
The Development of Alternative Financing Sources for SMEs & the Assessment of SME Credit Risk

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Washington D.C.
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Scoring Systems

- Qualitative (Subjective) – 1800s
- Univariate (Accounting/Market Measures)
 - Rating Agency (e.g. *Moody's* (1909), *S&P Global Ratings* (1916) and Corporate (e.g., *DuPont*) Systems (early 1900s))
- Multivariate (Accounting/Market Measures) – 1968 (Z-Score) Present
 - Discriminant, Logit, Probit Models (Linear, Quadratic)
 - Non-Linear and “Black-Box” Models (e.g., Recursive Partitioning, Neural Networks, 1990s), Machine Learning, Hybrid
- Discriminant and Logit Models in Use for
 - Consumer Models - *Fair Isaacs* (FICO Scores)
 - Manufacturing Firms (1968) – Z-Scores
 - Extensions and Innovations for Specific Industries and Countries (1970s – Present)
 - ZETA Score – Industrials (1977)
 - Private Firm Models (e.g., *Z'-Score* (1983), *Z''-Score* (1995))
 - EM Score – Emerging Markets (1995)
 - Bank Specialized Systems (1990s)
 - SMEs (e.g. *Edmister* (1972), *Altman & Sabato* (2007) & *Wiserfunding* (2016))
- Option/Contingent Claims Models (1970s – Present)
 - Risk of Ruin (Wilcox, 1973)
 - *KMV's* Credit Monitor Model (1993) – Extensions of Merton (1974) Structural Framework

Scoring Systems

- Artificial Intelligence Systems (1990s – Present)
 - Expert Systems
 - Neural Networks
 - Machine Learning
- Blended Ratio/Market Value/Macro/Governance/Invoice Data Models
 - Altman Z-Score (*Fundamental Ratios and Market Values*) – 1968
 - Bond Score (*Credit Sights*, 2000; *RiskCalc Moody's*, 2000)
 - Hazard (Shumway), 2001)
 - *Kamakura's* Reduced Form, Term Structure Model (2002)
 - Z-Metrics (Altman, et al, *Risk Metrics*®, 2010)
- Re-introduction of Qualitative Factors/FinTech
 - Stand-alone Metrics, e.g., Invoices, Payment History
 - Multiple Factors – Data Mining (Big Data Payments, Governance, time spent on individual firm reports [e.g., *CreditRiskMonitor's* revised FRISK Scores, 2017], etc.)

Major Agencies Bond Rating Categories

Moody's		S&P/Fitch
Aaa	Investment Grade	AAA
Aa1		AA+
Aa2		AA
Aa3		AA-
A1		A+
A2		A
A3		A-
Baa1		BBB+
Baa2		BBB
Baa3		BBB-
Ba1	High Yield ("Junk")	BB+
Ba2		BB
Ba3		BB-
B1		B+
B2		B
B3		B-
Caa1		CCC+
Caa		CCC
Caa3		CCC-
Ca		CC
C	C	
		D

High Yield Market



ABOUT US



wiserfunding



START

We incorporated in April 2016 in UK and in July 2016 in Italy and became partner of the Italian stock exchange in August.

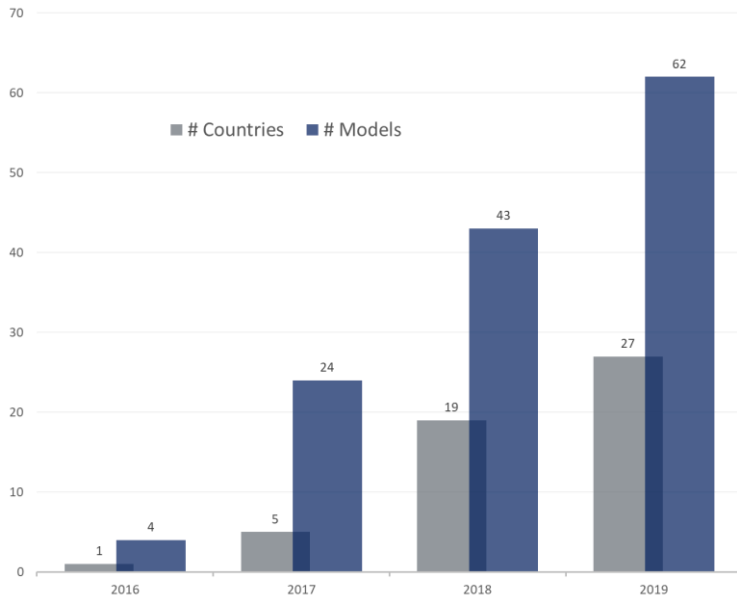
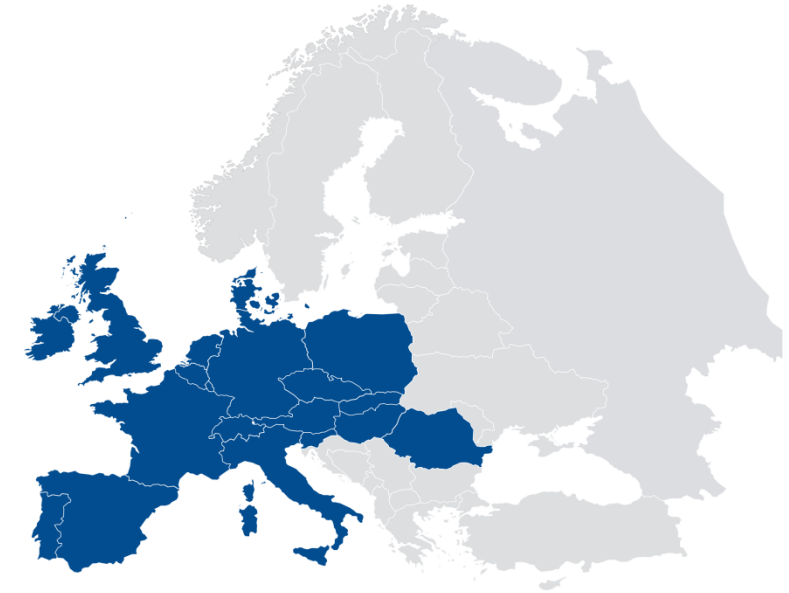
2016



MODELS

We have developed models for all countries in Europe each segmented by industry sectors

2017



TECHNOLOGY

Together with our partner CERTUA Ltd, we have designed and developed our platform to implement our models

2018



GOVERNANCE

We have selected and appointed our Board members and Advisors

2018



CLIENTS

We have built a diverse customer base including bank and non-bank lenders, funds, rating agencies and SMEs themselves.

2018



OUR VISION

BECOME THE MARKET STANDARD TO ASSESS THE CREDIT RISK OF SMEs

We are now ready to bring our innovations to U.S. and Asia to facilitate SME lending by providing the most advanced and predictive tools to assess their credit risk

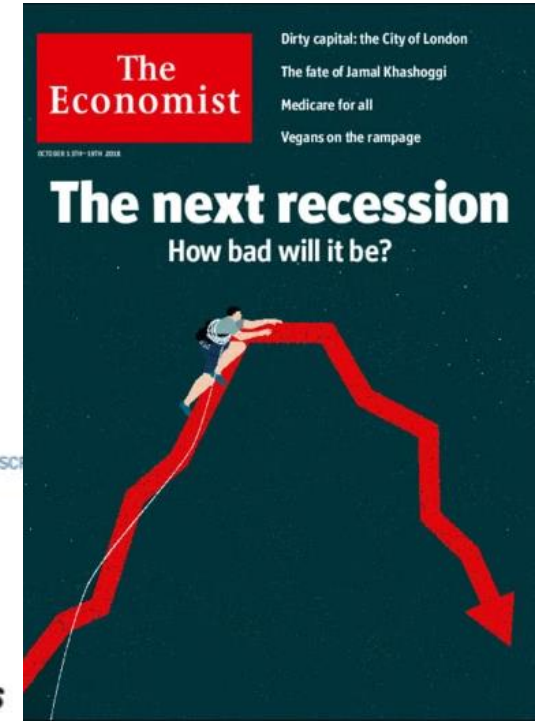
WHY IS A CREDIBLE AND SOUND RISK MODEL FOR SMEs INCREASINGLY RELEVANT?



Bank of England
Bank of England raises alarm over surge in high-risk lending

Central bank draws parallels to 2008

Several signs seem to suggest that the longest benign cycle in the history may be coming to an end soon. What impact would that have on the outstanding debt towards SME?

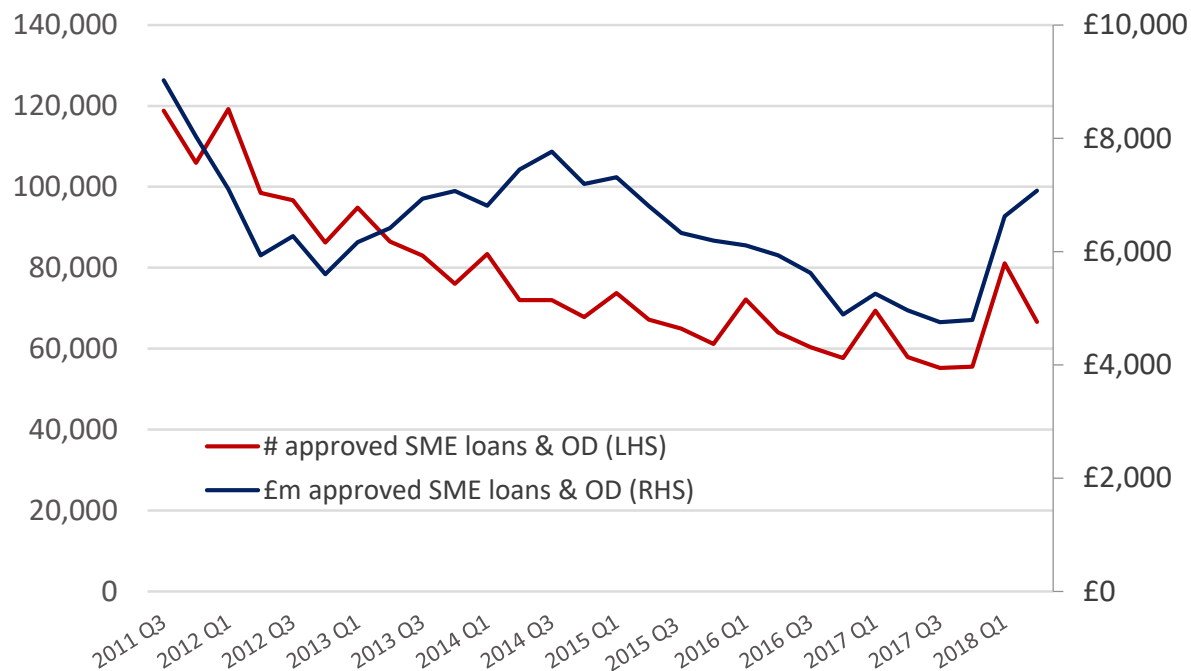


Why Italy Could be the Epicenter of the Next Financial Crisis



The Italian government's populist spending plans — a proposal is due to Brussels on Monday — have bond investors worried about the potential for

Bank lending to SMEs

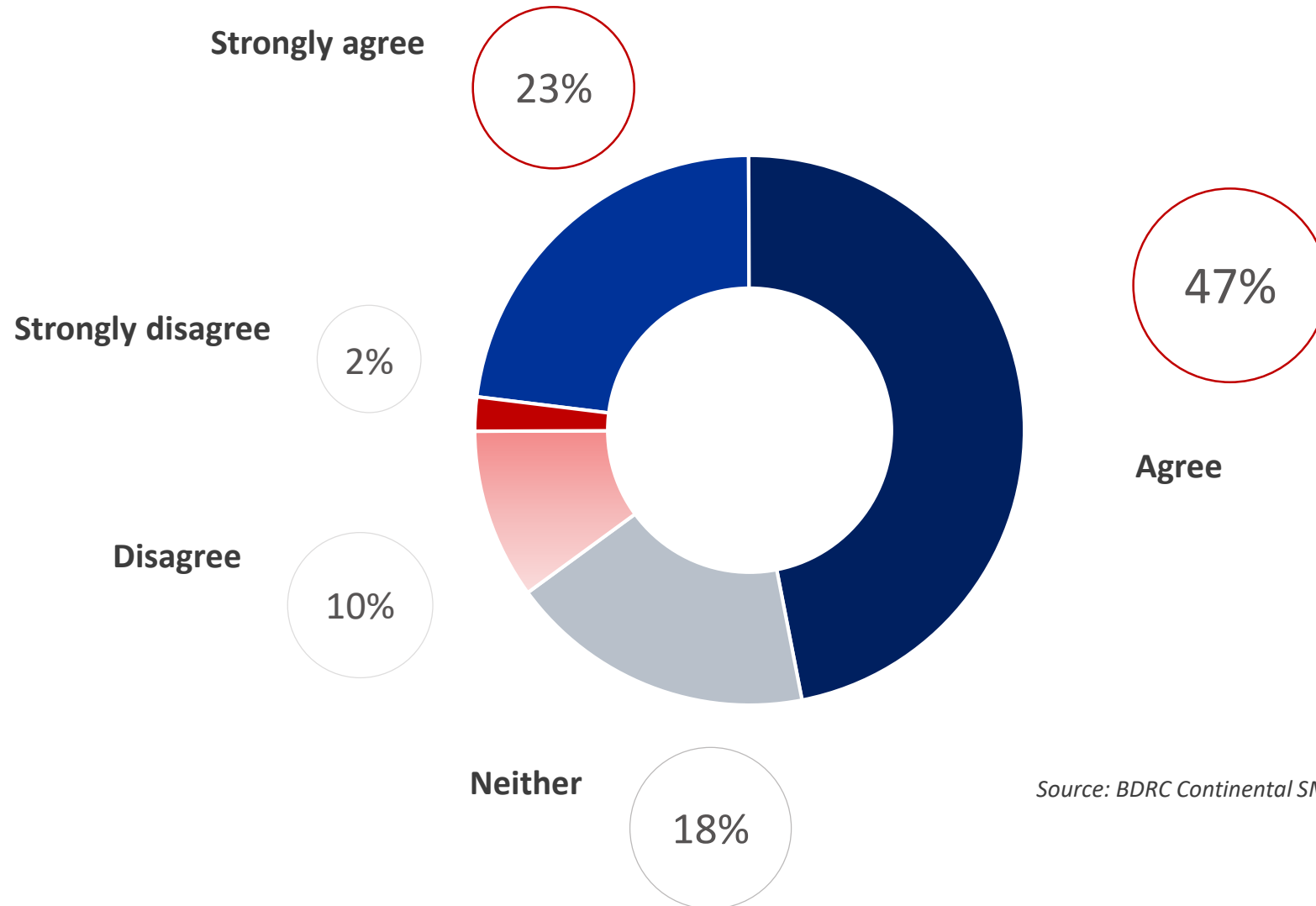


Are UK banks becoming less interested in the SME lending market?

Source: UK Finance, SME Finance Update Q2 2018

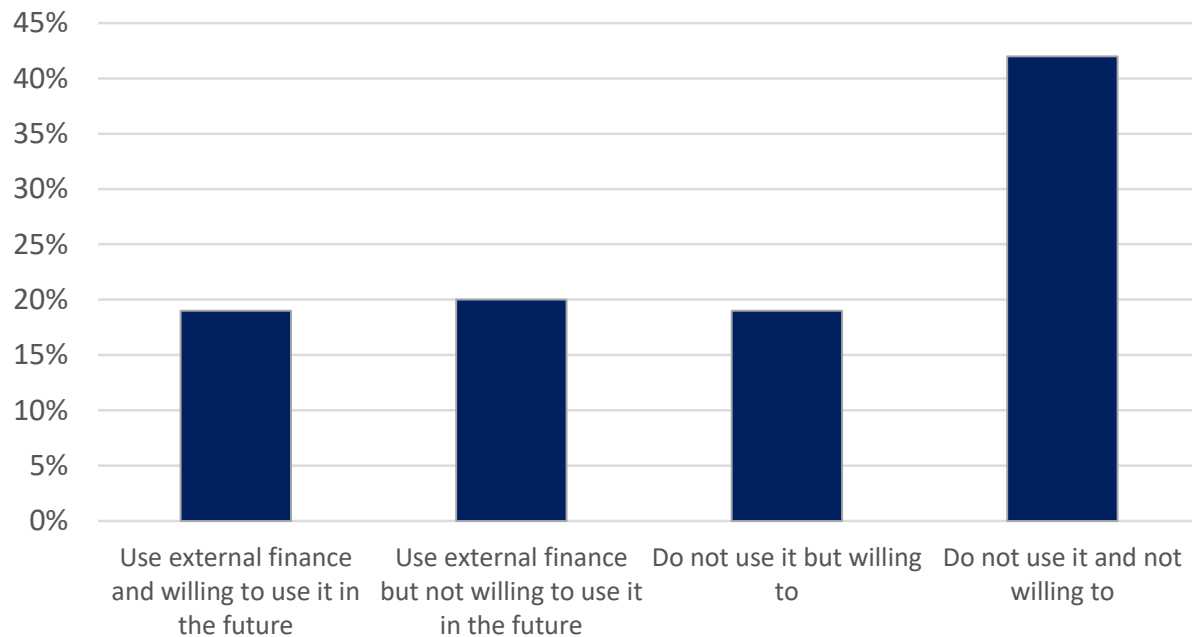
Banks approved almost 70,000 loans to SMEs this quarter and success rates remain high, with eight out of 10 applications getting the green light. Demand for finance amongst SMEs has increased, particularly among production and manufacturing industries.

Many SMEs will accept a slower growth rather than borrowing to grow faster



Source: BDRG Continental SME Finance Monitor, Q2 2017

Use of external finance and willingness to use in the future



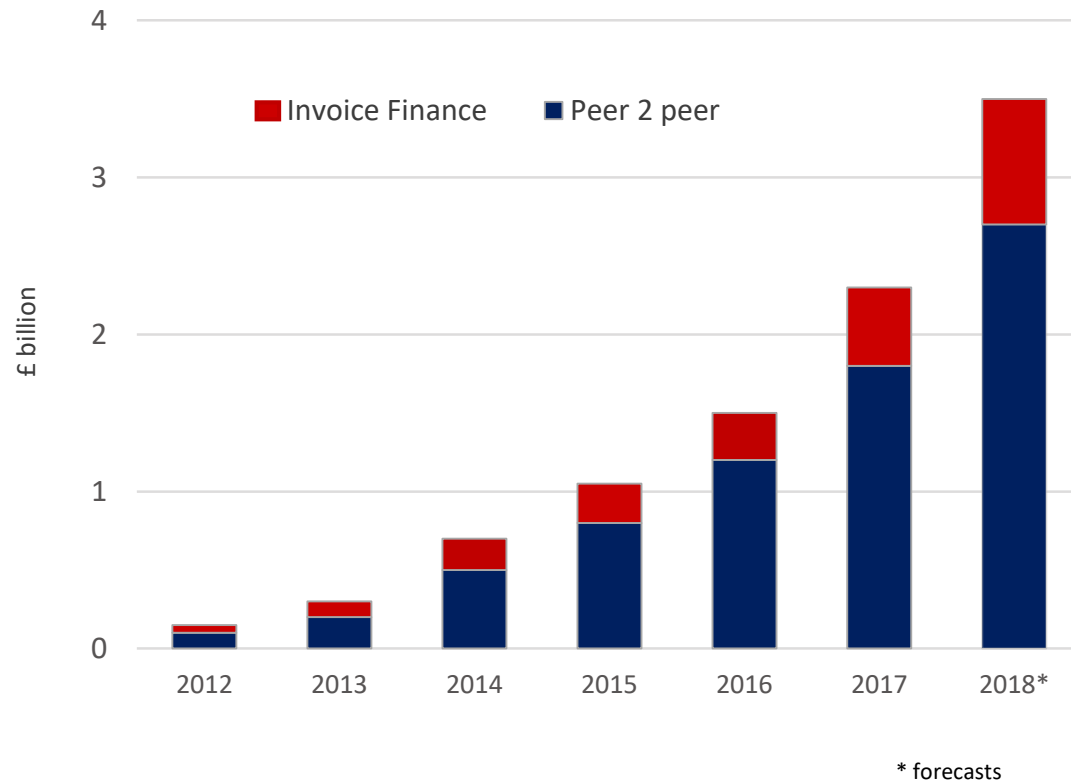
Why did SMEs become adverse to debt?

Source: BDRC Continental, SME Finance Monitor Q2 2017

Lack of awareness and understanding of financial products can also reflect a more fundamental apathy and perceived absence of relevance to business owners.

There is, after all, no reason for an entrepreneur to take the time to educate themselves on forms of finance if they have no intention of ever requiring or applying for external finance. Not least, doing so is time consuming and any ultimate first-time application is fraught with the real possibility of rejection.

Growth in UK peer2peer business lending and non-bank invoice finance

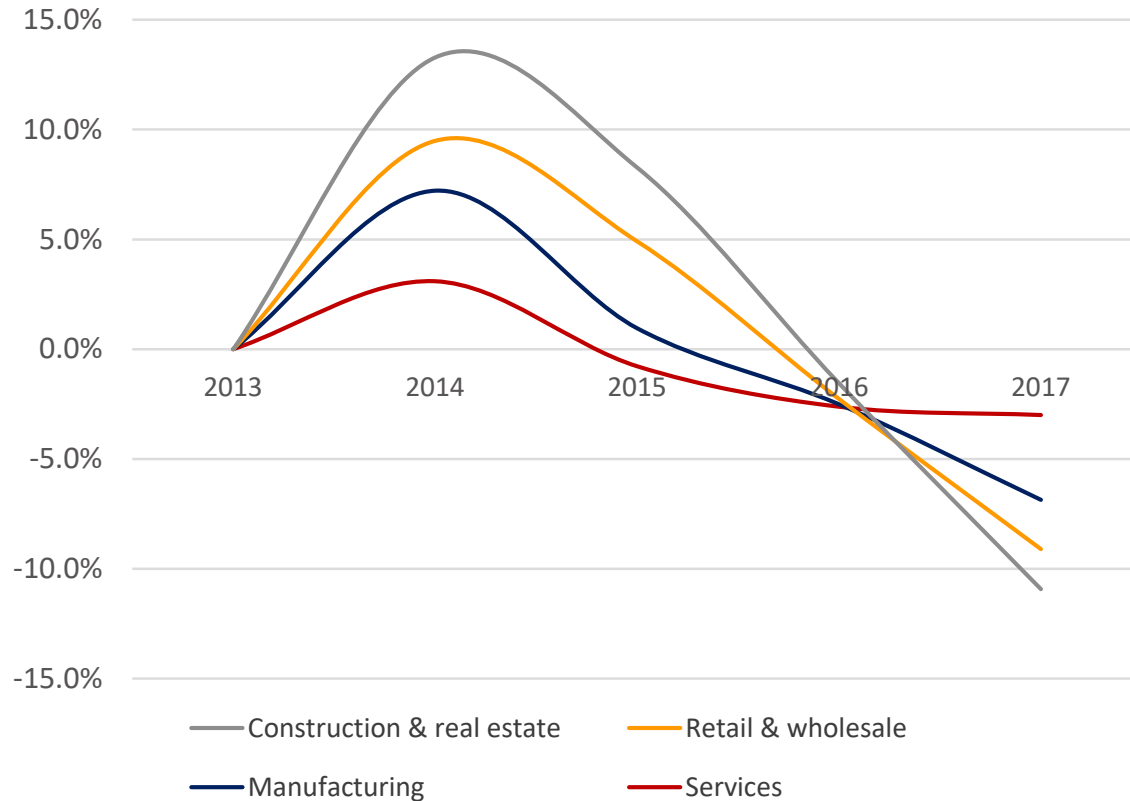


Are alternative lenders becoming the preferred choice?

Source: AltFi Data and Author compilation, non-bank SME lending Q3 2018

Non-bank lenders' values continue to grow. According to AltFi Data, total lending in 2017 exceeded £5bn, an increase of 45% on 2016. This brings the total to £13.4bn since started recording data in 2011.

SME Z-Score trends



SME credit risk profile is worsening across all sectors

Source: Wisefunding, SME Finance Review, Q3 2018

We run our models on more than 3 million active SMEs in the UK and we have consistently observed similar trends across regions and sectors with worsening credit risk profile and increasing amount of debt.

Z

THE Z-SCORE

The history and the legacy of a tool that has changed the way we assess the risk profile of companies



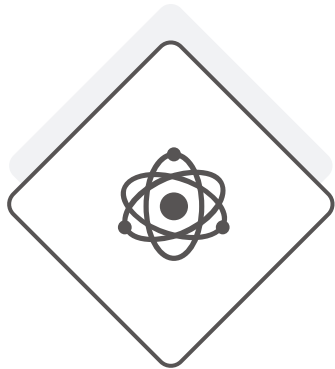
wiserfunding



Why has the Altman Z-Score been successful over the past 50 years?

Simplicity

5 financial indicators with objective weightings



Affordability

basically free



Predictivity

80% to 90% accuracy ratio



Credibility

More than 15.000 studies have been written regarding this model



Z-Score (1968) Component Definitions and Weightings

<u>Variable</u>	<u>Definition</u>	<u>Weighting Factor</u>
X ₁ -----	<u>Working Capital</u> Total Assets	1.2
X ₂ -----	<u>Retained Earnings</u> Total Assets	1.4
X ₃ -----	<u>EBIT</u> Total Assets	3.3
X ₄ -----	<u>Market Value of Equity</u> Book Value of Total Liabilities	0.6
X ₅ -----	<u>Sales</u> Total Assets	1.0

Zones of Discrimination: Original Z - Score Model (1968)

$Z > 2.99$ - “Safe” Zone
$1.8 < Z < 2.99$ - “Grey” Zone
$Z < 1.80$ - “Distress” Zone



Estimating Probability of Default (PD) and Probability of Loss Given Defaults (LGD)

Method #1

- Credit scores on new or existing debt
- Bond rating equivalents on new issues (Mortality) or existing issues (Rating Agency Cumulative Defaults)
- Utilizing mortality or cumulative default rates to estimate marginal and cumulative defaults
- Estimating Default Recoveries and Probability of Loss

or

Method #2

- Credit scores on new or existing debt
- Direct estimation of the probability of default
- Based on PDs, assign a rating



Median Z-Score by S&P Bond Rating for U.S. Manufacturing Firms: 1992 - 2017

Rating	2017 (No.)	2013 (No.)	2004-2010	1996-2001	1992-1995
AAA/AA	4.20 (14)	4.13 (15)	4.18	6.20*	4.80*
A	3.85 (55)	4.00 (64)	3.71	4.22	3.87
BBB	3.10 (137)	3.01 (131)	3.26	3.74	2.75
BB	2.45 (173)	2.69 (119)	2.48	2.81	2.25
B	1.65 (94)	1.66 (80)	1.74	1.80	1.87
CCC/CC	0.73 (4)	0.23 (3)	0.46	0.33	0.40
D	-0.10 (6)¹	0.01 (33)²	-0.04	-0.20	0.05

*AAA Only.

¹ From 1/2014-11/2017, ²From 1/2011-12/2013.

Sources: S&P Global Market Intelligence's *Compustat* Database, mainly S&P 500 firms, compilation by NYU Salomon Center, Stern School of Business.

Marginal and Cumulative Mortality Rate Actuarial Approach

$$\mathbf{MMR}_{(r,t)} = \frac{\text{total value of defaulting debt from rating } (r) \text{ in year } (t)}{\text{total value of the population at the start of the year } (t)}$$

MMR = Marginal Mortality Rate

One can measure the cumulative mortality rate (CMR) over a specific time period (1,2,..., T years) by subtracting the product of the surviving populations of each of the previous years from one (1.0), that is,

$$\mathbf{CMR}_{(r,t)} = 1 - \prod_{t=1 \rightarrow N} \mathbf{SR}_{(r,t)},$$

$r = \text{AAA} \rightarrow \text{CCC}$

here $\mathbf{CMR}_{(r,t)}$ = Cumulative Mortality Rate of (r) in (t),

$\mathbf{SR}_{(r,t)}$ = Survival Rate in (r,t) , $1 - \mathbf{MMR}_{(r,t)}$

Mortality Rates by Original Rating

All Rated Corporate Bonds*
1971-2018

Years After Issuance

		1	2	3	4	5	6	7	8	9	10
AAA	Marginal	0.00%	0.00%	0.00%	0.00%	0.01%	0.02%	0.01%	0.00%	0.00%	0.00%
	Cumulative	0.00%	0.00%	0.00%	0.00%	0.01%	0.03%	0.04%	0.04%	0.04%	0.04%
AA	Marginal	0.00%	0.00%	0.18%	0.05%	0.02%	0.01%	0.03%	0.04%	0.03%	0.04%
	Cumulative	0.00%	0.00%	0.18%	0.23%	0.25%	0.26%	0.29%	0.33%	0.36%	0.40%
A	Marginal	0.01%	0.02%	0.09%	0.10%	0.07%	0.04%	0.02%	0.22%	0.05%	0.03%
	Cumulative	0.01%	0.03%	0.12%	0.22%	0.29%	0.33%	0.35%	0.57%	0.62%	0.65%
BBB	Marginal	0.29%	2.26%	1.20%	0.95%	0.46%	0.20%	0.21%	0.15%	0.15%	0.31%
	Cumulative	0.29%	2.54%	3.71%	4.63%	5.07%	5.26%	5.46%	5.60%	5.74%	6.03%
BB	Marginal	0.89%	2.01%	3.79%	1.95%	2.38%	1.52%	1.41%	1.07%	1.38%	3.07%
	Cumulative	0.89%	2.88%	6.56%	8.38%	10.57%	11.92%	13.17%	14.10%	15.28%	17.88%
B	Marginal	2.84%	7.62%	7.71%	7.73%	5.71%	4.44%	3.58%	2.03%	1.70%	0.71%
	Cumulative	2.84%	10.24%	17.16%	23.57%	27.93%	31.13%	33.60%	34.94%	36.05%	36.50%
CCC	Marginal	8.05%	12.36%	17.66%	16.21%	4.87%	11.58%	5.38%	4.76%	0.61%	4.21%
	Cumulative	8.05%	19.42%	33.65%	44.40%	47.11%	53.23%	55.75%	57.86%	58.11%	59.88%

*Rated by S&P at Issuance
Based on 3,454 issues

Source: S&P Global Ratings and Author's Compilation

Mortality Losses by Original Rating

All Rated Corporate Bonds*
1971-2018

Years After Issuance

		1	2	3	4	5	6	7	8	9	10
AAA	Marginal	0.00%	0.00%	0.00%	0.00%	0.01%	0.01%	0.01%	0.00%	0.00%	0.00%
	Cumulative	0.00%	0.00%	0.00%	0.00%	0.01%	0.02%	0.03%	0.03%	0.03%	0.03%
AA	Marginal	0.00%	0.00%	0.01%	0.02%	0.01%	0.01%	0.00%	0.01%	0.01%	0.01%
	Cumulative	0.00%	0.00%	0.01%	0.03%	0.04%	0.05%	0.05%	0.06%	0.07%	0.08%
A	Marginal	0.00%	0.01%	0.03%	0.03%	0.04%	0.04%	0.02%	0.01%	0.04%	0.02%
	Cumulative	0.00%	0.01%	0.04%	0.07%	0.11%	0.15%	0.17%	0.18%	0.22%	0.24%
BBB	Marginal	0.20%	1.47%	0.68%	0.56%	0.24%	0.14%	0.07%	0.08%	0.08%	0.16%
	Cumulative	0.20%	1.67%	2.34%	2.88%	3.12%	3.25%	3.32%	3.40%	3.47%	3.63%
BB	Marginal	0.53%	1.14%	2.26%	1.09%	1.35%	0.74%	0.79%	0.49%	0.70%	1.05%
	Cumulative	0.53%	1.66%	3.89%	4.93%	6.22%	6.91%	7.65%	8.10%	8.74%	9.70%
B	Marginal	1.88%	5.33%	5.30%	5.18%	3.76%	2.41%	2.33%	1.12%	0.88%	0.50%
	Cumulative	1.88%	7.11%	12.03%	16.59%	19.73%	21.66%	23.49%	24.34%	25.01%	25.38%
CCC	Marginal	5.33%	8.65%	12.45%	11.43%	3.39%	8.58%	2.28%	3.30%	0.37%	2.66%
	Cumulative	5.33%	13.52%	24.29%	32.94%	35.21%	40.77%	42.12%	44.03%	44.24%	45.72%

*Rated by S&P at Issuance
Based on 2,894 issues

Source: S&P Global Ratings and Author's Compilation

What are the components of our models?



Step 1

Financial variables

We use 8 to 14 financial ratios specific to SMEs covering leverage, liquidity, profitability and coverage



Step 2

Corporate governance

We collect a vast amount of structured and unstructured data on directors and the company sourcing from several databases



Step 3

Macroeconomic variables

To ensure the stability of the model across time, we use industry specific macroeconomic data to help predicting the market outlook

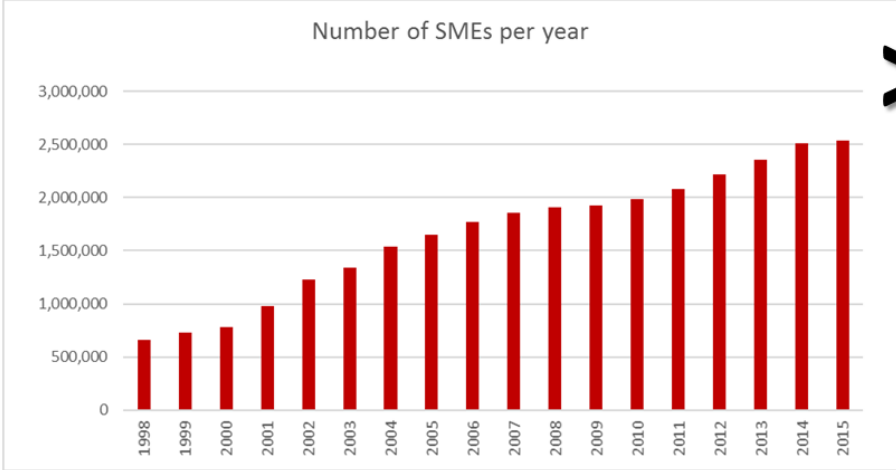


— WINNING STRATEGY

Replicate the human behavior to increase accuracy, stability and credibility



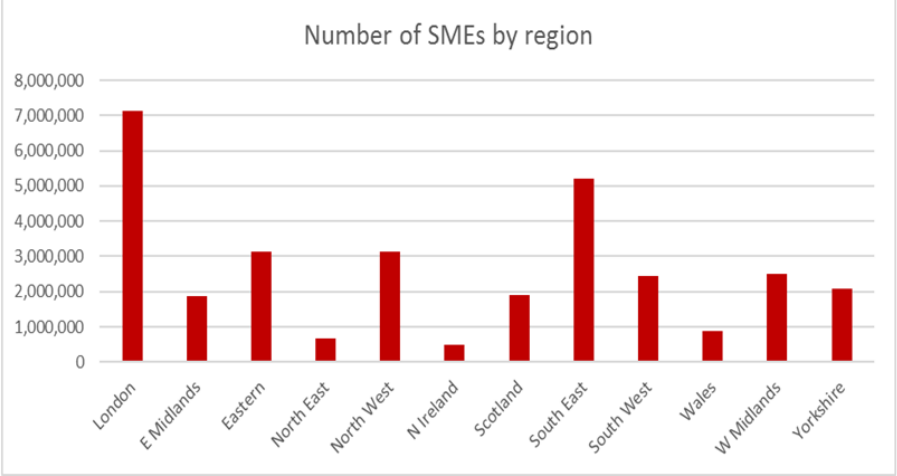
The UK SME Z-Score models



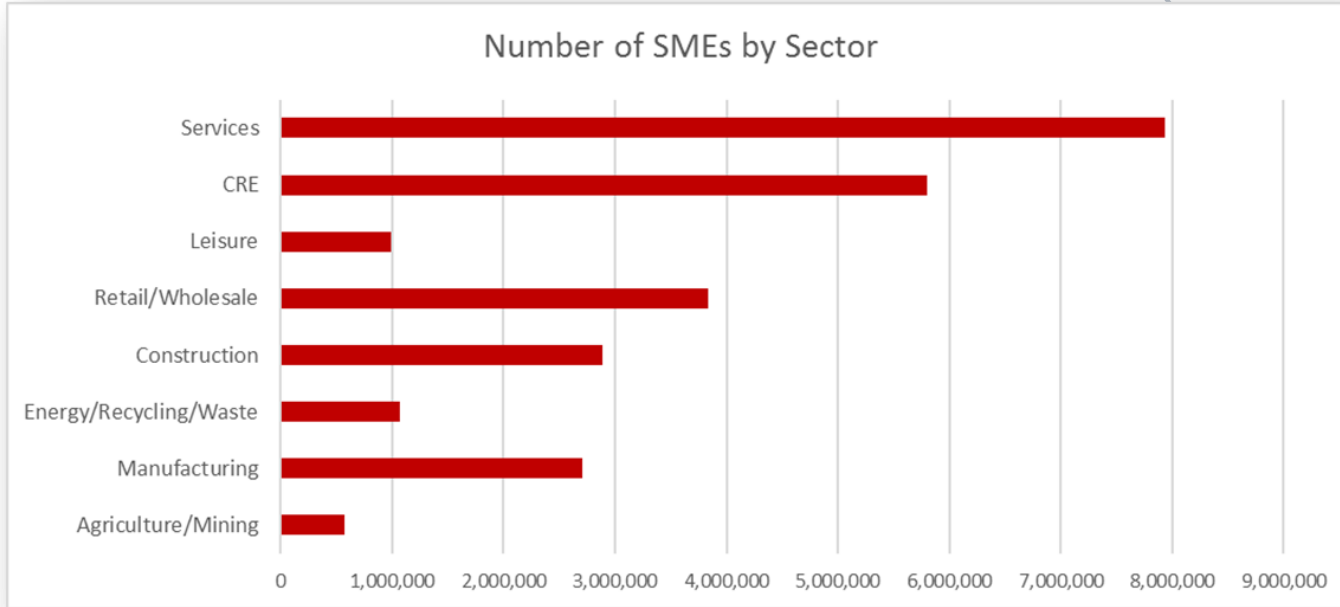
>30m of SMEs

1998- 2016

12 Regions



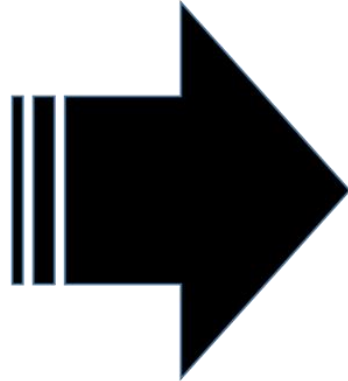
The UK SME Z-Score models



8 Sector models + 1 generic
for abridged accounts

A Full Risk Assessment

SME Z-Score



- ✓ Bond Rating Equivalent
- ✓ Debt capacity
- ✓ PD and LGD
- ✓ Commercial credit limit
- ✓ Peer comparison
- ✓ Funding options
- ✓ Pricing range

Point in Time Score
Not a Rating



wiserfunding^{ltd}

Assessing the Credit Worthiness of Italian SMEs and Mini-bond Issuers

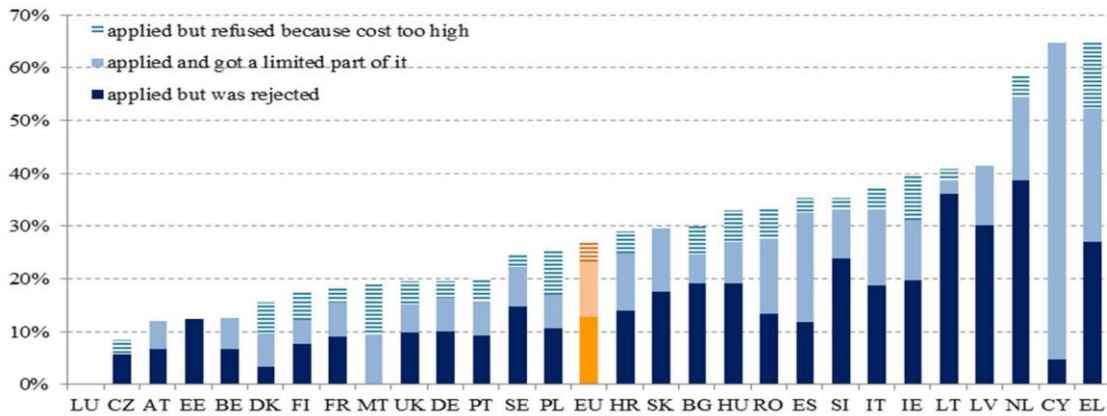
**Dr. Edward I. Altman, Professor of Finance, NYU Stern &
Co-founder, Wiserfunding Ltd., London, England**

The importance of SMEs

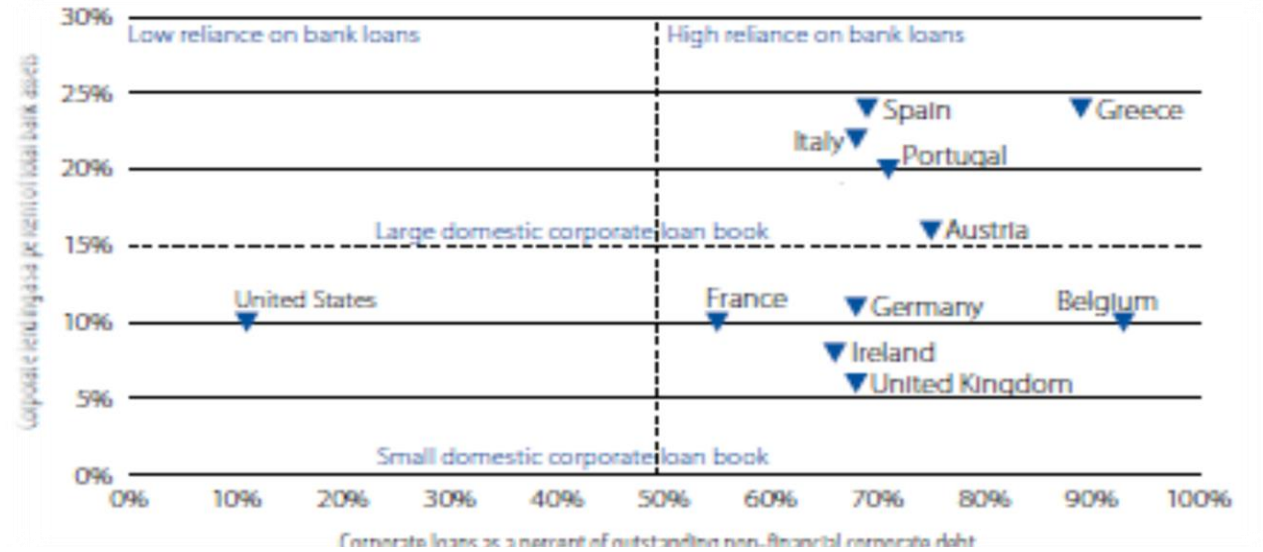
- SMEs comprise a major share of economic activity in advanced economies. They account for **over 95% of enterprises, 60% of employment and over 50% of value added in the Private sector**. In the EU, SMEs have created 85% of net new jobs from 2002/2010.
- After the last financial crisis, being heavily reliant on traditional bank lending, the majority of SMEs were faced with significant financing constraints in a deleveraging environment and with restricted credit availability from banks. Despite recent central banks' supportive stimulus, **capital market bond financing is increasingly attractive**.
- Non-bank market-based financing increasingly appeared as an option to improve the flow of credit to SMEs, while enhancing diversity and widening participation in the financial system.
- Since 2012, new channels have become increasingly important for SMEs to satisfy their funding needs. Examples of these new sources of funding are crowdfunding, P2P lending, equity participation, securitizations, and Mini-bonds. However, in Europe, SME financing is still heavily reliant on bank lending.

SMEs Access to Finance

SMEs not receiving most of the amount of bank loan requested (as % of total SMEs requesting bank loans)

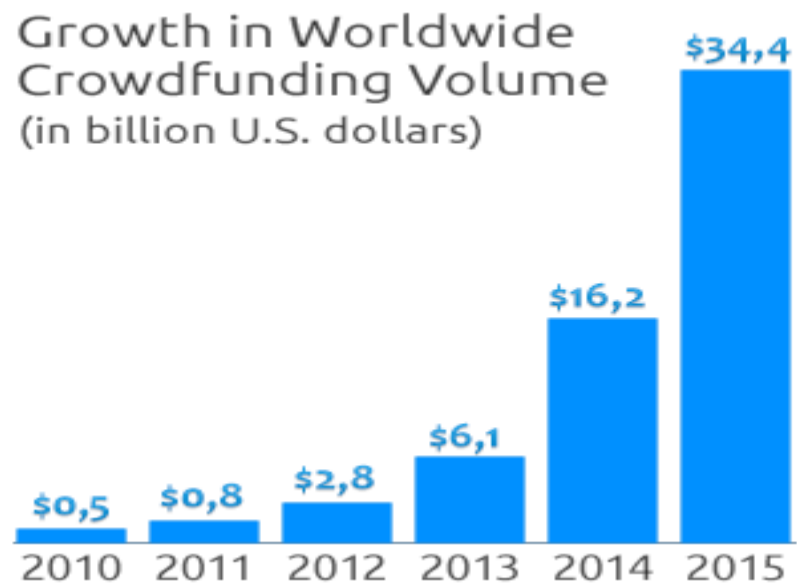


Reliance on bank financing by SMEs (in%)



Source: IMF (2012), based on data from the ECB, Eurostat, Federal Reserve and Haver Analytics.

New Funding Opportunities: CROWDFUNDING



Direct Crowdlending		Fixed income	
		Bank-originated loans 	Fixed income securities mediation
Equity			
Factoring or Invoice Discounting			

Source: BBVA Research

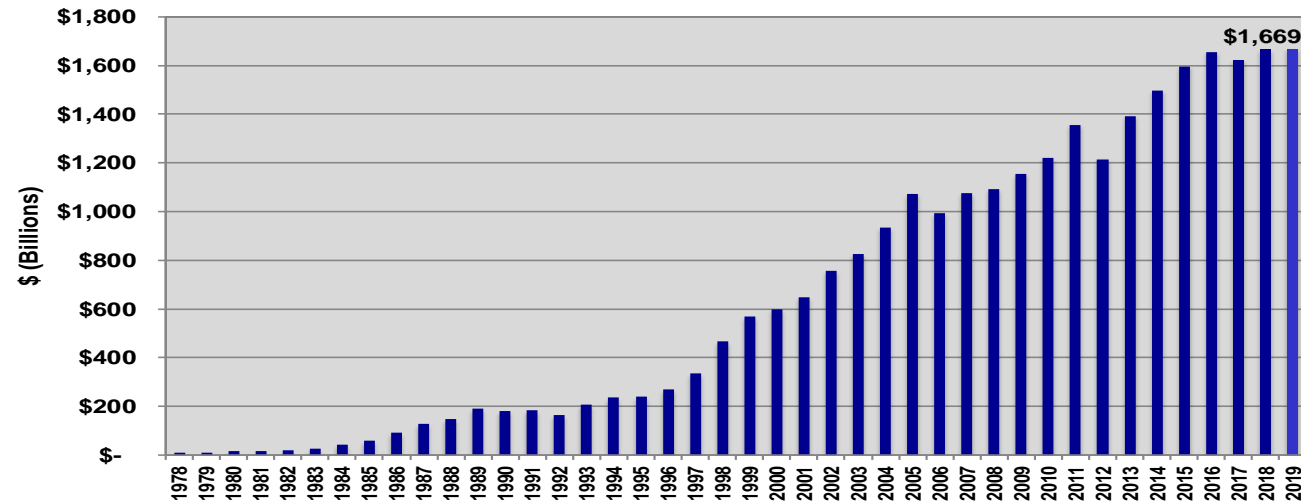
Crowdfunding has emerged as one of the strongest channels for SME financing across Europe, but has achieved limited success in Italy so far.

Size Of High-Yield Bond Market

US Market



1978 – 2019 (Mid-year US\$ billions)

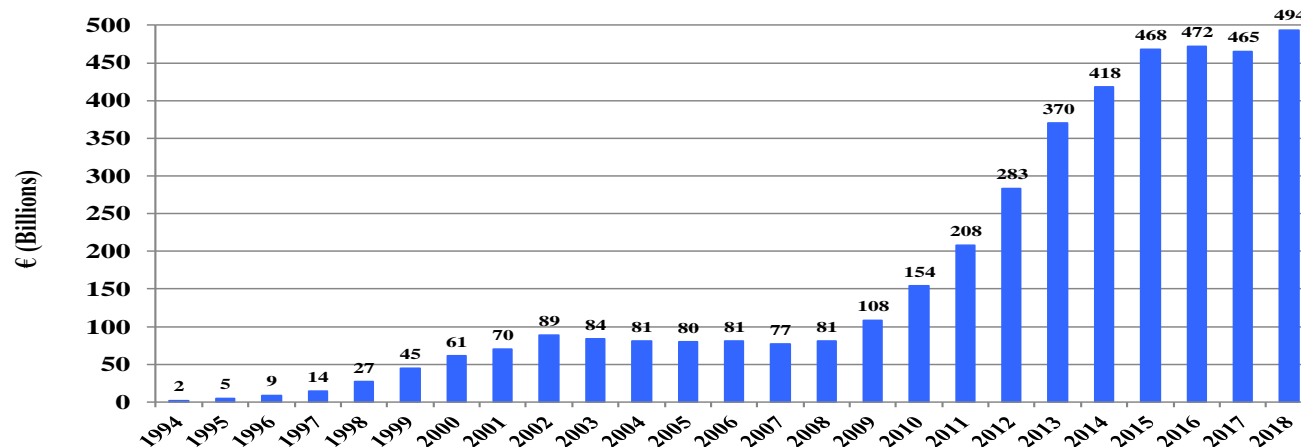


Source: NYU Salomon Center estimates using Credit Suisse, S&P and Citi data

Western Europe Market



1994 – 2018*



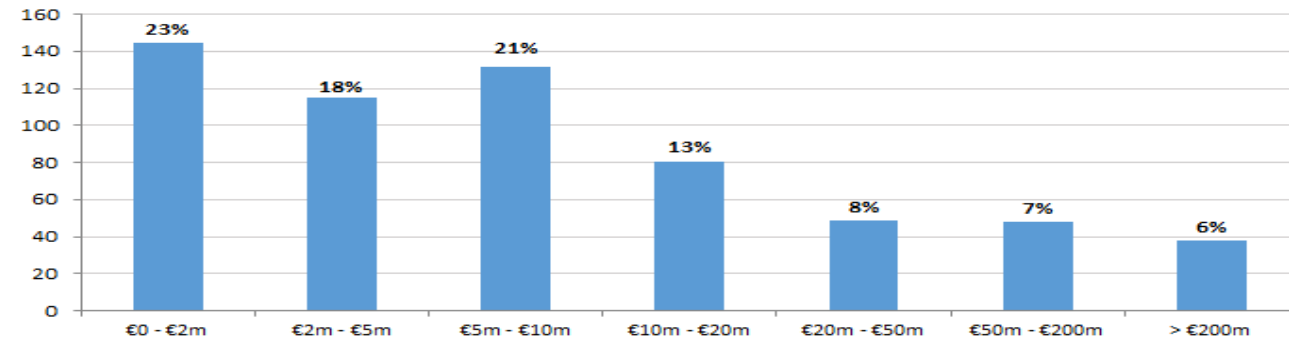
Source: Credit Suisse

* Includes non-investment grade straight corporate debt of issuers with assets located in or revenues derived from Western Europe, or the bond is denominated in a Western European currency. Floating-rate and convertible bonds and preferred stock are not included.

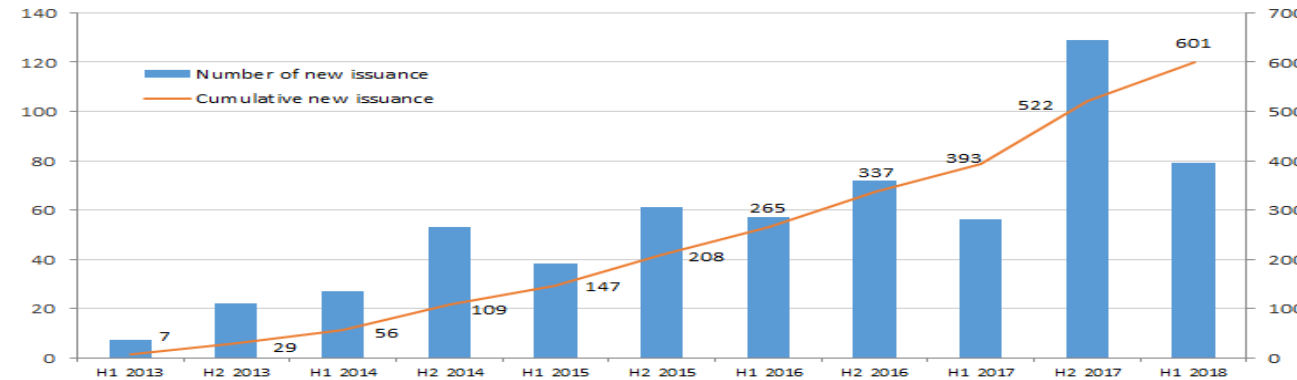
The Italian Mini-bond Market

- Europe High-yield bond market is still lagging behind the US one, but the growth has accelerated in the last 3 years.
- In Italy, the market for SME bonds is known as Extra-MOT PRO “Mini-bond” market.
- The new segment of the Extra-MOT market dedicated to listing of bonds, commercial paper, and project finance bonds started in February 2013.
- The total amount of listed issuances since February 2013 is 307, for a total issued amount of about 9,4B€. As of October 2018, there is 8,1B€ outstanding, from 224 issues.
- **In H2 2018, 30 new issues have been launched.**

Number of Italian Mini-bond Issuance by Size (2013 - H1 2018)



New Italian Mini-bond Issuance (2013 - H1 2018)



We believe “Mini-bonds” can be a success in Italy as long as the market supplies an attractive risk/return tradeoff to investors as well as affordable and flexible financing for borrowers.

What are the constraints to the success of the Italian ExtraMOT PRO Mini-bond market?

- All bond investments face three main risks (Market, Liquidity and Credit), but it is **credit risk that is perhaps most critical** for relatively unknown, smaller enterprises.
- Since the ExtraMOT PRO market is still quite young, there are not as yet aggregate default and recovery statistics. **We prefer, therefore, to concentrate on issuer default & return analytics based on Italian SME experience.**



The objective of our model is to help:

- **Italian SMEs to grow and succeed by assessing their risk profile and suggesting what would be the best funding option for them**
- **Lenders and investors to assess the risk-return trade offs in investing in either individual or portfolios of Italian SME mini-bonds**

SME Z_1 -Score: Summary of Results

- We segmented the Italian SMEs by industrial sectors and developed four default prediction models for Manufacturing, Services, Retail and Real Estate firms.
- Models have been developed on a representative sample of more than 14.500 SMEs located in the north of Italy and then certified for their relevance at national level.
- Prediction power of the models is significantly high due to the use of informative variables and appropriate techniques applied.
- In addition to the Score, Firms/Analysts/Investors also receive an estimated **Bond Rating Equivalent** and **Probability of Default**.
- The **SME Z_1 -Score** improves the matching of demand and supply in the capital markets between SMEs looking for funding options and investors.

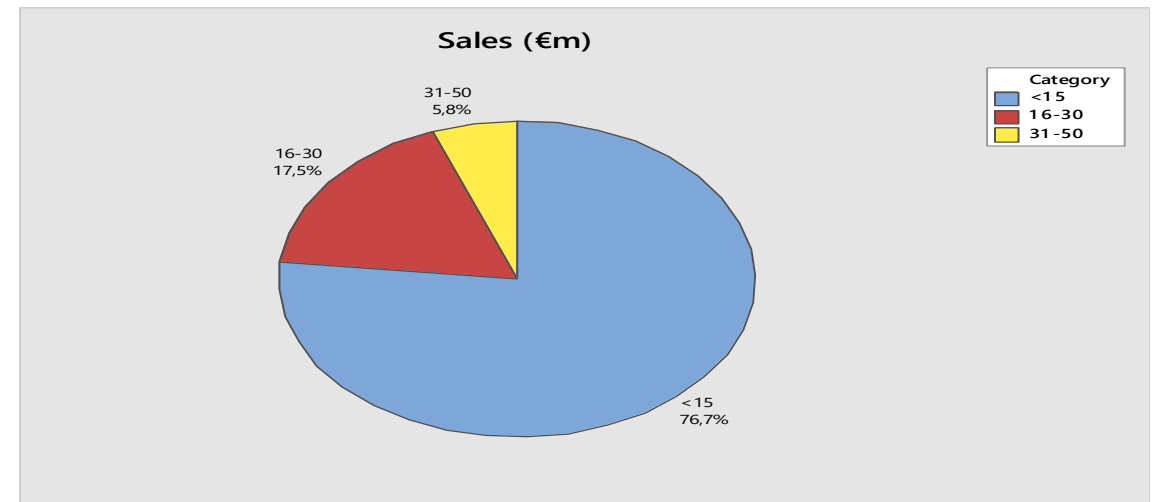
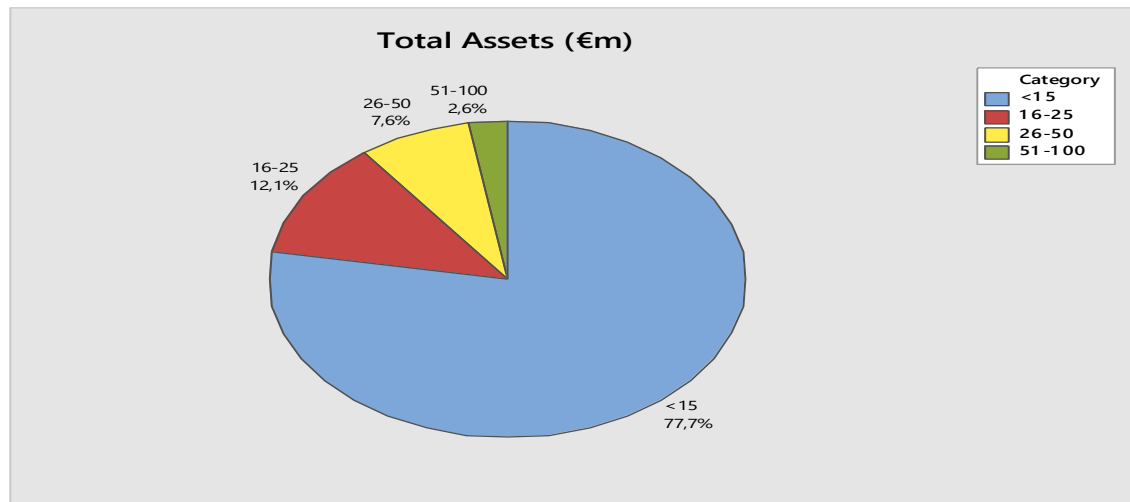
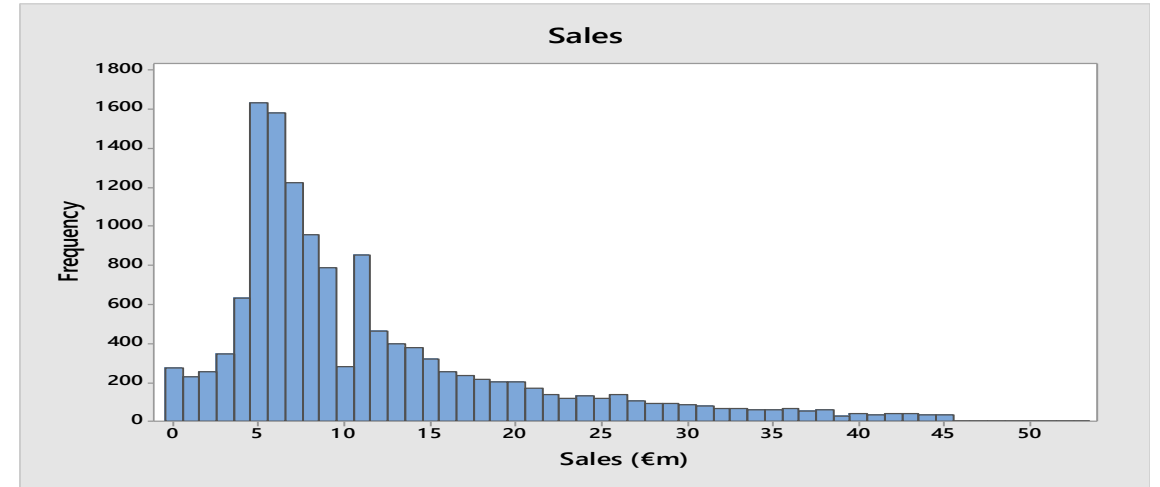
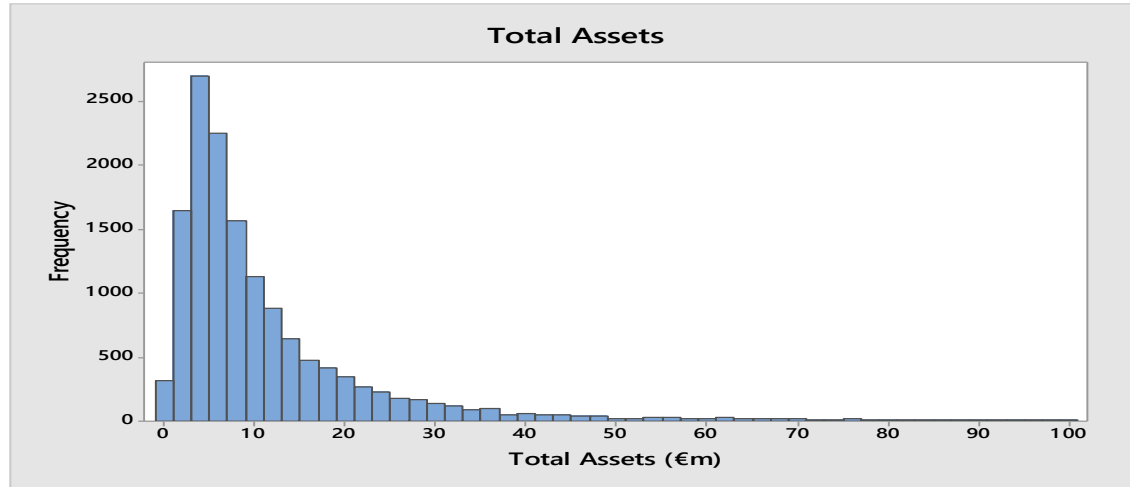
The Dataset

- Initially, financial data of 15,362 active and 1,000 non-active companies were extracted from AIDA (BvD) covering the years 2004 to 2014 (1).
- Few companies (1,852) had to be dropped due to missing financial information.
- The shape and size of the final development sample is reported below

	Number	Percentage
Non - defaulted firms	13,990	96.4 %
Defaulted firms	520	3.6 %
Total	14,510	100%

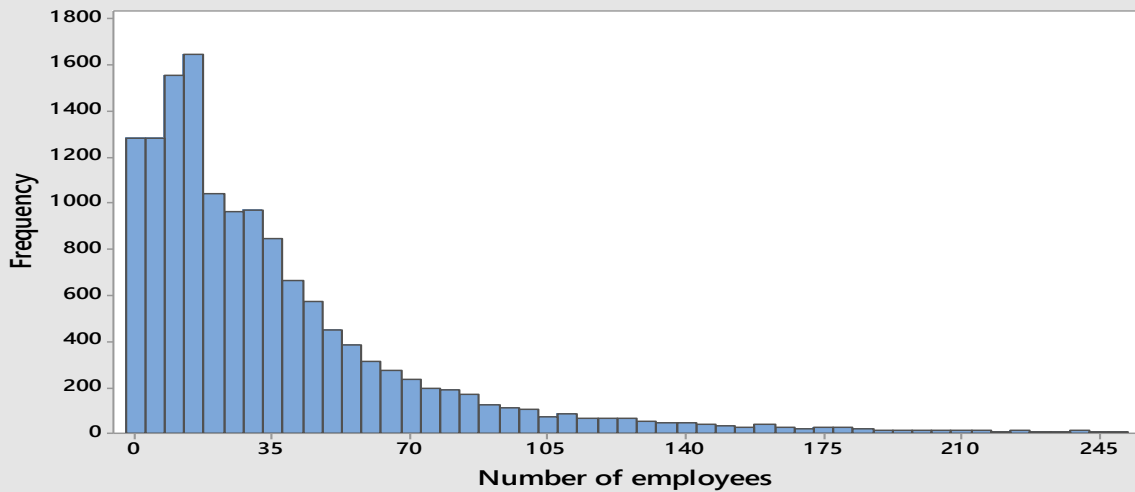
(1): We thank CLASSIS Capital and ASSOLOMBARDA for supporting this research by providing Italian SMEs data

Italian SMEs Profile

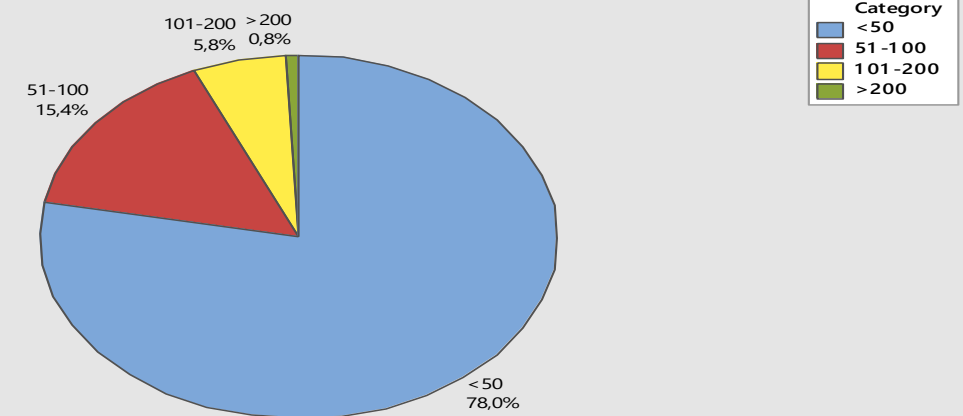


Italian SMEs Profile

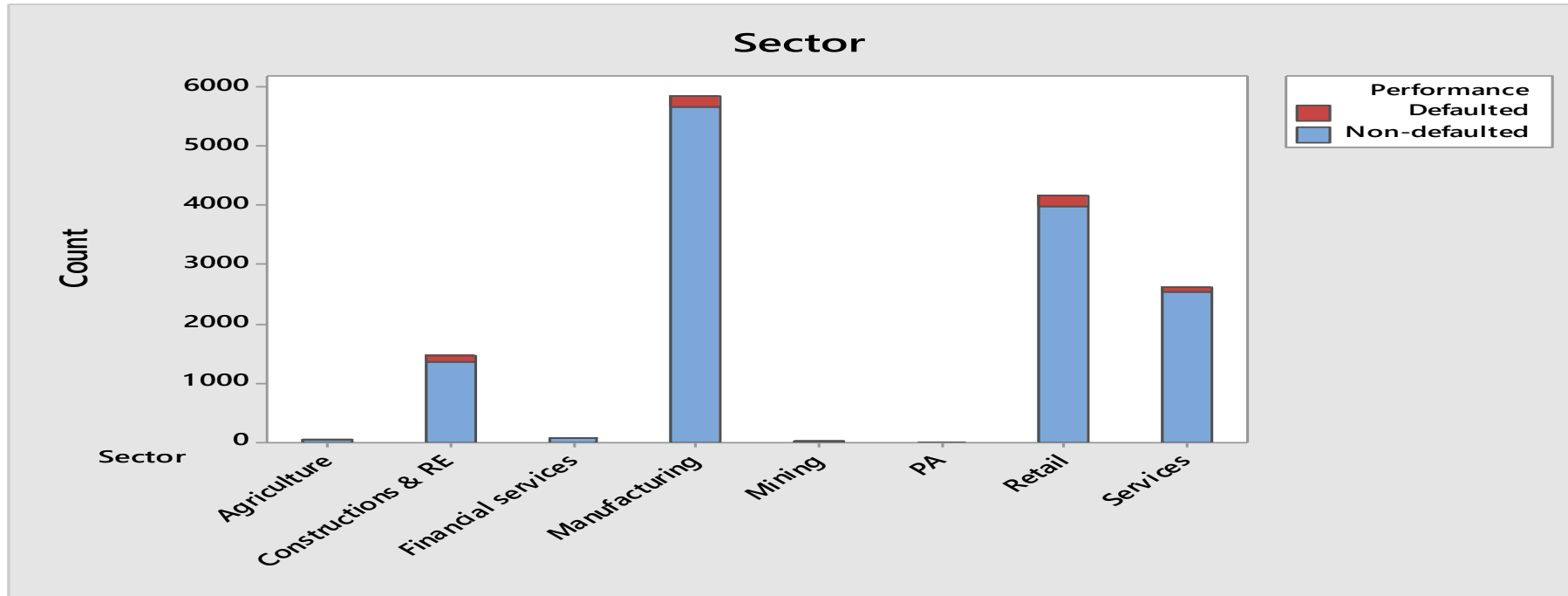
Number of employees



Number of employees



Sector Analysis



		Sector								Total
		Agriculture	Construction & RE	Financial services	Manufacturing	Mining	PA	Retail	Services	
Performance	Non-defaulted	47	1482	96	5697	31	2	4007	2628	13990
	Defaulted	0	107	5	161	0	0	168	79	520
		47	1589	101	5858	31	2	4175	2707	14510

Variables Selection

Accounting Ratio Category	Selected Variables
Leverage	Short Term Debt/Equity (Book Value) Equity (Book Value)/Total Assets Current ratio Quick ratio Short Term Debt/Total debt Short term debt/Total Assets Debt/EBITDA Net Debt/EBITDA Change Short term debt in Last 2Y Total debt/Total Assets
Liquidity	Cash/Total Assets Working Capital/Total Assets Tangible/Total assets Intangible/Total Assets
Profitability	Ebitda/Total Assets Net Income/Total Assets Return on Equity Retained Earnings/Total Assets Net Income/Sales
Coverage	Ebitda/Interest Expenses Ebit/Total assets
Activity	Sales/Total Assets Account Payable/Sales Account Receivable/Liabilities



- Consistent with a large number of studies, we choose five accounting ratio categories describing the main aspects of a company's financial profile: liquidity, profitability, leverage, coverage and activity.
- For each one of these categories, we create a number of financial ratios identified in the literature as being most successful in predicting firms' bankruptcy and transform them in highly predictive variables
- Next, we apply a statistical forward stepwise selection procedure to the selected variables and estimate the full model for each of the four sectors eliminating the least helpful covariates, one by one, until all the remaining input variables are efficient, i.e. their significance level is above the chosen critical level.

The Results

	Type I error rate	Type II error rate	1- Average Error Rate	Accuracy ratio
Manufacturing Model	6.92% (8.23%)	26.57% (27.64%)	83.26% (82.07%)	93.08% (92.21%)
Retail Model	16.77% (18.54%)	27.78% (28.89%)	77.73% (76.29%)	83.23% (81.76%)
Services Model	12.05% (14.88%)	24.54% (26.43%)	81.70% (79.35%)	87.94% (84.12%)
Constructions and Real Estate	8.89% (10.12%)	26.02% (28.24%)	82.55% (80.82%)	91.11% (89.86%)

The Bond Rating Equivalent

In order to provide additional measures of credit worthiness, we introduce the concept of Bond Rating Equivalents (BRE) and Probabilities of Default (PD). Our benchmarks for determining these two critical variables are comparisons to the financial profiles of thousands of companies rated by one of the major international rating agencies (Standard & Poor's) and the incidence of default given a certain bond rating when the bond was first issued. The latter is based on updated data from E. Altman's Mortality Rate Approach (Altman, Journal of Finance, 1989).

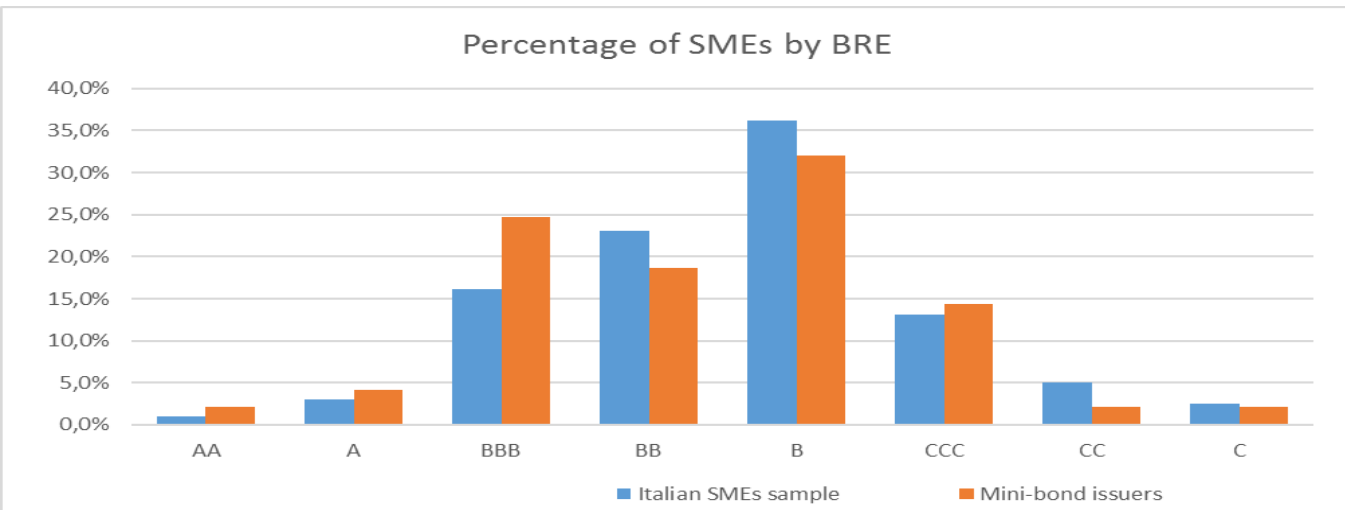
BRE	One-Year	Three-Year
AA	0.01%	0.14%
A	0.10%	0.17%
BBB	0.34%	3.96%
BB	0.95%	6.75%
B	2.86%	17.42%
CCC	8.15%	34.0%
CC	20.0%	50.0%
C	50.0%	70.0%

Source: Altman & Kuehne, NYU Salomon Centre, 2016

Risk Profile of Mini-bond issuers (2015)

Bond Rating Equivalent	# SMEs	% SMEs	Avg. Coupon Yield
AA	2	2%	0,057
A	4	4%	0,062
BBB	24	25%	0,065
BB	18	19%	0,055
B	31	32%	0,059
CCC	14	14%	0,065
CC	2	2%	0,030
C	2	2%	0,060

Source: Firms listed on Borsa Italiana Extra MOT, calculations by the authors



Source: Firms listed on Borsa Italiana Extra MOT, calculations by the authors

Applying our SME Z₁-Score on the mini-bond issuers as of 2015, we find that:

- Risk profile of SMEs doesn't seem to influence the bond pricing;
- Majority of existing mini-bond issuers classified as non-investment grade;
- The risk profile of the mini-bond issuers is better (i.e. less risky) than total SME sample.

Wiserfunding Ltd.: Helping Italian SMEs to Succeed

- Mission is to support small business growth by reducing information asymmetry by providing a common set of information to all market participants.
- The SME Z_1 -Score should not to be used in isolation. Other factor (e.g. debt capacity, cash flow, recovery profile, market outlook, directors' experience) are assessed when evaluating SMEs' financial strength.
- We believe that by providing lenders/investors and small businesses with the same set of information, we can help them speak the same language.
- We are working with Classis Capital, Borsa Italiana, Confindustria, several PMI organizations and SMEs to apply our model effectively.