Bankruptcy and the Business Cycle: Are SMEs Less Sensitive to Systematic Risk?

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Under the Basel II Accord, retail credit and loans to SMEs receive a relatively more favorable treatment because of a supposedly smaller default correlations, i.e. less exposure to systemic risk and greater exposure to idiosyncratic risk. Several studies, like Dietsch and Petey (2004, 2006), Ortiz-Molana and Penas (2006) and Jacobson, Lindé and Roszbach (2005) conclude that loans to small businesses may be riskier than those to corporations.

However, no research has been done yet that verifies if small businesses are indeed exposed to less systematic risk than larger corporates.

This paper attempts to clarify some of these issues and tests if the assumptions underlying Basel II are satisfied using a panel data set that contains all incorporated Swedish companies over the period 1990 Q1 – 1999Q4.

Motivation and background 1/3

- Sweden: ±65% of incorporated businesses < 6 empl.
- Basel II assumes
  - SMEs have smaller default correlations between credit exposures than corporates
- Underlying idea
  - SMEs are more exposed to idiosyncratic risk, and
  - SMEs are less exposed to systematic risk factor
- Assumptions and definitions (SME)
  - ambiguously or arbitrarily formulated
  - not well-verified by research

Background 2/3

- What is meant exactly by more exposure to idiosyncratic risk, and less exposure to systematic risk?
- Basel 2 and many studies:
  - build on idea of perfectly diversified portfolio in a one-factor model (the single (systematic) risk factor)
- Hence residual ⇔idiosyncratic risk
- What are firm-specific risk factors?

Background 3/3

- Default correlations
  - Measure sensitivity of PD to common systematic risk factors
  - Are crucial for shape of estimated loss distributions, but measuring them is difficult
  - Das Duffie, Kapadia Saita JF2007, Duffie Saita Wang JFE2007, Duffie Singleton [2006], Carling Ronnegard Roszbach [2005], Gordy Heitfield 2002, Lopez 2002

- Evidence
  - Allen, (DeLong) & Saunders [JBF 2004, JFSR 2004]
    - Assumed inverse relation between PD and ϱ controversial
    - Assumed relation based on idea that low quality firms have high asset price volatility. What about privately held firms?
  - Dietsch and Petey [JBF 2004]
    - Large firms more exposed to SR than SMEs at economy-wide level
    - In small portfolios, SMEs have bigger correlations
  - Jacobson, Linde and Roszbach [JFSR 2005]
    - SMEs often riskier than corporates (unexpected risk)

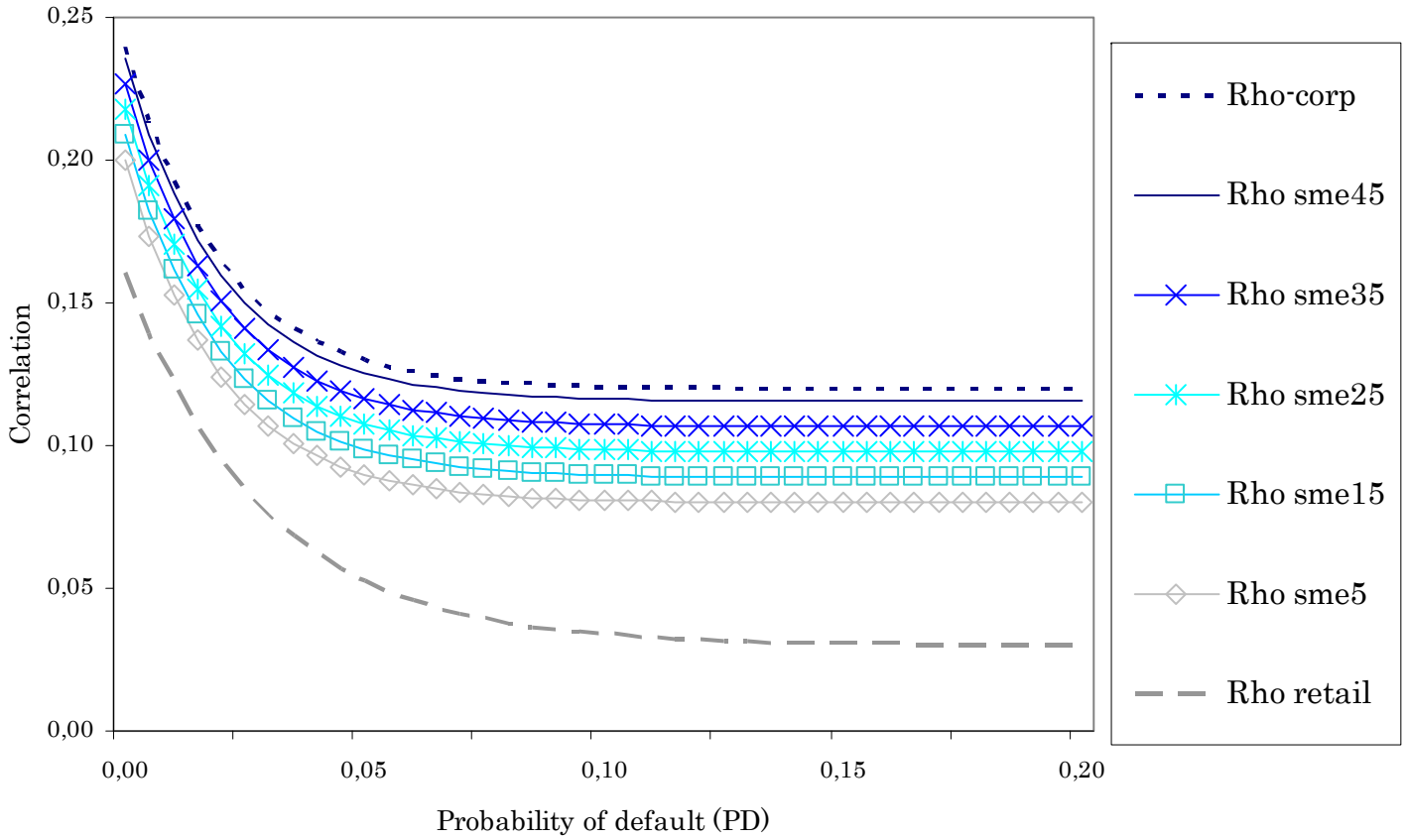
Evidence from day #1

- Beck, Demirguc-Kunt and Martinez-Peria (2008); Martinez-Peria and Schmukler (2008)
  - Macroeconomic factors are considered by banks to be a very important obstacle to SME lending
  - Definition of "small businesses" varies
- Berger and Black (2008)
  - Unclear if soft information processing is more characteristic for small-business lending and hard-info processing (credit scoring) more prevalent in lending to large firms
  - <= Credit scoring works better for smaller firms!

How does Basel II treat SMEs?

- Correlations are positively related to size of a firm (in terms of total sales)
  - Smallest correlation for TS = € 5 mn
  - At TS = € 50 mn, SMEs are treated as corporates
- Asset correlations are assumed to fall with increasing PDs
  - Expected to smooth capital charges for risky SMEs during recessions because these are thought to be more sensitive to downturns than larger firms.

Basel II correlations



Implications of Basel II for SME credit risk

- Expected losses may be higher for SMEs than for corporate credit
  - But: lenders should be compensated for higher expected risk through a higher interest rate
  - Banks provision for expected losses by means of loan-loss reserves, not by economic capital
- However: unexpected losses are expected to be smaller for SME credit portfolios - due to a supposedly lower default correlation
  - Hence economic capital is allowed to be smaller for SME than for corporate loan portfolios

- Testable "hypotheses"
  - Smaller firms have larger average default risk?
  - Smaller firms have smaller *un*expected loan losses (smaller correlations)
  - How does firm size affect exposure of firm to (default) risk factors?
    - Macroeconomic risk (systematic factors)
    - Firm specific risk (systematic factors)
    - Idiosyncratic risk
  - (Is hard-information processing more useful for small or large businesses)

What do we do?

- Compute default/loss rate distributions by size classes
  - Are small businesses riskier, on average and in tail?
- Estimate logit models of default by size classes
  - Are small businesses less exposed to systematic macro risk factors?
  - Are small businesses exposed to more firm specific and idiosyncratic risk?

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What do we find?

- Reaction to fluctuations in macroeconomy (output gap) generally stronger as firms size increases
- Reaction of PD to fluctuations in firm specific risk factors generally stronger as firm size increases
  - Some factors have flat effect; nonlinearities
- Idiosyncratic noise increases with size
- Average default risk falls with firm size
- *Un*expected default risk rises with firm size
  - (But: diversification effect due to # SME observations?)

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Data

- Upplysningscentralen = main credit bureau
- National company register authority
- 1990 Q1 – 1999 Q4
- Incorporated firms (“aktiebolag”)
- 8,106,138 obs.
- Default definition = “bankruptcy” (terminal stress events)

Method

- Logit models, LHS = "bankruptcy" dummy
- Split up data in size (total sales) intervals
  - 100 equally sized groups (percentiles)
  - 50 equally sized groups ***
  - "Intuitive" TS thresholds
- TS values used for sorting
  - Average or quarter-specific values
- Plot parameter estimates

Graphs

- Macro: output gap, repo rate, TW exchange rate
- Pseudo R^2
- Micro
  - Payment remarks (legal lights stress evens, tax arrears)
  - EBITDA/TA, TL/TA, LA/TL, I/TS, IP/(IP+EBITDA)
  - If late: Time to filing of last financial statement

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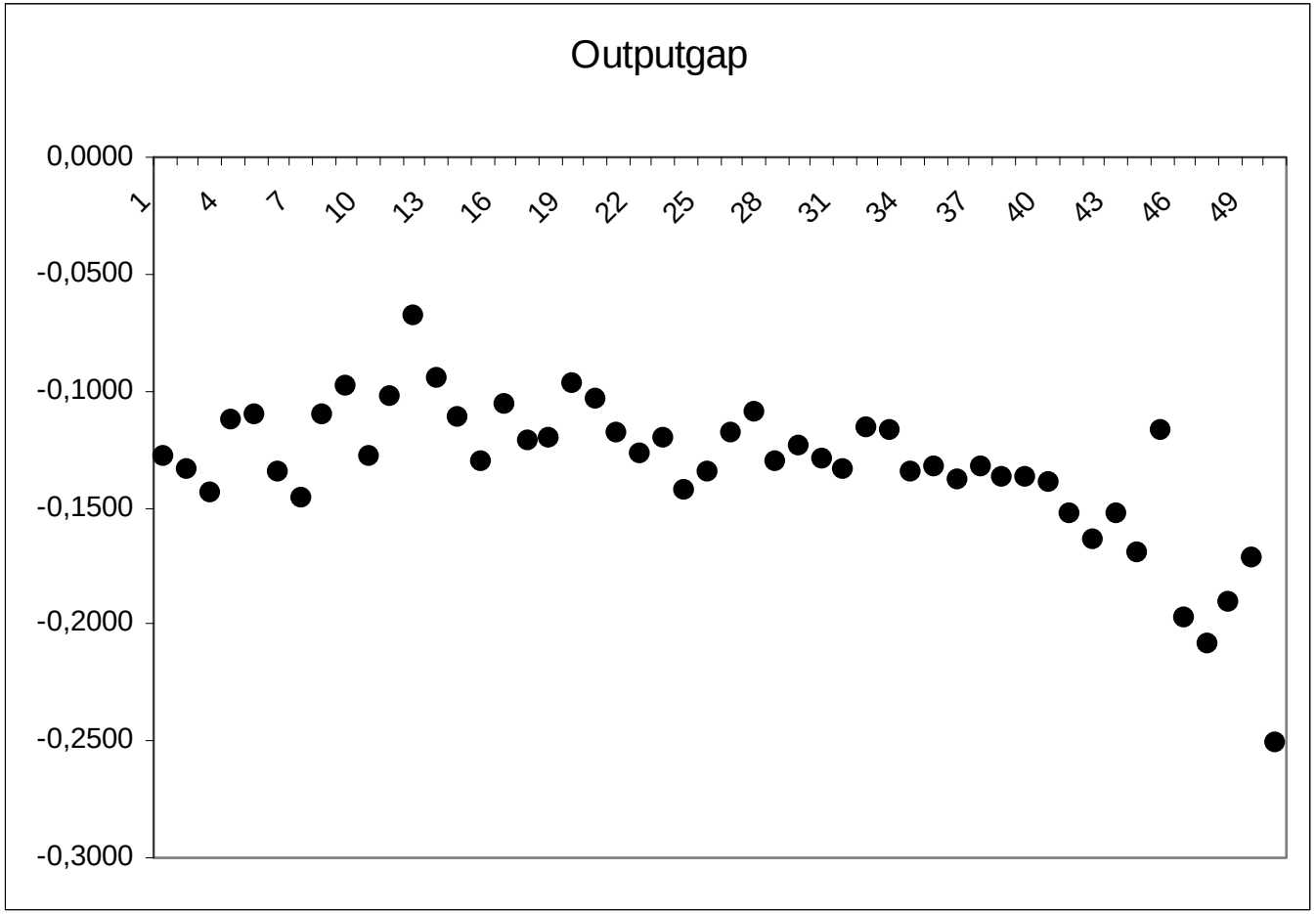
- Macro risk factors
  - Output gap
  - Repo rate
  - Trade-weighted real exchange rate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-0,1000
-0,1500
-0,2000
-0,2500
-0,3000
1
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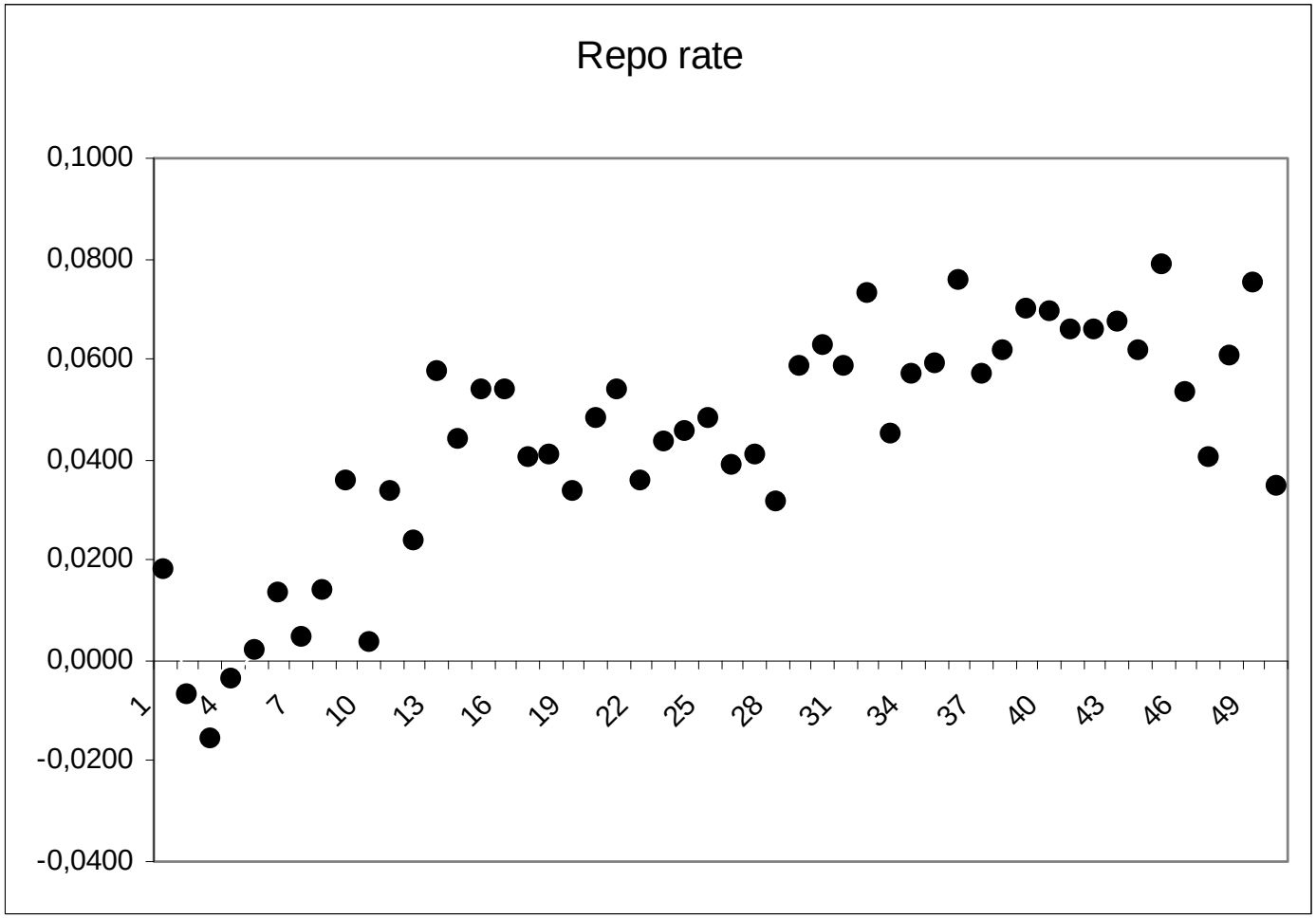
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0,0400
0,0200
0,0000
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-0,0400
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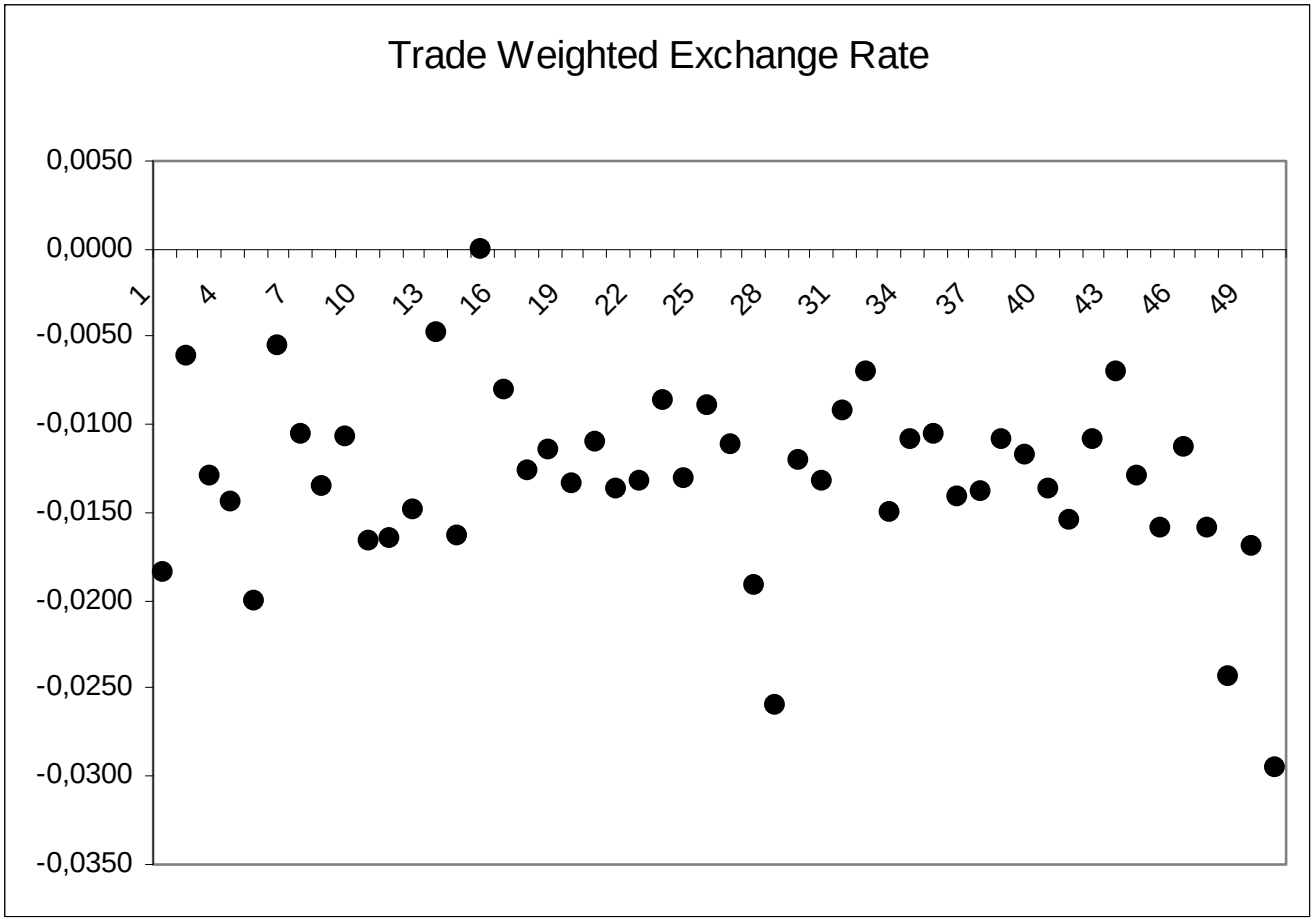
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-0,0150
-0,0200
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-0,0300
-0,0350
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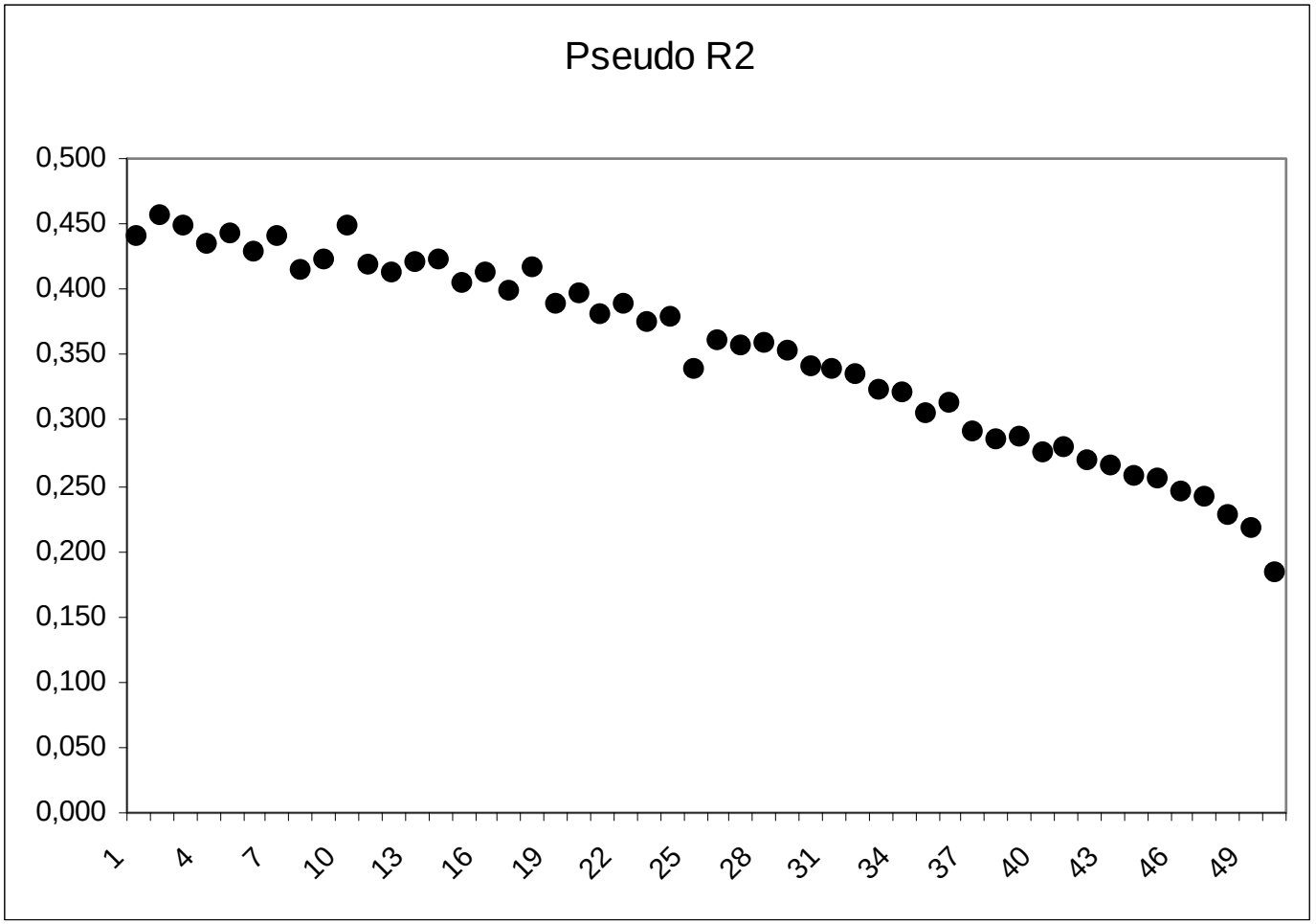
- Pseudo-R^2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0,200
0,150
0,100
0,050
0,000
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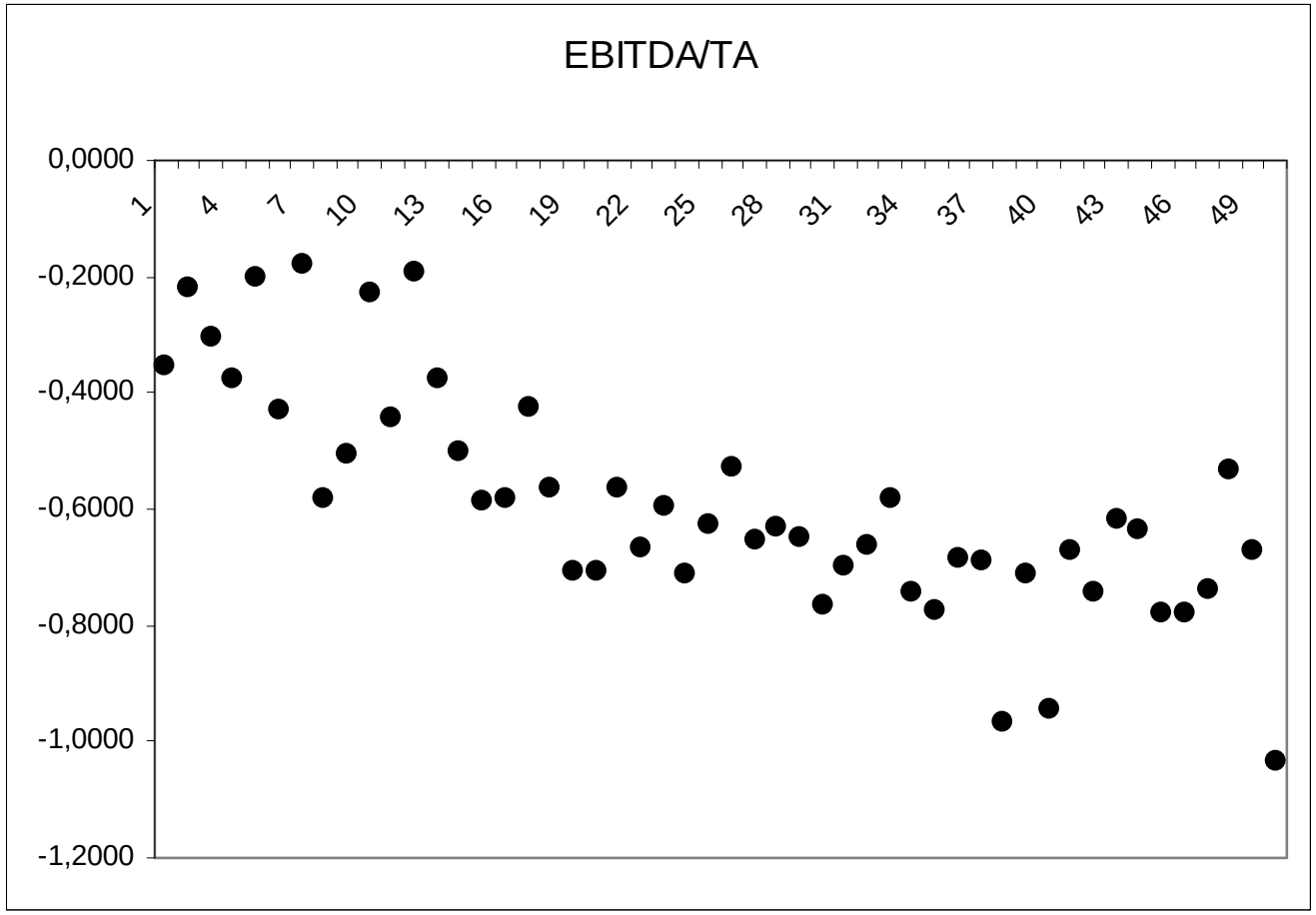
49

Micro risk factors

- Payment remarks
  - Legal remarsk (lights stress evens)
  - Tax arrear remarks
  - EBITDA/TA
  - TL/TA
  - LA/TL
  - I/TS
  - IP/(IP+EBITDA)
  - TTLFS


EBITDA/TA
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-0,6000
-0,8000
-1,0000
-1,2000
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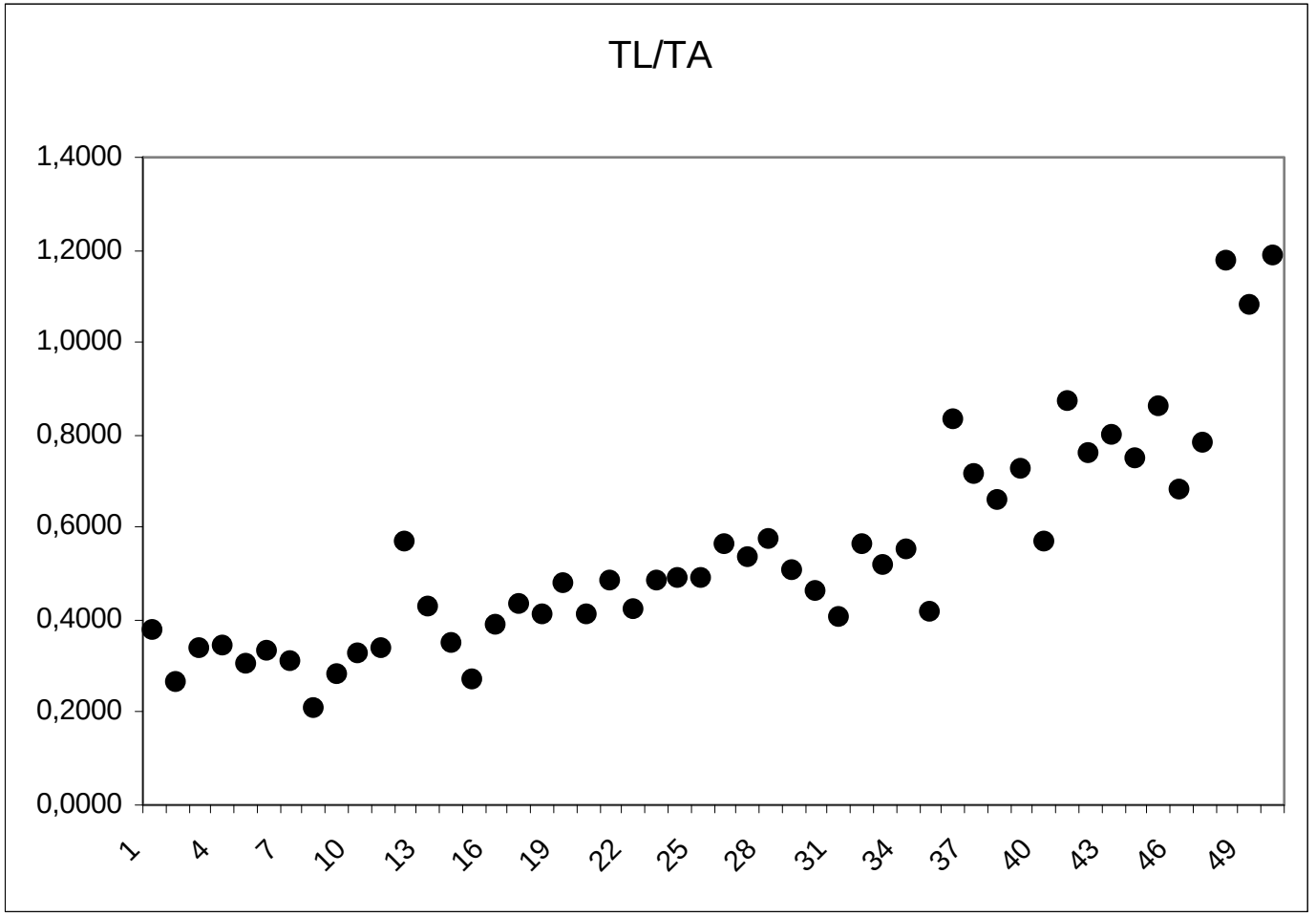
TL/TA
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1,0000
0,8000
0,6000
0,4000
0,2000
0,0000
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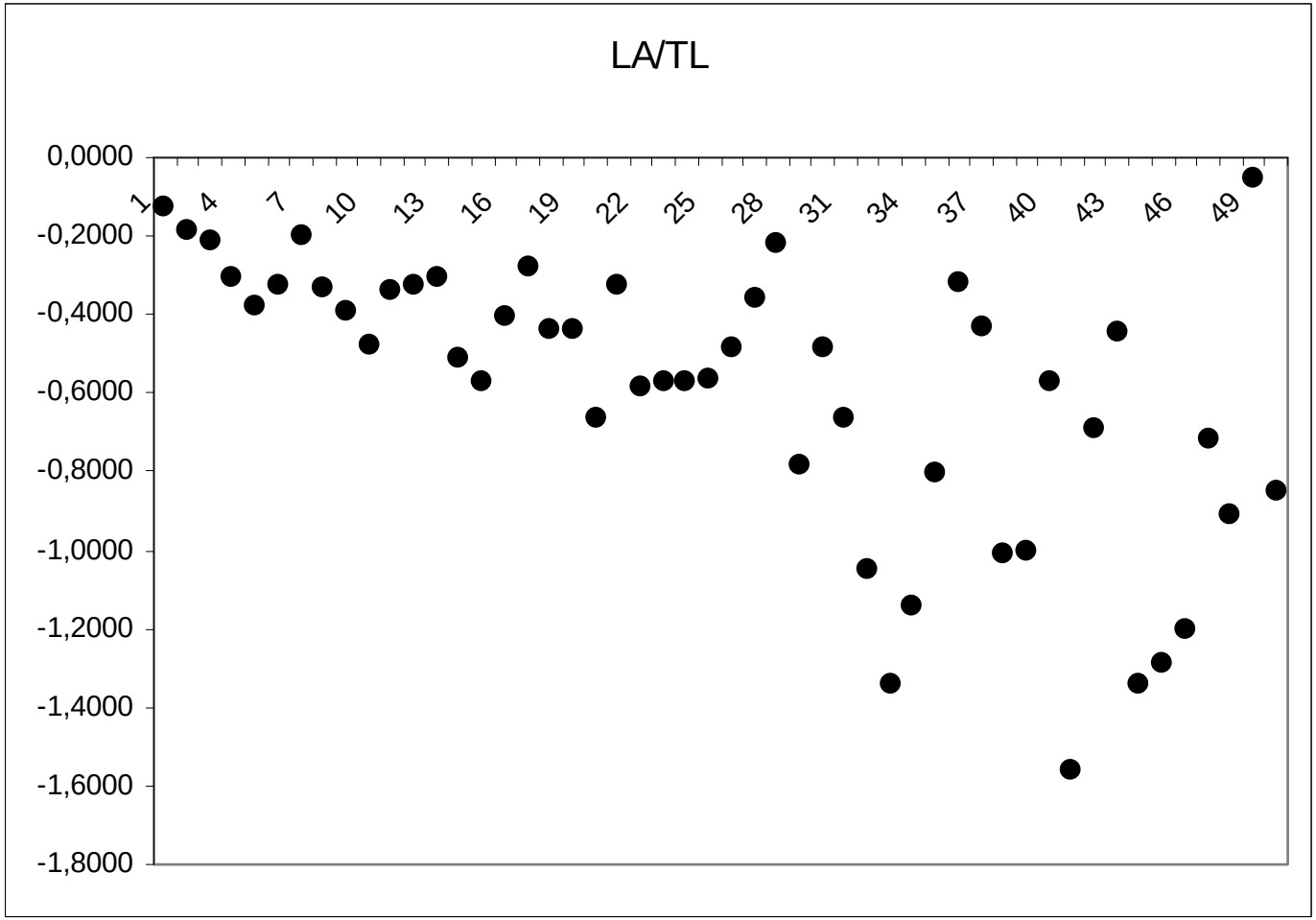
LA/TL
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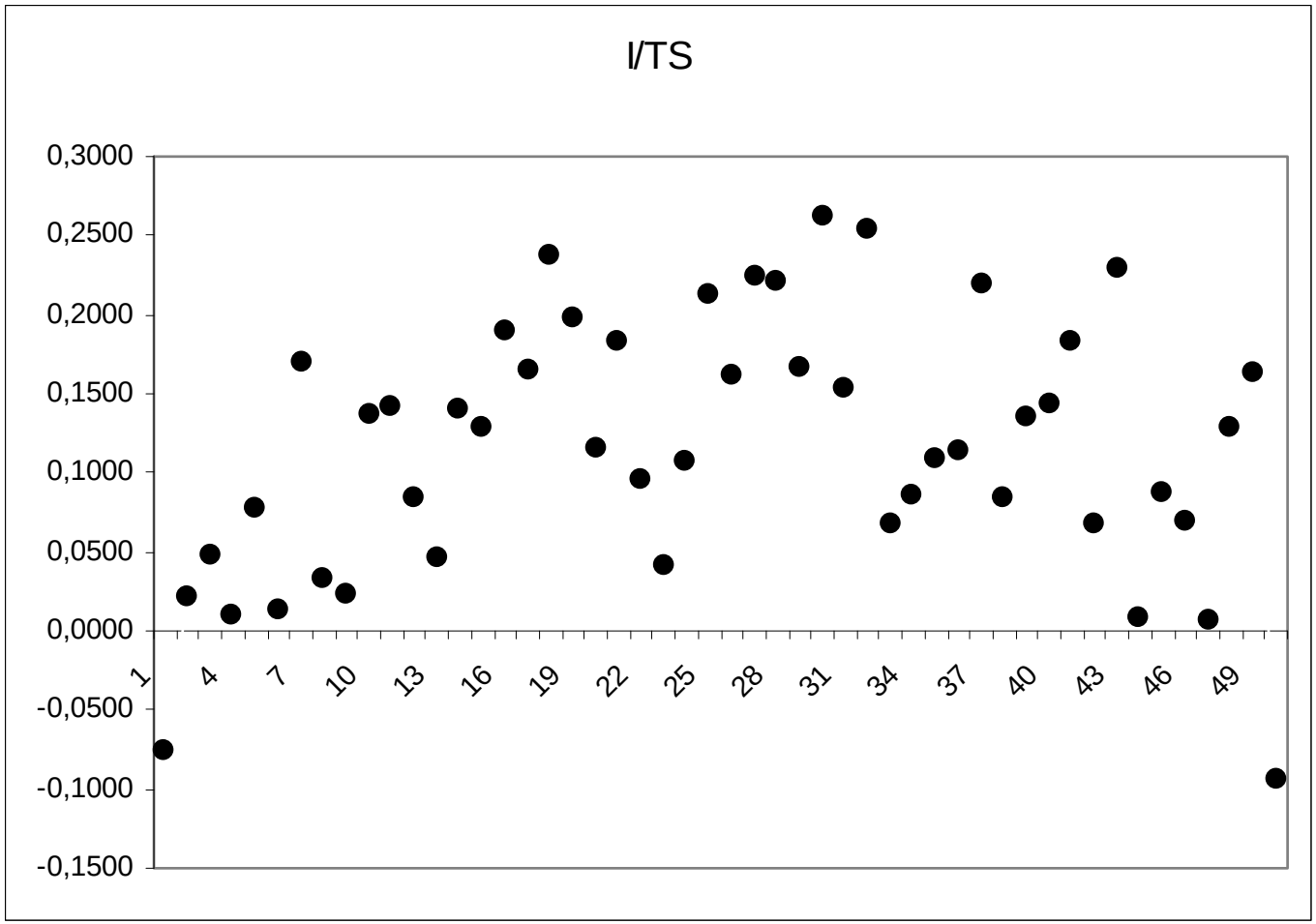
I/TS
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0,0000
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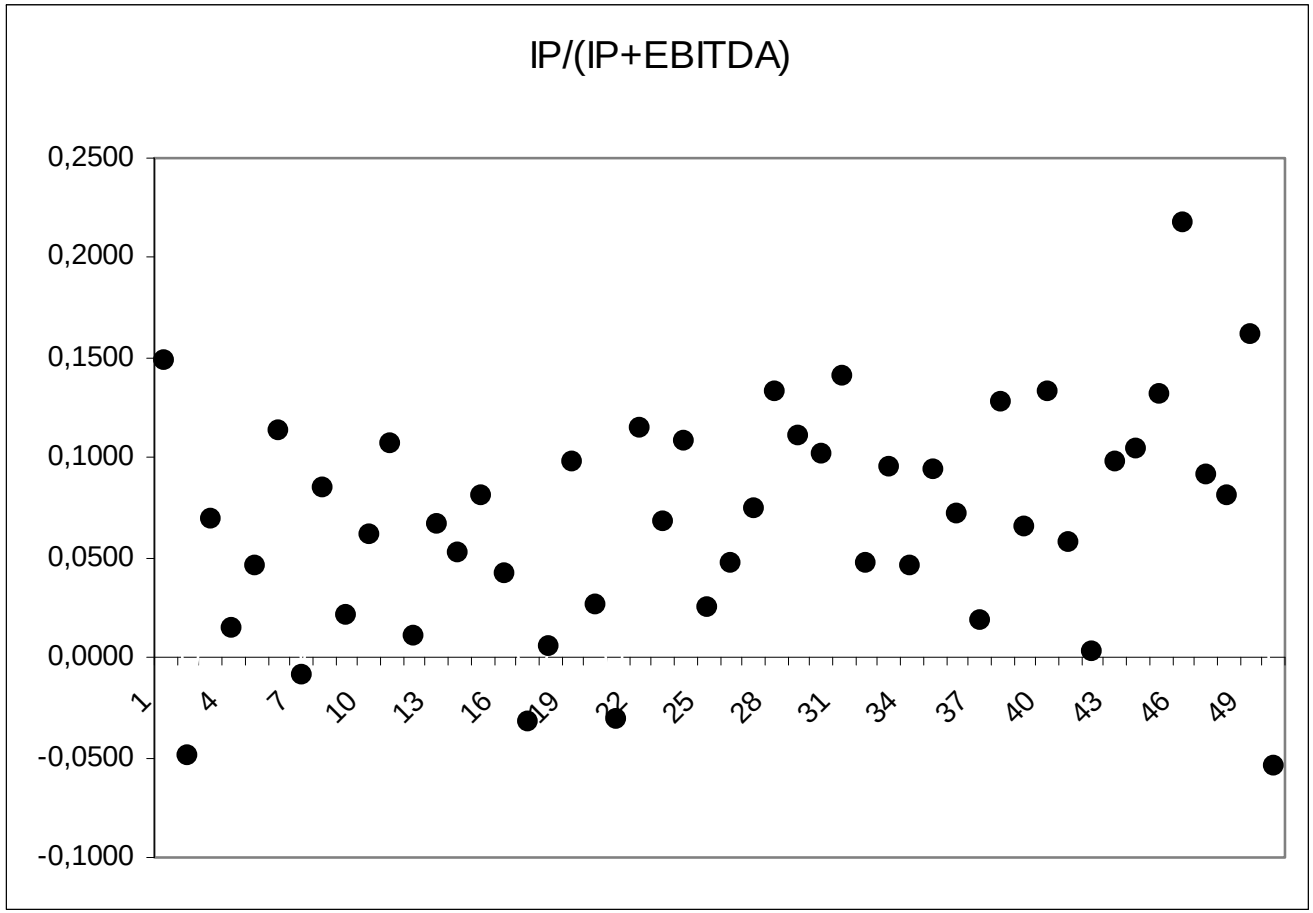
IP/(IP+EBITDA)
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0,2000
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-0,1000
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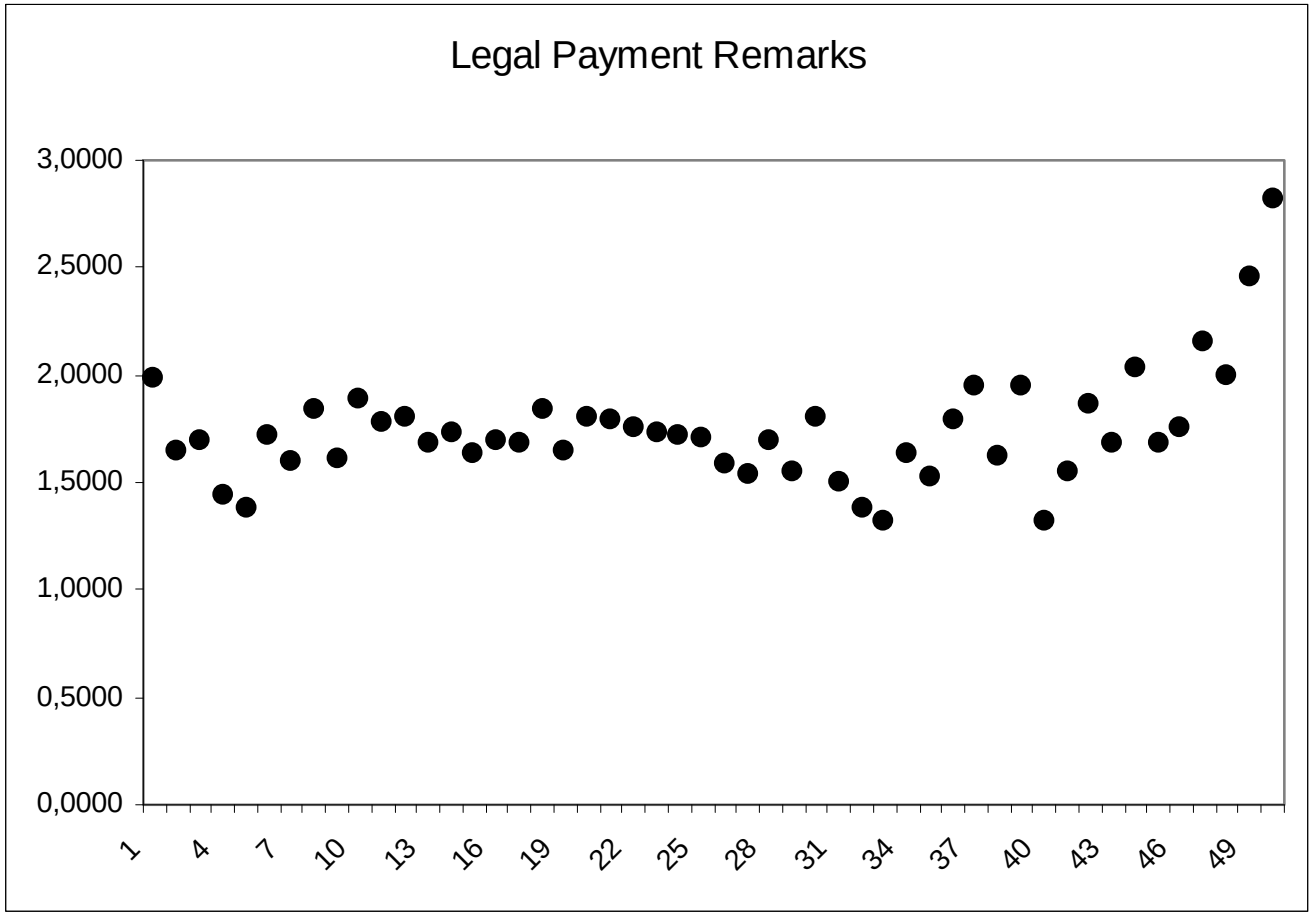
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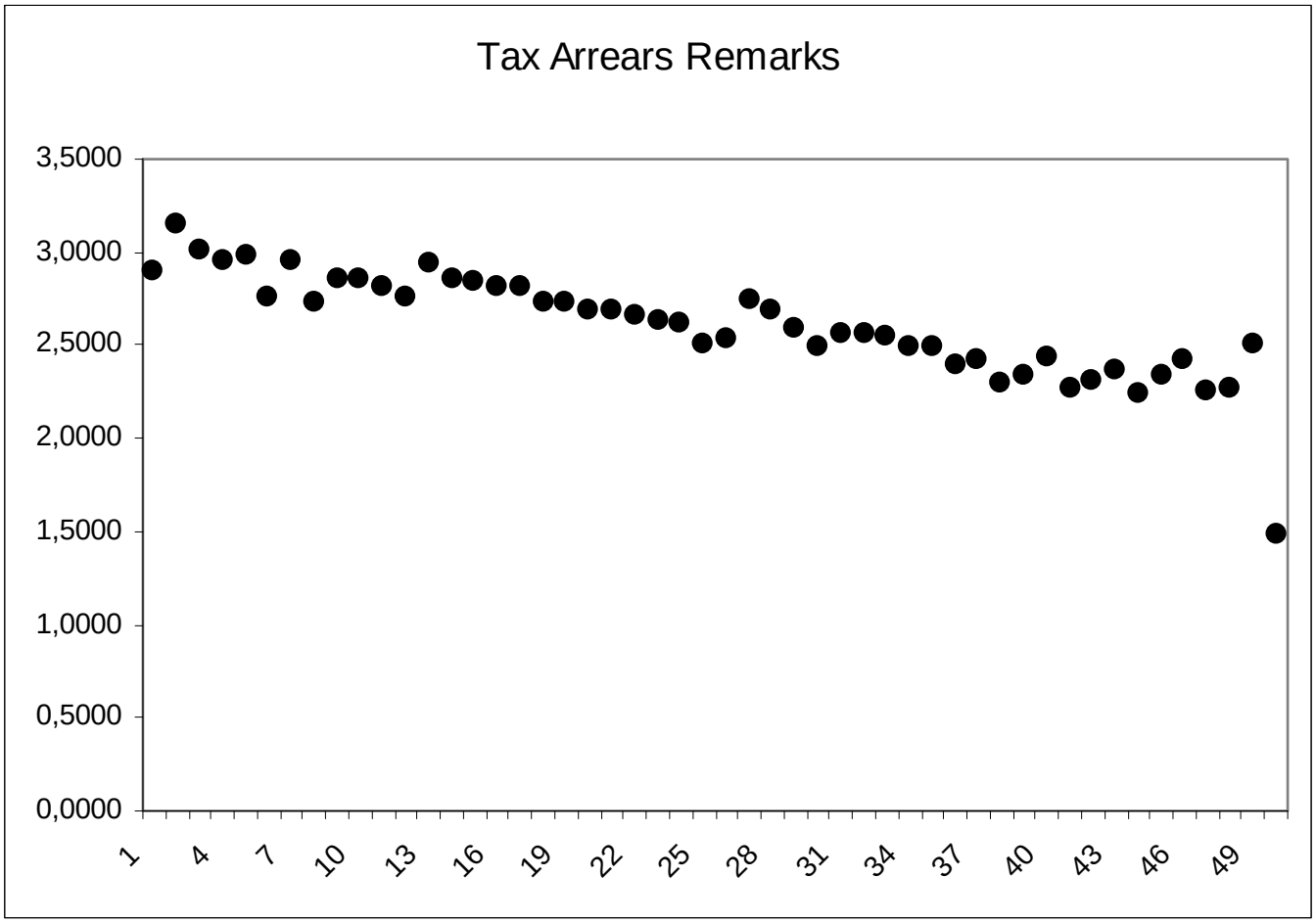
Tax Arrears Remarks
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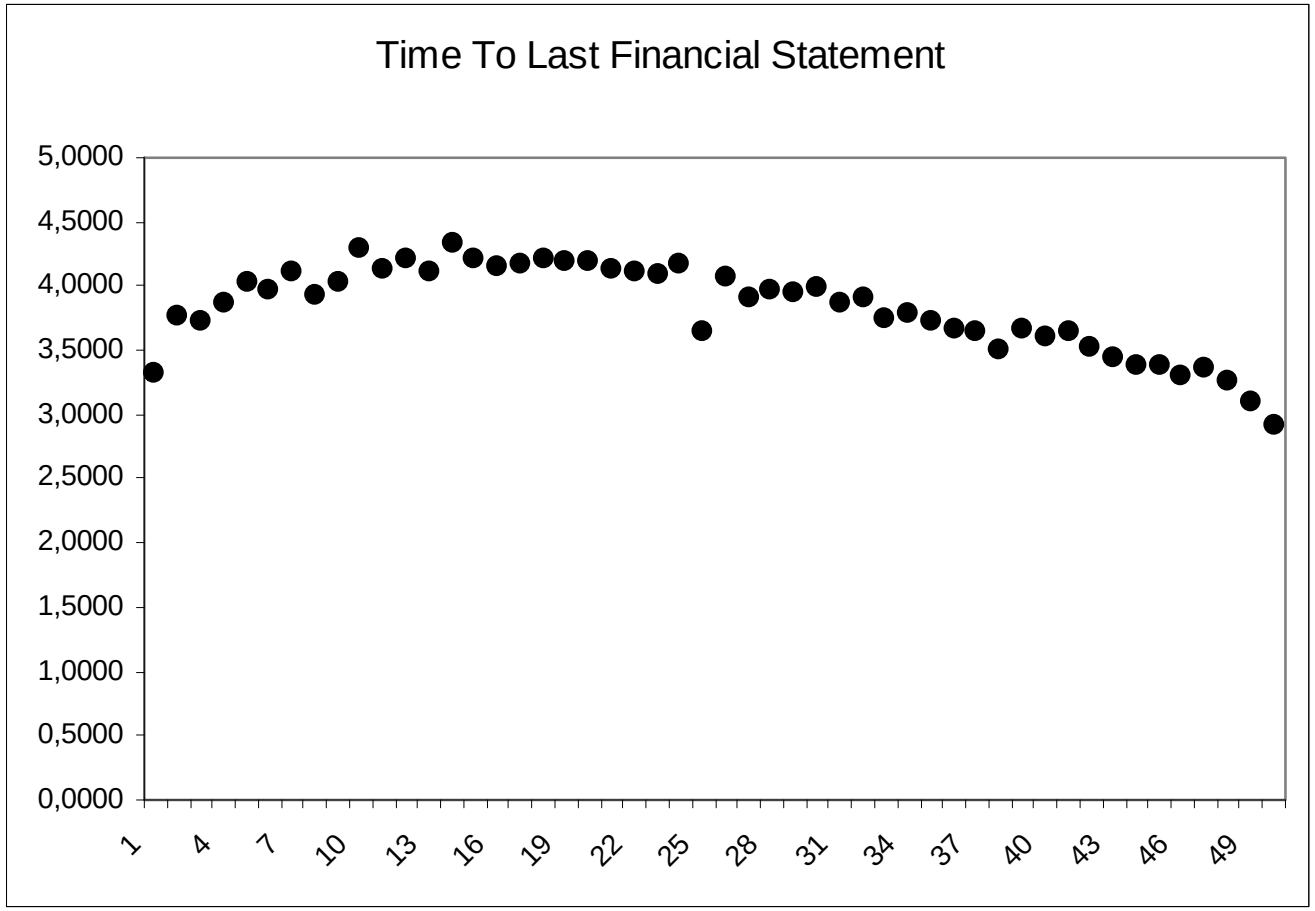
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- Credit loss distributions (prelim.)
  - Portfolio sampling methodology
    - Carey [JF 1998] non-parametric MC re-sampling
    - Re-sample portfolios over different size intervals
    - Simulation parameters
      - Random draw of quarter to avoid smoothing
      - 1,000 portfolios, 50,000 firms per portfolio
      - Horizon = 4 quarters
      - Share of each counterpart < 3%

TABLE 2a: Mean default rates

Sales threshold	Type	
0.25mn	SME	0.17
	Corporate	*0.15*
5mn	SME	0.17
	Corporate	*0.14*
25mn	SME	0.17
	Corporate	*0.15*
50mn	SME	0.17
	Corporate	*0.06*
100mn	SME	0.17
	Corporate	*0.04*
450mn	SME	0.17
	Corporate	*0.00*

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TABLE 2b: Unexpected loss rate distribution percentiles

Sales threshold		99.5	99.75	99.9
0.25mn	SME	0.18	0.18	0.18
	Corporate	0.35	0.35	0.38
5mn	SME	0.16	0.17	0.18
	Corporate	0.35	0.35	0.36
25mn	SME	0.15	0.16	0.16
	Corporate	1.35	1.37	1.39
50mn	SME	0.17	0.17	0.18
	Corporate	0.60	0.64	0.66
100mn	SME	0.17	0.17	0.18
	Corporate	0.67	0.68	0.68
450mn	SME	0.16	0.16	0.18
	Corporate	0.00	0.00	0.00

Conclusions

- Reaction of PD to macroeconomic fluctuations generally increases with firm size
- Reaction of PD to fluctuations in firm specific risk factors generally increases with firm size; some factors flat
- Idiosyncratic noise in PD increases with firm size!
  - "Scoring more informative for smaller businesses"
- Average default risk falls with firm size
- *Un*expected default risk rises with firm size (*caveat*)

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What we will do?

- Look at c.p. impact of aggregate fluctuations on smaller and larger businesses
- More robustness analysis on macro factors

Limitations

- Correlations are conditional: large portfolios diversify much risk and hence display smaller default correlations
- Should therefore look at impact of portfolio size on correlation
  - Not important in the "perfectly diversified one-factor" model
  - What is "normal" portfolio size?
- But not relevant for "exposure to firm specific and systematic factors"!
- Endogeneity of risk to information sharing / availability [Berger Udell JBF 2006, Japelli Pagano JBF 2002]