

The dynamics of bond spreads and credit metrics

Agenda

1. Credit Risk Metrics

Default probabilities, downgrade probabilities, and the Alpha Factor

2. Selected Case Study

PG&E

3. Dynamics of Credit Risk Metrics versus Bond Spreads

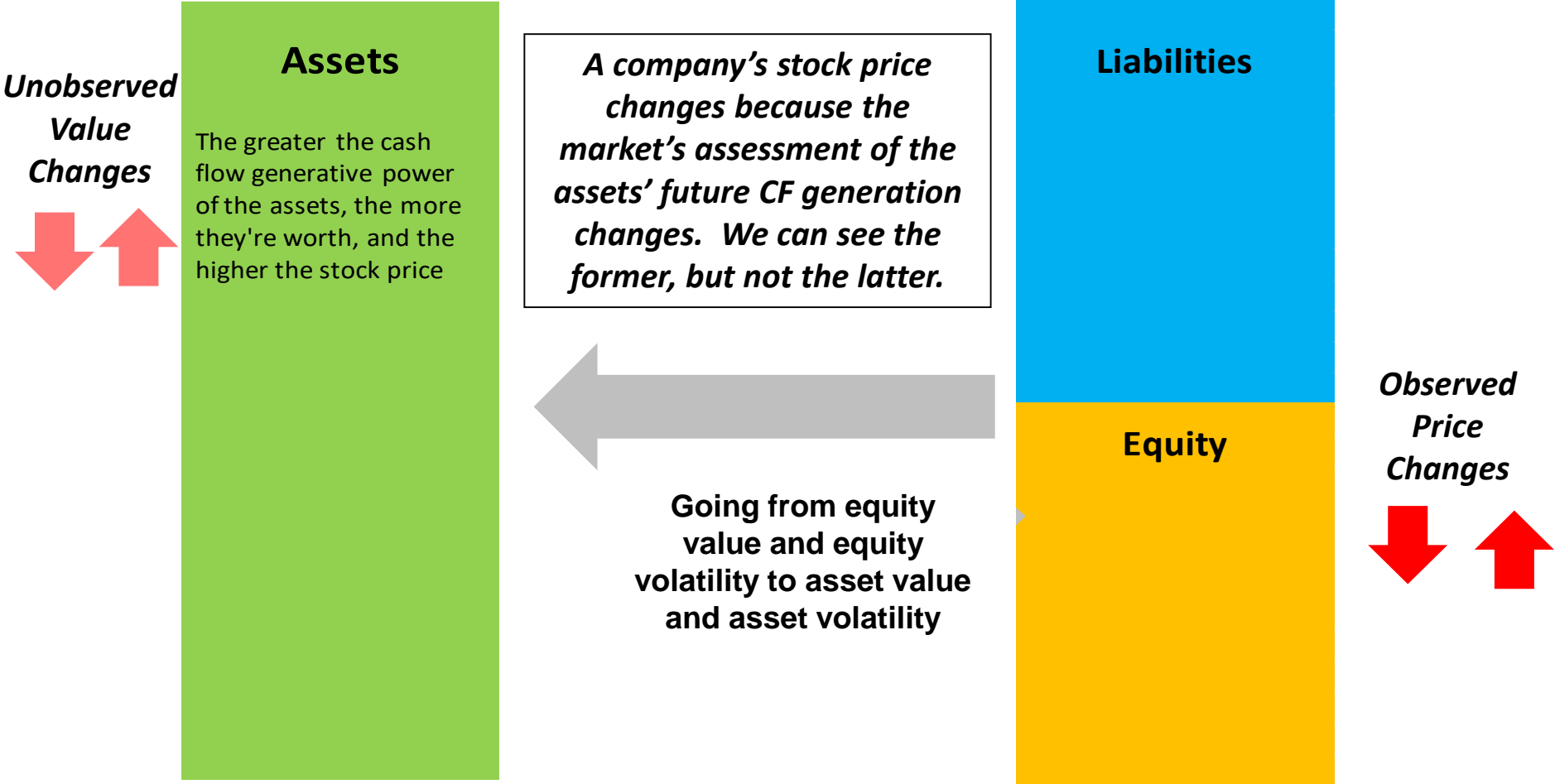
Selected results that PMs can use

1

Leading metrics

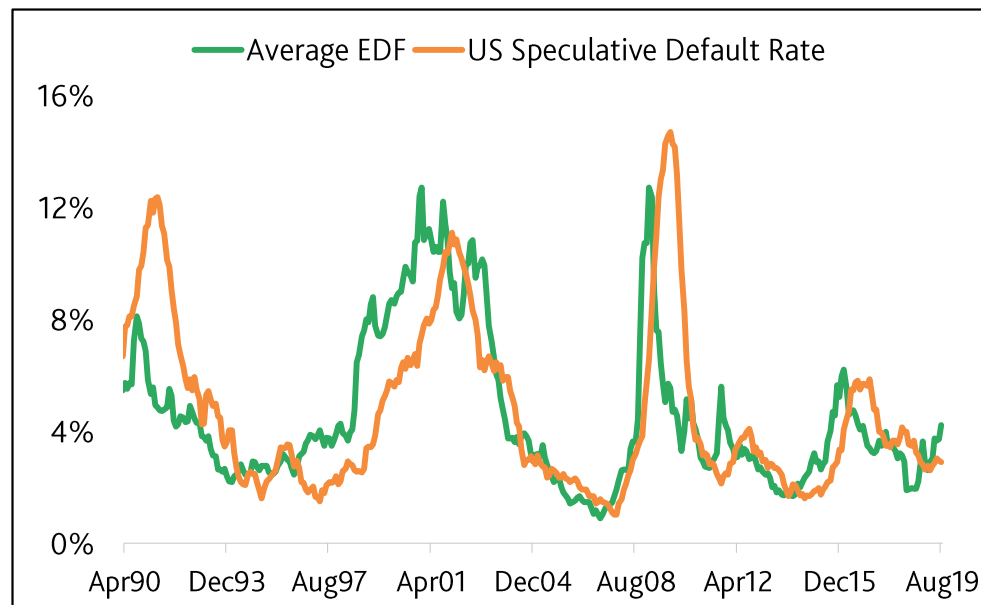
EDF, DP, AF

The EDF is the output of a **structural credit risk model**, in which default occurs when assets fall below the present value of liabilities.



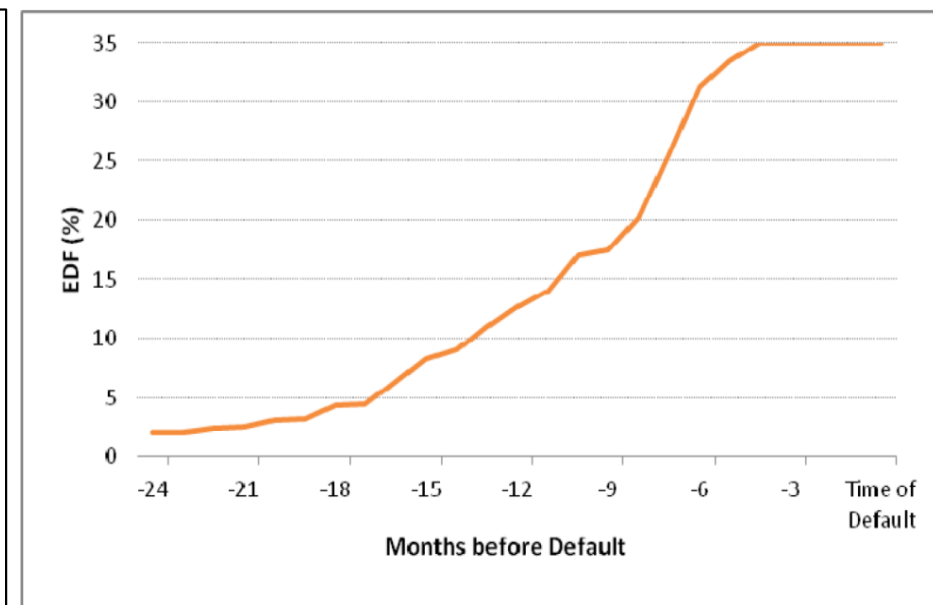
The CreditEdge public firm EDF model predicts default with accuracy and high degree of advance warning

Average EDF for high-yield firms vs. Moody's high-yield default rate



- » CreditEdge **accurately** and **timely** predicted the level of high-yield default rate

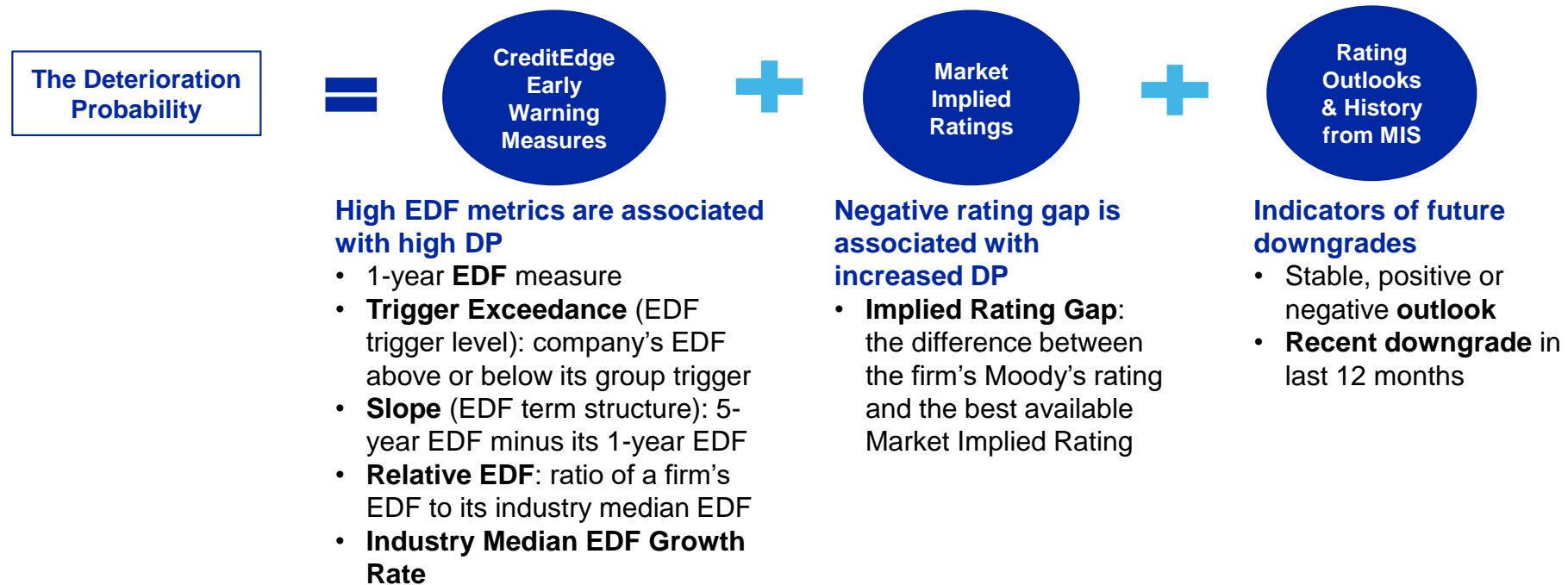
Median EDF for North American firms that defaulted between 2008-2010



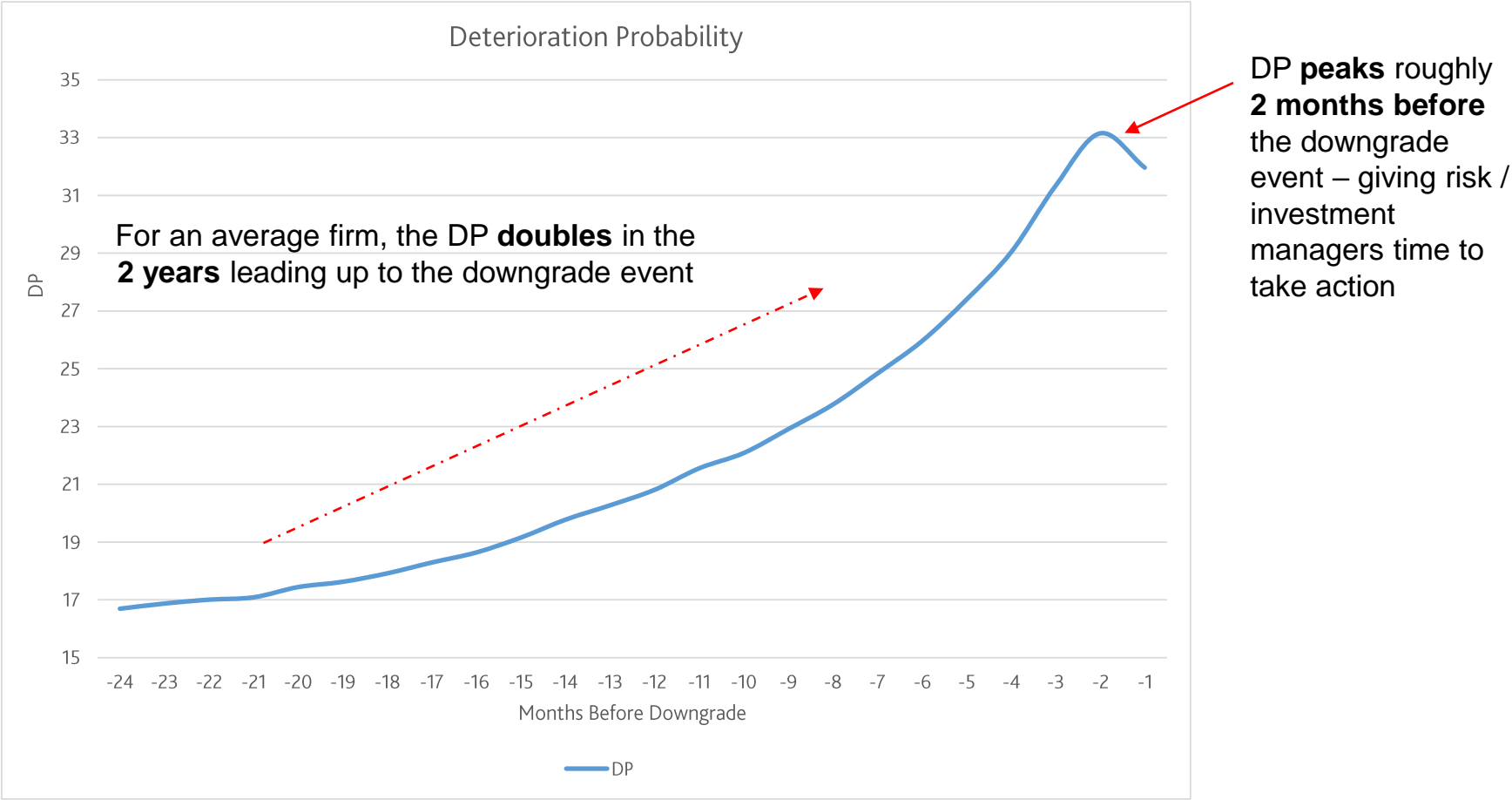
- » The EDFs of the North American credit crisis casualties increased many months before default

The Deterioration Probability (DP) measures the risk of downgrade of issuers

Deterioration Probability (DP) is a metric ranging from 1-70% that estimates probability of downgrade for rated firms in the next 12 months – DP does not measure the probability of upgrade



The validation shows Deterioration Probability provides a strong signal for downgrade events



Accuracy Ratios by Region: EDF for Defaults and DP for Downgrades

Region	EDF (Defaults)		DP (Downgrades)	
	AR	Num. of Obs	AR	Num. of Obs
North America	90.64%	148,960	54.18%	110,948
Europe	70.88%	107,276	53.92%	46,633
Japan	80.82%	106,887	55.02%	21,014
Rest of World	71.14%	433,311	49.30%	49,107
Global	76.38%	796,434	53.46%	227,702

Alpha Factor

A Bond's Alpha Factor = OAS/Fair Value Spread

The FVS is a bond-level model output

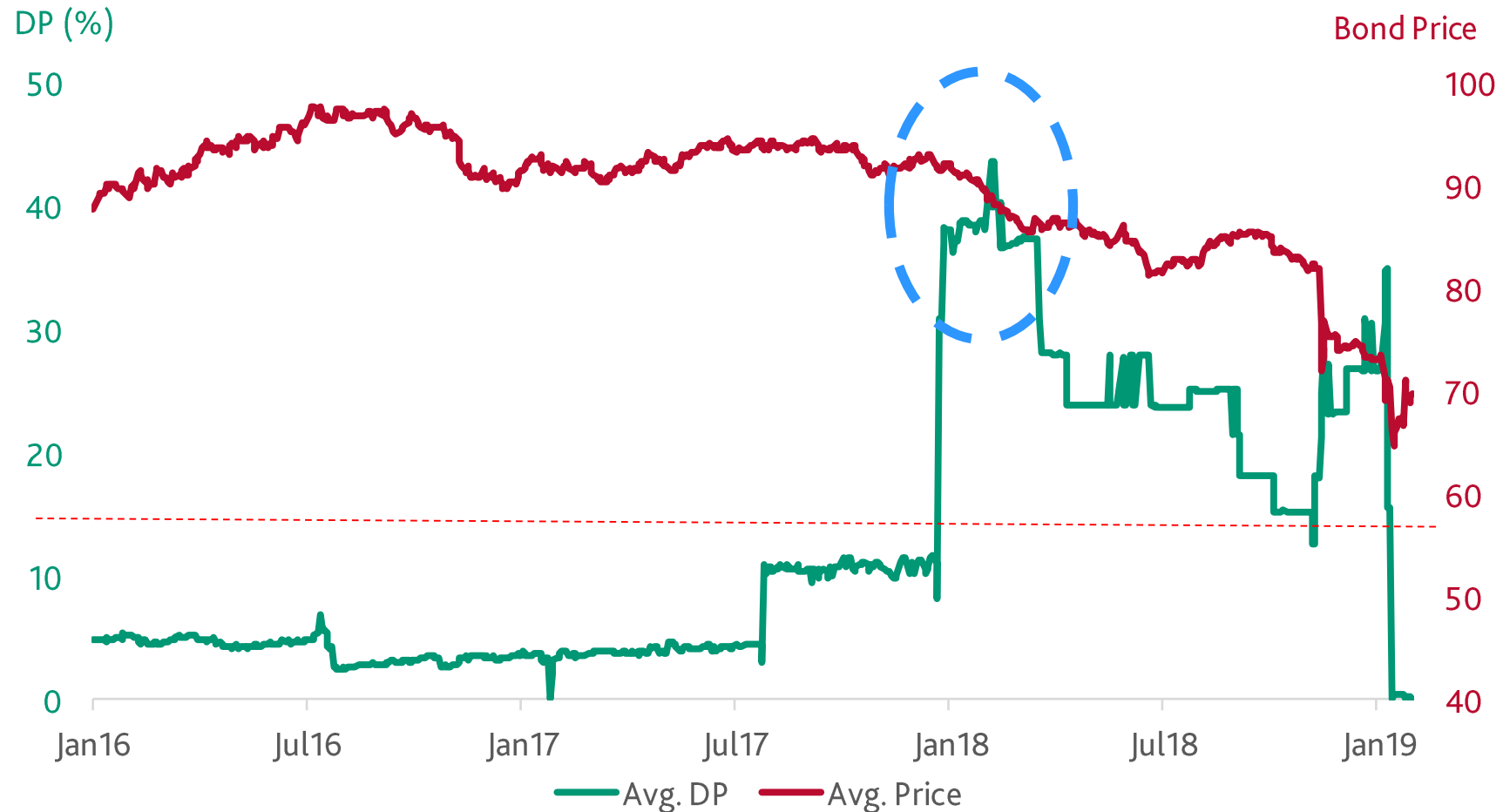
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Selected Case Study

PG&E

Pacific Gas & Electric

DP vs time, avg. bond price vs. time



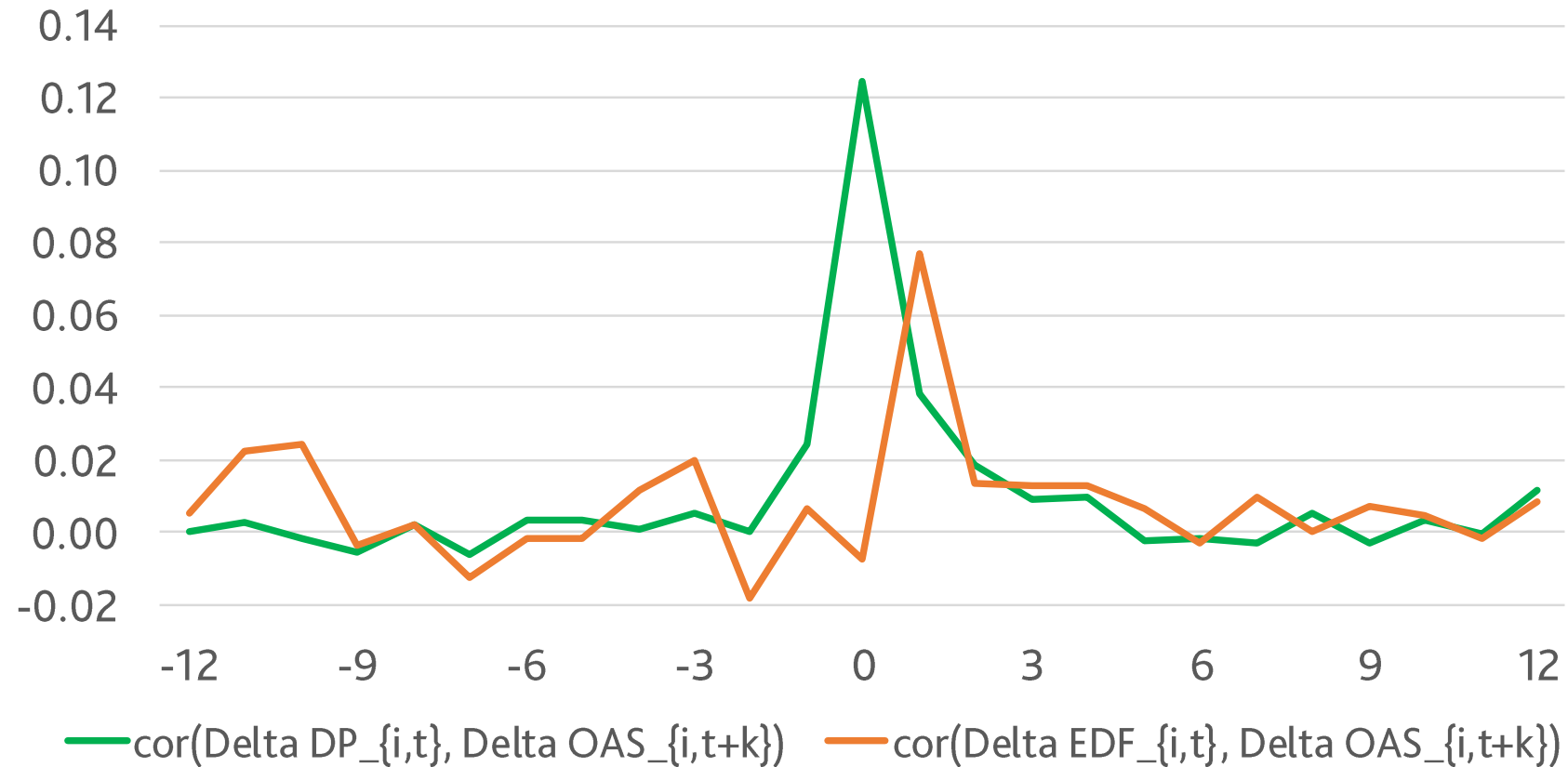
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Dynamics of Credit Risk Metrics vs. Bond Spreads

Results that PMs can use

Correlation Analyses of delta OAS and delta EDF (DP)

DP changes coincide with spread changes, while EDF changes lead



Correlation Analyses of average OAS and average EDF (DP)

Average spreads are strongly correlated with average default and downgrade risk

	EDF			DP		
	EDF	EDF (lag 3)	EDF (lag 6)	DP	DP (lag 3)	DP (lag 6)
Correlation with OAS	0.71	0.54	0.38	0.94	0.73	0.48
P-value	7.55E-20	3.30E-10	3.33E-05	1.84E-57	1.47E-20	8.30E-08

Granger causality tests to determine whether average EDF (or DP) is useful in forecasting average credit spreads

Average EDF and DP levels Granger-cause average spreads, and vice versa!

p-values	vs. EDF		vs. DP	
	vs. EDF (lag 3)	vs. EDF (lag 6)	vs. DP (lag 3)	vs. DP (lag 6)
OAS moves first?	8.853e-05 ***	2.2e-16 ***	0.0002394 ***	9.788e-08 ***
OAS moves later?	2.453e-05 ***	0.0009994 ***	0.04465 *	0.008104 **

→ This could be useful for tactical asset allocation ideas.

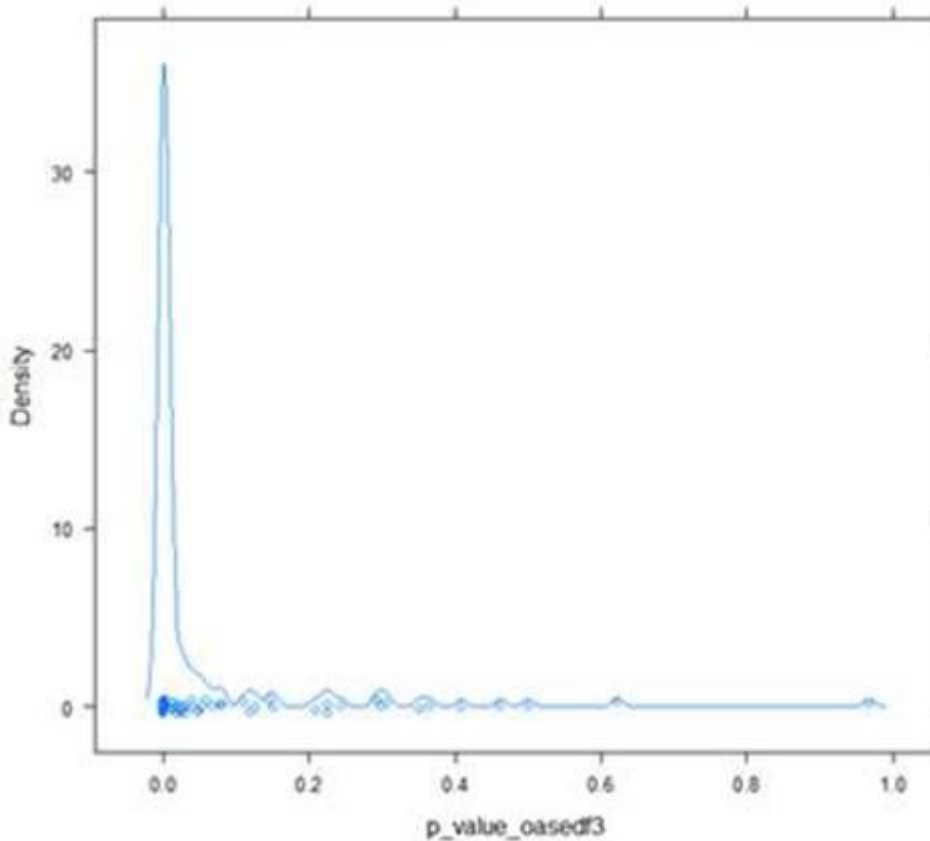
→ The answer to “Do spreads or credit metrics move first” is, “Both.”

Bond-level Granger causality test results: VAR(3), USIG

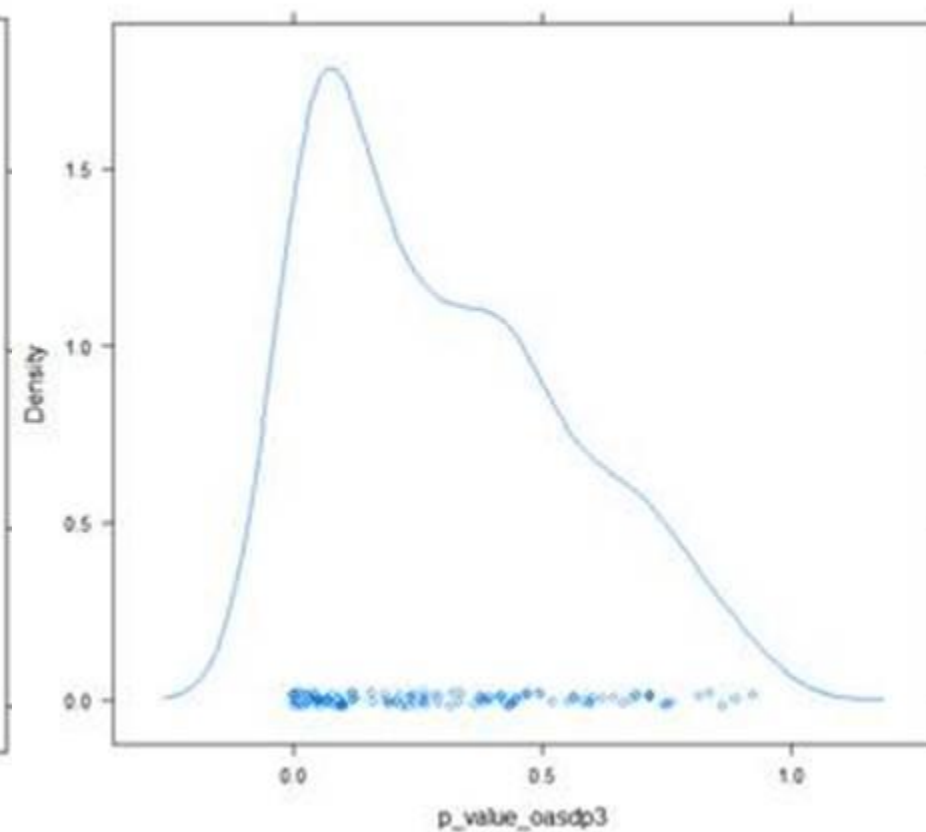
The EDF helps forecast spreads at the bond level for most bonds.

→ This lends itself to tactical security selection ideas.

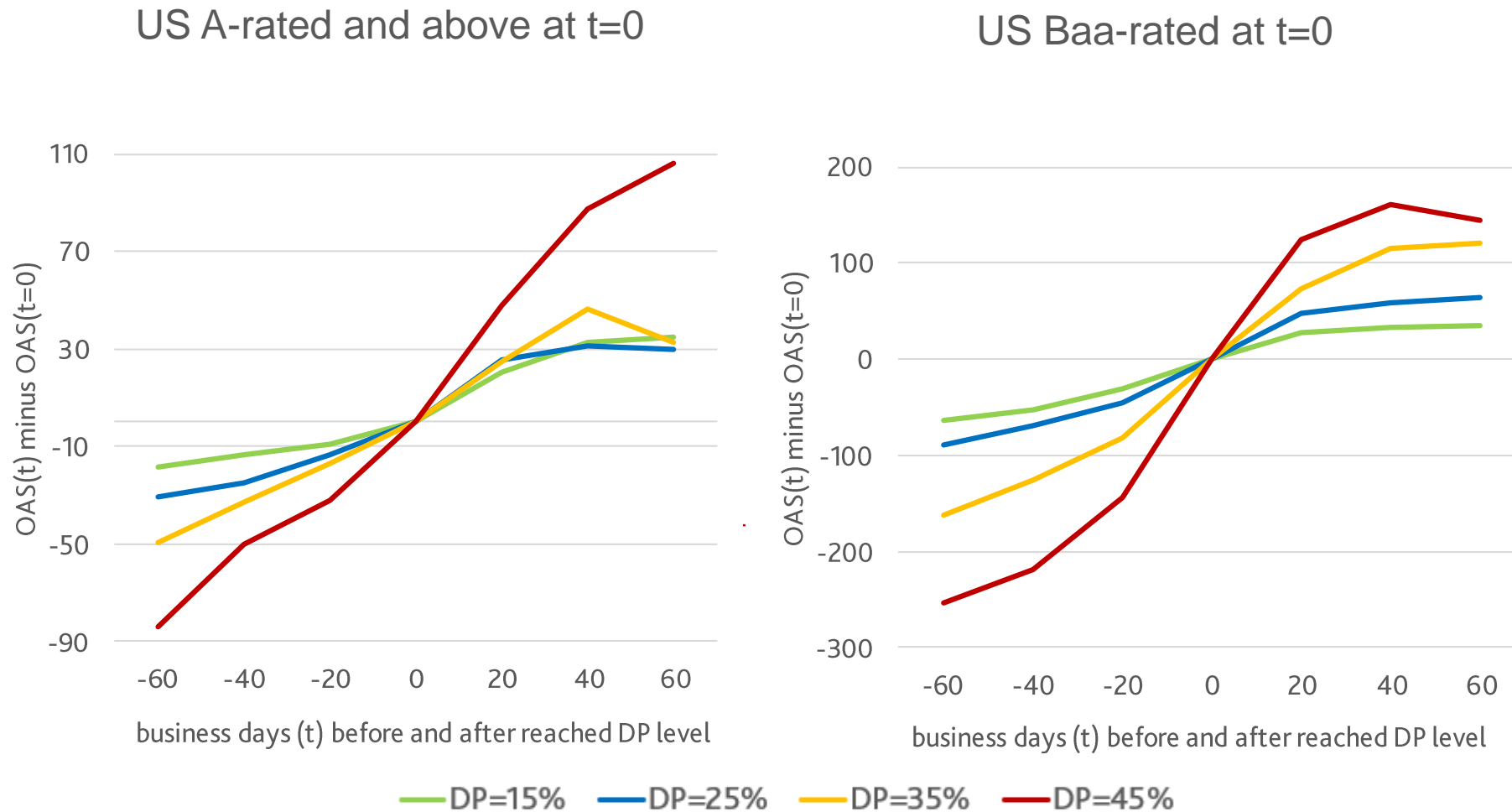
83% of the p-values for the EDF exercise are less than 0.05



18% of the p-values for the DP exercise are less than 0.05

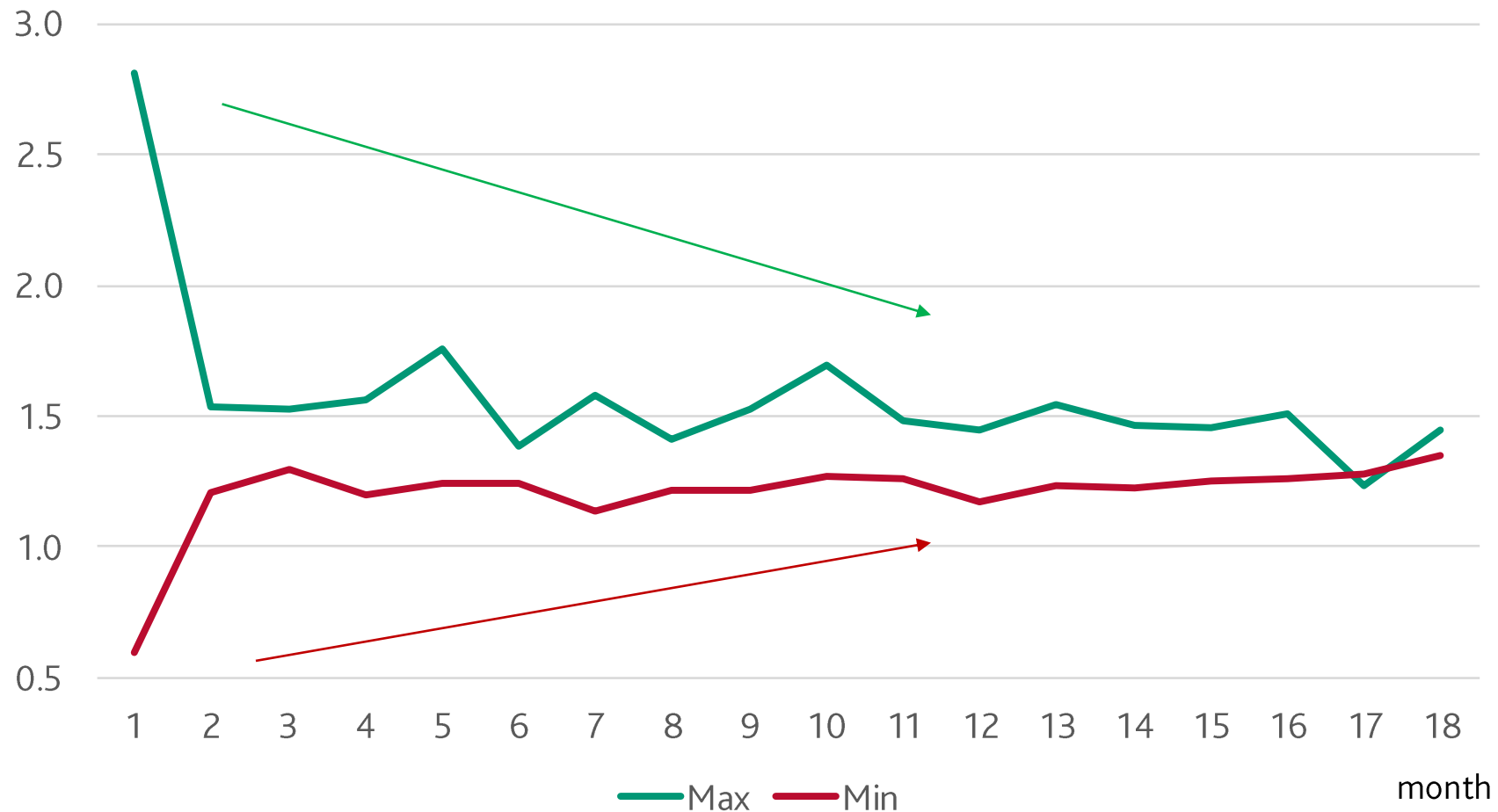


OAS movements in days (t) before and after reaching high DP levels



The average Alpha Factor for each sector converges.

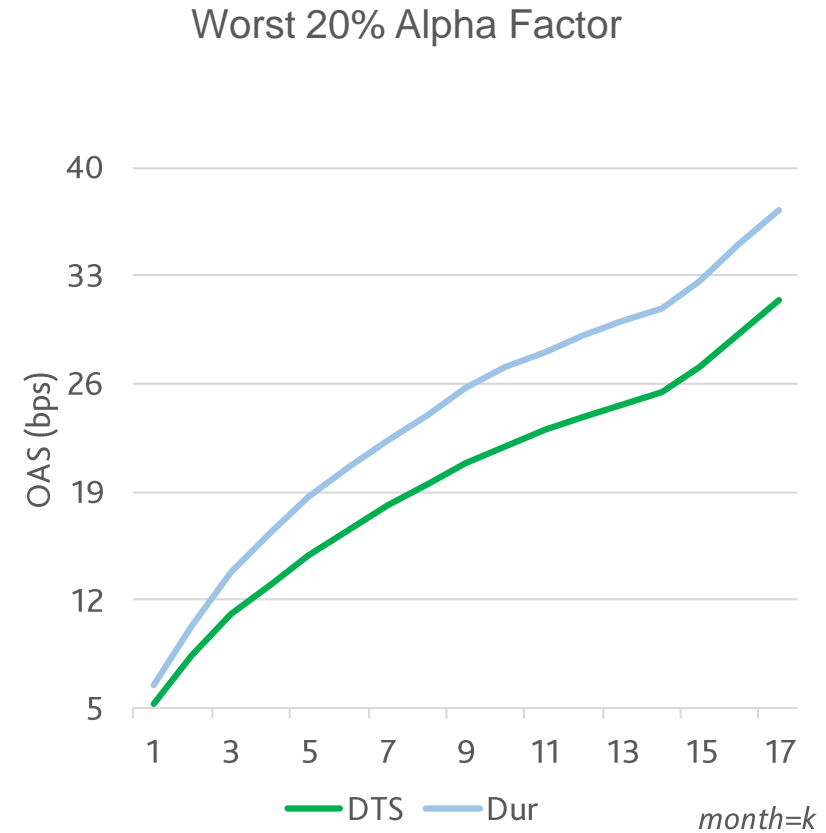
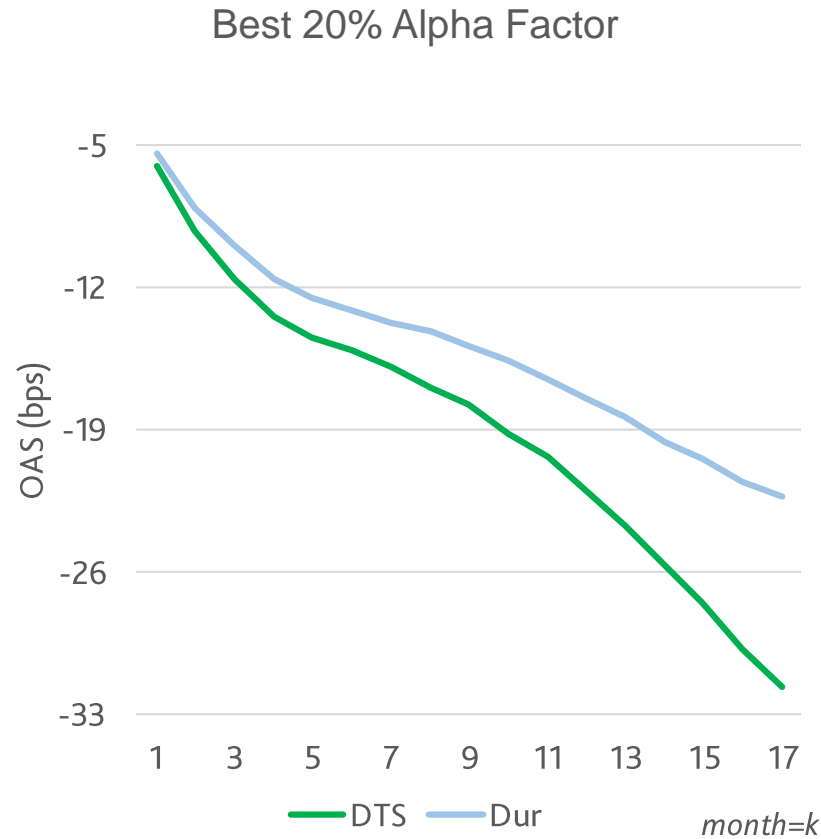
US IG: Average Alpha Factor for sector (2007-2018)



*Every month, we find the sector with the highest alpha factor (Max) and the lowest alpha factor (Min). Then, we track how the two sector mean alpha factors change over time.

The value gain/loss after a bond is added to the best/worst 20% groups can persist

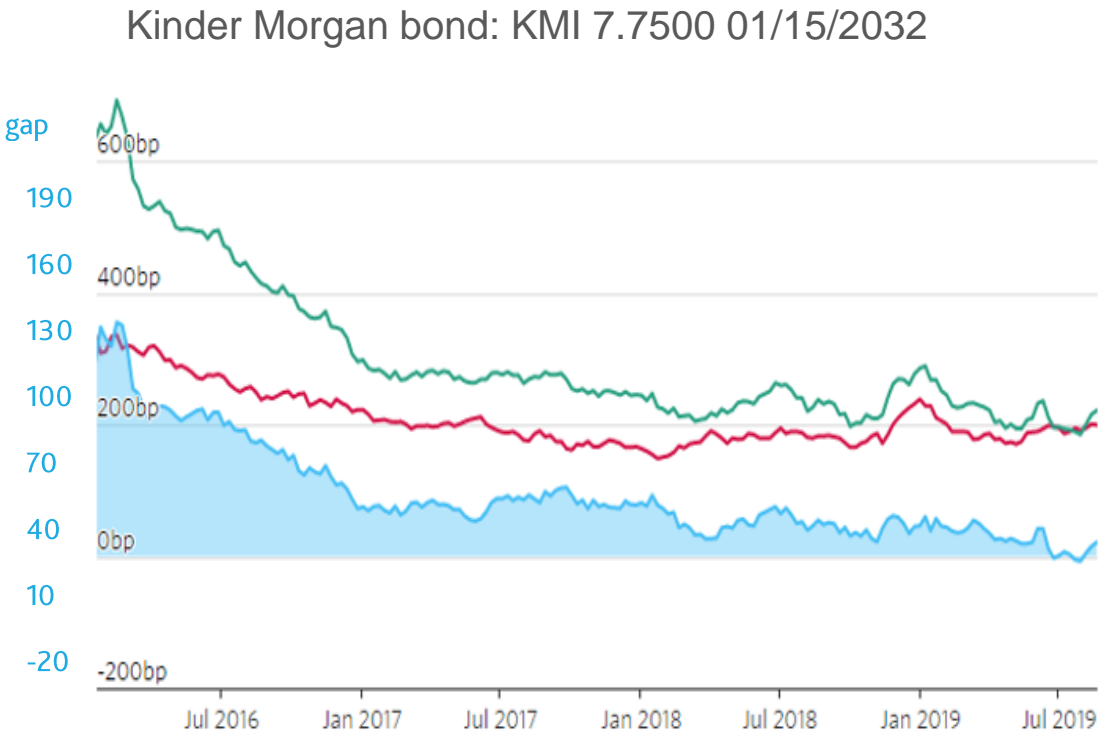
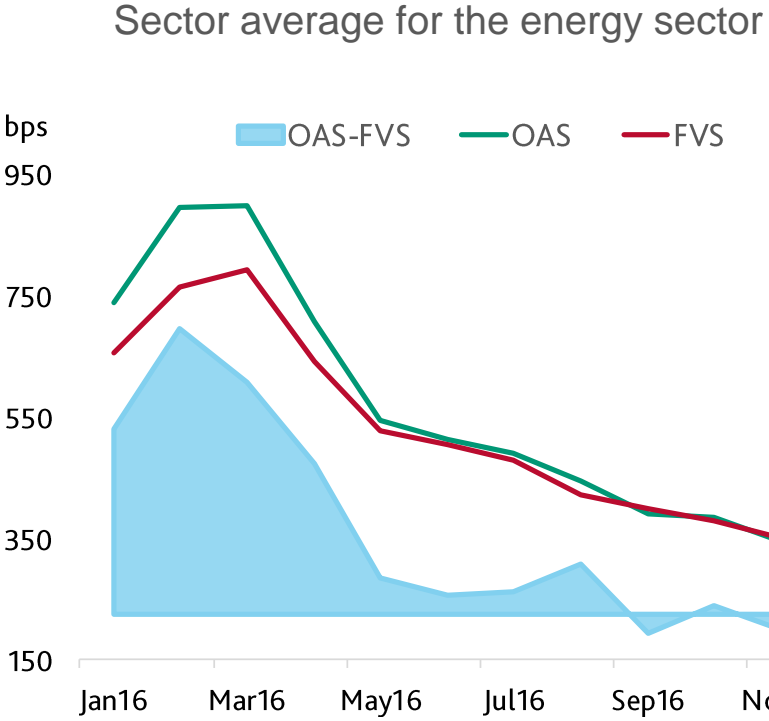
US IG: *Average cumulative bond spread change vs. the benchmarks, bp (2007-2018)



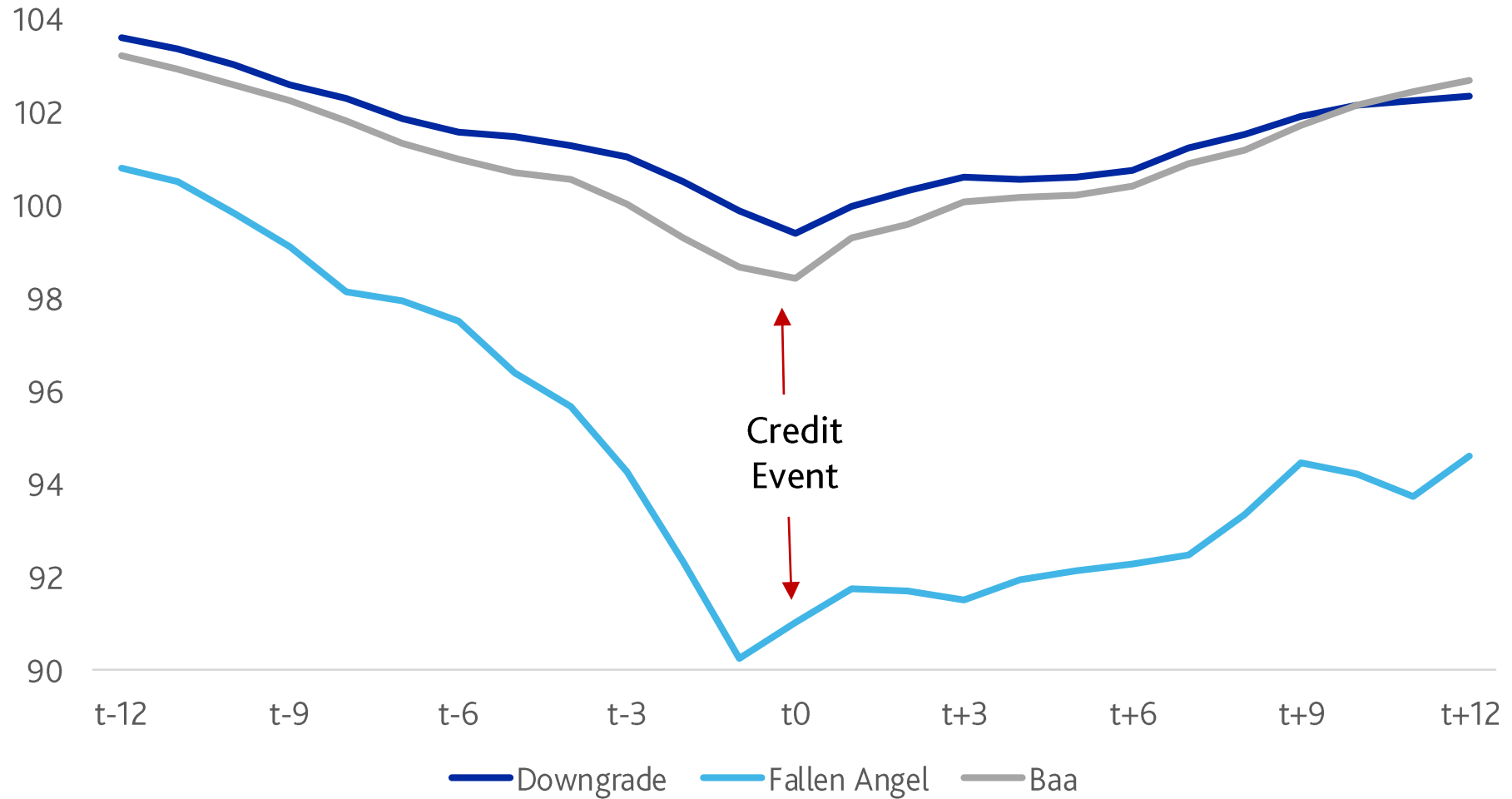
*delta OAS (bond) – delta OAS (index) within the same duration bucket

Tracking Convergence of Spreads to Fair Value at the Sector and Bond Levels

A Case Study of the Energy Sector



Mean bond bid price path around downgrade and FA events



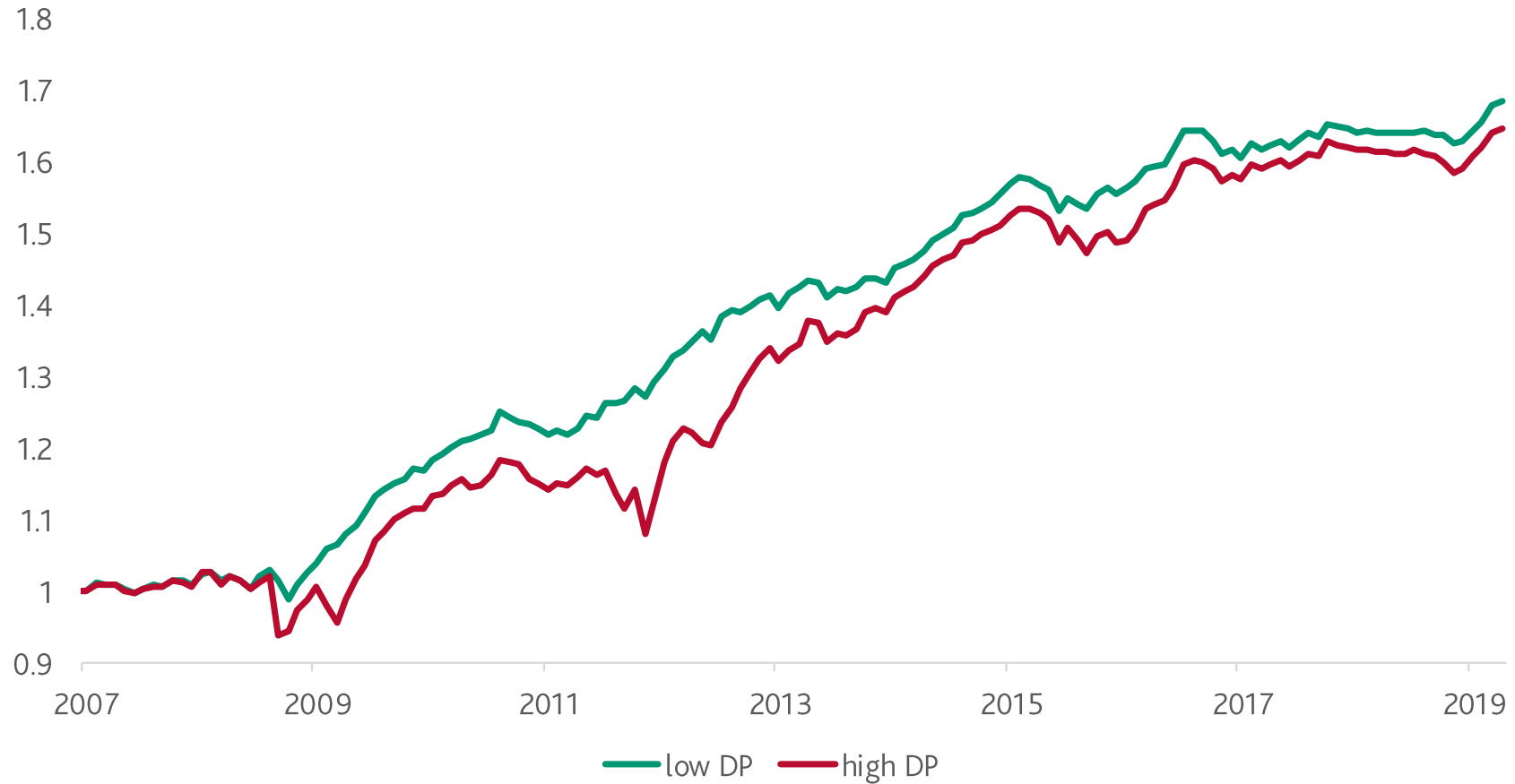
Cumulative total returns, high DP vs. low DP

US Investment Grade



Cumulative total returns, high DP vs. low DP

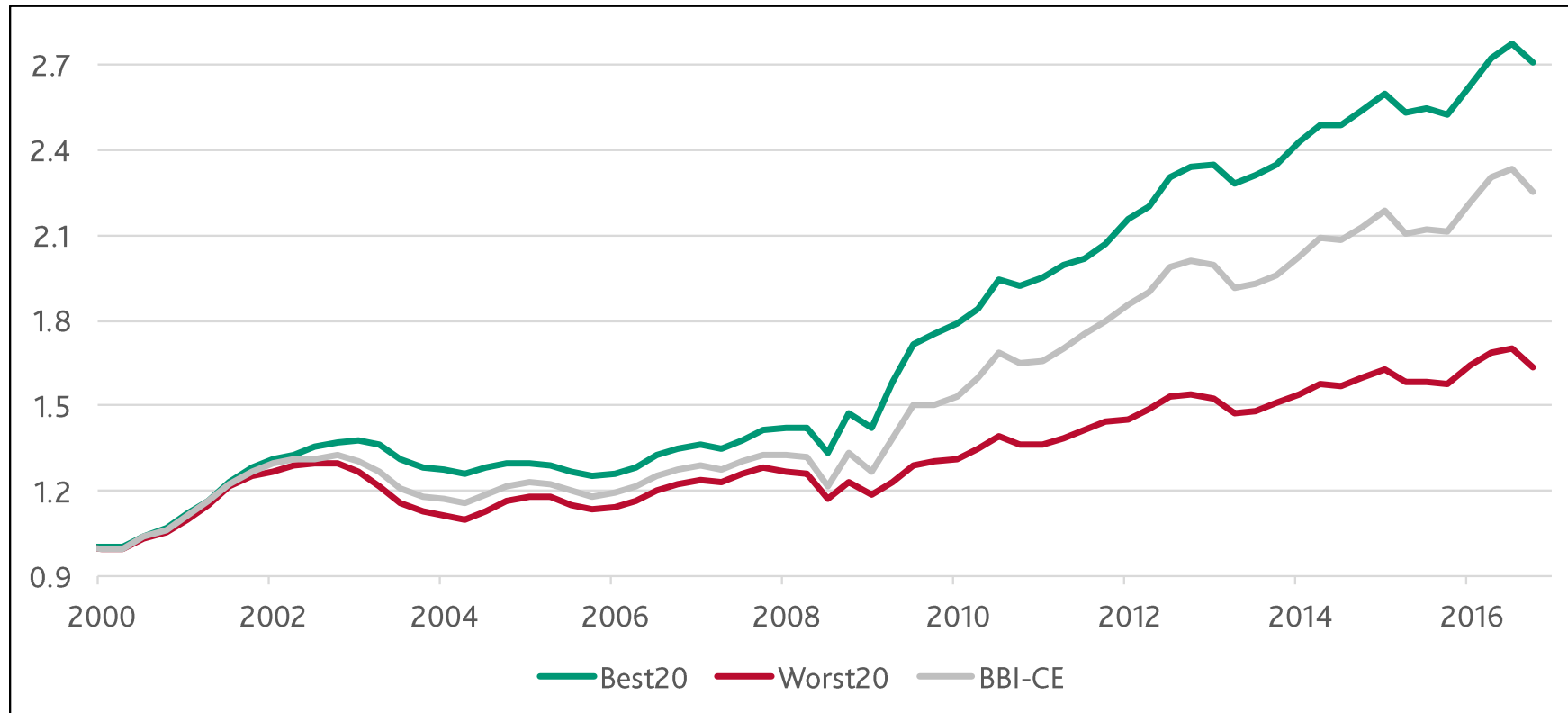
Euro Investment Grade



US Investment Grade bond strategy using Alpha Factor

US IG*: Performance of High AF/Low AF Strategies after applying Liquidity Screen and Transaction Costs

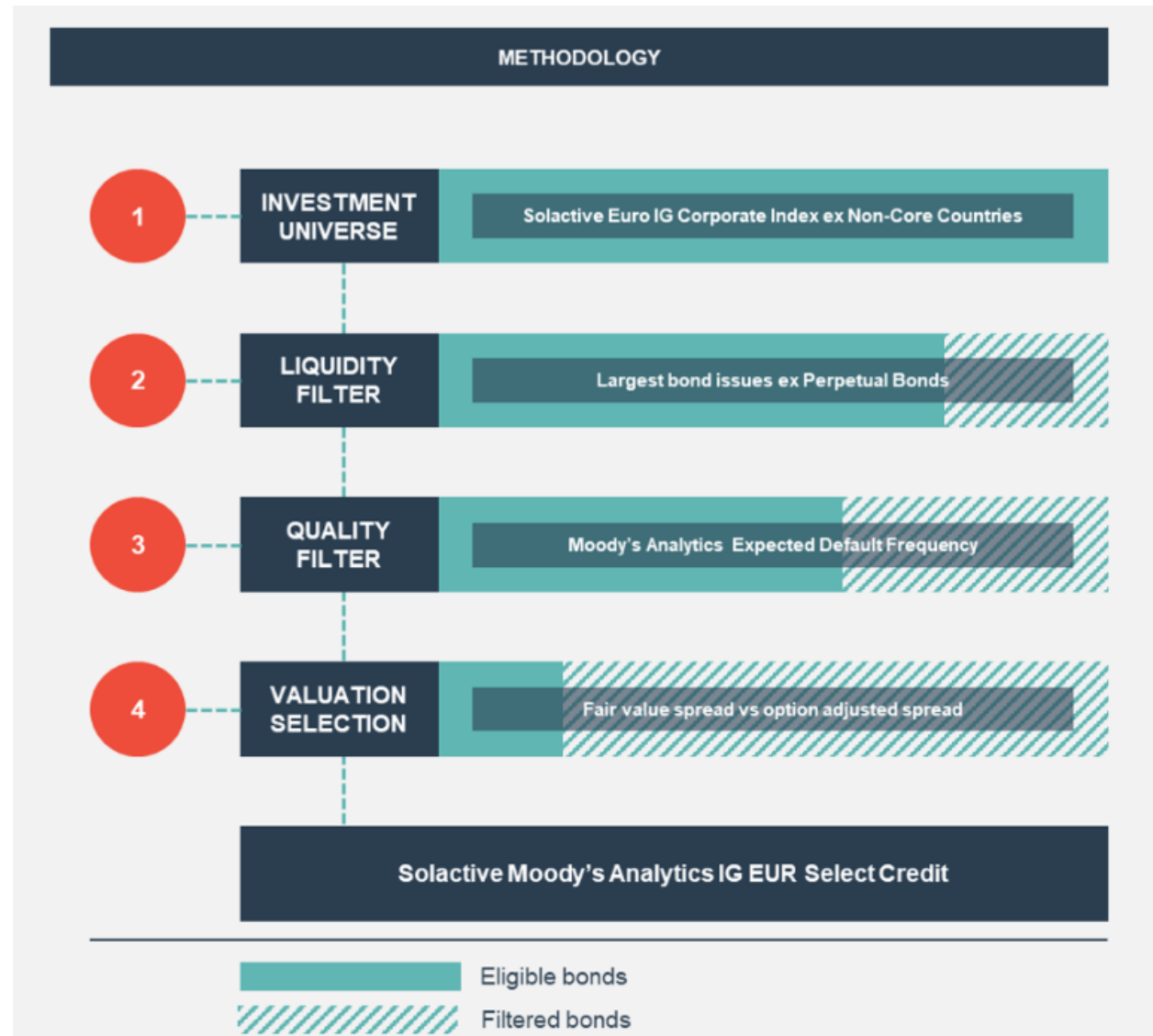
Trading Frequency: Quarterly



*Liquidity Screen: Amount outstanding \geq \$750m (IG) and \geq \$400m (HY).
Round-trip transaction costs = 10bps (IG) and = 25bps (HY)
High AF = Best20/ Low AF=Worst20

First EDF-based ETF: Ossiam Solactive Moody's Analytics IG EUR Select Credit ETF

- » Differentiates itself from traditional benchmarks in seeking to maximize the total return of a liquid and diversified selection of EUR-denominated investment group corporate bonds, while maintaining a low credit risk profile
- » **CreditEdge EDF and FVS metrics** act as filters to uncover corporate bonds with low default risk



Source: www.ossiam.com

Thank you

Questions welcome!

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Appendix

Granger causality tests to determine whether EDF is useful in forecasting future credit spreads, and vice versa.

Granger causality tests of average OAS and average EDF

lag3

```
> grangertest(avgedf ~ avgoas, order=3, data = avgdata)
```

Model 1: avgedf ~ Lags(avgedf, 1:3) + Lags(avgoas, 1:3)
Model 2: avgedf ~ Lags(avgedf, 1:3)

	Res.Df	Df	F	Pr(>F)
1	110			
2	113	-3	7.8208	8.853e-05 ***

lag6

```
> grangertest(avgedf ~ avgoas, order=6, data = avgdata)
```

Model 1: avgedf ~ Lags(avgedf, 1:6) + Lags(avgoas, 1:6)
Model 2: avgedf ~ Lags(avgedf, 1:6)

	Res.Df	Df	F	Pr(>F)
1	101			
2	107	-6	23.246	< 2.2e-16 ***

```
> grangertest(avgoas ~ avgedf, order=3, data = avgdata)
```

Model 1: avgoas ~ Lags(avgoas, 1:3) + Lags(avgedf, 1:3)
Model 2: avgoas ~ Lags(avgoas, 1:3)

	Res.Df	Df	F	Pr(>F)
1	110			
2	113	-3	8.9115	2.453e-05 ***

```
> grangertest(avgoas ~ avgedf, order=6, data = avgdata)
```

Model 1: avgoas ~ Lags(avgoas, 1:6) + Lags(avgedf, 1:6)
Model 2: avgoas ~ Lags(avgoas, 1:6)

	Res.Df	Df	F	Pr(>F)
1	110			
2	107	-6	4.1036	0.0009994 ***

Granger causality tests to determine whether DP is useful in forecasting future credit spreads, and vice versa.

Granger causality tests of average OAS and average DP

lag3

```
> grangertest(avgdp ~ avgoas, order=3, data = avgdata)
```

```
Model 1: avgdp ~ Lags(avgdp, 1:3) + Lags(avgoas, 1:3)
```

```
Model 2: avgdp ~ Lags(avgdp, 1:3)
```

	Res.Df	Df	F	Pr(>F)
1	110			
2	113	-3	6.9898	0.0002394 ***

lag6

```
> grangertest(avgdp ~ avgoas, order=6, data = avgdata)
```

```
Model 1: avgdp ~ Lags(avgdp, 1:6) + Lags(avgoas, 1:6)
```

```
Model 2: avgdp ~ Lags(avgdp, 1:6)
```

	Res.Df	Df	F	Pr(>F)
1	101			
2	107	-6	8.8261	9.788e-08 ***

```
> grangertest(avgoas ~ avgdp, order=3, data = avgdata)
```

```
Model 1: avgoas ~ Lags(avgoas, 1:3) + Lags(avgdp, 1:3)
```

```
Model 2: avgoas ~ Lags(avgoas, 1:3)
```

	Res.Df	Df	F	Pr(>F)
1	110			
2	113	-3	2.7771	0.04465 *

```
> grangertest(avgoas ~ avgdp, order=6, data = avgdata)
```

```
Model 1: avgoas ~ Lags(avgoas, 1:6) + Lags(avgdp, 1:6)
```

```
Model 2: avgoas ~ Lags(avgoas, 1:6)
```

	Res.Df	Df	F	Pr(>F)
1	110			
2	107	-6	3.0882	0.008104 **

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