

# SYSTEMIC RISK PRO-CYCLICALITY IN THE EUROPEAN FINANCIAL SYSTEM

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Systemic risks and policies to address them in  
Non-Bank Financial Intermediation (NBFI)  
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# INTRODUCTION

- The build-up of excessive leverage within financial markets are at the heart of the 2007-2009 global financial crisis;
- A financial system is pro-cyclical. **Periods of exuberance:** financial intermediaries's lending activity and stock debts are high. **Periods of turmoil:** asset prices decrease, the value of collateral diminishes and the borrowers's profitability deteriorates (**Bank for International Settlements, 2009; Financial Stability Board, 2009**);
- Several papers point to a strongly positive relationship between leverage and balance sheet size (**Gropp & Heider, 2010; Kalemli-Ozcan et al., 2012; Baglioni et al., 2013; Damar et al., 2013; Beccalli et al., 2015; Cincinelli et al., 2021**);
- Higher financial leverage (short-term leverage) induces banks to engage in illiquid and risky lending as well as securities activities resulted in the widespread failures of these institutions (**Adrian & Shin, 2010; Shleifer & Vishny, 2010; Mian & Sufi, 2011; Acharya et al., 2013; Acharya & Thakor, 2016**).

- We test the following hypotheses:
  - ① **Hypothesis A:** The leverage of European Financial Institutions is pro-cyclical;
  - ② **Hypothesis B:** The leverage of European Non-Bank Financial Institutions (NBFIs) is pro-cyclical;
  - ③ **Hypothesis C:** NBFIs are systemic risk-procyclical in addition to Traditional Banks (TBs).
- We evaluate the stability of the leverage and systemic risk pro-cyclicity hypotheses considering five meaningful sub-periods:
  - ① *Pre-Crisis* (2006:1-2007:2);
  - ② *Subprime Crisis* (2007:3-2008:3);
  - ③ *Global Financial Crisis* (2008:4-2010:2);
  - ④ *Sovereign Debt Crisis* (2010:3-2012:4);
  - ⑤ *Post-Crisis Period* (2013:1-2019:4).

- We now deal with the following issues:
  - ① How to identify NBFIs;
  - ② How to measure leverage pro-cyclicality;
  - ③ How to measure systemic risk pro-cyclicality;
  - ④ How to measure systemic risk:  $\Delta CoVaR$ , *MES*, *SRISK*.

- The **Financial Stability Board (December, 2021)** defines non-bank financial intermediation as a broad measure of all non-bank financial intermediaries (NBFIs), composed of all financial institutions that are not central banks, banks or public financial institutions;
- NBFIs are involved in credit intermediation and have increased potential for posing risks to financial stability through liquidity/maturity transformation and/or leverage;
- NBFIs provide an alternative to bank financing and helps to support real economic activity. However, if such intermediation involves activities typically performed by banks, such as maturity/liquidity transformation and/or the creation of leverage, it can become a source of systemic risk.

- Our data sample: panel of 597 European listed financial institutions between 2005:4 - 2019:4 time period;
- We consider both **Traditional Banks** (TBs) and those entities fully or partially outside the regular banking system, such as **Finance Services** (FSs), that provides credit or credit guarantees, or performing liquidity and/or maturity transformation without being regulated like a bank;
- We also consider **Real Estate Finance Services** (REFs), entities involved in the real estate industry which provide real estate leasing investment services and investments. Real estate investment is considered as a “*double-edge sword*”, in that requires intensive financial resources, thus increasing the probability of excessive leverage (**Beladi et al., 2021**, p. 1);
- The sample contains 129 **TBs**, 287 **FSs** and 181 **REFs**. The data source is *Refinitiv*;

# SPECIFICATION: LEVERAGE PRO-CYCLICALITY

$$\begin{aligned} \Delta \text{Leverage}_{i,t} = & \alpha_0 + \beta_1 \text{Leverage}_{i,t-1} + \beta_2 \Delta \text{Size}_{i,t} + \\ & \beta_{3,NBFI} \Delta \text{Size}_{i,t} * \text{NBFI}_i + \\ & (\text{or } \beta_{3,FS} \Delta \text{Size}_{i,t} * \text{FS}_i + \beta_{3,REF} \Delta \text{Size}_{i,t} * \text{REF}_i) + \quad (1) \\ & + \sum_{i=1}^{597} \text{Financial Institutions}_i + \sum_{t=2006:1}^{2019:4} \text{Time}_t + \varepsilon_{i,t} \end{aligned}$$

- $\Delta \text{Leverage}_{i,t}$ : *quasi-market leverage* (market value of assets over market capitalization) or *accounting leverage* (total asset over total equity) growth;
- $\Delta \text{Size}_{i,t}$ : size (natural logarithm of total assets) growth;
- $\text{Leverage}_{i,t-1}$ : leverage level (natural logarithm) in the previous quarter ( $t-1$ );
- *Financial Institutions* and *Time*: dummies capturing fixed effects for each institution (TBs, FSs, and REFs) and common effects for each quarter, respectively;
- Estimation: full sample and five sub-periods.

▶ Tables details



# LEVERAGE PRO-CYCLICALITY: SUMMARY OF THE MAIN RESULTS

**TABLE 1:** Leverage Pro-Cyclicality: summary of the main results

Types of Financial Intermediaries	Dependent variable	Full period (2006:1-2019:4)	Pre-Crisis (2006:1-2007:2)	Subprime Crisis (2007:3-2008:3)	Global Financial Crisis (2008:4-2010:2)	Sovereign Debt Crisis (2010:3-2012:4)	Post-Crisis Period (2013:1-2019:4)
Entire Financial System	Quasi-Market Leverage	YES	YES	YES	YES	YES	YES
	Accounting Leverage	YES	YES	YES	YES	YES	YES
Traditional Banks (TBs)	Quasi-Market Leverage	<b>YES (more than NBFs)</b>	NO	<b>YES</b>	NO	<b>YES (more than NBFs)</b>	<b>YES (more than NBFs)</b>
	Accounting Leverage	<b>YES (more than NBFs)</b>	<b>YES</b>	<b>YES</b>	<b>YES</b>	<b>YES (more than NBFs)</b>	<b>YES (more than NBFs)</b>
Non Bank Financial Intermediaries (NBFIs)	Quasi-Market Leverage	YES	NO	NO	NO	NO	YES
	Accounting Leverage	YES	NO	NO	YES	NO	YES
Finance Services (FSs)	Quasi-Market Leverage	<b>YES (more than REFs)</b>	NO	NO	NO	NO	<b>YES</b>
	Accounting Leverage	<b>YES (more than REFs)</b>	NO	NO	NO	NO	<b>YES</b>
Real Estate Finance Services (REFs)	Quasi-Market Leverage	NO	NO	NO	<b>Counter-cyclical</b>	NO	<b>YES (more than FSs)</b>
	Accounting Leverage	YES	NO	NO	<b>YES</b>	<b>YES</b>	<b>YES (more than FSs)</b>

YES= pro-cyclicality  
NO= no pro-cyclicality

# SPECIFICATION: SYSTEMIC RISK PRO-CYCLICALITY

$$\begin{aligned} \Delta \text{Systemic Risk}_{i,t} = & \alpha_0 + \beta_1 \text{Systemic Risk}_{i,t-1} + \beta_2 \Delta \text{Size}_{i,t} + \\ & \beta_{3,NBFI} \Delta \text{Size}_{i,t} * \text{NBFI}_i + \\ & (\text{or } \beta_{3,FS} \Delta \text{Size}_{i,t} * \text{FS}_i + \beta_{3,REF} \Delta \text{Size}_{i,t} * \text{REF}_i) + \quad (2) \\ & + \sum_{i=1}^{597} \text{Financial Institutions}_i + \sum_{t=2006:1}^{2019:4} \text{Time}_t + \varepsilon_{i,t} \end{aligned}$$

- $\Delta \text{Systemic Risk}_{i,t}$ : growth in each systemic risk measure ( $\Delta \text{CoVaR}$ ,  $\text{MES}$ ,  $\text{SRISK}$ );
- $\Delta \text{Size}_{i,t}$ : size (natural logarithm of total assets) growth;
- $\text{Systemic Risk}_{i,t-1}$ : level (natural logarithm) of each systemic risk measure;
- $\text{Financial Institutions}$  and  $\text{Time}$ : dummies capturing fixed effects for each institution (TBs, FSs, and REFs) and common effects for each quarter, respectively;
- Estimation: full sample and five sub-periods.

# SYSTEMIC RISK PRO-CYCLICALITY: SUMMARY OF THE MAIN RESULTS

**TABLE 2:** Systemic Risk Pro-Cyclicality: summary of the main results.

Types of Financial Intermediaries	Dependent variable	Full period (2006:1-2019:4)	Pre-Crisis (2006:1-2007:2)	Subprime Crisis (2007:3-2008:3)	Global Financial Crisis (2008:4-2010:2)	Sovereign Debt Crisis (2010:3-2012:4)	Post-Crisis Period (2013:1-2019:4)
Entire Financial System	ΔCoVaR	YES	YES	YES	YES	YES	YES
	MES	YES	YES	YES	YES	YES	YES
	SRISK	YES	YES	YES	YES	YES	YES
Traditional Banks (TBs)	ΔCoVaR	YES	YES	YES	YES	YES	YES
	MES	YES	YES	YES	YES	YES	YES
	SRISK	YES	YES	NO	NO	YES	YES
Non Bank Financial Intermediaries (NBFIs)	ΔCoVaR	NO	NO	NO	NO	YES	NO
	MES	YES	YES	NO	NO	NO	YES
	SRISK	YES	NO	NO	YES	NO	NO
Finance Services (FSs)	ΔCoVaR	NO	NO	NO	NO	YES (in addition to TBs)	NO
	MES	YES (in addition to TBs)	YES (in addition to TBs)	NO	NO	NO	NO
	SRISK	NO	NO	NO	YES (in addition to TBs)	NO	NO
Real Estate Finance Services (REFs)	ΔCoVaR	NO	NO	NO	NO	YES (in addition to TBs)	YES (in addition to TBs)
	MES	NO	YES (in addition to TBs)	NO	NO	NO	YES (in addition to TBs)
	SRISK	YES (in addition to TBs)	NO	NO	NO	NO	NO

YES= pro-cyclicality  
NO= no pro-cyclicality

- We undertake robustness checks of our findings:
  - ① We implement the **Hansen (1999)** model to study potential asymmetric effects in the level of leverage;
  - ② We replicate our analyses after excluding financial institutions belonging to **Portugal, Ireland, Italy, Greece, and Spain (PIIGS) countries**;
  - ③ We validate the relevance of explanatory variables to alternative systemic risk measure with Bonferroni adjusted p-value (**Bonferroni, 1936**);
  - ④ We test for causality relationship between assets growth, leverage and systemic risk measures via an extensive Granger causality in heterogeneous panels analysis (**Dumitrescu & Hurlin, 2012**).

▶ Tables details

# CONCLUSIONS AND POLICY IMPLICATIONS

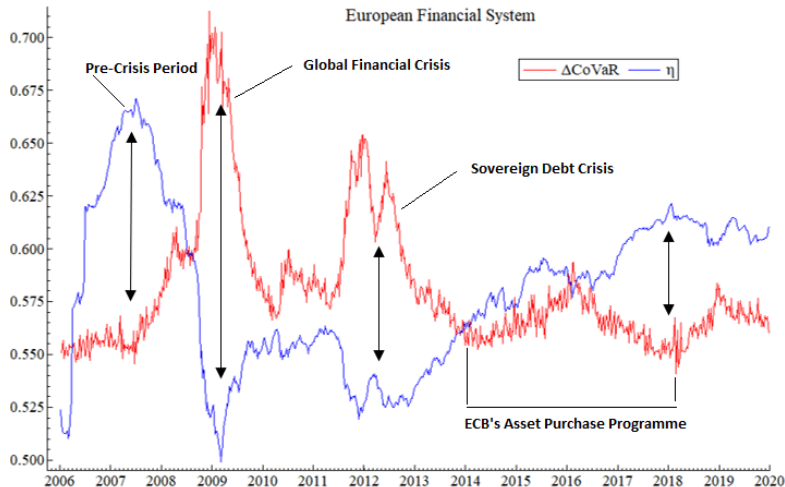
- Overall, we find strong evidence of leverage and systemic risk pro-cyclicality;
- NBFIs is pro-cyclical in periods of stress and contribute significantly to systemic risk;
- Starting from the Global Financial Crisis, excessive leverage leads to severe threats for the financial stability;
- To ameliorate financial stability risks, there is a need to carefully monitor:
  - bank-like activities involving maturity and/or liquidity transformation and leverage, and their interconnections with the banking system;
  - non-bank financial entities involved in credit intermediation process which may be less likely (or be seen to be less likely) to have appropriate control in place, leading to potential risks within the financial system.

- We are also investigating whether the Intermediary Capital Ratio ( $\eta$ ) of a financial institution may be considered a counter-cyclical driver of systemic risk;
- Define  $\eta$ , as proxy of an intermediaries's net worth, as **He et al. (2017)**:

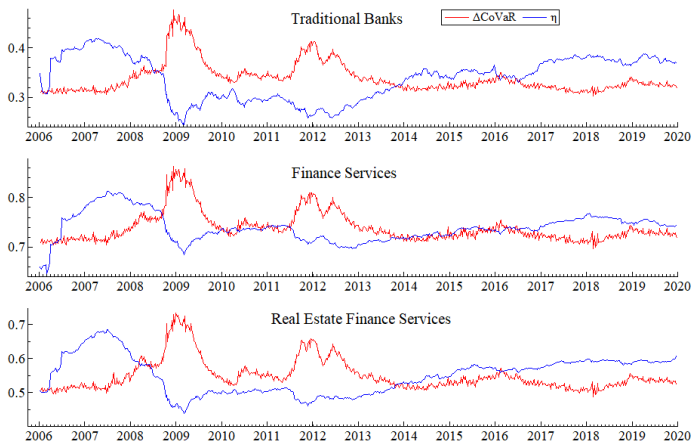
$$\eta_{i,t} = \frac{Mkt\ Equity_{i,t}}{(Mkt\ Equity_{i,t} + Book\ Debt_{i,t})} \quad (3)$$

- An interesting question to address is: do NBFIs intermediary net capital ratio differ from traditional banks? (Some first evidence is below.)

FIGURE 1: Systemic Risk ( $\Delta\text{CoVaR}$ ) and Intermediary Capital Ratio ( $\eta$ ).



**FIGURE 2:** Systemic Risk ( $\Delta CoVaR$ ) and Intermediary Capital Ratio ( $\eta$ ) across financial intermediaries.





# LOOKING AHEAD: SUMMARY OF THE RESULTS

- When the intermediaries's net worth falls, their risk-bearing capacity is impaired and they require higher compensation to take on risk;
- $\eta_{i,t} > \Delta \text{CoVaR}_{i,t}$  during tranquil market periods such as *Pre-Crisis* (2006:1-2007:2) and *Post-Crisis Period* (2013:1-2019:4);
- $\eta_{i,t} < \Delta \text{CoVaR}_{i,t}$  during financial market turmoil such as *Subprime Crisis* (2007:3-2008:3), *Global Financial Crisis* (2008:4-2010:2), and *Sovereign Debt Crisis* (2010:3-2012:4);
- A similar trend for  $\eta_{i,t}$  is evident for TBs and REFs, while for FSs is slightly different in particular during the ECB's Asset Purchase Programme;
- These differences may depend on the different balance sheet structures and composition.

**Thank you for the attention! We are available for Q&A.**