DC ENERGY

QUANTITATIVE TRADING

CRR Future Credit Exposure Weighting Factors

DC Energy Comments

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CRR FCE Weighting Factors

– Executive Summary –

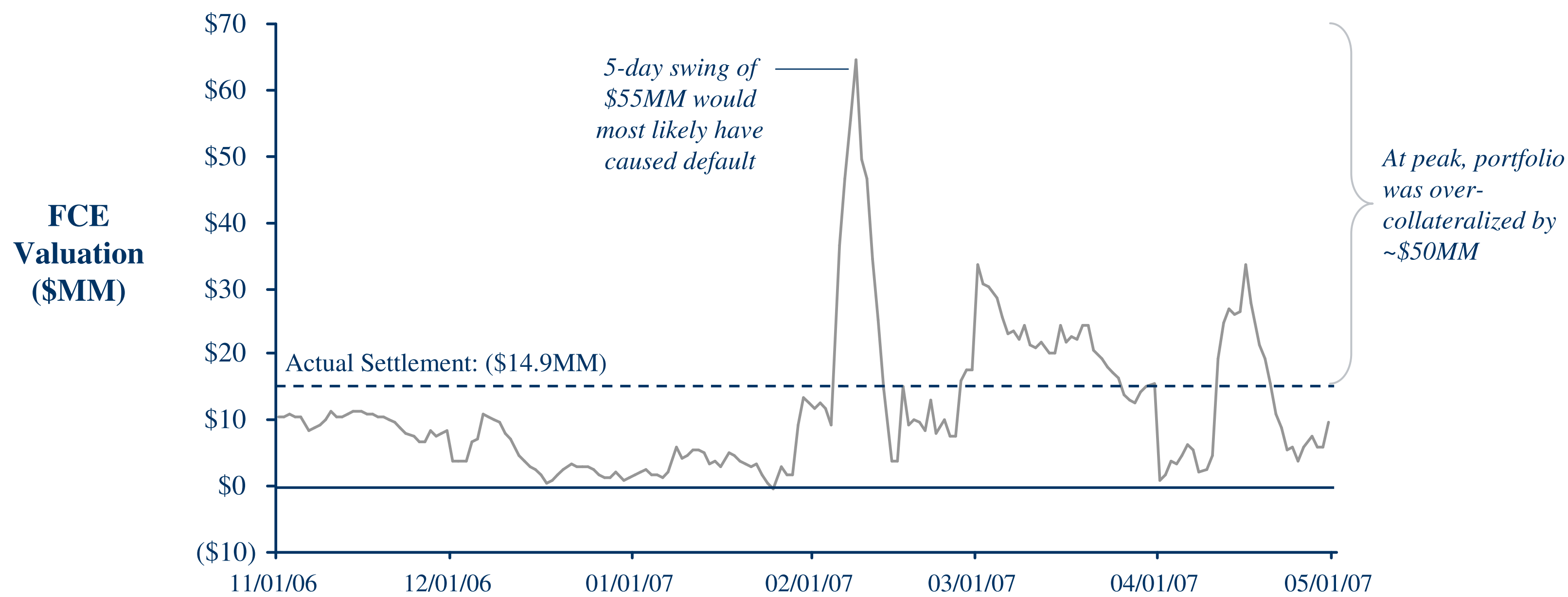
- **Selection of weighting factors can have dramatic impacts on FCE**
  - — Weights should provide adequate credit protection
  - — Weights should avoid unreasonable burdens on market participants
  - — Excessive or overly volatile collateral requirements could cause market liquidity to dry up
  - — Without market data, it is difficult to systematically optimize for the correct weights

- **Simulations on NYISO market data suggest existing weight proposal places too much emphasis on near term factors, particularly for long term CRRs**
  - — Observed extreme volatility in FCE across the year
  - — Likely to have created situations where unnecessarily high collateral levels caused defaults

- **There is no 'right' answer; however, we can try to derive weights from mathematical principles**
  - — Central limit theorem implies that larger samples are more representative than smaller ones
  - — We propose to use this theorem in selecting weights for the FCE
  - — Proposal is not 'mathematically pure', and there are many caveats, but in simulations it appears to produce outcomes that are reasonable both from a credit exposure and burden to participants perspective

In NYISO, Company X's November 2006 portfolio was the worst performing portfolio, but did not result in a default

Company X's November 2006 6 Month Portfolio
– FCE Valuation, ERCOT Proposed Initial Weights –



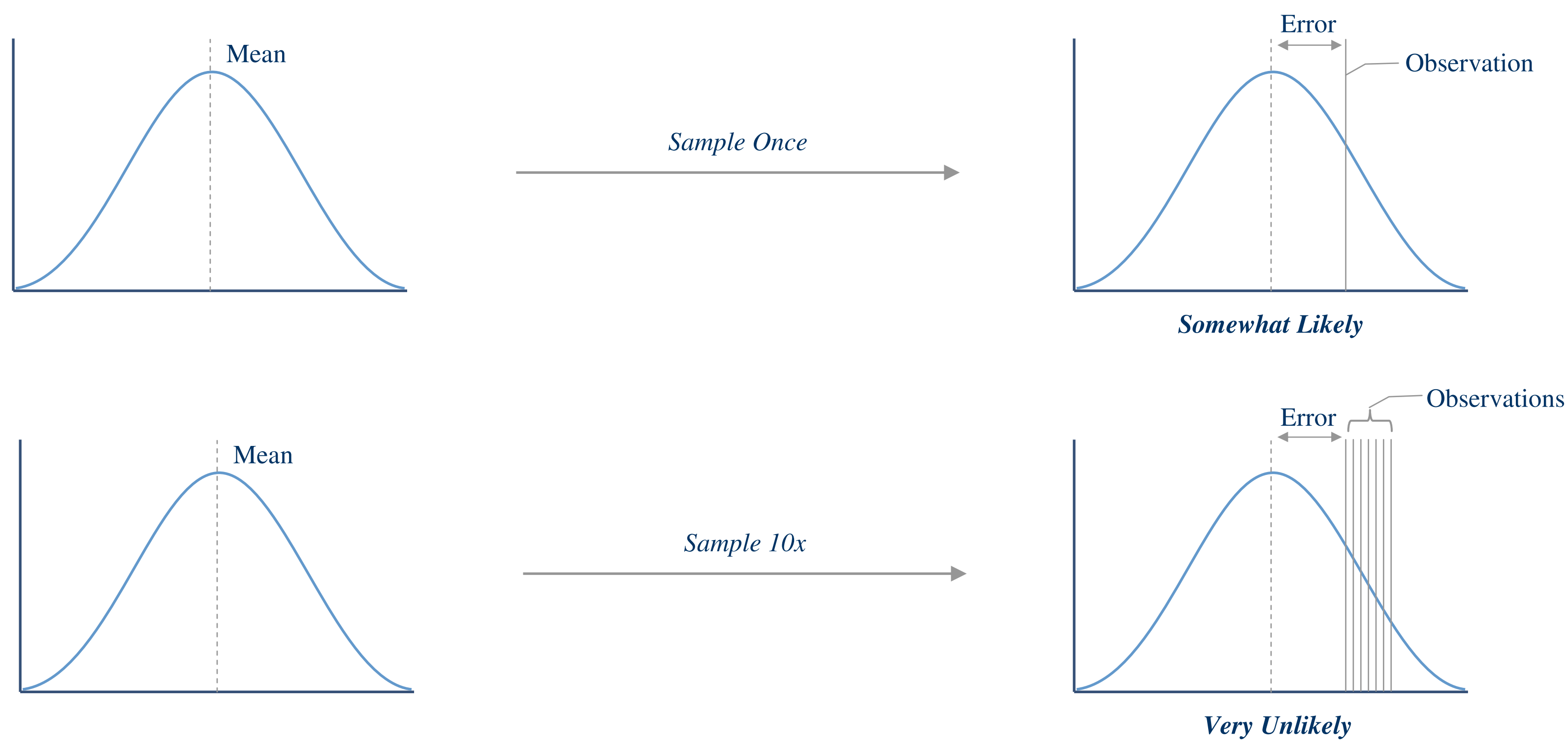
The dramatic swings in FCE are the result of the very high weightings of near term small sample size factors (1 day, 5 day) in the valuation of a long term portfolio.

Note: Only the 6-month portfolio of the company is analyzed and any sells or monthly/annual reconfiguration of positions is ignored. The mark-to-market valuations also do not discount for already settled days. Thus, mark-to-market valuation of each day ignores the history and projects the credit assuming it is the first day of the portfolio.

A single observation is relatively likely to produce a high error; for multiple observations the likelihood of a comparable error is much smaller

Estimating Distributions by Sampling

Illustrative



The higher the sample size, the less likely the error will be large

By virtue of their small sample size, the one day and five day metrics in the are most likely to miss-estimate the exposure of any given portfolio

Sampling Error vs. Sample Size

– Annual CRR –

Metric	Sample Size	Avg. Estimation Error[1]
• 1 Day	1	X
• 5 Day	5	$X/\sqrt{5}$
• Last Month	30	$X/\sqrt{30}$
• ACP	365	$X/\sqrt{365}$

Estimation Error decreases with sample size

Central Limit Theorem states that the sampling error is inversely proportional to the square root of the sample size

1 Error here represents the average standard deviation of the difference between the sample mean and the true mean. For n=1 the error is the actual standard deviation of the underlying distribution

Weights for the various timeframes should reflect the likelihood of sampling uncertainty; however, there are many caveats

CRR FCE Weights

– Deriving Weights From Sample Size –

Errors

	Today	Five Day	Last Month	ACP
CM, CM+1	X	X/√5	X/√30	X/√30
CM+2 & beyond	X	X/√5	X/√30	X/√365

↓ Weights should be inversely proportional to their volatility

Ratio of Weights

	Today	Five Day	Last Month	ACP
CM, CM+1	√1	√5	√30	√30
CM+2 & beyond	√1	√5	√30	√365

↓ Normalizing

Suggested Weights

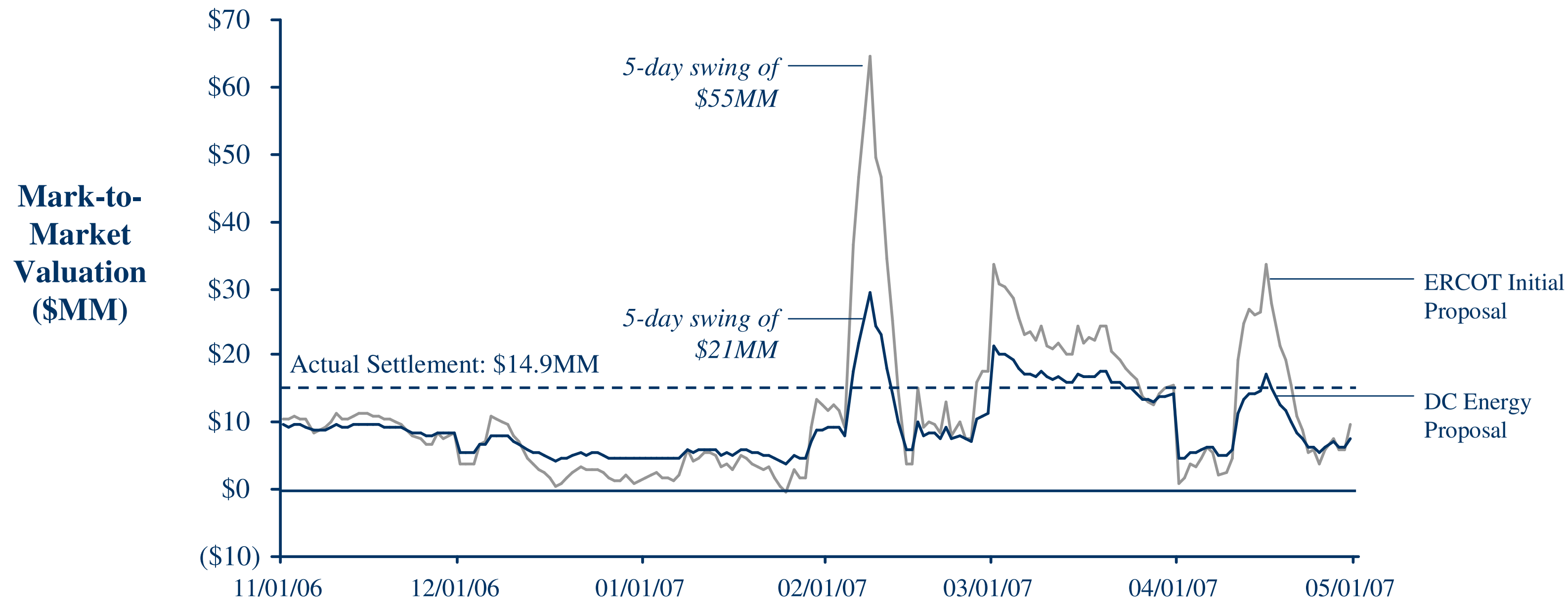
	Today	Five Day	Last Month	ACP
CM, CM+1	7.05%	15.76%	38.60%	38.60%
CM+2 & beyond	3.59%	8.04%	19.69%	68.68%

Note: For the monthly mark-to-market valuation the ACP of the most recent monthly auction should be used. μ and X are the mean and standard deviation of the initial distribution. In the case of n=1 and 5 the sample sizes are not large enough to justify the use of the Central Limit Theorem; a limitation of this approach. Also, it is assumed that the portfolio settlements are independent and identically distributed which is not necessarily the case.

DC Energy's proposed weights reduces the short term mark-to-market valuation during short term price spike events to modest levels

Company X's November 2006 6-month Portfolio

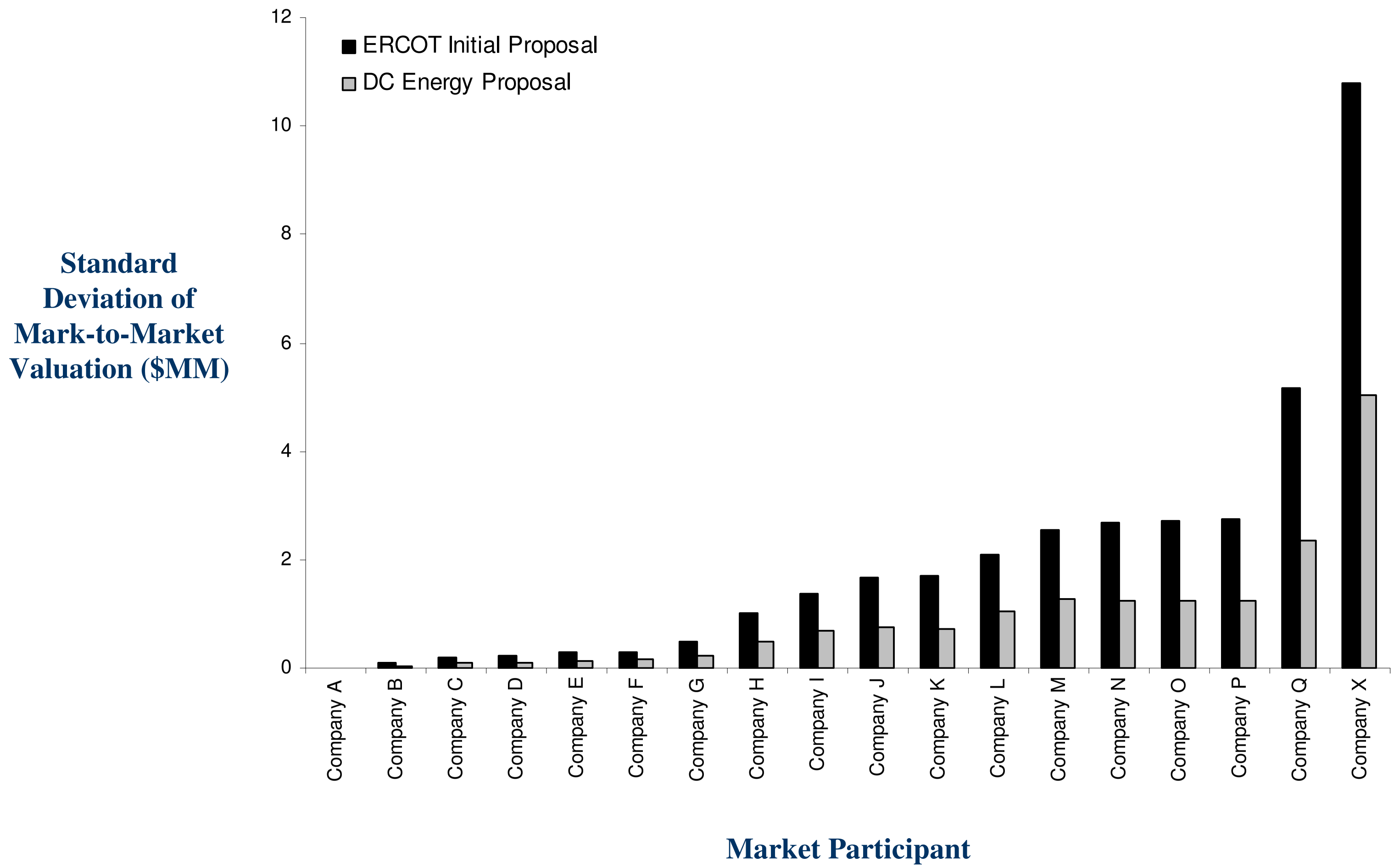
– FCE under ERCOT Initial Proposal and DCE Proposal –



Note: Only the 6-month portfolio of the company is analyzed and any sells or monthly/annual reconfiguration of positions is ignored. The mark-to-market valuations also do not discount for already settled days. Thus, mark-to-market valuation of each day ignores the history and projects the credit assuming it is the first day of the portfolio.

DC Energy's proposal for weights significantly reduces the volatility of the mark-to-market valuation at the portfolio level

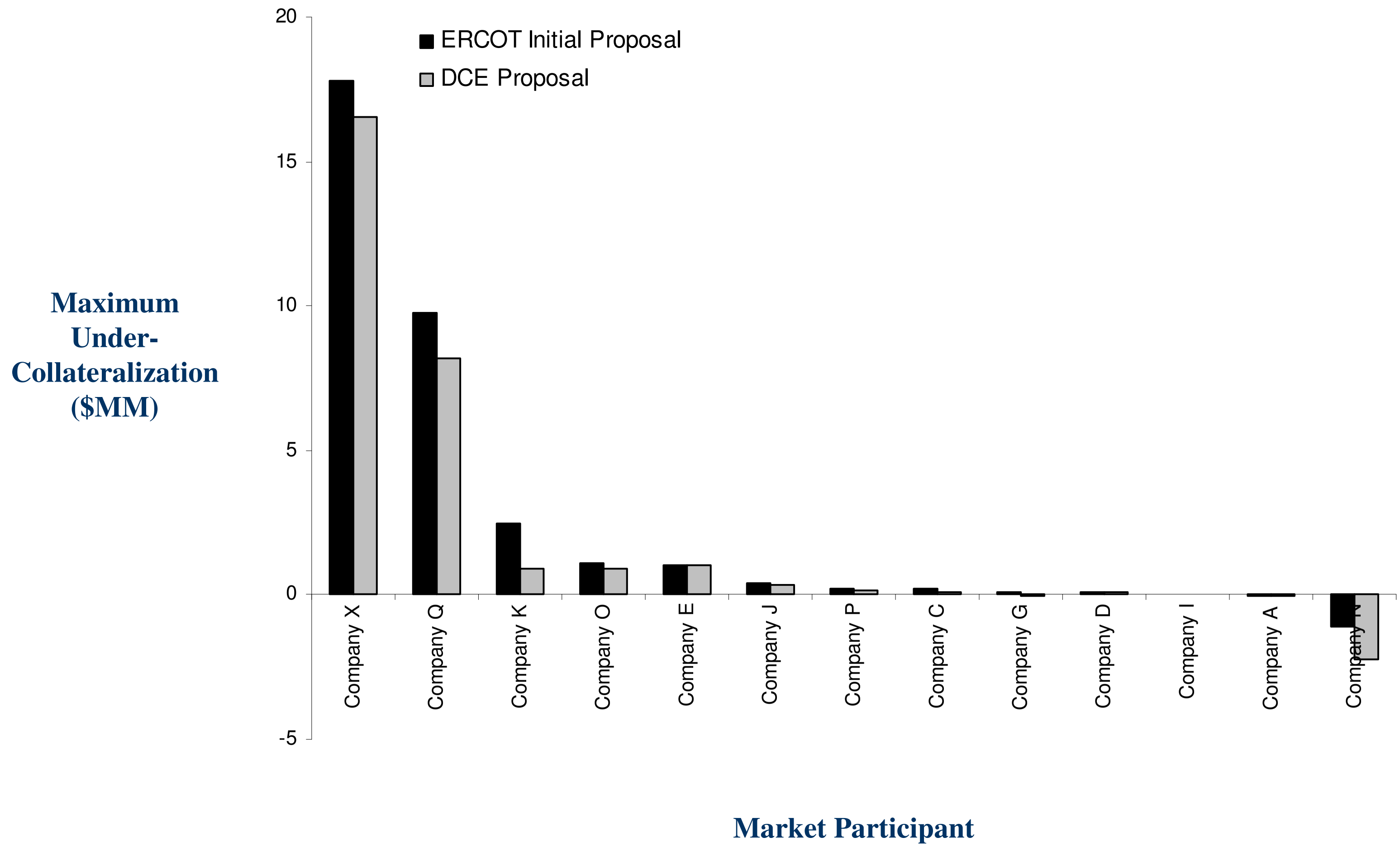
NYISO November 2006 6-Month Auction
– Mark-to-Market Valuation Standard Deviation –



DC Energy's proposal for weights in all cases has lower maximum under-collateralization for the negatively priced portfolios of market participants

NYISO November 2006 6-Month Auction

– FCE Under-Collateralization, Negative Portfolios –

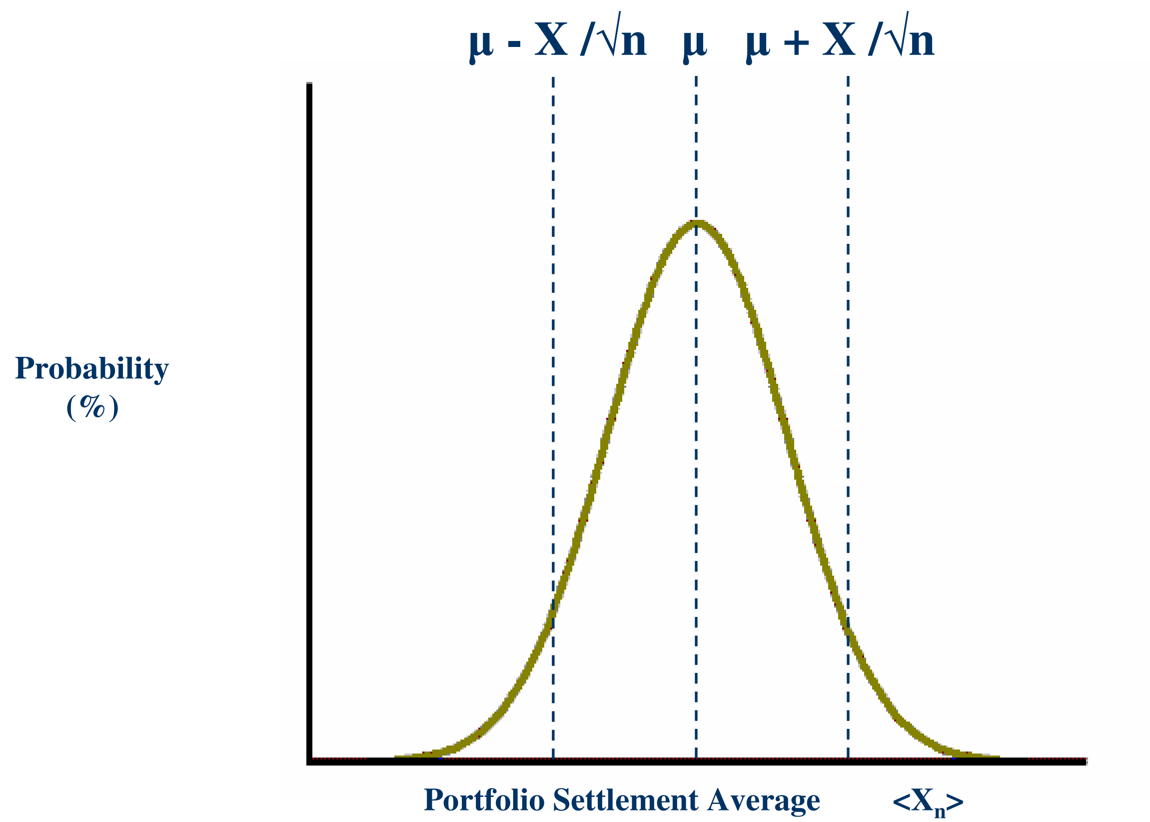


Backup

According to the Central Limit Theorem, a sample average approaches the normal distribution with standard deviation $X/\sqrt{n}$, regardless of the initial distribution

Central Limit Theorem
– Normal Distribution –

Backup



Note: μ and X are the mean and standard deviation of the initial distribution. In the case of n=1 and 5 the sample sizes are not large enough to justify the use of the Central Limit Theorem. It assumes that the portfolio settlements are independent and identically distributed which is not necessarily true in a rolling scenario.

Increase in sample size, gives a better estimate of the mean value of a distribution due to a decrease in standard deviation of the errors

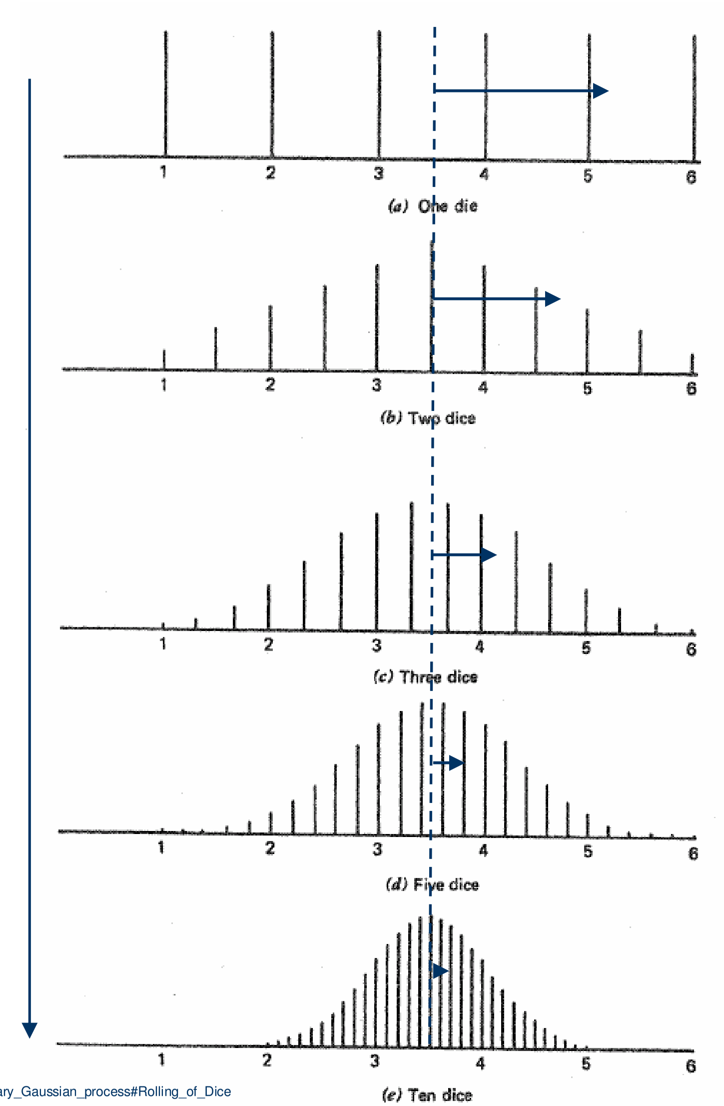
Central Limit Theorem

– Dice Example –

Illustration

Increase in number of samples corresponds to decrease in standard deviation from mean

CLT states these standard deviations decrease with the square root of the sample size



Source: http://controls.engin.umich.edu/wiki/index.php/SPC:_random_sampling_from_a_stationary_Gaussian_process#Rolling_of_Dice

We do not know what the standard deviation of the sampling errors are, but we do know the relative standard deviations as a function of sample size

Sample Mean Error Standard Deviation
– As a Function of Sample Sizes –

Backup

Increase in number of samples corresponds to decrease in standard deviation of miss-prediction by a ratio $1/\sqrt{n}$

	Today	Five Day	Last Month	ACP
Annual	$X/\sqrt{1}$	$X/\sqrt{5}$	$X/\sqrt{30}$	$X/\sqrt{365}$

Today: Has the highest standard deviation equal to that of the original distribution since there is no averaging

ACP: Based on the hypothesis that the ACP (Auction Clear Price) will reflect the annual or monthly average view of the CRRs

Shorter duration averages are more likely to misrepresent portfolio value

Note: For the monthly mark-to-market valuation the ACP of the most recent monthly auction should be used. μ and X are the mean and standard deviation of the initial distribution. In the case of n=1 and 5 the sample sizes are not large enough to justify the use of the Central Limit Theorem. It assumes that the portfolio settlements are independent and identically distributed which is not necessarily true in a rolling scenario.