La confiance ça se mérite

Amundi
ASSET MANAGEMENT

September 2018, presented during the 30th Annual Northfield conference held at Cape Neddick, Maine, USA

The cross-section of corporate bond returns

Mohamed Ben Slimane and Marielle de Jong

Research question

What factors are driving corporate bond returns?

1. State-of-the-art of the bond investment profession

2. We bring factors people believe in to the test

3. We relate newly-found factors to the traditional understanding of bond risk

Amundi
ASSET MANAGEMENT

State-of-the-art

Fierce debate on the factors that drive corporate bond returns

Old school	**New school**
Traditional bond managers	*Smart equity-inclined*
interest rates	size
creditworthiness	value
market liquidity	momentum

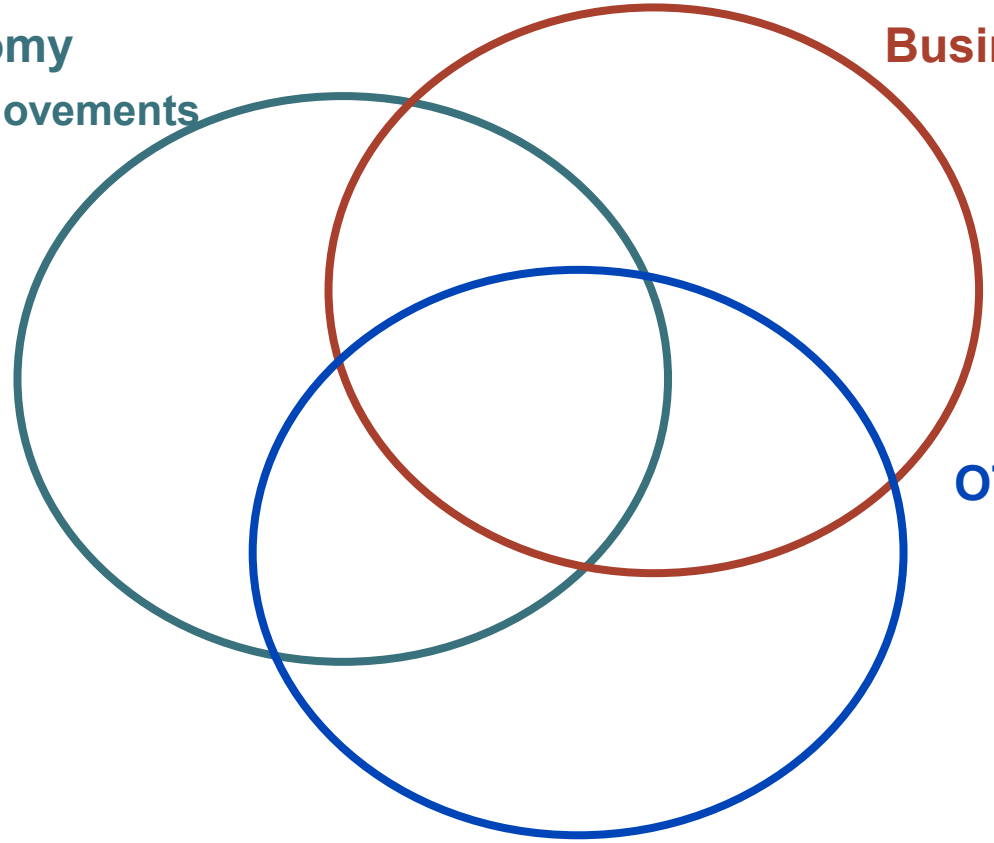
Amundi
ASSET MANAGEMENT

Traditional view on bond risk

Bonds are priced in the confluence of three market environments

Macro-economy
Interest-rate movements

Business environment
creditworthiness



OTC bond markets
liquidity

Amundi
ASSET MANAGEMENT

The *smart* view on bond risk

Certain pricing effects are common to all tradeable assets, in particular

SIZE	as a proxy for creditworthiness and market liquidity large firms diversify their business risks
VALUE	under-priced assets are distressed, out of favour, ..
MOMENTUM	due to price inertia and herding

Factor investing or the Alternative Risk Premia (ARP) philosophy

Thanks to common risk factors large multi-asset mandates can be managed efficiently in an interconnected factor framework.

Amundi
ASSET MANAGEMENT

Bond literature

disconnected from mainstream finance literature

1. No Modern Portfolio Theory, i.e. no mean-variance portfolio optimisation
2. No CAPM, i.e. no decomposition in Market- and asset-specific risk
3. (until recently) No Fama-French factors, i.e. Size, Value, Momentum

standard reference in equity literature $R = \alpha + \beta \cdot M + S + V + M + \varepsilon$

Carhart (1997)

Since Asness et al. (2013) "*Value and Momentum Everywhere*", style factors found relevant for other asset classes; for corporate bonds by Houweling et al. (2017) and Bektic et al. (2017).

Salient detail: in recent articles no reference is made to traditional understanding of bond risk.

Recent literature

- (**HZ**) Houweling, P., and van Zundert, J. (2017), Factor Investing in the Corporate Bond Market, *Financial Analysts Journal*

- (**BWWSS**) Bektic, D., Wenzler, J-S., Wegener, M., Schiereck, D., and Spielmann, T., (2016) Extending Fama-French Factors to Corporate Bond Markets, SSRN, www.ssrn.com/abstract=2715727

- (**IPR**) Israel, R., Palhares, D., and Richardson, S. (2016), Common Factors in Corporate Bond and Bond Fund Returns, *SSRN*, www.ssrn.com/abstract=2576784

- (**BNWW**) Bektic, D., Neugebauer, U., Wegener, M., and Wenzler, J. (2017), Common Equity Factors in Corporate Bond Markets, in Jurczenko, E. (Ed.), Factor Investing and Alternative Risk Premia, ISTE Press - Elsevier

Amundi
ASSET MANAGEMENT

Newly-found factors

Study	HZ (2017)	BWWSS (2016)	IPR (2016)	BNWW (2017)
Universe	Bloomberg Barclays US IG and HY [1994-2015]	ICE BAML US IG and HY (1996-2016) Europe IG (2000-2016)	ICE BAML US IG and HY (1997-2015)	ICE BAML US IG and HY (1999-2016)
Size	Market value of the issuer	Market cap of equity		Market cap of equity
Value	Comparing OAS to maturity x rating x 3M change in credit spread	Price to Book Value	Comparing OAS to duration x rating x excess return volatility	Price to Book Value
Momentum	6M credit return		6M credit + equity return	1Y equity return
Low risk	Short maturity + high credit rating		Market leverage x Duration x Profitability	1Y equity beta
Carry*			OAS	
Profitability		Earnings before tax / Book Value		
Investment		1Y Change in total assets		

*Carry can, in the way it is specified, be interpreted as a low-risk factor, see Ng and Phelps (2015).

Amundi
ASSET MANAGEMENT

Newly-found factors

Study	Findings, interpretations
HZ (2017)	"We provide empirical evidence that Size, Low-Risk, Value and Momentum factor portfolios generate economically meaningful and statistically significant alphas in the corporate bond market."
	One-way turnover (between 63% to 118%)
BWWSS (2016)	"While the FF factors are economically and statistically significant in the U.S. high yield market, we find mixed evidence for U.S. and European investment grade markets."
	"investment is not statistically significant for U.S. IG securities and size and value are not significant for the European IG market. Interestingly, profitability is negatively priced in both IG markets."
IPR (2016)	"We identify four key characteristics (carry, defensive, momentum and value) that together explain nearly 15% of the cross-sectional variation in corporate bond excess returns."
	10% (Beta + Rating + Duration + Maturity) → 15% (Beta + Rating + Duration + Maturity + Carry + Defensive + Momentum + Value)
	"We find strong evidence of positive risk-adjusted returns to measures of carry, defensive, momentum and value."
BNWW (2017)	"While size, value and momentum are economically and statistically significant in the U.S. high yield space we find that only size and momentum have explanatory power for the U.S. investment grade market."

Replication of the new findings

TEST SETUP

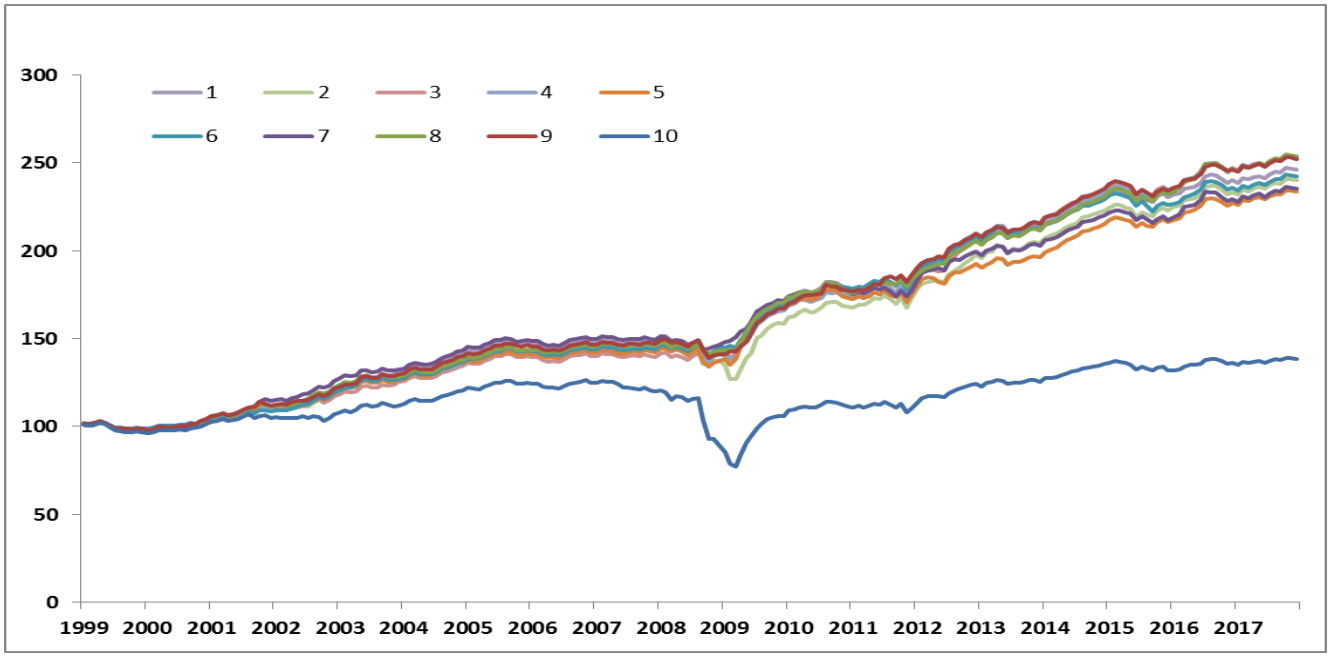
- ✓ Analysis by decile tests
- ✓ Performance of deciles is compared over time period:
  - ➢ January 1999 – December 2017

DATABASE

- ✓ Intercontinental Exchange Bank of America Merrill Lynch Global Large Cap Corporate Bond Index (ICE BofAML)
- ✓ Monthly Basis
- ✓ Investment Grade
  - ➢ Euro-denominated bonds: 5700 bonds issued by 1100 firms
  - ➢ USD-denominated bonds: 12800 bonds issued by 1800 firms

Size factor (1/2)

HZ's specification



small

big

smallest

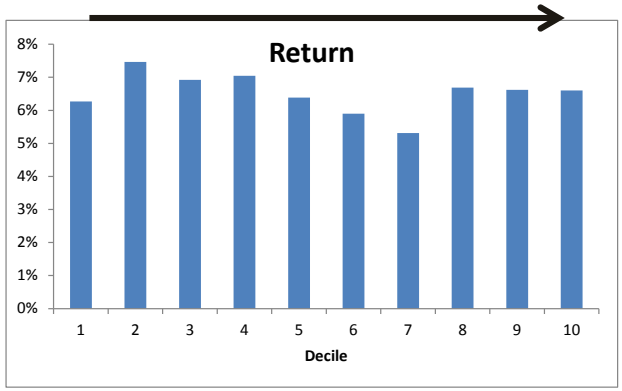
Size effect apparent but minor

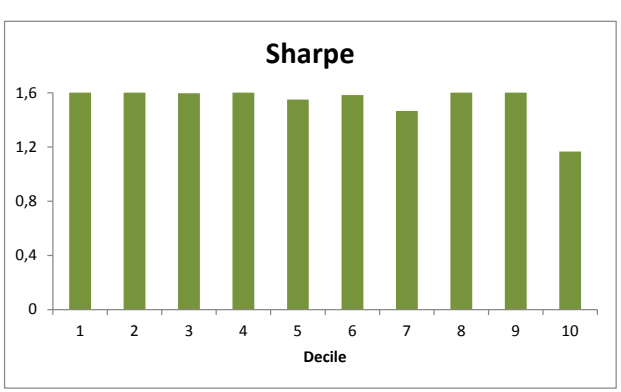
Smallest 10% out of sync

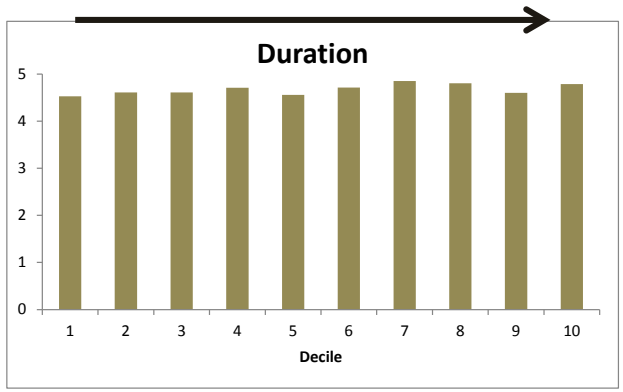
Size factor (2/2)

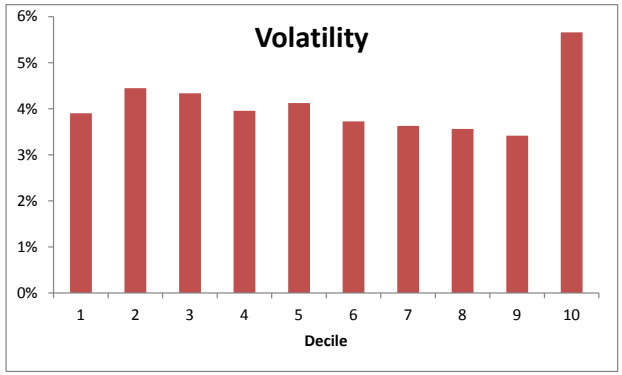
HZ's specification

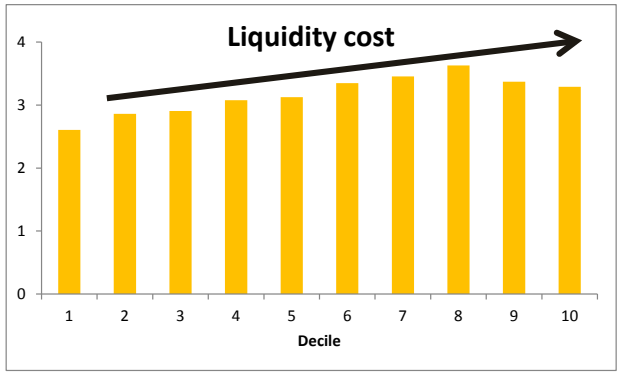
big …. Small

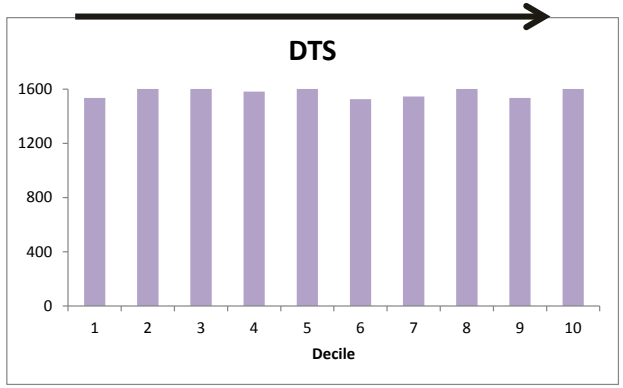








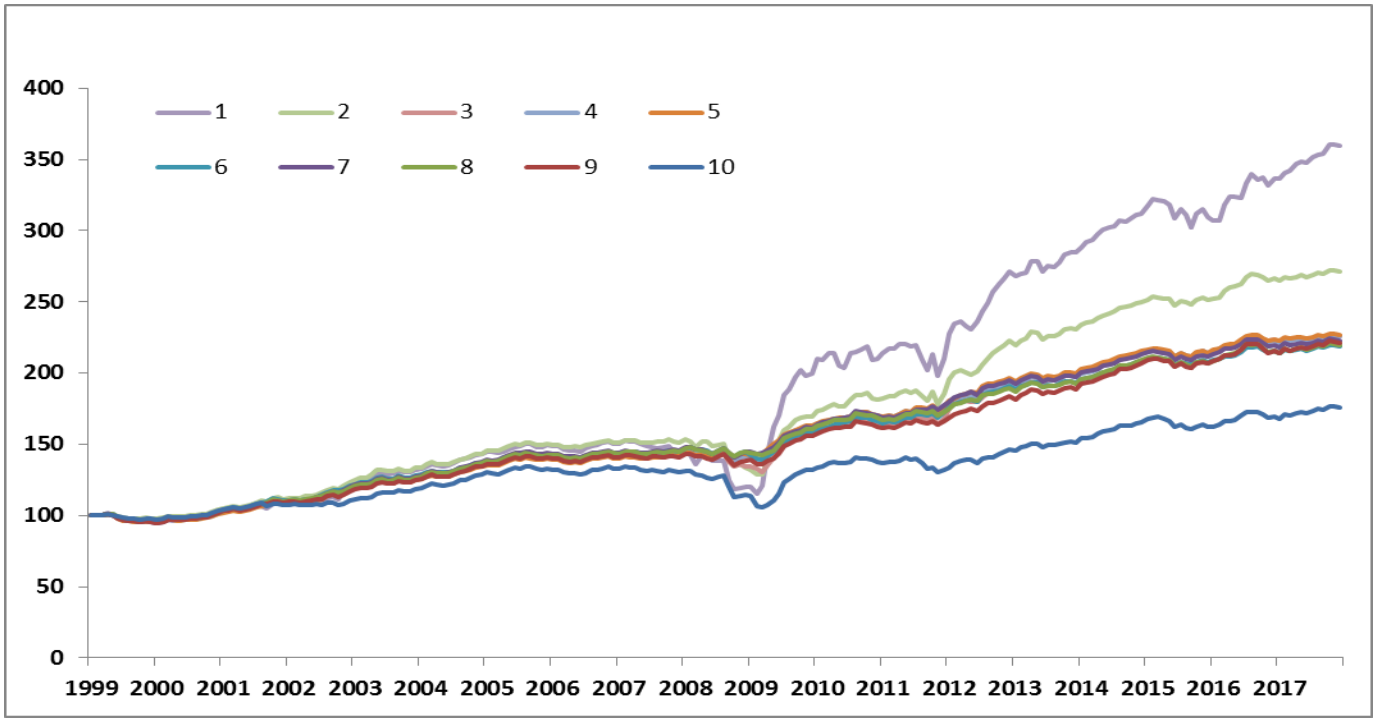




Size effect explained by liquidity costs

Value factor (1/2)

HZ's specification



cheap

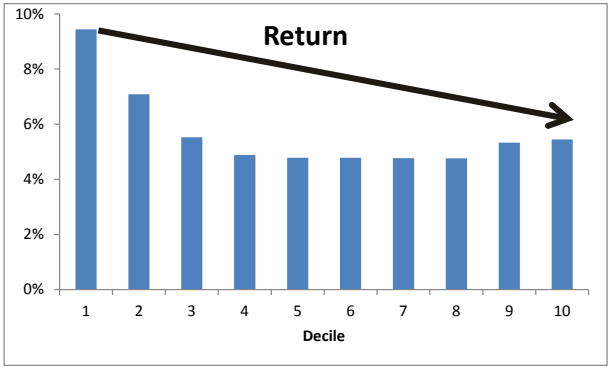
dear

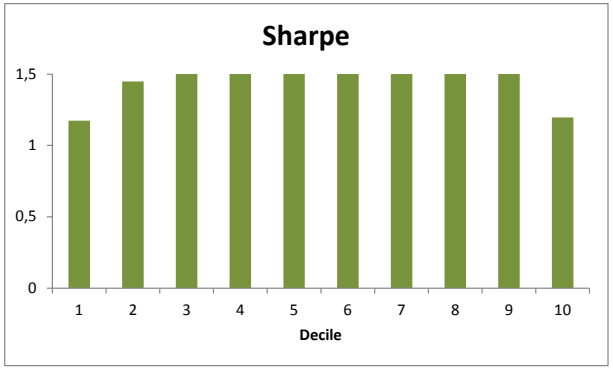
Value effect apparent, yet concentrated in few deciles over a short period

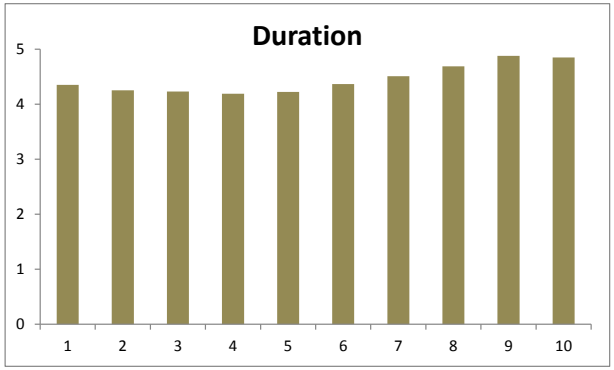
Value factor (2/2)

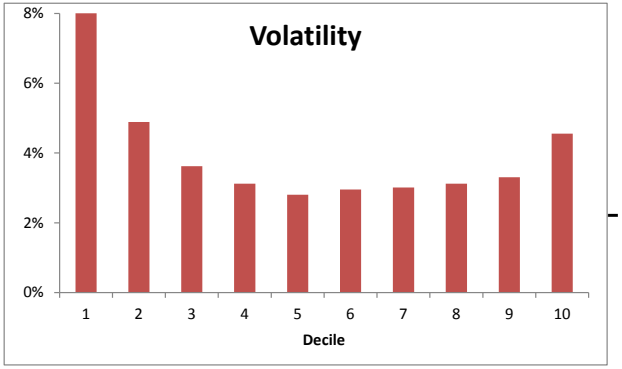
HZ's specification

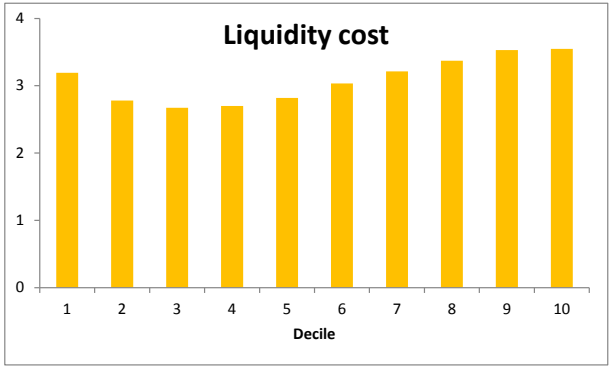
high … low

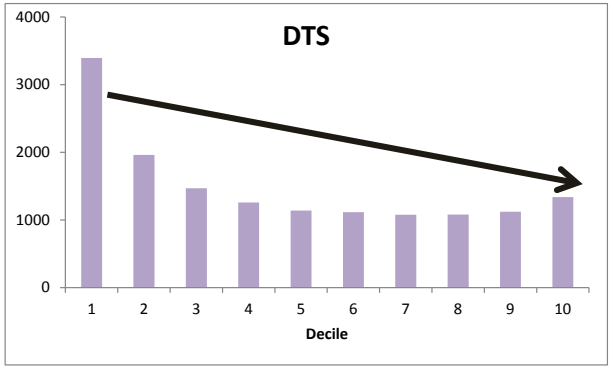








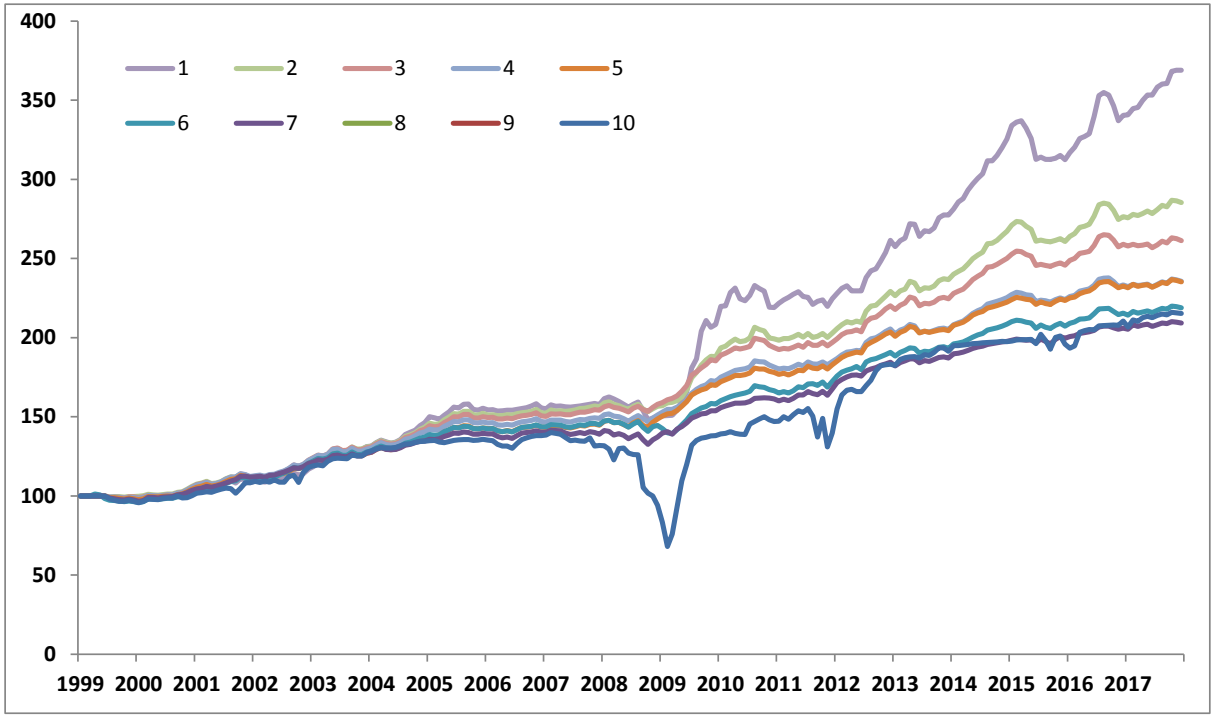




Value effect explained by credit risk: deciles descending by Duration-Times-Spread level

Momentum factor (1/2)

HZs specification



recent winners

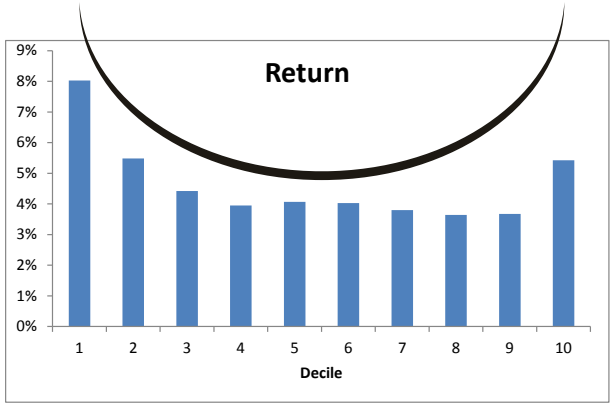
recent losers

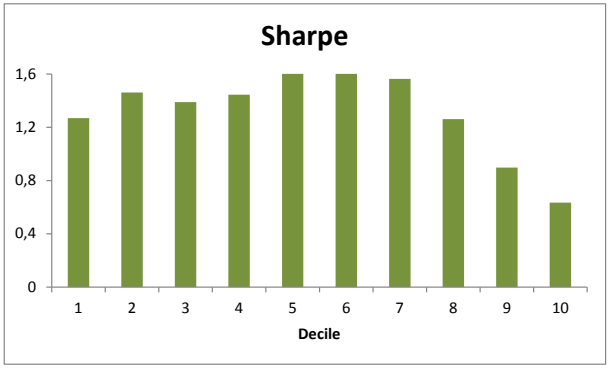
Momentum effect apparent: winners outperform … yet losers outperform also!

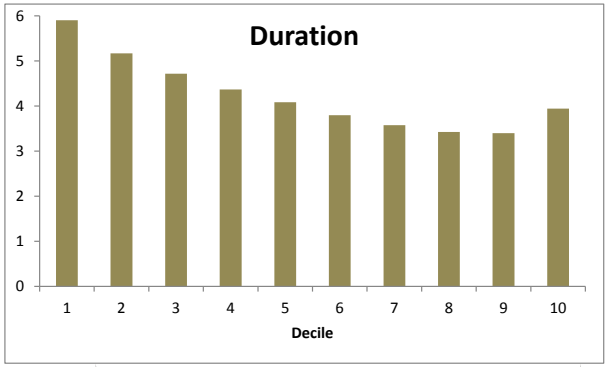
Momentum factor (1/2)

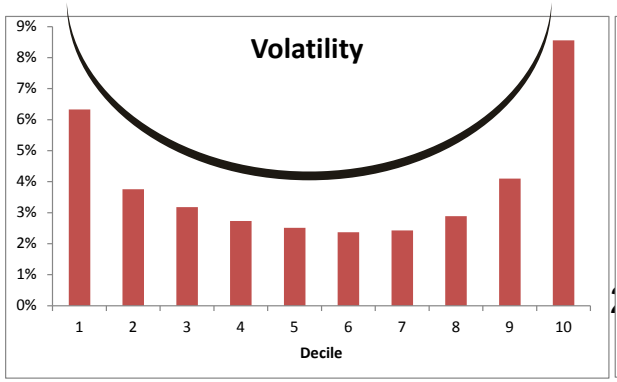
HZs specification

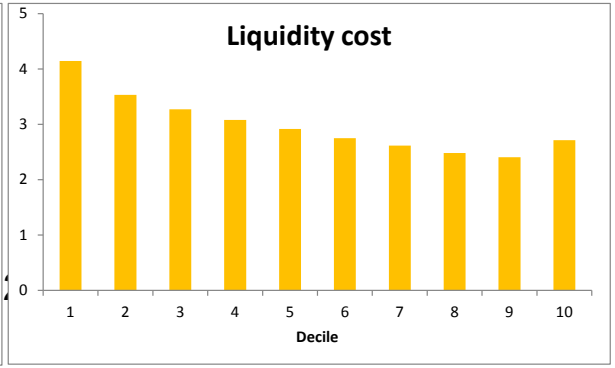
winners … losers

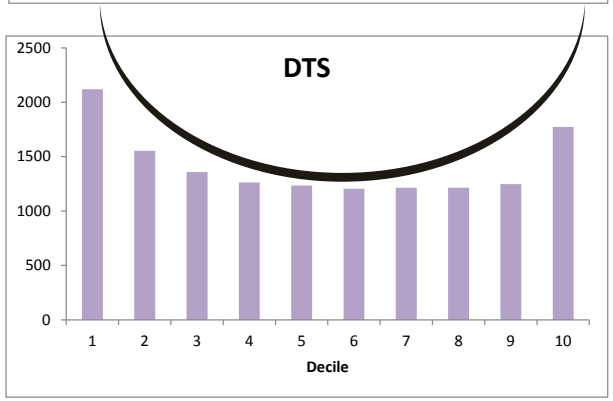








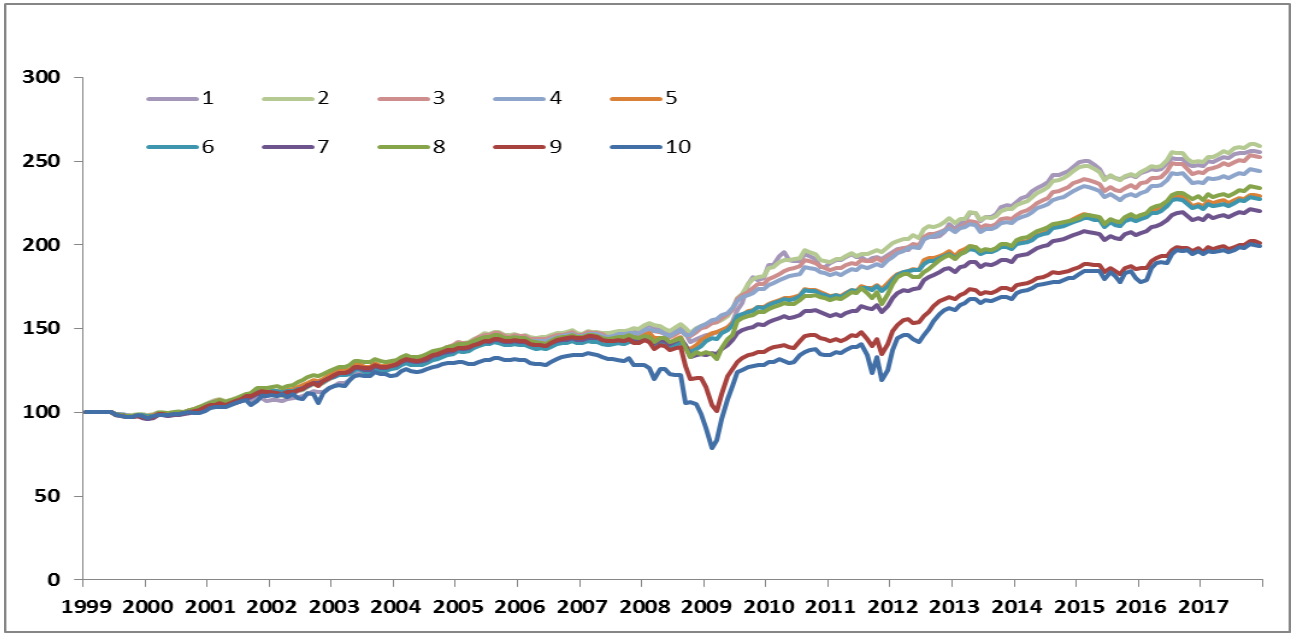




Decile returns and Duration-Times-Spreads are U-shaped, hinting at a specification problem

Momentum factor (1/2)

Amended specification recent returns scaled by bond durations



recent winners

recent losers

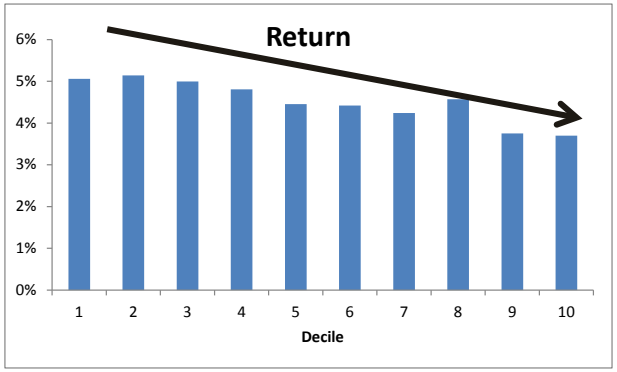
Momentum effect apparent

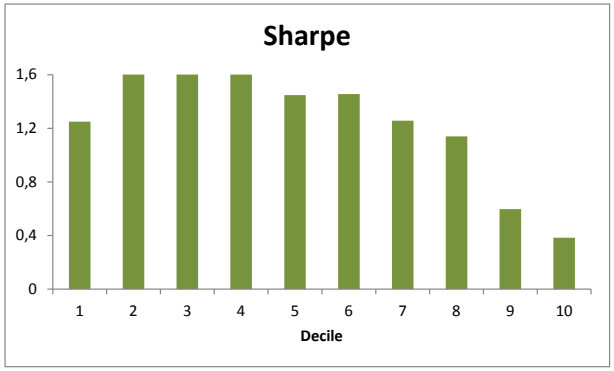
All deciles aligned

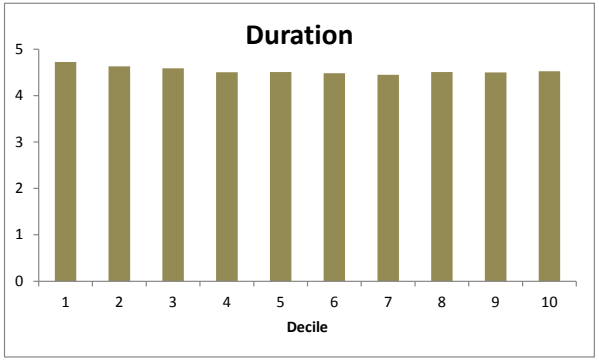
Momentum factor (2/2)

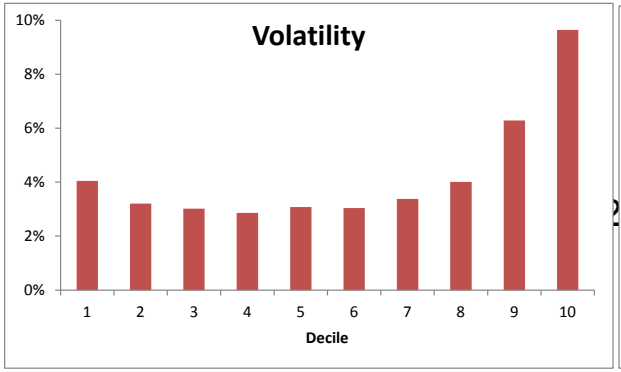
Amended specification

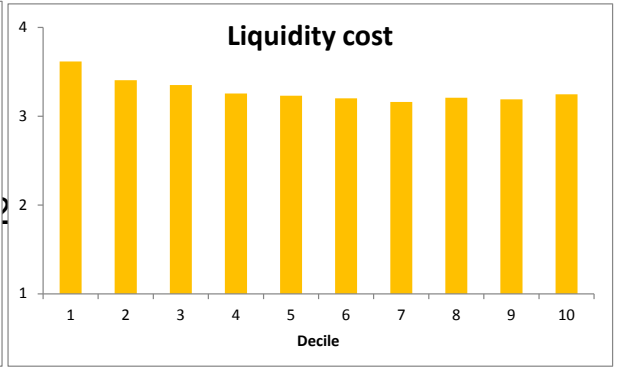
winners … losers

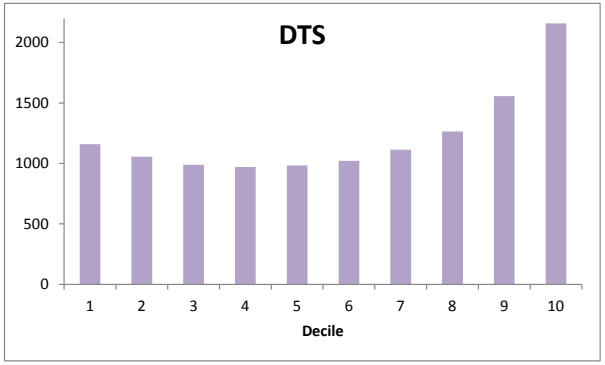












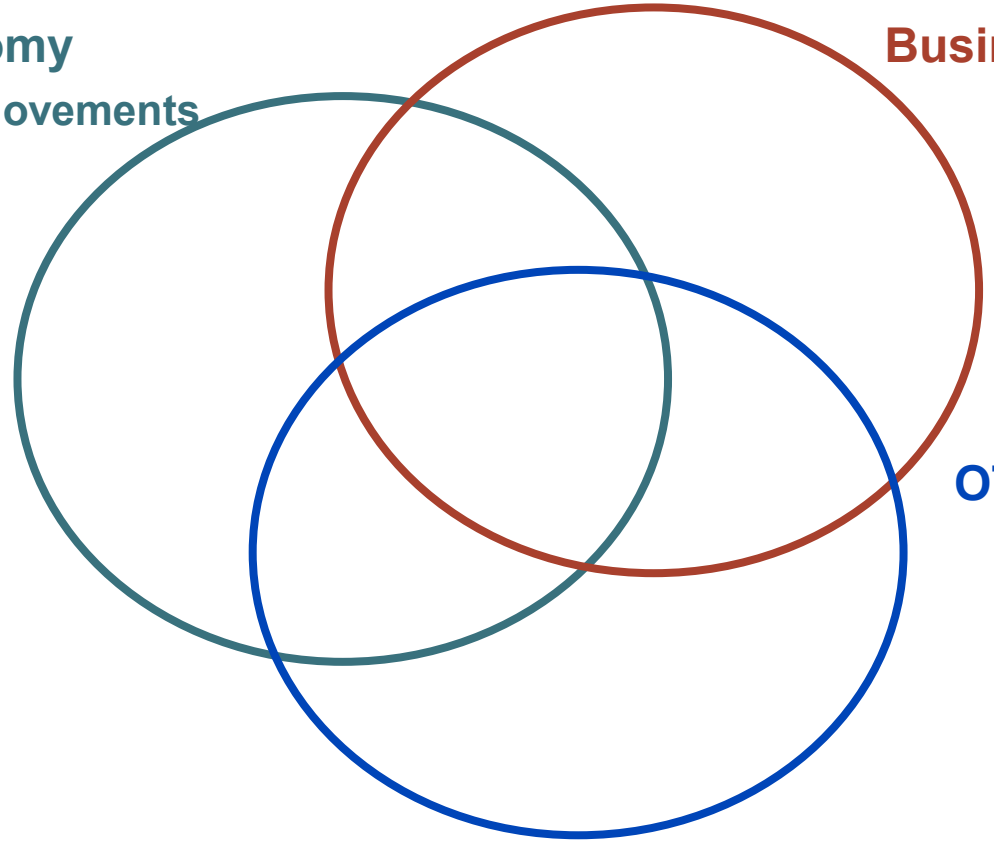
Amundi
ASSET MANAGEMENT

Traditional bond-risk factors

Corporate bond prices driven by three risk factors

Macro-economy
Interest-rate movements

Business environment
creditworthiness



OTC bond markets
liquidity

Amundi
ASSET MANAGEMENT

Concise traditional bond-risk model

Cross-sectional specification

$$R_{it} - y_{it} = \hat{\alpha}_t - d_{it} \cdot \left(\widehat{\Delta I}_t\right) - dts_{it} \cdot \left(\frac{\widehat{\Delta S}}{S}_t\right) + ltp_{it} \cdot \left(\hat{L}_t\right) + \hat{\varepsilon}_{it}$$

		D	C	L
return minus carry	duration	credit	liquidity	
	yield shifts	relative spread shifts	bid-ask spread[1]	

1 Ben Slimane and de Jong (2017) “Bond liquidity scores”, *Journal of Fixed-Income*

Amundi
ASSET MANAGEMENT

Liquidity cost scores

17 determinants

Individual characteristics	Common characteristics	Group definitions
↑ Size (nominal)	↑ Size of issuer group	↑ Treasury
↓ Age	↑ Size of country	↑ Investment Grade
↓ Time to maturity (ttm)	↓ Credit rating (numerical)	↓ Inflation Linked
↓ Coupon		↓ Subordinated[1]
↑ Carry[3]		↓ Zero Coupon
		↑ Major Currency[2]
		↑ Financial
		↓ Supranational
		↓ Government Related

↑ Positive for liquidity

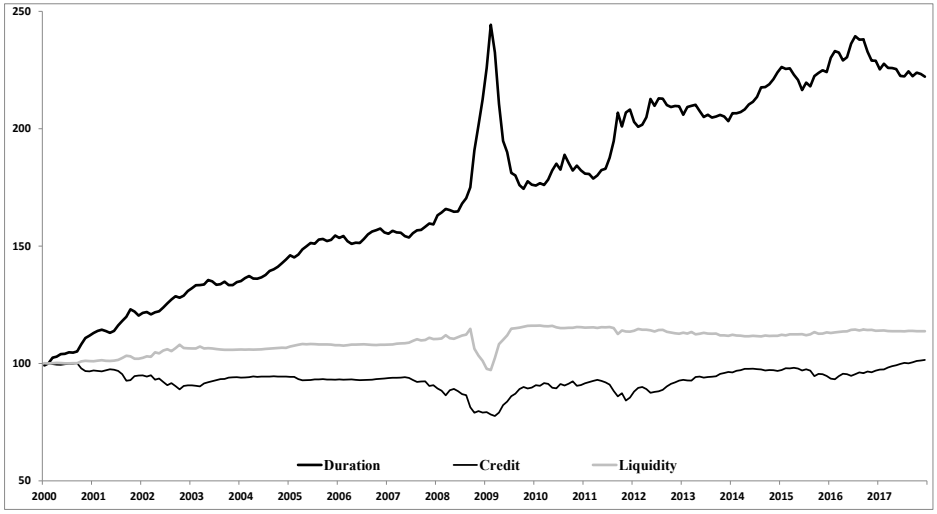
1 LT2, UT2, T1, T2, AT1

* AUD, CAD, CHF, EUR, GBP, JPY, KRW, NOK, NZD, SEK, SGD, USD

* Coupon over credit rating

Concise risk model

Estimation results



$R^2 = 0.59$

	T-stat	Return	Volatility
duration	13.0	4.5%	6.5%
credit	15.2	0.1%	3.8%
liquidity	3.3	0.7%	3.3%

Three factors important drivers for bond returns.
Factors are remunerated over test period (market risk premia).

- Duration premium due to gradual fall of interest rates
- Credit premium due to (minor) tightening of credit spreads and structural reward (carry)
- Liquidity premium represents transactions costs

Confrontation: old versus new school

Three significance tests

1. *cross-sectional regression over 6 factors*
2. *cross-sectional regression over 3 + 3 factors*
3. *time-series regression*

Amundi
ASSET MANAGEMENT

Newly-found factors

specified across bonds

$$R_{it} - y_{it} = \alpha_t + s_{it} \cdot \left(\widehat{\Delta S_t}\right) + v_{it} \cdot \left(\hat{V}_t\right) + m_{it} \cdot \left(\hat{M}_t\right) + \varepsilon_{it}$$

	S	V	M
return minus carry	size	value	momentum

S: total debt of issuer

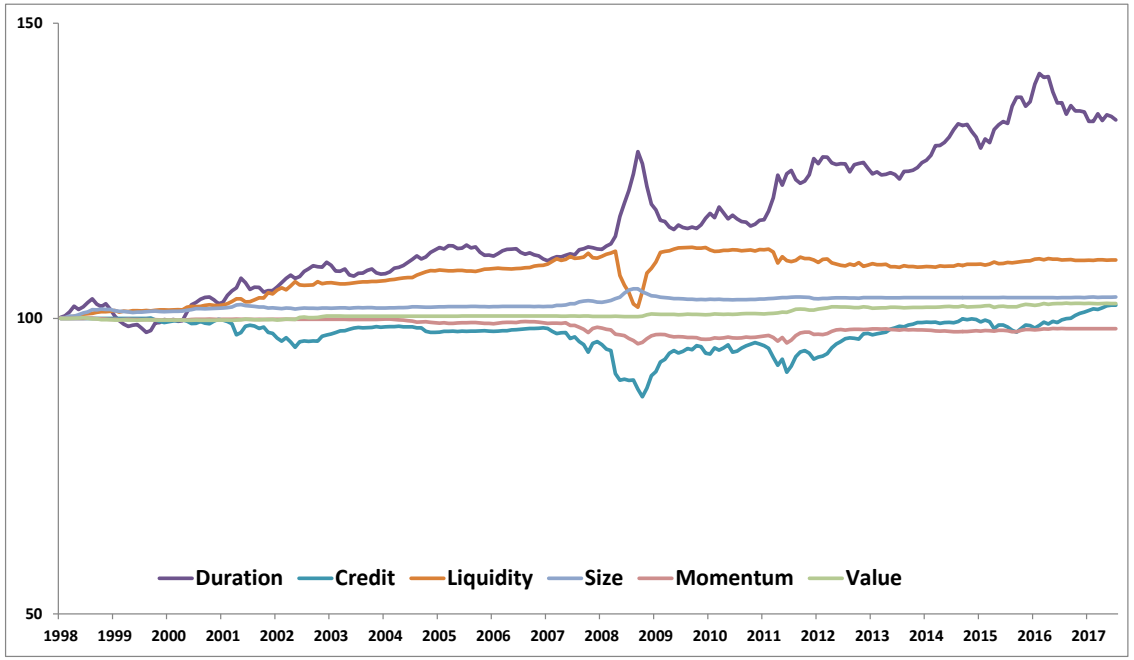
V: relative credit spread level within maturity x rating groups

M: trailing 6-month return scaled by bond duration

1. Six-factor model

Analogue to Carhart (1997)

$$R = \alpha + D + C + L + S + V + M + \varepsilon$$



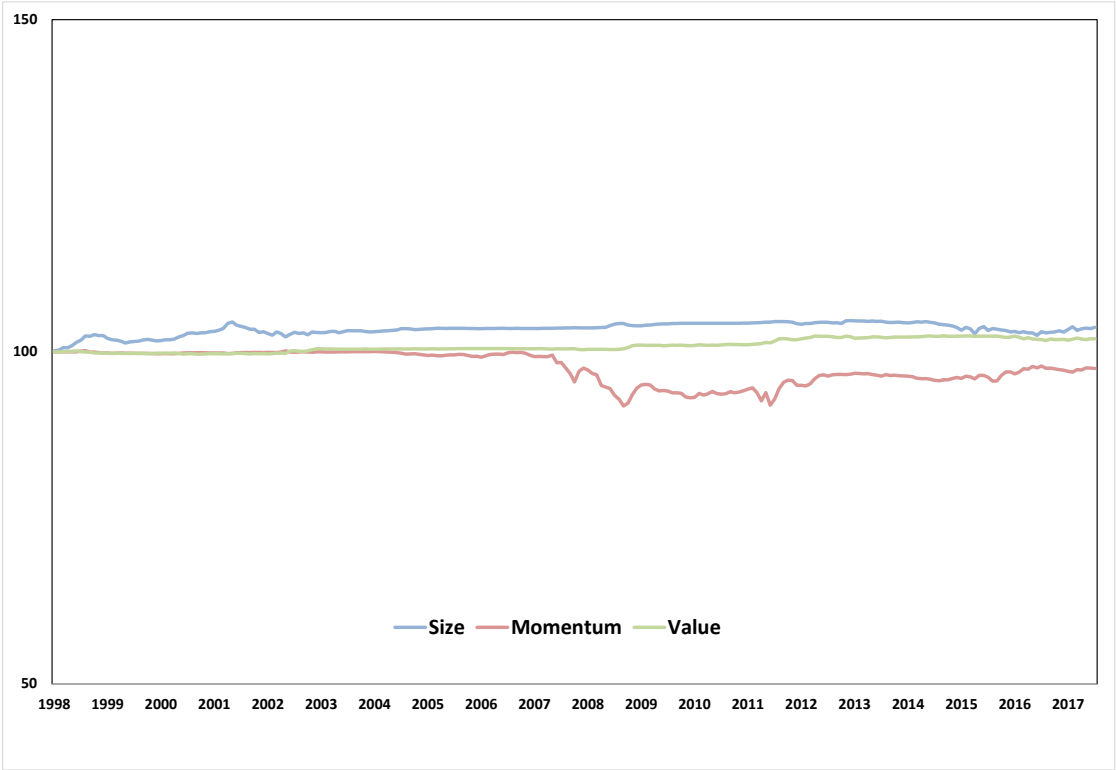
R^2	63%		
VIF	8,1		
	Return	**Vol**	**T Stat**
Benchmark	5,2%	3,3%	
Carry	3,7%	0,5%	
Intercept	0,9%	0,2%	1,0
Duration	1,5%	2,9%	5,5
Credit	-1,6%	2,7%	3,0
Liquidity	0,5%	1,7%	2,2
Size	0,2%	0,4%	1,2
Momentum	-0,1%	0,6%	1,2
Value	0,1%	0,2%	1,1
Residual	0,0%	1,6%	

Amundi
ASSET MANAGEMENT

2. Newly-found factors

Estimation result

$$R = \alpha + S + V + M + \varepsilon$$



R^2	27%		
VIF	2,0		
	Return	**Vol**	**T Stat**
Benchmark	5,2%	3,3%	
Carry	3,7%	0,5%	
Intercept	1,4%	0,3%	1,2
Size	0,2%	0,7%	1,6
Momentum	-0,1%	1,4%	1,8
Value	0,1%	0,3%	1,3
Residual	-0,1%	2,8%	

*

Amundi
ASSET MANAGEMENT

Tests on portfolio level

Setup

- Concise model tests significance on individual bond level.
- Pricing mechanisms related to alternative factors observable on an aggregate level.

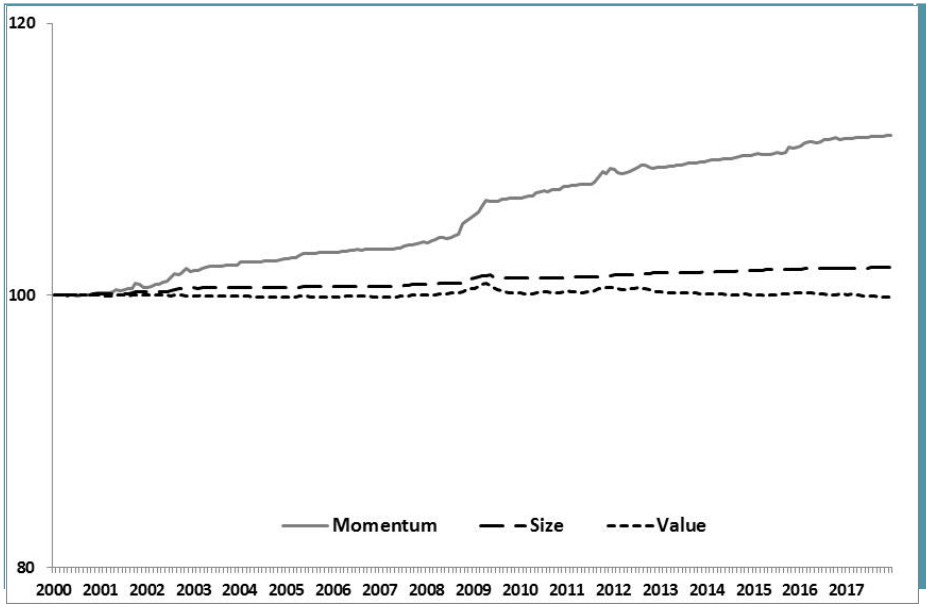
- Effects can be made apparent via *M*arket-neutral factor-tilted portfolios (*T*), with the same duration-, spread-, and liquidity level as the market.
- Portfolio performance analyzed via the simple regression:

$$T_t = \hat{\alpha} + \hat{\beta} \cdot M_t + \hat{\varepsilon}_t$$

- e.g. size-tilted portfolio contains small bond issues, weighted so that the overall DTS matches the market.
- The portfolios have time-stationary characteristics and a market beta close to 1.

Tests on portfolio level

Test results



	T-statistic	α (annual)	β
Size	4.7	0.13%	1.0
Value	2.3	0.08%	1.0
Momentum	9.0	0.81%	1.0

Correlation

	Size	Value	Momentum
Size	1		
Value	0.3	1	
Momentum	0.4	0.4	1

Size and momentum are genuine risk factors complementary to traditional risk sources

Value is an enhanced credit risk factor

Amundi
ASSET MANAGEMENT

Conclusion

- **We have placed the ongoing bond-factor debate into context,**
- **i.e. old school defending traditional risk factors vs new school defending new style factors.**
- **Significance tests show that both have a point**
  - Traditional risk factors are too significant to be ignored
  - New factors do determine bond returns to a certain extent
- **Implications**

  New findings offer new performance opportunity

  - Exposing to new factors without controlling for risk is ludicrous
  - A risk-controlled ARP strategy feasible yet needs management skill