

Reflections on the Great Global Financial Crisis  
Dr. Edward I. Altman – Stern School of Business  
New York University

*Presented by*



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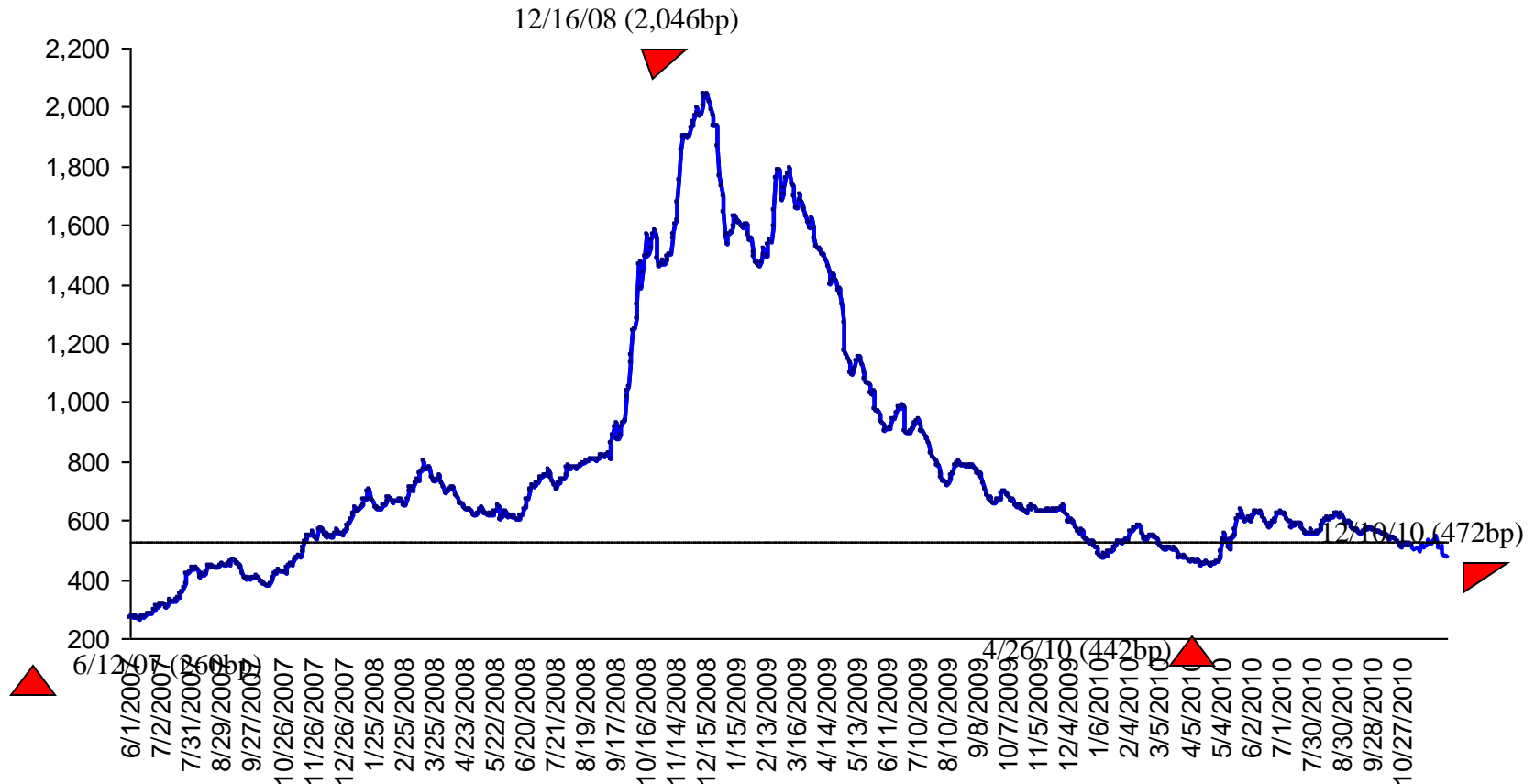
**The Cedar Edward Altman Event**  
Rooftop, Trident, Nariman Point – Mumbai  
January 25, 2011

*Partners*



# YTM Spread Between High Yield Markets & 10 Year Treasury Notes

June 01, 2007 – December 10, 2010



Source: Citigroup Yield Book Index Data

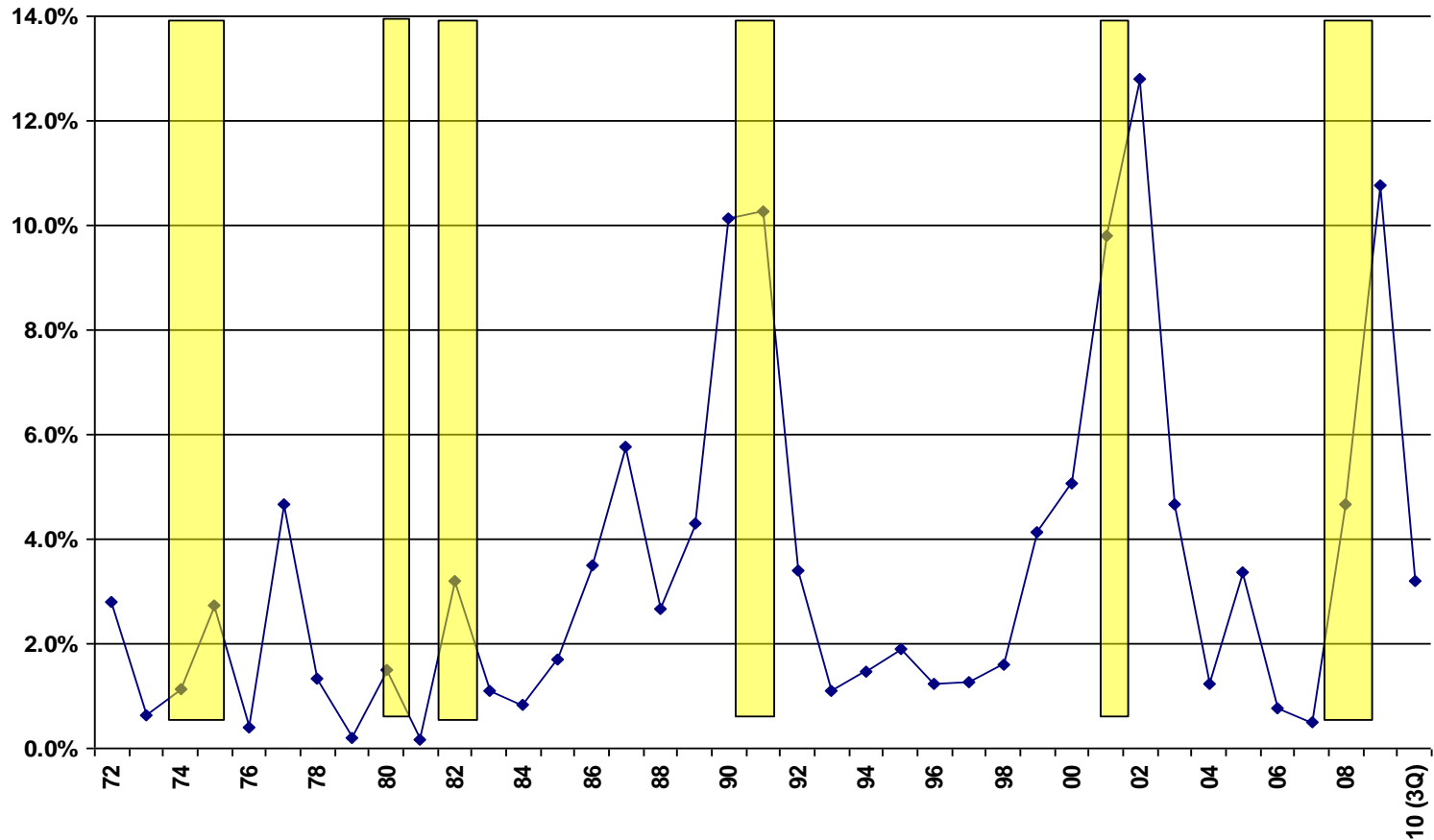
# Major Risks Going Forward (For 2011)

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- Real Economy – Primarily U.S. (Double-Dip?): Impact on Default Rates & Credit Availability
- Sovereign Debt Crisis – Europe
- Contagion Between Markets – Debt and Equity
- Maturity Schedule On Private and Public Debt
- Uncertainties (non-quantifiable)

# Historical Default Rates and Recession Periods in the U.S.

HIGH YIELD BOND MARKET (1972 – 2010 (3Q))



Periods of Recession: 11/73 - 3/75, 1/80 - 7/80, 7/81 - 11/82, 7/90 - 3/91, 4/01 – 12/01, 12/07 - 6/09

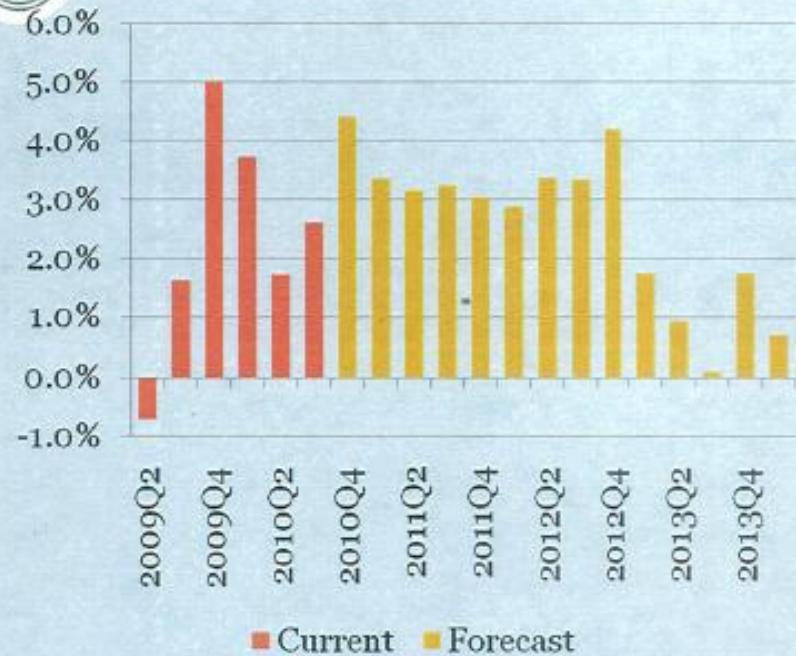
\*All rates annual except for 3Q 2010, which is the LTM default rate.

Source: E. Altman (NYU Salomon Center) & National Bureau of Economic Research

# The Forecast

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Q4 2010	Contribution to Annual Growth	
	Baseline	Scenario 1
Consumption	3.1%	3.1%
Non-Durables	0.8%	0.8%
Durables	1.8%	1.8%
Services	0.6%	0.6%
Investment	-0.2%	-0.2%
Residential	0.2%	0.2%
Non-Residential	0.5%	0.5%
Structures	0.2%	0.2%
Equipment & Software	0.4%	0.4%
Change in Inventories	-0.9%	-0.9%
Government	-0.4%	-0.4%
Federal	-0.3%	-0.3%
State & Local	-0.1%	-0.1%
Net Exports	2.2%	2.9%
Exports	0.8%	0.8%
Imports	1.4%	2.1%
<b>GDP</b>	<b>4.7%</b>	<b>5.1%</b>



**Strong:** Exports, Business Investment  
**Average:** Consumers  
**Weak:** Construction, Government

# Historical Default Rates

Straight Bonds Only Excluding Defaulted Issues From Par Value Outstanding, (US\$ millions)  
1971 – 2010 (12/10)

Year	Par Value Outstanding*	Par Value Defaults	Default Rates (%)	Year	Par Value Outstanding <sup>a</sup>	Par Value Defaults	Default Rates (%)
<b>2010 (12/10)</b>	<b>\$1,221,569</b>	<b>\$13,809</b>	<b>1.130%</b>	1984	\$40,939	\$344	0.840
2009	\$1,152,952	\$124,130	10.766	1983	\$27,492	\$301	1.095
2008	\$1,091,000	\$50,763	4.653	1982	\$18,109	\$577	3.186
2007	\$1,075,400	\$5,473	0.509	1981	\$17,115	\$27	0.158
2006	\$993,600	\$7,559	0.761	1980	\$14,935	\$224	1.500
2005	\$1,073,000	\$36,181	3.372	1979	\$10,356	\$20	0.193
2004	\$933,100	\$11,657	1.249	1978	\$8,946	\$119	1.330
2003	\$825,000	\$38,451	4.661	1977	\$8,157	\$381	4.671
2002	\$757,000	\$96,855	12.795	1976	\$7,735	\$30	0.388
2001	\$649,000	\$63,609	9.801	1975	\$7,471	\$204	2.731
2000	\$597,200	\$30,295	5.073	1974	\$10,894	\$123	1.129
1999	\$567,400	\$23,532	4.147	1973	\$7,824	\$49	0.626
1998	\$465,500	\$7,464	1.603	1972	\$6,928	\$193	2.786
1997	\$335,400	\$4,200	1.252	1971	\$6,602	\$82	1.242
1996	\$271,000	\$3,336	1.231	<b>Standard Deviation (%)</b>			
1995	\$240,000	\$4,551	1.896	<b>Arithmetic Average Default Rate</b>			
1994	\$235,000	\$3,418	1.454	1971 to 2009		3.332%	3.226%
1993	\$206,907	\$2,287	1.105	1978 to 2009		3.637%	3.424%
1992	\$163,000	\$5,545	3.402	1985 to 2009		4.323%	3.550%
1991	\$183,600	\$18,862	10.273	<b>Weighted Average Default Rate*</b>			
1990	\$181,000	\$18,354	10.140	1971 to 2009		4.552%	
1989	\$189,258	\$8,110	4.285	1978 to 2009		4.564%	
1988	\$148,187	\$3,944	2.662	1985 to 2009		4.601%	
1987	\$129,557	\$7,486	5.778	<b>Median Annual Default Rate</b>			
1986	\$90,243	\$3,156	3.497	1971 to 2009		1.896%	
1985	\$58,088	\$992	1.708				

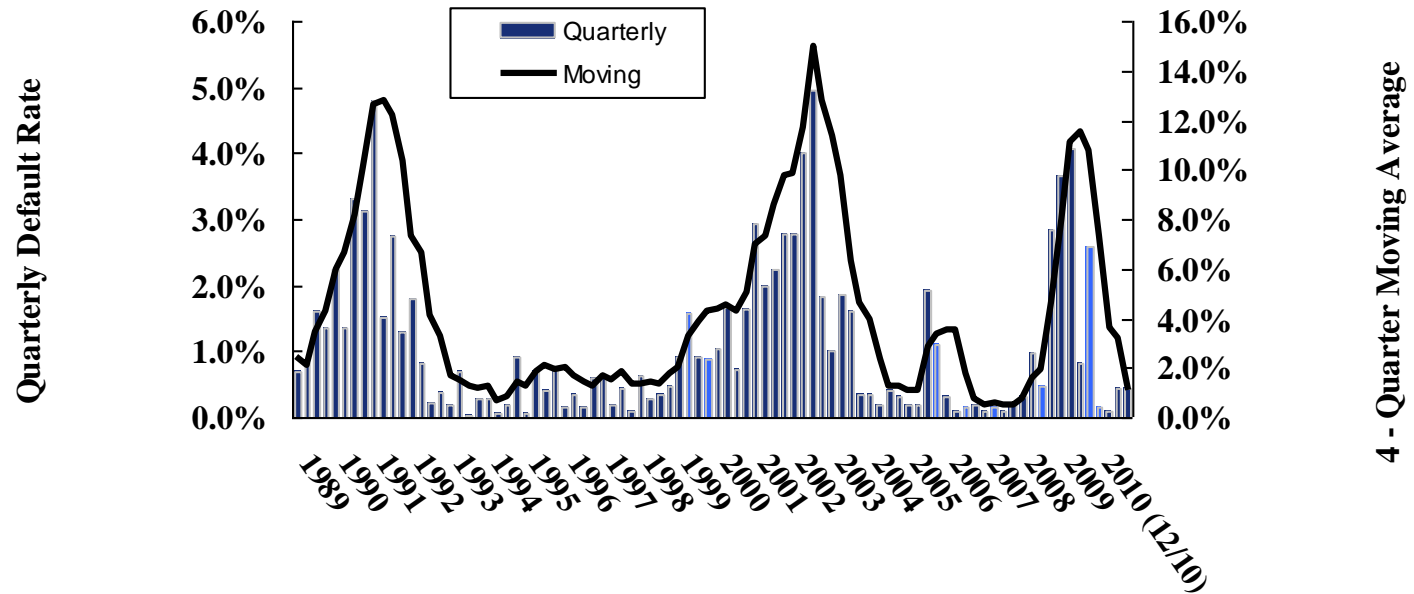
\* Weighted by par value of amount outstanding for each year.

Source: Author's compilation and Citigroup estimate

# Historical Default Rates

## QUARTERLY DEFAULT RATE AND FOUR QUARTER MOVING AVERAGE

1989 – 2010 (12/10)



Source: Author's Compilations

# Major Risks Going Forward (For 2011)

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# **A Novel Approach to Assessing Sovereign Debt Risk**

# Financial Health of the Corporate, Non-Financial Sector: Selected European Countries and U.S.A. in 2010/2009

(Z-Metrics PD Estimates and Implied PDs from CDS Spreads)

Country	No. of Listed Companies 2010 2009		Z-Metrics PD Estimates: Five-Year Public Model*				Five-Year Implied PD from CDS Spread**†	
			2010 (1/1 – 4/30) Median PD	2009 (1/1 – 6/30) Median PD	2010 Std. Dev.	2009 Std. Dev.	2010 (1/1 - 4/30)	2009 (1/1 – 6/30)
			Netherlands	61	60	3.33%	5.62%	7.52%
U.K.	442	433	3.62%	5.75%	11.60%	12.70%	6.52%	8.13%
U.S.A.	2226	2171	3.93%	6.97%	9.51%	15.15%	3.28%	4.47%
France	297	294	5.51%	7.22%	9.72%	12.34%	3.75%	4.05%
Germany	289	286	5.54%	7.34%	13.10%	15.16%	2.67%	3.66%
Spain	82	78	6.44%	7.39%	9.63%	11.26%	9.39%	8.07%
Ireland	28	26	6.45%	7.46%	16.29%	16.30%	12.20%	17.00%
Italy	155	154	7.99%	10.51%	10.20%	14.11%	8.69%	11.20%
Portugal	30	30	9.36%	12.07%	7.25%	12.44%	10.90%	7.39%
Greece	79	77	10.60%	11.57%	14.40%	12.99%	24.10%	13.22%

\* Based on median Z-Metrics PDs from January 1 – June 30, 2009 and January 1 – April 30, 2010.

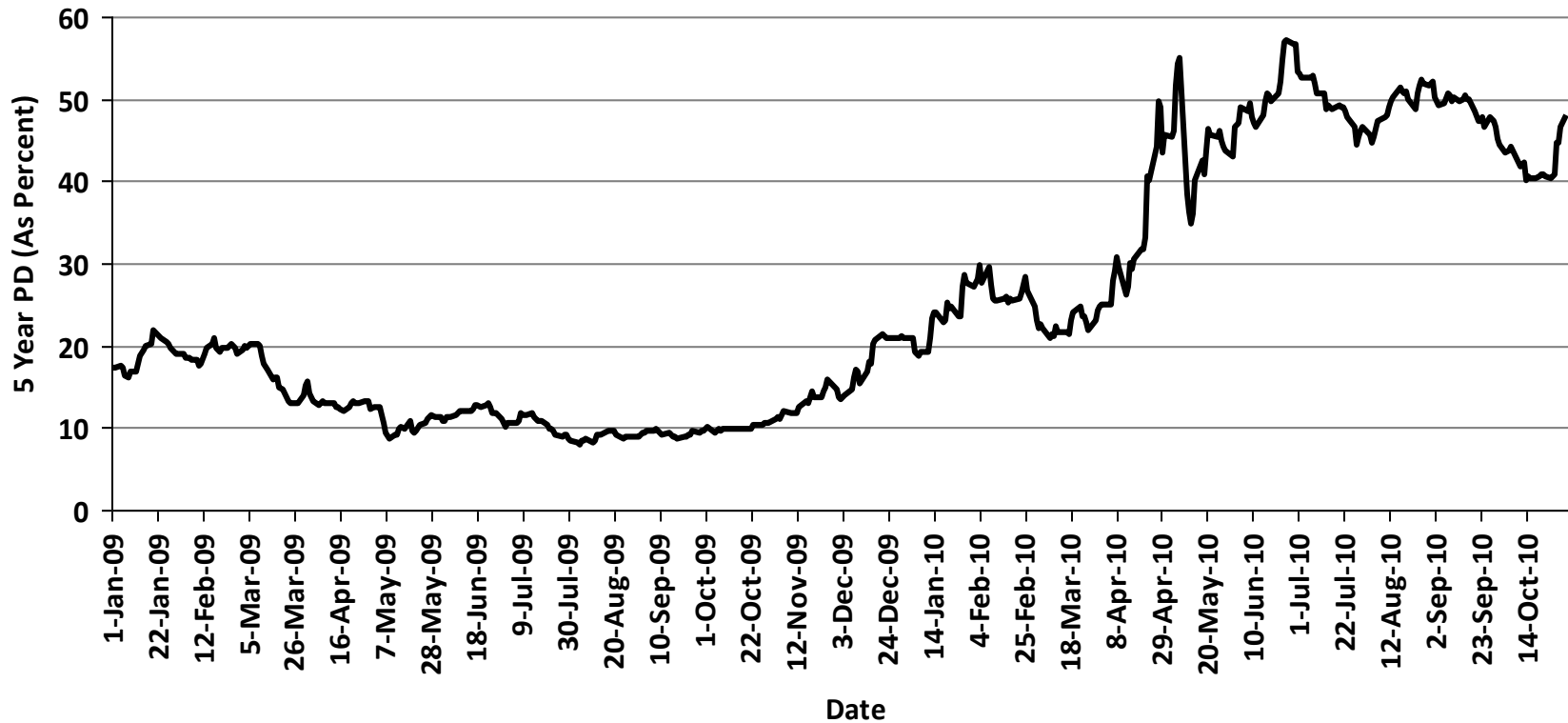
\*\*Assuming a 40% recovery rate; based on the median CDS spread observed for first six months of 2009 and first three months of 2010.

†PD Computed as  $1 - e^{(-5^s/(1-R))}$

Sources: RiskMetrics Group (MSCI), Markit, Compustat.

# Five Year Implied Probabilities of Default (PD) from CDS Spreads

Greec



Source: Markit

## Financial Health of the Corporate, Non-Financial Sector of Selected Asian Countries (2010 Results)

Country	No. of Listed Companies	Z-Metrics Five Year Probability of Default			Five Year Implied PD from CDs Spread
		Median PD	Mean PD	Std. Dev. PD	
Hong Kong	135	2.79%	5.47%	6.92%	3.75%
India (State Bank of)	610	4.29%	7.56%	8.50%	12.47%
Singapore	202	3.46%	7.65%	10.58%	3.69%

Sources: Author Calculations from MSCI Group, Compustat Data

# Recent Five-Year Probability of Default (PD) Implied From CDS Spreads

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(December 15, 2010 Results)

Country	Five Year Implied PD from CDs Spread
Netherlands	3.66%
United Kingdom	4.68%
USA	2.27%
France	6.65%
Germany	3.19%
Spain	19.45%
Ireland	33.67%
Italy	11.63%
Portugal	26.40%
Greece	51.79%

Sources: Author Calculations from *MSCI Group, Compustat Data*

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# Total Monthly Return Correlations on Various Asset Class Indexes During Stressed and Recovery Credit Cycles

		Citi HY Index	S&P 500 Stock Index
Stressed Cycle I <sup>a</sup> 01/1990 – 12/1991 (24 obs.)	Defaulted Bond Index	68%	12%
	S&P 500 Stock Index	48%	
Stressed Cycle II <sup>b</sup> 01/2001 – 12/2002 (24 obs.)	Defaulted Bond and Bank Loan Index	76%	23%
	S&P 500 Stock Index	54%	
Stressed Cycle III 01/2008 – 03/2009 (15 obs.)	Defaulted Bond and Bank Loan Index	80%	73%
	S&P 500 Stock Index	73%	
Recovery Cycle 04/2009 – 11/2010 (20 obs.)	Defaulted Bond and Bank Loan Index	70%	68%
	S&P 500 Stock Index	70%	
Full Sample Period 01/1987 – 11/2010 (287 obs.)	Defaulted Bond and Bank Loan Index <sup>c</sup>	64%	40%
	S&P 500 Stock Index	57%	
Most Recent Cycle 04/2010 – 11/2010 (8 obs.)	Defaulted Bond and Bank Loan Index	85%	76%
	S&P 500 Stock Index	82%	

<sup>a</sup>Correlation between Defaulted Bond Index and S&P 500 was -16% during recovery period. <sup>b</sup>Correlation between Defaulted Bond and Bank Loan Index and S&P 500 was 43% during recovery period. <sup>c</sup>Based on only the Defaulted Bond Index from 01/1987 – 12/1995.

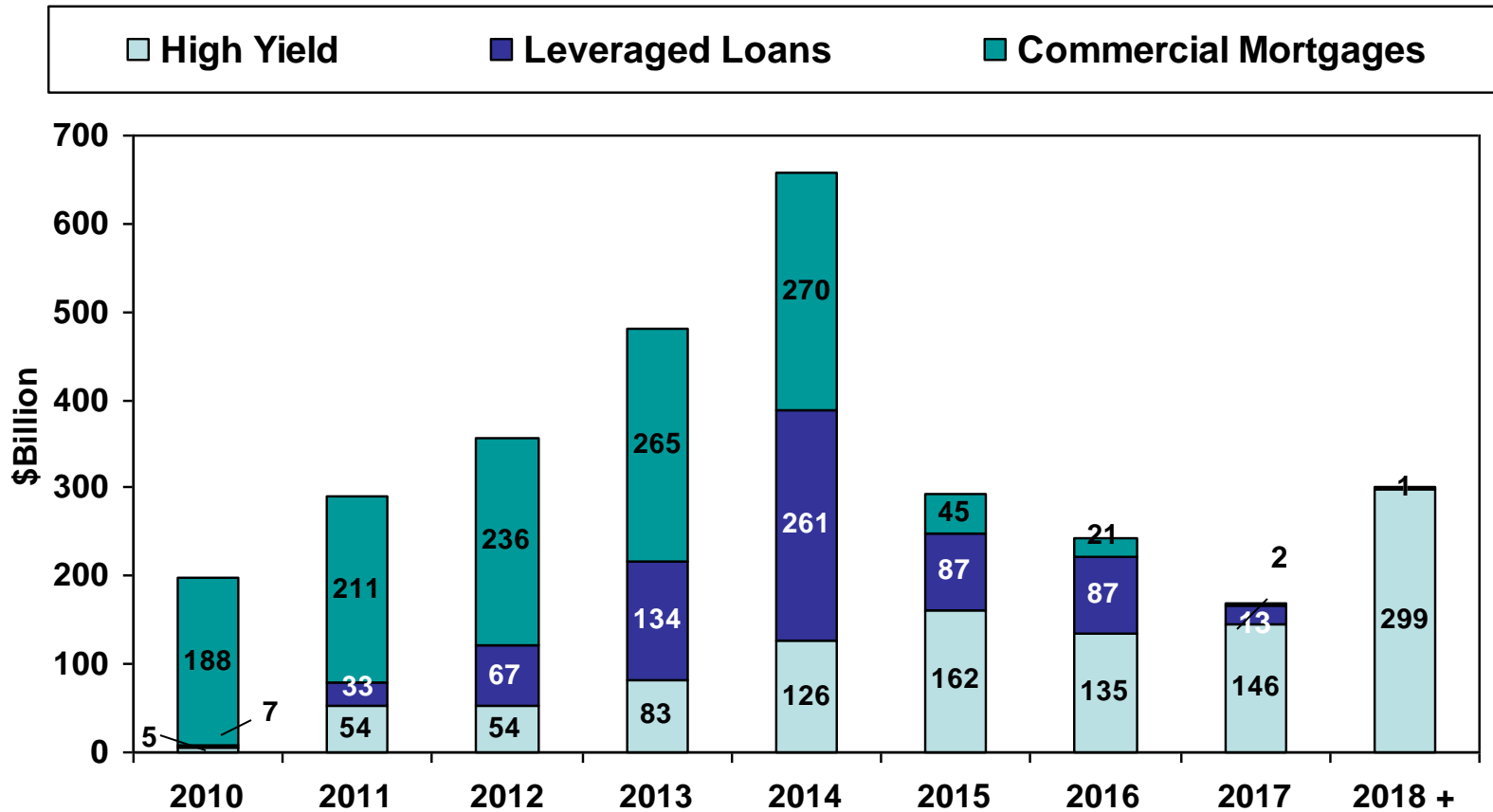
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# Upcoming Debt Maturities: 2010-2018

## High-Yield Bond, Leveraged Loan and Commercial Mortgage Maturities (\$ in billions)

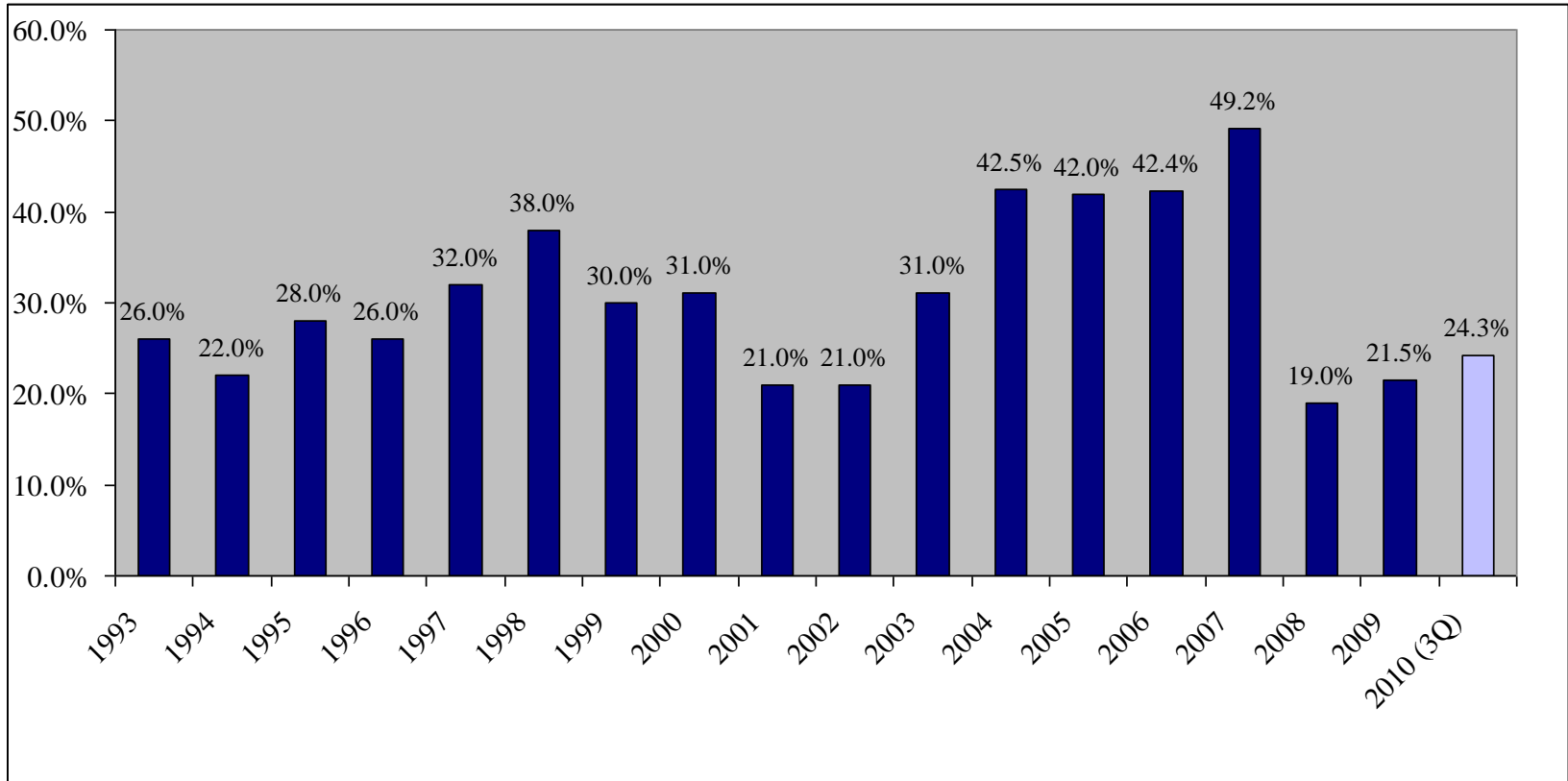


Source: J.P. Morgan & MarkIt as of September 17, 2010; S&P LCD.

# **Default Rate Forecasting**

# Method 1: Mortality Rate Analysis

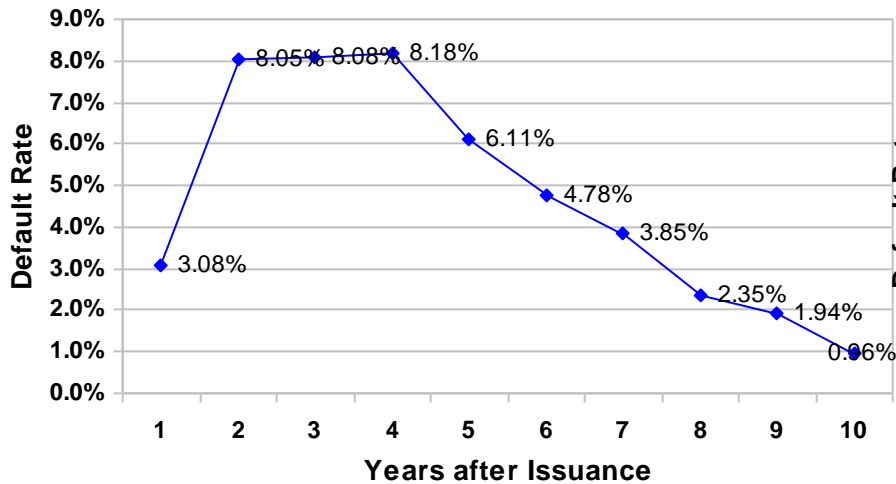
## New Issues Rated B- or Below as Percentage of all New Issues (1993 – 2010 (3Q))



Source: Standard & Poor's Global Fixed Income Research

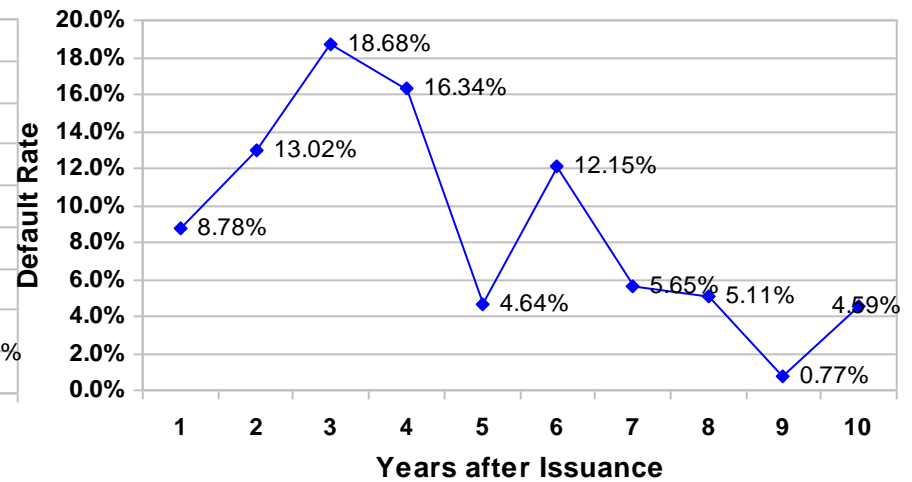
# Default Lag After Issuance: 'B' & 'CCC' Rated Corporate Bonds

## Default Lag after Issuance for 'B' Ratings



Source: Altman Mortality Tables (1971-2009)

## Default Lag after Issuance for 'CCC' Ratings



Source: Altman Mortality Tables (1971-2009)

# Mortality Rates by Original Rating

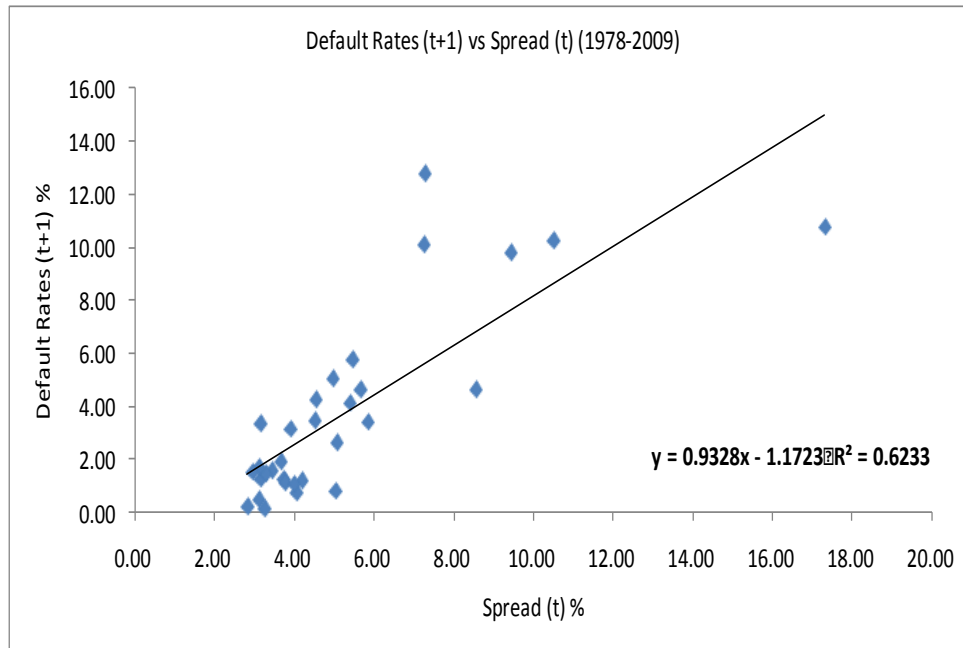
All Rated Corporate Bonds\*  
1971-2009

		1	2	3	4	5	6	7	8	9	10
AAA	Marginal	0.00%	0.00%	0.00%	0.00%	0.03%	0.02%	0.01%	0.00%	0.00%	0.00%
	Cumulative	0.00%	0.00%	0.00%	0.00%	0.03%	0.05%	0.06%	0.06%	0.06%	0.06%
AA	Marginal	0.00%	0.00%	0.27%	0.12%	0.02%	0.01%	0.00%	0.01%	0.03%	0.01%
	Cumulative	0.00%	0.00%	0.27%	0.39%	0.41%	0.42%	0.42%	0.43%	0.46%	0.47%
A	Marginal	0.01%	0.08%	0.18%	0.19%	0.15%	0.12%	0.05%	0.22%	0.12%	0.08%
	Cumulative	0.01%	0.09%	0.27%	0.46%	0.61%	0.73%	0.78%	1.00%	1.11%	1.19%
BBB	Marginal	0.42%	2.86%	1.48%	1.12%	0.68%	0.30%	0.36%	0.19%	0.18%	0.38%
	Cumulative	0.42%	3.27%	4.70%	5.77%	6.41%	6.69%	7.02%	7.20%	7.37%	7.72%
BB	Marginal	1.09%	2.23%	4.11%	2.18%	2.58%	1.50%	1.57%	1.20%	1.63%	3.30%
	Cumulative	1.09%	3.30%	7.27%	9.29%	11.63%	12.96%	14.32%	15.35%	16.73%	19.48%
B	Marginal	3.08%	8.05%	8.08%	8.18%	6.11%	4.78%	3.85%	2.35%	1.94%	0.96%
	Cumulative	3.08%	10.88%	18.08%	24.78%	29.38%	32.76%	35.34%	36.86%	38.09%	38.68%
CCC	Marginal	8.78%	13.02%	18.68%	16.34%	4.64%	12.15%	5.65%	5.11%	0.77%	4.59%
	Cumulative	8.78%	20.66%	35.48%	46.02%	48.53%	54.78%	57.33%	59.51%	59.83%	61.67%

\*Rated by S&P at Issuance  
Based on 2,527 issues  
Source: Standard & Poor's (New York) and Author's Compilation

# Updated Market-Based Annual Default Rate Forecast

## Annual Default Rate (t+1) versus High-Yield Spreads (t)



The regression equation is

$$\text{Default Rate} = -1.17 + 0.93 * \text{Spread}$$

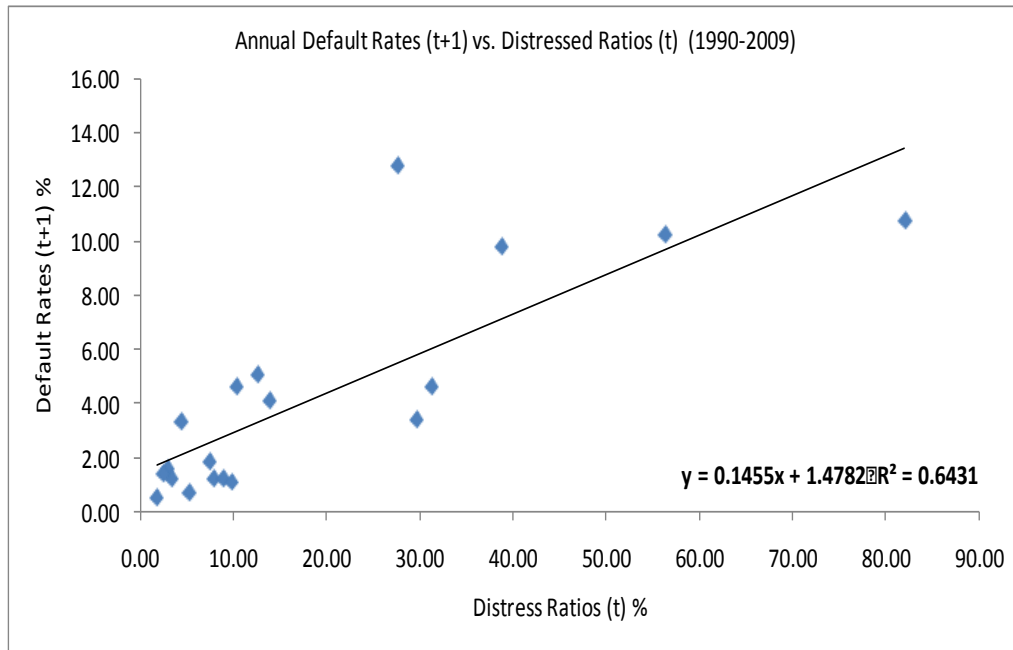
Predictor	Coef	SE Coef	T	P
Constant	-1.1723	0.8075	-1.4518	0.1573
Spread	0.9328	0.1347	6.9266	0.0000

S = 2.1914 R-Sq = 62.3% R-Sq(adj) = 61.0%

### Application

- Yield spread (12/31/2007) of 566bps, forecast  $P_D$  for 2008 = **4.11%** vs. actual of 4.65%
- Yield spread (12/31/2008) of 1,731bps, forecast  $P_D$  for 2009 = **14.97%** vs. actual of 10.77%
- Yield spread (12/31/2009) of 513bps, forecast  $P_D$  for 2010 = **3.61%**
- Yield spread (9/30/2010) of 564bps, forecast  $P_D$  for 9/30/2011 = **4.09%**

# Updated Market-Based Annual Default Rate Forecast Annual Default Rate (t+1) versus Annual Distressed Ratio (t)



The regression equation is

$$\text{Default Rate} = 1.48 + 0.15 * \text{Distress Ratio}$$

Predictor	Coef	SE Coef	T	P
Constant	1.4782	0.7352	2.0105	0.0605
Spread	0.1455	0.0263	5.5347	0.0000

S = 2.3745    R-Sq = 64.3%    R-Sq(adj) = 62.2%

## Application

- Distress ratio (12/31/2007) of 10.42%, forecast  $P_D$  for 2008 = **3.00%**      vs. actual of 4.65%
- Distress ratio (12/31/2008) of 82.05%, forecast  $P_D$  for 2009 = **13.42%**      vs. actual of 10.77%
- Distress ratio (12/31/2009) of 15.28%, forecast  $P_D$  for 2010 = **3.70%**
- Distress ratio (9/30/2010) of 12.15%, forecast  $P_D$  for 9/30/2011 = **3.25%**

# Default and Recovery Forecasts: Summary of Forecast Models

Model	12/31/2010 Recession Default Rate Forecast as of 12/31/2009	12/31/2010 No Recession Default Rate Forecast as of 12/31/2009	9/30/2011 Recession Default Rate Forecast as of 9/30/2010	9/30/2011 No Recession Default Rate Forecast as of 9/30/2010
Mortality Rate	5.06%	5.06%	5.06%	5.06%
Recession Scenarios	14.00%	n/r	13.20%	n/r
Yield-Spread	3.61% <sup>a</sup>	3.61% <sup>a</sup>	4.09% <sup>c</sup>	4.09% <sup>c</sup>
Distress Ratio	3.70% <sup>b</sup>	3.70% <sup>b</sup>	3.25% <sup>d</sup>	3.25% <sup>d</sup>
Average of Models (Recovery Rates)*	6.59% (32.0%)	4.12% (37.1%)	6.40% (32.4%)	4.13% (37.0%)

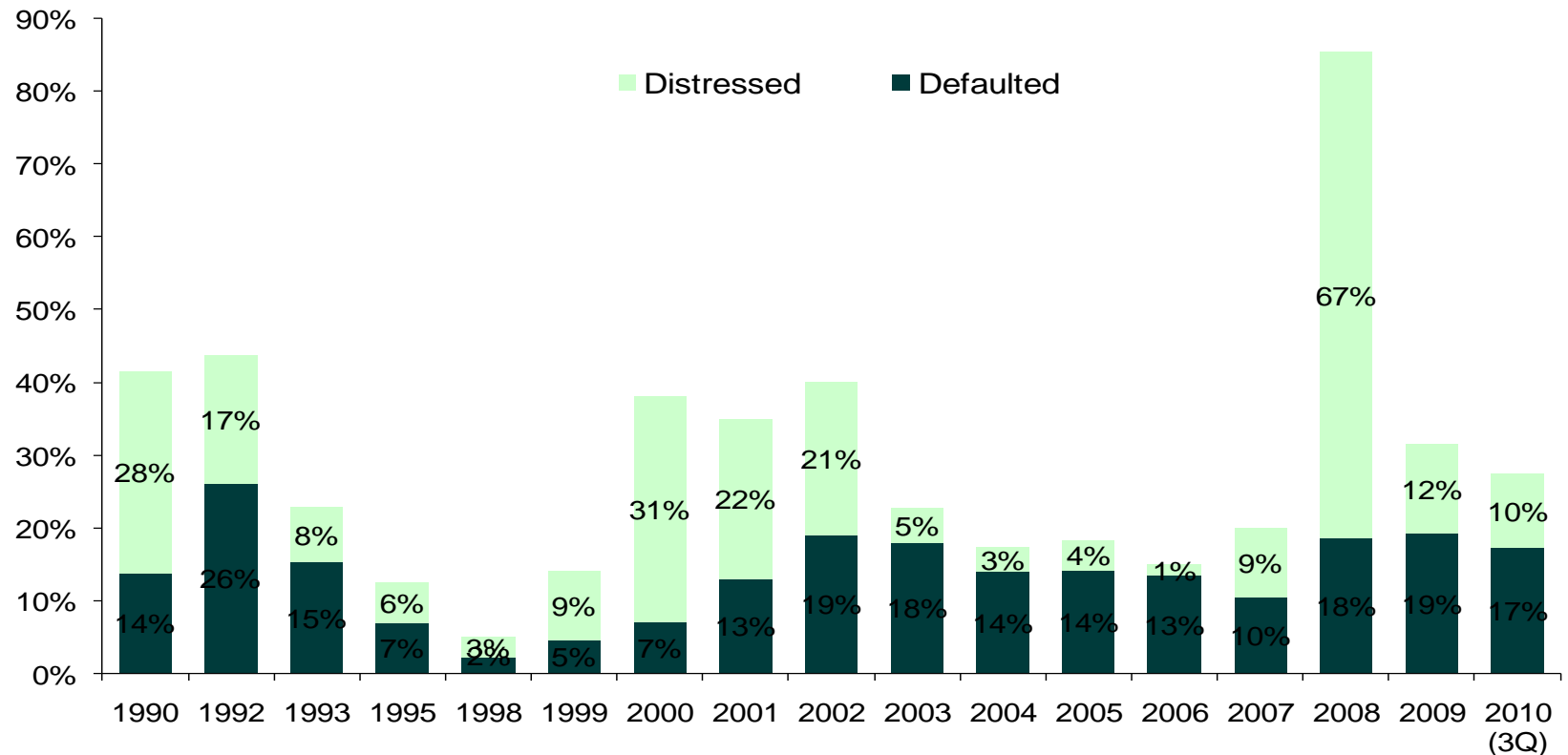
\* Recovery rate based on the log Linear equation between default and recovery rates, see Altman, et al (2005) Journal of Business, November and Slide 42. <sup>a</sup> Based on Dec. 31, 2009 yield-spread of 513.16bp. <sup>b</sup> Based on Dec. 31, 2009 Distress Ratio of 15.3%. <sup>c</sup> Based on Sep. 30, 2010 yield-spread of 564.0bp. <sup>d</sup> Based on Sep. 30, 2010 Distress Ratio of 12.15%.

Source: All Corporate Bond Issuance and Authors' Estimates of Market Size in 2010.

# **Size of Distressed Debt Market**

# Distressed<sup>a</sup> And Defaulted Debt as a Percentage of High Yield And Defaulted Debt Markets<sup>b</sup>

1990 – 2010 (3Q)



(a) Defined as yield-to-maturity spread greater than or equal to 1000bp over comparable Treasuries. (b) \$1.520 trillion as of 9/30/2010. (c) Some years not available as no survey results available.

Source: NYU Salomon Center

# Estimated Face And Market Values Of Defaulted And Distressed Debt (\$ Billions)

2008 – 2010 (3Q)

	<u>Face Value</u>			<u>Market Value</u>			Market/Face Ratio
	12/31/2008	12/31/2009	9/30/2010	12/31/2008	12/31/2009	9/30/2010	
<b><u>Public Debt</u></b>							
Defaulted	234.36	279.87	262.25 <sup>(1)</sup>	40.69	97.95	104.90	0.40
Distressed	888.53	180.95	152.81 <sup>(2)</sup>	488.69	135.71	114.61	0.75
<b>Total Public</b>	<b>1,122.89</b>	<b>460.82</b>	<b>415.06</b>	<b>529.38</b>	<b>233.67</b>	<b>219.51</b>	
<b><u>Private Debt</u></b>							
Defaulted	515.59	699.67	655.64 <sup>(3)</sup>	299.11	419.80	393.38	0.60
Distressed	1,954.76	452.38	382.02 <sup>(3)</sup>	1,368.33	361.90	305.62	0.80
<b>Total Private</b>	<b>2,470.35</b>	<b>1,152.05</b>	<b>1,037.66</b>	<b>1,667.44</b>	<b>781.70</b>	<b>699.00</b>	
<b>Total Public and Private</b>	<b>3,593.24</b>	<b>1,612.86</b>	<b>1,452.72</b>	<b>2,196.82</b>	<b>1,015.37</b>	<b>918.51</b>	

<sup>1</sup> Calculated using: (2009 defaulted population) + (2010 Defaults) - (2010 Emergences) - (2010 Distressed Exchanges).

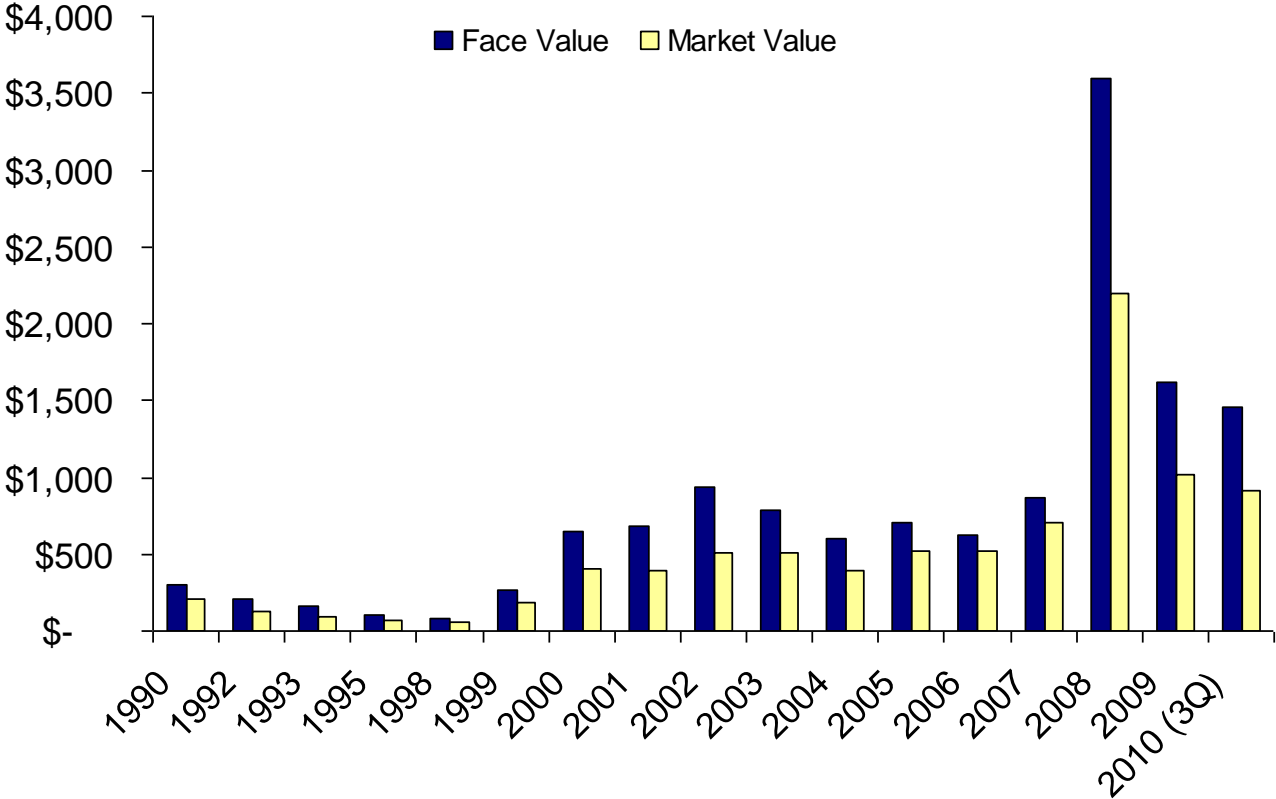
<sup>2</sup> Based on 12.15% of the high-yield bond market (\$1,258.0 billion) as of 30 Sep 10.

<sup>3</sup> Based on a private/public ratio of 2.5.

Source: NYU Salomon Center and estimates by Professor Edward I. Altman.

# Size Of The US Defaulted And Distressed Debt Market (\$ Billions)

1990 – 2010 (3Q)



Source: Author's Compilations