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Credit PFE for Energy Entities



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Agenda

- Simple Example
- PFE – Definition and Related Measures
- Counterparty Level Examples
- Portfolio Level Example
- System & IT Configuration

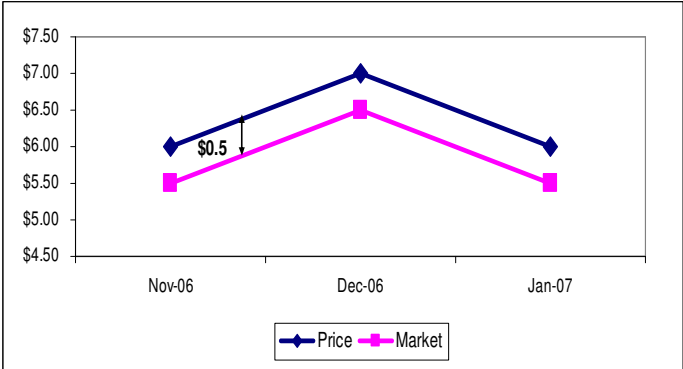


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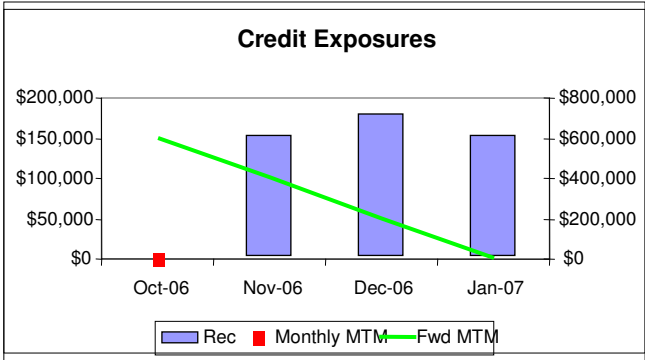
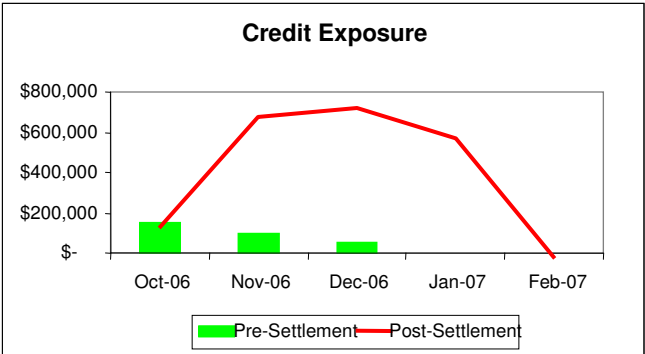
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Simple Example - Fixed

- Sell 100,000 mmBtu/Mo fixed price Nat Gas.
- Term: Nov 06-Jan 07.
- Today: 01-Oct-2006



VaR = \$250,000





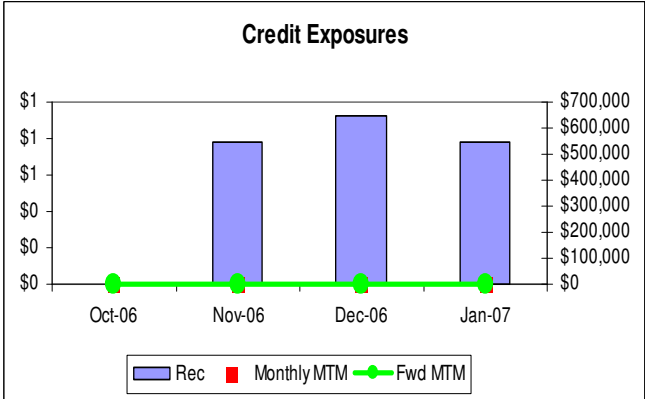
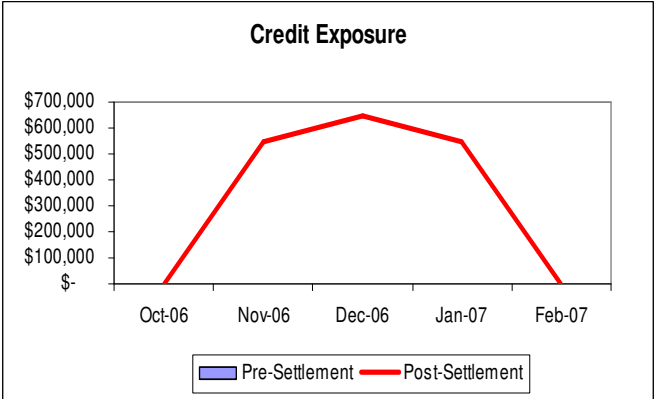
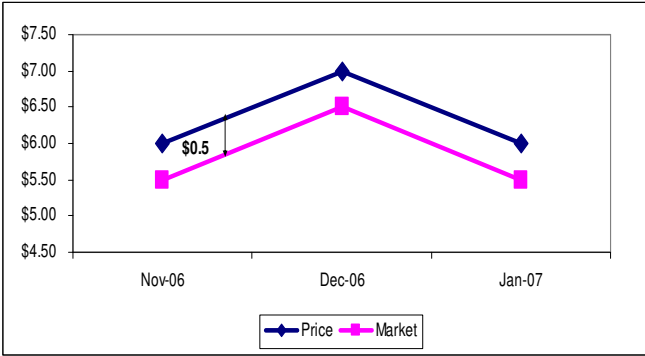
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Simple Example - Float

- Sell 100,000 mmBtu/Mo index Nat Gas.
- Term: Nov 06-Jan 07.
- Today: 01-Oct-2006

VaR = \$0

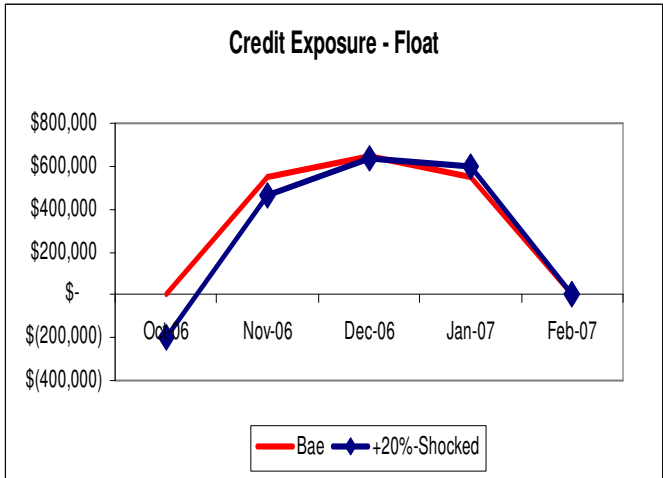
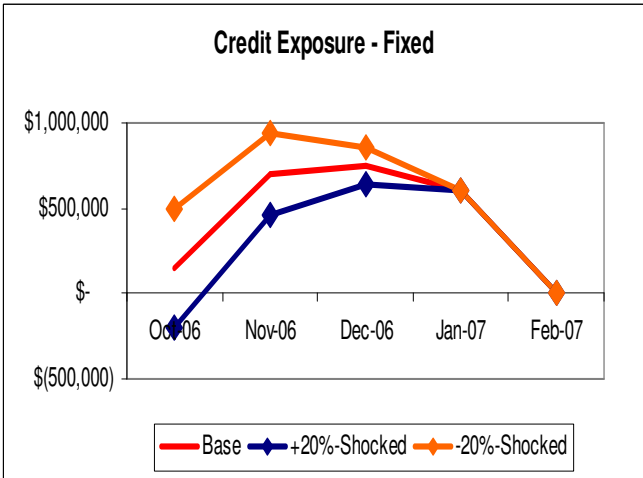
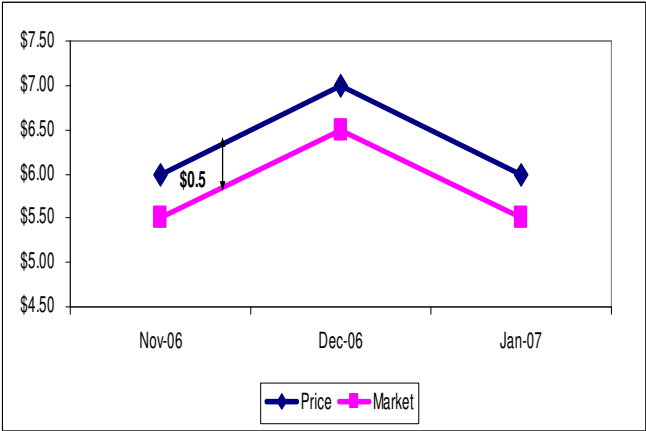




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Price Shocks





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Curse of Dimensionality

100 Curves * 12 Months * 10 Years = 12000 Grid-points

1100 Contracts / Year

1/100 Second of process time / Contract / Grid-point

500 Scenarios



2.1 Years!

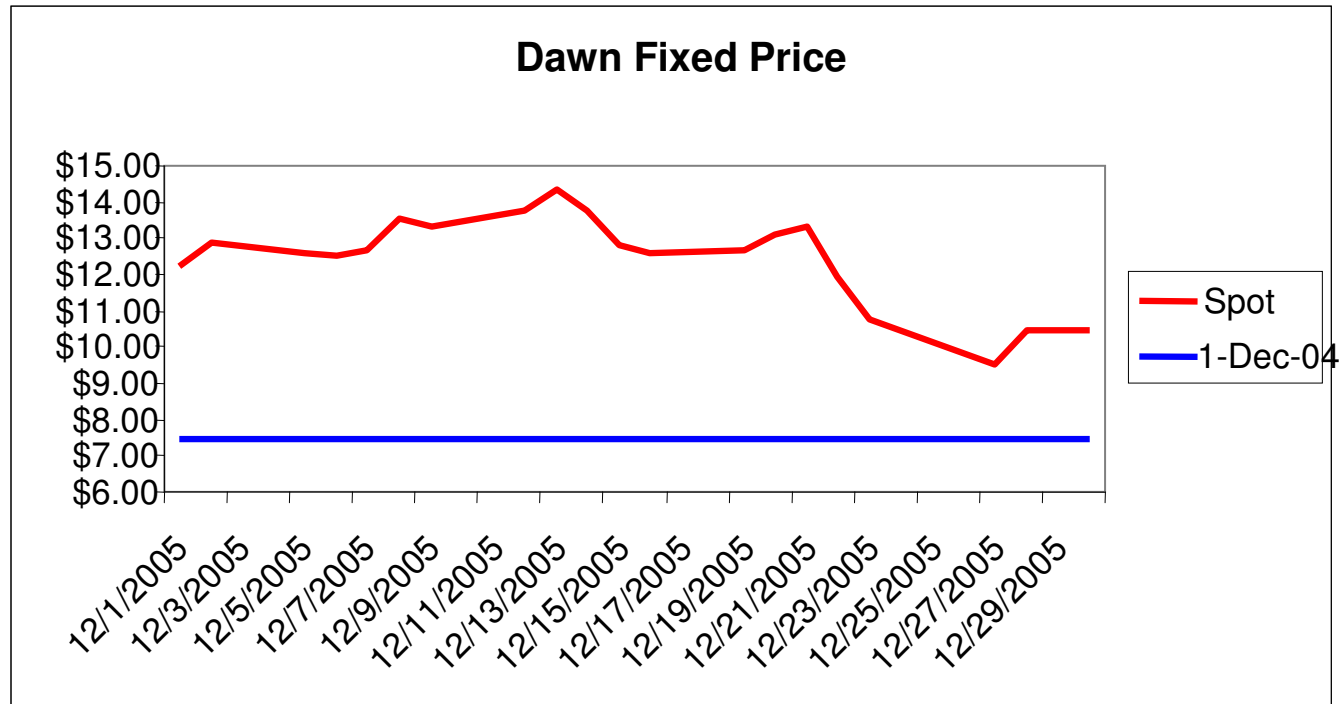
Brute Force Does NOT Work.



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Spot vs. Forward

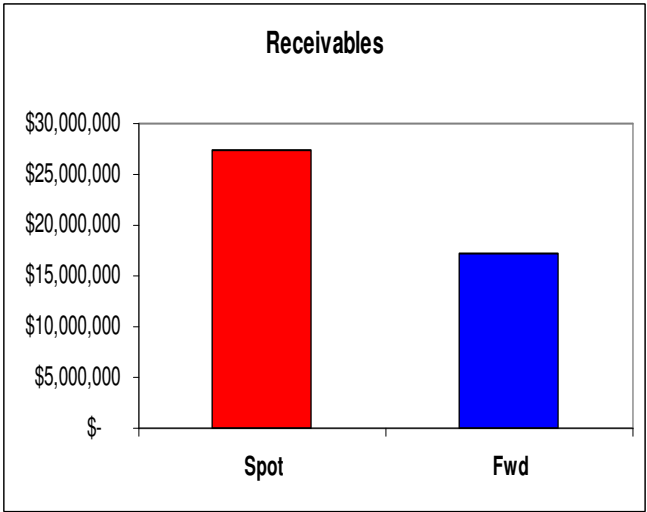
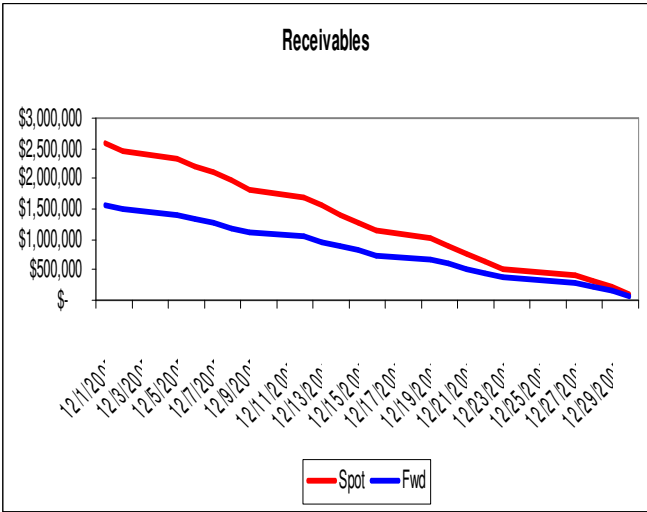
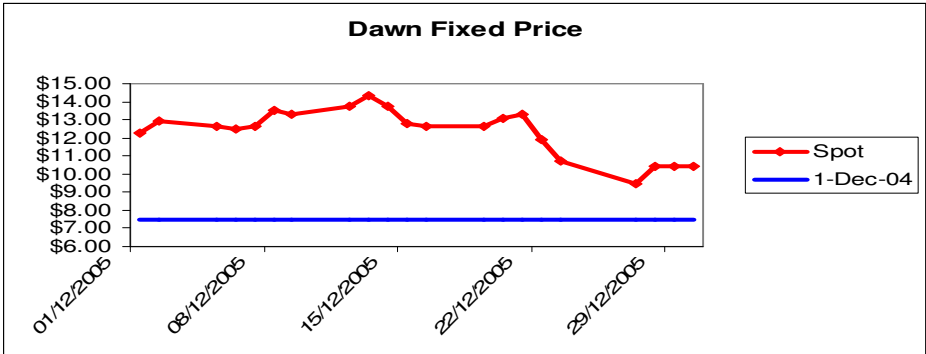




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Cash vs. Forward Exposures





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Short Conclusion

- There are too many interacting variables.
- There is large amount of data to be processed.
- Large amount of cross referencing.
- Brute force modeling does not work.
- Need computationally efficient environment.



Scientific Computing



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PFE - Definition

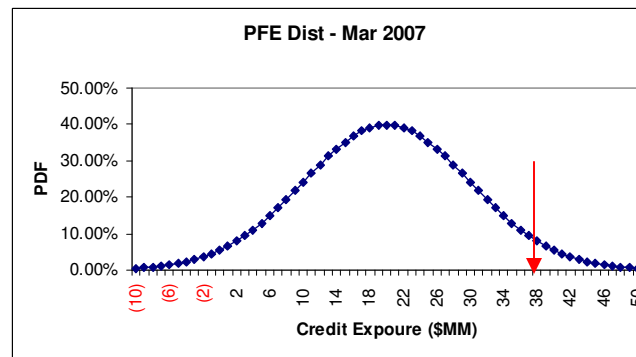
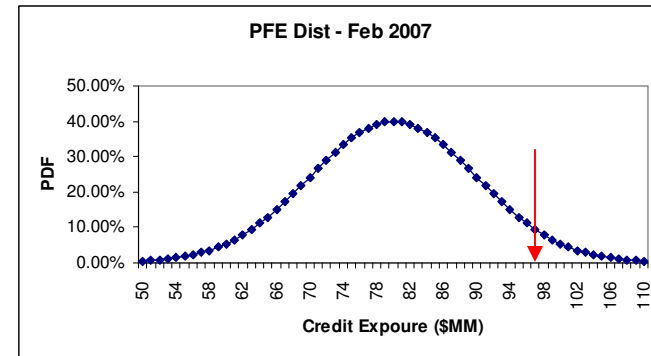
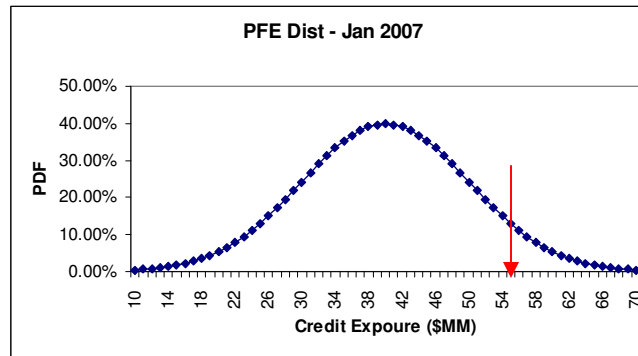
Distribution of credit exposure on a future date due to possible market and credit events, considering all the current credit practices and agreements.



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PFE





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PFE Statistics

PE	Peak Exposure	High percentile of exposure
MPE	Max. PE	Max PE till a specified date
EE	Effective Exposure	Average of PFE
EEE	Effective EE	Max of EE till a specific date
EPE	Expected Potential Exposure	Time Weighted Ave. of EE
EEPE	Effective EPE	Time Weighted Ave. of EEE
CVA	Credit Risk Premium	Spread*EPE*(T-t0)
EM	Effective Maturity	EPE(T)/EPE(1Year)



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PFE Parameters

Credit Exposures Depend on:

- Both spot and fwd prices.
- Prices now and in the future.
- Internal, transaction level, data.
- External level data.



Credit Process Flow

- Contract
 - Counterparty
 - Margin agreements
 - Collaterals, Initial margins, Independent margins, Haircuts, Triggers
 - Unsecured lines
 - Grace periods
 - Wrong-way exposures
 - Portfolio
 - Diversification effects
 - Counterparty cross correlation
 - Domino effects
- Path



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Example: Counterparty XYZ

Factor	Value	Comments
Credit Quality	BAA(BBB+)	Currently a Sell
No. of Tran.	351	-
Tran. Types	Phys & Swap	-
Term	2+ Years	-
No. of Markets	32	AECO,ECAN,USNE,MW
MtM	(\$ 6,000,000)	-
Margin Agreement	Yes	-
Netting	Yes	-
Collateral	\$ 10,000,000	Cash. No Hair Cuts.
Unsecured	\$ 5,000,000	-
Grace/Cure/Lag Period	1 week	Margin Lags.
Dynamic Margin	No	-



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Credit Questionnaire

Important Questions:

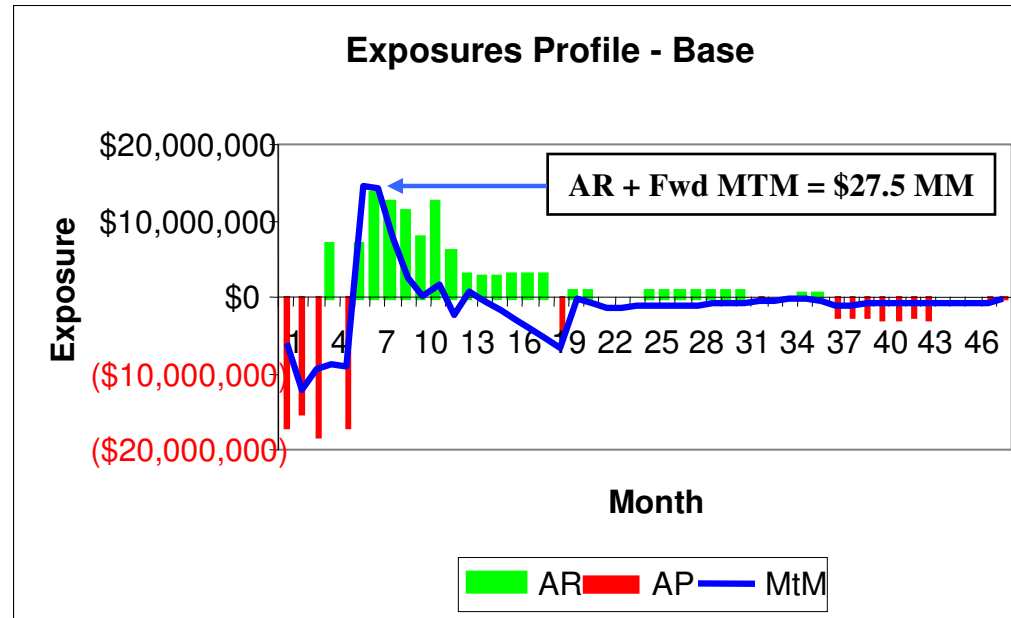
- What is my base credit exposure?
- How much of collateral should I request?
- What type of margin agreement is appropriate?
- What's the best credit management process to handle this exposure?
- What is my cost of credit & is the counterparty worth it?



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XYZ – Base Exposures

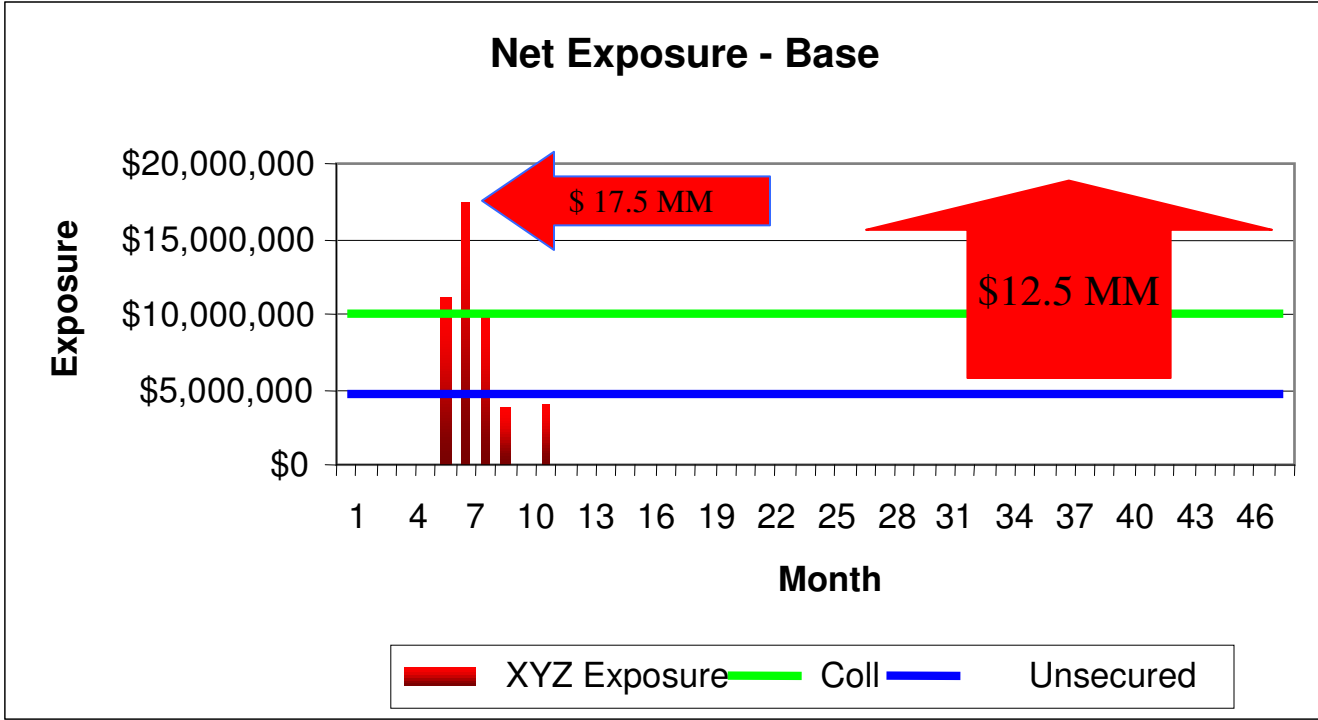




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XYZ – Net Base Exposures

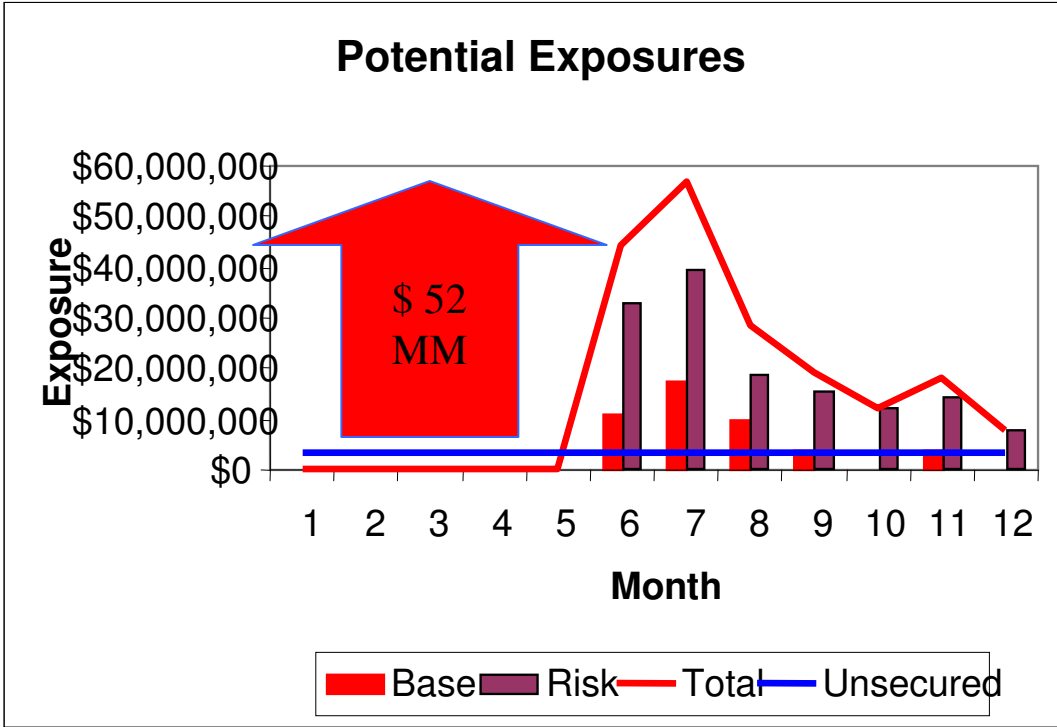




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XYZ – Potential Exposures





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XYZ – Counter-measures

- Require extra margin at the inception.

OR

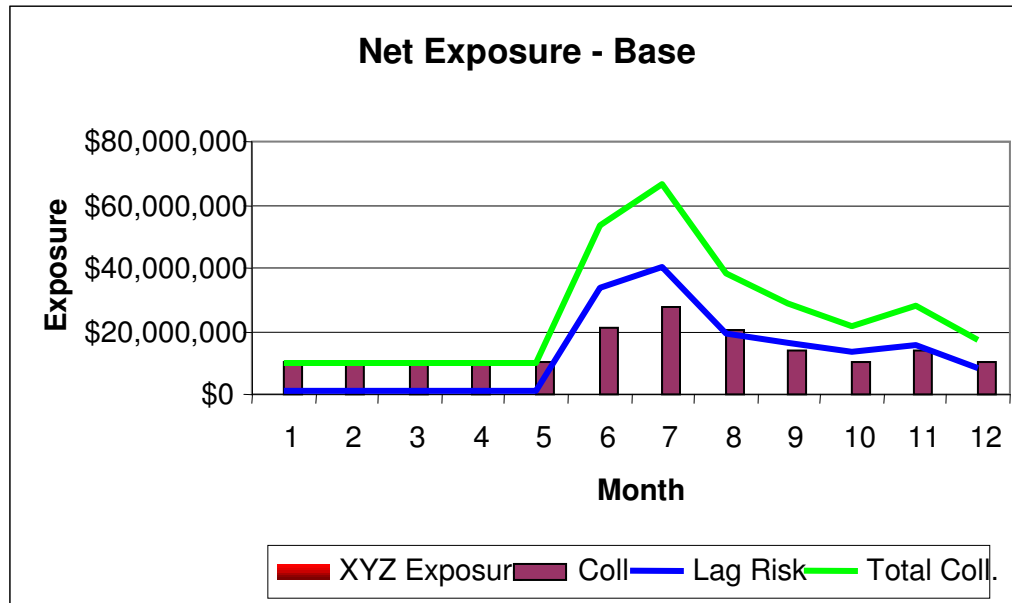
- Actively margin XYZ.
- Decrease unsecured margin.
 - Unsecured margin = 0



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XYZ – Fully Collateralized





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XYZ – Counter-measures

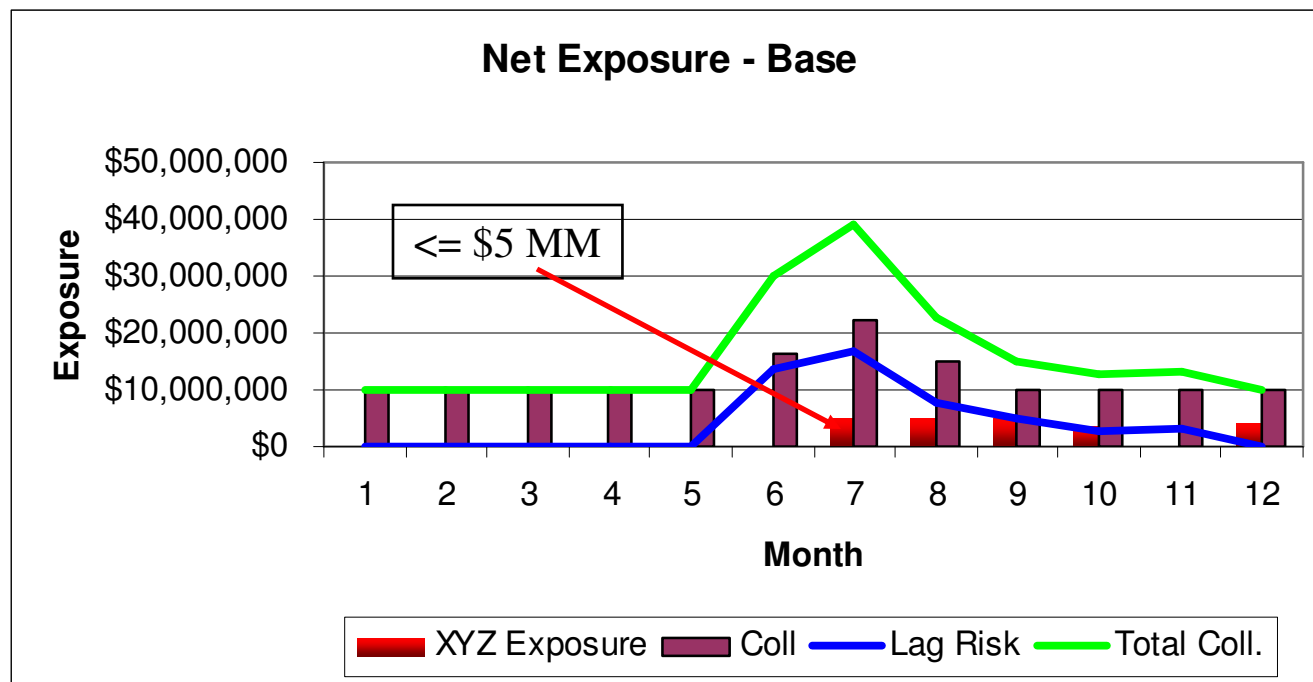
- Actively margin XYZ.
- Allow unsecured margins
 - Unsecured margin = \$5 MM
- Decrease margin lags.
 - Margin lag = 1 Day



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XYZ – Mostly Collateralized, Lag =1 Day





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Bilateral Agreement

- Both sides call margins (Hypothecation).
- Margins may or may not be netted off.
- Re-Hypothecation may exist.

Example:

- XYZ margin calls us as well.
- Has allowed for \$3MM of unsecured margin.
- We have already posted \$4MM initial margin.
- No re-hypothecation.

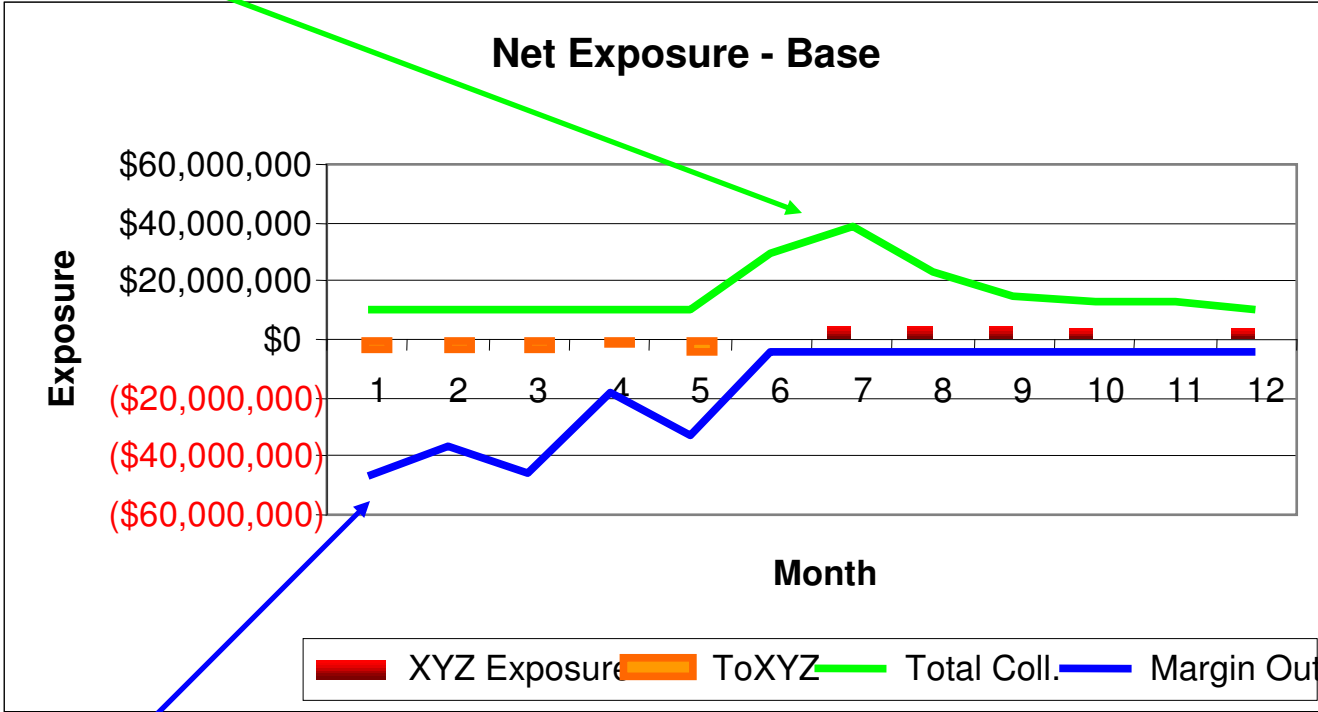


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XYZ – Bilateral & No Re-Hypothecation.

**Credit Manager
Capital Adequacy**



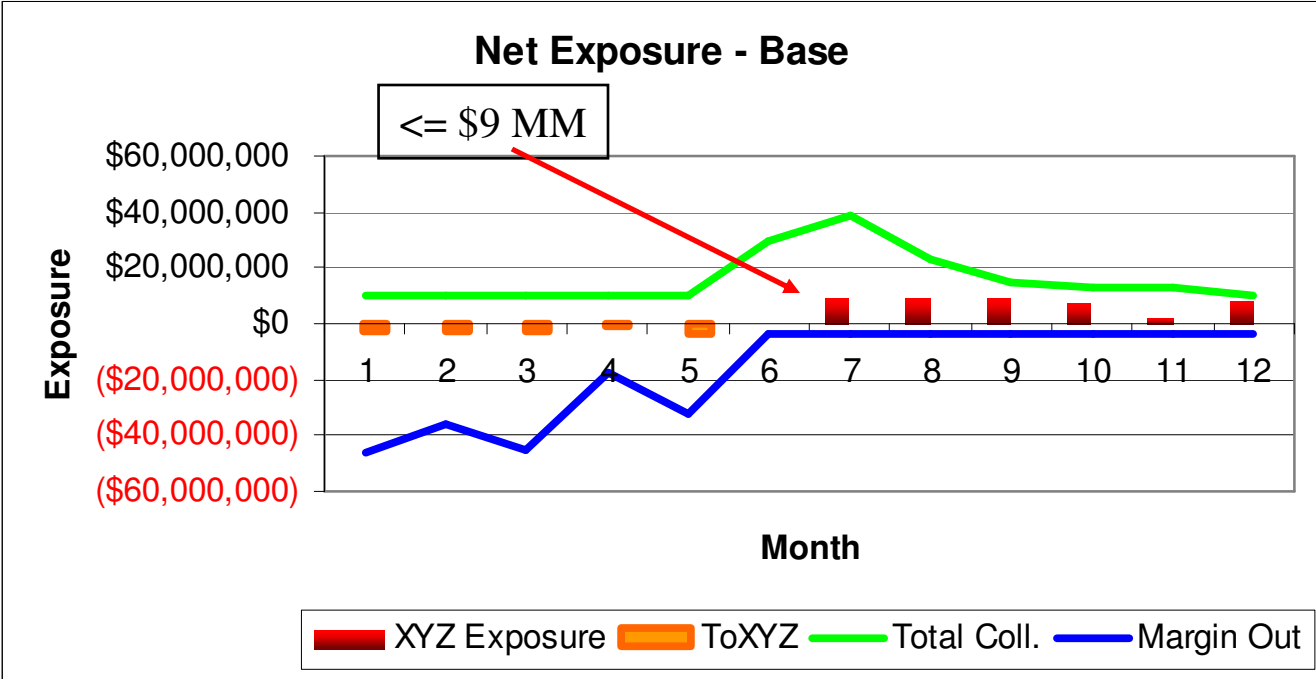
**Treasurer
Liquidity Risk**



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XYZ – Bilateral & Re-Hypothecation.

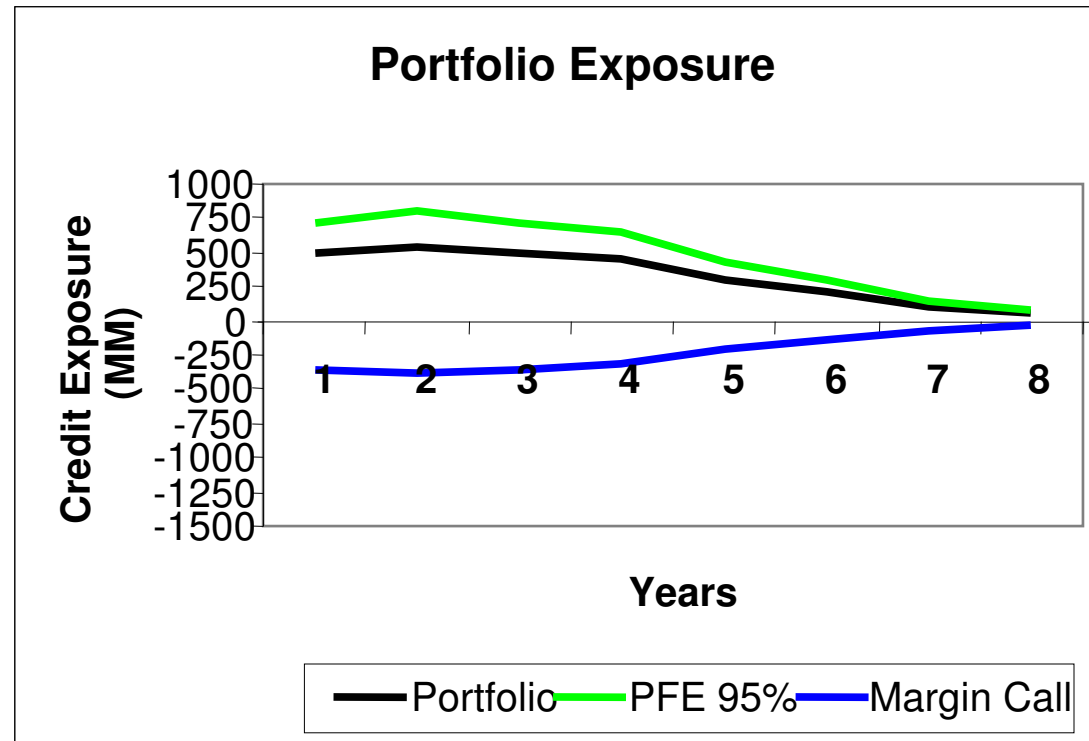




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Portfolio



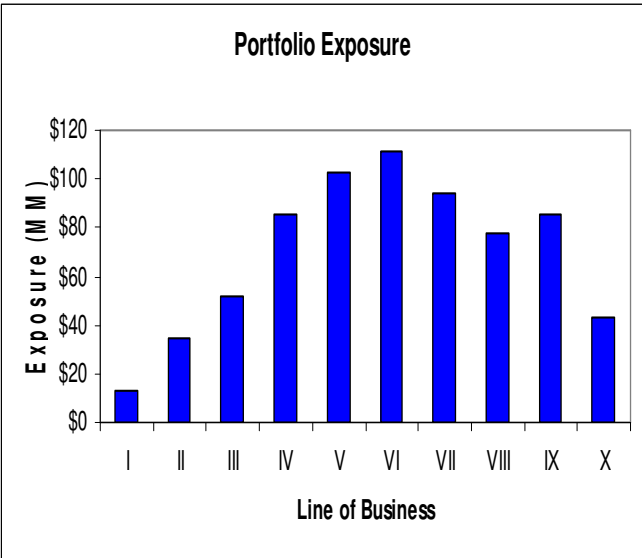
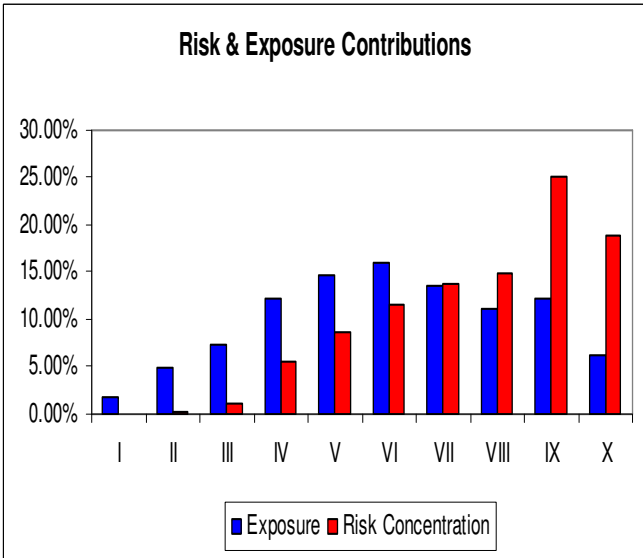


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Risk Concentration

I	II	III	IV	V	VI	VII	VIII	IX	X
Invest. Banks	A+ Utilities	Trusts	Governmental	Hedge Funds	Industrial	B+ Utilities	Chemicals	Retail	Residential



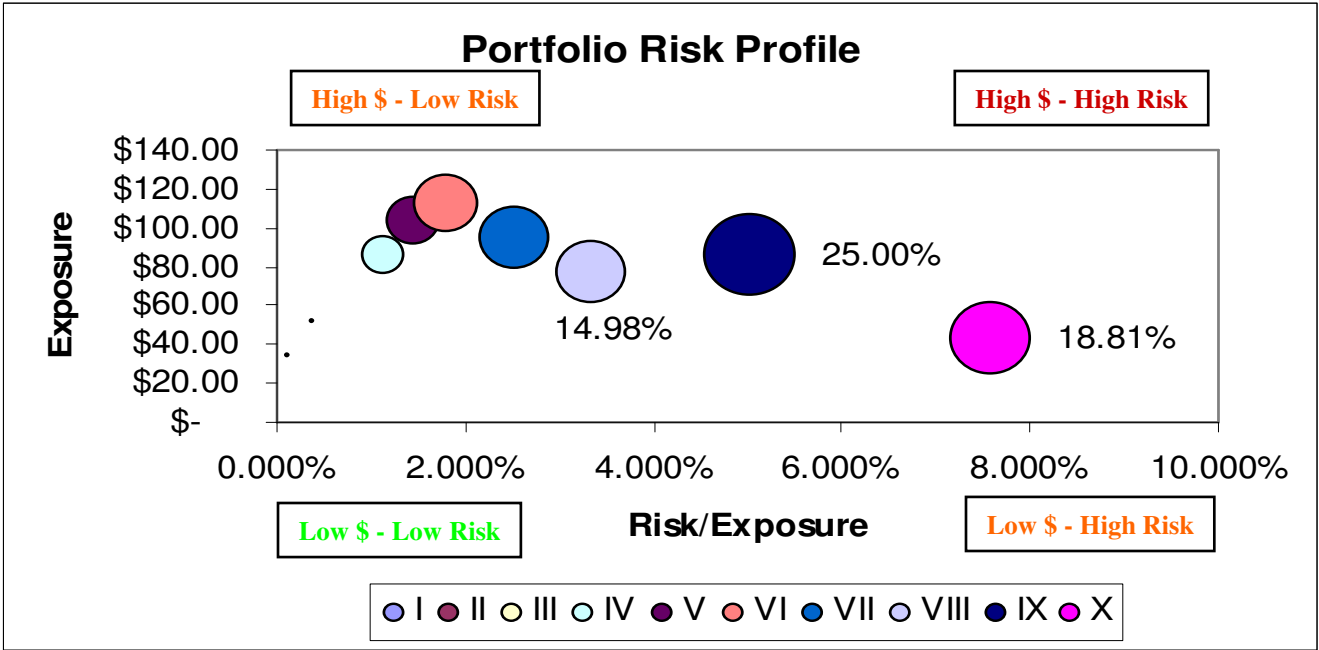


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Credit Risk Zones

I	II	III	IV	V	VI	VII	VIII	IX	X
Invest. Banks	A+ Utilities	Trusts	Governmental	Hedge Funds	Industrial	B+ Utilities	Chemicals	Retail	Residential



Bubble Size = Risk Concentration



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Triggers

Rating	Unsecured Margin (\$MM)
AAA	50
AA+	45
AA	40
AA-	35
A+	25
A	20
A-	15
BBB+	10
BBB	5
<=BBB-	0



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Migration Matrix

Moody's 1980-1999

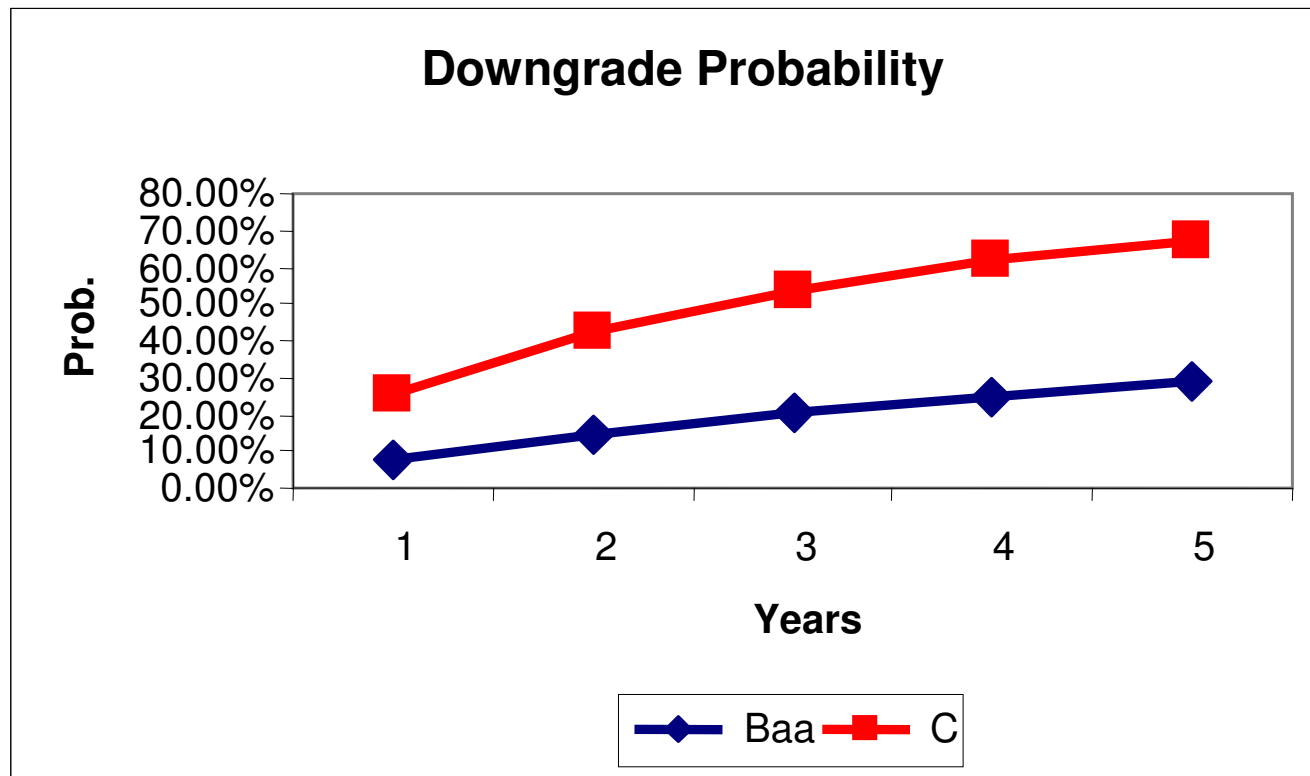
	Aaa	Aa	A	Baa	Ba	B	C	Def
Aaa	85.88%	9.76%	0.48%	0.00%	0.03%	0.00%	0.00%	0.00%
Aa	0.92%	84.87%	9.64%	0.36%	0.15%	0.02%	0.00%	0.04%
A	0.08%	2.24%	86.24%	6.09%	0.77%	0.21%	0.00%	0.02%
Baa	0.08%	0.37%	6.02%	79.16%	6.48%	1.30%	0.11%	0.19%
Ba	0.03%	0.08%	0.46%	4.02%	76.76%	7.88%	0.47%	1.40%
B	0.01%	0.04%	0.16%	0.53%	5.86%	76.07%	2.74%	6.60%
C	0.00%	0.00%	0.00%	1.00%	2.79%	5.38%	56.74%	25.35%
Def	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%



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Downgrade Triggers

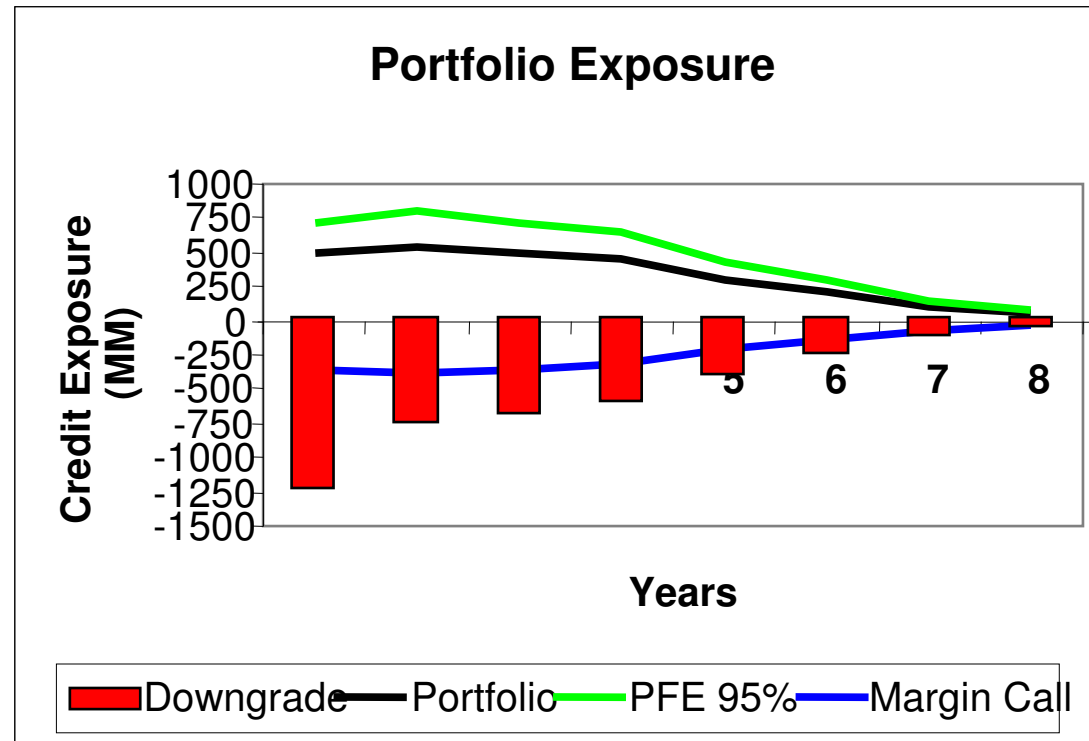




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Portfolio Downgrade





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Legal Risk

EC=\$2 B, Collateral Enforceable

EU=\$20 B, Collateral Not Enforceable

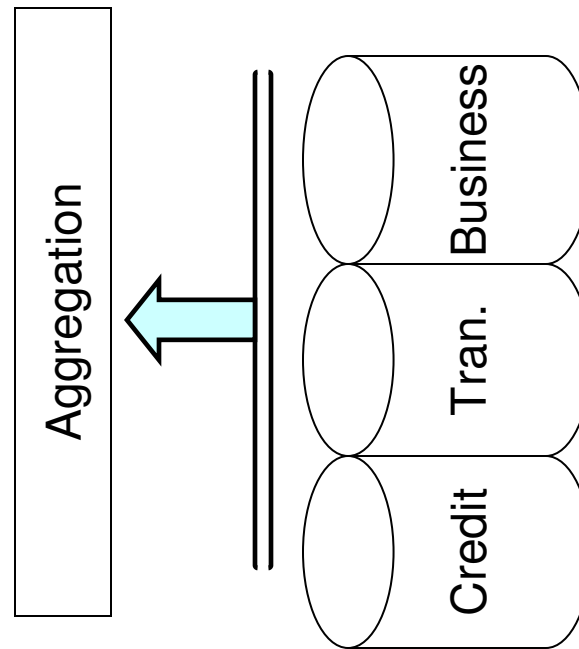




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Systems - Pre-processing

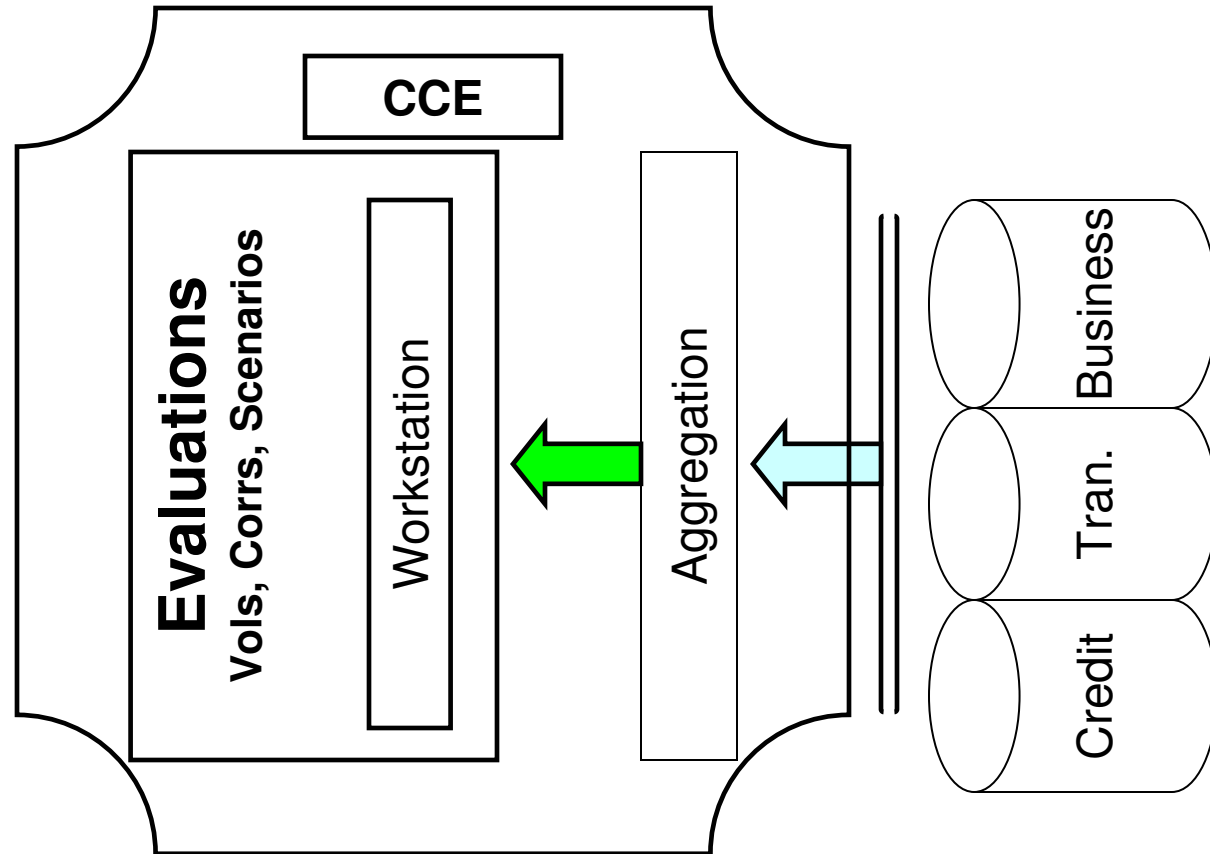




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Systems - Configuration

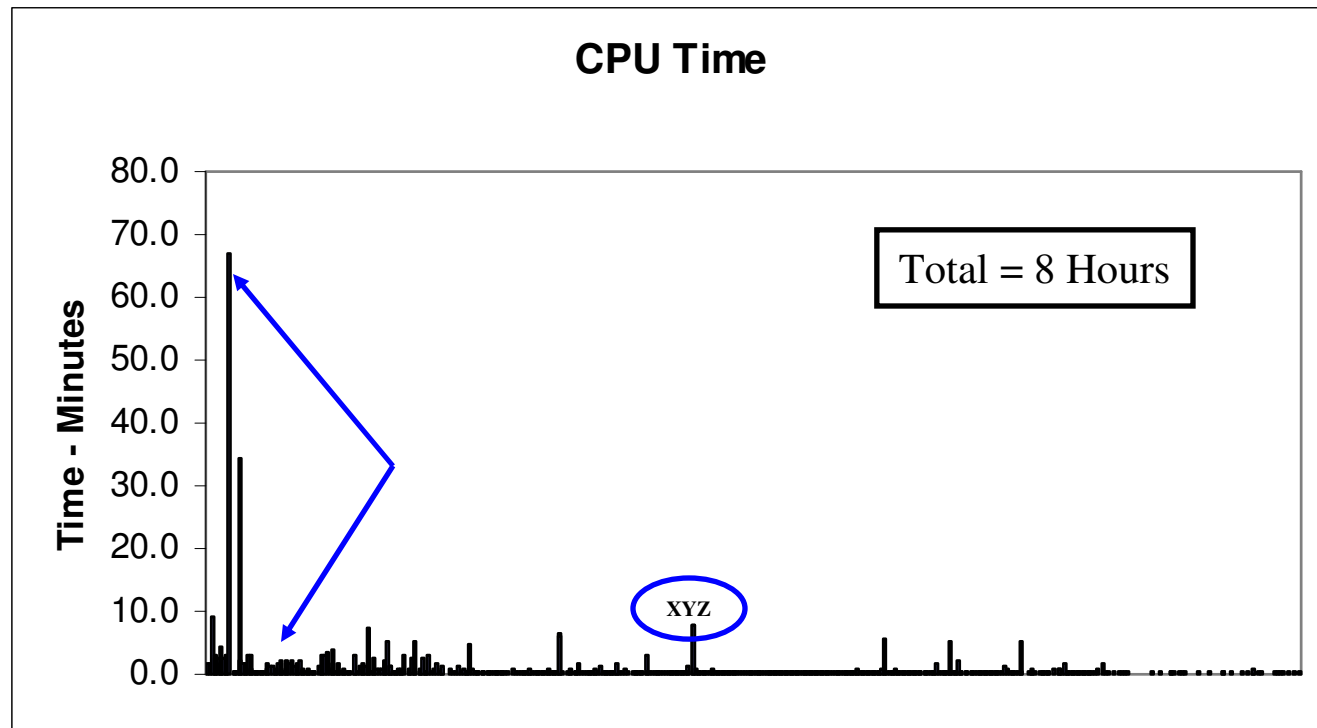




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Processing Time

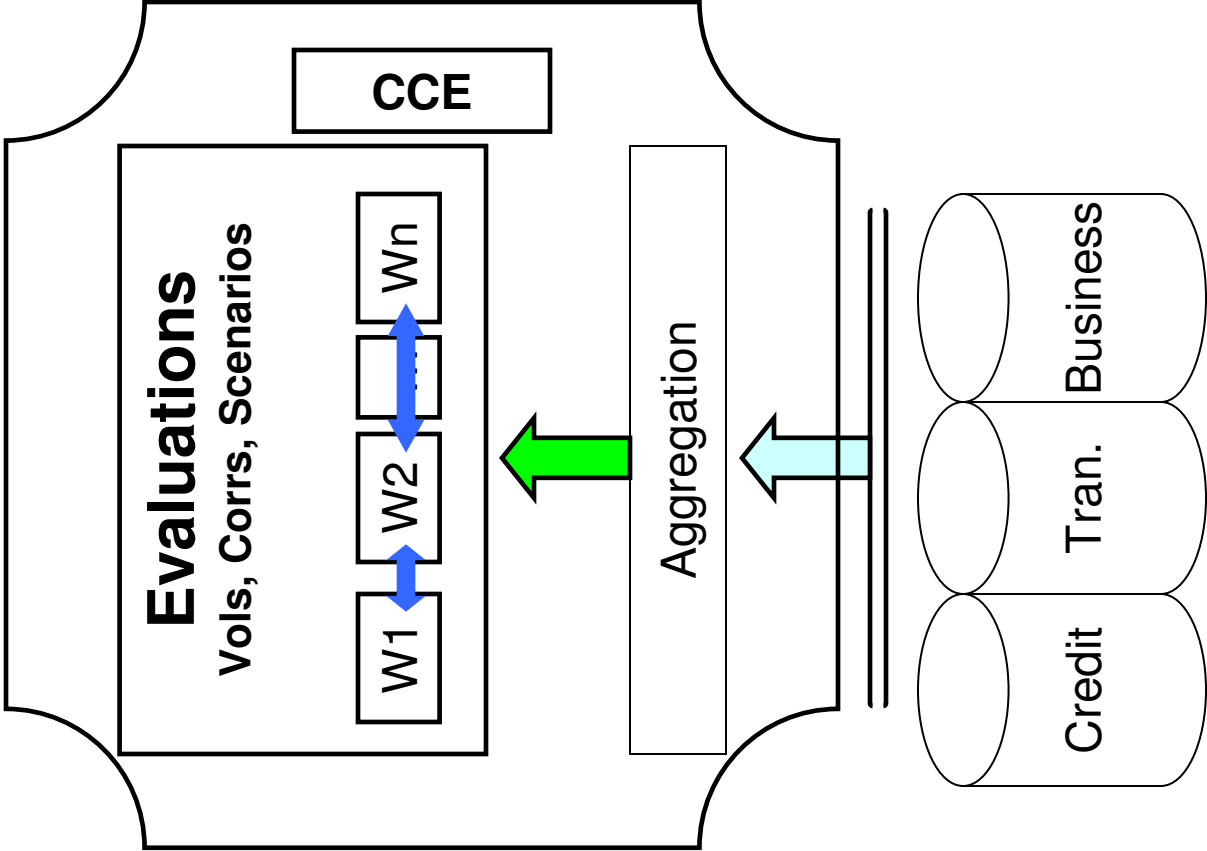




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Systems - Distributed Computing

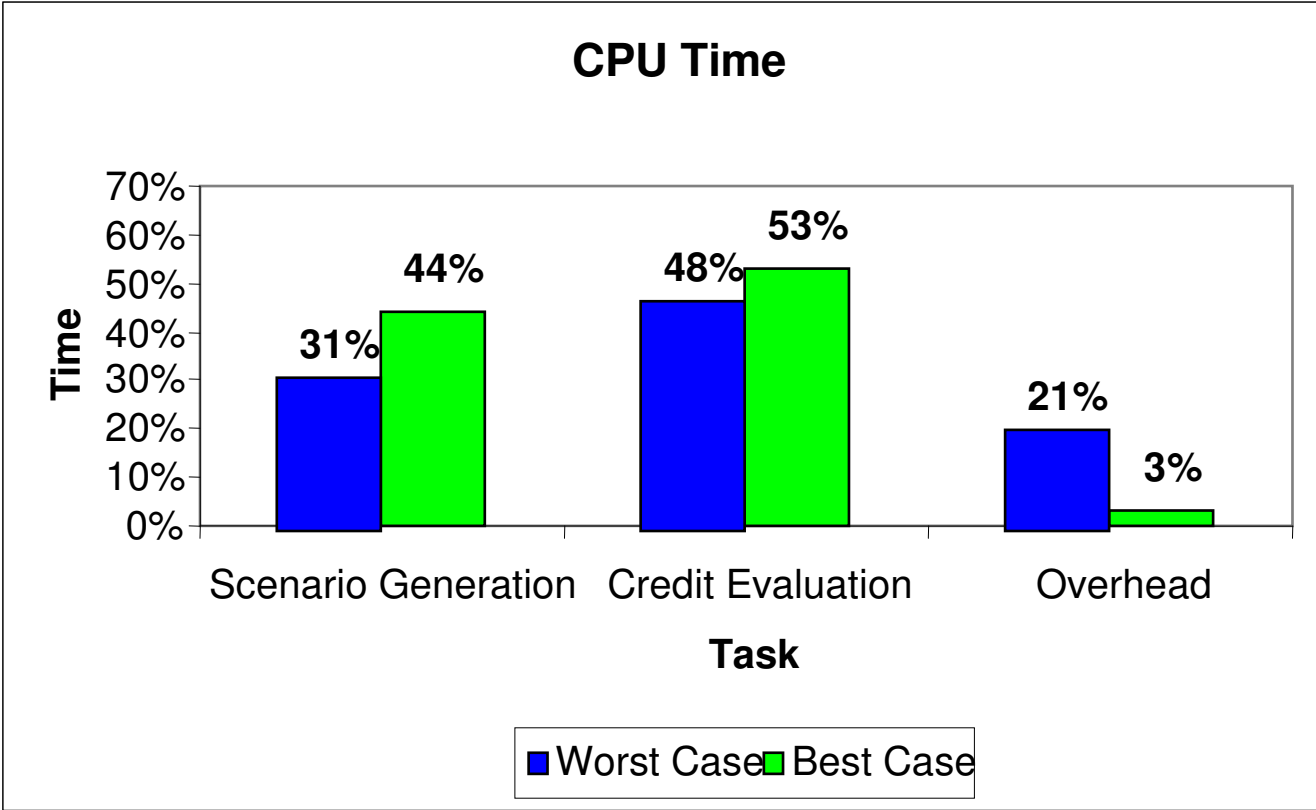




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Efficiency





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Thank You

