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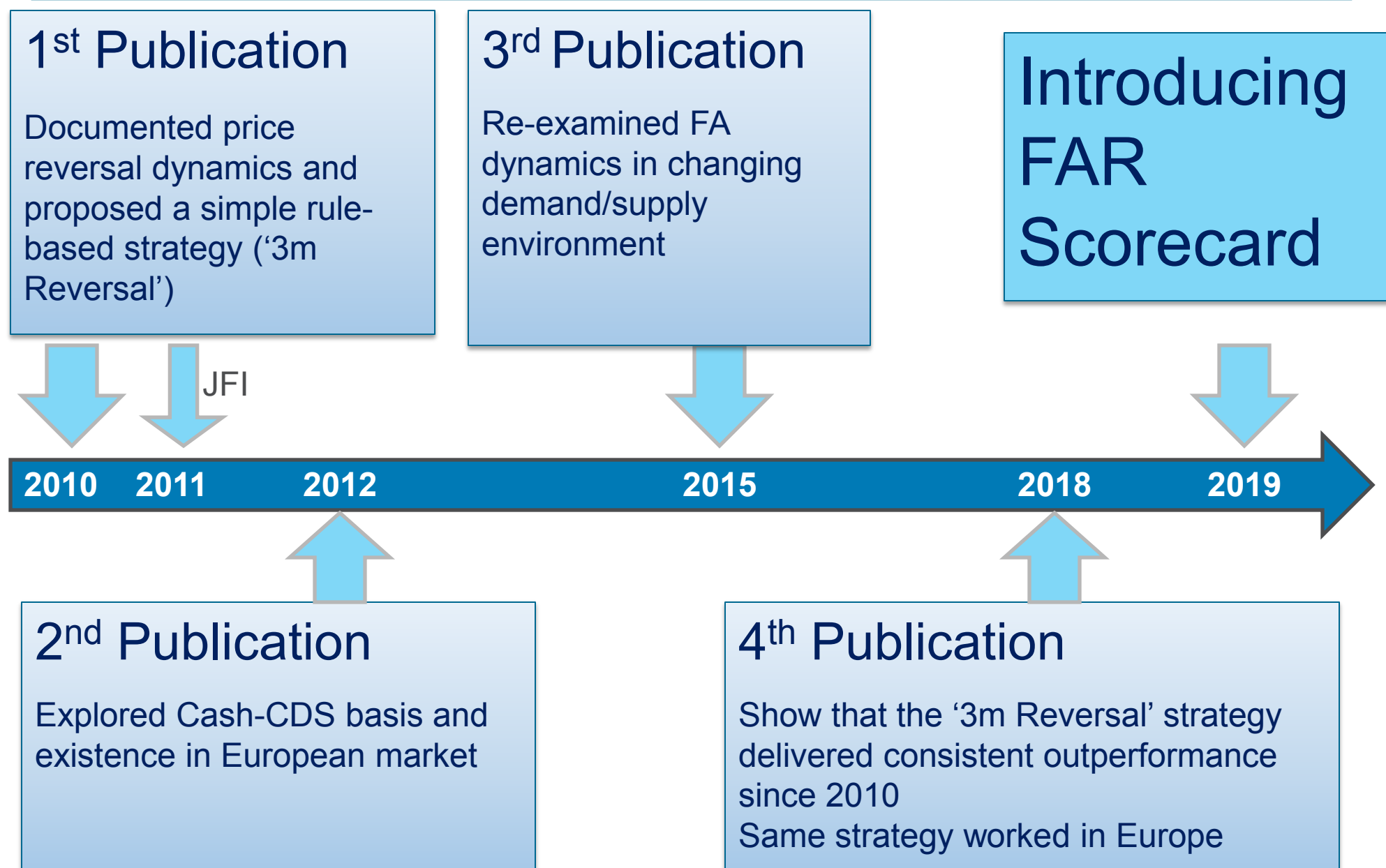
# Introducing the FAR Scorecard ("Fallen Angel" Reversal)

January 2019

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# Time-line of QPS Research on Fallen Angel



# What's Special about Fallen Angels?

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## Supply

- ❖ Most investors are required to sell
- ❖ Selling takes place over a short window

## Demand

- ❖ HY market << IG market
- ❖ IG bonds are larger than HY bonds, on average

Forced Selling + Supply Overwhelms Demand

**Excessive declines in fallen angels' bond prices followed by strong mean-reversion**

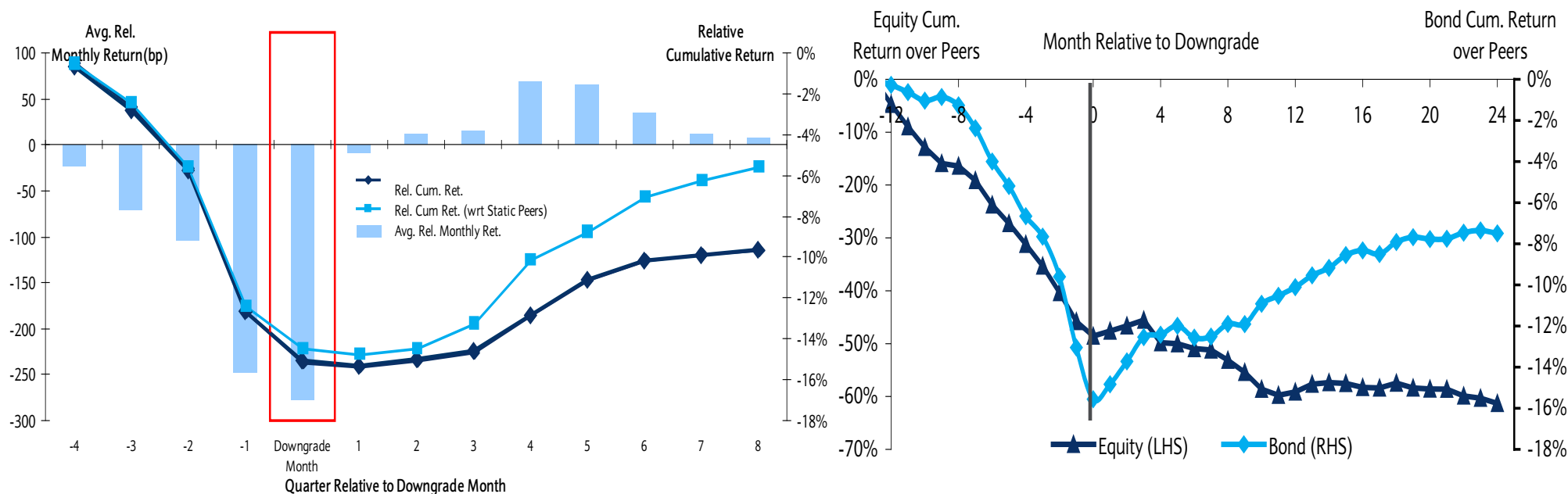
# Excessive Declines Followed by Mean-Reversion in Prices

- **Ben Dor and Xu (2010)** [Fallen Angels: Characteristics, Performance Implications for Investors](#)
- Fallen angels (FA) underperformed IG peers by 15.1% in the downgrade month and preceding year
- Outperformed IG and HY peers by 10.2% and 6.3% over the next two years, respectively
- Reversal is limited to bonds. FA equities continue to underperform

## FA Performance Around Downgrade Month

## FA Performance: Bonds Vs. Equities

Based on Monthly Observations January 1990 – June 2010



Note: Returns computed using value weighting. Source: Compustat, Barclays Research

# Fallen Angel 3M Reversal: Rule-based Fallen Angel Strategy

FA '3-Month Reversal' – invest in fallen angels while using rel. spread as buy and sell triggers

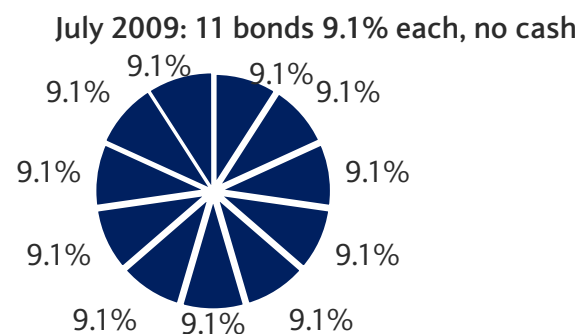
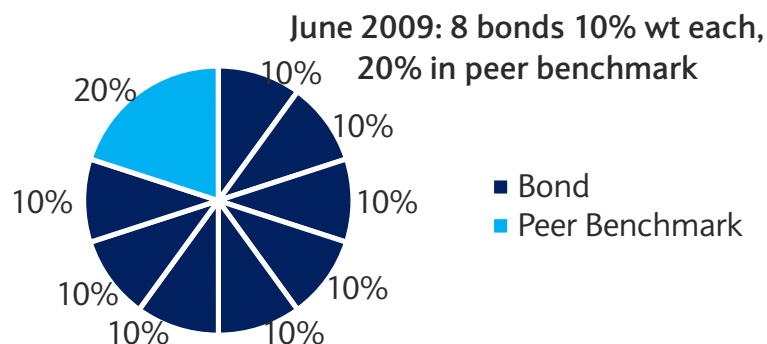
## Fallen Angel '3m Reversal' Strategy Bond Inclusion/Exclusion Criteria

Buy Conditions (if all are satisfied)	Timing Spread relative to Peers Bond Price	Month 3 >= 40 bps >=40
Sell Triggers (if any one is satisfied)	Timing Spread relative to Peers Technical	Month 24 Negative Bonds matured, defaulted or were called
Weighting		Equally weighted with 10% issuer cap
Rebalancing		Monthly

Source: Barclays Research

- **Peer group:** bonds with same credit ratings in the same fixed-income industry
- Fully seeded with cash at inception
- Unallocated capital invested in peer benchmark

## Example



Source: Barclays Research

# FA 3m Reversal Strategy Stayed Profitable Over Time

- FA 3m Reversal strategy still outperformed peers and had similar inf. ratios over the peer group in the recent period (January 2015 to Dec. 2018)

The Performance of FA 3m Reversal Portfolios					
	FA '3m Reversal' Portfolio	Peer Group	FA Ret. over Peer Group	High-Yield Index	FA Ret over HY Index
Jan. 1991 - Jun. 2010 (Ben Dor and Xu 2010 study)					
Average (Monthly)	1.62%	0.84%	0.78%	0.81%	0.82%
Volatility (Monthly)	3.99%	2.31%	2.63%	2.68%	2.56%
Sharpe/Inf. Ratio (Ann.)	1.12	0.76	1.03	0.61	1.11
% of Positive Ret. Months	75%	76%	63%	76%	64%
% Invested in Fallen Angels	69%				
Jul. 2010 - Dec. 2014 (Ben Dor and Xu 2015 update)					
Average (Monthly)	1.11%	0.80%	0.31%	0.74%	0.38%
Volatility (Monthly)	1.85%	1.62%	0.88%	1.78%	0.92%
Sharpe/Inf. Ratio (Ann.)	2.06	1.67	1.23	1.40	1.42
% of Positive Ret. Months	74%	74%	65%	74%	70%
% Invested in Fallen Angels	55%				
Jan. 2015 - Dec. 2018					
Average (Monthly)	0.87%	0.32%	0.55%	0.35%	0.52%
Volatility (Monthly)	2.77%	1.51%	1.61%	1.52%	1.54%
Sharpe/Inf. Ratio (Ann.)	0.99	0.56	1.18	0.62	1.18
% of Positive Ret. Months	63%	67%	65%	63%	65%
% Invested in Fallen Angels	87%				

Note: The returns for the portfolios' peer group were computed as the equal-weighted performances of the individual bonds' peer groups. Sharpe Ratio was calculated using 1m Libor. Inf. ratio is the ratio of average and standard deviation of relative returns. Source: Barclays Research

# FA 3m Reversal Strategy Outperformed FA ETFs

- **FA 3m Reversal** strategy outperformed popular FA ETFs
- Transaction cost does not account for the difference in performance

## The Performance of FA 3m Reversal Portfolios vs Fallen Angel ETFs

Fallen Angel '3m Reversal' Strategy vs. Fallen Angel ETFs			
iShare Fallen Angel ETF (FALN, Jul. 2016 - Nov. 2018)			
	FA '3m Reversal'	FALN US Equity	FA over FALN US Equity
Avg. Ret (%/m)	1.06	0.46	0.6
Vol. (%/m)	1.7	1.3	1.19
Sharpe (Inf.) Ratio (ann.)	1.91	0.92	1.74
Corr(FALN US Equity, FA)	0.71		
VanEck Vectors Fallen Angel ETF (ANGL, May 2012 - Nov. 2018)			
	FA '3m Reversal'	ANGL US Equity	FA over ANGL US Equity
Avg. Ret (%/m)	0.95	0.6	0.35
Vol. (%/m)	2.34	1.86	1.16
Sharpe (Inf.) Ratio (ann.)	1.33	1.02	1.05
Corr(ANGL US Equity, FA)	0.87		

Source: Barclays Research, Bloomberg

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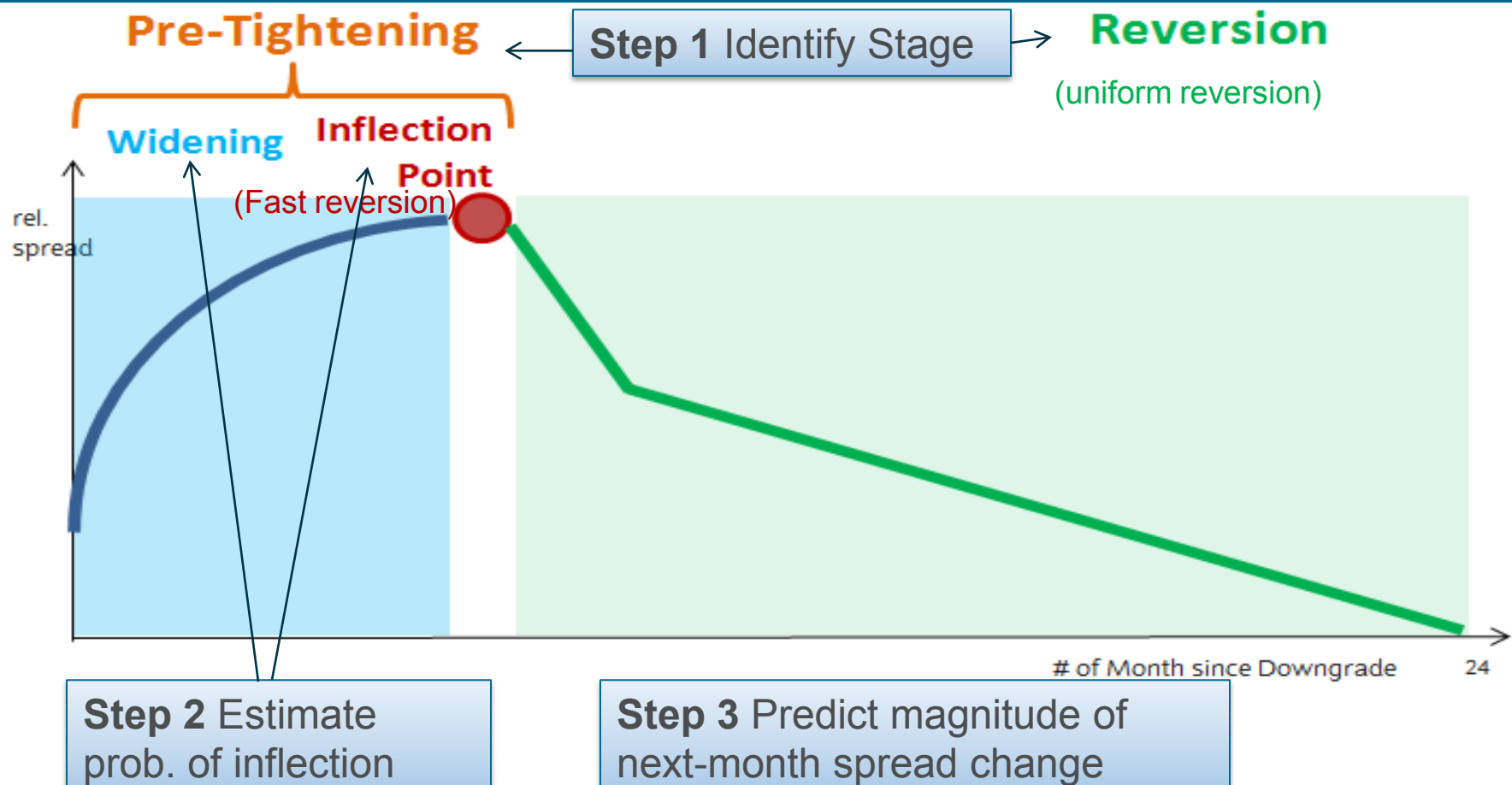
# Constructing the FAR Scores



# How is FAR different from '3m Reversal'?

- The '3m Reversal' strategy uses average dynamics of all FAs
- FAR scores take into account each FA specific characteristics
- FAR offers a ranking for each FA and allows more flexibility in selecting FAs

## Fallen Angels Reversal Cycle After Downgrade

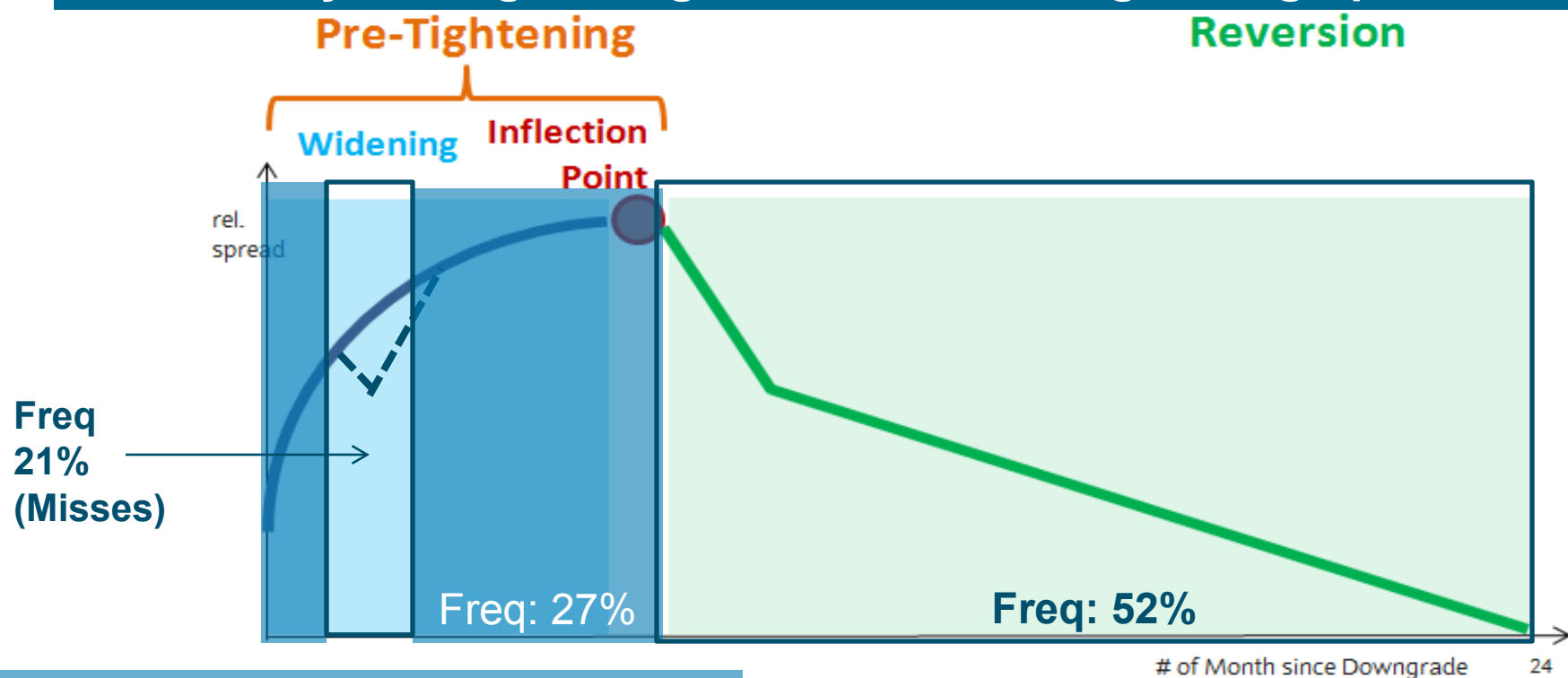


Source: Barclays Research

# Step 1. Identifying Stages of Reversion Cycle Ex Ante

- Ex Ante, we identify pre-tightening vs. reversion periods by looking at the trend of each FA's rel. spread since downgrade to that month
- A FA is characterized to be in 'pre-tightening' if its rel. spread in that month is the maximum since DG up to that month, and in 'reversion' otherwise

## Identify Pre-Tightening vs. Reversion Stage using Spread Trend



**Pre-Tightening**  
if  $\text{rel. OAS}_t = \max$  since DG to month  $t$

**Reversion**  
if  $\text{rel. OAS}_t < \max$  since DG to month  $t$

Source: Barclays Research



# Is it best to invest after Reversion has started?

- No! There is substantial profit in capturing the inflection point since it has the biggest next-month reversal
- However, widening and inflection months look very similar ex ante as both are preceded by spread-widening
- How do we tell them apart?

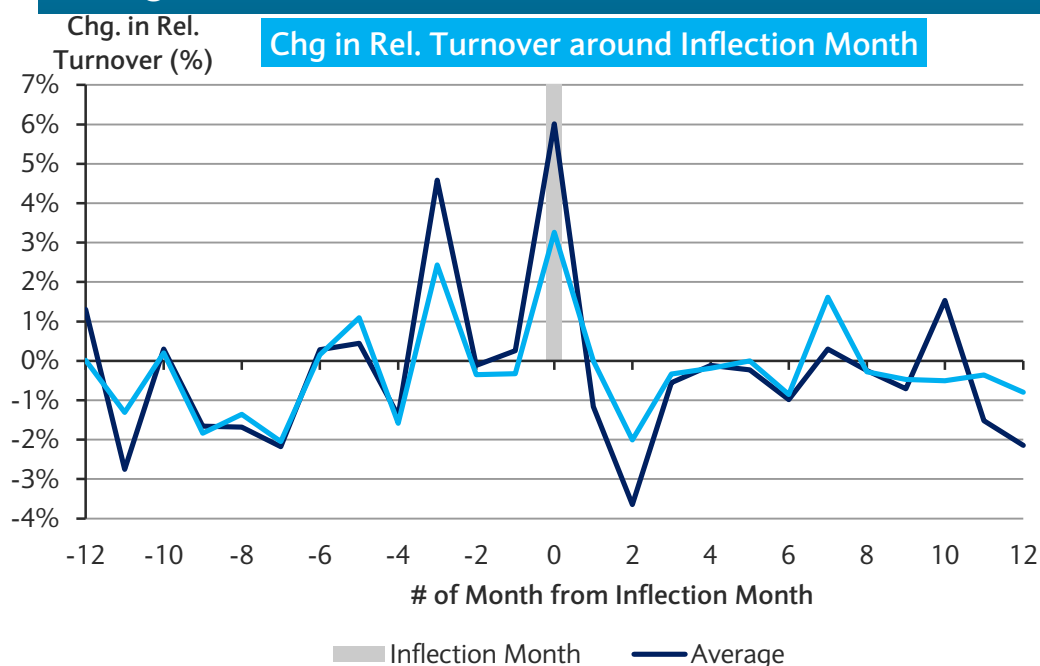
Frequency and Subsequent Spread Change by Stage (with hindsight) Jan. 1991 – Oct. 2018			
	Pre-Tightening (with hindsight)		Reversion (with hindsight)
	Widening	Inflection Point	
Stage definition	[DG, Inflection month)	max Rel. Spread from DG to DG + 24m	(Inflection Month, 24m after DG]
% of Months	40%	8%	52%
Next-month median rel. OAS chg	13 bps	-122 bps	-17bps
	Combined		
% of Months	48%		
Nex-month median rel. OAS chg	3bps		
Next-month average rel. OAS chg	-7bps		

Source: Bloomberg, Barclays Research

## Step 2. Estimating Prob. of Inflection

- We used monthly bond-level trading volume from TRACE to estimate the probability of each FA being at inflection point in month
- **Bond Monthly Turnover** = Monthly trading volume/ Amount Outstanding
- **Rel. Turnover** = Bond Monthly Turnover – Avg. (Peer Bond Monthly Turnover\*)
  - \* Peer bonds are defined as bonds with the same rating and in the same industries. Peer bond turnovers were VW using bond MV
- **Chg. in Rel. Turnover** = Rel. Turnover - Rel. Turnover<sub>previous month</sub>
- Rel. Turnover had a significant positive increase around inflection months

### Chg in Rel. Turnover in Inflection Months vs. Non-Inflection Months (Jan. 2007 – Oct. 2018)



Note: Source: Bloomberg, Barclays Research

Dependent Variable: Chg. In Rel. Turnover		
Coefficient	Whole Sample	Sub-Sample in Pre-Tightening period (Rel. OAS <sub>t</sub> = max since DG to month t)
Intercept	-0.41%*	3.25%***
Inflection Month Dummy (=1 if month t is an inflection month, 0 otherwise)	6.43%***	2.76%**

Note: \*\*\*/\*\*/\* indicates significance at 1%/5%/10%-level using robust standard errors correcting for heteroskedasticity.

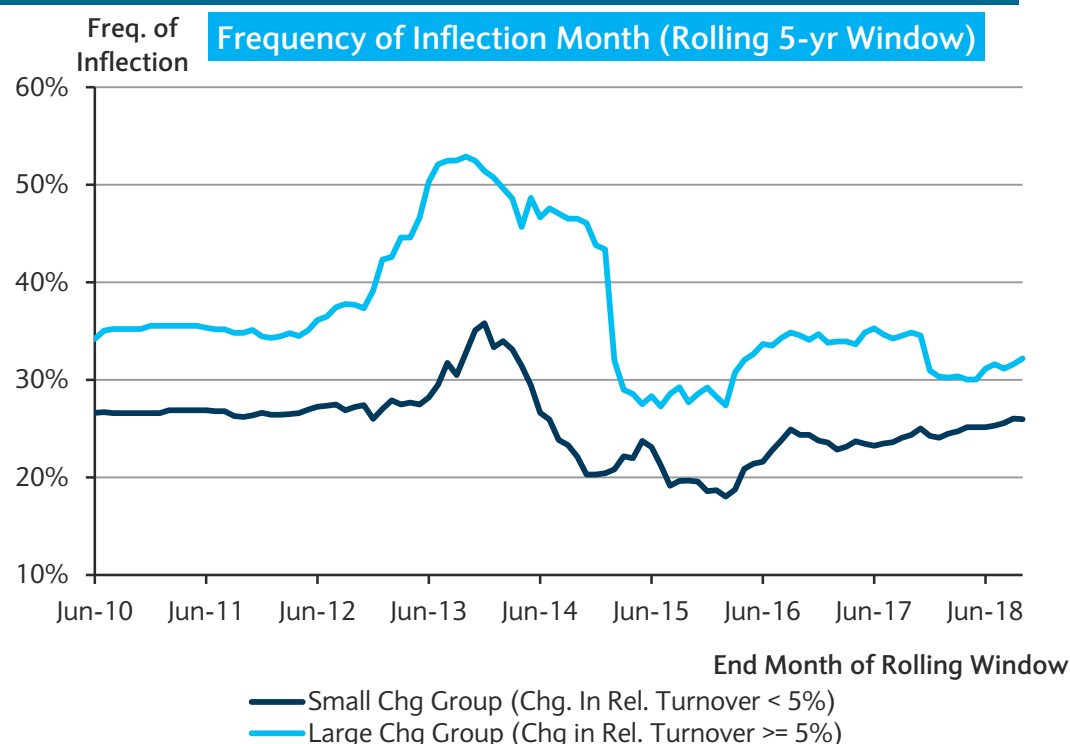
# Higher Chg in Rel. Turnover Has Higher Frequency of Inflection

## Probability of Inflection by Chg. in Rel. Turnover Groups (Jan. 2007 – Oct. 2018)

	Whole Sample		Sub-Sample in Pre-Tightening period (Rel. OAS_t = max since DG to month t)	
	# of Monthly obs	Frequency of Inflection	# of Monthly obs	Frequency of Inflection
Small Chg Group (Rel. Turnover chg <5%)	3,233	6%	697	26%
Large Chg Group (Rel. Turnover chg >= 5%)	1,251	13%	478	33%

## Rolling Estimation of Prob. of Inflection by Chg. In Rel. Turnover Groups

- We use the empirical frequencies of inflection months in the two rel. turnover chg groups (<5% and >=5%) in the trailing 5-year window to estimate prob. of inflection of each FA in the coming month



Note: the universe for the rolling estimation of frequency of inflection is the sub-sample in ex-ante pre-tightening period (rel. OAS\_t = max since DG up to month t).

Source: Trace, Bloomberg, Barclays Research

## Step 3. Predicting magnitude of next-month spread change

- Idea:** estimate expected relative spread adjustment using current month OAS assuming FA's rel. OAS reverts back to 0 at the end of 24m at the same rate per remaining month (rm)

$$\text{Rel. OAS} / \text{rm (remaining month)} = \frac{\text{OAS relative to Peers}}{24 - \# \text{ of months since downgrade} + 1}$$

- We use a regression approach to estimate sensitivities of next-month spread chg to current month's Rel. OAS/rm in different stages of reversion cycle
  - To calculate FAR each month, we estimate the sensitivities using trailing 60m data

### Estimating Sensitivities of next-month's Rel. OAS chg to current month's *Rel. OAS/rm*

Stages		Denoted as
Pre-Tightening (rel. OAS_t = max from DG to month t)	Widening	beta_widening
	Inflection (rel. OAS = max from DG to 24m)	beta_inflection
Reversion (rel. OAS_t < max from DG to month t)		beta_reversion

Source: Barclays Research

# Calculating FAR Scores

## FAR (Fallen Angel Reversion) Scores

### Meaning

A higher score indicates a larger reversal magnitude in spread relative to peers next month

### Score Calculation

Stage	Score Value
If Pre-Tightening (Rel. OAS <sub>t</sub> = max from DG to month t)	$P_{\text{inflection}} * (-\text{beta}_{\text{inflection}}) + (1 - P_{\text{inflection}}) * (-\text{beta}_{\text{widening}}) * \text{Rel.OAS}/\text{rm}$
If Reversion (Rel. OAS <sub>t</sub> < max from DG to month <sub>t</sub> )	$-\text{beta}_{\text{reversion}} * \text{Rel.OAS}/\text{rm}$

Note: Rel. OAS/rm is calculated as rel. OAS divided by (24 - # of months since downgrade + 1). Betas are estimated from trailing 5-year regression of subsequent-month's Rel. OAS on the interaction terms of *Rel. OAS /rm* and three state dummies (Pre-tightening non inflection, inflection, and reversion). *P<sub>inflection</sub>* is determined by the empirical frequency of inflection months in the two rel. turnover chg Groups (<5% and >=5%) in the trailing 5-year window.  
Source: Barclays Research

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# Efficacy of FAR Scores



# FAs with Higher FAR Scores Outperformed Peers More

## Ret. over Peers of Top and Bottom Portfolios Ranked on FAR Scores

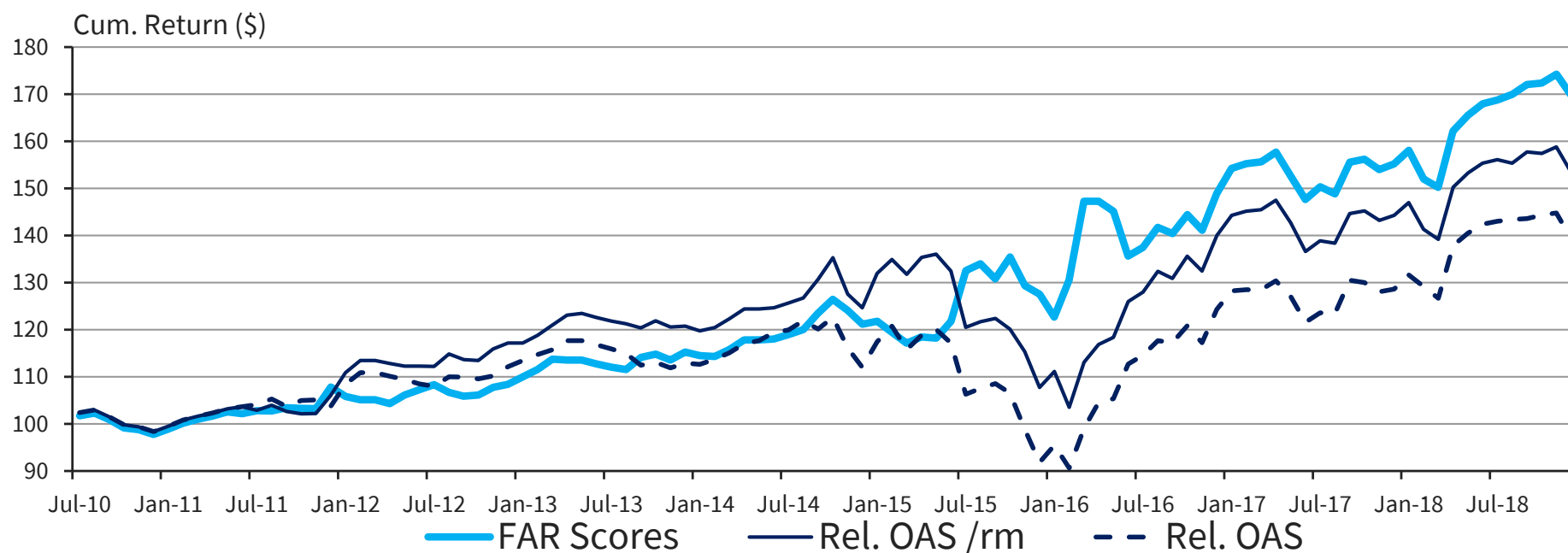
		Top / Bottom Half Portfolios Sorted on								
		Rel. OAS			Rel. OAS / rm			FAR Scores		
		Bottom Half	Top Half	Top Half - Bottom Half	Bottom Half	Top Half	Top Half - Bottom Half	Bottom Half	Top Half	Top Half - Bottom Half
Jul. 2010 - Dec. 2014 (Ben Dor and Xu 2015 update)	Average (%/yr)	1.79	4.46	2.67	0.59	5.67	5.07	0.95	5.33	4.38
	Volatility (%/yr)	3.01	6.16	5.42	4.01	5.72	5.73	4.25	4.96	4.55
	Inf. Ratio (Ann.)	<b>0.59</b>	<b>0.72</b>	<b>0.49</b>	<b>0.15</b>	<b>0.99</b>	<b>0.89</b>	<b>0.22</b>	<b>1.08</b>	<b>0.96</b>
	Worst Monthly Ret.(%)	-2.02	-5.40	-5.36	-3.87	-5.58	-5.73	-3.78	-3.91	-2.38
	Max. DD (%)	-3.62	-11.16	-8.69	-6.69	-9.21	-7.84	-7.81	-7.39	-4.45
Jan. 2015 - Dec. 2018	Average (%/yr)	7.09	13.44	6.34	7.28	13.26	5.98	5.68	14.84	9.17
	Volatility (%/yr)	7.85	16.56	13.40	8.31	16.04	12.64	9.88	15.02	12.32
	Inf. Ratio (Ann.)	<b>0.90</b>	<b>0.81</b>	<b>0.47</b>	<b>0.88</b>	<b>0.83</b>	<b>0.47</b>	<b>0.57</b>	<b>0.99</b>	<b>0.74</b>
	Worst Monthly Ret.(%)	-4.92	-8.75	-9.29	-4.47	-8.62	-9.03	-8.52	-5.42	-6.54
	Max. DD (%)	-4.92	-20.91	-24.96	-4.47	-20.05	-23.90	-13.72	-11.70	-9.42

Note: all bonds were EW subject to a 10% cap. Excess capital will have a return over peers of 0. Universe is FA with positive spreads immediately following downgrades and for as long as rel. spreads are positive. Source: Trace, Bloomberg, Barclays Research

# Top FAR Scores Generated More Persistent Outperformance

- The Top – Bottom portfolio sorted on FAR scores generated persistent performance, not experiencing large DD like using rel. OAS and rel. OAS/rm

## Time Series of Cumulative Ret (ret. over peers) of Top – Bottom Portfolios sorted on FAR Scores, Rel. OAS/rm, and Rel. OAS

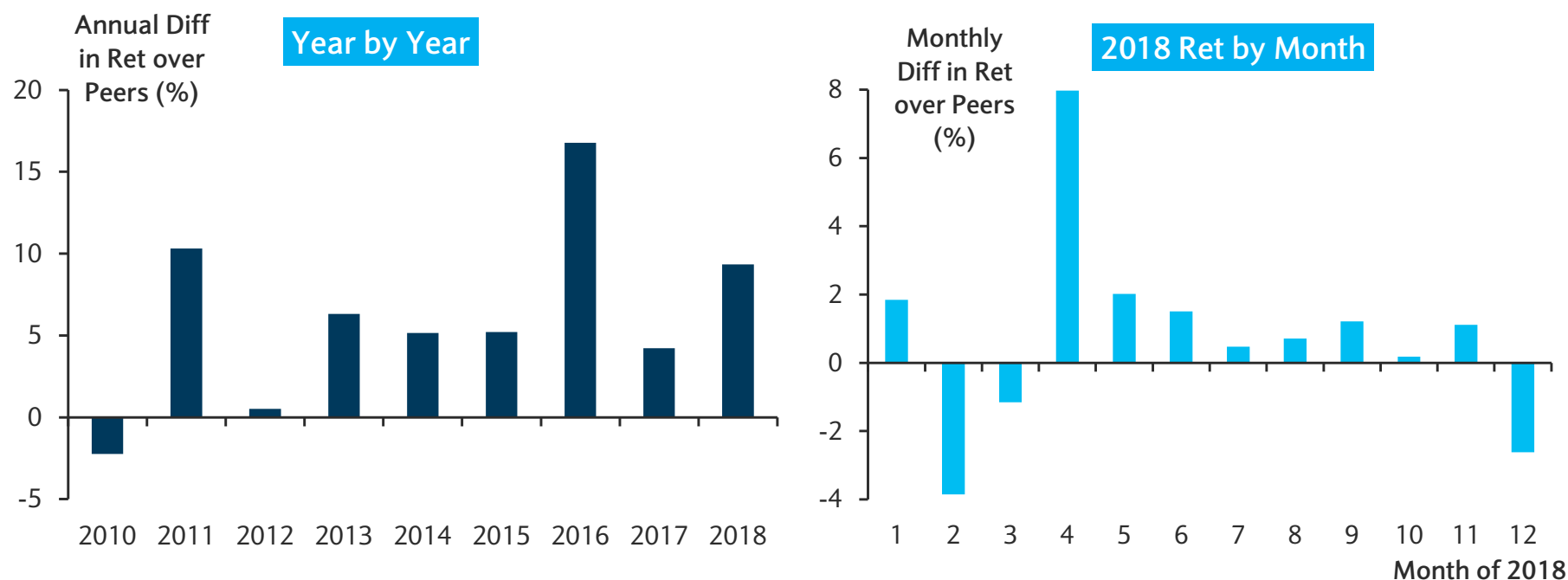


Source: Trace, Bloomberg, Barclays Research

# Top FAR Portfolio Generated Persistent Outperformance

- The Top – Bottom portfolio sorted on FAR scores generated positive diff in ret over peers in all years except 2010, which was a partial year

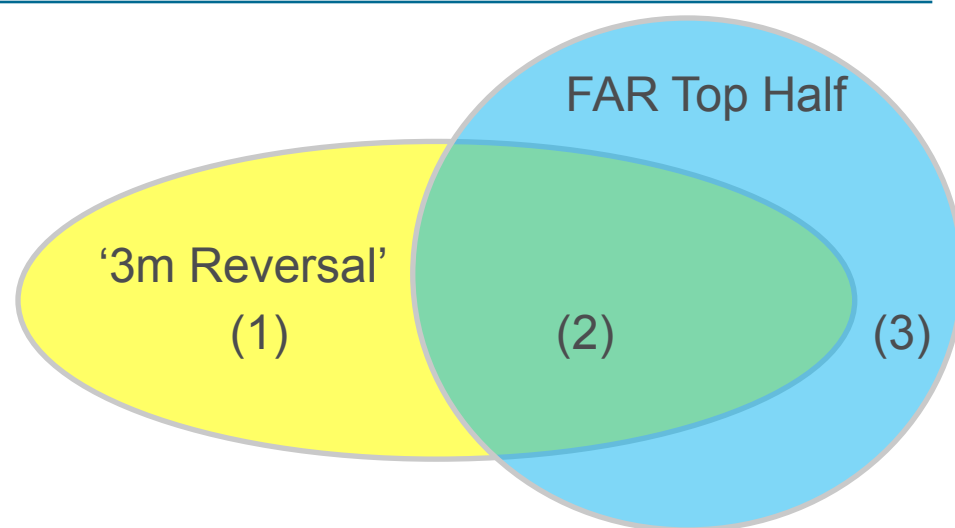
## Diff. in Ret over Peers of Top – Bottom Portfolio sorted on FAR Score Year-by-Year and 2018 Month-by-Month



Source: Trace, Bloomberg, Barclays Research

# What is the value of FAR Scores given '3m Reversal'?

- FAR scores are useful in
  - ✓ Distinguishing better performing FAs within the '3m Reversal' strategy
  - ✓ Identifying profitable FAs not included in the '3m Reversal' strategy



Ret over peers in Sub-Samples (Jul. 2010 - Dec. 2018)			
Sub-sample	(1)	(2)	(3)
	In '3m Reversal' exclusively	In both '3m Reversal' and FAR top half	In FAR top half exclusively
Avg. Ret over peers (%/m)	0.53	1.27	1.72
Std. Dev. (%/m)	5.82	7.47	9.36
t-stat	3.08	5.8	3.84
1st Quartile	-1.3	-0.97	-2.04
Median	0.14	0.57	0.91
3rd Quartile	1.81	2.44	4.82
# of monthly obs.	1155	1163	404

T-tests of Avg Rets being equal in sub-samples		
(Jul. 2010 - Dec. 2018)		
Test	t-stat	p-value
Avg(1)=Avg(2)	2.66	0.008
Avg(1)=Avg(3)	2.40	0.017
Avg(2)=Avg(3)	0.87	0.382

Source: Trace, Bloomberg, Barclays Research

## Key takeaways

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- ✓ FAR scores rank fallen angels on their expected reversal magnitude in the subsequent month
- ✓ FAR scores incorporate volume dynamics and identification of the stage of the reversion cycle of the fallen angel bonds and offer more flexibility than the '3m Reversal' strategy
- ✓ In July 2010 – Oct. 2018, the top half portfolio with higher FAR scores had higher return over peers in the subsequent months than the bottom half portfolio with lower FAR scores. The Inf. Ratio of top half over bottom half is 0.73
- ✓ Such outperformance of bonds with high FAR scores is persistent through time
- ✓ FAR scores can be used to enhance the '3m Reversal' strategy

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