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# Scorecard for Rates Carry in Global Markets: GRACE (Global Rate Adjusted Carry)

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# GRACE Scorecard

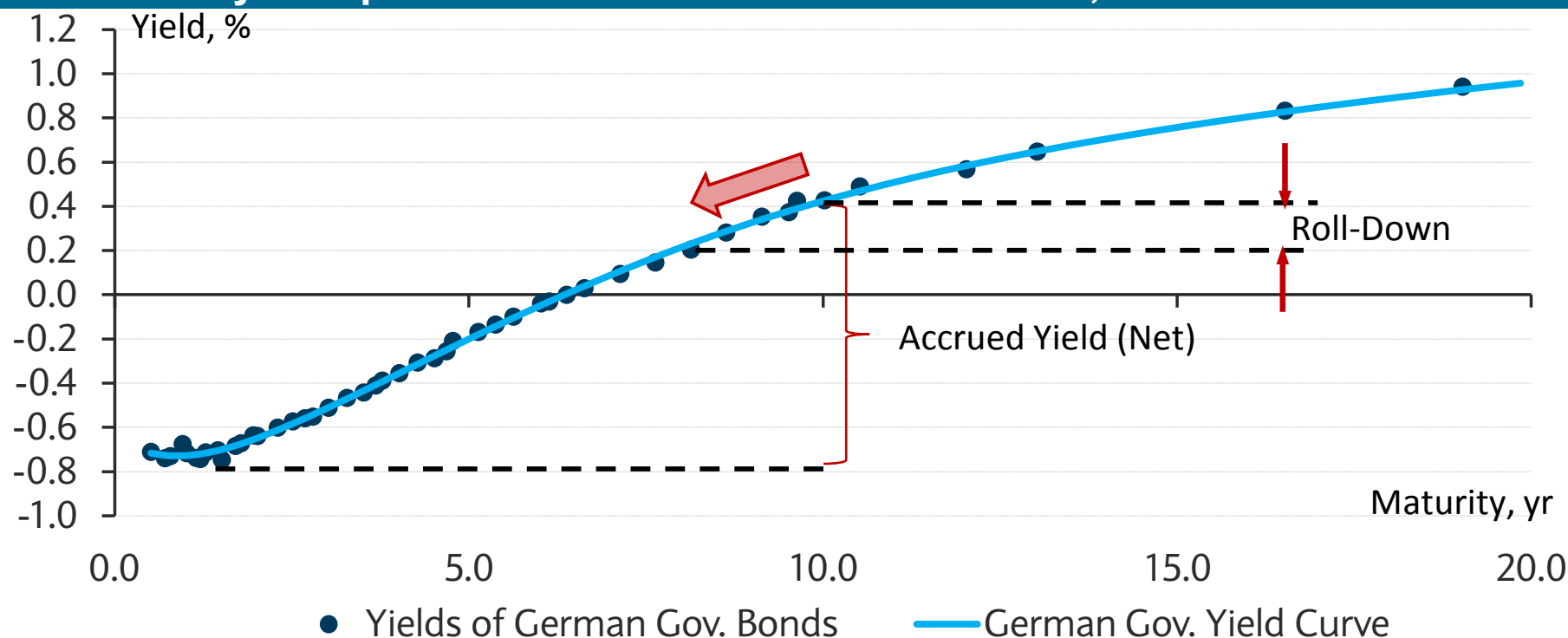
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- We introduce Global Rate Adjusted Carry (GRACE) Scorecard
- GRACE is a systematic framework designed to identify bonds with relatively high carry across global treasury markets
- The framework is based on our previous research, please see:
  - [Carry Strategies in Global Rates Markets, Barclays Research](#), 14 June 2017
- GRACE carry measure is calculated net of funding and adjusted for expected changes in rates
- GRACE is normalised for bond duration
- We will make GRACE bond-level scores available to clients on a regular basis

# Government Bond Carry

- We define *carry* as bond's return earned when yield curve does NOT change
- There are two components to consider: *accrued yield* and *roll-down*
  - Accrued yield is the interest accrued over time (e.g. bond yield)
  - Roll-down is the return earned as maturity declines
  - Roll-down is proportional to bond's duration and slope of the curve

## Carry Components: German Government Curve, 29 December 2017

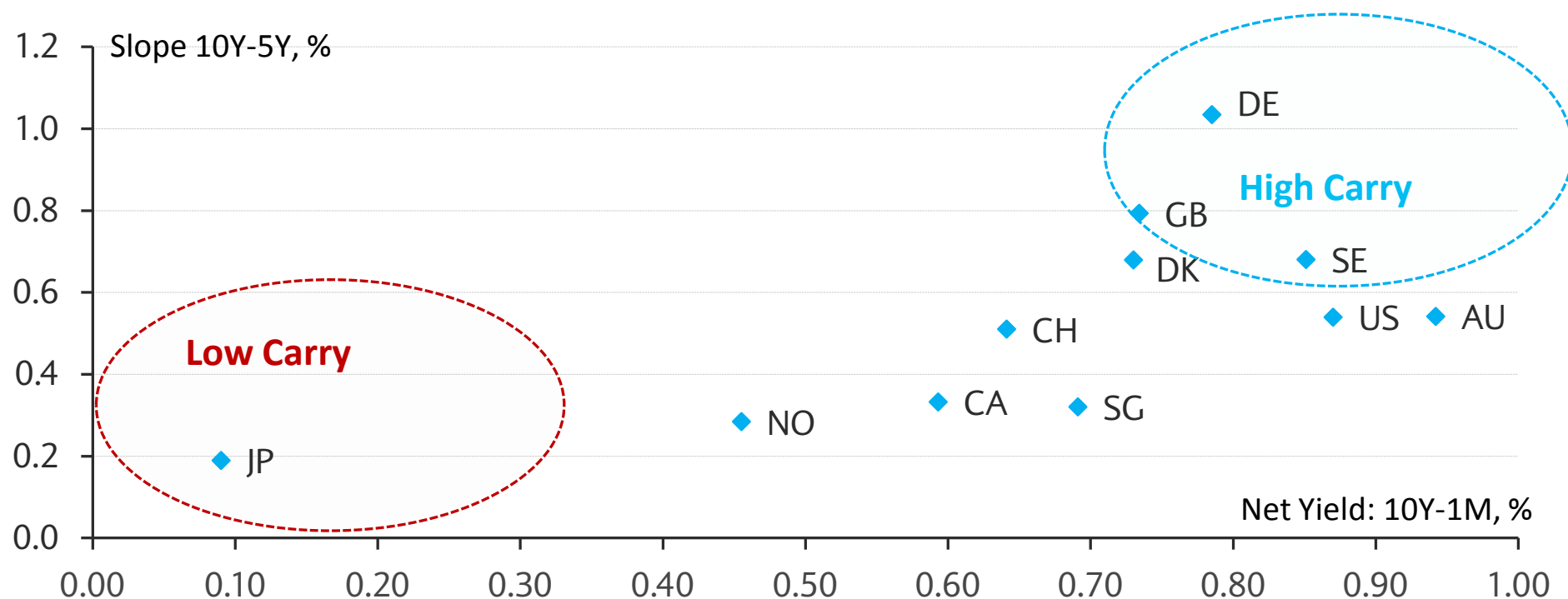


Source: Barclays Research  
See [Carry Strategies in Global Rates Markets, Barclays Research](#), 14 June 2017

# Carry Across G11 Markets

- Bond carry varies across government bond markets
- We include G11 Markets - ISO Codes: US, DE, JP, GB, CA, SE, AU, SG, NO, DK, CH
- Low yielding markets sometimes have relatively high carry when FX-hedged or unfunded
  - High carry: Germany, Sweden, UK
  - Low carry: Japan (flat curve and low net yield)

## Net Yields and Slopes Across Global Markets, 29 December 2017



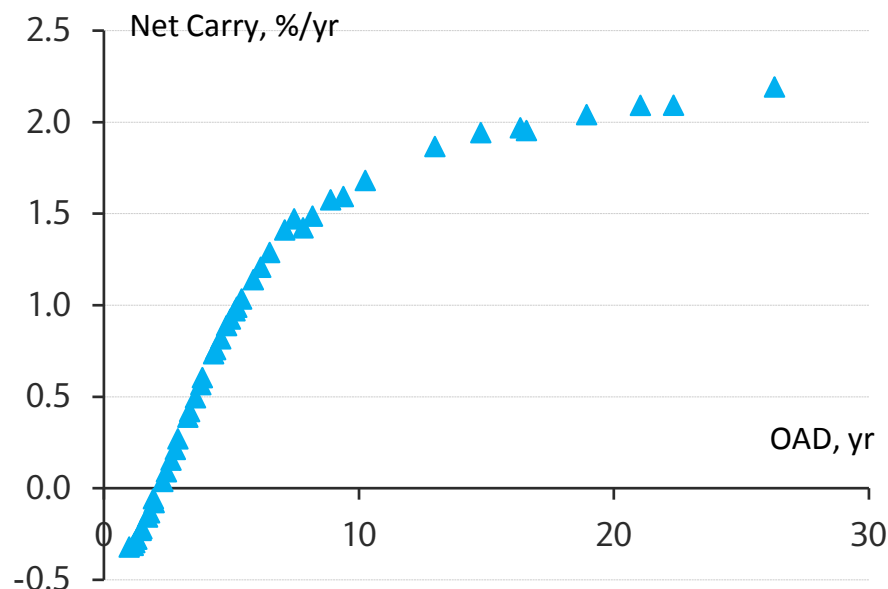
Source: Barclays Research

# Single Markets: Net Carry

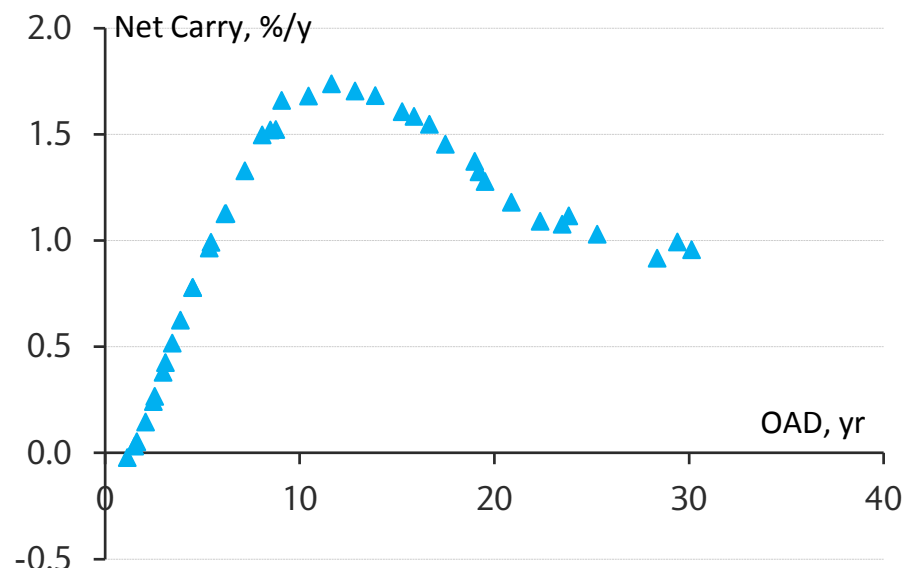
- We calculate bond carry by re-pricing individual bonds in each of the G11 markets
  - Bonds are priced using fitted curves
  - Curves are kept unchanged in the calculation period, while bond maturity shortens
  - Bond carry depends on duration and curve slope: it can decrease if slope flattens
    - Germany: carry increases with bond duration
    - UK: carry is bell-shaped as curve flattens at longer maturities

## Bond Carry (GB, DE) as Function of Duration, 29 December 2017

### German Govt. Bonds



### UK Govt. Bonds (GILTS)

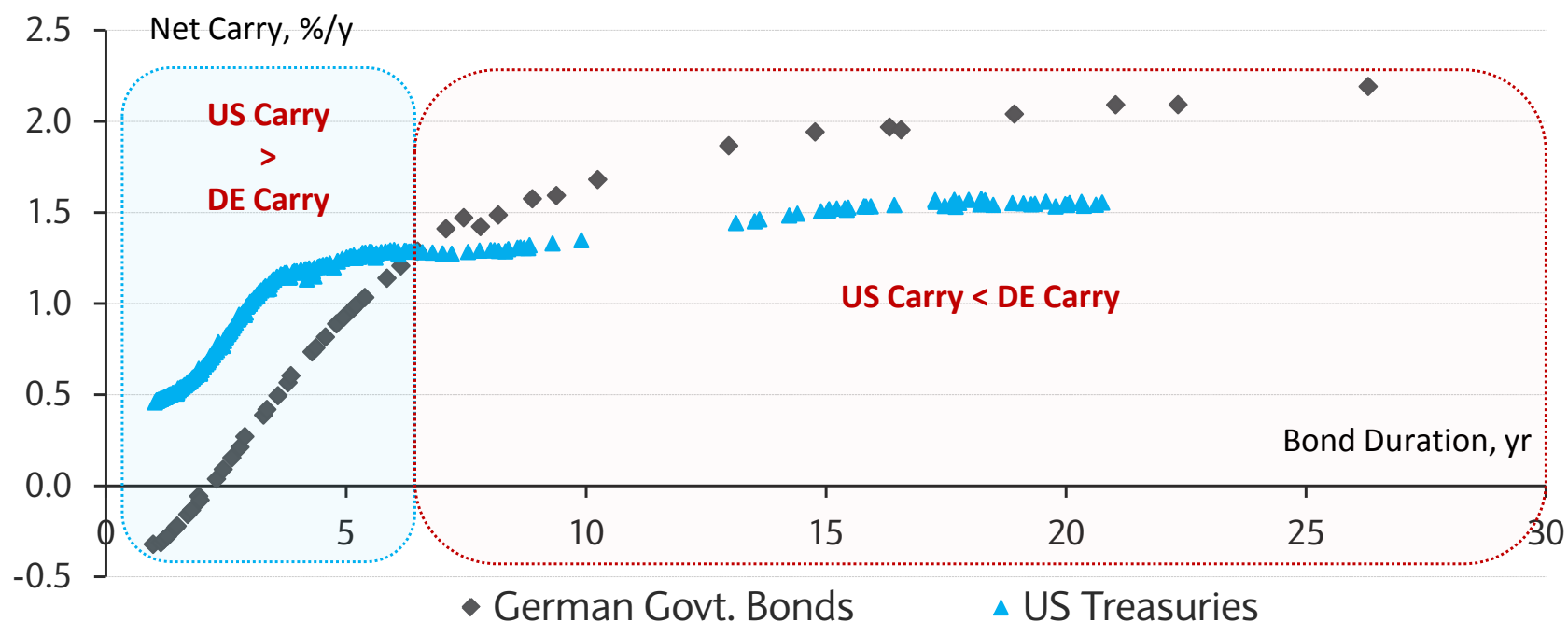


Source: Barclays Research

# Single Markets: Net Carry (cont.)

- Carry ranking of G11 markets can vary across different maturities
  - => Countries selected into “high carry portfolios” can be different for different maturity buckets
- Example: net carry of US and DE government bonds:
  - US Treasuries have higher net carry for shorter durations (1-7 years)
  - German bonds have higher carry for longer durations (7 years and higher)

## Net Carry of US and DE Bonds, 29 December 2017



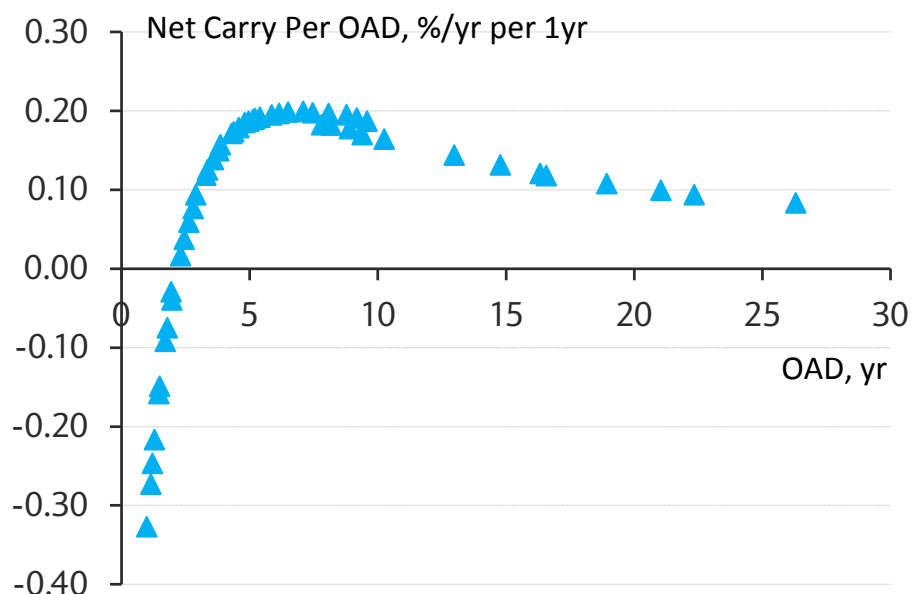
Source: Barclays Research

# Single Markets: Net Carry Per OAD

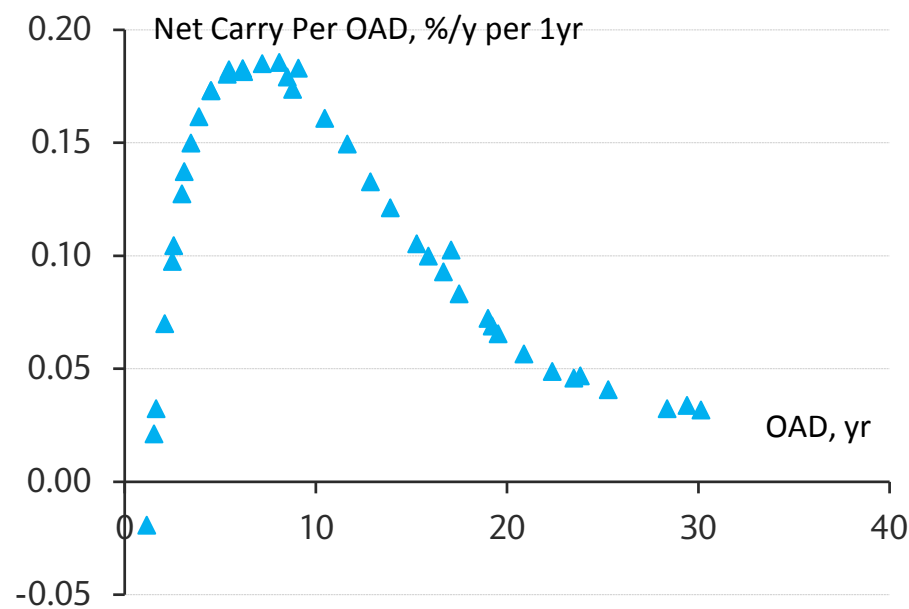
- Net Carry Per OAD is a carry measure per unit of duration exposure
  - Calculated as Net Carry divided by bond's OAD
  - Carry Per OAD depends on duration and curve slope
  - Often, net carry per OAD reaches maximum at a certain duration point
    - Germany and UK: carry per OAD reaches maximum around 7yr

## Bond Carry per OAD: Germany and UK, 29 December 2017

### German Govt. Bonds



### UK Govt. Bonds (GILTS)

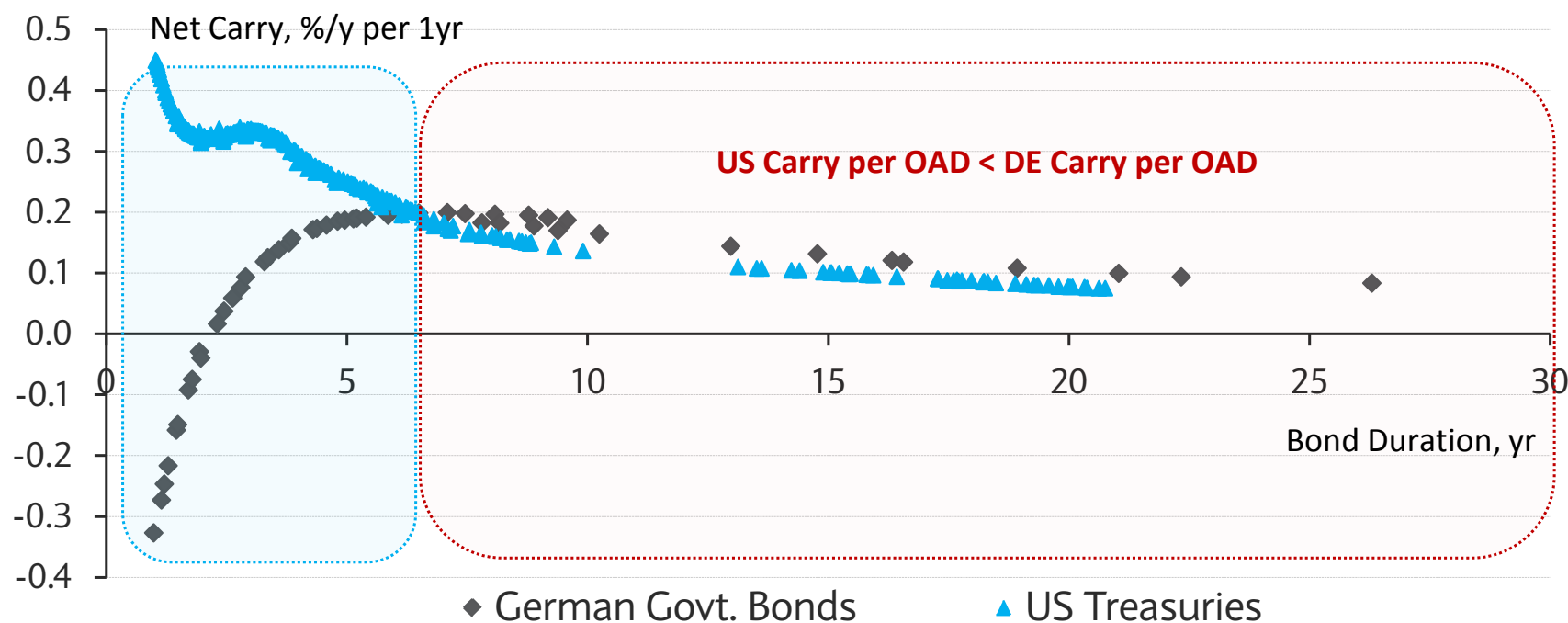


Source: Barclays Research

# Single Markets: Net Carry Per OAD (cont.)

- Example: net carry per OAD of US Treasuries and German government bonds
  - US Treasuries have higher carry per OAD for shorter durations: 1-7 years
  - German bonds have higher carry per OAD for longer durations: 7+ years
  - The difference between the two markets is more pronounced for shorter maturity bonds

## Net Carry Per OAD of US Treasuries and German Govt. Bonds, 29 December 2017



Source: Barclays Research



# Country Carry Ranking Across Different Maturities

- Country carry ranking can vary across maturity buckets
  - We rank G11 markets by Net Carry and Net Carry Per OAD
  - In each of the five maturity buckets: 3yr, 3-5yr, 5-7yr, 7-10yr, and 10yr+
- Variation in ranks => Examples: DE, DK, US, GB

Country Carry Ranks Across Different Maturity Buckets, 29 December 2017											
Ranks by Net Carry						Ranks by Net Carry Per OAD					
Net Carry Ranks	1-3	3-5	5-7	7-10	10+	Net Carry Per OAD Ranks	1-3	3-5	5-7	7-10	10+
Top (Rank=1)	AU	US	US	DE	DE	Top (Rank=1)	AU	US	AU	AU	AU
2	US	AU	AU	AU	DK	2	US	AU	US	DE	DE
3	SG	SE	SE	GB	AU	3	SG	SG	DE	GB	SE
4	CA	SG	DE	DK	SE	4	CA	SE	SE	US	DK
5	SE	CA	GB	SE	US	5	NO	CA	GB	SE	SG
6	NO	DE	SG	US	GB	6	SE	NO	SG	DK	US
7	DK	GB	DK	SG	SG	7	CH	GB	DK	SG	GB
8	CH	DK	CA	CH	CH	8	DK	DE	CA	CA	CH
8	GB	NO	CH	CA	JP	8	GB	DK	CH	CH	CA
10	JP	CH	NO	NO	CA	10	JP	CH	NO	NO	JP
Btm (Rank=11)	DE	JP	JP	JP	-	Btm (Rank=11)	DE	JP	JP	JP	-

Source: Barclays Research

# Adjusted Carry – Taylor Rule

- Can changes in market rates be anticipated?
- Central banks use policy rates to steer the economy => which factors drive policy rates?

Taylor Rule Rate = Real Rate + CPI + a x Inflation Gap + b x Output Gap

## FED Rate vs. Taylor Rule Estimate



Source: Bloomberg

# Adjusted Carry – Variable Choice

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- Information on GDP growth comes in slowly and with a significant lag
- It might be better to use more forward-looking data
- We use several factors to derive unobservable “target rates” via a regression model:
  - Inflation rates
  - Purchasing managers indicators (PMI)
  - Equity markets (inverse wealth indices)
- Each month we calculate fitted (“target”) rates and compare them with market rates
- The adjustment is the difference between fitted and observed rates
- We assume adjustment inertia towards fitted rates

$$\text{Adjustment} = - \text{Rho} \times (\text{Target Rate} - \text{Observed Rate}) \times \text{Duration}$$

# Performance Results

- We pick top and bottom three countries by net carry/OAD in five maturity buckets
- Countries are equally weighted in GRACE portfolios;
- Maturity buckets (1-3, 3-5, 5-7, 7-10, 10+ years) are weighted by index weights
  - We use customised Global Treasury G11 Index (market weighted)
- Carry adjustment improves the performance only slightly

## Performance of GRACE Portfolios in Different Periods

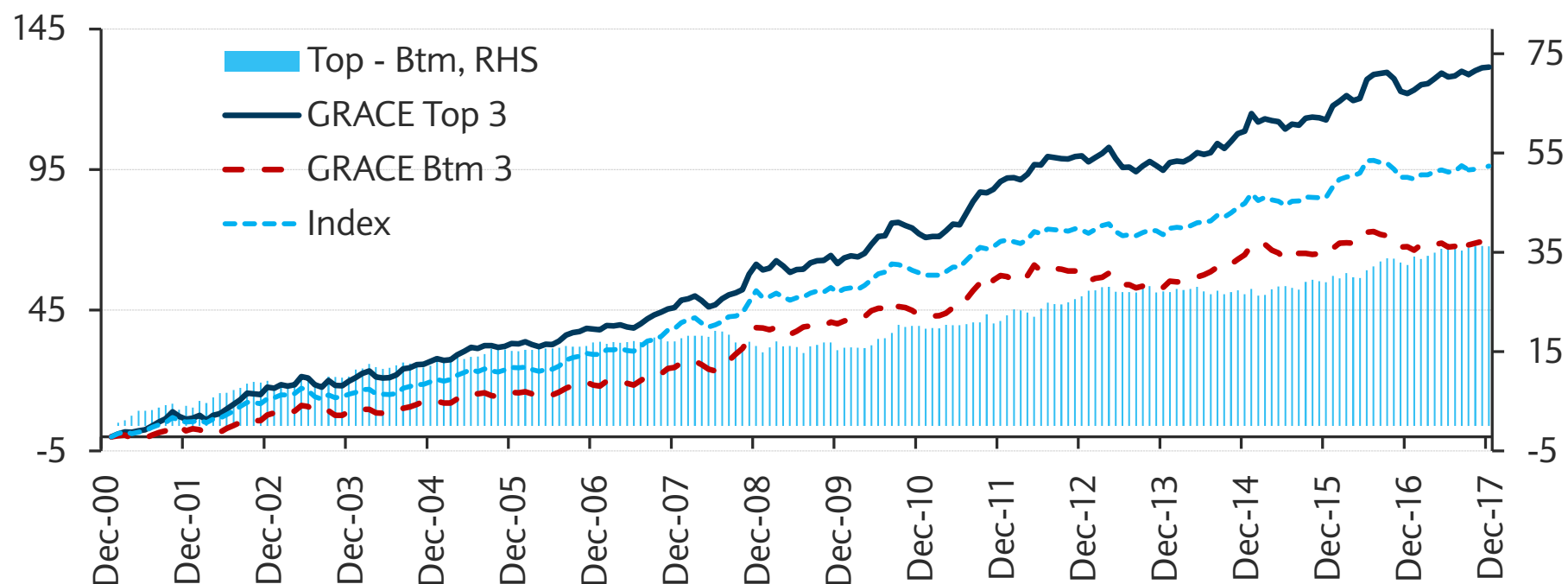
	No Adjustment			With Adjustment		
	Top 3	Btm 3	Top - Btm	Top 3	Btm 3	Top - Btm
<b>From Feb 2001 to Dec 2017</b>						
Avg. Return, %/yr	4.82	3.03	<b>1.79</b>	5.03	3.18	<b>1.85</b>
Volatility, %/yr	3.64	3.19	<b>2.00</b>	3.52	3.23	<b>1.98</b>
Sharpe / Inf Ratio	0.87	0.44	<b>0.89</b>	0.96	0.48	<b>0.93</b>
Market Beta	1.20	0.96	<b>0.24</b>	1.15	0.98	<b>0.17</b>
<b>From Feb 2001 to Jun 2007</b>						
Avg. Return, %/yr	5.20	2.64	<b>2.56</b>	5.26	2.85	<b>2.42</b>
Volatility, %/yr	3.34	2.95	<b>1.69</b>	3.34	2.96	<b>1.68</b>
Sharpe / Inf Ratio	0.67	-0.11	<b>1.52</b>	0.68	-0.05	<b>1.43</b>
Market Beta	1.15	0.94	<b>0.21</b>	1.15	0.95	<b>0.20</b>
<b>From Jul 2007 to Dec 2017</b>						
Avg. Return, %/yr	4.59	3.27	<b>1.31</b>	4.96	3.50	<b>1.46</b>
Volatility, %/yr	3.82	3.31	<b>2.17</b>	3.61	3.36	<b>2.14</b>
Sharpe / Inf Ratio	0.99	0.74	<b>0.61</b>	1.14	0.79	<b>0.68</b>
Market Beta	1.22	0.97	<b>0.25</b>	1.15	1.00	<b>0.15</b>

Source: Bloomberg Barclays Indices, Barclays Research

# Performance Results (cont.)

- We plot cumulative returns of Top and Bottom GRACE portfolios and the index
- We also plot cumulative outperformance of Top over Bottom portfolios
- The outperformance seems to be persistent over time

## Cumulative Returns of GRACE Portfolios and the Index



Source: Bloomberg Barclays Indices, Barclays Research

# Performance Results – By Maturity

- We report the performance of GRACE strategy (Top 3 over Bottom 3) in different maturity buckets
- GRACE portfolios equally weight top (bottom) countries sorted by Adjusted Carry per OAD
- Combined portfolios include all maturity buckets weighed by respective weights of the index
- GRACE strategy performed reasonably well across all maturity sectors
- Information ratio of the combined GRACE strategy is 0.93

## Performance of GRACE Portfolios by Maturity Bucket, Feb 2001 – Dec 2017

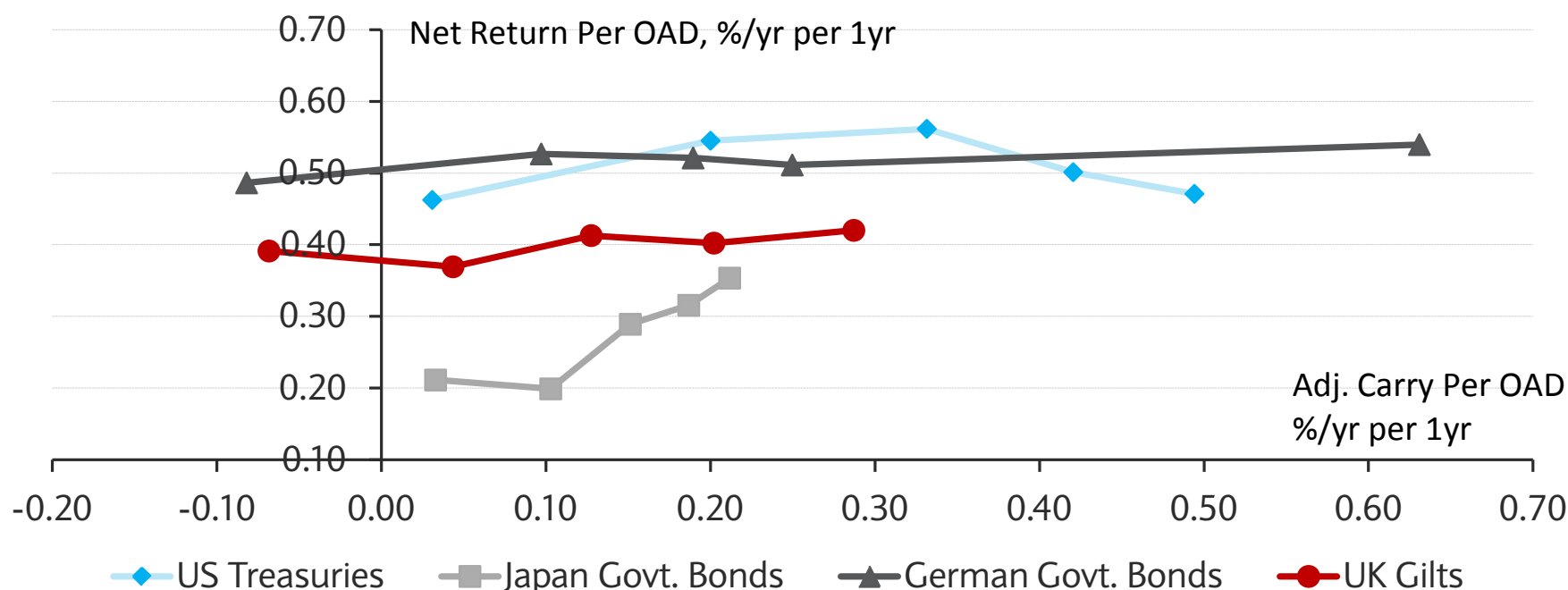
	Avg. Return, %/yr	Volatility, %/yr	Information Ratio	Market Beta to Index Buckets
1-3	0.54	0.87	0.62	-0.04
3-5	1.48	1.81	0.82	0.34
5-7	1.63	2.21	0.74	0.28
7-10	1.86	2.85	0.65	0.26
10+	3.67	4.40	0.84	0.15
<b>Combined</b>	<b>1.85</b>	<b>1.98</b>	<b>0.93</b>	<b>0.17</b>

Source: Bloomberg Barclays Indices, Barclays Research

# Carry and Bond Returns Within Individual Markets

- Does carry variation across bonds of a single market predict future performance?
  - Use Adjusted Carry per OAD to form quintile portfolios sorted by carry
  - Quintile portfolio returns net of funding per OAD
  - Net returns are calculated as USD-hedged returns in excess of USD ICE LIBOR 1 month
- Adjusted carry does not seem to predict future returns of bonds within a single market

## Adjusted Net Carry per OAD vs. Returns per OAD, Feb 2001 – Dec 2017

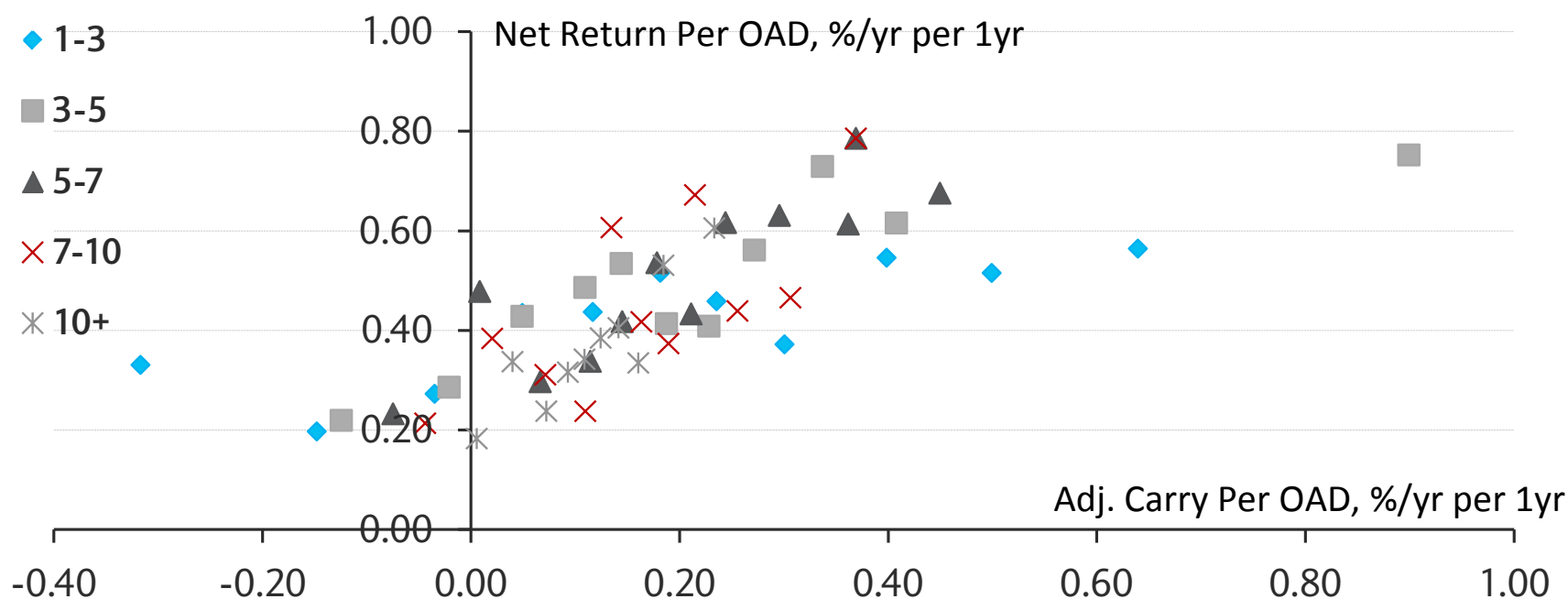


Source: Barclays Research

# Carry and Bond Returns Across Markets

- Does carry variation across markets predict future performance?
  - Calculate Adjusted Carry per OAD for each country / maturity bucket
  - Calculate net returns per OAD for each country / maturity bucket
  - Sort countries by carry separately within each maturity bucket
- Adjusted carry seems work well *across* markets

## Adjusted Net Carry per OAD vs. Returns per OAD, Feb 2001 – Dec 2017



Source: Barclays Research



# GRACE Conclusions

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- We present Global Rate Adjusted Carry (GRACE) scorecard, a framework designed to measure carry return of individual government bonds across different markets
- GRACE calculates carry per unit of duration adjusted for anticipated rate change
- Countries with higher GRACE measure tend to perform better than those with low GRACE in both absolute and risk-adjusted terms
- GRACE “validation” strategy goes long three markets with top carry (GRACE) and short three markets with bottom carry (GRACE)
  - The strategy has attractive risk-return characteristics
  - The strategy is moderately directional on returns of the global treasury market
- GRACE can be used for advanced beta strategies in government bonds
  - Can be used to filter investment universe
- Practical GRACE portfolios with turnover controls can be designed

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