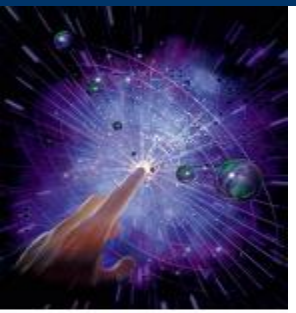

Value-at-Risk (VaR)

– a Risk Management tool

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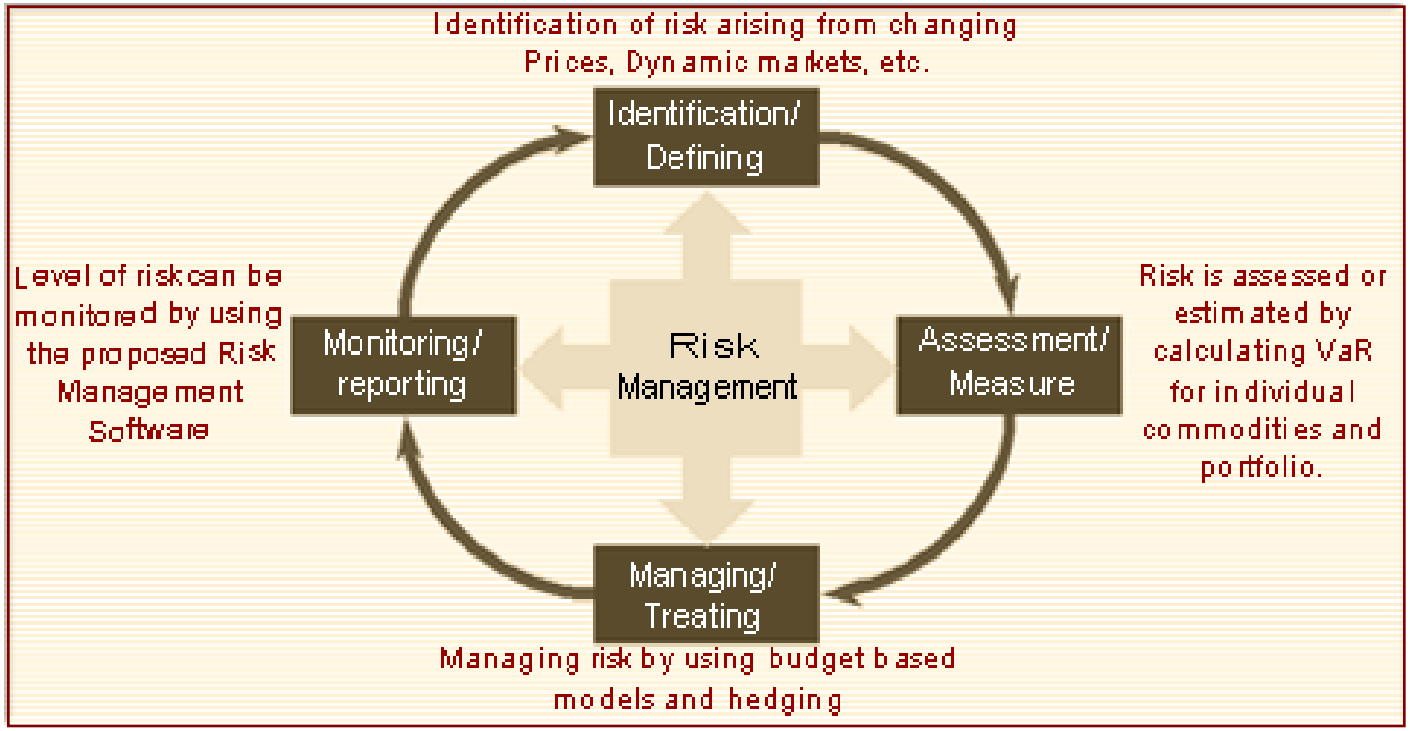
Risk Management



Key to successful Risk Management of a portfolio lies in ***identifying & quantifying*** the risk that the company faces due to price volatility in the markets exposed to.

Value-at-Risk

Value at Risk (VaR) answers the question, "In the worst case, how much do I stand to lose on my portfolio tomorrow?"

For instance, if the VaR estimate on a position is USD 20 per ton, it indicates that there stands a 95% chance that the loss will not exceed USD 20 on an investment of 1 ton for 1 day holding.

Inputs needed for VaR:

- Market Price
- Volatility
- Correlation between assets
- Exposure
- Portfolio holding horizon
- Level of confidence that the actual loss will not exceed VaR

Why quantify risk?

Quantifying risk in terms of an absolute number eliminates subjectivity in the decision making process. The shareholders, board, top management and traders will perceive the same risk thereby the objective of risk management is clear.

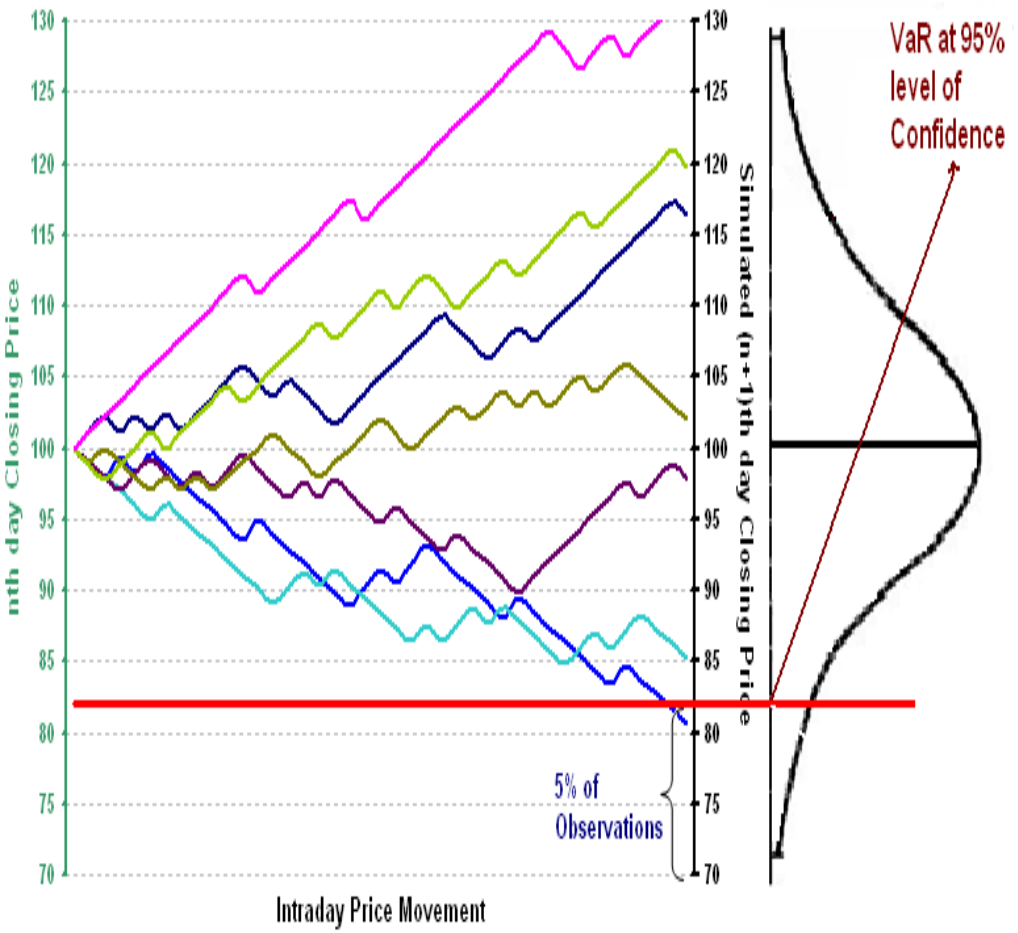
Understanding VaR in simple terms

Date / Day	Closing Price	Returns (% Change from previous day)
1	100	
2	101	1%
3	100	-1%
4	105	5%
99	101	-4%
100	95	-6%

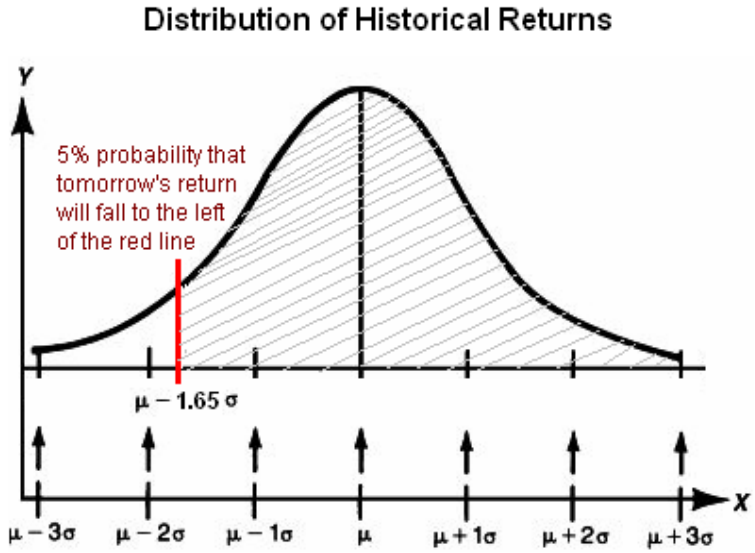
Reading data in the adjacent table:

- **99% of the observations are less than +/- 5%.**
- **95% of the observations are less than +/- 4%.**
- **Therefore if we assume the pattern of change in the prices, we can say maximum likely loss for a position will not exceed 4% with a 95% probability and 5% with a 99% probability.**
- **However this pattern will not hold true for next day of trading. To address this we employ 3 methodologies Parametric, Historical Simulation and Monte Carlo Simulation to estimate the maximum likely loss correctly in the context of dynamic and volatile markets.**
- **Therefore when we say portfolio risk is 100 thousand dollars, it does not mean to say that we will lose 100k but it means to say that even in extreme price volatile days the maximum likely loss will not exceed 100k.**
- **Lot of statistical algorithm creation / customization is done to estimate that maximum likely loss / Value at risk number, so that organization is always prepared for the worst.**

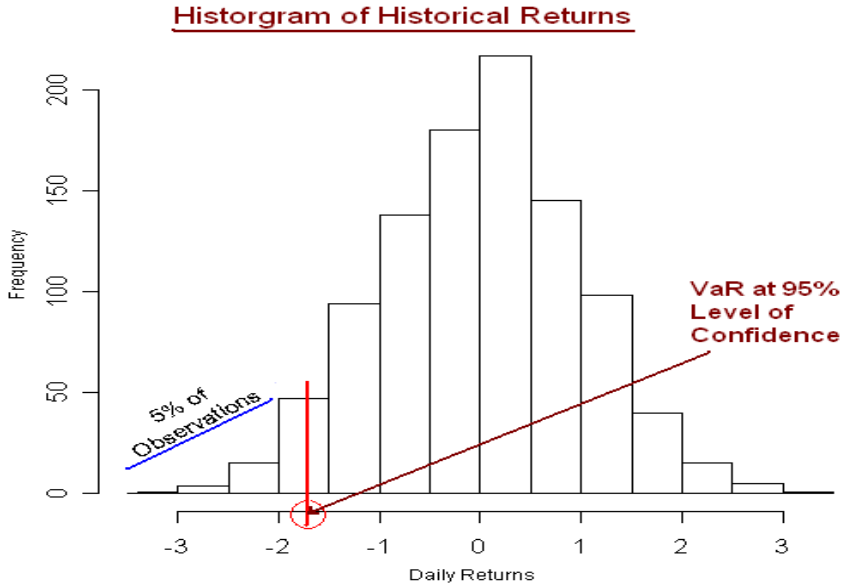
VaR Methodologies



Monte Carlo Simulation



Parametric



Historical Simulation

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VaR Methodologies - Pros & Cons

Type	Historical simulation	Parametric	Monte- Carlo simulation
Ease of Computation	Very simple to calculate. Doesn't need a VCV	Fast and simple to calculate though it needs VCV	Takes a lot of computational power and hence a longer time to estimate results. Needs correlation matrix
Data Requirements	Data intensive & Data dependant. Needs exhaustive enough data that represents all the risk factors.	EWMA method Needs lesser data	Same as Parametric but needs data that represents the actual variance and correlation structure.
Assumptions	An assumption that history repeats itself. No need to make any distributional assumptions.	Assumption that the returns are normally distributed has to be made	Distribution assumption is made on the underlying price returns.
Applicability	Appropriate for all types of instruments, linear or nonlinear	Accurate for traditional assets and linear derivatives, but less accurate for nonlinear derivatives like options.	Appropriate for all types of instruments, linear or nonlinear.

VaR tools: Risk Decomposition

Asset VaR

Risk for a standalone position. Depends only on the asset price volatility irrespective of the portfolio. Sum of Asset VaRs show undiversified risk.

Marginal VaR

A position's MVaR tells about the probable impact on the Portfolio Risk (VaR) due to a marginal change in the value of the position.

Component VaR

Risk contributed by an asset to the overall portfolio, depends its own volatility and correlation with portfolio return. Sum of all Component VaRs is the Portfolio Risk

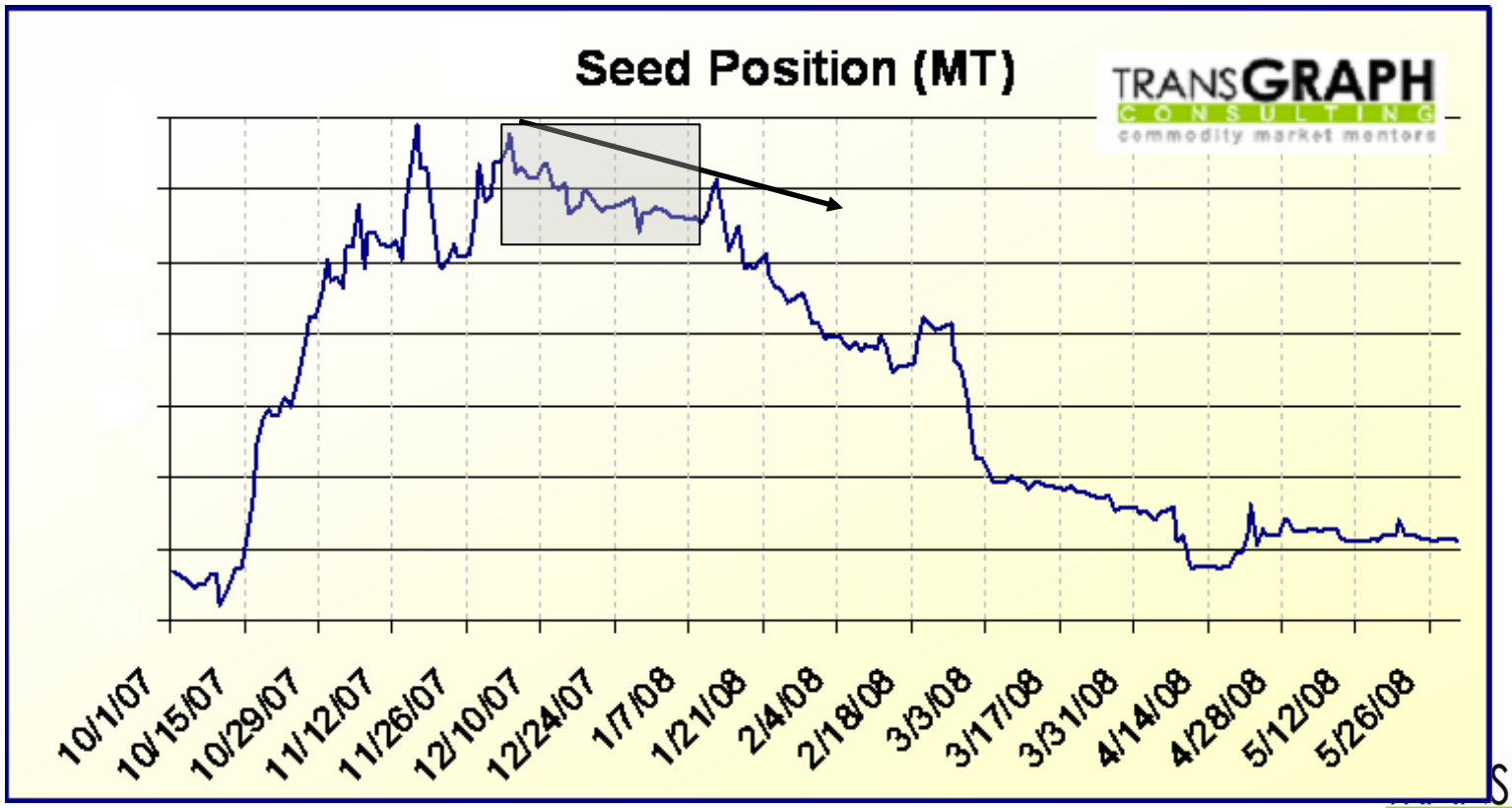
Diversification Benefit

Amount of Risk reduction achieved as a result of diversification in different commodities

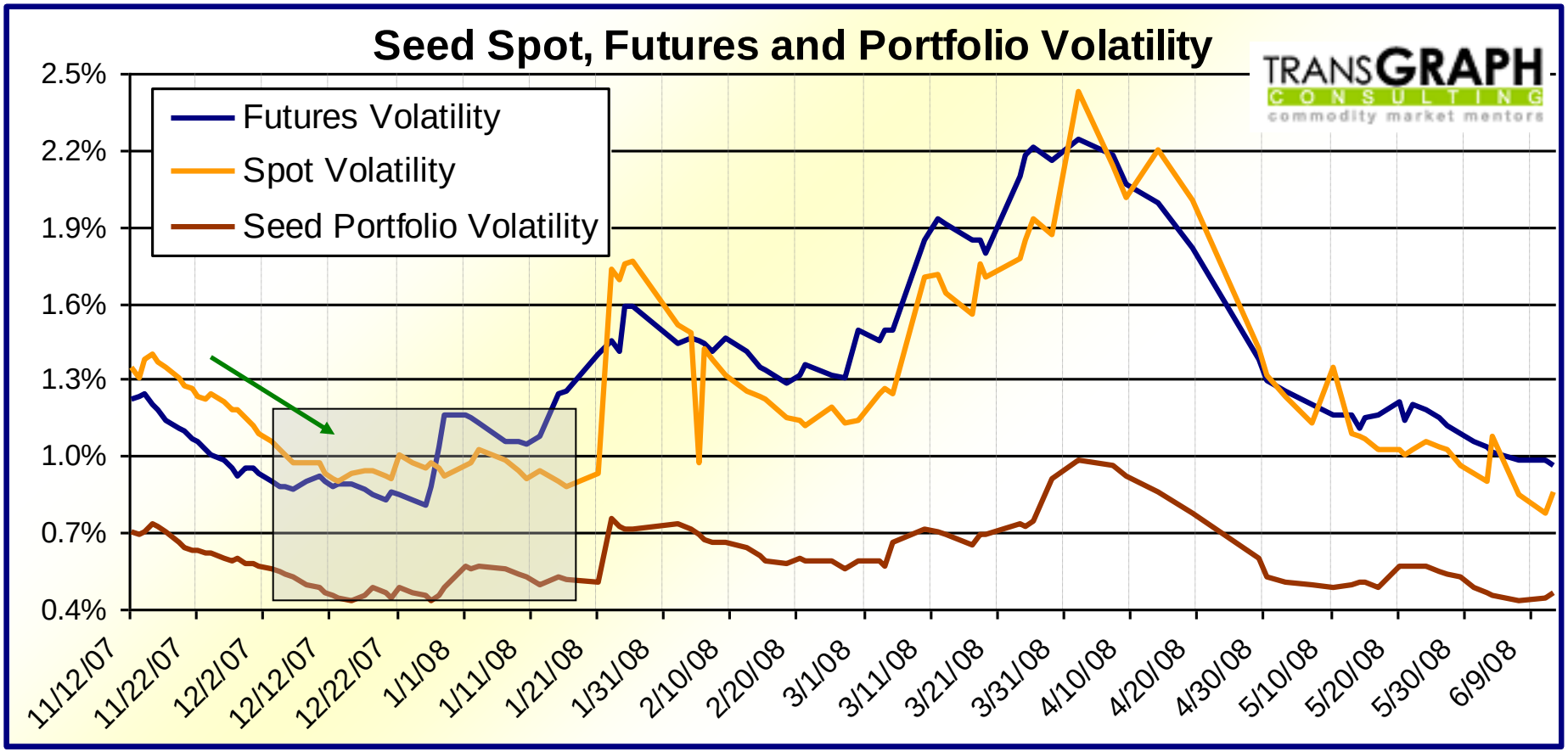
The problem

Context: Hypothetical portfolio of Soybean Physicals and Futures for a seed crushing company.

Was it a right decision to reduce Open Physical Quantities in the first week of December?*...solution follows…*



Volatility Trend – Important tool for increasing / reducing quantities



Volatility (and therefore risk) was reducing at the time and continued so for almost a month before picking up again, thus there was no need to reduce Physical positions

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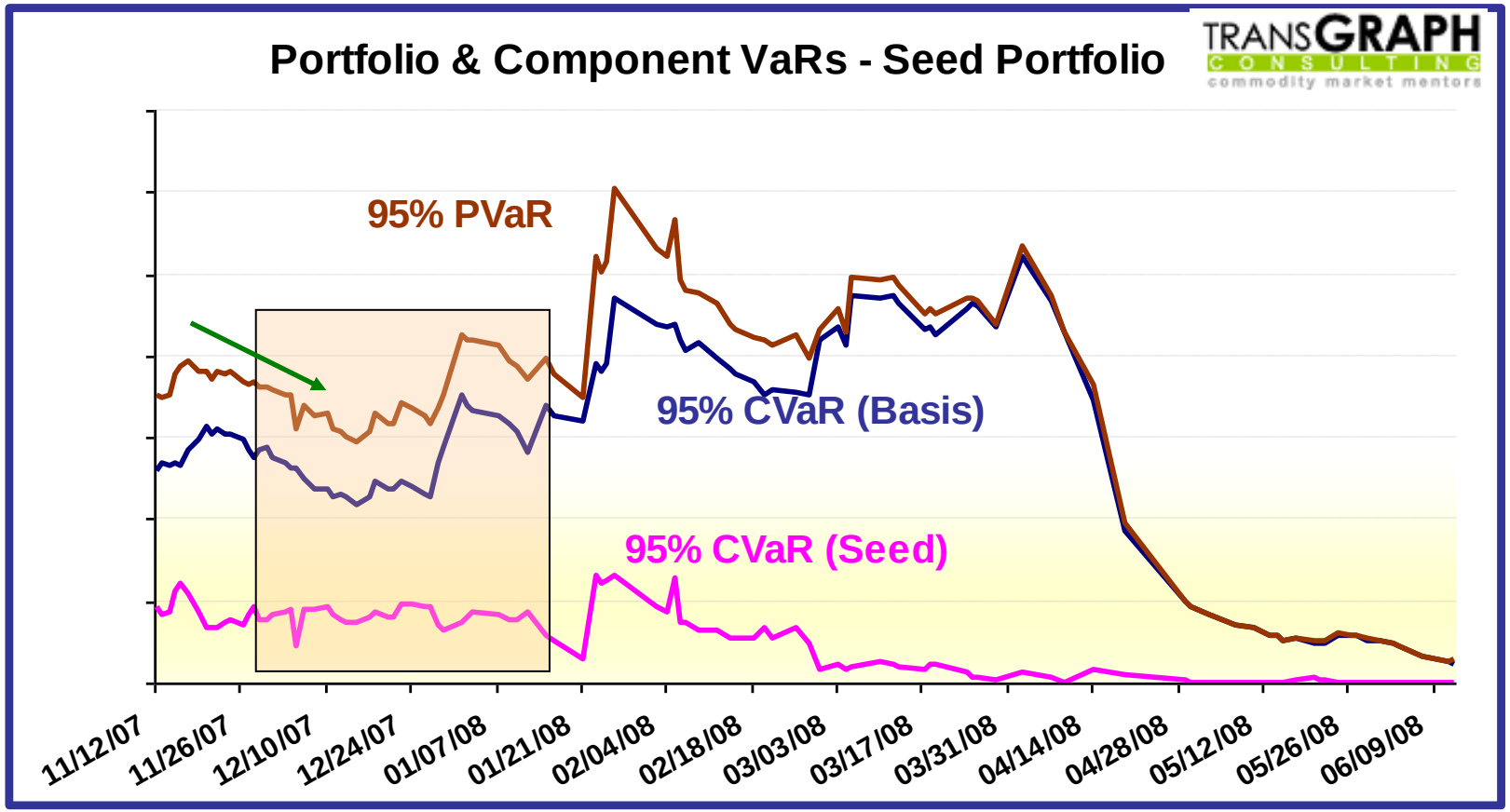
Risk Trend



Risks too, reduced for almost a month before picking up again, again signaling towards increasing rather than reducing physical positions if the view on price was positive/ bullish.

Risk Parameters

Volatility Correlation Matrix		
Commodity	Soybean Seed, INDORE	Soybean Seed, NCDEX
Soybean Seed, INDORE	1.05%	45.09%
Soybean Seed, NCDEX	45.09%	0.92%

Optimal Hedge Ratio: 0.52

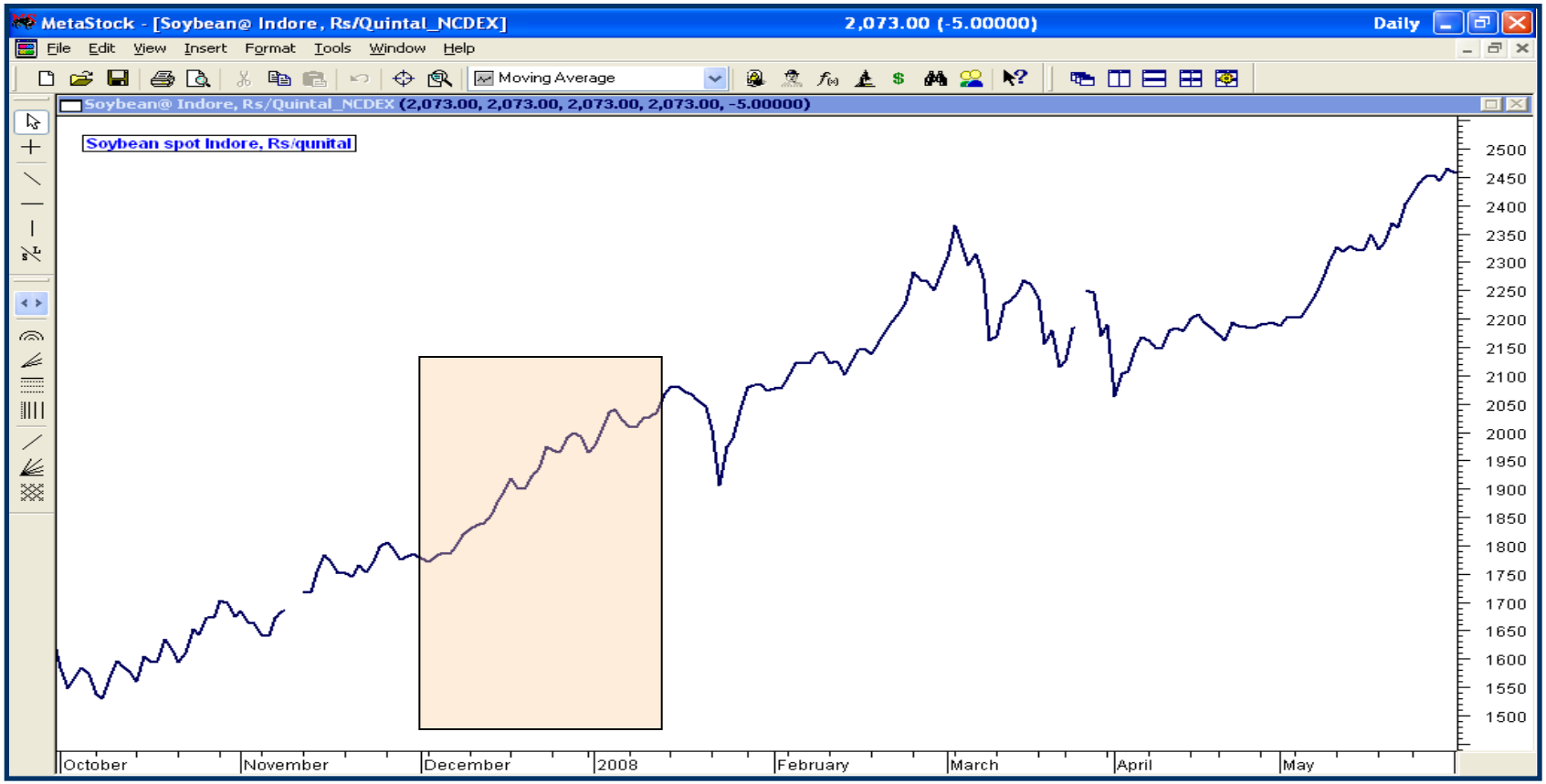
Portfolio Risk as % of M2M Value at comfortable levels

AVaR / Ton (Seed Spot): Rs. 308.80

AVaR / Ton (Seed Hedged): Rs. 306.57

Portfolio Risk as a % of Portfolio M2M Value was well within comfort zone. Therefore, no urgency to reduce the exposure.

Price Trend



Prices maintained the bull trend for the selected period which was missed out due to reduction of positions in the physical market. **(The price view from our consulting team was bullish during the period)**

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Summary

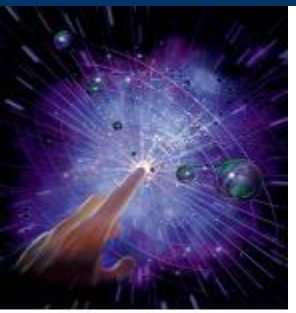
Trends

- Volatility – Reducing
- Portfolio Risk – Reducing
- Correlation – Average
- Portfolio Risk as % of M2M Value - Low

Conclusion

- The decision to reduce physical position taken could have been postponed giving slightly more weight to the price outlook (price outlook at that time was bullish for the medium-term)
- If slightly aggressive stance was acceptable, the physical position could have been increased.
- Thus, Risk Analysis can play a crucial role in trading decisions with focus on not just reducing risk, but also bettering the P&L.

Thank You



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