

An Asset Manager's Approach To Assessing Quantitative Credit Risk

Moody's KMV Credit Practitioner Conference

September 25, 2006

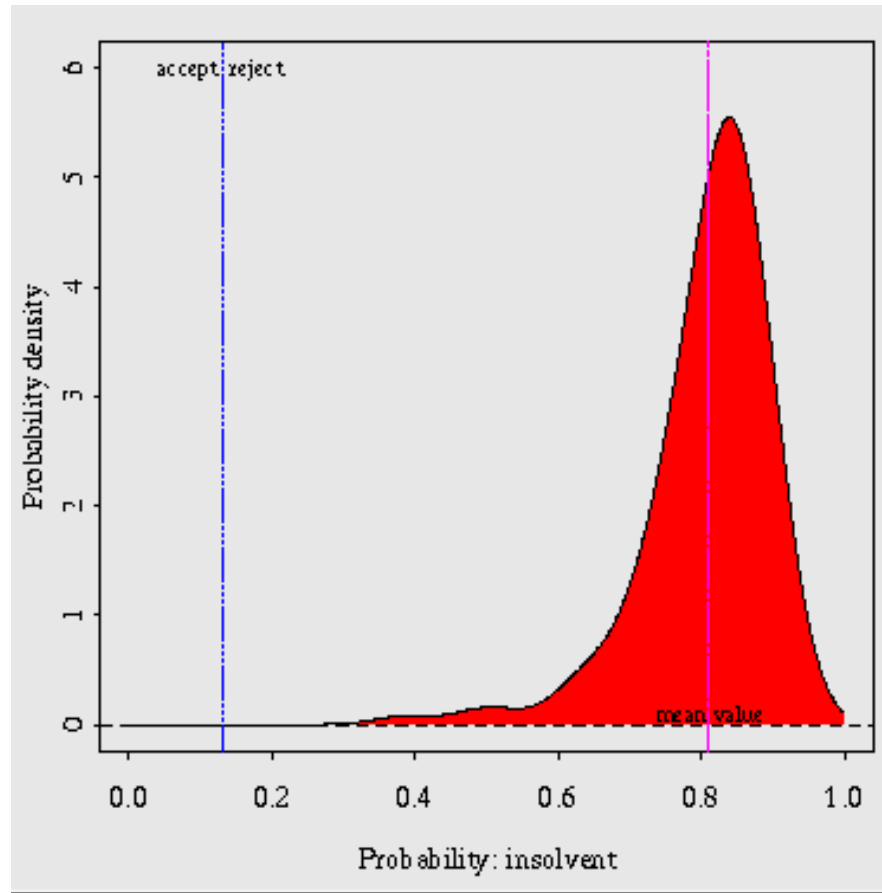
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Evergreen Investments
Quantitative Research and Risk Management



Credit Risk



Credit Risk Distribution



Source: www.ais.fraunhofer.de/AS/nn/pages/statbil_EN.html

Credit Risk

Typical Approach to construction of credit portfolios:

- Single Security Approach
- Fundamental Bottoms-up
- Limits on issuers and sector weights relative to a benchmark

Credit Risk

Drawbacks to typical approach

- Ignores correlations
- Credit derivatives (CDX, etc.) make single security approach more difficult
- Difficult to optimize risk taking: Issuer and sector limits “pigeon hole” risk as compared to overall measures of risk

Evergreen Approach

- Single Security “Doppler” Process
- Portfolio risk measures – correlation, unexpected risk, expected spread
- Utilize MKMV “Portfolio Manager” as “engine” for analytics

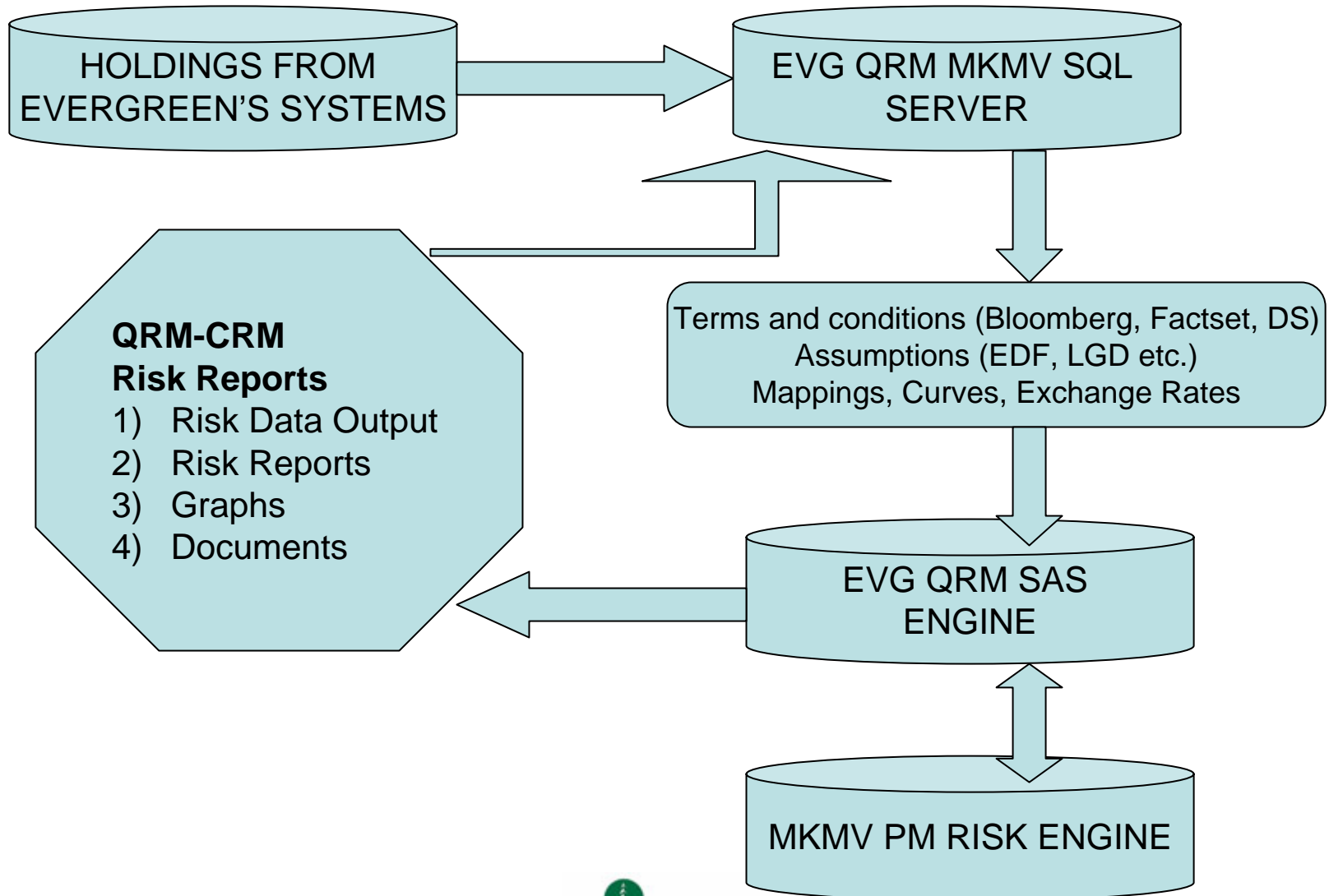
Evergreen Approach

- Close interaction with fundamental research analytics (Credit Edge Plus available to analyst teams)
- Ongoing interaction with portfolio management teams to review portfolio risk results

Case Study

- Evergreen's MKMV PM implementation overview.
- Evergreen's credit portfolio exposure and key risk-return measures for credit risk assessment of portfolios..
- A view of Evergreen's approach to using MKMV portfolio risk calculations for effective portfolio management and risk identification.

KMV PM AND EVERGREEN'S IMPLEMENTATION OVERVIEW



MKMV PM AND EVERGREEN'S IMPLEMENTATION OVERVIEW

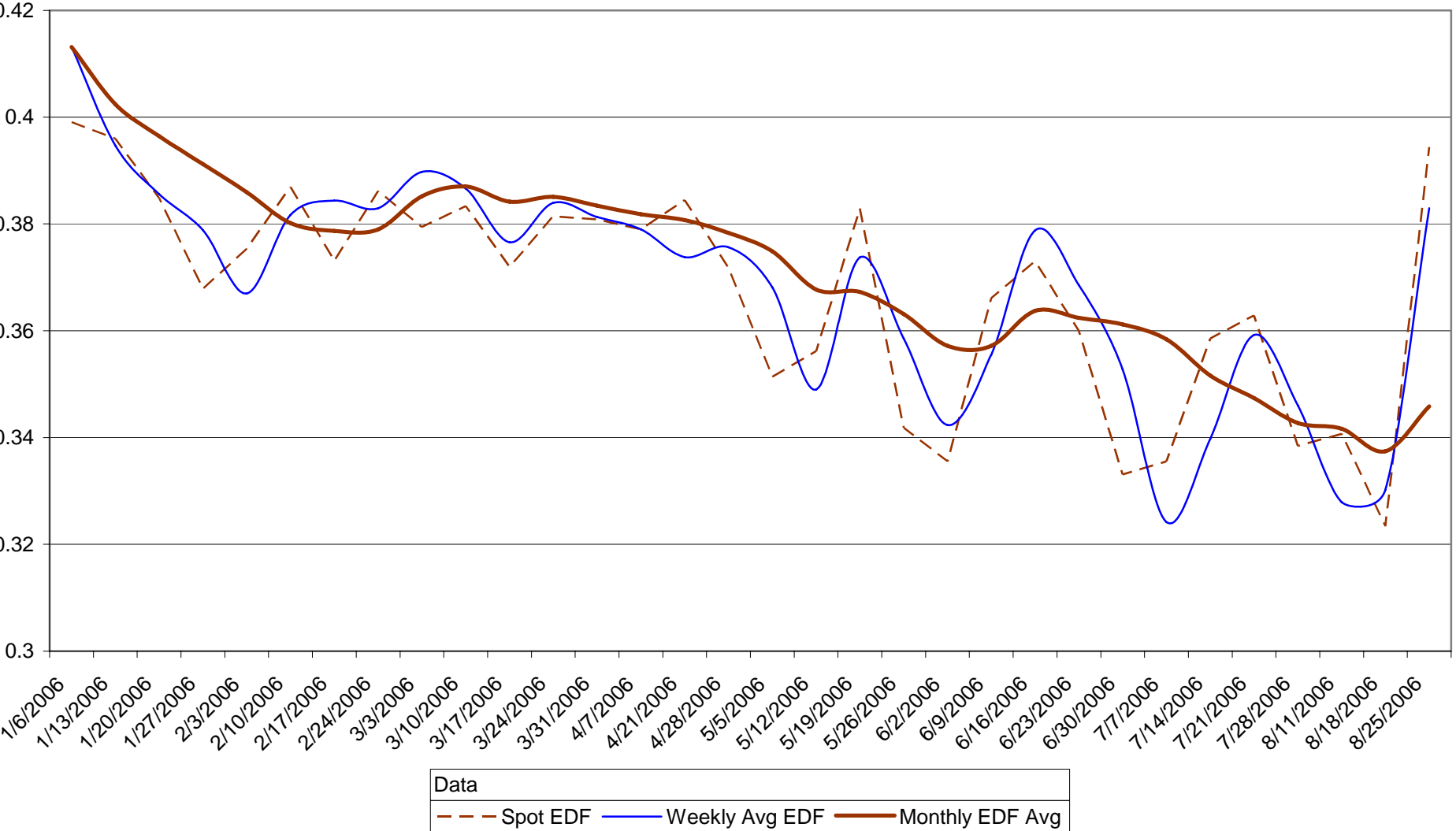
- Evergreen has over 300 portfolios with investment grade, high yield and international corporate credit exposure. (with market value of over \$20 billion)
- MKMV Portfolio Manager serves as our credit risk simulation back-end engine for risk computations.
- Internal SQL data server stores relevant terms-conditions and model specific data to drive the engine.
- SAS based application platform performs the necessary computations to run the engine for over 300 portfolios and then generate multiple report packages.
- This process is scalable to multiple portfolios.

EVERGREEN'S CREDIT RISK ASSESSMENT GUIDELINES

- Focus on optimizing credit risk while outperforming the return of the benchmark.
- Measure the downside risk and expected return of portfolio and the benchmark independently using portfolio unexpected loss and credit VaR as risk measures.
- Identify the major sources that contribute to this risk and decide on suitable trades that can reduce this risk. This information is derived from loss contribution numbers aggregated across sectors and ratings.

SAMPLE ISSUER LEVEL EDF ANALYSIS

WEEKLY AVERAGE EDF



SAMPLE ISSUER LEVEL EDF ANALYSIS

SECTOR LEVEL EDF DISTRIBUTION

Sector=Consumer, Cyclical

Industry Name	Issuer Name	Mean KMV EDF	Mean KMV Rtg	S&P Issuer Rating	Moody's Issuer Rating	EDF Change - 1 Month	EDF Change - 3 Months	Market Value
Airlines	AMR CORP/DE	1.25	B	B-	Caa2	(20%)	4%	\$1,752,485
	ATLAS AIR WORLDWIDE HLDG INC	0.43	BB-	D	C	(10%)	7%	\$421,181
	CONTINENTAL AIRLS INC -CL B	1.15	B	B-	Caa2	(21%)	(3%)	\$1,397,018
<i>Airlines</i>		<i>0.94</i>	<i>B</i>			<i>(17%)</i>	<i>3%</i>	<i>\$3,570,684</i>
Apparel	ELLIS PERRY INTL INC	0.16	BB+	B+	B2	(41%)	(48%)	\$160,883
	KELLWOOD CO	0.14	BBB-	BB	Ba3	(18%)	(18%)	\$290,073
	OXFORD INDUSTRIES INC	0.23	BB	BB-	B1	(8%)	(23%)	\$222,134
	PHILLIPS-VAN HEUSEN CORP	0.02	AAA	BB+	B1	.0%	.0%	\$441,952
	QUIKSILVER INC	0.19	BB+	.	.	6%	(30%)	\$409,423
	UNIFI INC	2.16	B-	CCC+	Caa2	(1%)	23%	\$196,545
	WARNACO GROUP INC	0.15	BBB-	BB-	B1	(29%)	(12%)	\$234,955
<i>Apparel</i>		<i>0.44</i>	<i>BB-</i>			<i>(13%)</i>	<i>(15%)</i>	<i>\$1,955,964</i>

Industry Sectors Are As Defined By Bloomberg

% change in EDF is highlighted in red if change is worse than 20%

EDF mapped rating is highlighted in yellow if high-yield

SAMPLE ISSUER LEVEL EDF ANALYSIS

QUANTITATIVE CREDIT RISK MANAGEMENT High Yield Analysis

Sep 01, 2006
Holdings as of Aug. 31, 2006

Sample High Yield Credit				
Sector	Wt	Avg EDF	One Month Avg Change	
Aerospace	0%	0.30	9.0bp	43% ↑
Basic Industries	11%	0.84	-6.9bp	-8% ↓
Cable TV / Printing / Publish	14%	2.74	16.1bp	6% ↑
Consumer Goods & Durable	21%	0.57	-0.5bp	-1% ↓
Equipment	1%	0.25	6.7bp	37% ↑
High Tech	2%	1.23	-14.6bp	-11% ↓
Materials / Extraction	25%	0.52	-1.6bp	-3% ↓
Medical	3%	0.08	-0.7bp	-8% ↓
Other Financials	2%	0.29	2.7bp	10% ↑
REIT	6%	0.81	24.4bp	43% ↑
Transportation	6%	3.73	0.5bp	0%
Utilities	9%	0.36	-4.1bp	-10% ↓

Benchmark High Yield Index				
Sector	Wt	Avg EDF	One Month Avg Change	
Aerospace	1%	0.39	-4.3bp	-10% ↓
Banks and S&Ls	0%	0.04	-0.5bp	-11% ↓
Basic Industries	15%	1.44	0.8bp	1% ↑
Cable TV / Printing / Publish	14%	3.10	-0.6bp	0%
Consumer Goods & Durable	20%	1.09	5.3bp	5% ↑
Equipment	2%	2.30	14.8bp	7% ↑
High Tech	4%	1.48	-3.8bp	-2% ↓
Materials / Extraction	21%	0.55	-7.0bp	-11% ↓
Medical	5%	0.38	-7.7bp	-17% ↓
Other Financials	3%	0.85	14.1bp	20% ↑
REIT	2%	1.09	29.2bp	37% ↑
Transportation	3%	0.64	8.0bp	14% ↑
Utilities	10%	0.30	-2.1bp	-7% ↓

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In the context of Moody's KMV quantitative credit model, a firm is assumed to have defaulted when the market value of assets falls below its liabilities payable (default point). KMV uses an economic structural model to measure the probability of default or the Expected Default Frequency (EDF) of a firm. The three main elements that determine the EDF value are:

- **Market Value of Assets**– The market value of assets is not fixed and evolves over time as new information (including stock price) about the prospects of the firms becomes available. Hence, asset value is modeled as a random walk.
- **Asset Volatility**– This is a measure of the firm's business and industry risk.
- **Leverage**– The book value of liabilities relative to market value of assets is the pertinent measure of the firm's leverage.

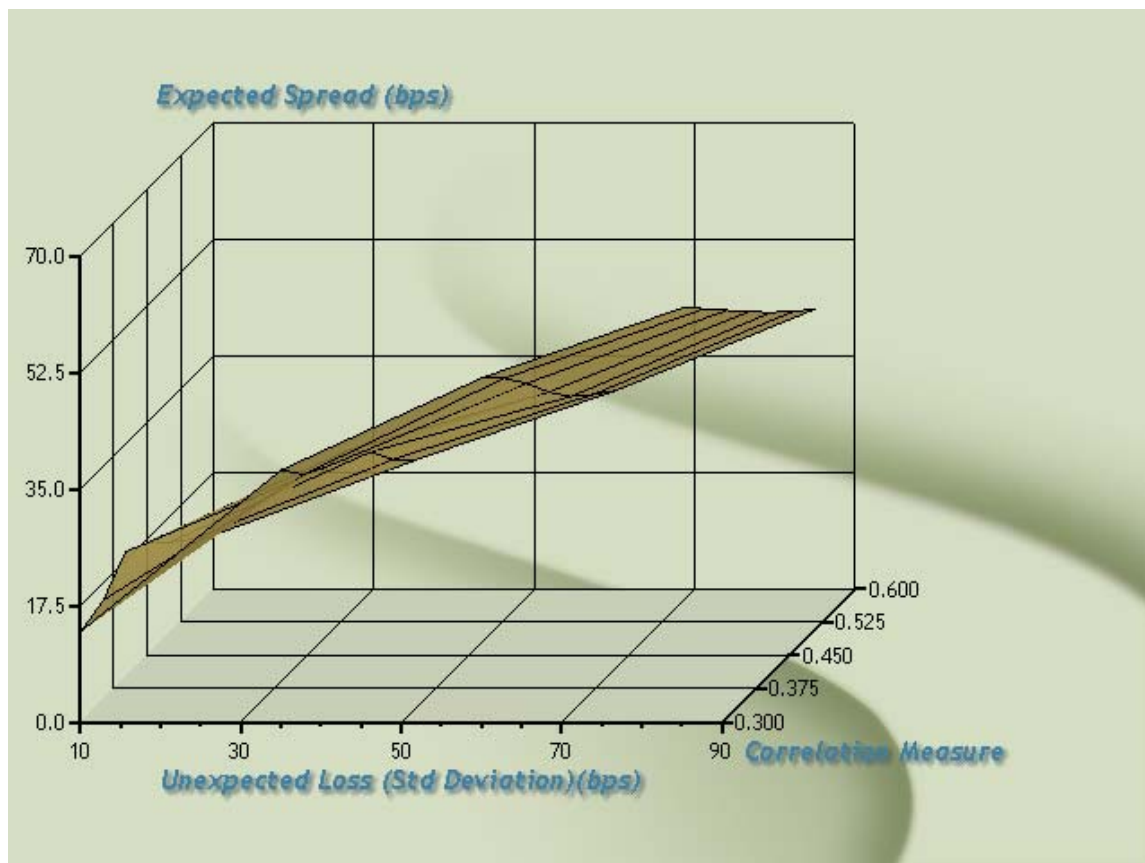
With the market price of equity as known, the market value of assets and volatility of assets is determined using an option pricing based approach.

As part of our quantitative credit initiative, QRM publishes several weekly reports around KMV EDF on Investnet. The focus of these reports is analysis of credit issues around individual issuers captured by the dynamic KMV EDFs which are not always evident in the generally "sticky" agency ratings.

While capturing credit quality, we also try to identify the key quantitative drivers. Using KMV's implied LGD (loss-given-default) measure, we also analyze pricing relevant market spread information not generally captured by EDF.

The time period under consideration is between July 31 2006 and August 31 2006. The sector definitions are as per KMV classification. The one month average EDF change is the change in average EDF over this one month period.

EVERGREEN'S APPROACH FOR CREDIT RISK ASSESSMENT OF PORTFOLIOS



- Portfolio level Risk-Return-Correlation chart for about 150 corporate bond portfolios.
- Risk as measured by unexpected loss.
- Correlation as measured by the percent of risk retained after benefits of diversification.
- Increasing returns with increasing risk is evident from the graph alongside.
- Same risk portfolios have slightly lower expected returns for increasing correlation.

CREDIT RISK MEASURES AND ANALYSIS

- Portfolio level risk-return overview.
- Breakdown by sectors.
- Breakdown by ratings.
- Identify sources of underperformance.
- Identify top risk contributors.

SAMPLE PORTFOLIO AND BENCHMARK OVERVIEW

As of: 8/31/2006	Sample	Benchmark
Total Credit Exposure	\$390,230,764	\$544,163,887,542
Num of Issues	110	1484
Unexpected Loss (bps)	76	81
Expected Spread (bps)	46	52
Expected Loss (bps)	6	6
Correlation Measure	33%	33%
Sharpe Ratio	0.60	0.64
Credit-Var (95% Confidence) (bps)	145	149

The screenshot shows a table with two columns: 'Sample' and 'Benchmark'. The rows correspond to the metrics in the main table above, such as Total Credit Exposure, Num of Issues, Unexpected Loss (bps), Expected Spread (bps), Expected Loss (bps), Correlation Measure, Sharpe Ratio, and Credit-Var (95% Confidence) (bps).

- BB-B High-Yield sample with 110 bonds from 108 issuers.
- BB-B benchmark with 1484 bonds from 813 issuers.
- Sample risk (UL) and VaR are less than benchmark.
- Sample expected return is less than benchmark.
- Sample sharpe ratio is less than benchmark indicating an unfavorable expected return both on absolute and risk-adjusted basis.



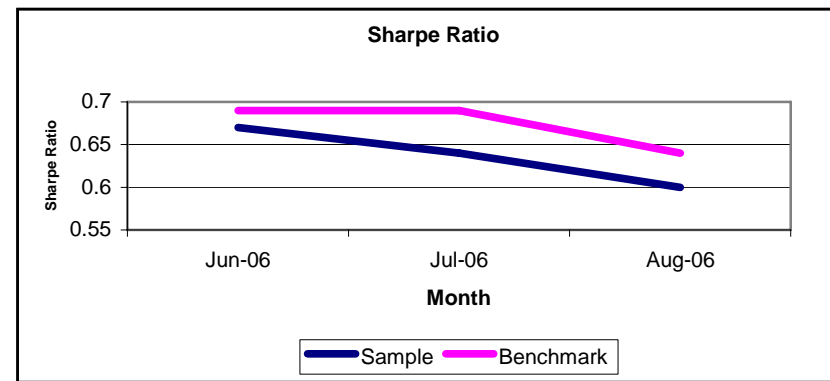
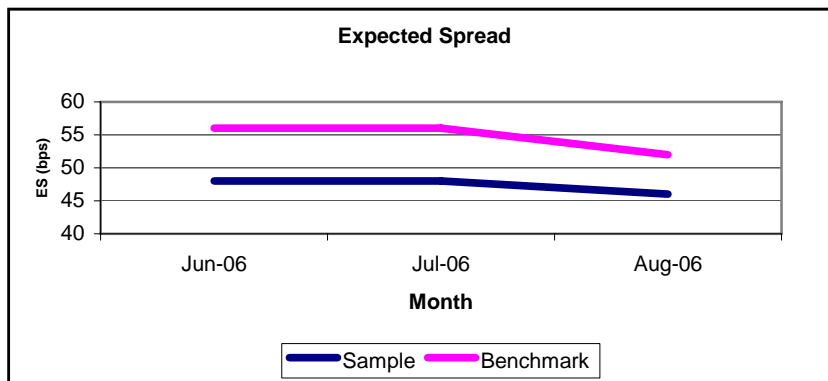
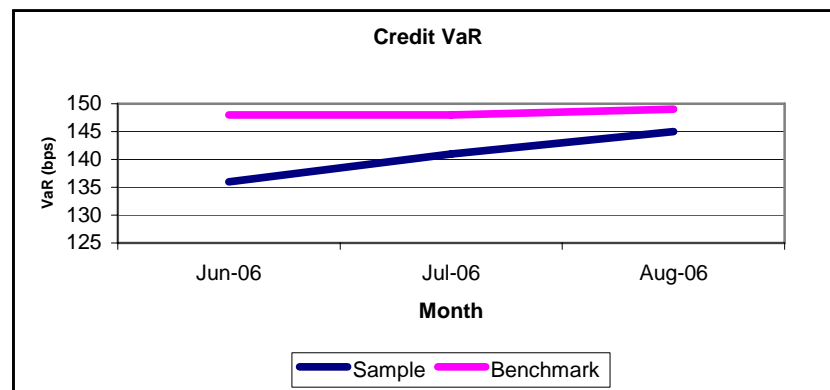
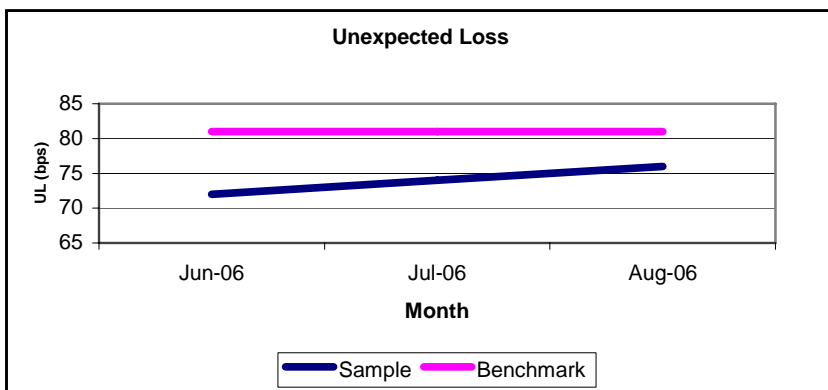
PORTFOLIO CREDIT CHARACTERISTICS

Rating	Sample							Benchmark						
	Wt	LGD	R-Sqr	1-Yr EDF	EDF to Mat	Time to Mat	Cpn	Wt	LGD	R-Sqr	1-Yr EDF	EDF to Mat	Time to Mat	Cpn
BBB	1%	59%	33%	0.07%	1.2%	9.8	7.1%							
BB	35%	53%	26%	0.14%	1.4%	6.6	7.2%	46%	54%	27%	0.13%	1.6%	8.3	7.5%
B	65%	59%	22%	0.56%	4.3%	6.6	8.0%	54%	58%	22%	0.79%	6.2%	7.7	8.4%

Sector	Sample							Benchmark						
	Wt	LGD	R-Sqr	1-Yr EDF	EDF to Mat	Time to Mat	Cpn	Wt	LGD	R-Sqr	1-Yr EDF	EDF to Mat	Time to Mat	Cpn
Materials / Extraction	24%	56%	21%	0.40%	3.2%	6.9	7.9%	19%	56%	22%	0.48%	4.0%	7.8	8.2%
Consumer Goods	19%	62%	19%	0.49%	3.6%	6.3	8.3%	11%	58%	24%	0.66%	5.9%	9.2	8.3%
Basic Industries	14%	58%	19%	0.34%	2.9%	7.2	7.1%	17%	57%	18%	0.51%	3.8%	6.7	7.9%
Utilities	13%	55%	32%	0.60%	4.4%	6.1	7.9%	14%	53%	33%	0.40%	4.1%	9.8	8.0%
Media / Publishing	12%	57%	22%	0.46%	3.8%	6.9	7.5%	16%	55%	22%	0.46%	3.9%	8.1	8.1%
Medical	5%	65%	19%	0.36%	3.2%	7.6	6.6%	5%	59%	18%	0.68%	5.6%	8.2	7.5%
Other Financials	4%	50%	47%	0.16%	1.2%	5	7.5%	7%	54%	31%	0.42%	3.2%	7.5	7.9%
REIT	4%	54%	18%	0.16%	1.3%	6.2	8.3%	2%	52%	29%	0.21%	1.7%	6.4	7.4%
High Tech	2%	54%	30%	0.32%	2.7%	6.7	6.5%	4%	58%	27%	0.49%	3.6%	6.9	7.7%
Equipment	2%	51%	42%	0.18%	1.5%	5.5	8.7%	1%	56%	31%	0.50%	3.5%	5.5	8.4%
Transportation	1%	56%	19%	0.15%	1.5%	6.8	6.3%	2%	53%	21%	0.32%	2.9%	8	8.0%
Aerospace	1%	69%	22%	0.13%	1.8%	9.1	6.4%	2%	66%	18%	0.53%	4.1%	6.9	7.3%
Banks and S&Ls								1%	54%	34%	0.15%	1.6%	8.4	8.2%
		57%	23%	0.41%	3.3%	6.7	7.7%		56%	24%	0.49%	4.1%	8	8.0%

PORTFOLIO RISK-RETURN TREND ANALYSIS

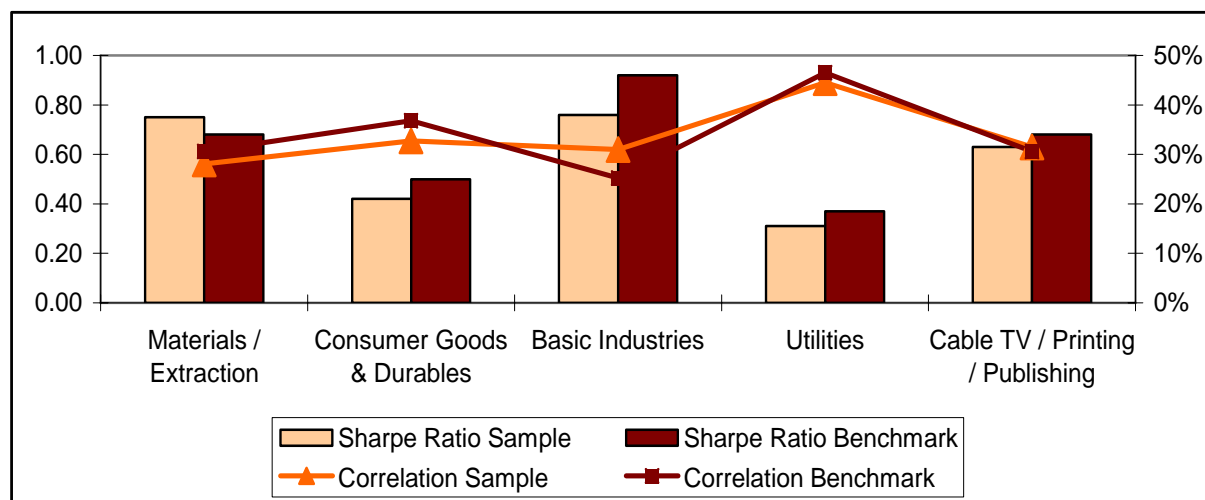
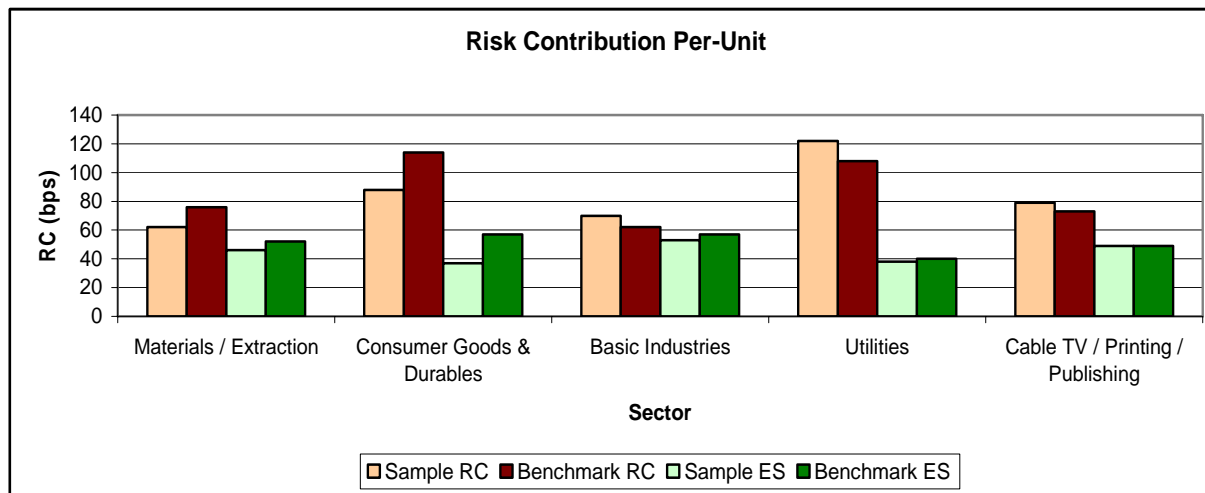
Month End	Sample						Benchmark					
	LGD	R-Sqr	1-Yr EDF	EDF to Mat	Time to Mat	Cpn	LGD	R-Sqr	1-Yr EDF	EDF to Mat	Time to Mat	Cpn
Jun-06	57%	24%	0.38%	2.97%	6.6	7.60%	56%	24%	0.47%	4.04%	8.1	8.00%
Jul-06	57%	23%	0.41%	3.21%	6.7	7.70%	56%	24%	0.47%	3.99%	8	8.00%
Aug-06	57%	23%	0.41%	3.26%	6.7	7.70%	56%	24%	0.49%	4.08%	8	8.00%



CURRENT PORTFOLIO RISK BY SECTOR

Sector	Sample					Benchmark				
	Wt	Risk Contribution (bps)	Expected Spread (bps)	Sharpe Ratio	Correlation	Wt	Risk Contribution (bps)	Expected Spread (bps)	Sharpe Ratio	Correlation
Materials / Extraction	24%	15	11.2	0.7	28%	19%	14.4	9.8	0.7	31%
Consumer Goods & Durables	19%	16.2	6.8	0.4	33%	11%	12.4	6.2	0.5	37%
Basic Industries	14%	9.7	7.4	0.8	31%	17%	10.2	9.3	0.9	25%
Utilities	13%	16.4	5.2	0.3	45%	14%	15.3	5.6	0.4	47%
Cable TV / Printing / Publishing	12%	9.3	5.8	0.6	32%	16%	11.9	8	0.7	31%
Medical	4%	3.3	2	0.6	31%	5%	4.4	3.6	0.8	30%
Other Financials	4%	2.2	3.2	1.4	36%	7%	5.2	4	0.8	34%
REIT	4%	0.9	0.9	1.0	19%	2%	1	0.9	0.9	33%
High Tech	2%	1.6	1.8	1.1	32%	4%	3.4	2.1	0.6	33%
Equipment	2%	0.8	0.3	0.5	35%	1%	0.9	0.5	0.5	33%
Transportation	1%	0.4	0.7	1.7	23%	1%	0.8	0.9	1.1	28%
Aerospace	1%	0.5	0.4	0.7	30%	2%	1.1	0.6	0.5	27%
Banks and S&Ls						1%	0.3	0.4	1.7	25%
		76.3	45.6		110		81.3	52		

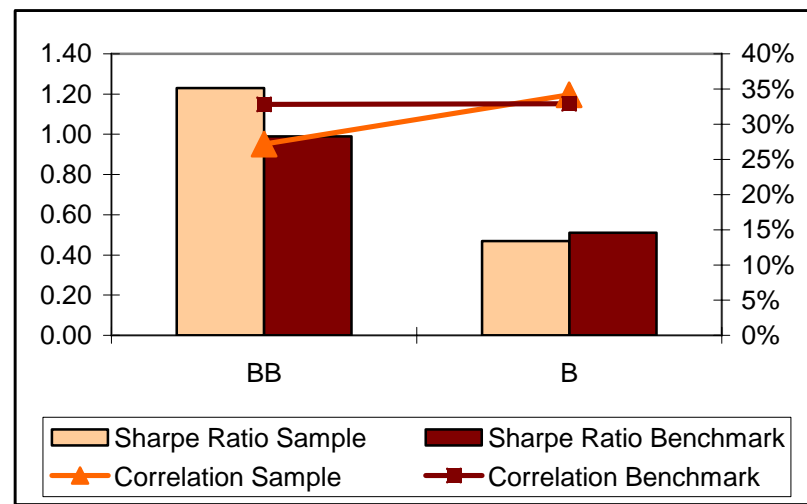
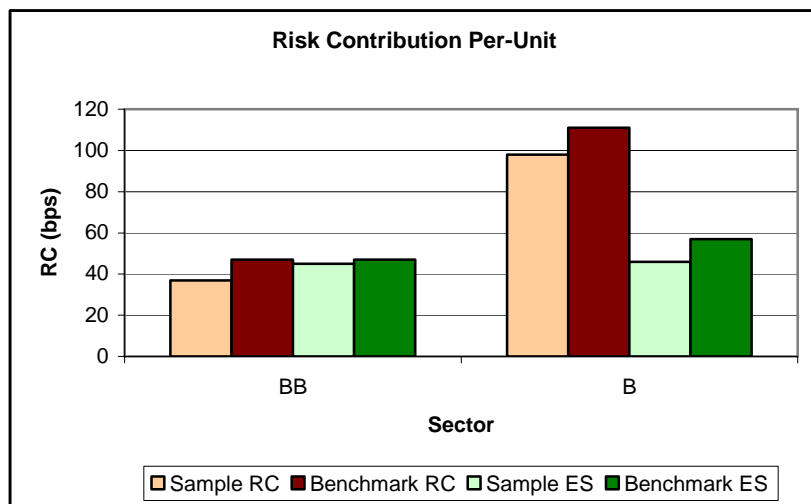
CURRENT PORTFOLIO RISK BY SECTOR



- Top 5 sectors constitute 80% of the sample and 76% of benchmark by weight.
- Sample overweight 5% materials/extraction and 7% consumer goods/durables. Per-unit risk is less than benchmark however per-unit expected return is less than benchmark as well.
- Other sectors are more risky than benchmark while providing about same expected return.
- On a risk-adjusted basis all sectors except Materials/Extraction look unfavorable.
- Correlation as defined by retained-risk is consistent across sample and benchmark.

CURRENT PORTFOLIO RISK BY RATING

Issue Agency Rating	Weight	Sample				Weight	Benchmark			
		Risk Contribution (bps)	Expected Spread (bps)	Sharpe Ratio	Correlation		Risk Contribution (bps)	Expected Spread (bps)	Sharpe Ratio	Correlation
BBB	1%	0.3	0.3	1	33%					
BB	35%	12.8	15.7	1.2	27%	46%	21.9	21.7	1.0	33%
B	65%	63.3	29.6	0.5	34%	54%	59.4	30.3	0.5	33%
	100%	76.3	45.6			100%	81.3	52		



- Sample is 11% underweight BB and 11% overweight B.
- On a per-unit basis sample BBs are 10 bps less risky and Bs are 13 bps less risky than the benchmark.
- Sample BBs provide 2bps less expected return. However, sample Bs provide 11 bps less expected return.
- On a risk adjusted basis sample BBs look better than the benchmark.

SAMPLE PORTFOLIO RISK ALLOCATION SORTED BY RISK CONTRIBUTION

Issuer Name	OAS (bps)	Wt	EDF Used	LGD	R-Sqr	RC (bps)	% RC	Exp Loss	Total Spread	Retained Risk	Sharpe Ratio
DYNEGY INC	380	1.11%	B-	58%	35%	277.3	4.08%	0.15%	0.81%	55%	0.24
MIRANT CORP	256	1.14%	B-	58%	34%	221.3	3.29%	0.15%	0.53%	51%	0.17
QWEST COMMUNICATION INTL INC	312	1.12%	B-	46%	31%	189.9	2.76%	0.10%	0.73%	45%	0.33
UNITED AUTO GROUP INC	211	1.12%	B-	68%	25%	174.9	2.63%	0.16%	0.30%	43%	0.08
AES CORP. (THE)	243	1.10%	B-	58%	42%	177.9	2.63%	0.06%	0.46%	60%	0.23
RELIANT ENERGY INC	280	1.23%	B-	46%	39%	156	2.50%	0.05%	0.61%	57%	0.36
NRG ENERGY INC	253	1.14%	B-	46%	30%	163.3	2.50%	0.11%	0.51%	48%	0.24
R H DONNELLEY CORP	180	1.38%	B-	68%	22%	123.7	2.24%	0.08%	0.16%	41%	0.06
BUCKEYE TECHNOLOGIES INC	366	1.26%	B-	58%	16%	132.1	2.24%	0.11%	0.75%	35%	0.49
MEDIACOM COMMUNICATIONS CORP	275	1.11%	B-	58%	29%	141.1	2.11%	0.13%	0.48%	37%	0.24
LIN TV CORP	316	0.91%	B-	68%	23%	164.8	1.97%	0.17%	0.73%	35%	0.34
EL PASO CORP	223	1.12%	B	58%	49%	127	1.84%	0.04%	0.43%	52%	0.31
OWENS-ILLINOIS INC	304	1.19%	B-	46%	27%	116.6	1.84%	0.05%	0.67%	45%	0.53
IRON MOUNTAIN INC	229	0.75%	B-	68%	25%	184	1.84%	0.16%	0.39%	42%	0.12
PAYLESS SHOESOURCE INC	249	1.11%	B-	68%	19%	122.7	1.84%	0.08%	0.46%	38%	0.31
LAMAR ADVERTISING CO -CL A	270	1.08%	B	68%	25%	121.6	1.71%	0.06%	0.61%	36%	0.45
EXTENDICARE INC -SVTG	65	1.13%	B-	68%	22%	115.3	1.71%	0.08%	0.02%	37%	-0.05
NEIMAN-MARCUS GROUP INC	282	0.73%	B-	58%	23%	176.7	1.71%	0.15%	0.50%	40%	0.2
AQUILA INC	312	0.78%	B-	58%	28%	163.8	1.71%	0.15%	0.30%	42%	0.09
INGLES MARKETS INC -CL A	163	0.97%	B-	68%	18%	127.2	1.58%	0.16%	0.22%	33%	0.05
TARGA RESOURCES INC	352	1.15%	B-	46%	15%	107.2	1.58%	0.11%	0.70%	32%	0.55
DEL MONTE FOODS CO	199	1.15%	B-	68%	16%	106.9	1.58%	0.08%	0.32%	36%	0.22
UNITED RENTALS INC	281	0.89%	B-	58%	27%	131.6	1.58%	0.12%	0.61%	38%	0.38
TRIAD HOSPITALS INC	291	0.95%	B-	68%	13%	121.9	1.58%	0.14%	0.64%	29%	0.42
LEVI STRAUSS JAPAN KABUSHIKI K	397	0.81%	CCC+	58%	11%	129.6	1.45%	0.21%	0.77%	26%	0.43
		26.50%					52.24%				

Summary

- We argue that quantitative credit risk measurement and analysis on both single security and portfolio level is a vital part of credit research and portfolio management.
- Evergreen approach to measuring credit risk which includes single security EDFs doppler as well as portfolio measures of risk is complementary to the firm's fundamental research efforts and bottom-up portfolio management process.
- Evergreen has built a scalable quantitative portfolio credit risk measurement system using MKMV PM as the risk computation engine which provides measures of portfolio credit risk including correlation, VaR and expected spread.

Main Idea

Our main proposal is that quantitative credit research and risk management is becoming a vital part of credit portfolio management.

We provide a scalable and comprehensive approach to quantitative measuring and analyzing corporate credit risk consistently across a large set of portfolios as well as providing a deep dive into the risk contributions for any individual portfolio.

QUESTIONS

