

# Aggregate Implications of Financial Market Imperfections: Lessons from Micro-level Data (Part I)

Daniel Carvalho

USC Marshall School of Business

**Encontro Brasileiro de Finanças**

**July 15, 2016**

# Overview

- A fundamental question in corporate finance is to understand the implications of financing frictions for the real economy
  - Frictions limiting firms' ability to raise outside financing
  - Credit-market imperfections should play a major role here
- Most empirical research in corporate finance addressing this issue focuses on firm-level effects, i.e. how frictions affecting a given firm shapes its investment or growth
  - Examples: link between firm investment and cash flows or the availability of bank credit.
  - Clearly an important first step to establish if these frictions seem relevant.

# Overview

- But the broader implications of financing frictions for the economy really depend on how these frictions affect outcomes at a more aggregate level
  - Suppose we find evidence that credit-market imperfections lead some firms to invest less
  - This will create incentives for other firms to “fill this gap” – lower prices for capital, labor and other inputs, as well as reduce competition in product markets
  - What if some firms invest less because of such frictions, but others invest more in response to this? Should we care about such effects?
  - In order to examine these broader implications we really need to explicitly consider how firm-level effects translate into more aggregate outcomes

# Overview

- These two lectures will focus on recent research building on micro-level evidence to address two of these broader implications of credit-market frictions
  - (1) Financing frictions and the amplification of economic downturns
    - financial accelerator effects where poor aggregate economic conditions weakens the financial positions of several firms at the same time, deteriorating even further economic conditions, and so on.
  - (2) The role of financial markets in shaping economic growth
    - well-functioning financial markets can play an important role in channeling resources to firms with best opportunities – increasing aggregate productivity

# Financing Frictions and Amplification

- Large body of theoretical research argues that the effects of financing frictions can be quantitatively more important at the aggregate level – (in contrast with the previous intuition)
  - Reason: negative externalities imposed by financially constrained firms in bad economic states of the world
  - Example: aggregate economic conditions deteriorate → greater financing constraints → lower asset prices for all firms → weaker balance sheets for all firms → further increases in financing constraints, and so on.
  - E.g., Shleifer and Vishny (1992), Kiyotaki and Moore (1997), Bernanke, Gertler and Gilchrist (1999), Lorenzoni (2008), and Brunnermeier and Sannikov (2013).
  - *This idea plays a central role in explanations for the severity of economic downturns or financial crisis based on financing frictions*

# Research Questions

- (1) Do these effects lead to a quantitatively important amplification of economic downturns, i.e. do they lead to significant financial multipliers?
- (2) Do these *ex-post* effects lead firms' *ex-ante* financial policies to impose significant externalities on other firms?
- (3) Under what conditions should we expect these effects to be most important?

# Estimating Financial Multipliers

- Requires comparing the impact of the same negative aggregate shock on a given firm when other firms face greater financial problems in response to the shock
- Natural to examine this issue at the industry level – focus on the financial conditions of industry peers - some of the main channels proposed in the literature would operate within an industry
- If real assets are specialized by industry, industry peers' financial conditions can play an important role in determining the prices at which firms can sell their assets → impact on firms' balance sheets → determine ability to borrow against assets or raise funds through asset sales
- Main advantage relative to an economy-wide analysis: can better identify the importance of these externalities and their economic drivers

# What Determines the Importance of such Multipliers?

- Net effect of financial contagion effects (including both positive and negative)
  - If constrained firms lower their industries' asset prices, they will reduce their peers' cost of buying capital.
  - Firms can also benefit from distressed peers in product markets.
  - If these positive contagion effects dominate negative effects, externalities imposed by financially weaker firms would limit, rather than amplify, the impact of industry downturns.
- Importance of feedback loops between financial and economic conditions

# Empirical Evidence - I

- Initial set of studies have looked at the relative importance of negative and positive contagion effects by examining how firms' value, loan yields, and CDS spreads change around the bankruptcy of their industry peers
  - Examples: Lang and Stulz (1992), Jorion and Zhang (2007), and Hertzler and Officer (2012).
- However, it is difficult to isolate the impact of firms' financial conditions on their peers with this evidence.
- The financial distress or bankruptcy of some firms in an industry might reflect new information about the industry that is relevant to predict the performance of peers.

# Empirical Evidence - II

- Benmelech and Bergman (2011) address this concern by showing that distressed airlines differentially increase the spreads on the debt of other airlines that is secured by the specific types of aircraft they use.
- They address the previous identification issue by contrasting different debt tranches by airlines – each one is secured by a specific type of aircraft
- The liquidation values associated with these different tranches will depend on the price of the specific aircrafts pledged as collateral → financial distress of the specific airlines (as opposed to airlines in general) which use these aircrafts should matter the most

# Empirical Evidence - II

- This analysis allows them to isolate the importance of one type of negative contagion effect but does not estimate the overall effect of distressed airlines on the cost of debt or value of other airlines → their results do not address the relative importance of negative versus positive contagion effects (central condition for the existence of amplification effects).
  - Their results capture the impact of distressed airlines on the relative spreads of different types of debt of other airlines. For example, product market interactions could lead distressed airlines to decrease spreads in all debt of other airlines, but this decrease could be smaller for debt secured by the type of aircraft they use. Additionally, if distressed airlines reduce the cost for peers of buying capital, their distress could increase the value of peers while still increasing the spreads in their existing debt.
- Moreover, these studies do not examine the extent to which negative contagion effects inside an industry lead to feedback loops by affecting peers' own financial conditions.

# Empirical Evidence - III

- Carvalho (2015): approach to examine the economic importance of amplification effects that allows one to measure the net effects from the externalities imposed by financially distressed firms on their industry peers, while still addressing the identification challenges in isolating within industry contagion.
  - This approach also allows one to incorporate feedback loops while quantifying the magnitude of these effects.
- Firms' liquidity needs during negative economic shocks should be largely determined by their debt maturity structures.
  - Financing frictions should be especially binding during bad economic conditions for firms with maturing debt because they need to either roll over or pay down their debt during these adverse conditions.
  - Use the *ex-ante* maturity structure of a firm's long-term debt to predict its financial exposure to industry downturns.
  - Firms do not typically spread out their long-term debt maturity dates across time (Almeida et al. (2012)), which leads to significant differences across firms in the fraction of their debt maturing at the time of unexpected shocks.
- Therefore, one can relate firms' valuation losses during industry downturns over the same period to cross-sectional differences in their peers' *ex-ante* debt maturity structures.

# Initial Evidence

$$\begin{aligned} \text{AbnormalRet}_{ijt} = & \theta_t + \gamma \times \text{IndDownturn}_{jt} + \alpha_0 \times \text{HighMatDebtFirm}_{ijt} \\ & + \alpha_1 \times \text{HighMatDebtInd}_{jt} + \beta_0 \times \text{IndDownturn}_{jt} \times \text{HighMatDebtFirm}_{ijt} \\ & + \beta_1 \times \text{IndDownturn}_{jt} \times \text{HighMatDebtInd}_{jt} + \delta' X_{ijt} + \varepsilon_{ijt} , \end{aligned}$$

*Abnormal Ret*: yearly abnormal return for firm  $i$  in industry  $j$  and year  $t$  (also look at investment and other real outcomes)

*High Maturing Debt Firm*: variable that equals one if the firm has a high fraction of its long-term debt maturing within a year in the previous year

*High Maturing Debt Industry*: variable that equals one if the industry has a high share of high maturing debt firms

Coefficient of interest:  $\beta_1$

# Industry Downturns

- Motivated by previous work identifying distressed industries (Opler and Titman (1994), and Acharya, Bharath and Srinivasan (2007)), focus on industry-years where there are negative unadjusted median stock returns and low median revenue growth
- Different samples of industry downturns based on different thresholds for revenue growth
  - Always impose the negative median stock return condition
  - Leads to three definitions of industry downturns
  - Samples represent 8.3%, 14.5% and 20.9% of firm-year observations
- Want shocks to be external to the industry – use broader industry definitions to classify downturns, track effects across narrower industry groups

# Do Firms Experience Greater Valuation Losses when Peers Have their Debt Maturing During Downturns?

	Abnormal return					
	(1)	(2)	(3)	(4)	(5)	(6)
<i>High Maturing Debt Industry_1 × IndustryDownturn_1</i>	-0.077*** (0.015)					
<i>High Maturing Debt Industry_1 × IndustryDownturn_2</i>		-0.078*** (0.012)				
<i>High Maturing Debt Industry_1 × IndustryDownturn_3</i>			-0.062*** (0.011)			
<i>High Maturing Debt Industry_2 × IndustryDownturn_1</i>				-0.104*** (0.024)		
<i>High Maturing Debt Industry_2 × IndustryDownturn_2</i>					-0.076*** (0.018)	
<i>High Maturing Debt Industry_2 × IndustryDownturn_3</i>						-0.052*** (0.016)
Year x Industry Downturn FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	84,720	84,720	84,720	55,220	55,220	55,220
R <sup>2</sup>	0.02	0.02	0.02	0.02	0.02	0.02

Can estimate multiplier by comparing effects to valuation loss generated by downturn in industries with low maturing debt

**Implied magnitudes:** For the average industry, a downturn leading to an initial loss of 10% in the value of firms is estimated to have a final impact between 13.4% and 15.8% because of contagion effects.

# Results by Importance of Long-Term Debt

	Abnormal return			
	<i>Low LT Debt Industry (33%)</i>	<i>Higher LT Debt Industry (33%)</i>	<i>Low LT Debt Industry (25%)</i>	<i>Higher LT Debt Industry (25%)</i>
	(1)	(2)	(3)	(4)
<i>High Maturing Debt Industry_1 × IndustryDownturn_3</i>	-0.007 (0.023)	-0.057*** (0.012)	0.030 (0.031)	-0.066*** (0.011)
Year × industry downturn FE	Yes	Yes	Yes	Yes
Observations	29,191	68,205	21,078	76,318
R <sup>2</sup>	0.03	0.03	0.03	0.03

# Fundamental Issue

- Industries' debt maturity structures are endogenously determined. As a consequence, differences in maturity structure across industries could be capturing differences in the economic severity of their downturns rather than the effect of industries' financial structures.
- **First concern:** results may capture persistent differences in debt maturity structure across industries. For example, industries relying on shorter-term debt will be more likely to have their debt maturing in a given year and might have different exposures to downturns.
  - For example, industries which rely on shorter-term debt could be riskier industries which face a greater cost in raising long-term financing (e.g. adverse selection problems).

# Addressing Concerns

- Examine changes over time in industries' past debt maturity structures.
- Imagine we are predicting the exposure of industries to downturns in 2000.
- Industries can be identified as financially exposed to downturns in 2000 if their debt is maturing in three years in 1997.
  - Persistent differences in debt maturity structures will make some industries more likely to have their debt maturing in three years in any given year before 2000.
- However, one can control for industries' average tendencies over time to have their debt maturing in three years.
  - Some industries might happen to have a higher fraction of their debt maturing in three years in 1997 but lower values of this same fraction in other years before 2000.

# Do Firms Experience Greater Valuation Losses when Peers Have their Debt Maturing During Downturns?

Panel A: No Controls for Persistent Differences in Industries' Past Debt Maturity Structures						
	Abnormal Return					
	(1)	(2)	(3)	(4)	(5)	(6)
<i>High Maturing Debt Industry_1 (Lag 3) × IndustryDownturn_1</i>	-0.057*** (0.014)					
<i>High Maturing Debt Industry_1 (Lag 3) × IndustryDownturn_2</i>		-0.036*** (0.012)				
<i>High Maturing Debt Industry_1 (Lag 3) × IndustryDownturn_3</i>			-0.032*** (0.011)			
<i>High Maturing Debt Industry_2 (Lag 3) × IndustryDownturn_1</i>				-0.060*** (0.017)		
<i>High Maturing Debt Industry_2 (Lag 3) × IndustryDownturn_2</i>					-0.051*** (0.014)	
<i>High Maturing Debt Industry_2 (Lag 3) × IndustryDownturn_3</i>						-0.046*** (0.013)
Year x Industry Downturn FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	60,444	60,444	60,444	42,220	42,220	42,220
R <sup>2</sup>	0.02	0.02	0.02	0.02	0.02	0.02

Same specification as before, now using past debt maturity variables to predict the financial exposure of firms/industries to downturns

**Implied magnitudes:** an initial loss of 10% in the value of firms is estimated to have a final impact between 13.3% and 13.6% because of contagion effects.

# Do Firms Experience Greater Valuation Losses when Peers Have their Debt Maturing During Downturns?

Panel B: Controlling for Persistent Differences in Industries' Past Debt Maturity Structures						
	Abnormal Return					
	(1)	(2)	(3)	(4)	(5)	(6)
<i>High Maturing Debt Industry_1 (Lag 3) × IndustryDownturn_1</i>	-0.058*** (0.020)					
<i>High Maturing Debt Industry_1 (Lag 3) × IndustryDownturn_2</i>		-0.037** (0.016)				
<i>High Maturing Debt Industry_1 (Lag 3) × IndustryDownturn_3</i>			-0.036*** (0.014)			
<i>High Maturing Debt Industry_2 (Lag 3) × IndustryDownturn_1</i>				-0.066*** (0.026)		
<i>High Maturing Debt Industry_2 (Lag 3) × IndustryDownturn_2</i>					-0.085*** (0.022)	
<i>High Maturing Debt Industry_2 (Lag 3) × IndustryDownturn_3</i>						-0.076*** (0.019)
Controls for Persistent Differences in Industry Debt Maturity	Yes	Yes	Yes	Yes	Yes	Yes
Year x Industry Downturn FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	47,446	47,446	47,446	32,795	32,795	32,795
R <sup>2</sup>	0.03	0.03	0.03	0.03	0.03	0.03

Magnitudes remain very similar after adding these controls

# Additional Concerns

(1) Results capture trends in industry debt maturity – capture industries shifting over time towards shorter-term maturity

(2) Matching of asset and debt maturity

- This concerns are addressed with additional simple tests (see Carvalho (2015))
- For example, the debt maturity of industry peers does not predict significant effects outside common shocks across an industry (industry downturns)

# Additional Evidence

(1) Results are driven by industries with specialized assets - industry-specific assets, measured in five different ways

(2) Results are only important for competitive industries – in theory, positive contagion effects where firms benefit from weaker competitors should be more important in concentrated industries (where profits are higher)

(3) Drops in firm value are matched with drops in gross or net investment

Supports the view that the previous effects are driven by the adverse impact that financially constrained firms have on the balance sheets of their industry peers.

# Potential Directions for Future Research - Issues

- Propagation of effects across different industries – speaks more directly to macroeconomic implications
- Different sources of externalities that might operate at more aggregate level (across industries), e.g. local demand effects through input or consumer demand
- Feedback between economic conditions and bank lending → economic downturns should weaken banks' balance sheets → reductions in bank lending → further deterioration of economic conditions, and so on.
- Consider richer structure for network through which these contagion effects operate – network structure associated with contagion effects could be important
- Implications for (social) efficiency of privately optimal financial decisions of firms

# Potential Directions for Future Research - Methods

- The previous papers focus on reduced-form specifications which try to estimate industry equilibrium effects
- A very promising approach is to try to integrate calibrated models of these issues (as used in macro) with reduced-form effects such as the previous ones.
  - A main issue with these calibrated models is that their parameters are identified using very broad relationships which could capture a range of factors outside the model – e.g. the magnitude of the employment drop in a recession
- These reduced-form analyses allow one to “more credibly” estimate some effects of interest that will play a key role in such models (i.e., do a better job in isolating these effects from other factors in the data outside the model)
- So using such effects to calibrate models would allow one to analyze their predictions with “realistic” inputs – this could allow one to answer important questions which are challenging to examine only with reduced-form results