

# Modelli per l'analisi del rischio di credito complaint con le nuove normative regolamentari

Accurate and Efficient Measure of Default Risk



**Analisi e valutazione del rischio di credito  
delle obbligazioni corporate**

Our story begins with broad and deep insight from well-respected names

# MOODY'S

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ANALYTICS





# Rating Implicito vs Rating Tradizionale: Gestione del Rischio nel Rispetto delle Nuove Normative

# Differenze fra Ratings impliciti e ‘tradizionali’?

## Ratings delle agenzie

- Qualitativo e a volte soggettivo
- Ranking per classi per es. Aaa, Aa1, ecc.
- Società diverse nello stesso gruppo
- Stabile o “through the cycle”

## Rating impliciti o EDF

- Quantitativo ed oggettivo
- Misura anche livelli numerici o “assoluti” di rischio per es. 5.01%
- Granulare per es. 5.01% vs. 5.02%
- Molto dinamico, aggiornamenti giornalieri
- Analisi quantitativo – Possibilità di “What-if Analysis”
- Informazioni provenienti da tutte le fonti disponibili: bilanci, prezzi di mercato, ecc.

# **Expected Default Frequency: Società quotate in Borsa**

## Analisi Quantitativa

CreditEdge e' un modello econometrico che calcola la probabilita' di default (PD) o EDF di societ  quotata.

CreditEdge si basa sulla teoria delle opzioni (Black-Scholes-Merton) e l'analisi empirica per calcolare la PD o EDF (Expected Default Frequency) di societ  quotata.

EDF e Rating implicito per un orizzonte temporale da 1 a 10 anni.



# EDF Methodology Summary

Equity is a Call Option on the Assets.  
Solve for Market Value of Assets and Asset Volatility.

Market Value of Equity

Amount of Short and Long Term Liabilities

Amount of Short/Long Term Liabilities determine Default Point

Market Value of Assets

Asset Volatility

Default Point

Distance to Default is the cushion between Market Value of Assets and Default Point, expressed as a multiple of Asset Volatility.

Distance to Default

MKMV's Default Database is used to empirically map DD to EDF.

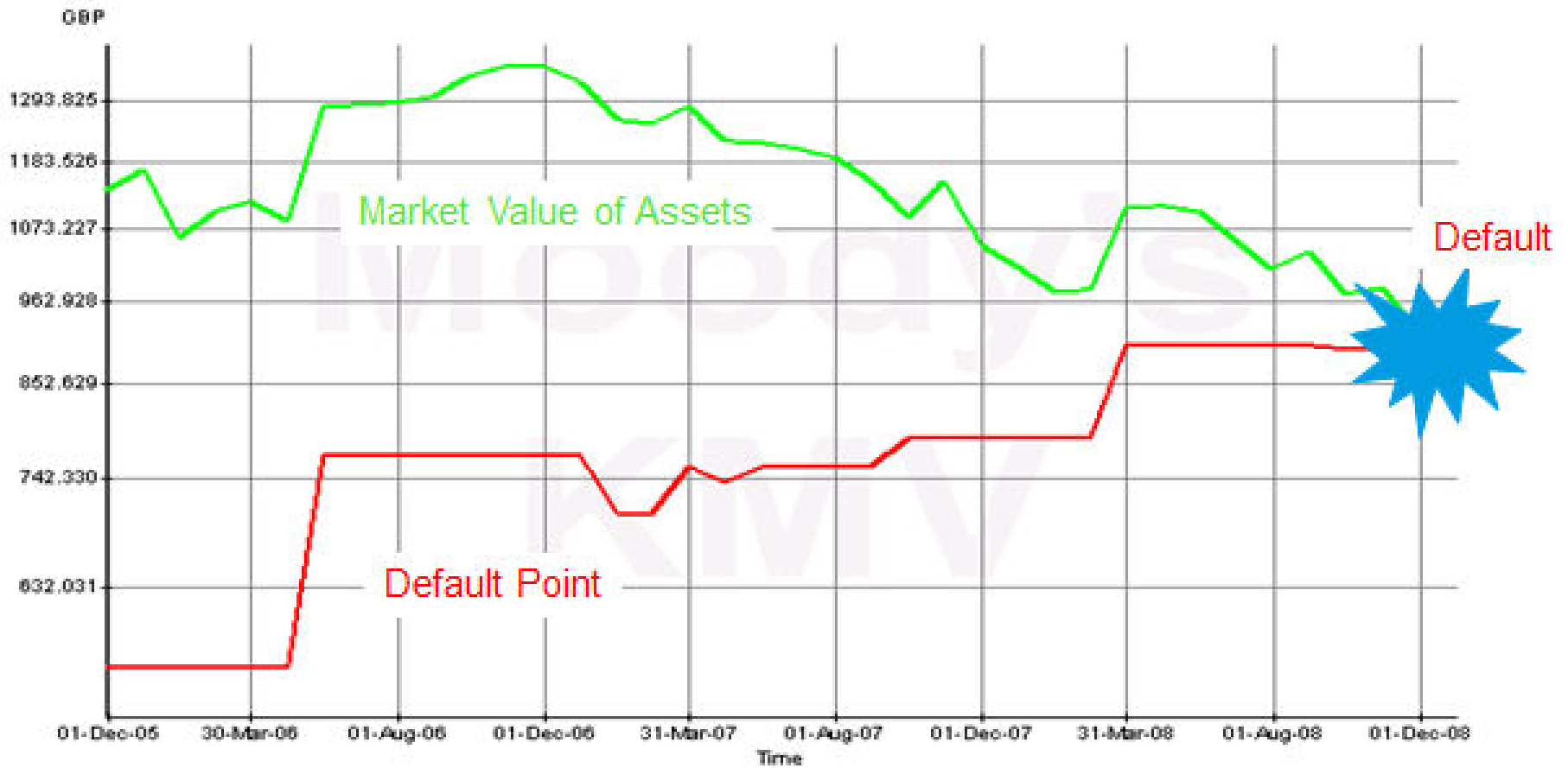
DD-EDF Mapping

EDF is the probability that the firm will default within the specified time horizon.

**EDF**

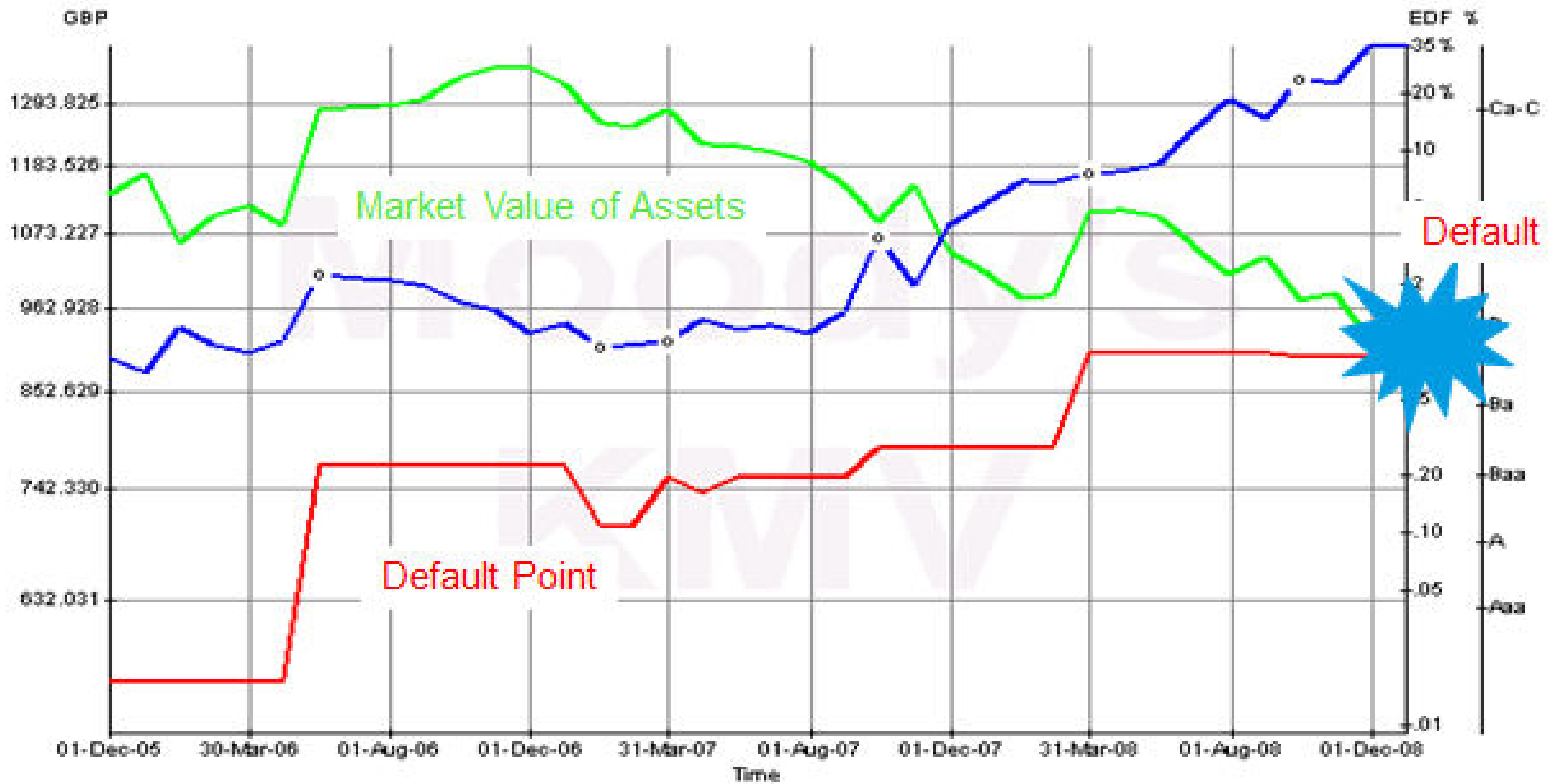
**Implied Rating**

# When do Firms Default?

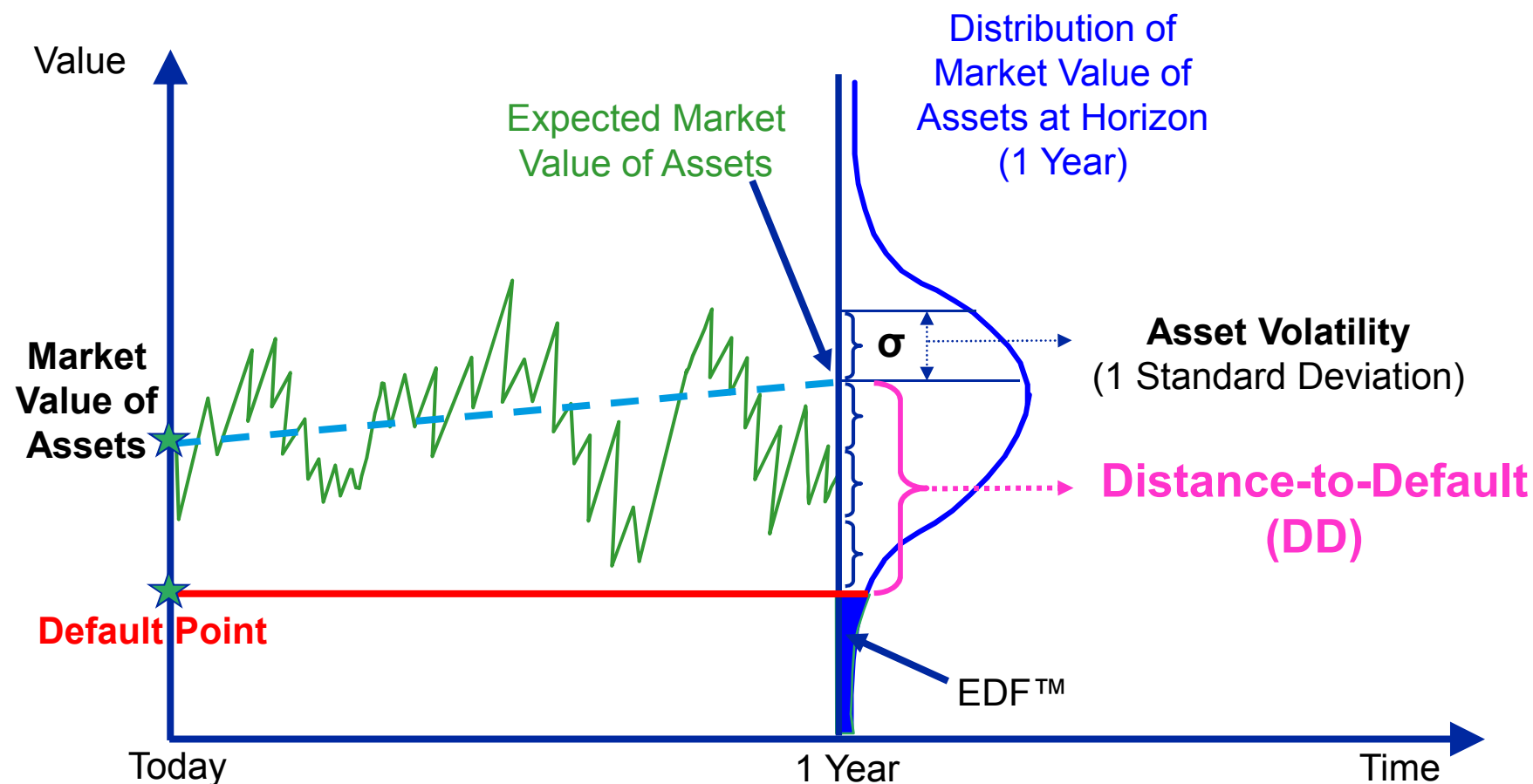




# When do Firms Default?



## Calcolo della Distance-to-Default (in breve)

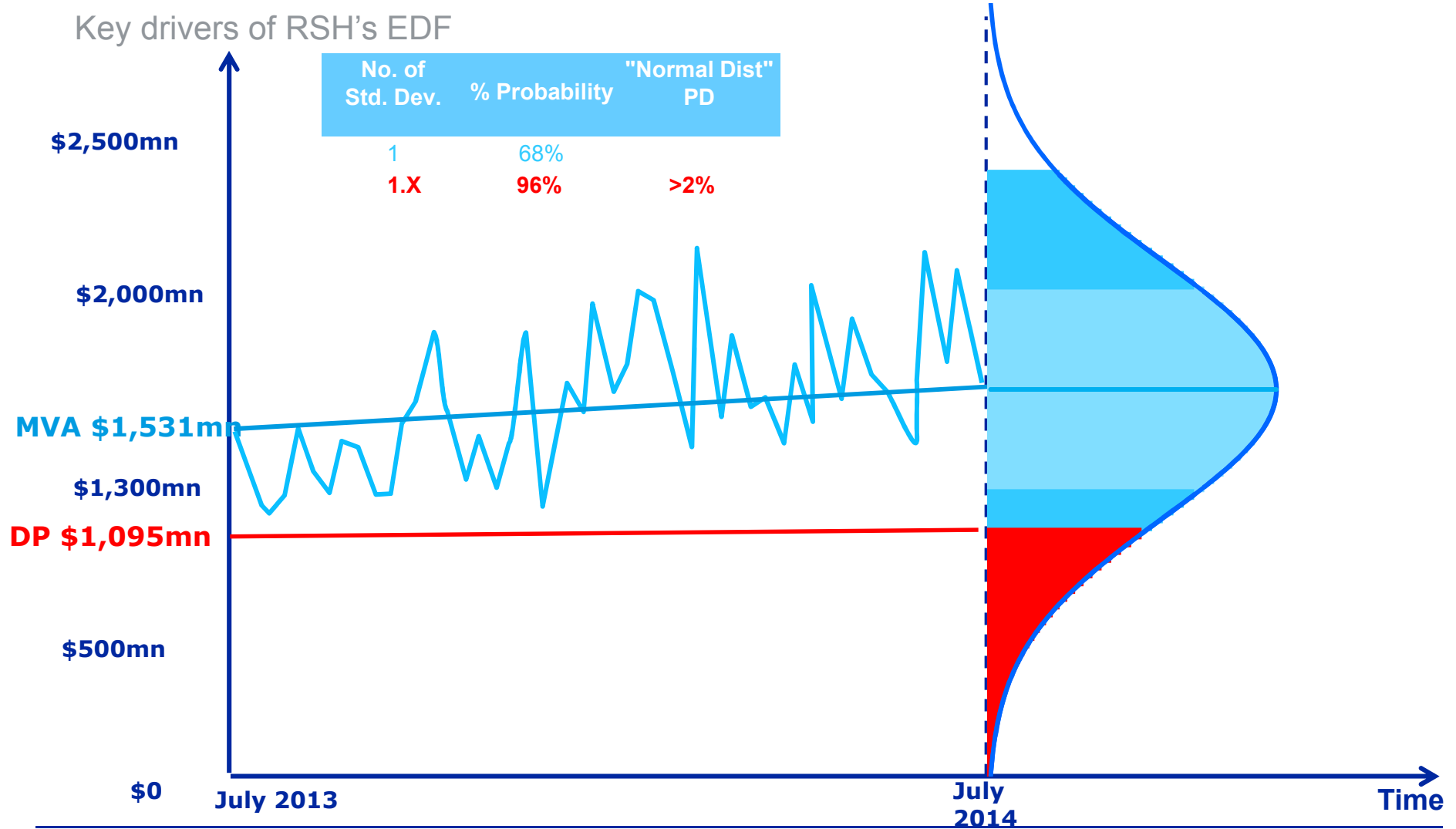


**Distance-to-Default (DD)**  $\approx$  The number of Standard Deviations the Market Value of Assets is away from the Default Point

# RadioShack is a very high risk company: a small gap between its MVA and DP and excessive asset volatility

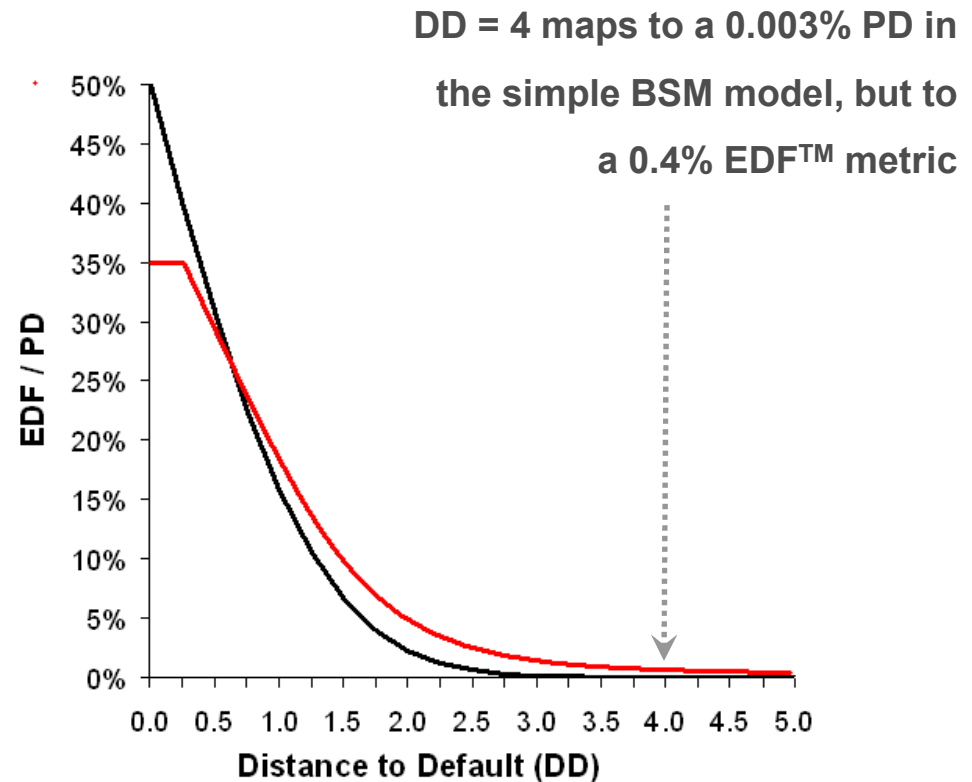
Key drivers of RSH's EDF

No. of Std. Dev.	% Probability	"Normal Dist" PD
1	68%	>2%
<b>1.X</b>	<b>96%</b>	



## Come trasformare la DD in un EDF → Rating implicito

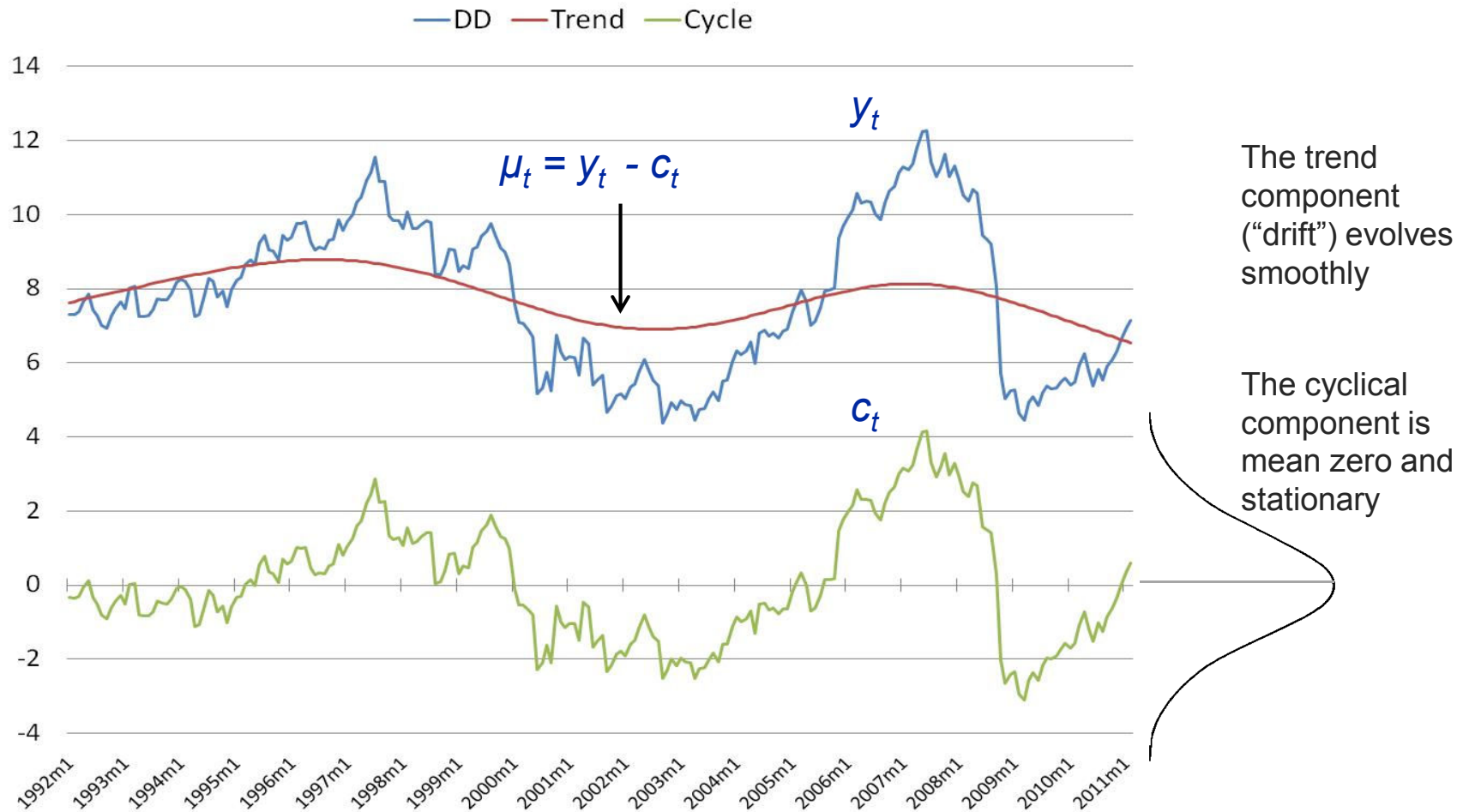
- » EDFs are derived from an empirical mapping of DDs to historical default rates
- » Public firm EDFs were calibrated using US corporates from 1980 to 2007, including over 8,000 defaults. This is being extended to take into account the more recent experience.



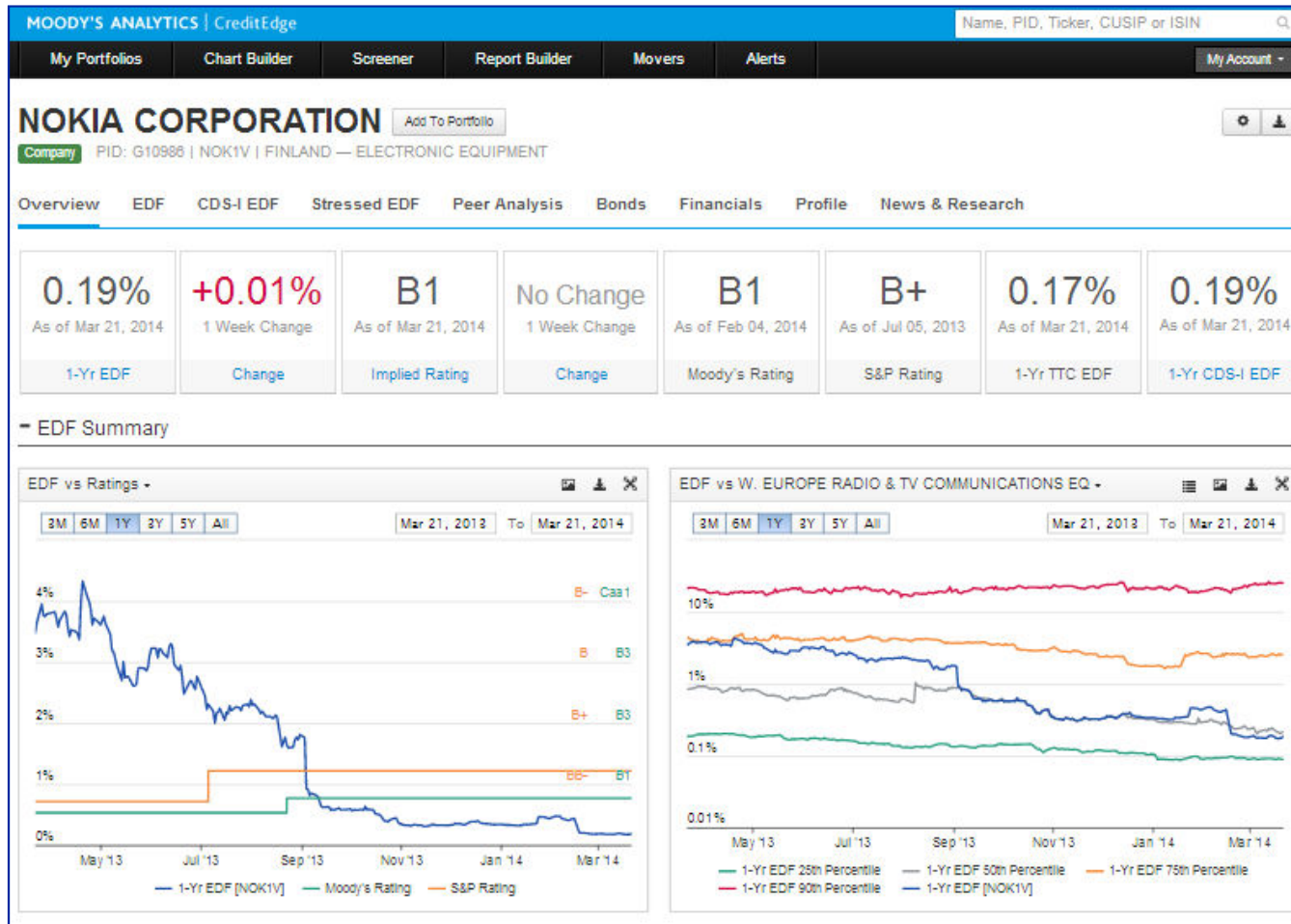
Note: the EDF-DD curve in the graph is a stylized representation of the actual DD to EDF mapping function

## Decomposizione di DD in $\mu_t + c_t$

The HP filter trend-cycle decomposition bears a resemblance to the classic asset value dynamics model



# Daily EDF measures and other credit risk metrics for 35,000 public entities...



Summary of most relevant credit metrics for over 35,000 entities

Side-by-side charts for easy monitoring of company risk and relative performance vs. risk

# ....and more than 1,500 private entities and sovereigns

**ITALY** Add To Portfolio  
Government PID: S10554

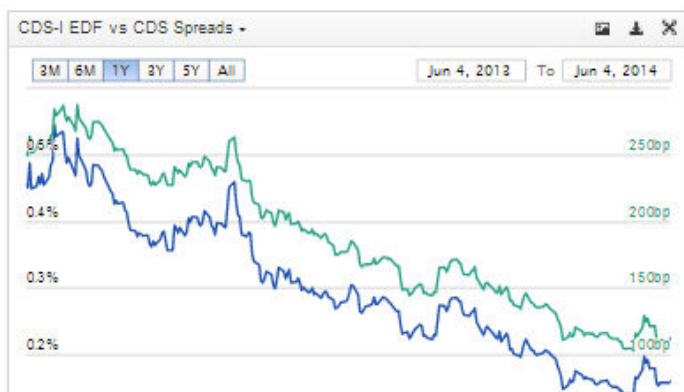
## Overview

<b>0.07%</b> As of Jun 04, 2014 1-Yr CDS-I EDF	<b>+0.00%</b> 1 Week Change Change	<b>A2</b> As of Jun 04, 2014 Implied Rating	<b>No Change</b> 1 Week Change Change	<b>Baa2</b> As of Apr 28, 2014 Moody's Rating	<b>BBB</b> As of May 31, 2014 S&P Rating	<b>112bp</b> As of Jun 04, 2014 5-Yr CDS Spread
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**0.79**  
As of Jun 04, 2014  
Sharpe Ratio

Historical credit performance of over 80 sovereigns using different credit metrics

## CDS-Implied EDF Details



Analyze sovereign credit risk vs. credit risk outlook of the corporate or financial sectors in the same country

# Documentazione chiara e completa: No Secrets

## POWER AND LEVEL VALIDATION OF THE EDF CREDIT MEASURE IN THE EUROPEAN MARKET

**ABSTRACT**

In this paper, we validate the performance of the Moody's KMV EDF™ credit measure in its timeliness of default prediction, ability to predict default levels, with a focus on Europe for most of our tests. Wherever possible, we compare the performance of the EDF credit measure to other popular alternatives like agency ratings, Z-scores, and other EDF-based models. We also compare the median spread levels of EDF-based contracts, controlling for EDF level, with those of agency ratings, and this implies that the EDF-based contracts correspond to similar magnitudes of risk as agency ratings. Our tests indicate that the Moody's KMV EDF credit measure is a better other popular credit risk measures.

APRIL 2012 CAPITAL MARKETS RESEARCH

Moody's ANALYTICS

### ITraxx Investment Grade Cash Portfolio Performance Report March 2012

## 22bp Outperformance in March, 194 bp since the October Index Roll

1. 22 bp Outperformance in March

Our Fair Value Spread-based model portfolio posted a total return of 90 bp in March, as credit spreads generally rallied. The benchmark ITraxx High Grade Index reference obligations also generated a positive return of 68 bp, resulting in a good portfolio excess return of 22 bp (Figure 1). Since the October launch of Series 16 of the ITraxx Investment Grade CDS Index, when both the index and the portfolio were rebalanced, the portfolio has posted a 194 bp cumulative outperformance.

Figure 1. March 2012 Total Return Performance

Portfolio	Return (bp)
FVS-based portfolio	90
ITraxx Cash Index	68
<b>Outperformance</b>	<b>22</b>

Our index consists of reference bond obligations for CDS contracts index Series 16. The bonds in the portfolio are drawn from the index. The net security's OAS exceeds its Fair Value Spread by a given amount. Then we Value Spreads are modeled outputs based on the issuer's Expected Default estimate of loss given default, the market price of risk, and issue size, with durations of 3 to 5 years. We assume 6 bp in transaction costs try for further details.

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JUNE 26, 2009

Moody's | K·M·V

## VALIDATING THE PUBLIC EDF™ MODEL PERFORMANCE DURING THE CREDIT CRISIS

MODELING METHODOLOGY

**ABSTRACT**

**AUTHORS**  
Irina Korabely  
Shibong Qi

In this paper, we validate the performance of the Moody's KMV EDF™ (Expected Default Frequency) model during the recent credit crisis. We analyze the model performance during the past two years, and compare this performance to the model's longer history (1996-2006). We focus on the model's ability to differentiate between good and bad firms, the timeliness of its default prediction, and accuracy of levels for two primary samples: North American non-financial firms and global financial firms. The current credit crisis has elevated default rates in both samples. Details during the current crisis are somewhat unique because added complexity involving government bailouts created, in effect, ambiguous defaults. We measure performance with predictive power, early warning, and level validation. We also compare the performance of EDF credit measures with agency ratings and credit default swap (CDS) spreads.

Overall, the EDF model's predictive power is as good as or better than in the previous ten years, and is comparable with CDS spreads on their respective samples. The model provides an early warning signal a few years before default occurs; EDF levels were conservative (higher than subsequently realized defaults and) before the crisis compared with later-realized default rates, and levels were statistically consistent with later-realized default rates.

## PARSIMONY IN PRACTICE: AN EDF-BASED MODEL OF CREDIT RISK

MODELING METHODOLOGY

**ABSTRACT**

In recent years, the Moody's KMV Expected Default Frequency™ (EDF) credit measure has become a standard measure of corporate credit risk among traders and managers of credit risk. Beyond predicting defaults, one other important application of any quantitative credit risk measure is to value credit risky claims such as corporate bonds, loans and credit derivatives.

The goal of this paper is to provide evidence on the valuation performance of an EDF-based valuation model on a comprehensive sample of corporate bond data. This paper serves to document some of the valuation related research done at Moody's KMV and builds on previously published work. We apply our valuation method to a large sample of bond spreads and find that, unlike many other versions of structural models, ours performs quite well. Our model consistently explains more than 80% of the cross-sectional variation in bond spreads.

## EDF™-IMPLIED RATING

MODELING METHODOLOGY

**ABSTRACT**

The EDF-implied rating (EIR) is a credit risk measure based on the Moody's KMV Public Firm EDF 8.0 model, and is incorporated into Market Implied Ratings of Moody's Investors Service. This document describes the procedures to translate an EDF value to an EIR, and highlights changes in EIR due to the most recent EDF model change.



**Expected Default Frequency:  
Società non quotate**

# Analisi Quantitativo e Qualitativo



## Output:

	A 1-anno	A 5-anni
Frequenza Attesa d'Inadempienza (EDF)	0.35%	2.09%
Rilevazione della percentuale di obbligazioni insolute	Baa2.edf	Baa2.edf
Percentile	22.53%	22.60%
Organizational Rating	4	D

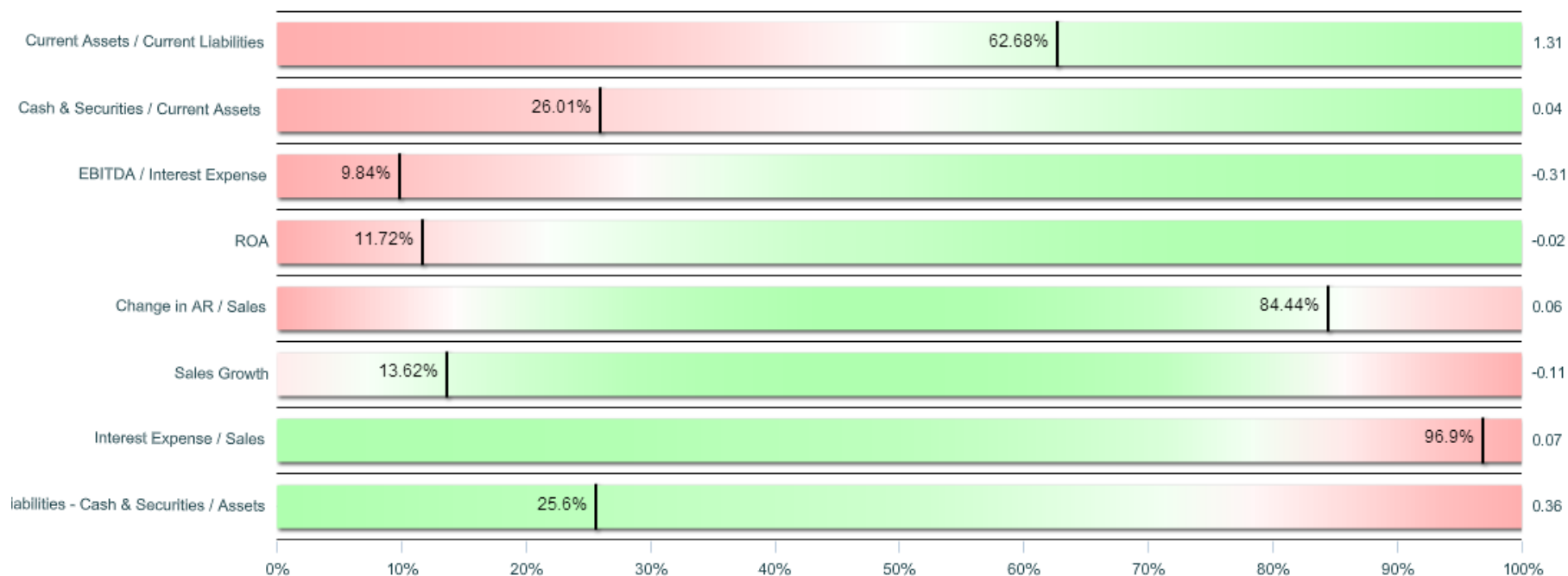
	A 1-anno	A 2-anni	A 3-anni	A 4-anni	A 5-anni
Totale	0.35%	0.76%	1.19%	1.63%	2.09%
Differita	0.35%	0.41%	0.43%	0.45%	0.46%
Annualizzata	0.35%	0.38%	0.40%	0.41%	0.42%

**1-year e 5-year EDF: probabilità di default a 1 e a 5 anni.**

**Bond Default Rate Mapping: is the agency rating whose historical average default rate best matches RiskCalc's EDF**

# Analisi indici di bilancio:

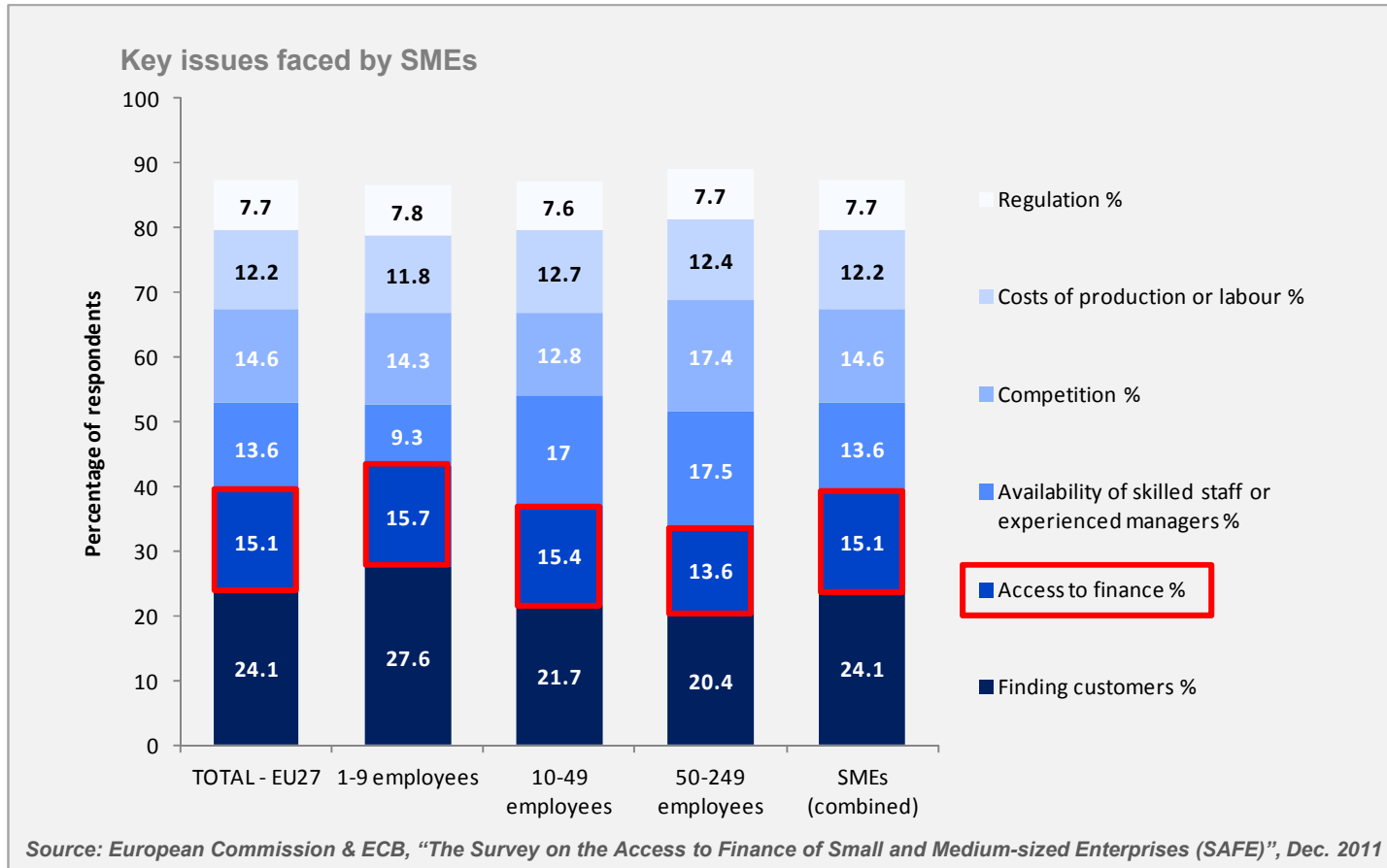
	Contribuciones relativas		Gráfico de sensibilidad relativa		Percentil	Ratio o nivel
	1 año	5 años	1 año	5 años		
Cargos financieros / Ventas	29.97%	33.34%	44.11%	14.73%	96.90%	0.066
UT antes impto, int depr y amort / Gastos interés	19.50%	24.41%	-451.41%	-673.80%	9.84%	-0.312
Cambio en CC / Ventas	0.63%	0.63%	32.67%	10.00%	84.44%	0.060
Crecimiento de ventas	4.90%	4.72%	-77.53%	-22.01%	13.62%	-0.112
Pasivo - Efectivo y valores / Activo	-11.21%	-9.39%	23.86%	6.15%	25.60%	0.363
Activo circulante / Pasivo circulante	-2.06%	-2.59%	-51.29%	-19.27%	62.68%	1.308
Efectivo y valores / Activo circulante	3.38%	4.55%	-75.65%	-44.66%	26.01%	0.036
RSA	28.35%	20.37%	-43.48%	-9.38%	11.72%	-0.019



# Qualitative Overlay: Output

Question	Weight	Answer	Score		
<b>Industry / Market</b>	25		100		
Customer Power	40	Weak	100		
Diversification of Products	60	Few Products, Broad Market	100		
<b>Company</b>	25		98.1		
Year in Relationship	30	> 2 Year	66.7		
Supplier Power	30	Weak	100		
Conduct of Account	40	Good	110		
<b>Management</b>	25		100		
Year in Relationship	20	> 2 Year	66.7		
Supplier Power	15	Weak	100		
Conduct of Account	45	Good	110		
Conduct of Account	20	Good	110		
<b>Balance Sheet Factors</b>	25		100		
Audit Method	10	Unqualified	66.7		
Debtor Risk/Accounts Receivable Risk	70	Good spread/ Good quality	100		
Pro-forma Liquidity	10	Improving Credit Risk Significantly	110		
Pro-forma interest coverage	10	Improving Credit Risk Significantly	110		
▼ Final Score Summary					
	<b>Score</b>	<b>Score(Standardized)</b>	<b>Moodys Rating</b>	<b>Organization Rating</b>	
<b>Quantitative</b>					
EDF	0.70%	-0.32	Ba1	Ba1	
<b>Qualitative</b>					
Industry/Market	100.00				
Company	98.06				
Management	92.50				
Balance Sheet Factors	75.00				
Qualitative Score	89.77	-2.90	Aa3	Aa3	
	<b>PD</b>	<b>Score(Standardized)</b>	<b>Moodys Rating</b>	<b>Organization Rating</b>	<b>Percentile</b>
<b>Combined Measure</b>	0.25%	-1.48	Baa1	Baa1	6.98%

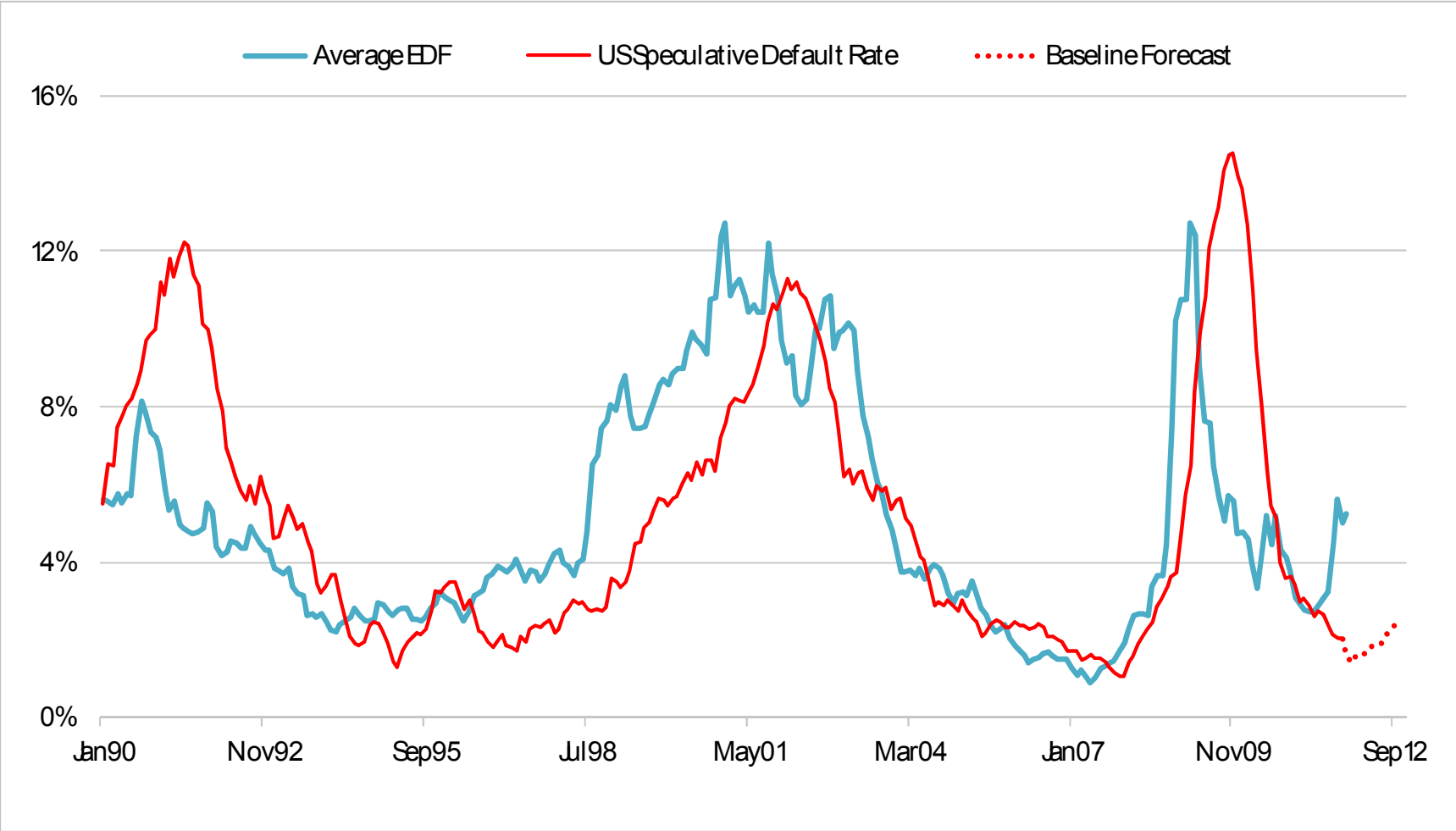
# Access to finance is key problem no. 2 for SMEs, second only to finding customers



How Do We Know that the  
Model Works?

# EDFs and Realized Default Rates

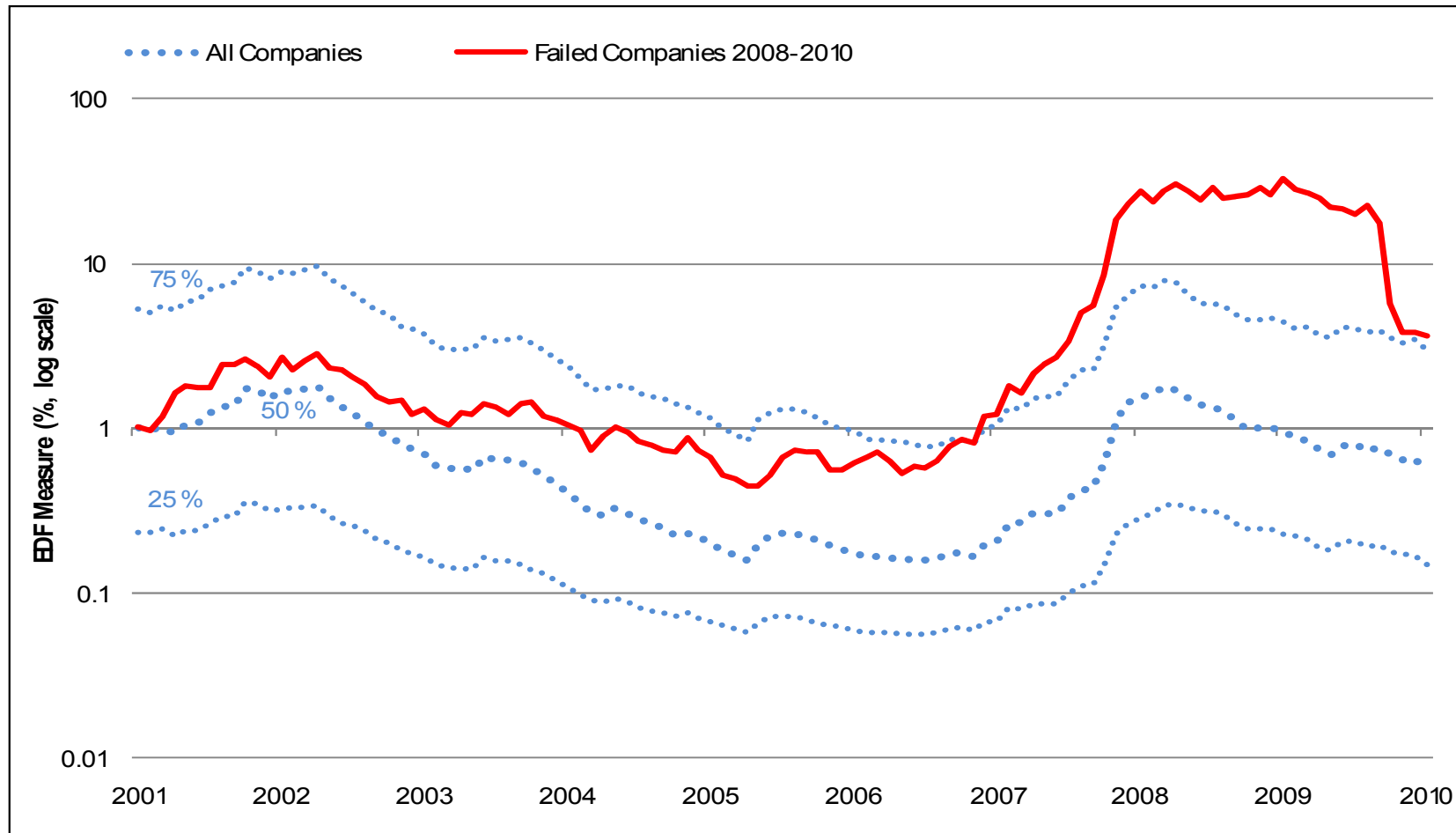
1-year HY EDF vs. the 1-year HY default rate





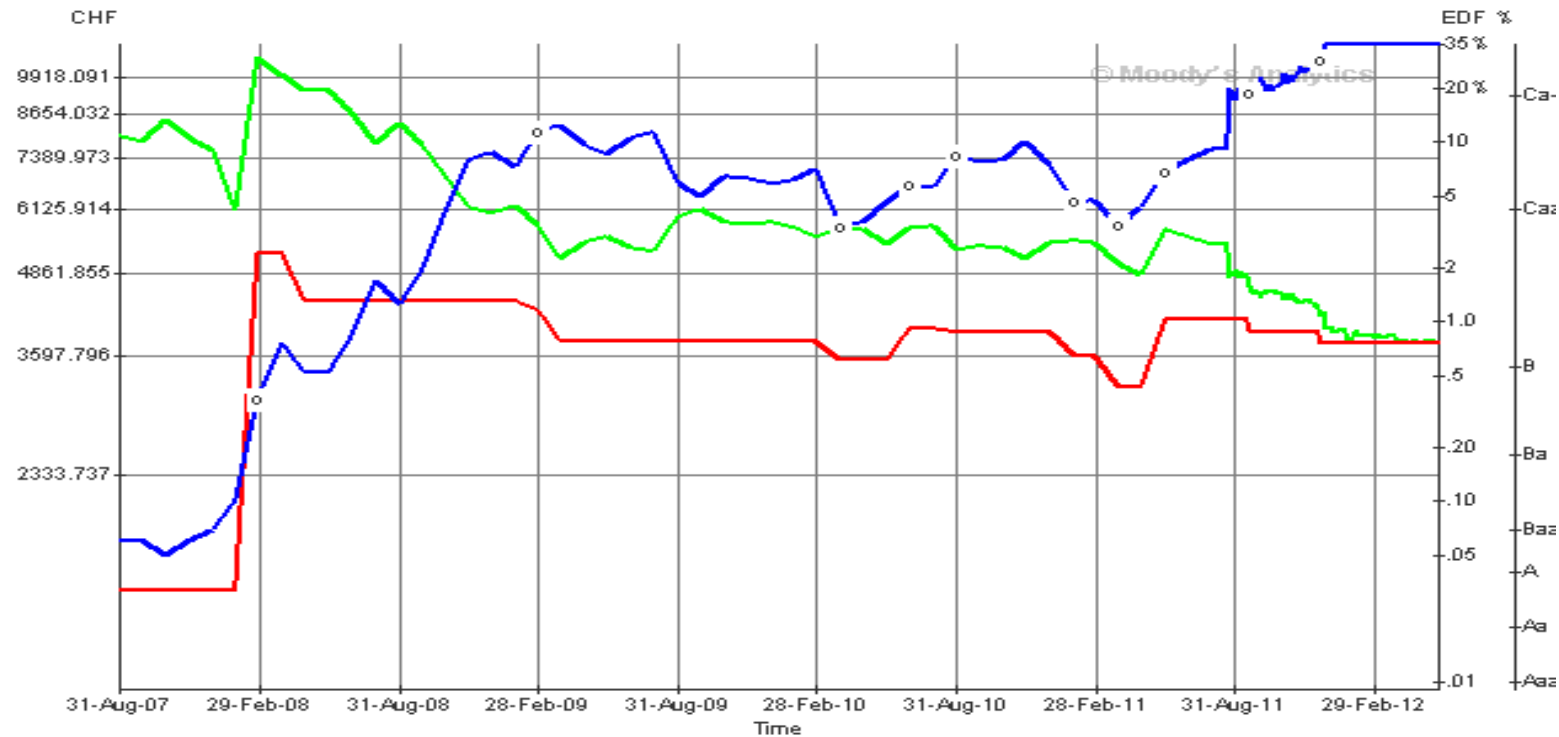
# Defaulted Firms Behave Differently Than All the Rest

EDFs for all European corporates and for 2008-2010 defaulters



# Petroplus default on 25th January 2012

Chart Builder PETROPLUS HOLDINGS AG [PPHN]



Plot: Values

Period: Last 5 Years

From: 21 August 2007

Currency: SWISS FRANC[CHF]

To: 21 August 2011

Description

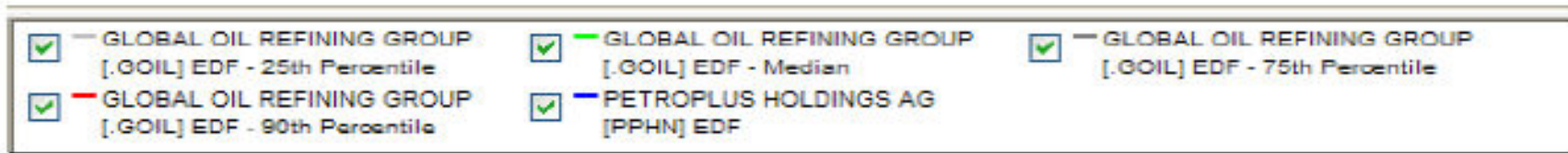
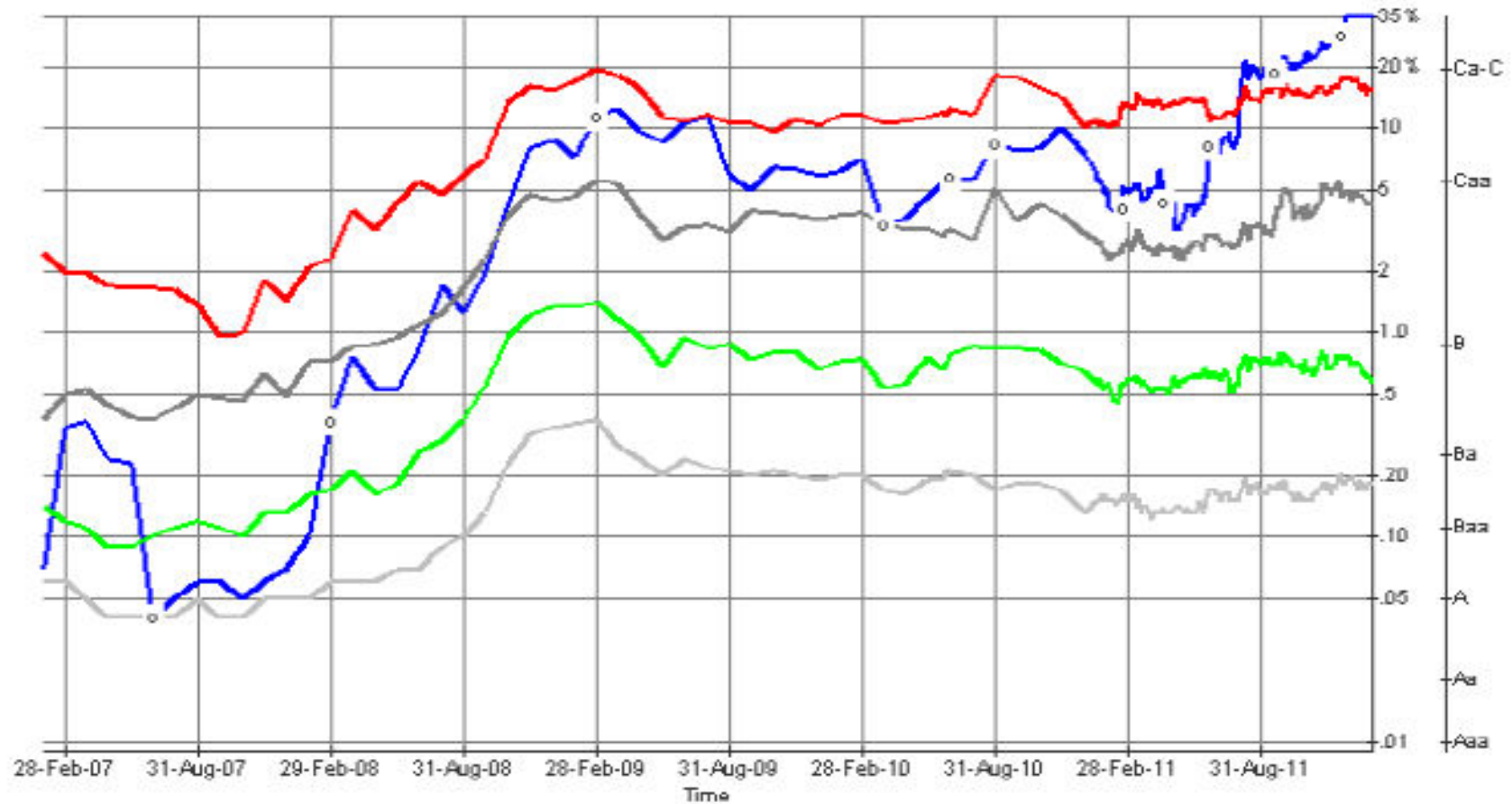
-PETROPLUS HOLDINGS AG [PPHN] Market Value of Assets  
 -PETROPLUS HOLDINGS AG [PPHN] Default Point  
 -PETROPLUS HOLDINGS AG [PPHN] Asset Volatility  
 -PETROPLUS HOLDINGS AG [PPHN] EDF

Value As Of

3775....23-May-12  
 3771....23-May-12  
 18.82 23-May-12  
 35.00 23-May-12

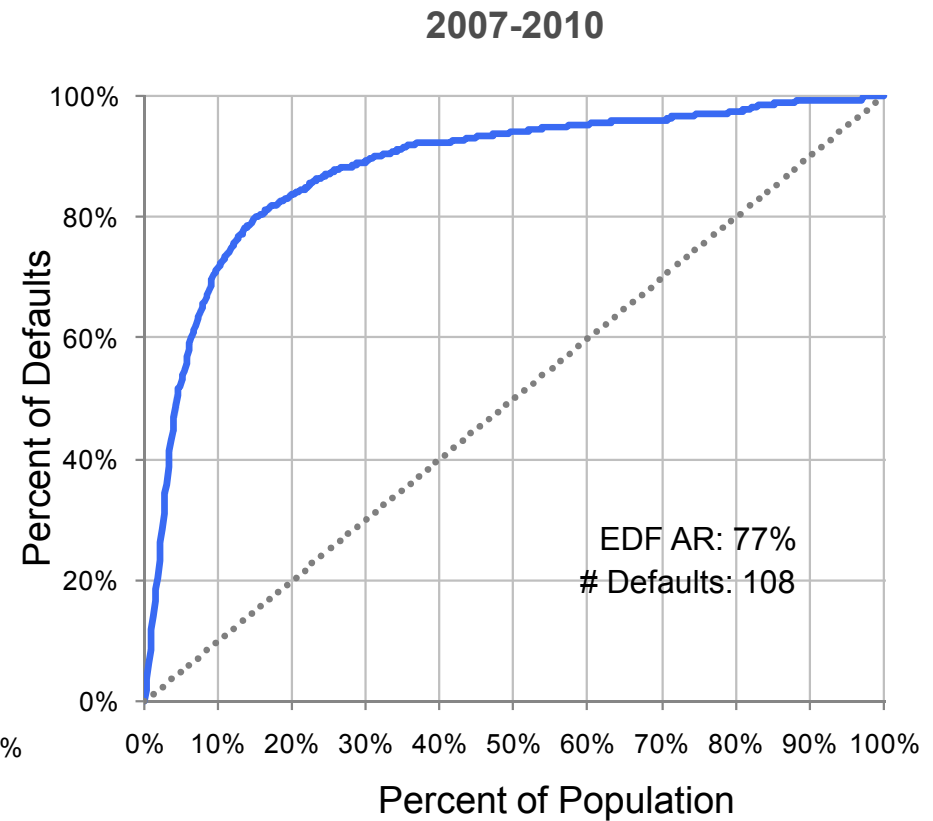
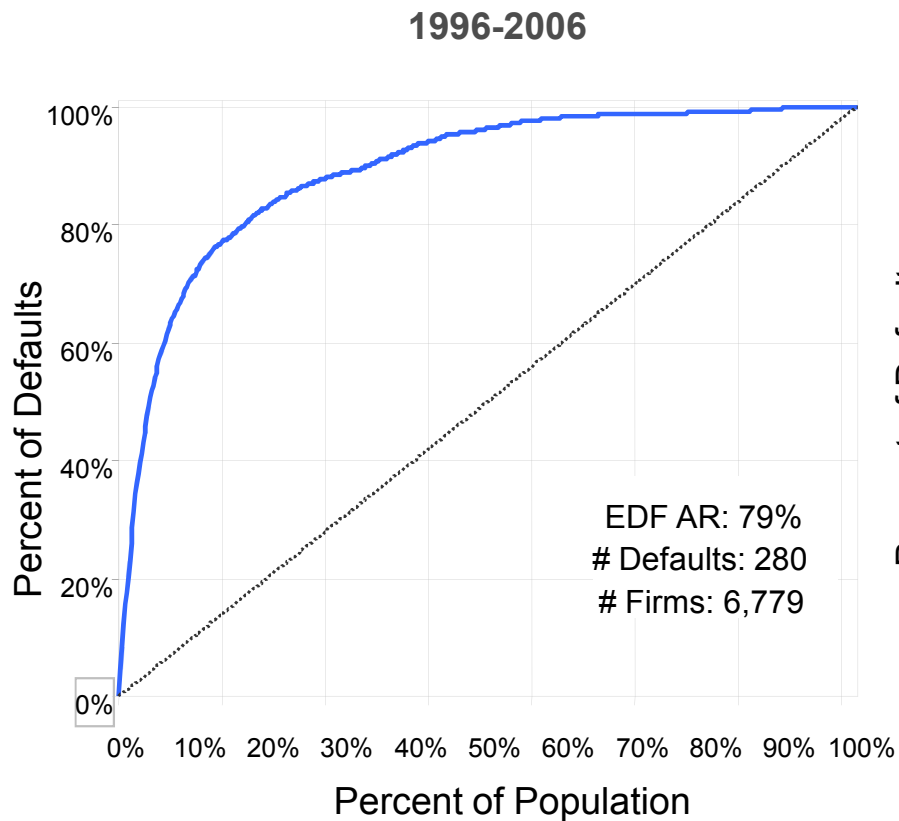
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# Petroplus default on 25th January 2012



# How did the model work during the crisis?

## Power Curves and Accuracy Ratios for Global Financials



Note: Certain government bailouts not counted as defaults

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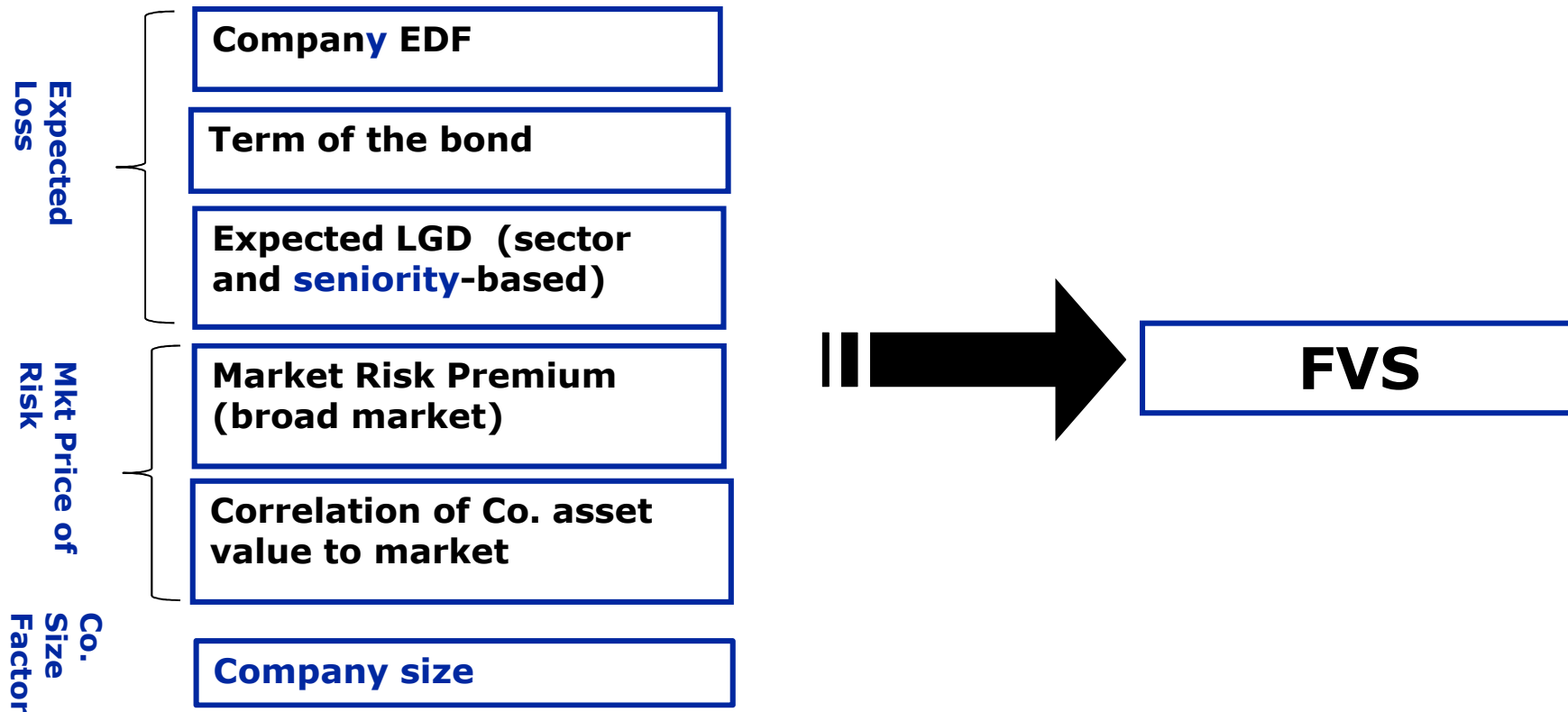
# Appendix

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# EDFs alone don't equate to credit spreads. They are a key component of our modeled bond-level FVS.

A simplified/stylistic view of the FVS model at the bond level



## The principal bond selection criterion for the model portfolios is the issues' Alpha Factors

### A Bond's Alpha Factor = OAS/FVS

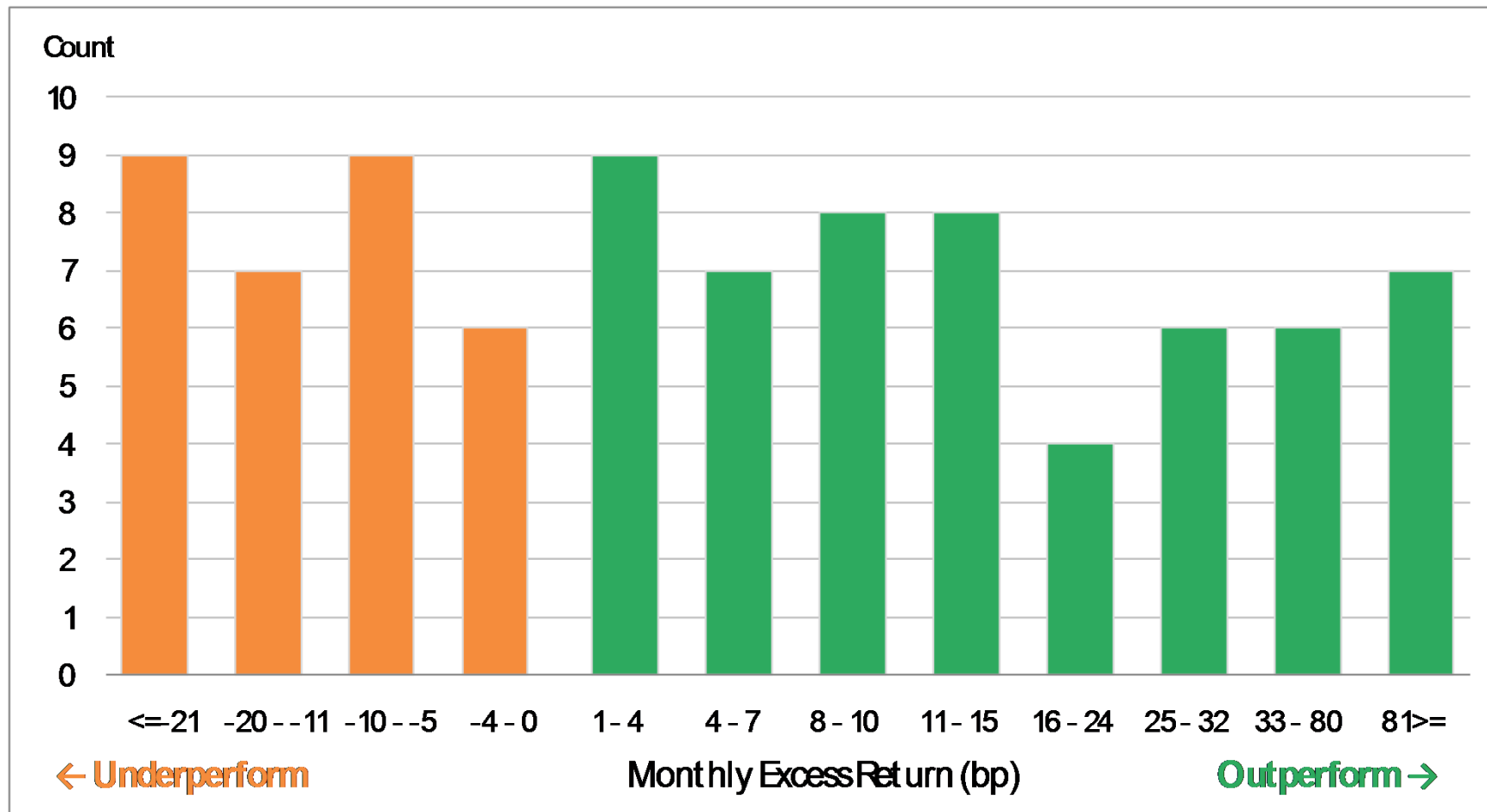
- » The Alpha Factors for a given month are based on values from the previous month

#### Investment Universe:

- » A member of ML Euro Investment Grade or Sterling Investment Grade Indices
- » Sold by a publicly traded company with a Moody's Analytics EDF credit measure
- » Rated by Moody's or S&P

## The euro IG model portfolio had positive excess returns in 64% of the months, with a bias towards strongly positive months

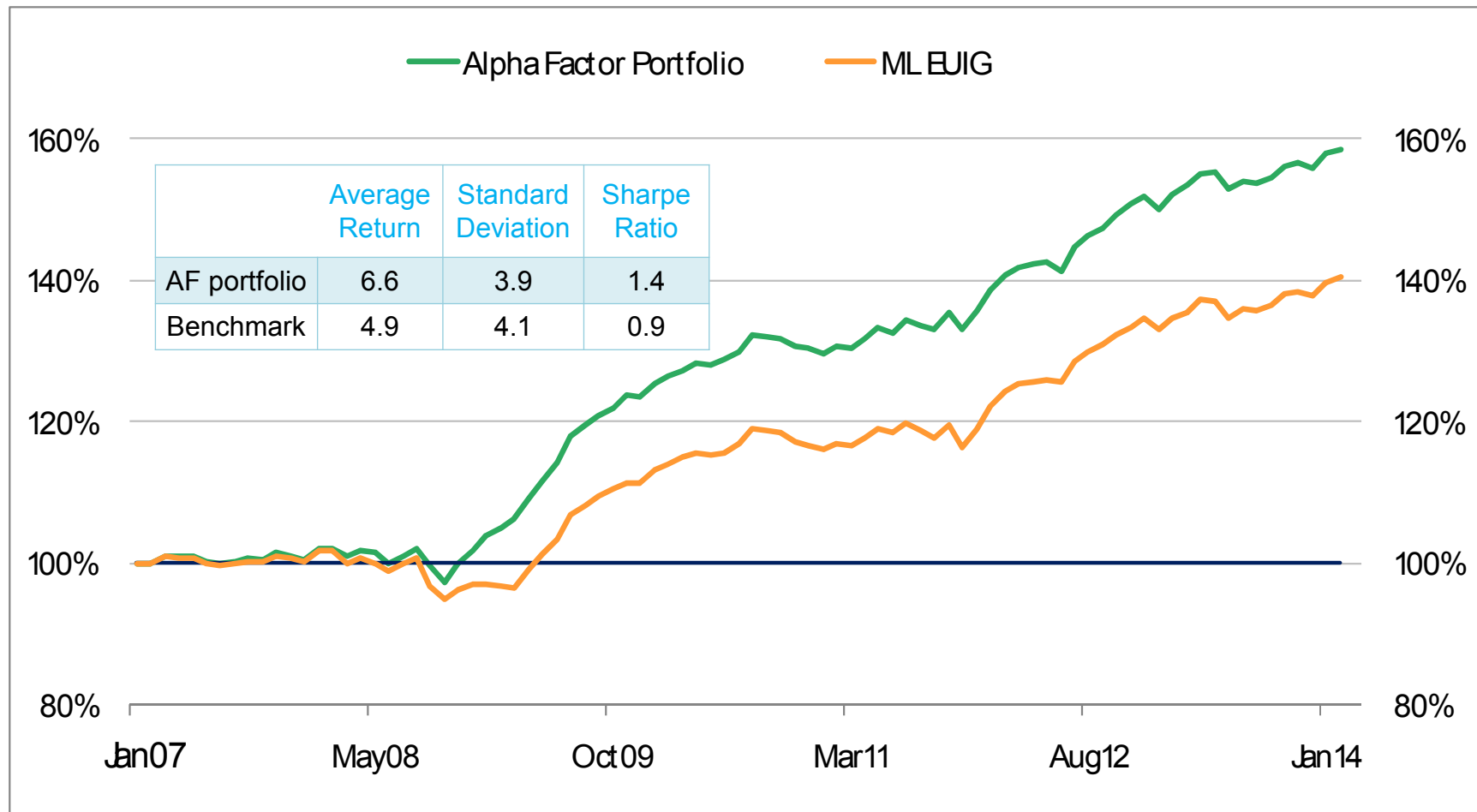
Count of Euro investment grade model portfolio excess returns by month (1/07-2/2014)



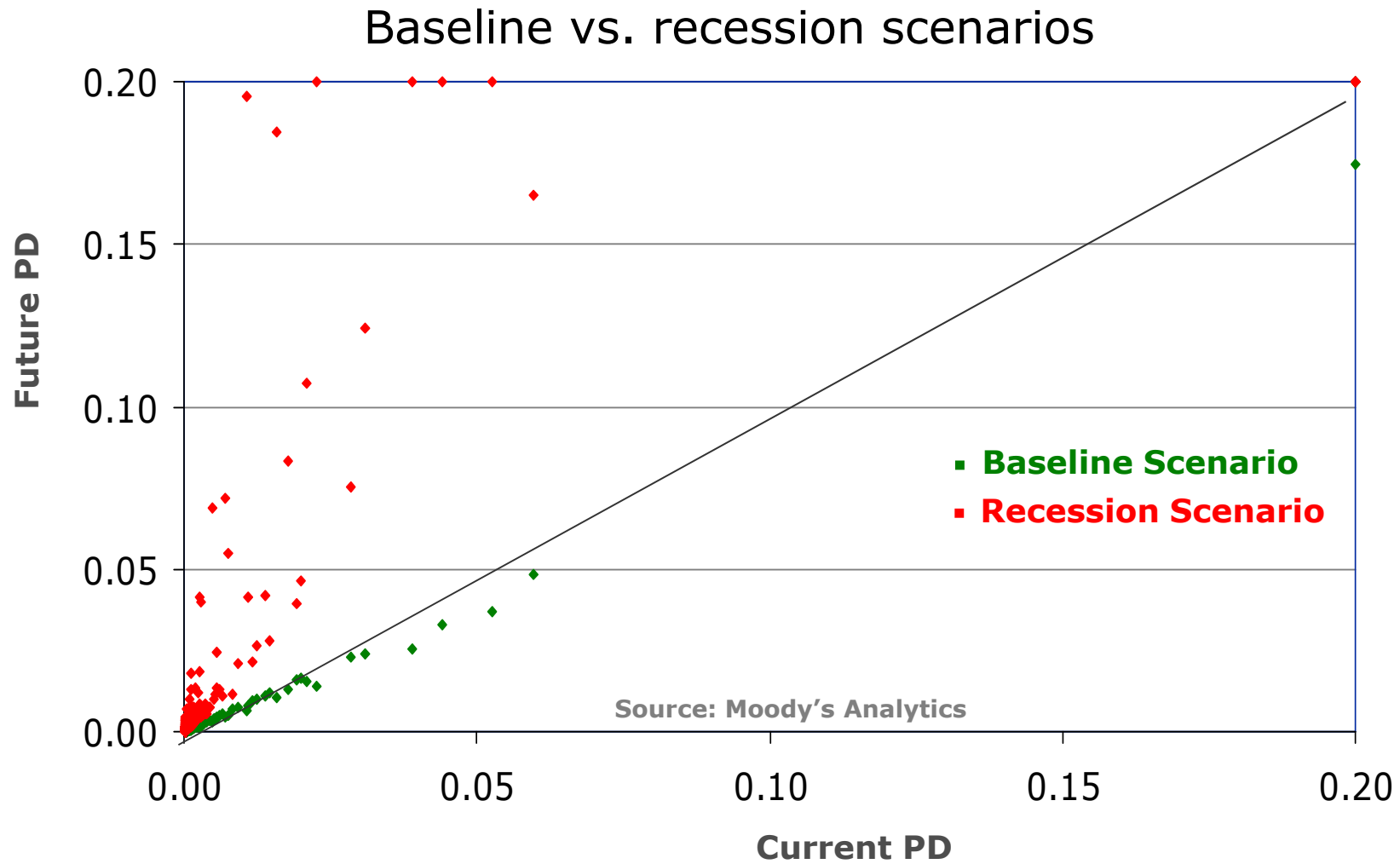


# The euro IG model portfolio has outperformed strongly on a cumulative basis

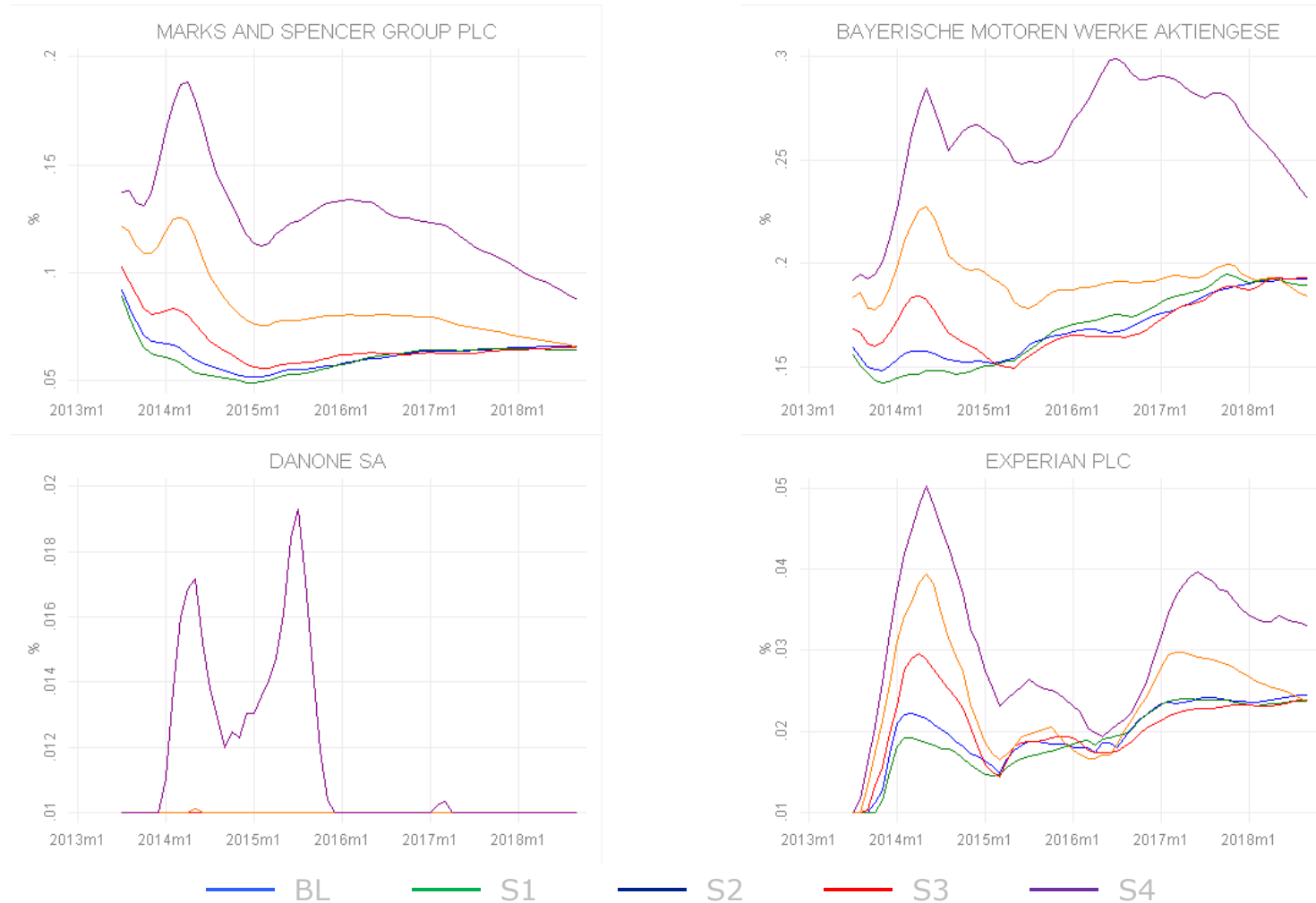
Euro IG performance vs. the ML Euro IG Corp Index (2007-2014)



# Stress Testing of PDs



# Firm-Level Stressed EDF Measure Examples



Source: Moody's Analytics, September 2013

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**Pablo Barbagallo**

Product Specialist

EMEA Sales

+44 (0) 20 7772 1669 tel

+44 (0) 7730 910158 mobile

Pablo.Barbagallo@moodys.com

Moody's Analytics UK Ltd.

One Canada Square

Canary Wharf

London, UK E14 5FA

[www.moodys.com](http://www.moodys.com)

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