Book-to-Market, Mispricing, and the Cross-Section of Corporate Bond Returns

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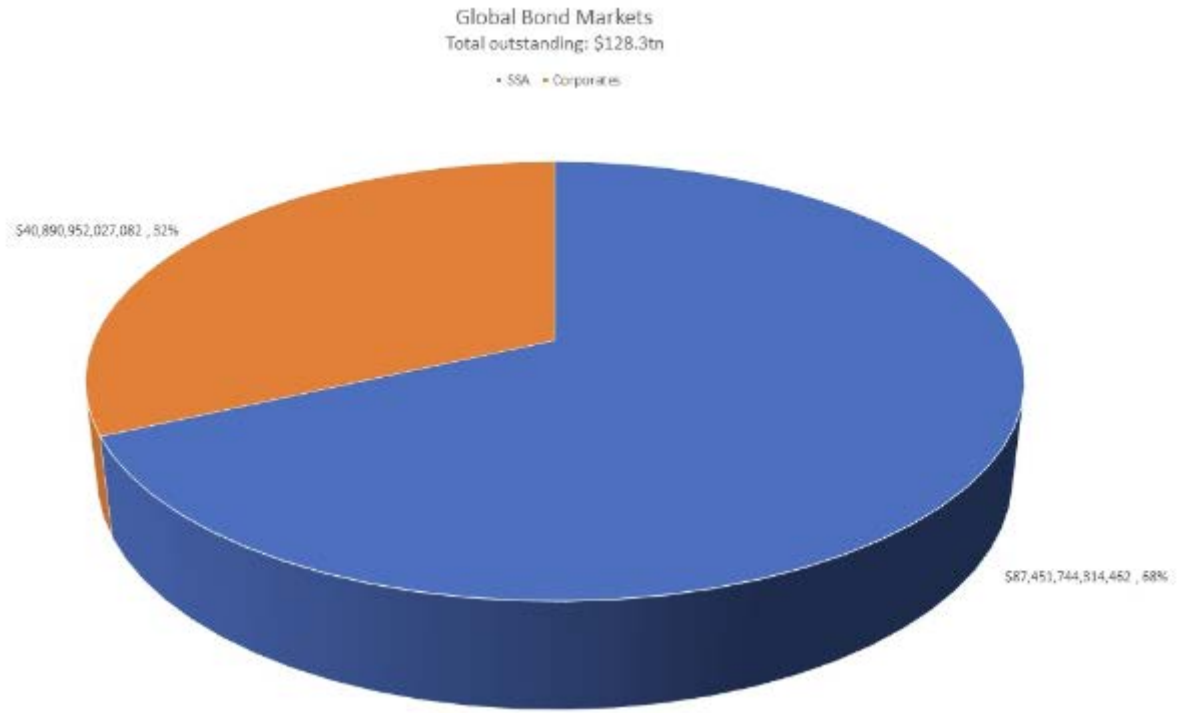
Söhnke M. Bartram, University of Warwick and CEPR
Mark Grinblatt, UCLA Anderson and NBER
Yoshio Nozawa, University of Toronto

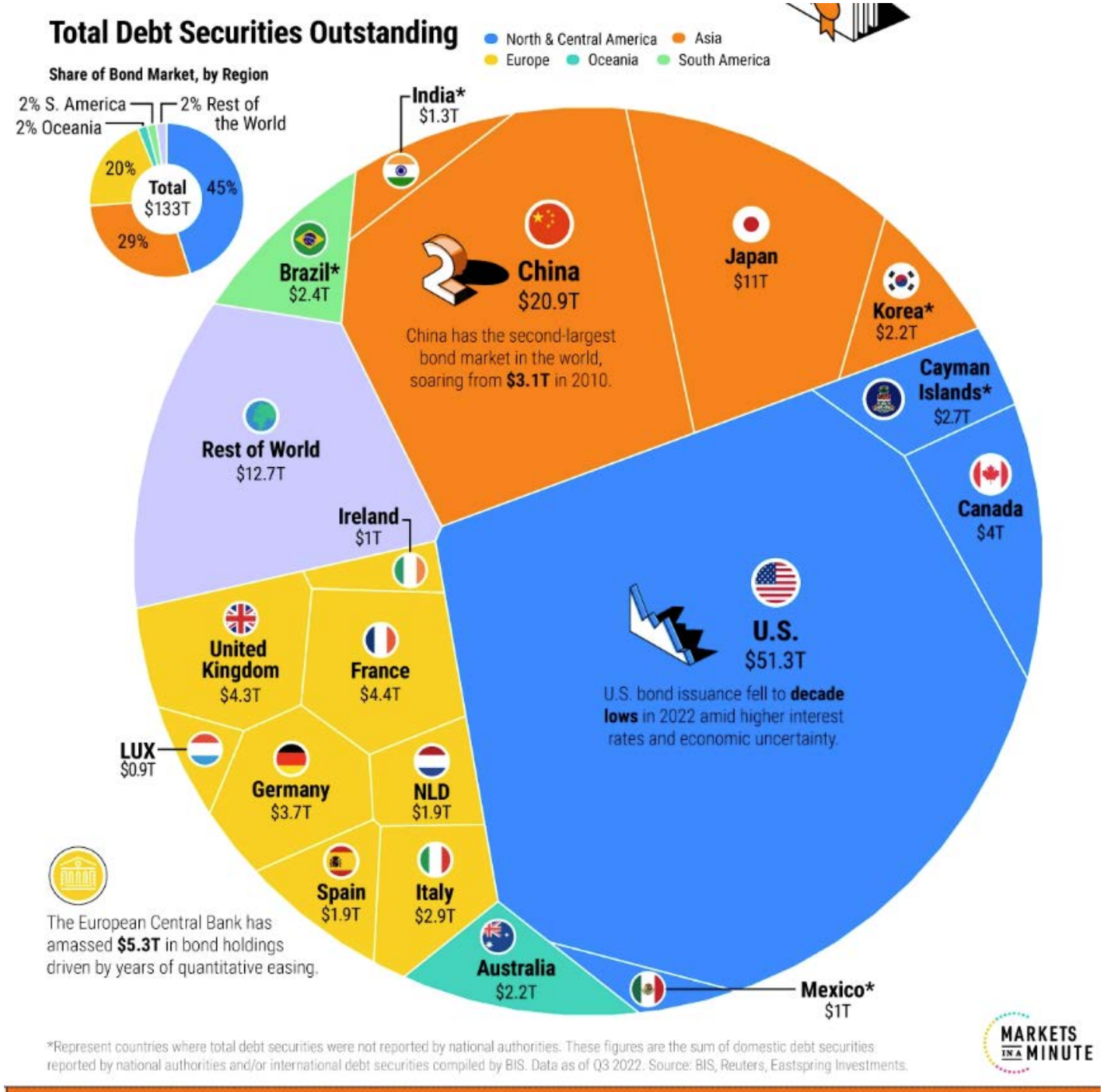
Stock and Bond Market Efficiency

- A lot of evidence of trading signals
  - Research has documented more than 450 predictors of stock returns
    - Jensen, Kelly, and Pedersen (JF 2023), Hou, Xue, and Zhang (RFS 2020), Green, Hand, and Zhang (RAS 2013)
  - More than 26 predictors of corporate bond returns
    - Dick-Nielsen, Feldhütter, Pedersen, and Stolborg (2023)
- Motivation and rationales not always clear
- Equity Book-to-Market is a major predictor of equity returns
  - Risk vs. Mispricing?

Global Market for Fixed-Income Securities

- The bond market is by far the largest securities market in the world
  - In 2022, the global bond market totalled $133 trillion
  - Compared to $122 trillion equity market capitalization




Total Debt Securities Outstanding
North & Central America
Asia
Europe
Oceania
South America
Share of Bond Market, by Region
2% S. America
2% Oceania
2% Rest of the World
20%
Total
$133T
45%
29%
India*
$1.3T
Brazil*
$2.4T
China
$20.9T
China has the second-largest bond market in the world, soaring from $3.1T in 2010.
Japan
$11T
Korea*
$2.2T
Cayman Islands*
$2.7T
Canada
$4T
Rest of World
$12.7T
Ireland
$1T
U.S.
$51.3T
U.S. bond issuance fell to decade lows in 2022 amid higher interest rates and economic uncertainty.
United Kingdom
$4.3T
France
$4.4T
LUX
$0.9T
Germany
$3.7T
NLD
$1.9T
Spain
$1.9T
Italy
$2.9T
Australia
$2.2T
Mexico*
$1T
The European Central Bank has amassed $5.3T in bond holdings driven by years of quantitative easing.
*Represent countries where total debt securities were not reported by national authorities. These figures are the sum of domestic debt securities reported by national authorities and/or international debt securities compiled by BIS. Data as of Q3 2022. Source: BIS, Reuters, Eastspring Investments.
MARKETS IN A MINUTE

What The Paper Does

- Study the Role of Bond Book-to-Market (BBM)
  - Corporate bonds allow better distinction between risk and mispricing
  - Help understand the role of book-to-market in asset pricing
- Methodological Innovation
  - Return estimation for illiquid markets like corporate bonds
  - Separation of trading signal and future returns
- Analysis
  - Risk-adjusted returns of BBM trading strategy
  - Effect of a delayed signal
  - Results for risker bonds and Treasury bonds
  - Control for bond HML factor

Bond Empirical Studies: The Obstacle

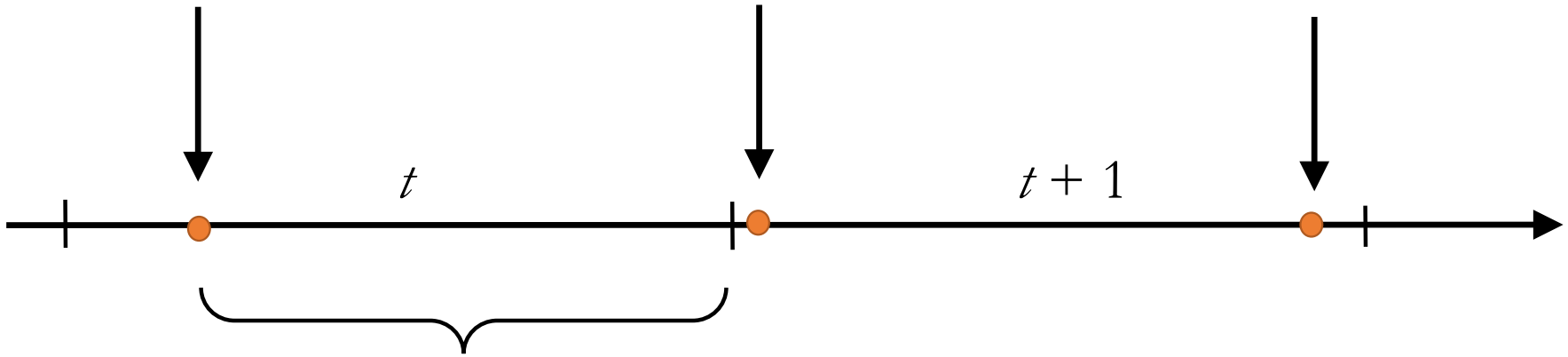
- Measuring Monthly Returns
  - No price at end of month
  - Estimates of end of month price have measurement errors
- Prior Research Focus
  - Only bonds with frequent trades
  - Private marks of bond values for the purpose of computing bond index value
- Our Solution
  - Accept noisy estimates of bond prices but only from trades on other dates

BBM and Monthly Returns

P^S: Price to construct signal in month t

P^B: Beginning price for the return in month $t+1$

P^E: End price for the return in month $t+1$



Minimum of one week gap between P^S and end of month t

Letting P denote clean/flat price, monthly return is calculated as:

$$R_{t+1} = \frac{P^E_{t+1} + AI_{t+1} + C_{t+1}}{P^B_{t+1} + AI_t} - 1$$

BBM Trading Signal

- BBM Signal = (Book Value of a Bond)/(Market Value of a Bond)
  - Book value amortizes the offering price toward face value at maturity in a linear fashion
  - Market value is from the clean price on month-*t* signal date

Sample and Data

- Sample
  - All transaction in senior, unsecured bonds ("traditional" bonds)
  - February 2003 to September 2020
  - 8,925 bonds, 838 firms and 459,040 observations
- Data Sources
  - Enhanced TRACE: Corporate bond transaction data
  - Mergent FISD: Bond characteristics, such as credit rating, maturity, issue price, and coupons
  - CRSP/Compustat PIT Database: Issuers' fundamentals as known to investors at the time

Selected Summary Statistics: Issue Price and Thin Trading

Panel A: Offering Price Statistics

				Percentiles				
	N	Mean	Minimum	1	10	50	90	95	99
Traditional Bonds	8,925	99.6	40.8	97.3	99.1	99.8	100.0	100.0	100.0
All Bonds	12,643	99.6	25.0	97.6	99.2	99.9	100.0	100.0	100.0

Panel B: Time Difference Between Trading Signals and Bond Return

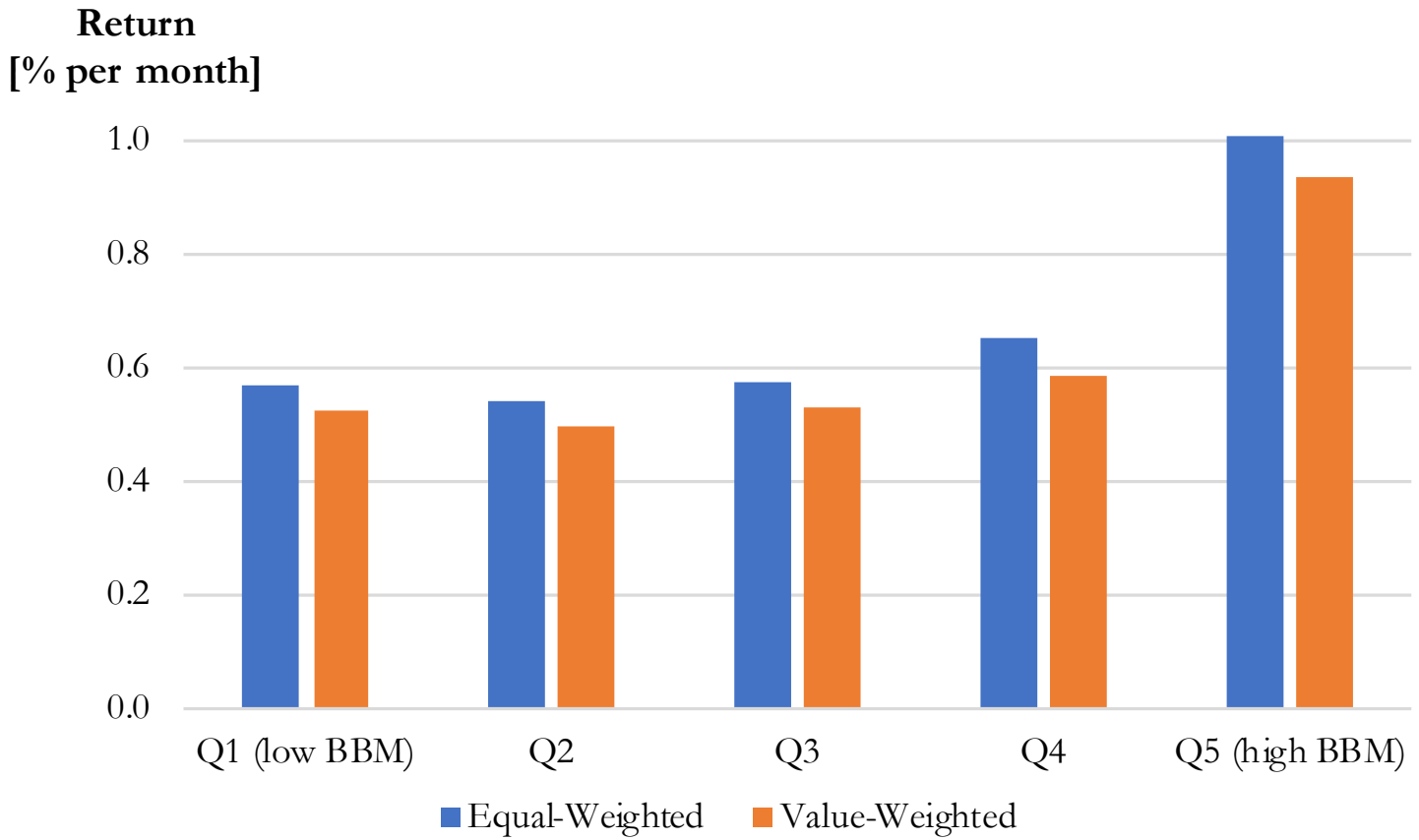
			Percentiles					
	N	Mean	1	10	50	90	95	99
Traditional Bonds	459,040	15.9	8.0	8.0	11.0	26.0	37.0	89.0
All Bonds	566,346	19.4	8.0	8.0	11.0	34.0	52.0	134.0

Selected Summary Statistics
BBM Quintile Portfolios

			Bond Book/Market (BBM) Quintiles	
	All	Correlation	Q1 (low BBM)	Q5 (high BBM)
Bond Book/Market	0.963	1.00	0.845	1.094
Bond Mispricing	-0.001	0.29	-0.011	0.011
Bond Yield	4.779	0.42	4.682	6.191
Bond Maturity	11.18	-0.10	16.41	12.02
Bond Rating	8.159	0.24	7.462	9.126
Investment Grade	0.863	-0.24	0.954	0.726
Non-Investment Grade	0.137	0.24	0.046	0.274
Offering Price	99.49	0.05	99.23	99.56
Equity Book/Market	0.652	0.20	0.591	0.825

Numerical credit ratings: A-=7, BBB+=8, BBB=9, BBB-=10

Average Monthly Returns
BBM Quintile Portfolios



	(1)			(2)			(3)			(4)		
	Coef	*t*-stat		Coef	*t*-stat		Coef	*t*-stat		Coef	*t*-stat	
Bond Book/Market Q5	0.441	[3.62]	***	0.445	[3.64]	***	0.265	[3.21]	***	0.320	[4.05]	***
Bond Coupon Rate Q5							0.011	[0.16]		0.046	[0.74]	
Bond Yield Q5							0.416	[5.78]	***	0.433	[6.11]	***
Bond Credit Spread Q5							0.042	[0.64]		0.046	[0.69]	
Bond Value Q5							-0.049	[-0.89]		-0.070	[-1.43]	
Bond Age Q5							0.035	[0.87]		0.006	[0.14]	
Bond Maturity Q5							0.122	[0.64]		0.110	[0.61]	
Bond Duration Q5							0.129	[0.73]		0.108	[0.64]	
Bond Bid/Ask Spread Q5							0.076	[1.90]	*	0.070	[1.83]	*
Bond Reversal Q5							-0.010	[-0.26]		-0.029	[-0.78]	
Bond Momentum Q5							0.005	[0.11]		-0.026	[-0.58]	
Bond Rating Q5							-0.242	[-3.35]	***	-0.219	[-2.61]	***
Nearness to Default Q5							-0.010	[-0.19]		0.041	[0.54]	
Stock Characteristic Controls	No			No			No			Yes		
Market Microstructure Controls	No			Yes			Yes			Yes		
Industry Control	Yes			Yes			Yes			Yes		
Observations	1,149			1,149			1,149			1,149		
Adj. R-Squared	0.11			0.12			0.25			0.28		

Main Results

- Bond Book-To-Market ratio predicts corporate bond returns
  - Predictability after controlling for known predictors such as yield-to-maturity
  - Survives host of bond, stock and market microstructure controls
- Rational versus behavioral explanations
  - Rapid decay in efficacy
  - Not pronounced for bonds with high default risk
  - Bond HML factors cannot fully explain alphas
- Profits after transaction costs for buy-and-hold implementation

Implications for Market Participants

- The empirical evidence suggests that the U.S. corporate bond market is not perfectly efficient.
- While data is not as readily available, this might likely be true for bond markets in other countries and regions, such as Europe.
- Consequently, there are investment opportunities that investors can exploit
  - Transactions costs (bid/ask spread, fees, short-selling constraints/costs)
  - Holding period/trade implementation
  - Portfolio tilts

Söhnke M. Bartram

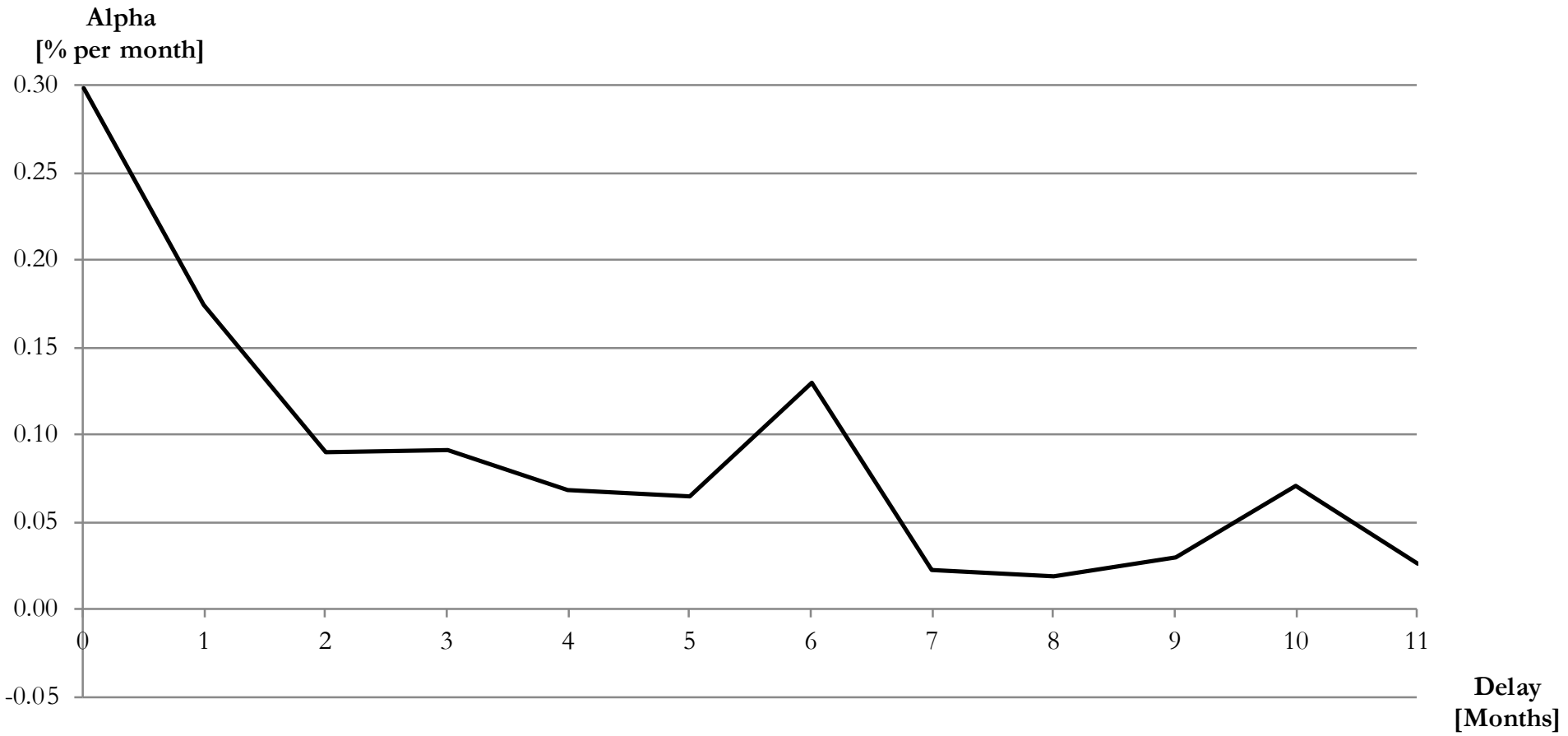
Professor of Finance
CEPR Research Fellow
University of Warwick
Warwick Business School
Finance Group
Coventry CV4 7AL
United Kingdom
Phone: +44 (24) 7657 4168
Fax: +1 (425) 952 10 70
Email: s.m.bartram@wbs.ac.uk
Internet: http://go.warwick.ac.uk/sbartram/
Research: http://papers.ssrn.com/sol3/cf_dev/AbsByAuth.cfm?per_id=260018
LinkedIn: https://www.linkedin.com/in/s%C3%B6hnke-bartram-3925277/

Default Risk and BBM Effect

- Nearness to default: negative of distance to default
- Bond rating: numerical score from 1(AAA) to 21(C)

	Nearness to Default			Bond Rating		
	Coef	*t*-stat		Coef	*t*-stat	
Bond Book/Market Q5 * Default Risk Q5	-0.100	[-0.73]		-0.006	[-0.05]	
Bond Book/Market Q5	0.317	[4.31]	***	0.293	[4.08]	***
Default Risk Q5	0.101	[0.82]		-0.222	[-2.51]	**
Observations	1,149			1,149		
Adj. R-Squared	0.29			0.29		
Bond Characteristic Controls (see Table 3)	Yes			Yes		
Stock Characteristic Controls (see Table 3)	Yes			Yes		
Market Microstructure Controls (see Table 3)	Yes			Yes		
Industry Controls	Yes			Yes		

Delay and Signal Efficacy



Transaction Costs

Portfolio	Alpha	One-Way Turnover	All: Transaction Costs	All: Net Performance	All: *t*-stat		Institutions: Transaction Costs	Institutions: Net Performance	Institutions: *t*-stat	
Panel A: Monthly Rebalancing										
Augmented BBW Factor Model										
Q1	0.128	12%	0.085	0.198	[3.65]	***	0.045	0.165	[3.08]	***
Q5	0.358	19%	0.410	-0.004	[-0.05]		0.147	0.234	[2.76]	***
Q5-Q1	0.230	31%	0.495	-0.202	[-2.03]	**	0.192	0.069	[0.75]	
Panel B: Buy-and-Hold										
Augmented BBW Factor Model										
Q1	0.141	2%	0.018	0.157	[2.89]	***	0.009	0.150	[2.77]	***
Q5	0.298	4%	0.090	0.221	[3.36]	***	0.033	0.273	[4.25]	***
Q5-Q1	0.157	7%	0.108	0.064	[1.04]		0.043	0.123	[2.06]	**

BBM and Bond Mispricing

- Bond Mispricing: percentage deviation of firm's predicted liability value from its actual value

	(1)			(2)		
	Coef	*t*-stat		Coef	*t*-stat	
Bond Book/Market Q5	0.287	[3.79]	***	0.245	[3.32]	***
Bond Mispricing Q5				0.202	[2.94]	***
Observations	1,014			1,014		
Adj. R-Squared	0.31			0.32		
Bond Characteristic Controls (see Table 3)	Yes			Yes		
Stock Characteristic Controls (see Table 3)	Yes			Yes		
Market Microstructure Controls (see Table 3)	Yes			Yes		
Industry Controls	Yes			Yes		

BG Mispricing Signal (Bartram and Grinblatt, 2018)

- Cross-sectional regressions: Fair value is regression prediction
  - Dependent variable: market value of issuing firm's liabilities
  - Regressors: 28 most reported accounting items
    - Scaled on a firm wide basis, not per share

- "Mispricing"
  - Percent deviation of the firm liabilities' fair value from its actual value
  - In domestic and international equity markets
    - Deviation is a strong predictor of equity returns

Factor Model Time-Series Regressions

- CAPM-Model

- 5-Factor Model (Bai, Bali, and Wen, JFE 2019) “BBW Factor Model”
  - Bond Market Factor
  - Bond Value-at-Risk Factor
  - Bond Rating Factor
  - Bond Illiquidity Factor
  - Bond Reversal Factor

- 6-Factor Model “Augmented BBW Factor Model”
  - Add Term Structure Factor

- 21-Factor Model

Augmented BBW Factor Model Alphas

	Q1 (low BBM)			Q5 (high BBM)			Q5-Q1 (high - low BBM)		
	Coef	*t*-stat		Coef	*t*-stat		Coef	*t*-stat	
Equal-weighted portfolios									
Intercept	0.128	[2.38]	**	0.358	[4.35]	***	0.230	[2.55]	**
R-Squared	0.79			0.80			0.61		
Observations	212			212			212		
Value-weighted portfolios									
Intercept	0.059	[1.33]		0.236	[3.06]	***	0.177	[2.11]	**
R-Squared	0.85			0.83			0.60		
Observations	212			212			212		

Sample of All Corporate Bonds

- Including junior bonds and bonds with embedded options

	(1)		(3)		(5)		(7)	
	Coef	*t*-stat	Coef	*t*-stat	Coef	*t*-stat	Coef	*t*-stat
Bond Book/Market Q5	0.575	[4.79] ***	0.569	[4.72] ***	0.336	[3.64] ***	0.384	[4.26] ***
Observations	1,315		1,315		1,315		1,315	
Adj. R-Squared	0.11		0.12		0.23		0.26	
Bond Characteristic Controls (see Table 3)	No		No		Yes		Yes	
Stock Characteristic Controls (see Table 3)	No		No		No		Yes	
Market Microstructure Controls (see Table 3)	No		Yes		Yes		Yes	
Industry Controls	Yes		Yes		Yes		Yes	

Sample of All Corporate Bonds

	Q1 (low BBM)			Q5 (high BBM)			Q5-Q1 (high - low BBM)		
	Coef	*t*-stat		Coef	*t*-stat		Coef	*t*-stat	
Intercept	0.137	[2.60]	**	0.616	[6.77]	***	0.478	[5.67]	***
R-Squared	0.80			0.82			0.67		
Observations	212			212			212		
6 Factors (see Table 4 Panel B)	Yes			Yes			Yes		
Intercept	0.212	[5.25]	***	0.495	[7.96]	***	0.283	[6.25]	***
BHML Factor (*t*+1)	-0.351	[-5.04]	***	0.573	[3.32]	***	0.924	[7.86]	***
R-Squared	0.85			0.87			0.88		
Observations	212			212			212		
6 Factors (see Table 4 Panel B)	Yes			Yes			Yes		