



BAD TIMES, GOOD CREDIT

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Question?

- Is assessing borrower quality harder or easier for banks in bad times than it is in good times?

Why?

- Want to understand if information frictions between banks and their borrowers are driving the cyclical of bank credit to firms



Credit markets are cyclical

- Banks' credit to corporations fluctuates heavily, more than markets
 - Both volumes and prices
- Supply is a part of these swings
 - Banks claim it in the Fed survey
 - Crisis event studies: Peek Rosengren (1997) , Chava Purnanandam (2011), Jiménez, Ongena, Peydró and Saurina (2012)
 - Jiménez, Ongena, Peydró and Saurina (2017), Supply effects (bank BS strength) drive credit only in crisis times, demand effects (firm BS strength) in good and crisis times
 - Substitution away from bank debt: Kashyap Stein Wilcox (1993), Becker Ivashina (2014, '15)
- Welfare costs of these swings are potentially large
 - Insufficient lending in bad times: Peek and Rosengren (1997), Chava Purnandam (2009), Dell'Ariccia Detragiache, Rajan (2008), etc.
 - Transaction lending disappears: Bolton Freixas Gambacorta Mistrulli (2014)
 - Excess lending in good times: Axelson Strömberg Weisbach (2010)



What explains the cyclicality of credit supply?

- Frictions in bank funding
 - Holmström Tirole (1997), Khwaja and Mian (2008), Chodorow Reich (2014), Jiménez, Ongena, Peydró, Saurina (2014), Becker Ivashina (2014), Benmelech Meisenzahl Ramcharan (2014)
- Agency problems are worse in recessions
 - Bernanke Gertler (1989), Kiyotaki Moore (1997), Bernanke Gertler Gilchrist (1999), Christiano Motto Rostagno (2010)
- Information problems (AI or learning) worse in recessions
- Well established that (static) information frictions play role in credit markets
 - Standard models: Leland Pyle 1977, Stiglitz Weiss 1981
 - Ample evidence: covenants (Smith Warner 1979), credit amount (Garmaise Natividad 2013), loan prices (Ivashina 2009), relationships (Petersen Rajan 1994), credit registries (Hertzberg, Liberti Paravisini 2011)
 - Outside credit markets information frictions matter as well: Myers Majluf (1984), Kyle (1986)



On the one hand

- Theory suggests information frictions are greater in a crisis => less credit => less investment
- Intuition: information frictions restrict credit markets, and credit drops in recessions => a natural hypothesis would be: information frictions must be *worse* in recessions
 - Some recent work suggests the presence of a feedback between asymmetric information in financial markets and output
 - Gorton He (2008), Kurlat (2013), Ordóñez (2013), Guerrieri Shimer (2014), Fishman Parker (2015)



On the other hand

- *“You only find out who is swimming naked when the tide goes out”* (Warren Buffett, 2001)
- Periods of poor economic performance reveal information about credit quality => information problems are smaller in recessions.
- Several theories can support this explanation
 - Screening incentives are counter-cyclical (Ruckes 2004)
 - Loan officer skills deteriorate in booms (Berger Udell 2004)
 - In booms, more new borrowers, makes AI worse (Dell’Ariccia Marquez 2006)
 - Counter-cyclical risk aversion (Cohn, Engelmann, Fehr, Maréchal 2014)



Question this paper addresses

- Is assessing borrower quality harder or easier (for banks) in bad times (recessions) than it is in good times?
- This paper is not about:
 - *Aggregate* uncertainty (Bloom et al, Fajgelbaum et al, etc)
 - Whether AI matters in general (I.e., in a static sense)
 - Whether AI is cyclical in equity markets or other financial markets
 - The cyclicity of *credit itself*'
- This paper eliminates some explanations, but does not
 - Fully explain *what* drives the cyclical variation in the quality of banks' information



Agenda

- Data: a borrower panel data set from a large, Swedish cross-border “IRB” bank covering two business cycle downturns
- Main results:
 - Use bank’s own assessments of borrowers to predict loan defaults
 - Does precision vary over time?
- Reasonable doubts, open issues, and some robustness results



Data

- Bank corporate lending data, 2004:01-2012:12, 202k borrowers
 - Internal ratings (38k larger borrowers, 80% of bank's corporate credit)
 - Monitoring by loan officers: schedules, dates, decisions
 - Loan features and defaults (missed payment by 60 days)
- Credit bureau Upplysningscentralen ("UC")
 - Payment histories and accounting data
 - Generates unsolicited statistical ratings, without soft information
- Macro
 - Recessions by GDP growth rate or stock market returns
 - Total bank credit in Sweden



Internal ratings are well behaved

- Predict default ([refreshed ratings only](#))

	(1)	(2)	(3)	(4)	(5)
Sample	All obs 12M	All obs 12M	All obs Marginal effects 12M	All obs 24M	All obs 24M
Independent variable					
IR	-0.107 *** (0.003)	-0.078 *** (0.005)	-0.003 *** (0.000)	-0.102 *** (0.004)	-0.067 (0.005)
IR Polynomial					
Slack					
Controls	NO	YES	YES	NO	YES
Time FE	YES	YES	YES	YES	YES
Clusters	Borrower	Borrower	Borrower	Borrower	Borrower
No. Clusters	32.672	16.702	16.702	27,940	15,895
Pseudo R2	0.083	0.119		0.660	0.113
Nobs	1,406,144	688.692	688.692	1,044,105	602.725



Key question

Is there cyclical variation in the quality of bank's internally generated credit quality information, i.e., the default forecasting precision of "Internal Ratings"?

1. Graphical presentation of univariate measures of cyclical variation:
 - I. Accuracy curve
 - II. Kaplan-Meier survival rate
 - III. Relative default rates, for soft and hard information measures

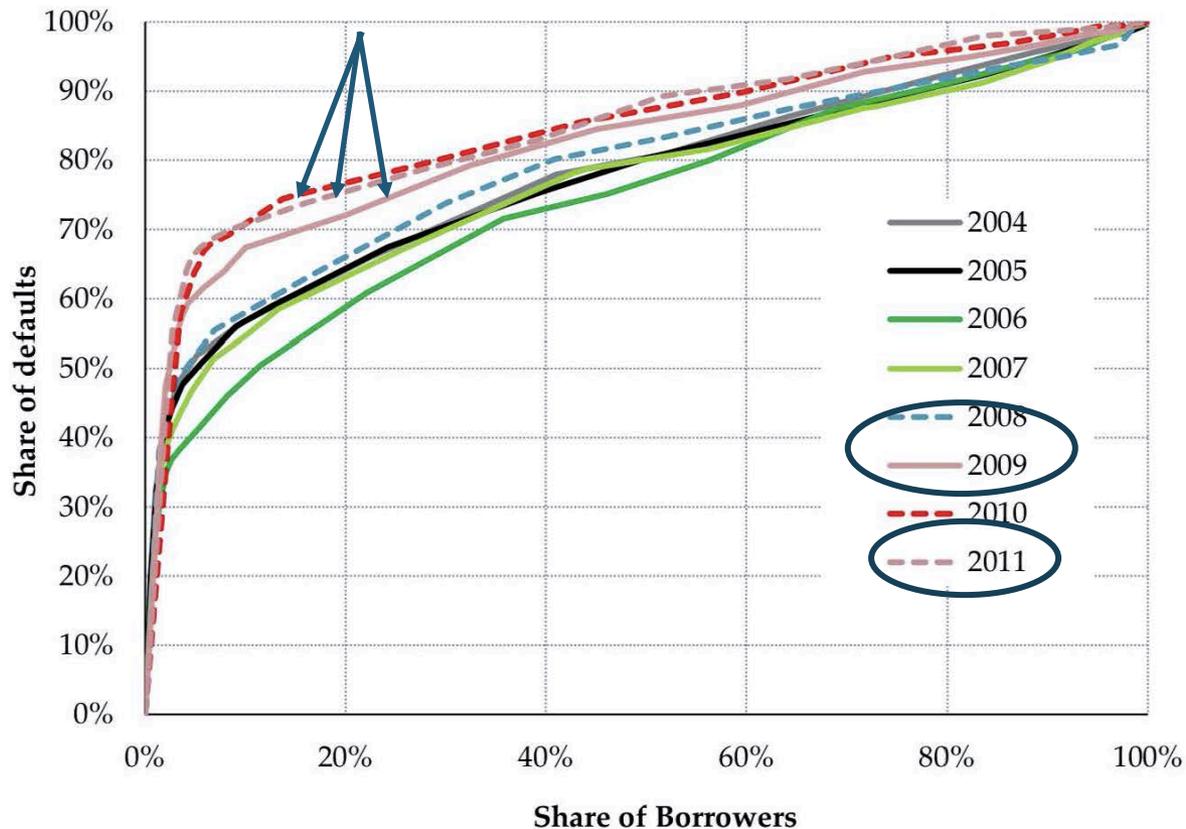
2. Regression analysis of cyclical variation:
 - I. Default prediction performance



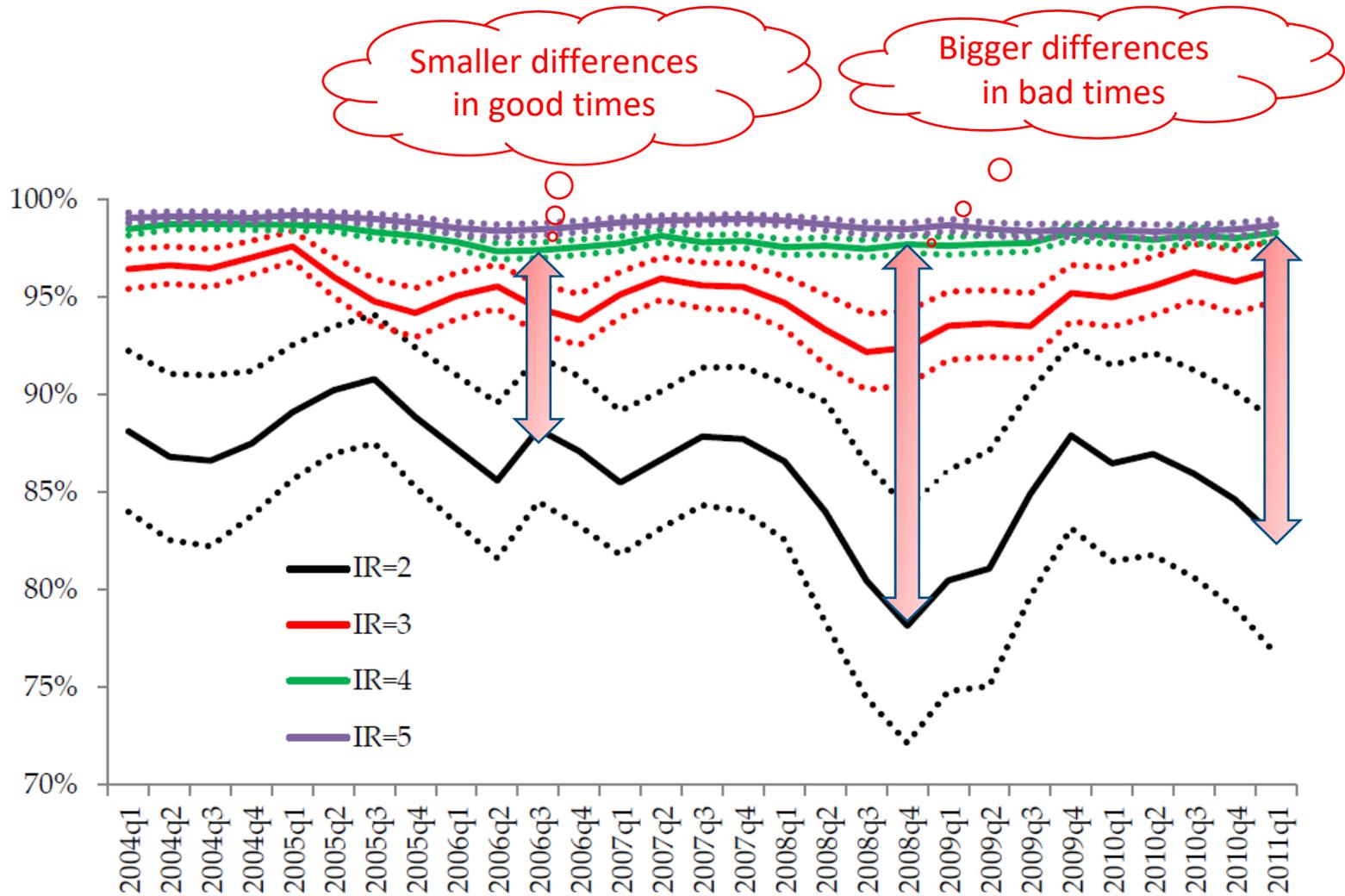
Default forecasting accuracy (12M ahead) tends to be higher in worst years

Figure 2. Accuracy of internal ratings by year, 2004-2011

This figure shows Moody's one-year cumulative accuracy profiles for the banks Internal Ratings for each year from 2004-2011. The accuracy curve maps the proportion of defaults within 12 months that are accounted for by firms with the same or a lower rating (y-axis) with the proportion of all firms with the same or a lower rating (x-axis).



Kaplan-Meier 12M survival rates indicate worst rating grades capture most bad loans in bad times



Statistic of rel. informativeness of worst ratings

- Statistic that compares default rates for (firms with) bad ratings to default rate for (firms with) ratings in the overall sample:

$$r = \frac{\text{def_rate}_{weak}}{\text{def_rate}_{all}} = \frac{\frac{d_{weak}}{n_{weak}}}{\frac{d_{weak} + d_{strong}}{n_{weak} + n_{strong}}}$$

- If ratings are completely uninformative: no difference in default rates

$$r = 1$$

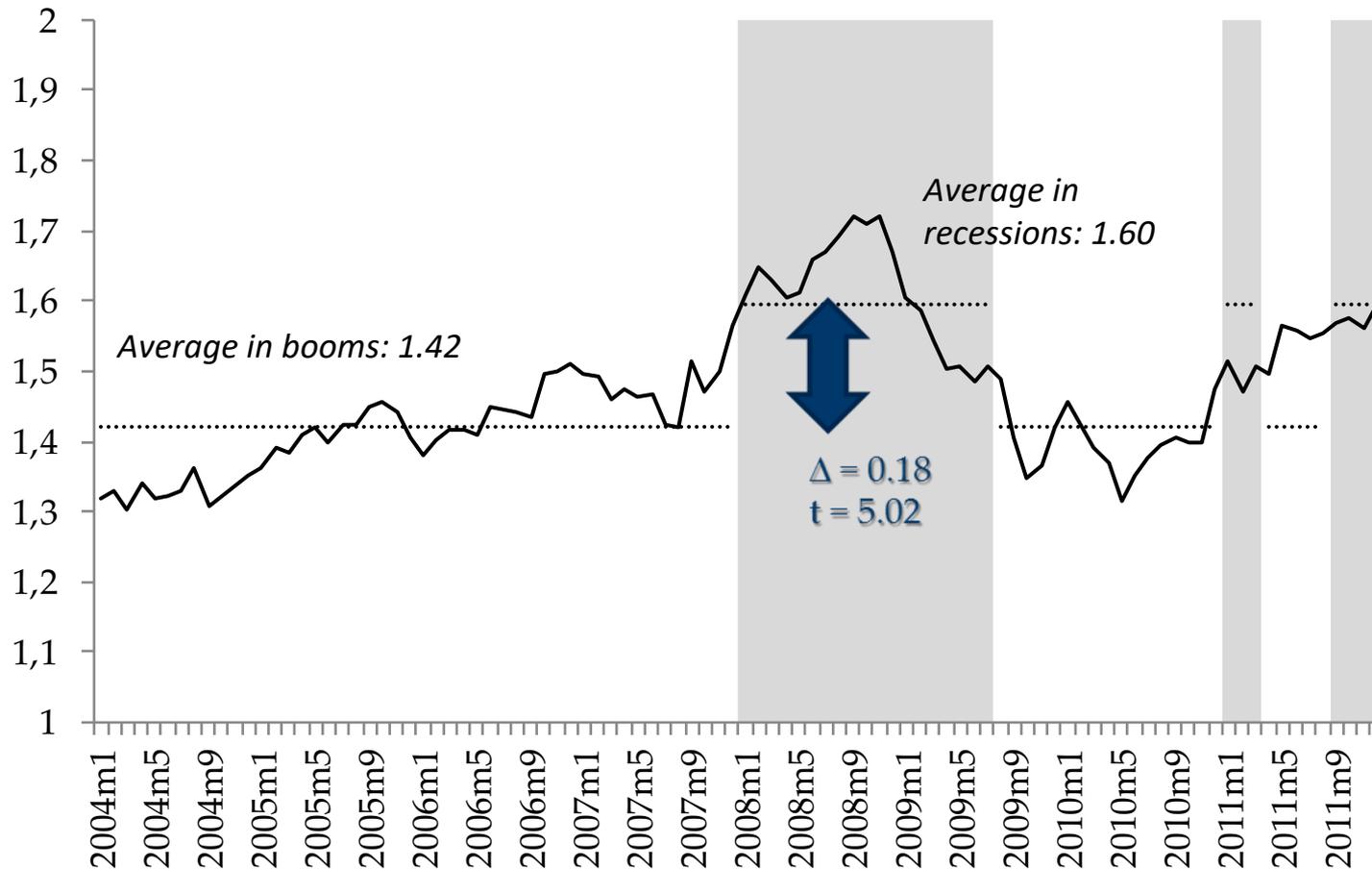
- If ratings discriminate perfectly: no defaults among best rated (“strong”) firms

$$r = \frac{n_{weak} + n_{strong}}{n_{weak}} \approx 2$$

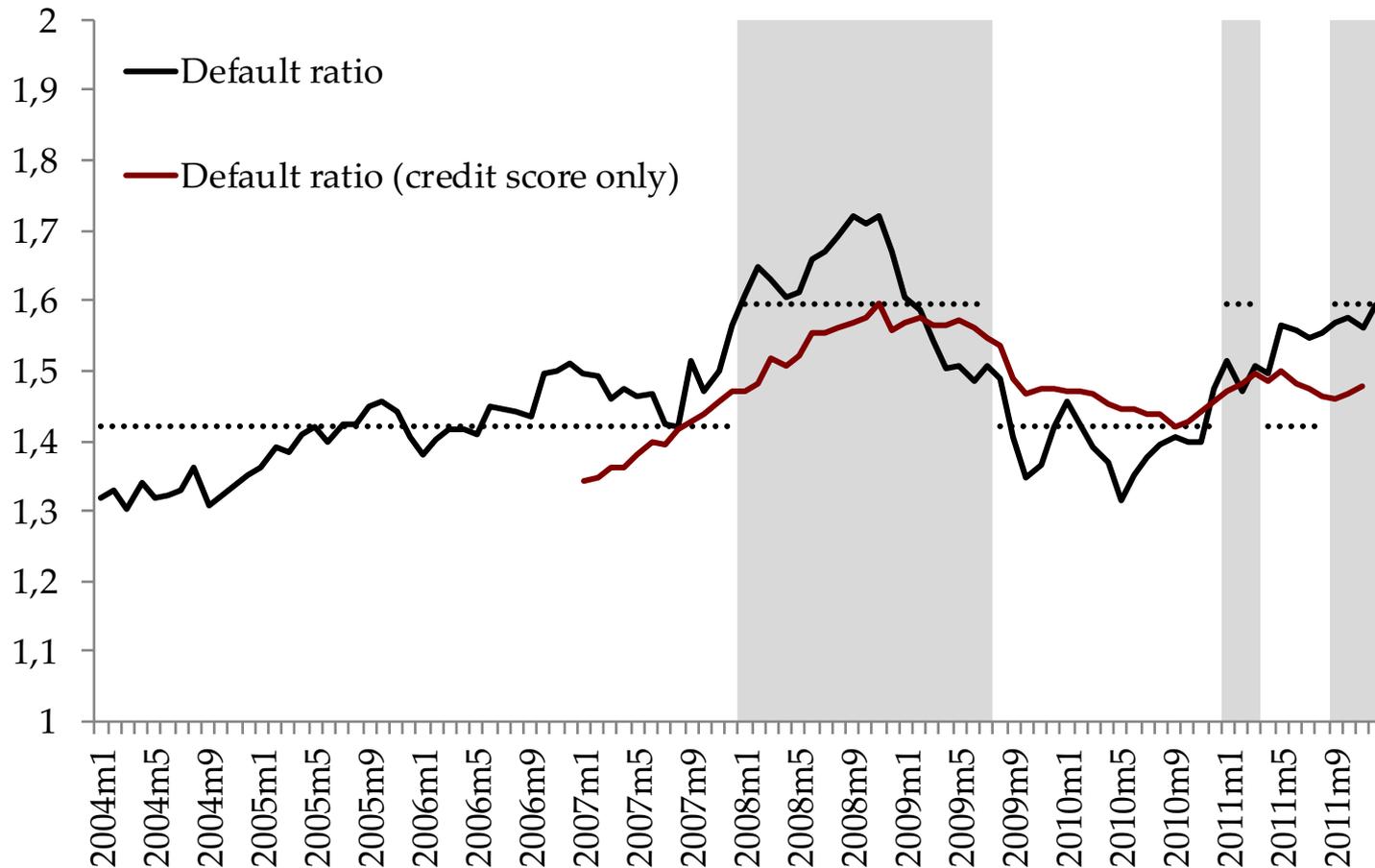
- “Natural” range for statistic is [1; 2] when using groups of equal size



Defaults occur more among firms that banks gave poor ratings during a recession than in good times



Soft info contributes to counter-cyclicality of credit info; but hard info ratings display same pattern



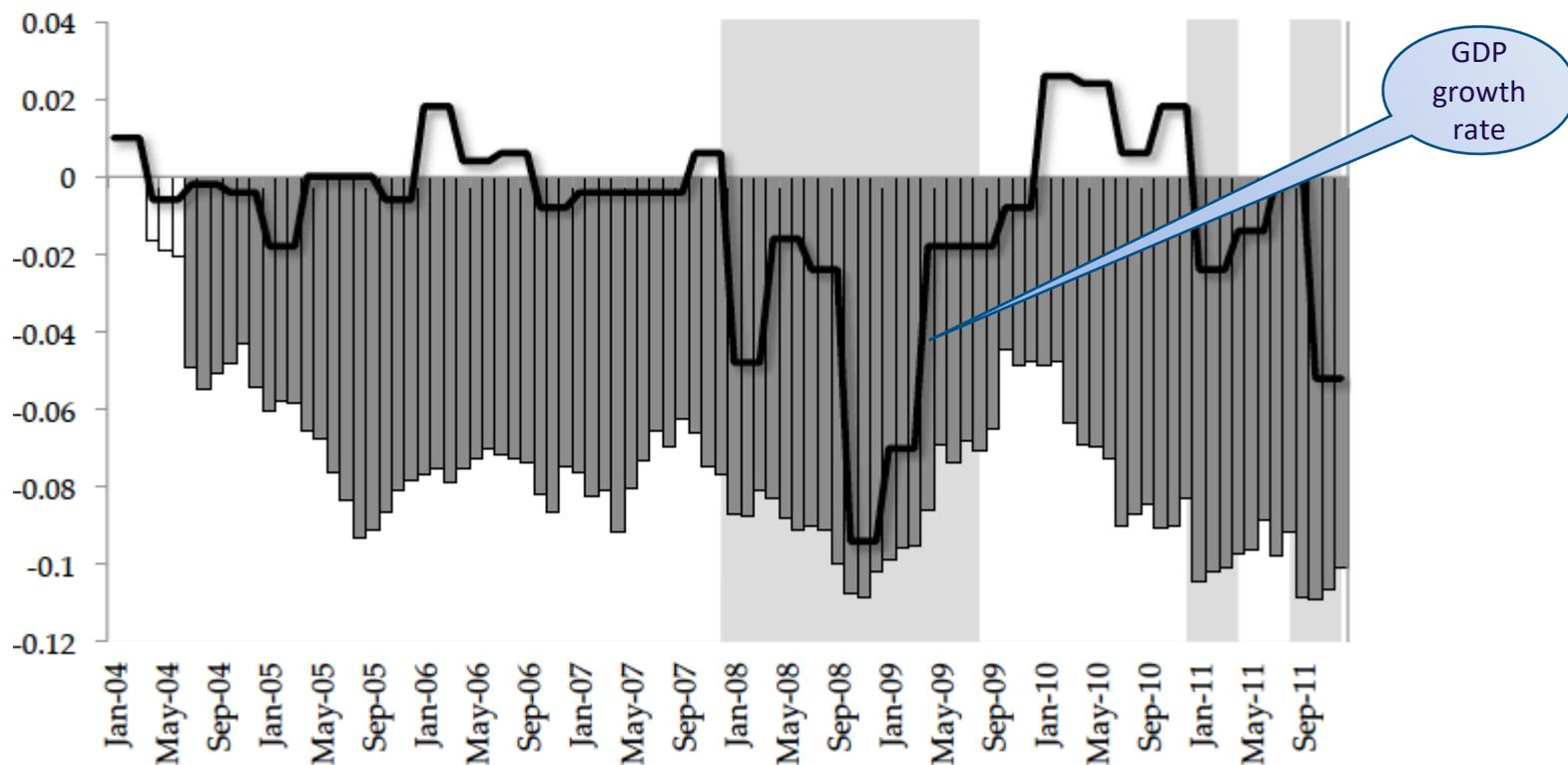
Does IR importance vary over business cycle?

- $Default_{<12M, i, t} = \beta_{1t} * IR_{i, t} * Timedummy + controls + \varepsilon_{i, t}$
- Controls for “hard information” variables and isolates internal “soft information”
- $X_{i, t}$ (hard information):
 - ROC, ROA, gross margin, net margin, log (sales), log (assets), tangible fixed assets / total assets, leverage, outstanding loan balance, credit bureau score, interest rates, duration, collateral



Substantial variation in the quantitative importance of internal “soft” information over the cycle ...

Bars indicate coefficient on IR (dark: statistically significant, white insignificant)



Do IR have greater predictive power in recessions?

- $Default_{<12M, i, t} = \beta_1 * IR_{i, t} + \beta_2 * IR_{i, t} * Recess + controls + \varepsilon_{i, t}$
- $X_{i, t}$ (hard information):
ROC, ROA, gross margin, net margin, log (sales), log (assets),
tangible fixed assets / total assets, leverage, outstanding loan
balance, credit bureau score, interest rates, duration, collateral



Cyclicalty of IR informativeness is stat. significant

	(1)	(2)
Sample / Estimation method	All obs 12M	All obs 12M
<hr/>		
Independent variable		
IR	-0.0712 *** (0.00550)	-0.0712 *** (0.00545)
IR x Recession	-0.0243 *** (0.00780)	-0.0243 *** (0.00790)
Controls	YES	YES
Time FE	YES	YES
Clusters	Borrower	Industry
No. Clusters	16.702	54
Pseudo R2	0.120	0.120
Nobs	688.692	688.692

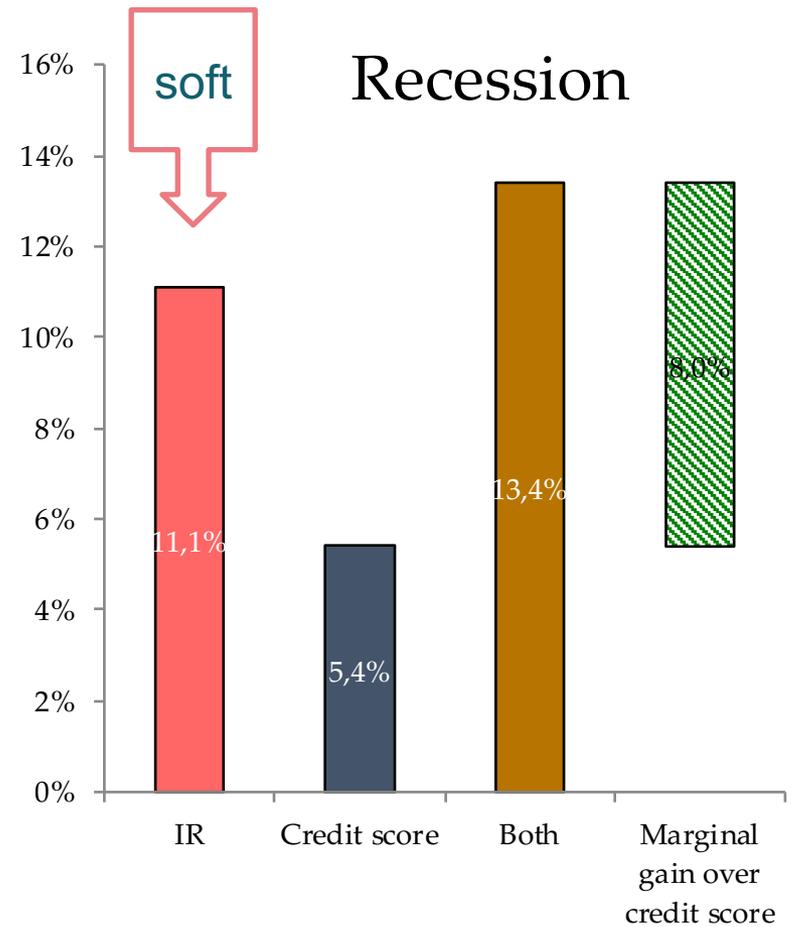
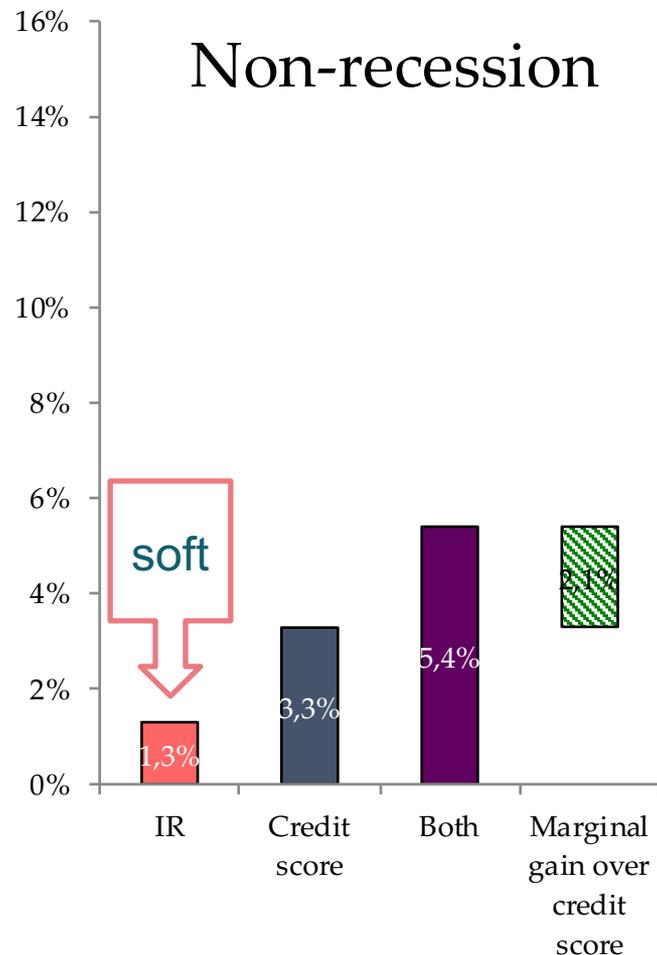


Hard and soft information display the same pattern, and complement each other

Sample / Estimation method	(6)	
	All obs	12M
Independent variable		
IR	-0.0728 *** (0.00548)	
IR x Recession	-0.0179 ** (0.00815)	
CBCS	0.0209 *** (0.00164)	
CBCS x Recession	0.0108 *** (0.00403)	
Controls	YES	
Time FE	YES	
Clusters	Borrower	
No. Clusters	16.702	
Pseudo R2	0.120	
Nobs	688.692	



How much of default risk do soft and hard info explain over cycle? Soft info more in recessions



Robustness tests

- New credit granted in bad times could endogenously drive results:
 - Condition on no increase in debt over next 12 months TABLE
- Compositional changes as in Dell'Arriccia Marquez (06) could drive results
 - Use only old clients (12m+) TABLE
- Is it specific for small firms?
 - Drop small firms: Weaker significance TABLE
- Maybe ratings contain “old” information (bad times data in good times)?
 - Use monitoring data and consider only “fresh” IR
- Ratings may be used for other purposes than good predictions TABLE
 - Use slack in credit lines (willingness to lend) or bankruptcy instead of default
- Use a non-linear model
- Attrition: Cannot for reasonable parametrizations



Robustness: no new loans

	(1)	(2)	(3)	(4)
Sample / Estimation method	No new credit this bank	No new credit <i>all</i> banks	Existing customers	No small firms
<hr/>				
Independent variable				
<hr/>				
IR	-0.0777 *** (0.00631)	-0.0861 *** (0.00634)	-0.0730 *** (0.00557)	-0.0602 *** (0.00731)
IR x Recession	-0.0269 *** (0.00895)	-0.0135 (0.00883)	-0.0252 *** (0.00791)	-0.0214 * (0.0111)
Controls	YES	YES	YES	YES
Time FE	YES	YES	YES	YES
Clusters	Borrower	Borrower	Borrower	Borrower
No. Clusters	16,035	15,121	16,197	7,662
Pseudo R2	0.142	0.161	0.12	0.089
Nobs	455,491	377,299	661,397	325,072



Robustness: only old clients

	(1)	(2)	(3)	(4)
Sample / Estimation method	No new credit this bank	No new credit <i>all</i> banks	Existing customers	No small firms
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Independent variable				
IR	-0.0777 *** (0.00631)	-0.0861 *** (0.00634)	-0.0730 *** (0.00557)	-0.0602 *** (0.00731)
IR x Recession	-0.0269 *** (0.00895)	-0.0135 (0.00883)	-0.0252 *** (0.00791)	-0.0214 * (0.0111)
Controls	YES	YES	YES	YES
Time FE	YES	YES	YES	YES
Clusters	Borrower	Borrower	Borrower	Borrower
No. Clusters	16,035	15,121	16,197	7,662
Pseudo R2	0.142	0.161	0.12	0.089
Nobs	455,491	377,299	661,397	325,072



Robustness: only larger firms

	(1)	(2)	(3)	(4)
Sample / Estimation method	No new credit this bank	No new credit <i>all</i> banks	Existing customers	No small firms
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Independent variable				
IR	-0.0777 *** (0.00631)	-0.0861 *** (0.00634)	-0.0730 *** (0.00557)	-0.0602 *** (0.00731)
IR x Recession	-0.0269 *** (0.00895)	-0.0135 (0.00883)	-0.0252 *** (0.00791)	-0.0214 * (0.0111)
Controls	YES	YES	YES	YES
Time FE	YES	YES	YES	YES
Clusters	Borrower	Borrower	Borrower	Borrower
No. Clusters	16,035	15,121	16,197	7,662
Pseudo R2	0.142	0.161	0.12	0.089
Nobs	455,491	377,299	661,397	325,072



Robustness: use slack instead of internal limit

	(5)
Sample / Estimation method	All obs 12M
<hr/>	
Independent variable	
<hr/>	
Slack	-0.071 *** (0.005)
Slack x Recession	-0.025 *** (0.008)
Controls	YES
Time FE	YES
Clusters	Borrower
No. Clusters	16.702
Pseudo R2	0.120
Nobs	688.692



Summary and reflections

- Ability to detect differences in default risk is *best in worst* times.
- Why do we find this?
 - Results suggest cyclicalities of bank credit does not reflect information frictions between bank and borrowers
 - Not driven by variation in loan officer effort, information timing, selection
 - Other factors must drive cycles: agency problems or frictions related to bank financing
- Implications for link between macro-economic fluctuations and financial frictions => search for different frictions, at least for corporate investment
- Provides support for countercyclical capital (buffers)
- External validity
 - Large multi-national bank, following BCBS/IRB
 - Sweden: much information is (i) In official registers (reliable) and (II) publicly available through credit bureau and transparency rules, making soft info less important driver

