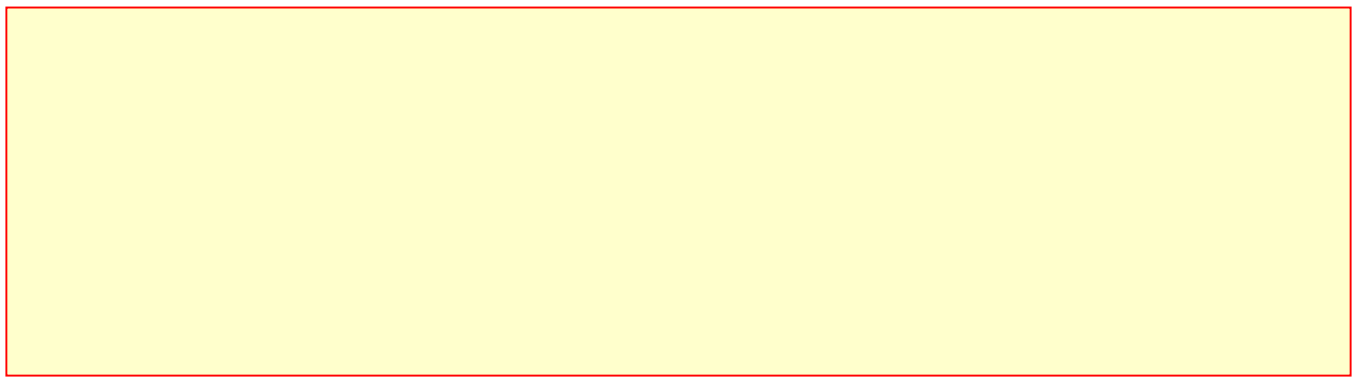
Risk Management



Bank Risks

- **Market Risk. The risk in reducing the value of the Bank's positions due to changes in markets.**
- **Credit Risk. The risk in reducing the value of the Bank's assets due to changes in the credit quality of the counterparties.**
  - **Counterparty deafult is an extreme case, but losses can also occur when a counterparty's credit quality decreases.**
  - **Credit risk is an issue even when the bank holds only payment obligations.**
- **Liquidity Risk. The risk of losses because of travel-time delays of assets.**
- **Operational Risk.**
  - **Fraud.**
  - **Model risk (using the wrong pricing model, for instance)**
  - **Human Factor**
- **Legal and Regulatory Risk.**
  - **Transactions that are voided due lack of appropriate licenses.**
  - **Changes in Tax Laws**

G-30 Policy recommendations

- General Policies:

"*Policies governing derivatives use should be clearly defined, including the purposes for which these transactions are to be undertaken. Senior management should approve proceedures and controls to implement these policies, and management at all levels should enforce them*"

G-30 Policy recommendations

Market Risk Policies.

- Mark-to-market
- Market valuation methods (e.g., derivatives should priced at mid-market levels, taking into account funding costs, administrative costs, etc.)
- Identifying revenue sources
- Measuring market Risk (VaR)
- Stress simulations
- Investment and funding forecasts
- Independent market risk management
- Practices by end users
- Measuring credit exposure

G-30 Policy recommendations

Credit Risk Policies.

- Aggregate credit exposures, taking into account netting agreements.
- Independent credit risk management
- Master agreements
- Credit enhancements

Recommended bibliography

- P. Jorion "*Value at Risk".* Irwin (1996).
- Croughy, Galai and Mark "*Risk Management*", McGraw Hill (2000)

Measure of Market Risk

Value-at-Risk (VaR)

It is the loss that the portfolio will experience under distress.

- The loss is taken over a time horizon: a day, a month, sometimes even one year.
- "Distress" is quantified by a percentile of the P&L function, usually 95% or 99%.

VaR is a measure of risk which has several drawbacks, as we will see next, but it is an accepted industrial standard, after J.P.Morgan introduced their RiskMetrics document in 1994. It is now part of the implementation of the Bassel convention of 1991.

VaR drawbacks

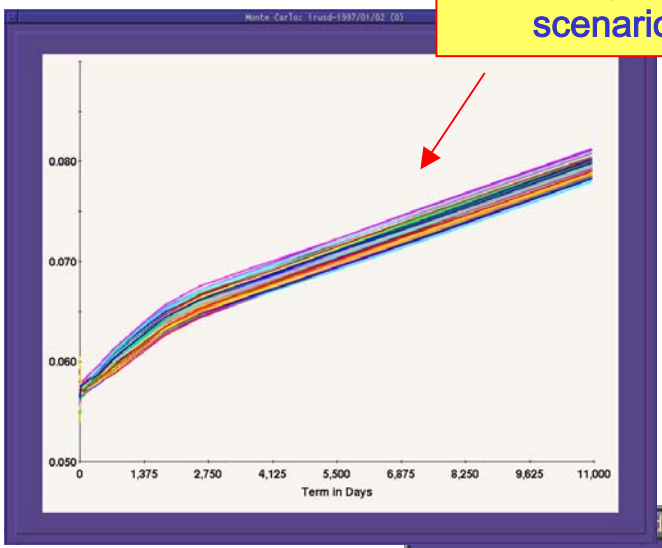
- It is not sub-additive: the VaR of a portfolio with several components can be larger or smaller than the VaR of each of its components.
- Difficult to calculate:
  - Sampling methods are ineffective, as most of the elements of the sample are irrelevant.
  - The quantile function is very unstable, un-robust at the tail.

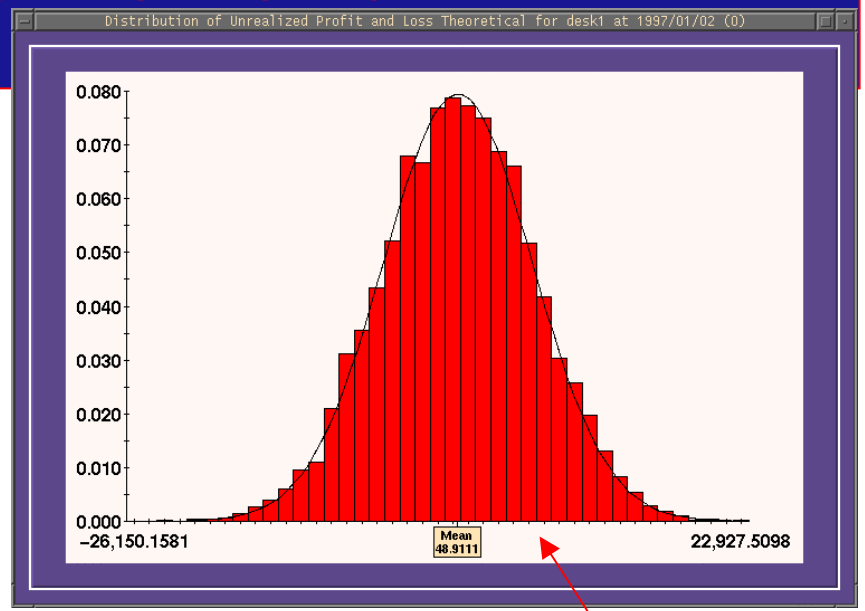
Three calculation methods

- Historical
- Monte-Carlo
- Analytic.

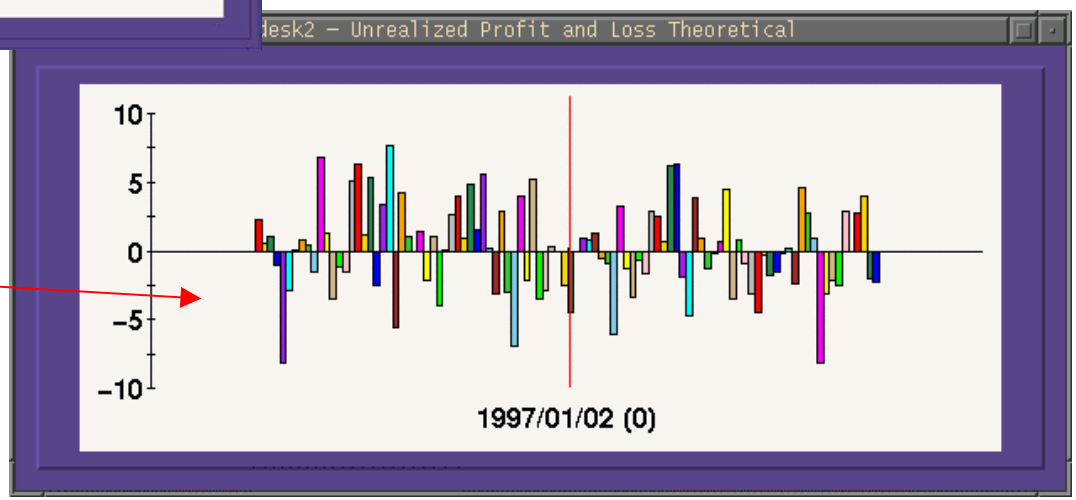
VaR calculation: general framework

Step 1: generate scenarios



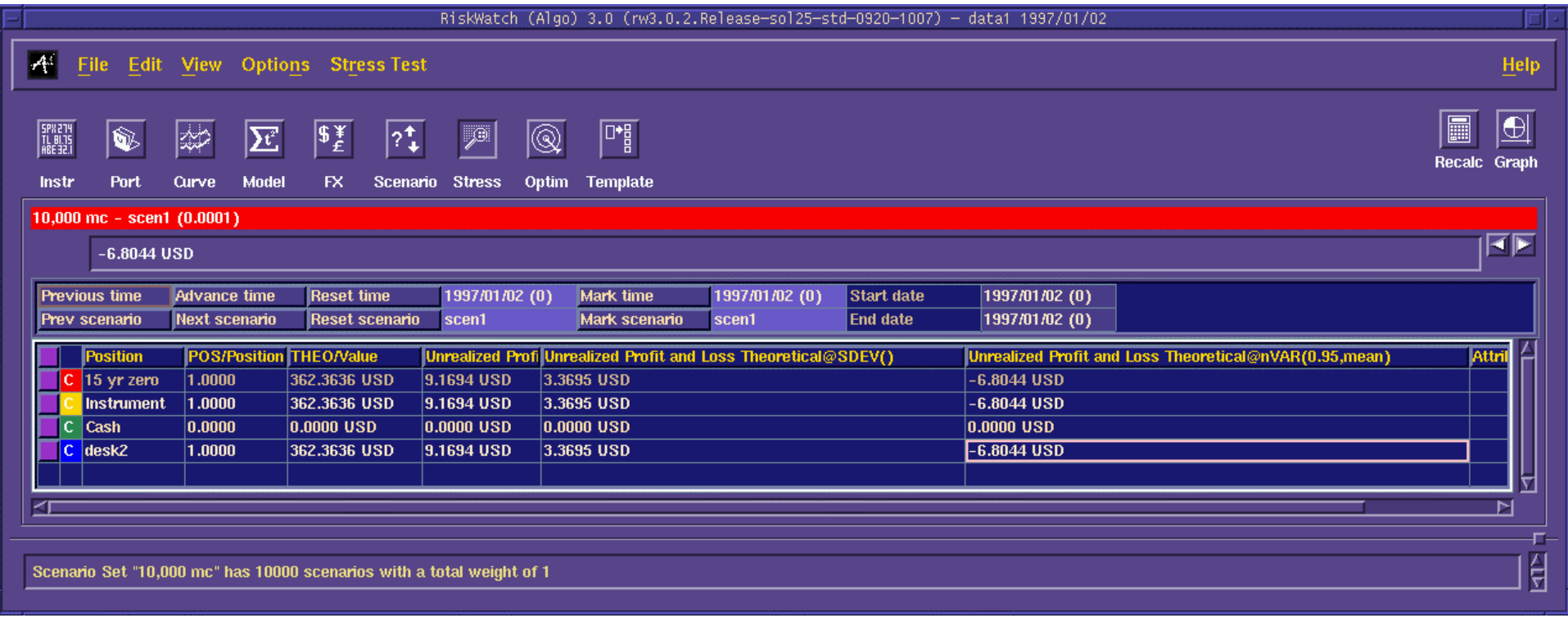


Step 2: evaluate P&L under each scenario



Step 3: computer P&L statistics

The answer


RiskWatch (Algo) 3.0 (rw3.0.2.Release-sol25-std-0920-1007) - data1 1997/01/02
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Instr Port Curve Model FX Scenario Stress Optim Template
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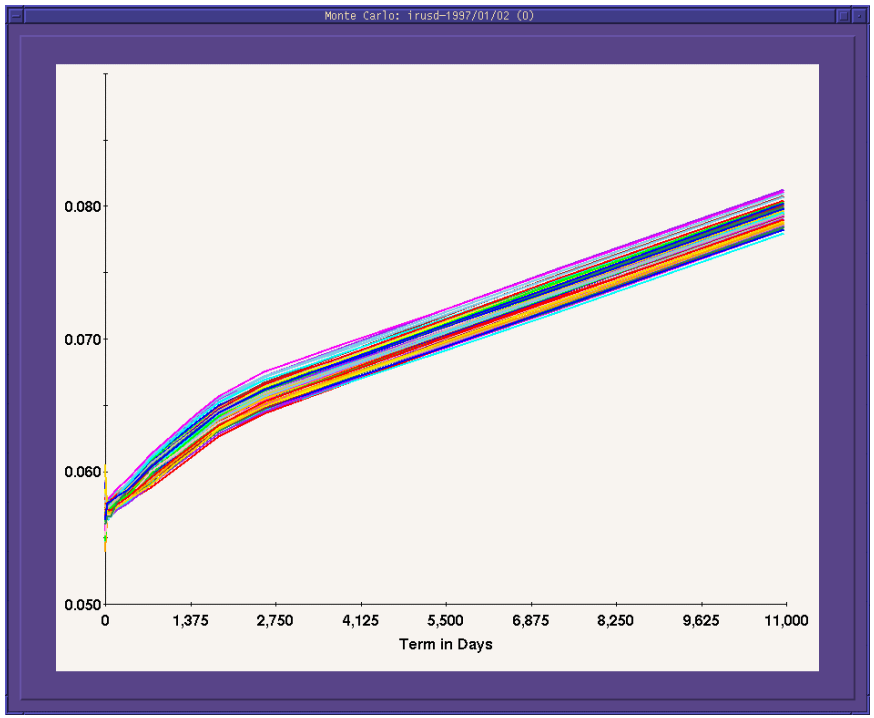
C desk2 1.0000 362.3636 USD 9.1694 USD 3.3695 USD -6.8044 USD
Scenario Set "10,000 mc" has 10000 scenarios with a total weight of 1

MonteCarlo VaR

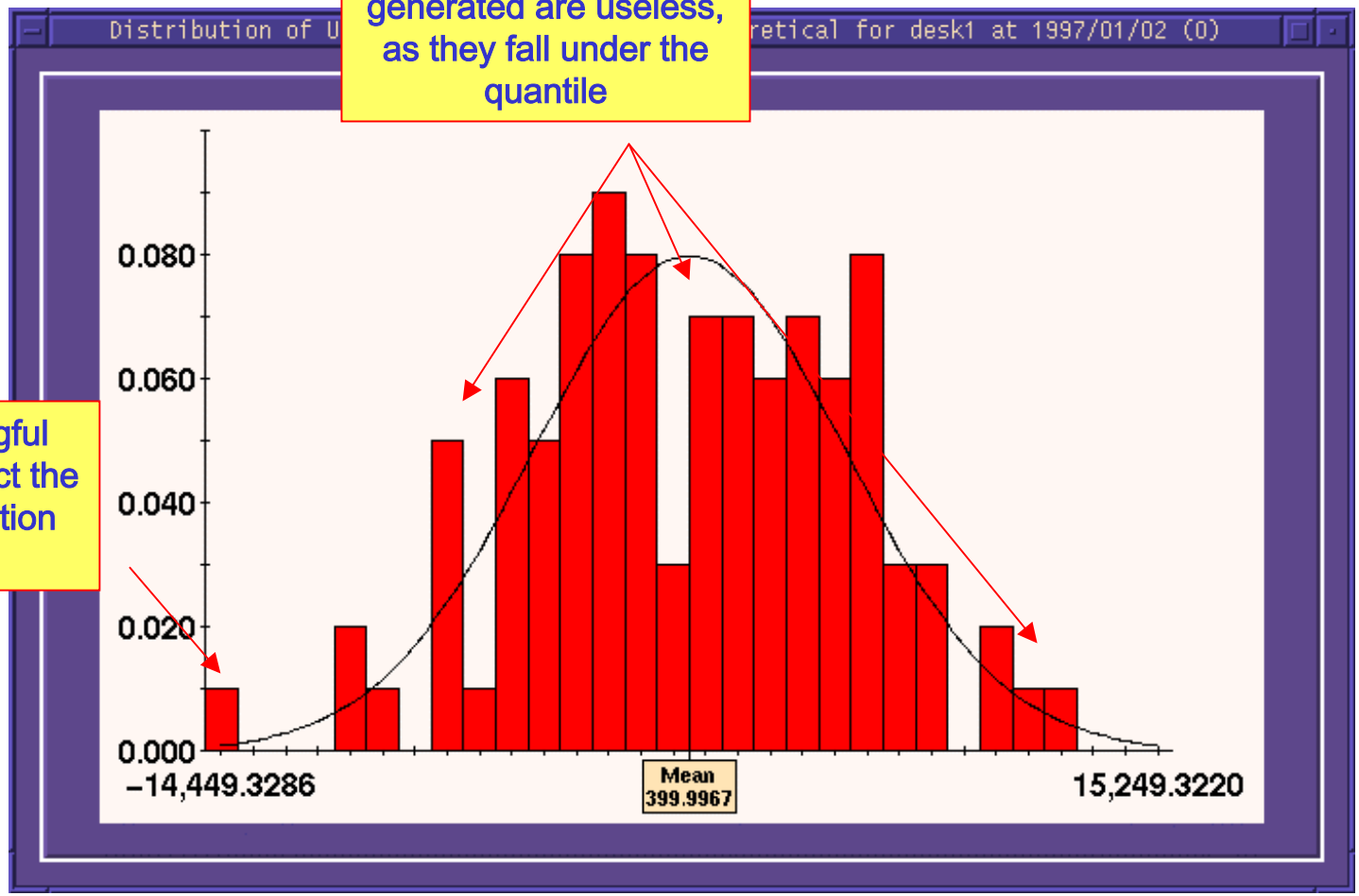


- Scenarios are generated taking random samples from probability distributions.
- Pros:
  - it can fit any given distribution in an adequate manner
  - It is not hostage to historical events: it can come up with new ones

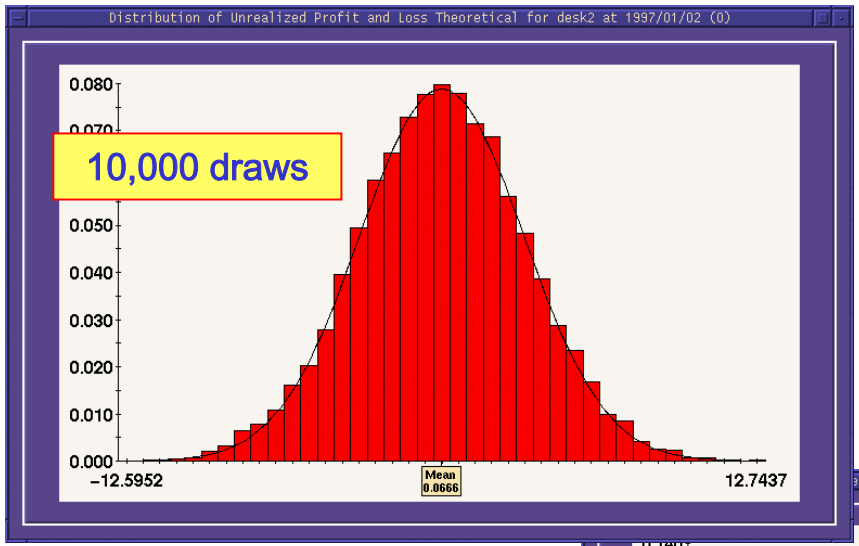
MonterCarlo VaR: Cons

Most scenarios generated are useless, as they fall under the quantile

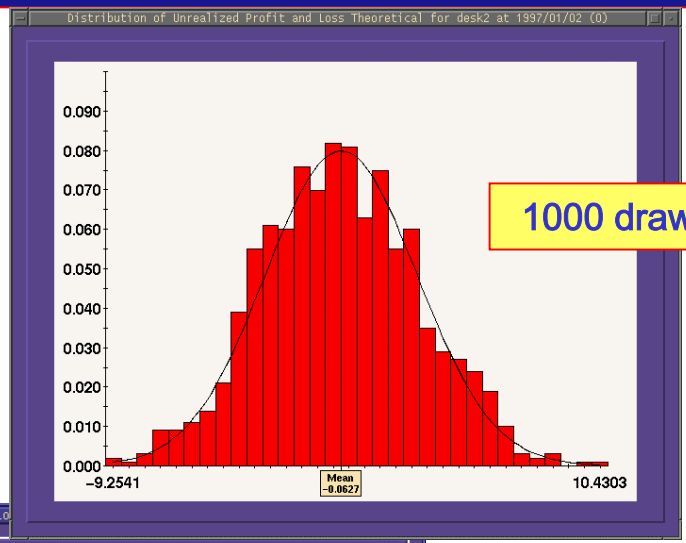
The few meaningful may not reconstruct the tail of the distribution adequately.



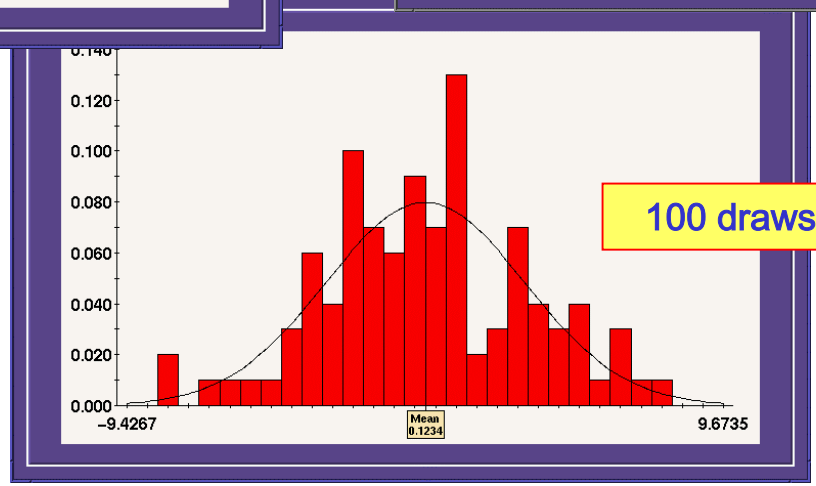
MonteCarlo VaR: more cons



10,000 draws



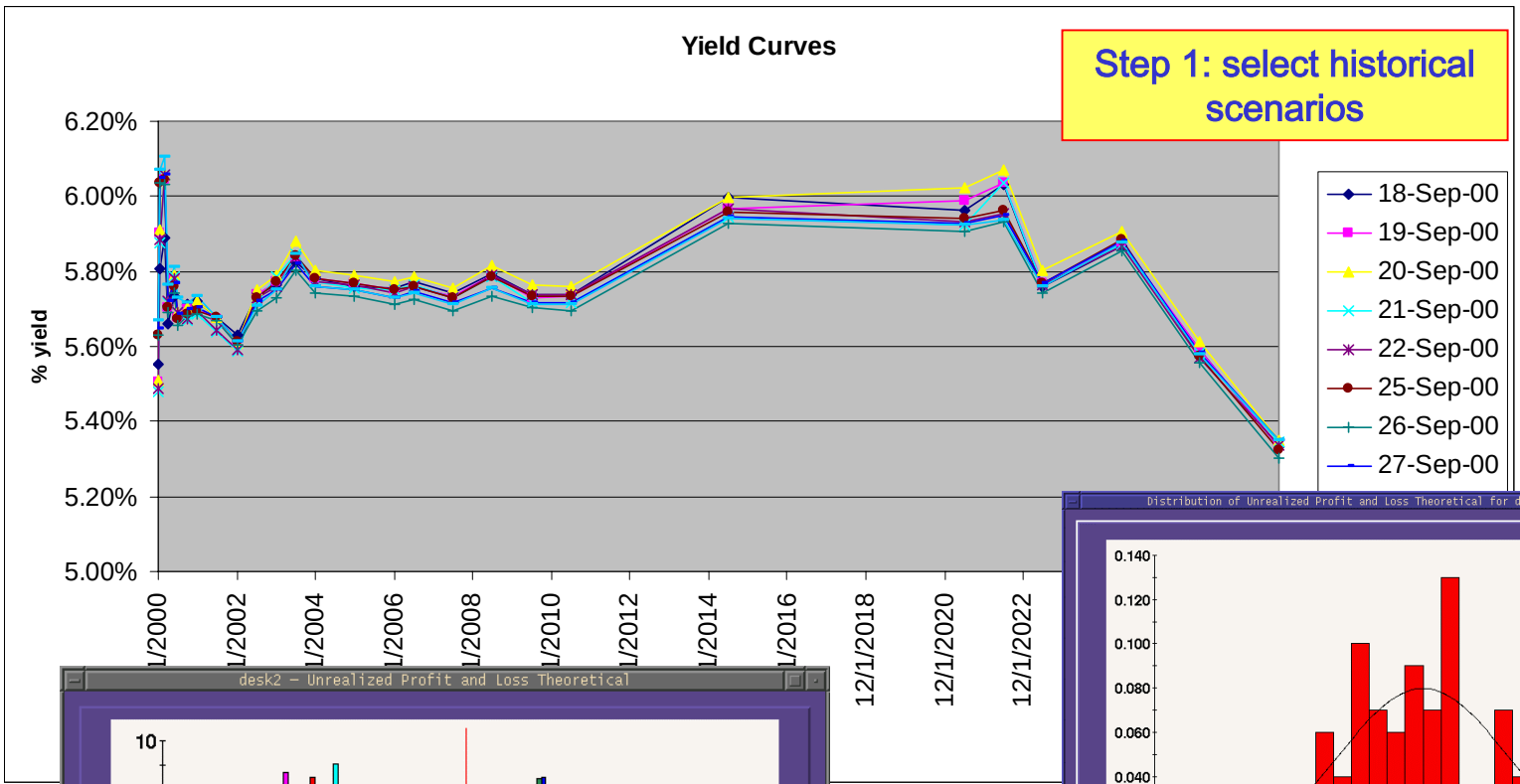
1000 draws



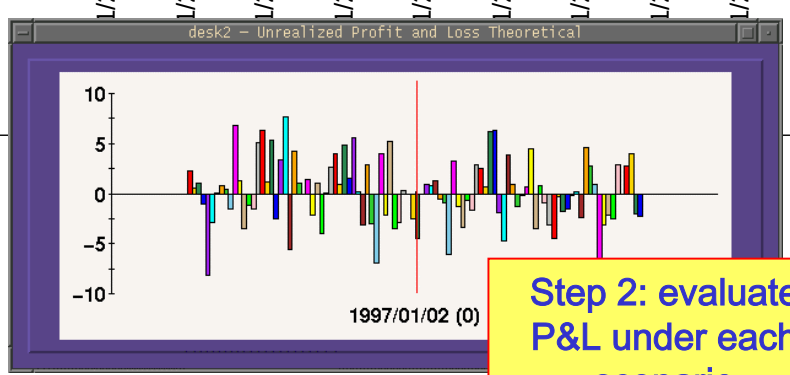
100 draws

How may scenarios to take?

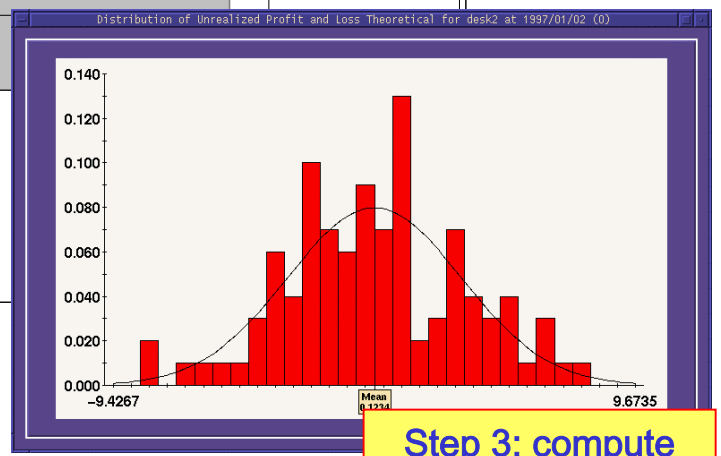
Historical VaR



Step 1: select historical scenarios



Step 2: evaluate P&L under each scenario



Step 3: compute P&L statistics