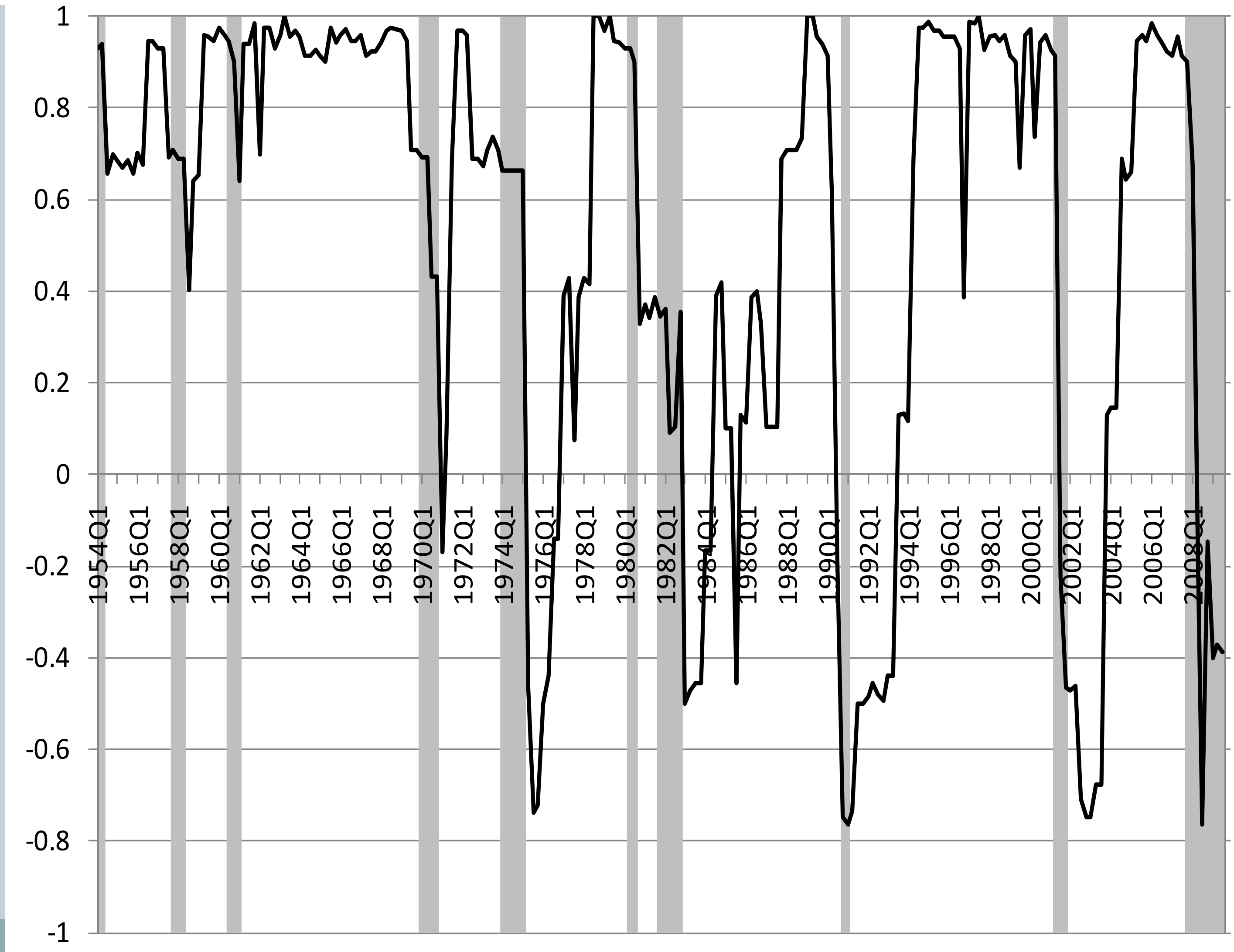
ST: proportion of short-term liabilities

ISR = Monetary interest paid/(Net operating surplus + interest receipts)

Nonfinancial nonfarm corporate



Financial Business



Conclusion

- Index is not built to fine tune the economy
- Index is not meant to forecast the timing and size of financial crises.
- Index is meant to be used for regulatory and supervisory purpose: Low default rate, High profitability, and rising net worth are not necessarily signs of financial health

=> macroeconomic financial fragility (financial instability risk, i.e. macroprudential risk) grows during periods of stability.