

# Common Equity Factors in Corporate Bond Markets

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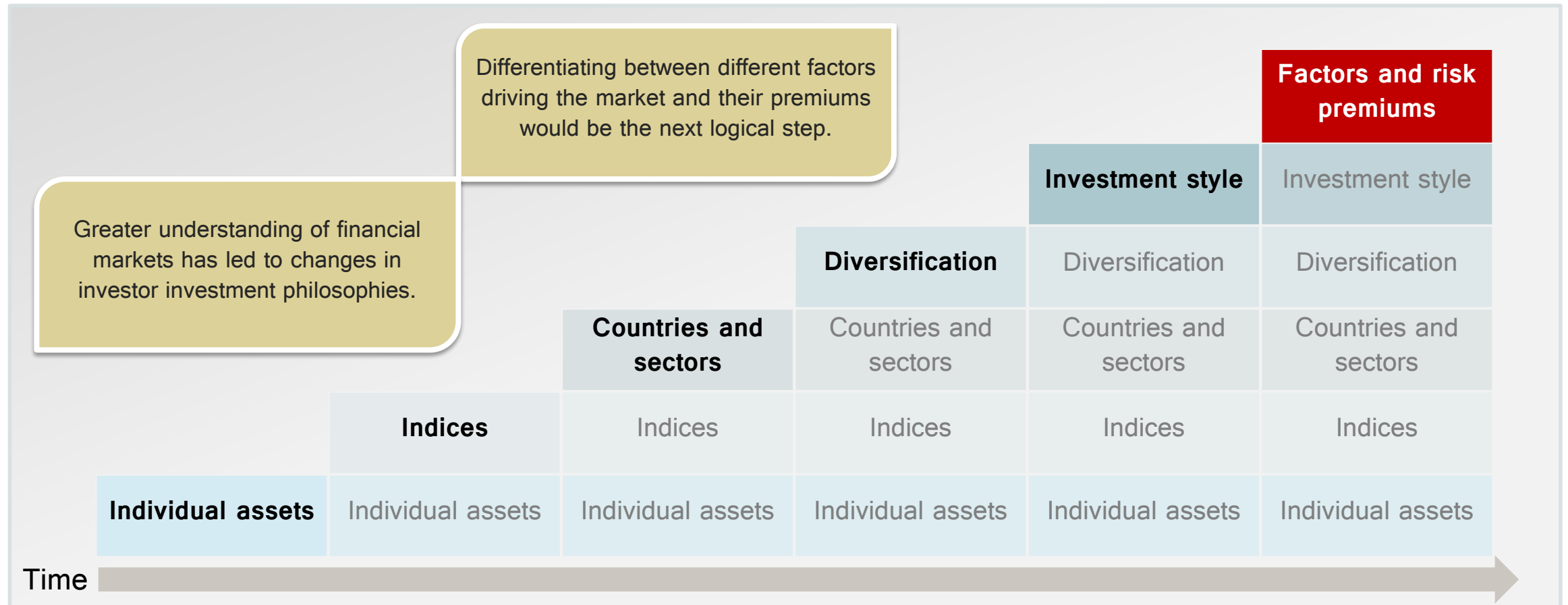
Northfield Seminar in Abu Dhabi, April 2019

The Deka logo is displayed in white text on a red background. It features a stylized icon of three vertical bars of increasing height to the left of the word "Deka".

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# Introduction I

## Evolution of Markets and Investors



# Introduction II

## Evolution of Portfolio Theory and Asset Pricing



### Modern Portfolio Theory (MPT) vs. Factor-based Approaches

‡ Optimal asset allocation is based on asset classes (Markowitz, 1952)

- Estimate return, „risk“ (standard deviation) & correlation -> **Diversification (optimal portfolios)**

‡ The first factor (Sharpe-Lintner-Mossin-Treynor, 1964)

- **Capital Asset Pricing Model (CAPM):** The market is the key risk factor (at least for equities)

$$E[R_i] - R_f = \beta_i^{\text{market}} (E[R_{\text{market}}] - R_f) \qquad \beta_i^{\text{market}} = \frac{\text{cov}(R_i, R_{\text{market}})}{\sigma^2(R_{\text{market}})}$$

‡ Additions to the market factor (Ross, 1976)

- **Arbitrage Pricing Theory (APT)**  $R_i = \alpha_i + \sum_{j=1}^{n_\theta} \beta_i^j \theta_j + \epsilon_i$
- A factor can be any characteristic that explains a security's risk and/or return component

‡ „Factor zoo“ (Cochrane, 2011)

- Plethora of extensive studies for equity markets (Harvey et al., 2015, count > **300 equity factors**)

# Introduction III

## Factor-based Investing: A Revolution?



### „Old“ Asset Class Thinking vs. „New“ Factor-based Thinking

- ‡ Analysis of the Norwegian Sovereign Wealth Fund (Ang et al., 2009)
  - A substantial part of **active returns can be explained** by exposure to risk factors
  - **Recommendation** to allocate to **risk factors** instead of asset classes
  - „Alpha“ vs. „Beta“ debate
- ‡ Index providers started to offer factor-based products (**primarily for equities**)
  - Russell, MSCI, S&P Dow Jones, etc.
  - Exotic-, Alternative-, Strategic-, Scientific-, **Smart-Beta**, Style Premia, Quant factor investing etc.
- ‡ Factor investing
  - Factor risk premiums are earned through **bearing risk** which other investors wish to avoid
  - **Risk-based vs. return-based** factor strategies
  - Systematic investment approach which takes positions **away from market capitalization weights**

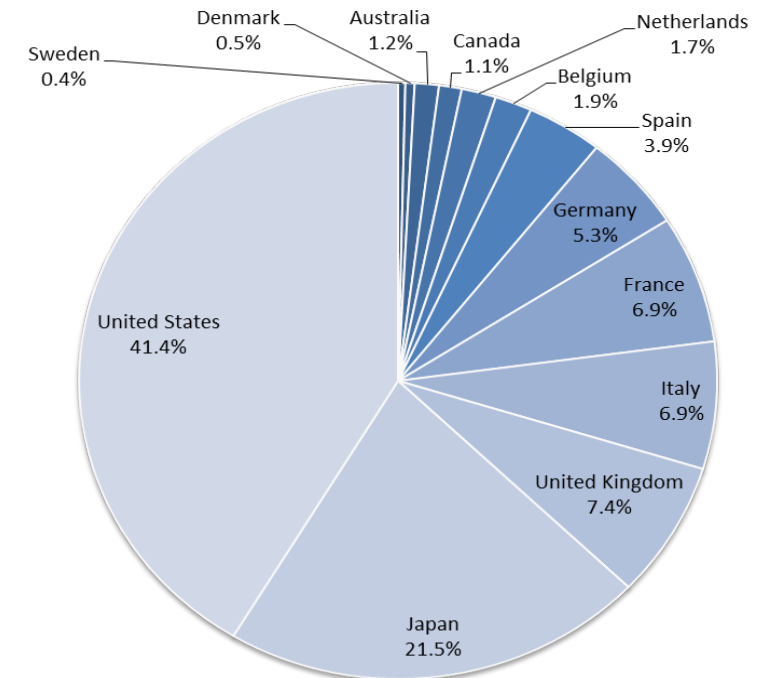
# Motivation I

## Shortcomings of Typical Bond Indices



### Deficits and Shortcomings

- ‡ Motivation for **factor-based solutions** comes from shortcomings of bond indices
- ‡ Greatest **deficits** are:
  - Market-capitalization weighting **suboptimal for diversification** and unwanted risk-exposures (e.g., PIIGS)
  - Lack of **investability** and **replicability**
    - **Benchmarks** usually include a **large number of bonds**
    - Many bonds are **not sufficiently liquid**
- ‡ **What do we actually need?**
  - **Investable solutions**
  - **Better diversification**
  - **Better risk-exposures**



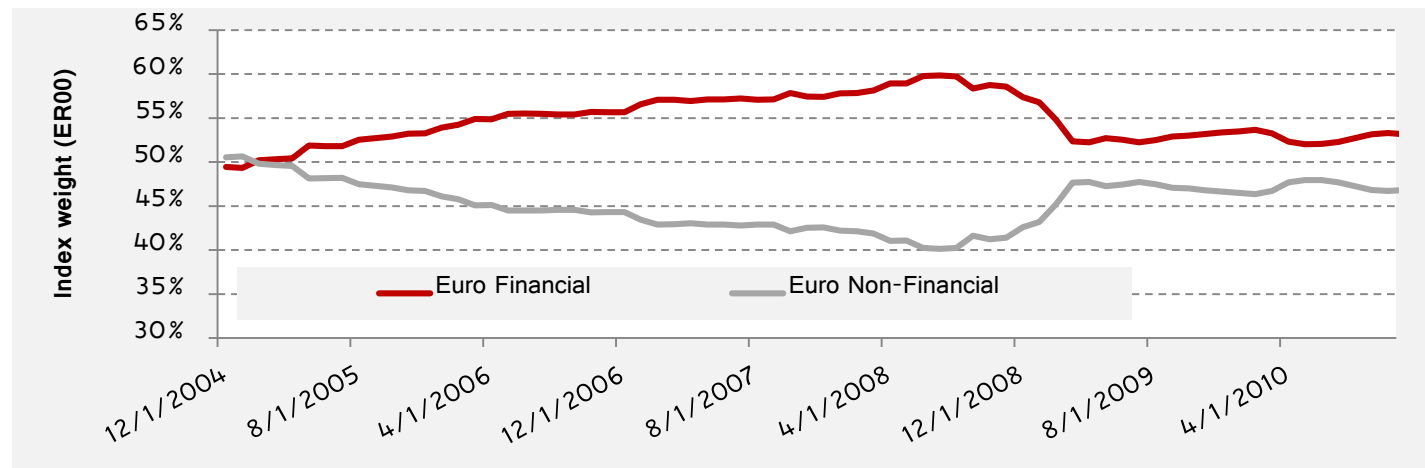
# Motivation II

## Market-capitalization Weighting



### Equities vs. Bonds

- ‡ Equities: Market-capitalization weighting = Most valuable company has greatest weight
- ‡ Bonds: Market-capitalization weighting = Largest borrower has greatest weight
- ‡ Issuers with highest amount outstanding constitute greatest portion of the index
- ‡ Index funds are forced to buy bonds of these issuers and drive up prices
- ‡ Therefore, yields of these bonds are declining
  - As a result, these issuers can borrow money at even lower rates



# Motivation III

## Possible Solutions



### Different factor approaches

- Factors explain the main risk and return characteristics of securities -> harvesting of long term risk premia
- ‡ Similar factors are combined into well-known factor clusters : **Size, Quality, Value and Momentum**
- ‡ There are essentially three implementation variations
  - ‡ Optimisation (factors with mid-frequent adjustments)
  - ‡ Restrictions (risk and return factors with fast adjustments)
  - ‡ Strategic benchmark (return factors with slow rate of change)

### Alternative to market capitalisation - factor clusters

<b>Size</b> Cluster 1 <i>Based on balanced allocation</i>	<b>Quality</b> Cluster 2 <i>Focus on solid issuers</i>
<b>Value</b> Cluster 3 <i>Focus on undervalued issuers and maximising regular returns</i>	<b>Momentum</b> Cluster 4 <i>Focus on issuers with positive performance (fundamentals, price, estimates, etc.)</i>



**Goal: Systematic, transparent, robust and uncorrelated portfolio composition**

# Data and Methodology I

What is a „good“ factor?



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## Risk premium or just data mining?

- ‡ Novy-Marx, R., „Predicting Anomaly Performance with Politics, the Weather, Global Warming, Sunspots and the Stars“, Journal of Financial Economics, 112, 137-146.
- ‡ According to Ang et al., 2009 and Amenc et al., 2012 a relevant factor should:
  - Exhibit significant explanatory power for cross-sectional returns (academic research)
  - Have exhibited significant premia that are expected to persist in the future
  - Be motivated by some economic intuition and/or behavioral explanation
  - Have return history available in non-U.S. countries and regions including drawdowns
  - Be implementable in liquid instruments



# Data and Methodology II

## Data



### Bank of America Merrill Lynch (BAML)

- ‡ Monthly data of all senior U.S. High Yield (HY) and Investment Grade (IG) corporate bonds
- ‡ Data from December 1996 to December 2016
- ‡ Excess returns over duration matched Treasuries
- ‡ Only publicly traded issuers
  - As factors are based on financial statement ratios and equity market data
- ‡ We eliminate securities that have different payout characteristics compared to standard senior coupon bonds (e.g., junior debt, puttable bonds, coco's...)
- ‡ 6-month lag prevents any forward looking bias (see Fama & French 1992, 1993, 2015)

# Data and Methodology III

## Portfolio Construction



### Single- and Multi-Factor Portfolios

- ‡ U.S. High Yield (HY) and U.S. Investment Grade (IG)
- ‡ Decile analysis (Jegadeesh and Titman, 1993 or Jostova et al. 2013)
- ‡ Equally-weighted single-factor portfolios

- $N$  is the number of unique issuers,  $M(n)$  is the total number of bonds corresponding to issuer  $n$
- The weight for each issuer is given by  $1/N$  and the weight for bond  $m$  of issuer  $n$  by

$$1/N \times 1/M(n) = \omega_{nm} \quad \text{Total weight is then given by: } \sum_{n=1}^N \sum_{m=1}^{M(n)} \omega_{nm} = 1$$

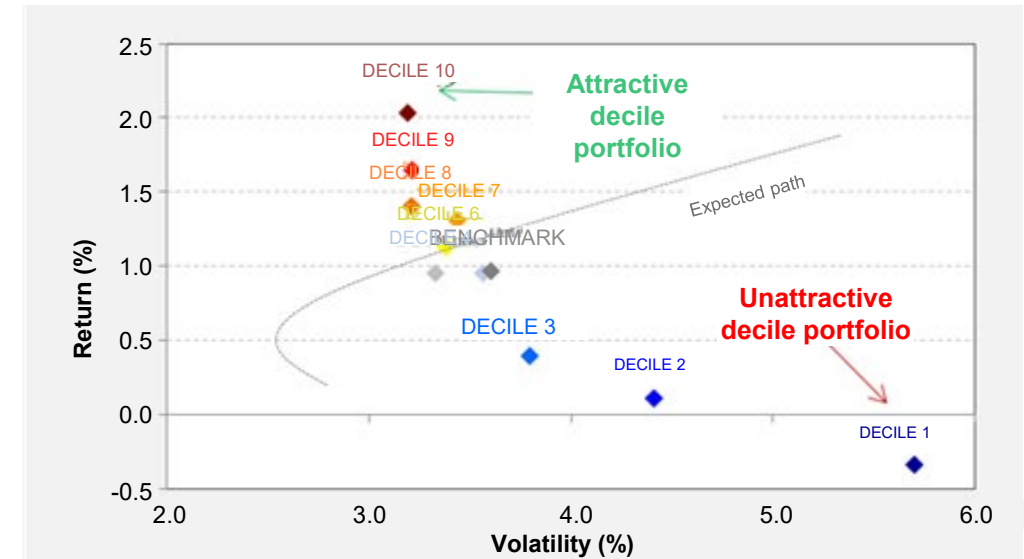
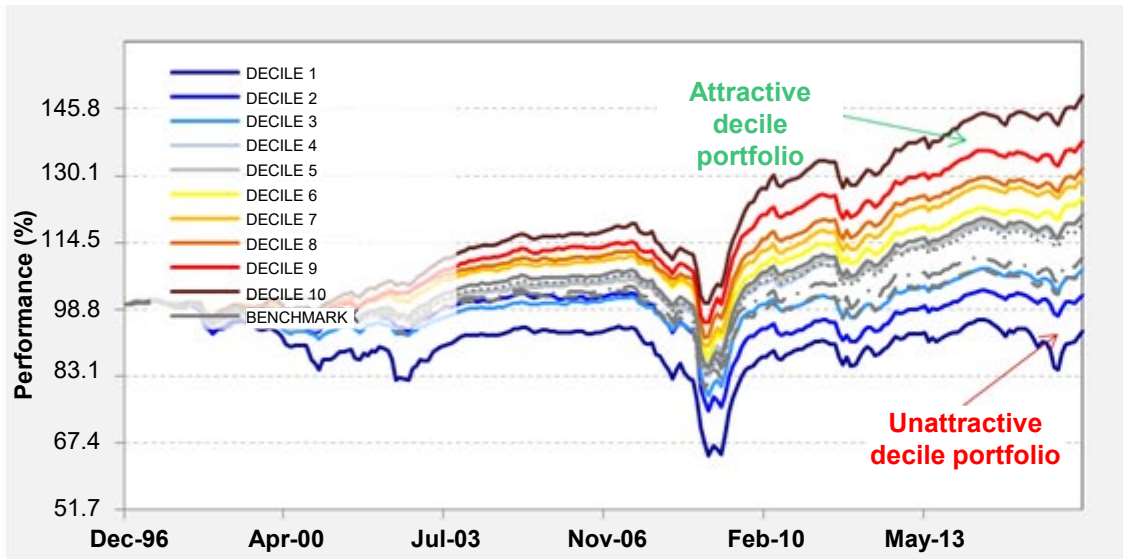
- ‡ Ensures that each decile accounts for 10% of the total weight
- ‡ Equally-weighted multi-factor portfolios (each factor weight = 16.67%)

# Data and Methodology IV

## How to find „good“ factors?



### Decile/Quintile analysis



- ‡ Universe is usually divided into 10 equal-sized decile portfolios
- ‡ Performance of the decile portfolios is compared
- ‡ Effects due to rating, duration, spread (and duration times spread [DTS]) biases are identified and eliminated

- ‡ Goal: Factors with risk-reward profiles that are orthogonal to the classical efficient frontier
- ‡ As a result, these factors offer higher returns for lower risk over the long term

# Related Literature I

## Factors in Equity Markets



### Well-known, Classic Factors

- ‡ **Value** (Basu, 1977; Fama and French 1992, 1993)
- ‡ **Size** (Banz, 1981; Fama and French 1992, 1993)
- ‡ **Profitability** (Haugen and Baker, 1996; Nowy-Marx 2013; Fama and French 2015)
- ‡ **Investment** (Titman et al., 2004; Watanabe et al., 2013; Fama and French 2015)
- ‡ **Momentum** (Jegadeesh and Titman, 1993; Asness et al., 2013)
- ‡ **Low-Beta** (Black et al., 1972; Frazzini and Pedersen, 2014)

➤ **Why should equity factors work in corporate bond markets?**

- ‡ A bridge between equities and bonds: Structural credit risk models (Merton, 1974)

# Related Literature II

## Option Pricing Theory



### Black and Scholes (1973)

- ‡ To relate equity and debt in the Merton model, **equity is valued as a call option** on the value of assets  $V$ 
  - Applying the put-call parity yields the value of debt  $D$  and equity  $E$  as  **$E + D = V$** , where

$$E_t = Call_{BS}(V_t, F, \mu, T - t, \sigma)$$

$$D_t = P_t - Put_{BS}(V_t, F, \mu, T - t, \sigma)$$

- ‡  $P$  represents the **nominal value of liabilities**.
- ‡ According to the model the spread between risky credit debt and risk-free debt is the value of the **put option**.

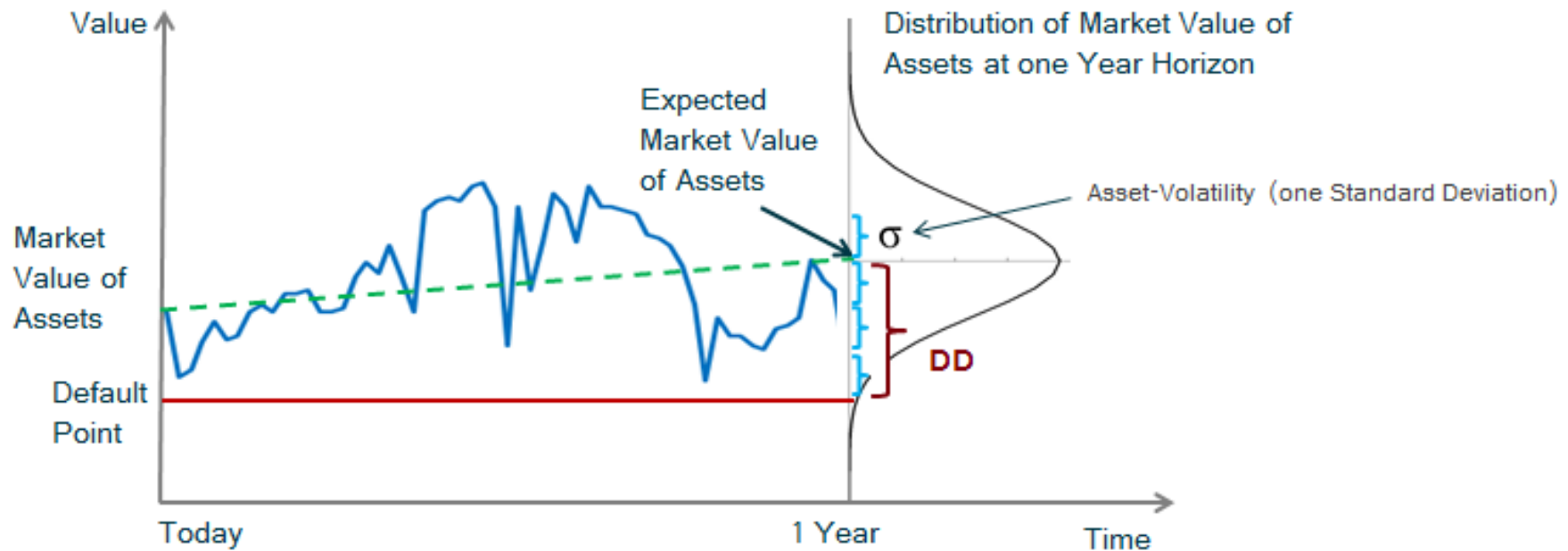
# Related Literature III

## The Distance-To-Default Measure (Merton, 1974)



### Interaction Between Asset Volatility and Equity/Bond Prices

‡ **Default risk** is the uncertainty surrounding a firm's ability to service debts and obligations



**DD** = Number of standard deviations the market value of assets is away from the default point

# Analyzed Factors

## Factor Definitions



### Original Equity Factor Definitions

‡ Size  $Size_t = SO_t \times PPS_t$

**Size** (Banz, 1981)

*Small companies outperform large companies*

Focus on “small” companies

‡ Value  $Value_t = \frac{BE_{t-6}}{ME_t}$

**Low-Beta** (Haugen and Heins, 1972)

*Risks are not adequately rewarded*

Focus on issuers with “low” credit risk

‡ Profitability  $OP_t = \frac{EBT_{t-6}}{BE_{t-6}}$

**Investment** (Fama and French, 2015)

*Companies are often poor investors*

Focus on issuers with “little” investment

**Value** (Basu, 1977)

*Undervalued issuers provide better returns*

Focus on “low-priced” issuers

‡ Investment  $Inv_t = \frac{TA_{t-6} - TA_{t-18}}{TA_{t-18}}$

**Momentum** (Jegadeesh and Titman, 1993)

*Yesterday's winners → Tomorrow's winners*

Focus on issuers with “good” performance

‡ Momentum  $Momentum_t = \frac{EP_t}{EP_{t-12}} - \frac{EQMKT_t}{EQMKT_{t-12}}$

**Profitability** (Fama and French, 2015)

*Benefits from stable cash-flow quality and stability*

Focus on “solid” issuers

‡ Low-Beta  $Beta_t = \frac{cov(r_s, r_m)}{var(r_m)}$

# Asset Pricing Tests

## Excess returns and risk-adjusted returns

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### Time Series Regressions

1) 
$$SR_i = \frac{\tau_i}{\sigma_i}$$

2) 
$$R_{it} = \alpha_{it} + \beta_i DEF_t + \varepsilon_{it}$$

3) 
$$R_{it} = \alpha_{it} + \beta_{i1}MKT_t + \beta_{i2}SMB_t + \beta_{i3}HML_t + \beta_{i4}UMD_t + \beta_{i5}TERM_t + \\ \beta_{i6}DEF_t + \beta_{i7}BValue_t + \beta_{i8}BMomentum_t + \beta_{i9}BABC B_t + \varepsilon_{it}$$

- The data on MKT, SMB, HML, RMW, and CMA is obtained from Kenneth French's website: [http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data\\_library.html](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html).
- Data on BValue, BMomentum and BABC B is obtained from AQR's website: <https://www.aqr.com/library/data-sets>.



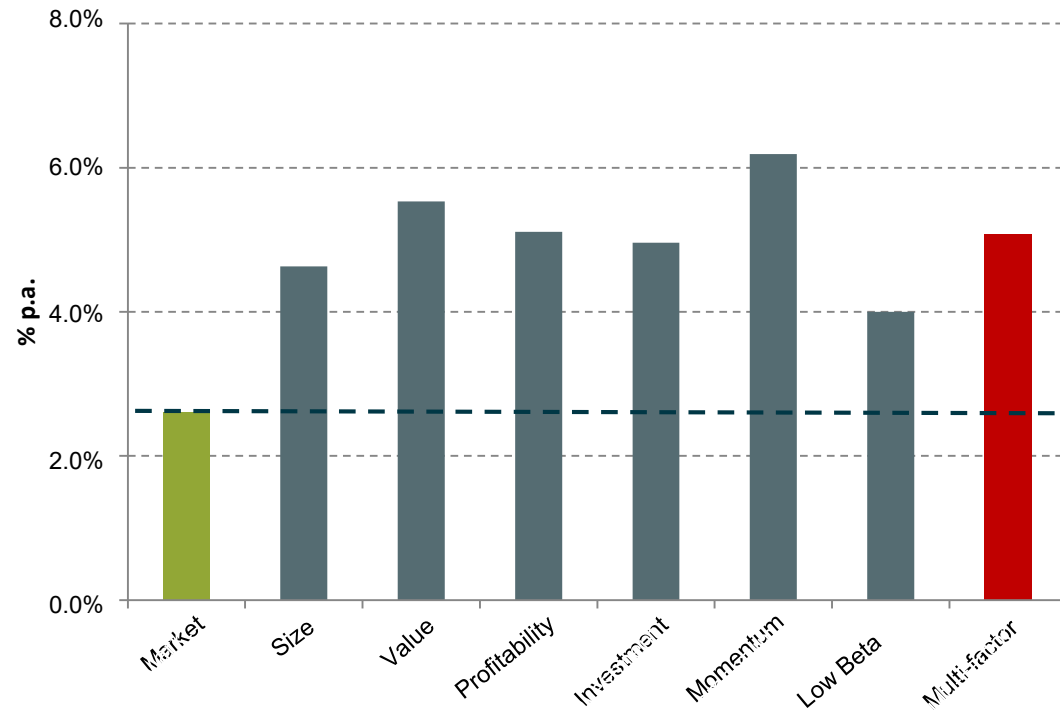
# Empirical Results I

## Excess Returns

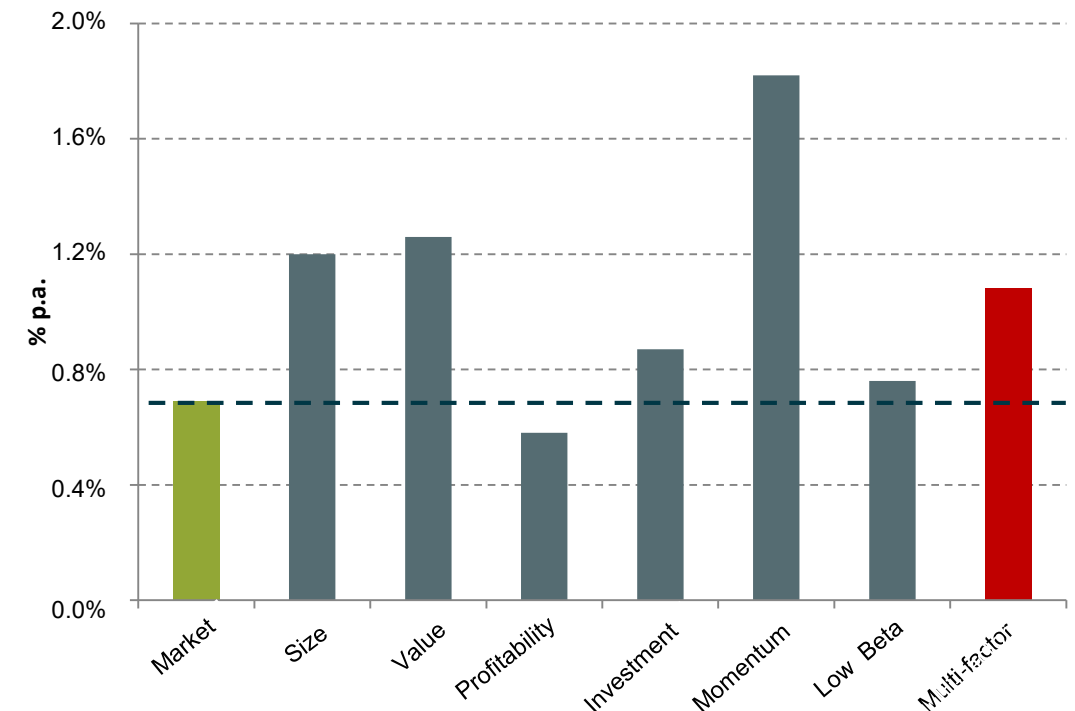


### Academic findings\*

#### U.S. HY Factor Premium



#### U.S. IG Factor Premium



\* Data and results from December 1996 – December 2016

Source: Extending Fama-French Factors to Corporate Bond Markets: Bektić, Wenzler, Wegener, Schiereck and Spielmann, 2018, Journal of Portfolio Management, forthcoming

Source: Common Equity Factors in Corporate Bond Markets: Bektić, Neugebauer, Wegener and Wenzler, 2017, Factor Investing, Elsevier.

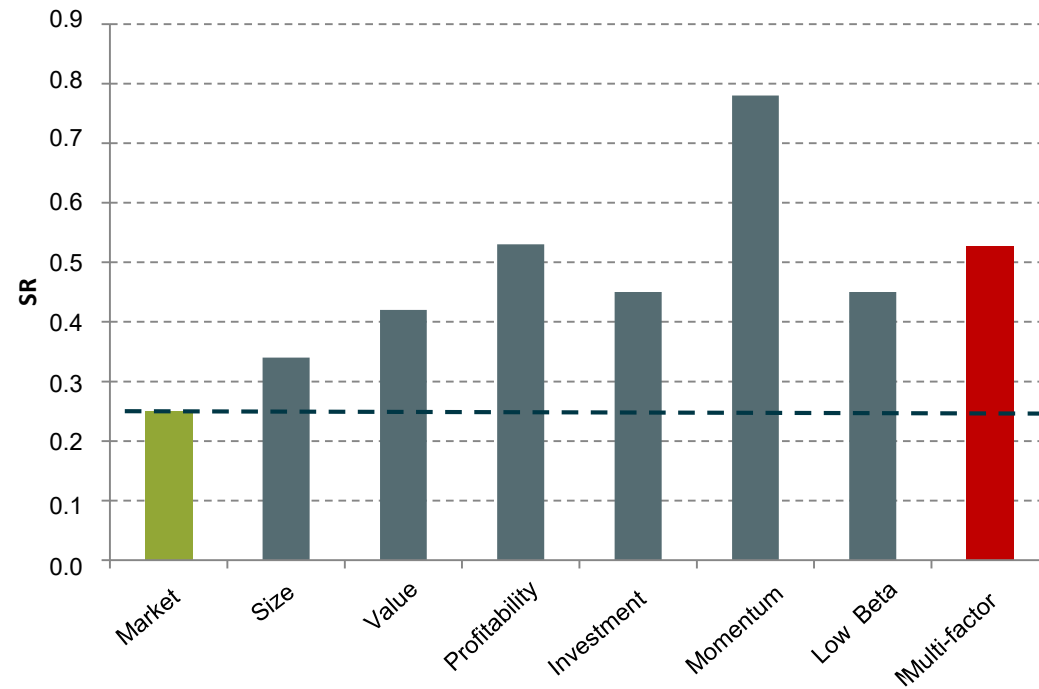
# Empirical Results II

## Risk-adjusted Returns

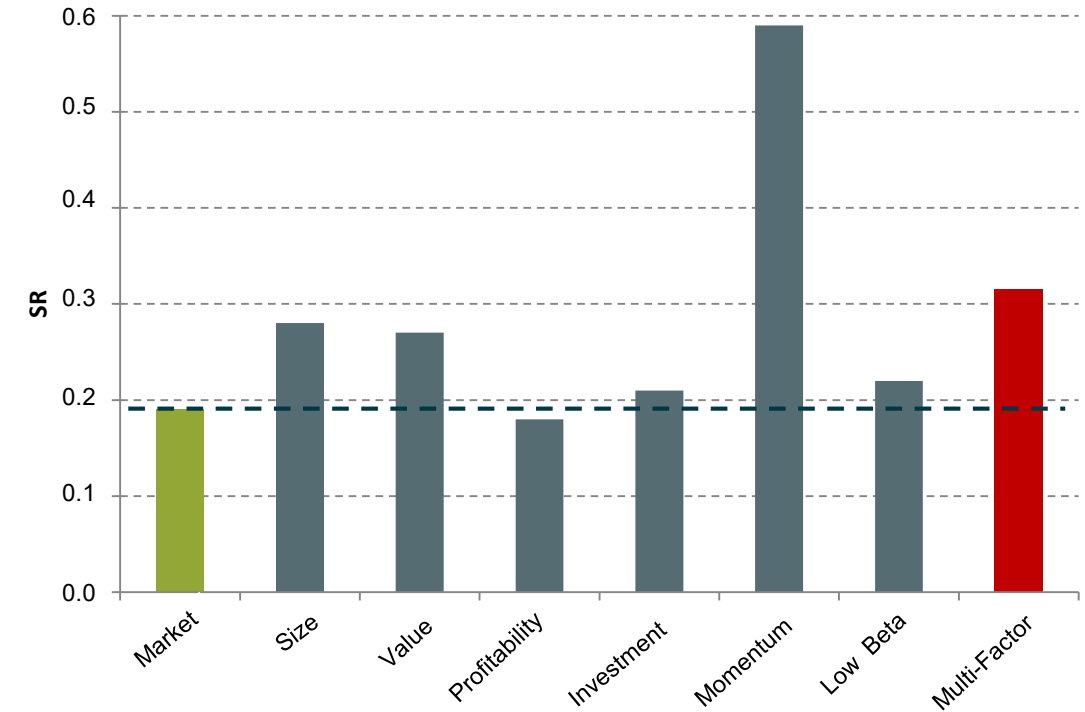


### Academic findings\*

#### U.S. HY Sharpe Ratio



#### U.S. IG Sharpe Ratio



\* Data and results from December 1996 – December 2016

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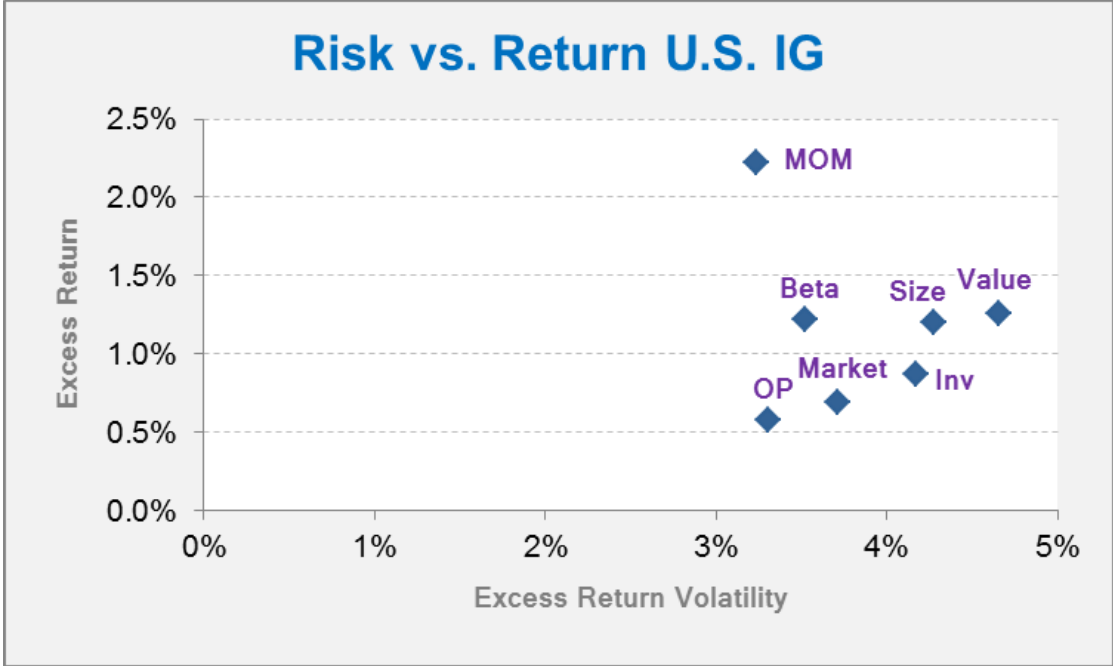
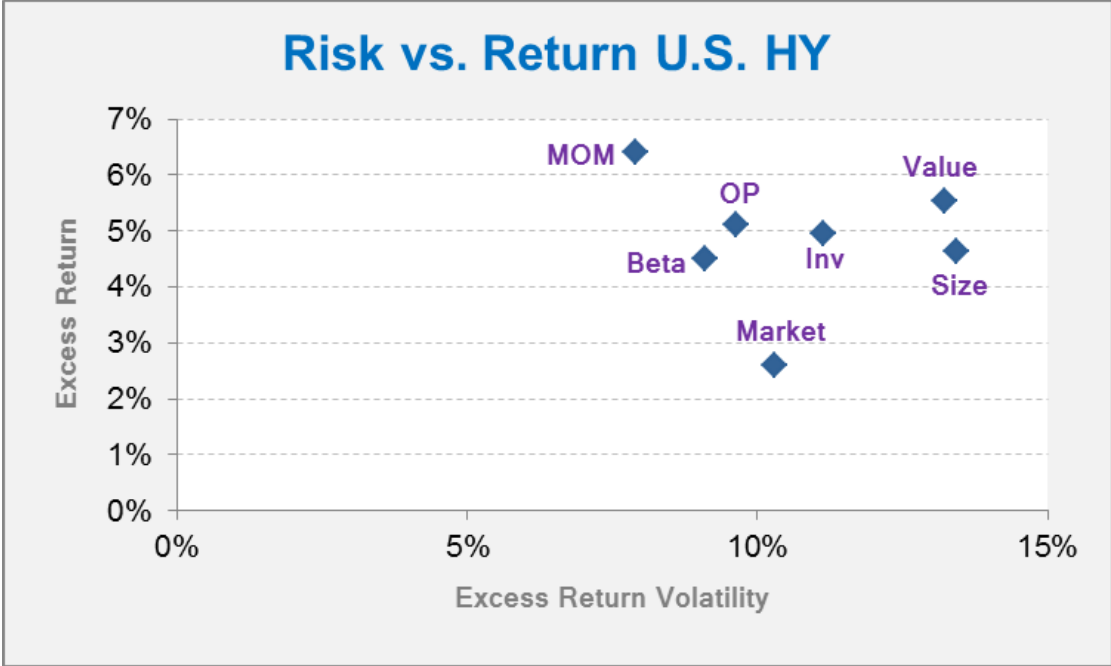
Source: Common Equity Factors in Corporate Bond Markets: Bektić, Neugebauer, Wegener and Wenzler, 2017, Factor Investing, Elsevier.

# Empirical Results III

## Risk/Return



### Risk vs. Return of Long-Only Factor Portfolios



\* Data and results from December 1996 – December 2016

Source: Extending Fama-French Factors to Corporate Bond Markets: Bektić, Wenzler, Wegener, Schiereck and Spielmann, 2018, Journal of Portfolio Management, forthcoming

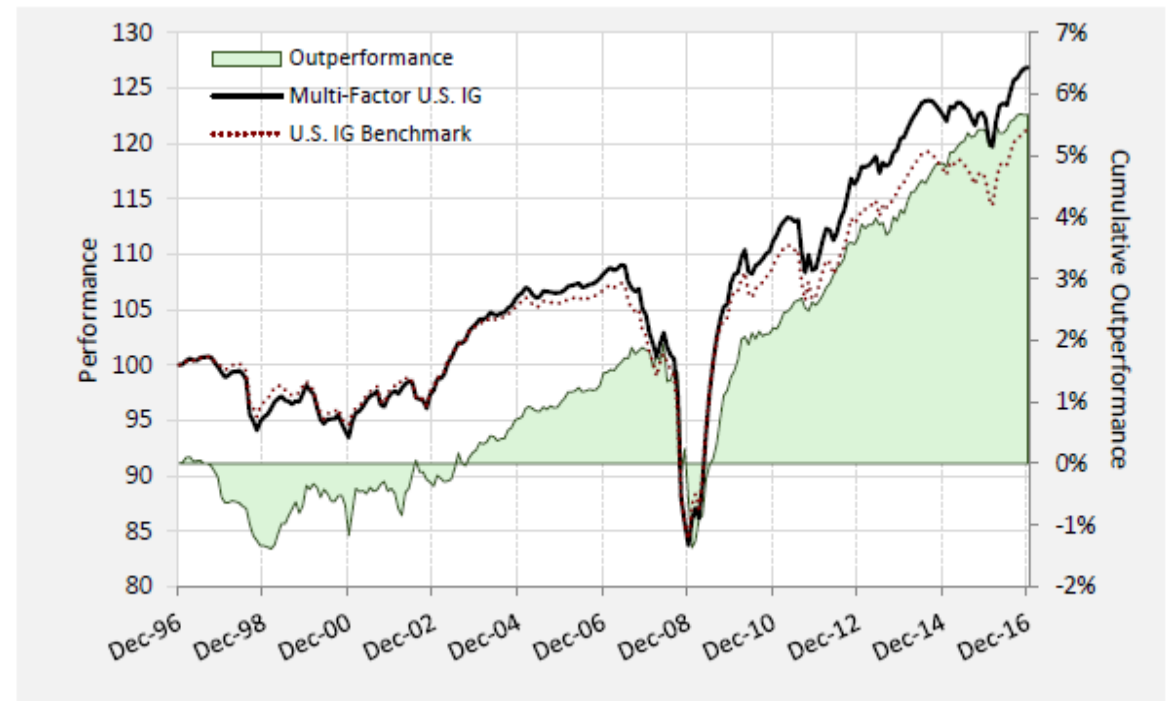
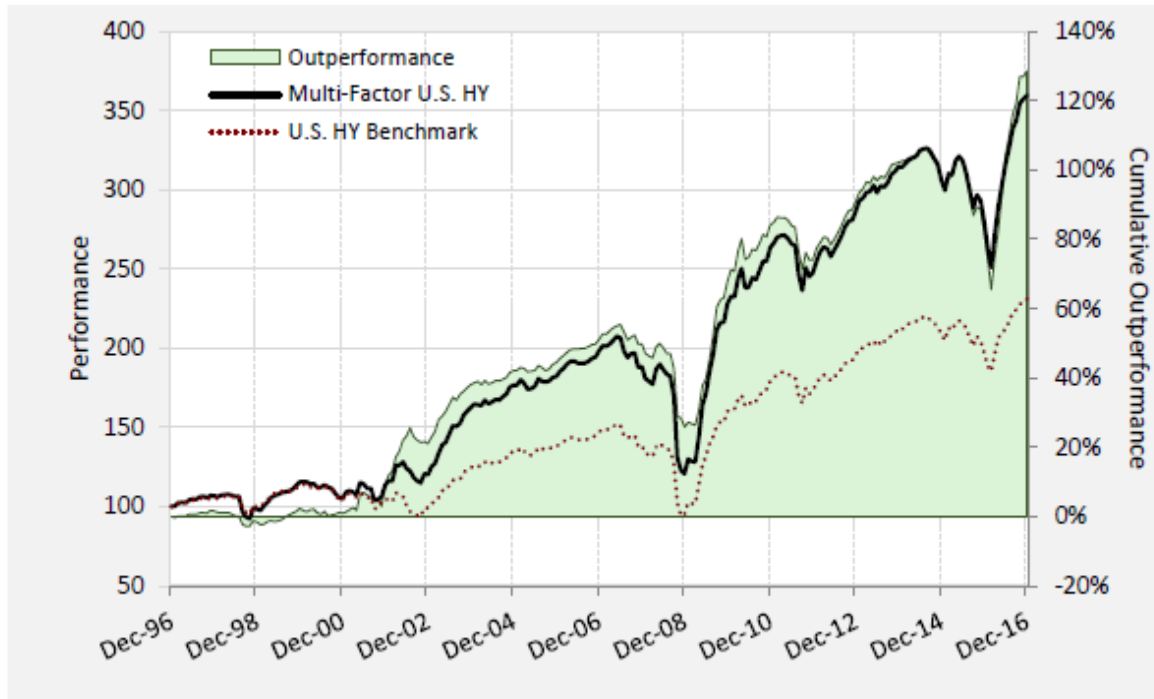
Source: Common Equity Factors in Corporate Bond Markets: Bektić, Neugebauer, Wegener and Wenzler, 2017, Factor Investing, Elsevier.

# Empirical Results IV

## Historical Performance



### Cumulative Multi-factor Returns



\* Data and results from December 1996 – December 2016

Source: Extending Fama-French Factors to Corporate Bond Markets: Bektić, Wenzler, Wegener, Schiereck and Spielmann, 2018, Journal of Portfolio Management, forthcoming

Source: Common Equity Factors in Corporate Bond Markets: Bektić, Neugebauer, Wegener and Wenzler, 2017, Factor Investing, Elsevier.

# Conclusion

## Main Findings in a Nutshell



### Fama-French Factors in Corporate Bond Markets

- ‡ Results suggest that the equity factors size, value, profitability, beta, momentum and investment can be used for corporate bond investing
- ‡ BUT: These factors do not fully translate into fixed income markets
  - All factors exhibit statistically significant results in U.S. HY markets (size & value for bond investors only)
  - Momentum statistically significant in the IG space
  - A possible explanation: market segmentation
    - Bonds occupy a different position in firm's capital structure
    - Institutional investors perceive risk differently compared to individual investors
- ‡ Multi-factor portfolios generate positive (risk-adjusted) returns in both markets
  - Reduce tracking error and drawdown (higher risk-adjusted returns)
  - Benefit from diversification

# Summary

## Implications



## Implications for Implementation and Future Research

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- ‡ Factor-based investment in **stocks and corporate bonds** is based on **similar principles**
- ‡ Findings from stock investments can be transferred to corporate bonds
- ‡ **Multi-factor portfolios** achieve **significant alphas**
- ‡ **Factor-based investment** is an alternative to traditional strategies and styles
  - Concerned with making **strategic decisions**
  - Involves using a **long-term risk premium**
  - Provides an **answer** to the question of what determines **asset returns**
  - Offers the possibility of **diversification** and/or generating **alpha** compared to traditional benchmarks as well as an alternative to traditional benchmarks
  - Involves risks, **short-term losses** cannot be ruled out

# Factor-based Investing with Bonds

More Information?



## Quantitative academic research

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‡ Visit our website: [www.iq-kap.de](http://www.iq-kap.de)

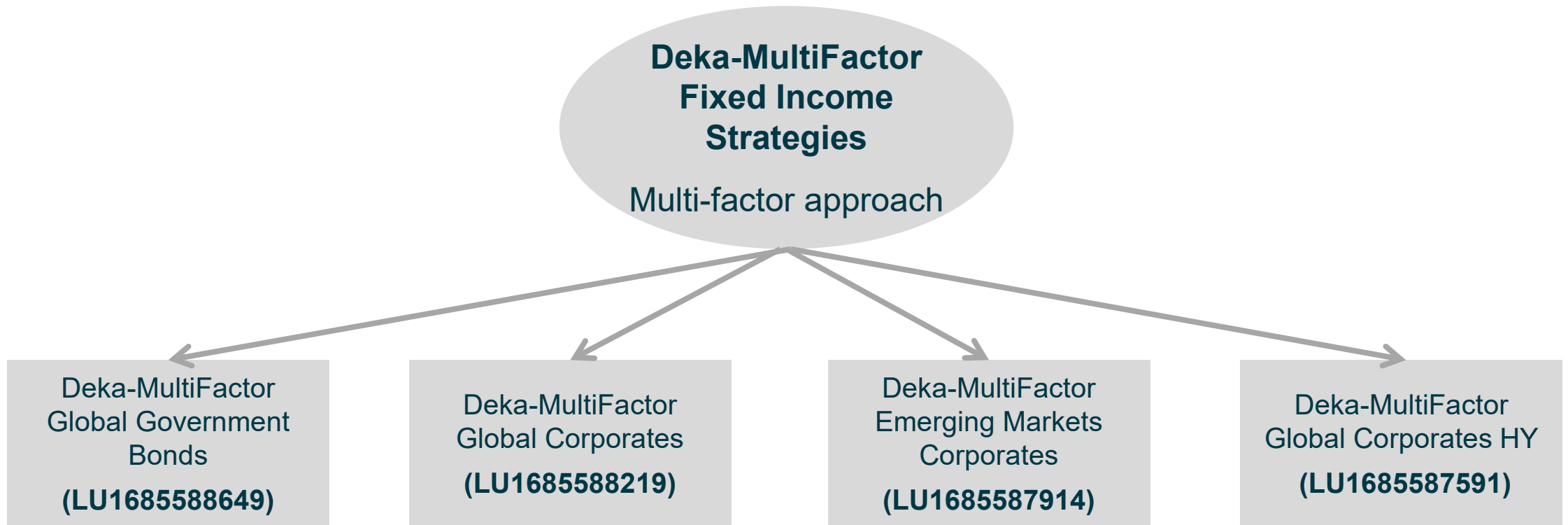


### ‡ Published articles:

1. Bektić, Wenzler, Wegener, Schiereck, Spielmann (2019): **Extending Fama-French Factors to Corporate Bond Markets**,  
*\*Journal of Portfolio Management*
2. Bektić (2019): **Residual Equity Momentum Spillover in Global Corporate Bond Markets**,  
*\*Journal of Fixed Income*
3. Bektić, Regele (2018): **Exploiting Uncertainty with Market Timing in Corporate Bond Markets**,  
*\*Journal of Asset Management*
4. Bektić (2018): **The Low Beta Anomaly: A Corporate Bond Investor's Perspective**,  
*\*Review of Financial Economics*
5. Bektić, Neugebauer, Wegener, Wenzler (2017): **Common Equity Factor in Corporate Bond Markets**,  
*\*Book Chapter in Factor Investing: From Traditional to Alternative Risk Premia*
6. Bektić (2017): **ESG Factors in Corporate Bond Returns: Perspectives for Academic Research and Investors**,  
*\*Journal of Environmental Law and Policy*

# Factor-based Investing with Bonds

Global MultiFactor Strategies since November 2017





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