BlackRock®

Discussant: Do Distributional Characteristics of Corporate Bonds Predict Their Future Returns?

David Greenberg

24 April 2015

Summary of Theory and Evidence higher order moments risk premia

In equity, investors don’t like systematic vol, kurtosis, and –ve skew
Main anomaly is non-systematic volatility has –ve risk premium

	Non-systematic			Systematic		
	Volatility	Skewness	Kurtosis	Volatility	Skewness	Kurtosis
Evidence (Equities)	-	-	+	+	-	+
Authors	Ang (06)	Conrad,Ghysels (08)		Ang (06)	Chang, Christoffersen (00)	
Theory						
Higher Moments CAPM	0	0	0	+	-	+
Intertemporal CAPM	0	0	0	+/-	+/-	+/-
Segmented Markets	+	-	+	+	-	+
Leverage Constraints	-	-	-	-	-	+
Prospect Theory	-	-	-	+/-	-	+/-

In corporate bonds, Bai, Bali, and Wen (15) find +ve and –ve risk premium for non-systematic volatility and skewness respectively

Evidence (Corporates)	+	-	0	N/A	N/A	N/A
Theory: Hi Moment CAPM	0	0	0	+	-	+

Stylized Facts on USD nominal rates risk premium

Fact #1: The 30 year bond rally (1981-2012) almost perfectly overlaps with the obs period of this study!

Fact #2: Longer duration bonds have higher expected returns, e.g. there exists a term premium

Fact #3: The highest sharpe ratios are concentrated in the short end of the curve. (True for 52-82 and 82-12)

- Yield curve is steepest at short end so large carry from rolldown

Fact #4: Expectations hypothesis not confirmed by the data; High forward rates forecast do not forecast higher spot rates, they forecast higher returns (Fama Bliss 1987)

- Mother of all asset pricing mysteries – why are all variations in yield/valuation ratio (low P/D ratio, steep yield curve) explained by time-varying discount rates and not time-varying cash flows

Monthly Treasury Excess Returns and Risk (1978-2012)

1978.1 - 2012.12	1yr	2yr	10yr	20yr	30yr
Excess Return (Monthly %)	0.08	0.13	0.27	0.32	0.38
Geometric Excess Ret (Monthly %)	0.08	0.13	0.24	0.28	0.31
Volatility(Monthly)	0.23	0.86	2.48	3.06	3.74
Sharpe Ratio(Annual)	**1.21**	**0.53**	**0.38**	**0.37**	**0.35**
Average Duration(on 2012.12)	0.95	2.00	9.06	14.52	19.98

USD Treasury Bond rally (1978-2012)

Stylized facts on USD Credit Spreads and Average Return for USD Corporates

Fact #1: Sharpe Ratios from Credit risk premia (duration hedged) are modest

Fact #2: Credit Excess return and SR don't decrease monotonically with credit rating

- BB Bonds have the highest excess returns – "Fallen angels" phenomena
- CCC have lower excess returns – "stretching for yield"

Fact #3: Credit spreads are mean reverting in the cross-section

- Spreads that widened most last year will tighten most next year

Monthly Corporate Returns and Risk (Hedged Duration)

1983.7 - 2013.12	AAA	AA	A	BBB	BB	B	CCC
Excess Return(Monthly %)	0.02	0.05	0.08	0.15	0.38	0.31	0.30
Geometric Excess Return(Monthly %)	0.02	0.05	0.08	0.14	0.36	0.28	0.21
Volatility(Monthly)	0.43	0.74	1.10	1.34	2.13	2.74	4.18
Sharpe Ratio(Annual)	0.13	0.25	0.26	0.40	0.62	0.40	0.25

Higher Moment Proxies

Dependent Variables:

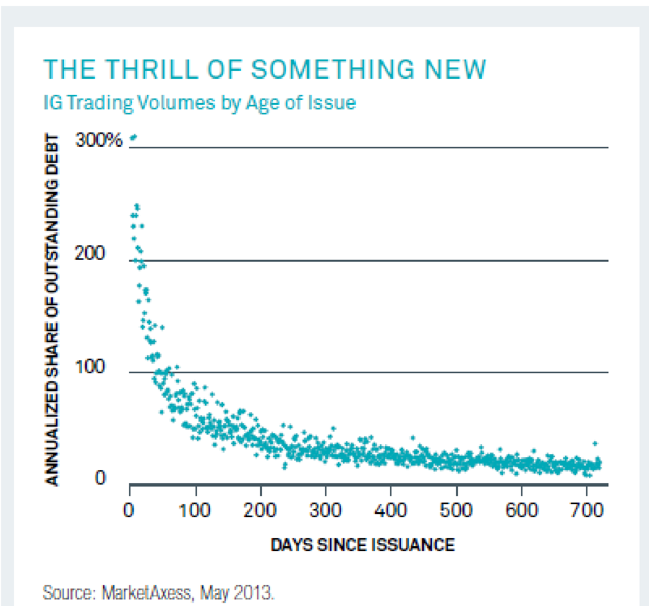
VOL $= \frac{1}{n-1}\sum_{1}^{n}\left(R_{it} - \overline{R_i}\right)^2$, n=60

SKEW $= \frac{1}{n}\sum_{1}^{n}\left(\frac{R_{it}-\overline{R_i}}{\hat{\sigma}_{it}}\right)^3$, n=60

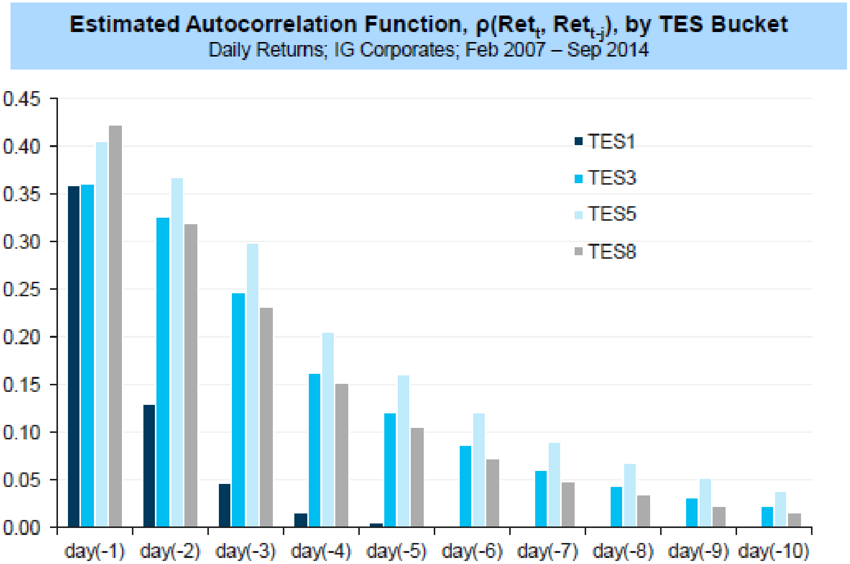
KURT $= \frac{1}{n}\sum_{1}^{n}\left(\frac{R_{it}-\overline{R_i}}{\hat{\sigma}_{it}}\right)^4$-3, n=60

1% VaR: Minimum monthly return over previous 60 months

Problem: Corporate bonds > 60 months old are illiquid with autocorrelated returns



Source: MarketAxess, May 2013.
Note: Trades since Jan. 1, 2012, on bonds issued after Jan. 1, 2010.



Source: *Barclays; TES, Trade Efficiency Score = average of bond tcost/unit of duration and volume*

VOL Factor: DTS provides a much simpler proxy for volatility

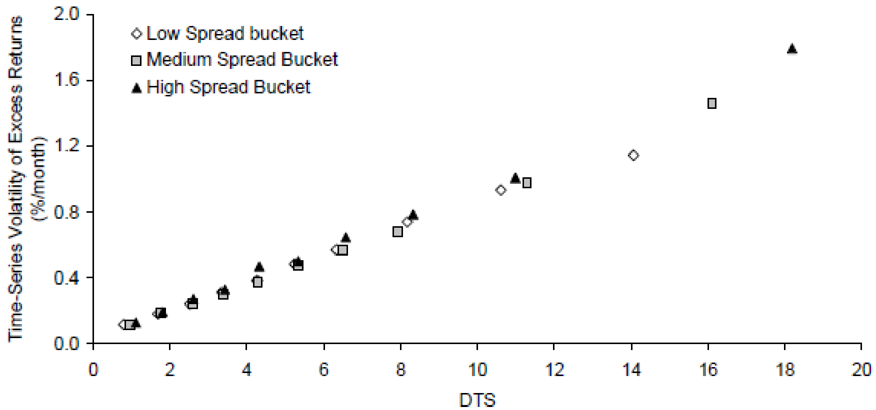
VOL Factor: Simpler proxy for credit excess return vol is spread duration times spread (DTS)

- Excess return volatility on credit instruments is linear in DTS (Dor, Dynkin 07)
- Result holds in cross-section, time-series,, asset classes (e.g. CDS, ABS, EM)
- Has theoretical justification via Merton Model
- Doesn't require any history at all – just current spread and duration

If spread level is collinear with volatility, then volatility premium is just another way of saying bonds with higher spreads usually earn higher return

- Another manifestation of yield/valuation asset pricing mystery

Figure 18: Excess Return Volatility versus DTS; Based on monthly observations of all IG bonds (9/1989–1/2005); Bonds are first partitioned to 10 DTS buckets and then further subdivided to 3 spread buckets



Source: Dor, Dynkin, et al (07)

SKEW factor – The problem of pre-formation sorts

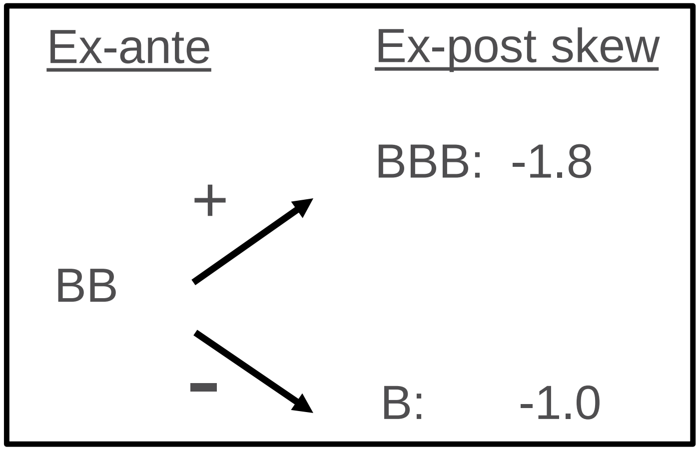
How do we know portfolios formed using trailing 60 month skew estimates reflect expected skew? Need to verify post-formation skew is similar to pre-formation skew.

An example where preformation and post formation skew sorts have opposite signs:

Skew estimated from Moody's 1982-2013 ratings transition matrix

Rating	Skew
AAA/AA	-0.3
A/BBB	-1.8
BB	-1.3
B	-1.0
CCC	-0.7

Source: *Blackrock,Moody's*



Possible forward looking skew proxies (at least for robustness check)

1. Implied skew from CDS Index options (Market Skew – use as a control for coskewness)
2. Create "pseudo bond" returns using equity and empirical put option prices (Culp, Veronesi (14)). Then use KMV-type Distance to Default to map bonds to "pseudo bond". Compute skew on "pseudo bond"
3. Conditional Ratings transition model
4. Econometric model on bond characteristics (leverage, size, time to maturity)

Even if proxy is valid, skew result may be explained by spread mean reversion

KURT factor – The problem of pre-formation sorts “The Sequel”

- **Kurtosis very difficult to estimate statistically (Kim and White, 2004)**
  - One or two data-points can account for most of the kurtosis estimate
  - Kurtosis hard to distinguish from time varying 2nd moments
  - Authors winsorize kurtosis estimates but not original returns data

Monte Carlo Simulation of 5 different t-distributions, N=60 (100,000 trials)

			I	II	III	IV	V
	df		9	8	7	6	5
	Excess Kurtosis		1.2	1.5	2	3	6
	Table 8 Kurtosis	MC Kurtosis	I	II	III	IV	V
KURT 1	-0.075	-0.78	22%	21%	20%	19%	17%
KURT 5	6.40	5.81	14%	16%	19%	23%	28%

Possible forward looking kurtosis proxies (see previous slide)

Controls: Δ10yr and ΔTERM

Quintiles	Average volatility	Average excess return	5-factor alpha	7-factor alpha with ΔDEF and ΔTERM	7-factor alpha with ΔCredSpr and Δ10Yr	Average Portfolio Characteristics		
						Rating	Maturity	Size
Low VOL	4.440	0.031	-0.063	-0.067	-0.067	5.888	9.837	0.272
		(0.33)	(-0.71)	(-0.70)	(-1.20)			
2	7.169	0.124	0.015	0.010	0.008	5.902	12.450	0.242
		(1.15)	(0.14)	(0.09)	(0.14)			
3	9.561	0.139	0.004	-0.002	-0.002	5.862	15.250	0.242
		(1.16)	(0.03)	(-0.01)	(-0.04)			
4	12.678	0.204	0.048	0.042	0.040	5.888	17.980	0.233
		(1.56)	(0.39)	(0.33)	(0.62)			
High VOL	27.592	0.439	0.295	0.289	0.287	6.472	20.240	0.229
		(2.77)	(1.89)	(1.75)	(2.54)			
High-Low Return/Alpha diff.		0.408***	0.358***	0.356***	0.354***			
		(4.06)	(3.30)	(3.28)	(3.47)			

Notice Strong maturity gap between V5 and V1 yet adding ΔTERM and Δ10yr has no impact on alpha.

Δ10yr = change in 10 year yield

- Does not account for coupon or rolldown

Monthly excess returns (%) (78-12)

Maturity	NONE	FF5+Δ10yr CMT	FF5+ 10yr ret
10 yr Tsy	0.27	0.18	0.00
20 yr Tsy	0.32	0.24	0.02
20yr - 10yr	0.05	0.06	0.02

Odd random observation: Everything in paper is done in arithmetic returns even though VOL and SKEW are the two main factors! Some aggregate V5-V1 return plots would be nice

Controls: Co-movement, rating, liquidity

If the story of the paper is about non-systematic risk, why are there no controls for systematic higher moment risk?

- Co-skewness (Harvey and Siddique (99))
- Co-kurtosis (Conrad, Dittmar, and Ghysels (12))
- Co-volatility (Ang 06)

Controls for granular rating buckets a bit odd since rating is a lagged, noisy proxy of spread, and spread drives the dependent variable of excess volatility.

- Paper uses 60% Lehman data but doesn't use Lehman rating conventions

Perhaps should also control for bond liquidity as a characteristic (using some liquidity proxy incorporating bond age, size, TRACE volume, OTR/off the run)

Need to understand and measure common factors of bond returns before looking at anomalies

We haven't moved much past "Common Factors in Stock and Bond returns" (FF 1993) in defining baseline common factors for corporates. FF5+TERM +DEF leave unexplained portfolio variation in time-series

TS Regression Monthly Excess Returns by Rating (78-12) FF5+TERM+DEF

Ratings	AAA	AA	A	BBB	BB	B	CCC
alpha	-0.02	-0.01	0.00	0.04	0.26	0.21	0.05
R2	20%	44%	55%	80%	67%	62%	58%

Need common factors tailored to corporates, not borrowed from equity

$$R_{i,ex} = \lambda_1 DTS_{i,IG} + \lambda_2 \, DTS_{i,HY} + \lambda_3 \widehat{\beta}_{\, i,MKT} + \lambda_4 \widehat{\beta}_{\, i,VAL} + \lambda_5 \widehat{\beta}_{\, i,MOM} + \lambda_6 \widehat{\beta}_{\, i,LIQ} + \lambda_7 \, \widehat{\beta}_{\, i,CARRY} + \lambda_8 \widehat{\beta}_{\, i,VOL}$$

Form Factor Mimicking Portfolios by sorting bonds into terciles by style factors

VALUE: Specific to region/asset class! (Δ yields prior 5 years) (Asness, Moskowitz 13)

MOMENTUM: Specific to region/asset class!

LIQUIDITY: (corporate bid-ask spread, TRACE volume)

CARRY: (Expected return under "nominal scenario") (Koijen, Moskowitz, Pedersen 13)

VOLATILITY: Return on a basket of options on SPX