

Access to capital, investment, and the financial crisis

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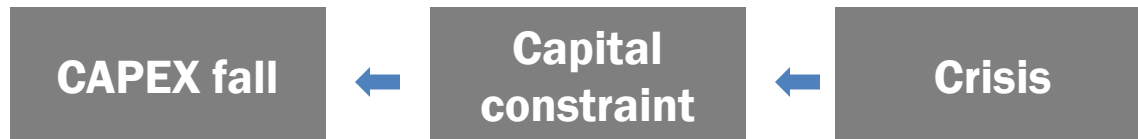
OUTLINE

- Introduction
- Theories
 - I. Bank lending
 - II. Credit supply
 - III. Demand shock
 - IV. B/L multiplier
- Tests
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 2. Net debt
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INTRODUCTION

Theories of impaired access to capital

-Explain how losses on subprime mortgage led to the worst recession



Objective: test whether

1. bank lending and credit supply shock is the first order determinant of firm investment and financing policies
2. balance sheet multiplier effect worsen the crisis.

Method: Cross- sectional variation change

Data:

- 48,202 firms
- Quarterly data from 2006Q3-2010Q1

Type of firms

Bank-dependent firms



Bank relationship: Firms that have 2 or more loan from a US bank in 5 years (before the end of 2006q2)

Leverage: Select top quintile of leverage at the end of 2006q2

Small: Bottom quintile of asset with no credit rating

Non-bank financing firms

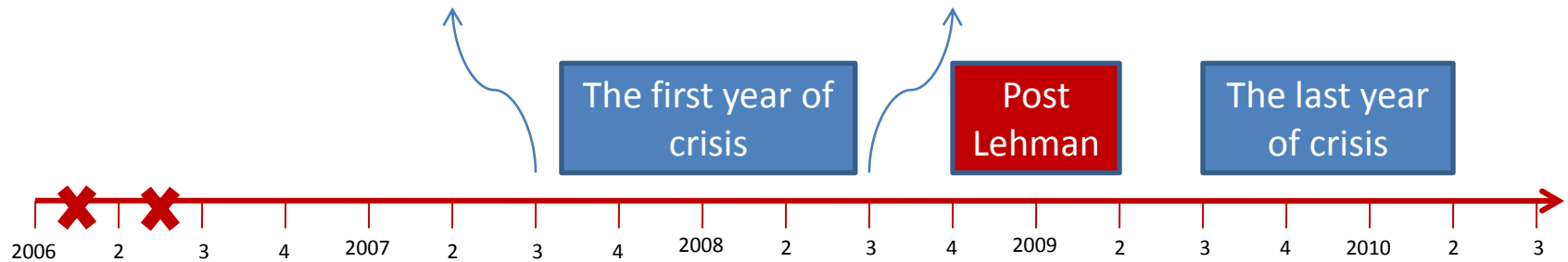
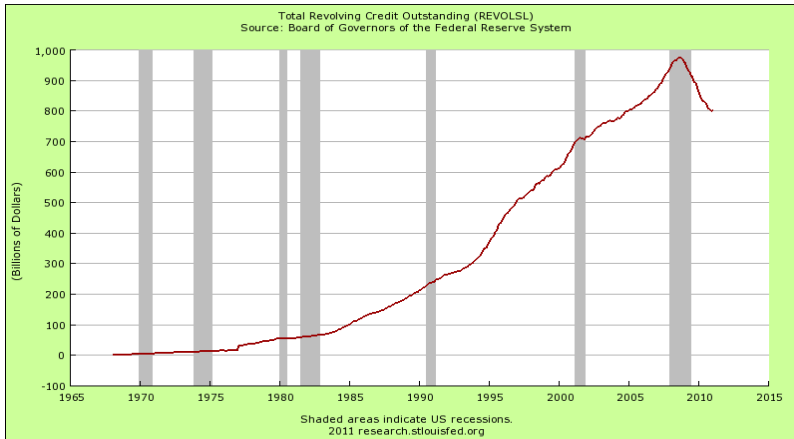


No leverage: zero leverage, below 5%



High cash holding: top quintile

PERIOD



1. First year of crisis

(2007Q3-2008Q2)

- The period after credit boom(2007Q2)
- Less effect from demand shock

2. Post-Lehman period

(2008Q4-2009Q1)

- The collapse was on 2008Q3
- Decrease in net debt and CAPEX

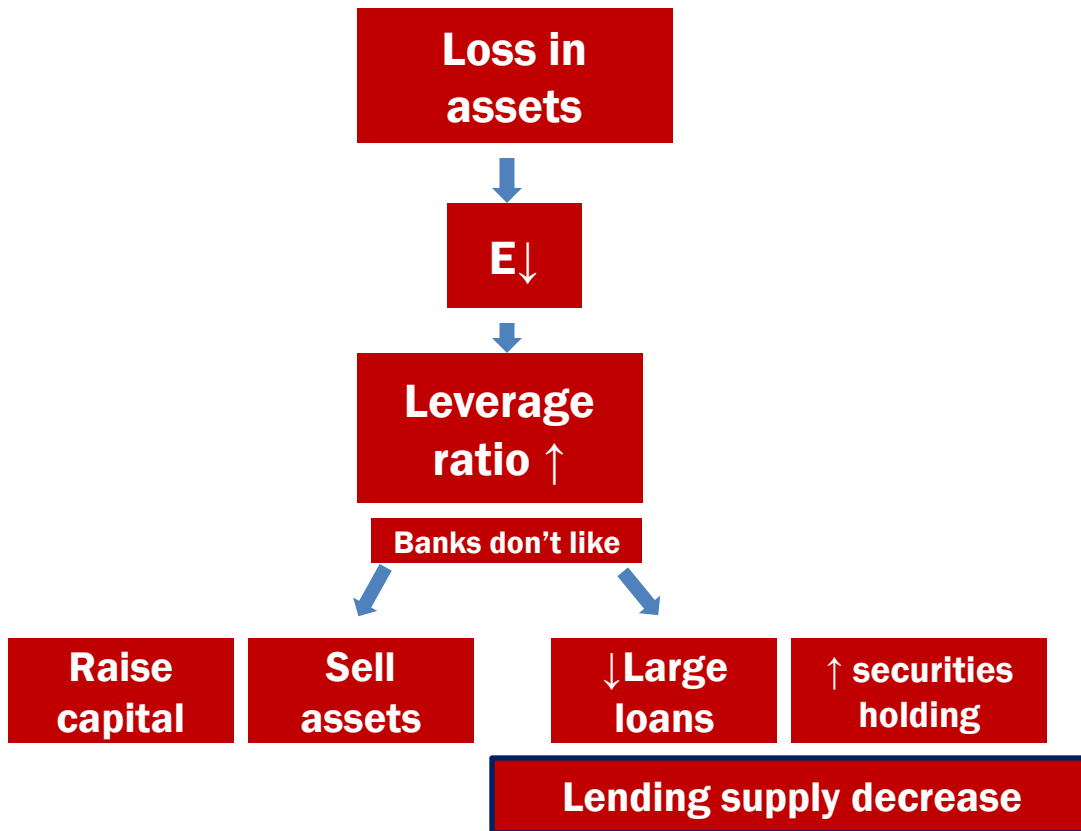
3. Last year of crisis

(2009Q2-2010Q1)

- Economy revived

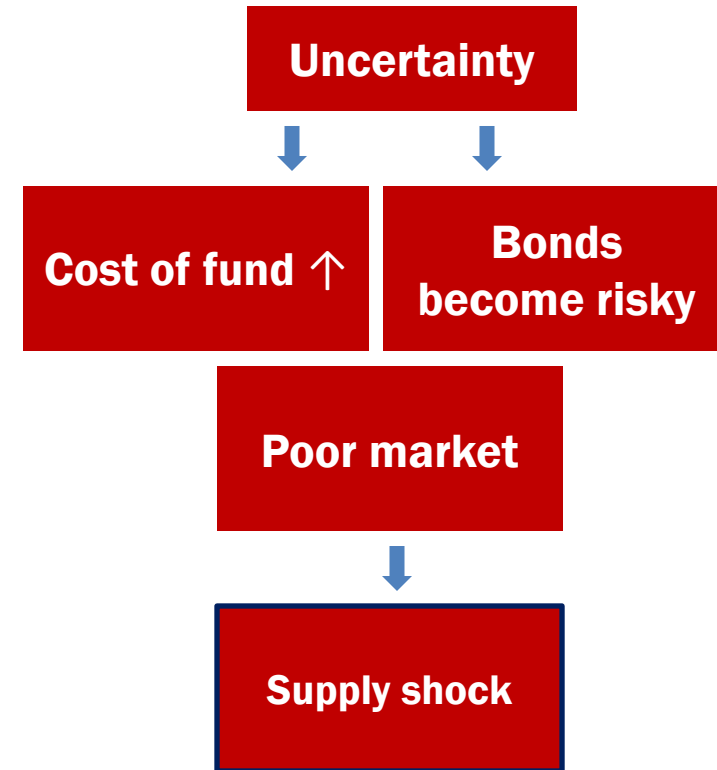
THEORIES

1. Bank lending supply shock theory



Expectation: Bank-dependent firms get the most impact(CAPEX and net debt↓) especially in the 1st year

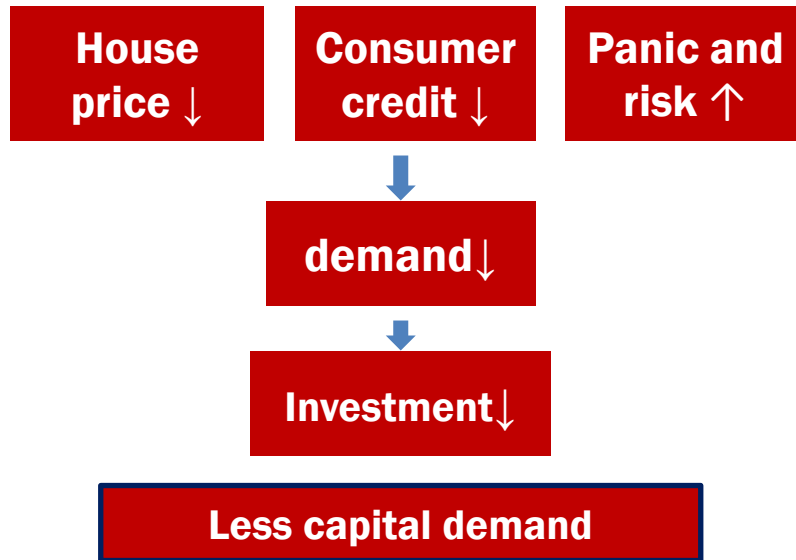
2. Credit supply shock theory



Expectation: Credit-dependent firms get impacted the most (CAPEX & net debt issuance↓) especially in the 1st year.

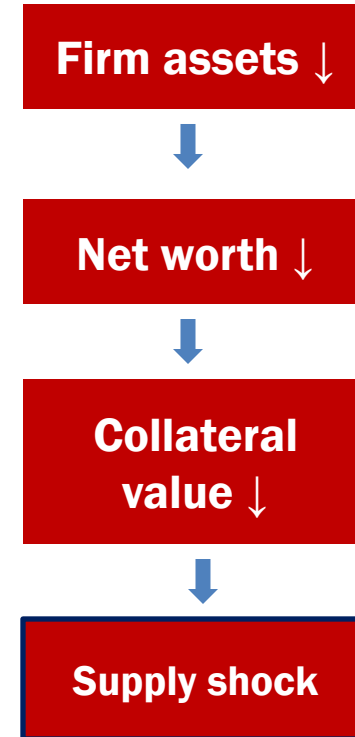
THEORIES

3. Demand shock theory



Expectation: For all firms, CAPEX & net debt+ equity issuance ↓

4. Balance sheet multiplier effect theory



Expectation: Leverage firm will experience more decrease in CAPEX & borrowings

Results summary

- Not support the bank lending and credit shock theory from the evidence of the first year period.
- Not support balance sheet multiplier theory as the results are similar regardless degree of leverage during the crisis.
- But it is support demand shock theory

Approach

- Matching approach comparing the change between treated and control groups
 - Difference in differences(DID)
 - Abadie-Imbens' average effect of the treatment on the treated(ATT matching)
 - based on market-to book ratio, operating cash flow, size, cash holdings, leverage ratio, two-digit SIC industry, and credit ratings
- Regression with interaction term between indicator variables for firms and crisis indicators.

1. Capital Expenditure

Keys:

1. CAPEX not fall in first year but after Lehman. Bank supply and credit supply shock are not held.
2. All types have negative figures → demand shock is hold.
 - High leverage should fall the most
3. No leverage CAPEX fall more than leverage → B/L not hold.
4. All decrease CAPEX as demand shock included.

| | Whole sample | Bank relation | High leverage | High leverage, bank dependent | Small, bank dependent | No leverage | High cash |
|--------------------------------------|------------------------|---------------|---------------|-------------------------------|-----------------------|-------------|-----------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Crisis period averages | | | | | | | |
| 1. Precrisis (2006Q3–2007Q2) | 0.0147 | 0.0167 | 0.0158 | 0.0157 | 0.0147 | 0.0111 | 0.0080 |
| 2. First year (2007Q3–2008Q2) | 0.0148 | 0.0165 | 0.0165 | 0.0166 | 0.0143 | 0.0120 | 0.0087 |
| 3. Post-Lehman (2008Q4–2009Q1) | 0.0114 | 0.0132 | 0.0128 | 0.0133 | 0.0112 | 0.0083 | 0.0063 |
| 4. Last year (2009Q2–2010Q1) | 0.0098 | Lending shock | Credit supply | 0.0108 | 0.0096 | 0.0072 | 0.0062 |
| Difference (2–1) | 0.0001 | –0.0002 | 0.0007 | 0.0009 | –0.0004 | 0.0009 | 0.0007 |
| p-value for t-test | 0.7175 | 0.6865 | 0.2739 | 0.2227 | 0.4498 | 0.1487 | 0.1993 |
| Difference (4–1) | Demand shock ✓ –0.0049 | –0.0062 | –0.0048 | –0.0049 | –0.0051 | –0.0040 | –0.0018 |
| p-value for t-test | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0022 |
| | ↓34% | ↓37% | ↓30% | ↓31% | ↓34% | ↓36% | ↓23% |
| Post-Lehman versus pre-Lehman | | | | | | | |
| 2009Q1 | 0.0098 | 0.0113 | 0.0108 | 0.0109 | 0.0095 | 0.0069 | 0.0054 |
| 2008Q4 | 0.0131 | 0.0150 | 0.0149 | 0.0157 | 0.0130 | 0.0098 | 0.0072 |
| 2008Q3 | Demand shock ✓ 0.0143 | 0.0160 | 0.0154 | 0.0161 | 0.0141 | 0.0113 | 0.0082 |
| Difference (2009Q1–2008Q3) | –0.0046 | –0.0047 | –0.0047 | –0.0051 | –0.0046 | –0.0044 | –0.0028 |
| Paired Difference (2009Q1–2008Q3) | –0.0049 | –0.0049 | –0.0054 | –0.0057 | –0.0048 | –0.0047 | –0.0033 |
| p-value for t-test | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |

B/L multiplier

CAPEX: Matching approach

High values are preferable for bank firm and leverage firm.

1. Finding in 1st year is not what bank supply and credit supply shock expect!!
 ✓ In the small, CAPEX ↑ relative to their matching firms in all periods.
2. Treated firms fall less also not support theories
3. High cash&no leverage, CAPEX↓ smaller than their matching firm in the last two period(consistent)

Panel B: Capital expenditures during the crisis versus the precrisis

| | Bank relation | High leverage | High leverage, bank dependent | Small, bank dependent | No leverage | High cash |
|---|---------------|---------------|-------------------------------|-----------------------|-------------|------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Precrisis (2006Q3–2007Q2) versus first year (2007Q3–2008Q2) | | | | | | |
| Treated firms | | | | | | |
| Precrisis | 0.01660 | 0.01649 | 0.01628 | 0.01487 | 0.01236 | 0.00909 |
| First year | 0.01606 | 0.01670 | 0.01653 | 0.01411 | 0.01273 | 0.00971 |
| Difference | 0.00054 | ↑ -0.00021 | -0.00025 | 0.00076 | -0.00037 | -0.00062 |
| Control firms | | | | | | |
| Precrisis | 0.01737 | 0.01895 | 0.01649 | 0.01544 | 0.01342 | 0.01101 |
| First year | 0.01589 | 0.01707 | 0.01793 | 0.01289 | 0.01286 | 0.01037 |
| Difference | 0.00148 | 0.00188 | -0.00144 | 0.00254 | 0.00056 | 0.00064 |
| DID | | | | | | |
| Matching estimator (ATT) | -0.00094 | -0.00209** | 0.00119 | -0.00179* | -0.00093 | -0.00127 |
| Number of observations | 783 | 517 | 400 | 699 | 298 | 235 |
| Precrisis (2006Q3–2007Q2) versus post-Lehman (2008Q4–2009Q1) | | | | | | |
| Treated: precrisis-post-Lehman | | | | | | |
| Control: precrisis-post-Lehman | 0.00434 | 0.00465 | 0.00420 | 0.00439 | 0.00391 | 0.00198 |
| DID | 0.00412 | 0.00471 | 0.00483 | 0.00593 | 0.00463 | 0.00438 |
| Control: precrisis-post-Lehman | | | | | | |
| DID | 0.00023 | -0.00006 | -0.00064 | -0.00154 | -0.00072 | -0.00240* |
| Matching estimator (ATT) | -0.00157 | 0.00001 | -0.00078 | -0.00268* | -0.00167 | -0.00304** |
| Number of observations | 718 | 446 | 347 | 612 | 269 | 197 |
| Precrisis (2006Q3–2007Q2) versus last year (2009Q2–2010Q1) | | | | | | |
| Treated: precrisis - last year | | | | | | |
| Control: precrisis - last year | 0.00702 | 0.00693 | 0.00711 | 0.00655 | 0.00570 | 0.00308 |
| DID | 0.00555 | 0.00842 | 0.00110 | 0.00859 | 0.00606 | 0.00454 |
| Control: precrisis - last year | | | | | | |
| DID | 0.00148 | -0.00150 | 0.00601** | -0.00205 | -0.00036 | -0.00146 |
| Matching estimator (ATT) | 0.00236* | -0.00149 | 0.00650** | -0.00273** | -0.00067 | -0.00213** |
| Number of observations | 705 | 424 | 331 | 587 | 262 | 186 |

Credit supply

Lending shock

1

3

2



Regression approach

- Using dummy variables for treated firms
- Dummy for firms* dummy for crisis period
- The results are consistent.

Regression



Matching

Summation for CAPEX

- Bank & credit shock are not held
 - In the 1st year, CAPEX NOT decreases more for the bank and credit-dependent firms
- Demand shock seem to get strong support
 - After Lehman fell, CAPEX in all firms drops.
- B/L Multiplier also is not get strong supported having 1st order effect



2. Net debt issuance

Did credit contract more for bank dependent firm?

- High leverage fall in the first year → credit shock
- High leverage fall the most → balance sheet multiplier
- Net debt issuance falls with Lehman.

Panel A: Quarterly net debt issuance during the crisis

| | Whole sample | Bank relation | High leverage | High leverage, bank dependent | Small, bank dependent | | | |
|-------------------------------------|--------------|---------------|---------------|-------------------------------|-----------------------|---------|---------|---------|
| | (1) | (2) | (3) | (4) | (5) | | | |
| Crisis period averages | | | | | | | | |
| 1. Precrisis (2006Q3–2007Q2) | 0.0080 | 0.0085 | 0.0095 | 0.0111 | 0.0077 | | | |
| 2. First year (2007Q3–2008Q2) | 0.0085 | 0.0092 | 0.0076 | 0.0083 | 0.0075 | | | |
| 3. Post-Lehman (2008Q4–2009Q1) | -0.0021↓ | -0.0027 | -0.0107 | -0.0078 | -0.0033 | | | |
| 4. Last year (2009Q2–2010Q1) | -0.0037 | -0.0042 | -0.0067 | -0.0070 | -0.0062 | | | |
| Difference (2 - 1) | 0.0005✗ | 0.0007✗ | -0.0020✓ | -0.0027✓ | -0.0003✓ | | | |
| p-value for t-test | 0.4426 | 0.5460 | 0.3531 | 0.2121 | 0.8570 | | | |
| Difference (4 - 1) | -146% | -0.0117 | -149% | -0.0127 | -171% | -0.0163 | -0.0181 | -0.0139 |
| p-value for t-test | | 0.0001 | | 0.0001 | | 0.0001 | 0.0001 | 0.0001 |
| Post-Lehman versus pre-Lehman | | | | | | | | |
| 2009Q1 | -0.0040 | -0.0046 | -0.0106 | -0.0076 | -0.0039 | | | |
| 2008Q4 | -0.0001 | -0.0008 | -0.0108 | -0.0080 | -0.0027 | | | |
| 2008Q3 | 0.0079 | 0.0078 | 0.0048 | 0.0045 | 0.0089 | | | |
| Difference (2009Q1 - 2008Q3) | -0.0119 | -0.0124 | -0.0154 | -0.0122 | -0.0128 | | | |
| Paired Difference (2009Q1 - 2008Q3) | -0.0119 | -0.0128 | -0.0145 | -0.0116 | -0.0127 | | | |
| p-value for t-test | 0.0001 | 0.0001 | 0.0001 | 0.0033 | 0.0002 | | | |

Bank lending

Credit supply

B/L multiplier

Demand shock

Net debt: Matching approach

We like the high number in the precrisis-period and the DID&ATT

- Bank relationship firms increase its net debt in 1st year
- high leverage tends to follow the credit shock

Panel B: Net debt issuance during the crisis versus the precrisis

| | Bank relation | High leverage | High leverage, bank dependent | Small, bank dependent |
|---|---------------|---------------|-------------------------------|-----------------------|
| | (1) | (2) | (3) | (4) |
| Precrisis (2006Q3–2007Q2) versus first year (2007Q3–2008Q2) | | | | |
| Treated firms | | | | |
| Precrisis | 0.00910 | 0.01118 | 0.01191 | 0.00824 |
| First year | 0.00912 | 0.00789 | 0.00891 | 0.00821 |
| Difference | -0.00002 | 0.00329 | 0.00300 | 0.00002 |
| Control firms | | | | |
| Precrisis | 0.00779 | 0.01165 | 0.01654 | 0.00746 |
| First year | 0.00880 | 0.01063 | 0.00592 | 0.00399 |
| Difference | -0.00100 | 0.00102 | 0.01062 | 0.00347 |
| DID | 0.00099 | 0.00227 | -0.00762 | -0.00345 |
| Matching estimator (ATT) | 0.00405 | 0.00241 | -0.00508 | -0.00442 |
| Number of observations | 775 | 514 | 397 | 688 |
| Precrisis (2006Q3–2007Q2) versus post-Lehman (2008Q4–2009Q1) | | | | |
| Treated: precrisis - post-Lehman | 0.01183 | 0.02071 | 0.01984 | 0.01085 |
| Control: precrisis - post-Lehman | 0.01442 | 0.01209 | 0.03324 | 0.00873 |
| DID | -0.00259 | 0.00862** | -0.01341 | 0.00211 |
| Matching estimator (ATT) | 0.00187 | 0.00895* | -0.01468* | -0.00149 |
| Number of observations | 705 | 444 | 345 | 598 |
| Precrisis (2006Q3–2007Q2) versus last year (2009Q2–2010Q1) | | | | |
| Treated: precrisis - last year | 0.01318 | 0.01788 | 0.01904 | 0.01235 |
| Control: precrisis - last year | 0.00964 | 0.01666 | 0.01297 | 0.01338 |
| DID | 0.00354 | 0.00122 | 0.00607 | -0.00103 |
| Matching estimator (ATT) | 0.00645 | 0.00113 | 0.00692 | -0.00252 |
| Number of observations | 696 | 425 | 331 | 569 |



Bank lending

credit supply



B/L multiplier

Net debt: Regression

Regression



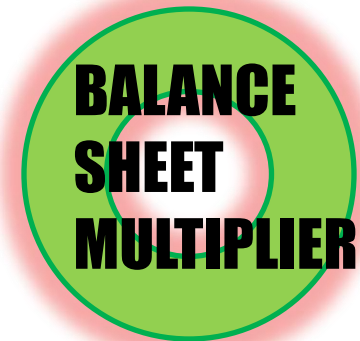
Matching

High leveraged firms

| 1 st year | Last year |
|----------------------|-----------|
| low | high |

Summation for Net debt

- The same as CAPEX, Bank-dependent firms do not have lower net debt in the 1st year
- After the fall of Lehman, most subgroups have less net debt issued but that of highly leveraged firms decline more than other(not more in CAPEX)
- **Only High leverage** results comply with the credit supply shock and B/L multiplier effect



2 alternative sources of funding

- 1. Net equity issuance**
- 2. Cash holdings**

3. Substitution of net equity issuance

Whether there is a substitution toward equity or a flight to quality?

1. Credit supply shock then issue equity is an alternative method of funding.
2. As there is a flight to quality, equity issuance become less attractive.

Net equity issuance

| | Whole sample | Bank relation | High leverage | High leverage, bank dependent | Small, bank dependent | No leverage | High cash | |
|-------------------------------------|-----------------|---------------|------------------|-------------------------------|-----------------------|-----------------|-----------|--------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | |
| Crisis period averages | | | | | | | | |
| 1. Precrisis (2006Q3–2007Q2) | 0.0103 | repurchase | -0.0018 | 0.0125 | 0.0084 | 0.0144 | 0.0184 | 0.0417 |
| ↓ 2. First year (2007Q3–2008Q2) | 0.0048 | | -0.0043 | 0.0075 | 0.0038 | 0.0067 | 0.0060 | 0.0185 |
| ↓ 3. Post-Lehman (2008Q4–2009Q1) | ↓32% 0.0015 | | -0.0018 | 0.0032 | 0.0015 | 0.0006 | 0.0028 | 0.0100 |
| ↑ 4. Last year (2009Q2–2010Q1) | 0.0115 | | Lowest 0.0012 | 0.0106 | 0.0058 | 0.0110 | 0.0169 | 0.0379 |
| ↓ Difference (2–1) × | ↓53% -0.0054 | -0.0025 | -0.0050 | -0.0045 | -0.0076 | ↓67% -0.0124 | -0.0232 | |
| p-value for t-test | 0.0001 | 0.0001 | 0.0025 | 0.0022 | 0.0001 | 0.0001 | 0.0001 | |
| Difference (4–1) | 0.0013 | 0.0030 | -0.0019 | -0.0026 | -0.0034 | -0.0015 | -0.0038 | |
| p-value for t-test | 0.0910 | 0.0001 | 0.2814 | 0.1054 | 0.0260 | 0.6499 | 0.3947 | |
| Post-Lehman versus pre-Lehman | | | | | | | | |
| 2009Q1 | 0.0029 | -0.0010 | 0.0042 | 0.0015 | 0.0016 | 0.0064 | 0.0164 | |
| 2008Q4 | 0.0001 | -0.0027 | 0.0022 | 0.0014 | -0.0004 | -0.0008 | 0.0037 | |
| 2008Q3 | 0.0021 | -0.0040 | 0.0031 | 0.0008 | 0.0045 | 0.0009 | 0.0106 | |
| Difference (2009Q1 - 2008Q3) ✓ | 0.0008 | 0.0031 | 0.0011 | 0.0007 | -0.0029 | 0.0054 | 0.0058 | |
| Paired Difference (2009Q1 - 2008Q3) | 0.0010 | 0.0032 | 0.0010 | 0.0008 | -0.0020 | 0.0049 | 0.0065 | |
| p-value for t-test | 0.2733 | 0.0001 | 0.6439 | 0.3074 | 0.1743 | 0.1789 | 0.2217 | |

Net equity: other methods

Matching method:

- Bank relationship firms facing negative net equity issuance in the precrisis but matching firms facing positive

Regression method:

- Bank relationship firms repurchase less which may imply substitution
- During the last year, no leverage and high cash issue net equity a lot while bank relationship firms have negative issuance.

Summation for net equity

- Flight to quality in the 1st year and post-Lehman
- Seem to substitute net debt as it move toward opposite direction in the last year .
- But cumulative decrease in net equity is more than net debt.



4. Cash holding

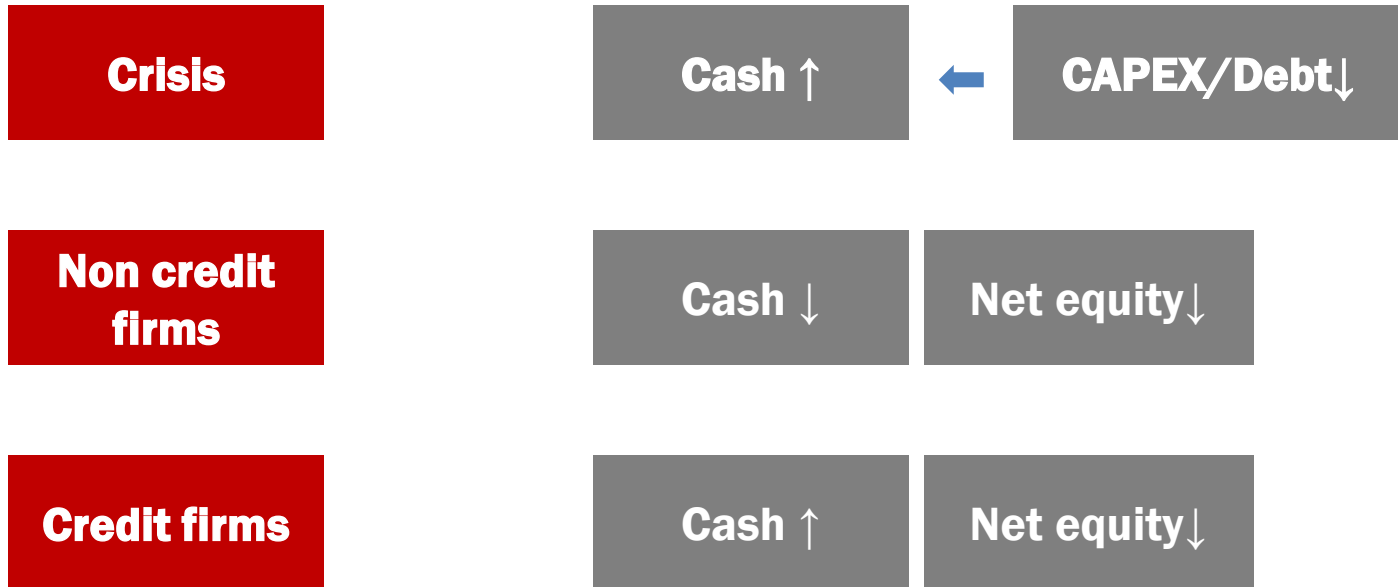
Cash is used to relief the effect from shock.

As CAPEX and Net debt not decrease in the 1st year

Panel A: Quarterly cash holdings during the crisis

| | Whole sample | Bank relation | High leverage | High leverage, bank dependent | Small, bank dependent | No leverage | High cash |
|-------------------------------------|--------------|---------------------|---------------|-------------------------------|-----------------------|----------------------|----------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Crisis period averages | | | | | | | |
| 1. Precrisis (2006Q3–2007Q2) | 0.2196 | 0.0806 | 0.1230 | 0.0791 | 0.1668 | 0.4519 | 0.6511 |
| 2. First year (2007Q3–2008Q2) | 0.2101 | 0.0770 | 0.1214 | 0.0794 | 0.1592 | 0.4075 | 0.5906 |
| 3. Post-Lehman (2008Q4–2009Q1) | 0.2006 | 0.0841 | 0.1144 | 0.0789 | 0.1533 | 0.3821 | 0.5460 |
| 4. Last year (2009Q2–2010Q1) | 0.2185 | 0.1002 | 0.1271 | 0.0928 | 0.1711 | 0.3901 | 0.5544 |
| Difference (2 - 1) | -0.0095 | -0.0036 | -0.0016 | 0.0003 | -0.0077 | -0.0444 | -0.0605 |
| p-value for t-test | 0.0062 | 0.2226 | 0.7976 | 0.9171 | 0.2185 | 0.0020 | 0.0006 |
| Difference (4 - 1) | -0.0011 | 0.0196 [↑] | 0.0041 | 0.0137 [↑] | 0.0042 | -0.0618 [↓] | -0.0967 [↓] |
| p-value for t-test | 0.7503 | 0.0001 | 0.5174 | 0.0078 | 0.5185 | 0.0001 | 0.0001 |
| Post-Lehman versus pre-Lehman | | | | | | | |
| 2009Q1 | 0.2016 | 0.0859 | 0.1128 | 0.0790 | 0.1525 | 0.3838 | 0.5400 |
| 2008Q4 [↑] | 0.1996 | 0.0823 | 0.1161 | 0.0787 | 0.1540 | 0.3805 | 0.5519 |
| 2008Q3 | 0.1947 | 0.0756 | 0.1142 | 0.0745 | 0.1494 | 0.3697 | 0.5452 |
| Difference (2009Q1 - 2008Q3) | 0.0069 | 0.0102 | -0.0014 | 0.0045 | 0.0031 | 0.0141 | -0.0051 |
| Paired Difference (2009Q1 - 2008Q3) | 0.0077 | 0.0099 | 0.0006 | 0.0028 | 0.0054 | 0.0236 | 0.0056 |
| p-value for t-test | 0.0001 | 0.0001 | 0.8432 | 0.2536 | 0.0432 | 0.0001 | 0.3902 |

Summation for cash holdings



***No evidence that

“Bank-dependent firms reduce their cash holding more than other firms to offset borrowing”.

Conclusion

Key points

1. CAPEX move similar ways regardless how they finance
 - Not decrease in the 1st year
2. Bank-dependent firm
 - CAPEX& Net debt not fall more than other firms
 - Net equity↓&cash↑(not the substitution)
3. Leverage firm
 - CAPEX& Net debt not fall more than other firms
 - Similar CAPEX and cash to non leverage firms

**The impaired
access to capital**

Missing

Bank relationship:
CAPEX&Net debt fall more
than other firms

