Course: Impact of COVID-19 to financial markets

The impact on risk factors

Professor Nabijon Holov

THE CORPORATE ENVIRONMENT

- **Financial Environment**
  - **concerned with the market value of portfolios of financial instruments (eg RiskMetrics,CreditMetrics)**
- **Corporate Environment:**
  - **concerned with company shareholder value and key financial results such as earnings and cashflows**
- **CorporateMetrics enables companies to:**
  - **forecast financial results for a range of projected market rates and prices**
  - **from the range of forecasts, calculate market risk measures**

- **Create a *benchmark* approach for market risk measurement in the corporate environment**
- **Promote market risk transparency and better risk management tools**
- **Complement existing market risk management techniques**

Stimulate a dialog with clients on risk management issues

- **Increased focus on earnings volatility as it impacts share valuation and shareholder value**
- **“Globalisation” has increased cross-border market risk, with an impact on earnings**
- **Risk Management practices are increasingly scrutinized by analysts, investors and rating agencies**
- **Increasingly companies interested in using VaR measures focussed on corporate risks**

Companies increasingly need transparent risk management to handle external factors and account for...

- **SEC Reporting Guidelines require reporting of activity in "trading" and "non-trading" market risk sensitive instruments**
- **VaR disclosure expressing the potential loss in future earnings, fair values or cashflows**
- **CorporateMetrics risk measures and methodology are applicable in relation to SEC Rules.**

… THE TREND TOWARDS RISK-BASED DISCLOSURE

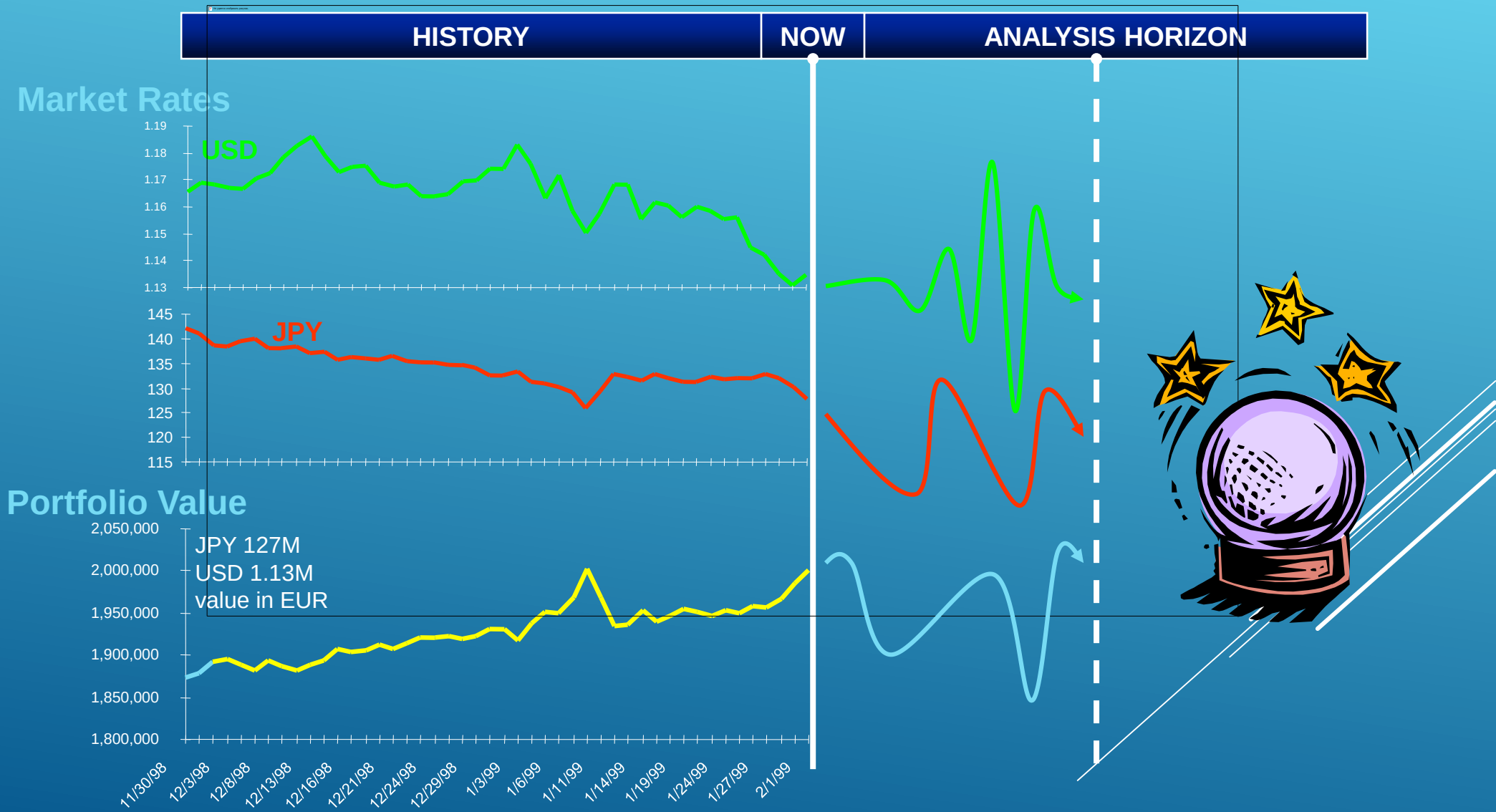
Risk disclosure is well developed in the financial environment, based on accepted risk models

AGENDA

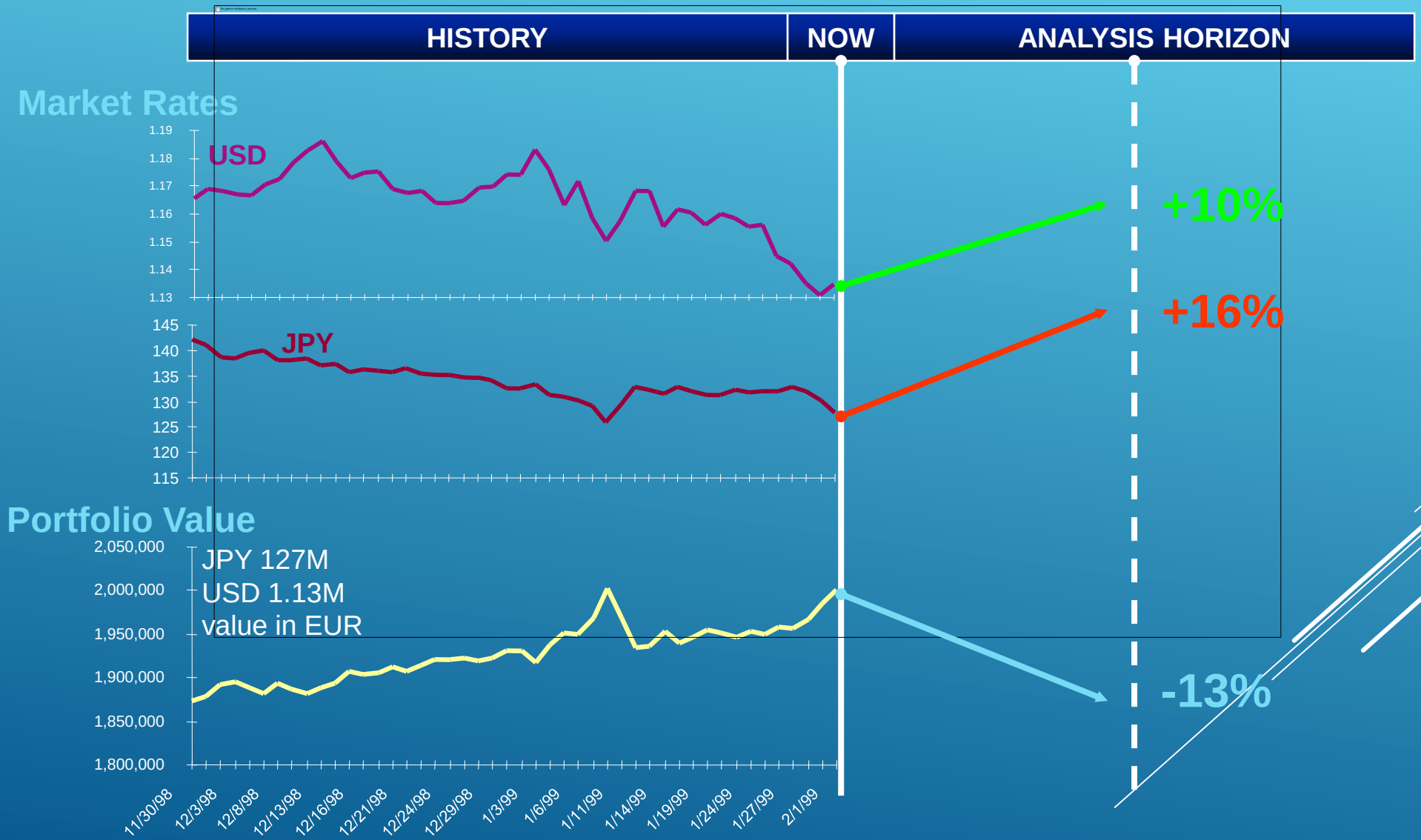
- Aims and Objectives for CorporateMetrics
- The RiskMetrics Financial Risk Framework
- The CorporateMetrics Framework
- Sample Applications
- Implementing CorporateMetrics

How do we measure financial market Value-at-Risk?

RISK MEASUREMENT AS FORECASTING...

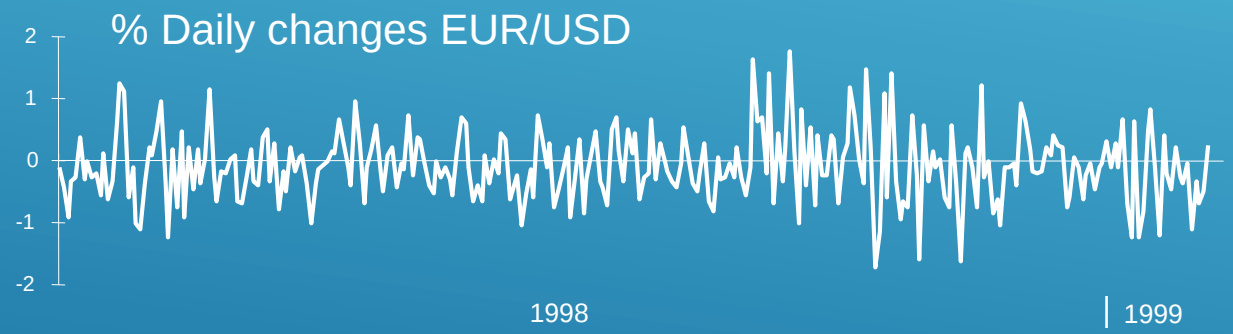


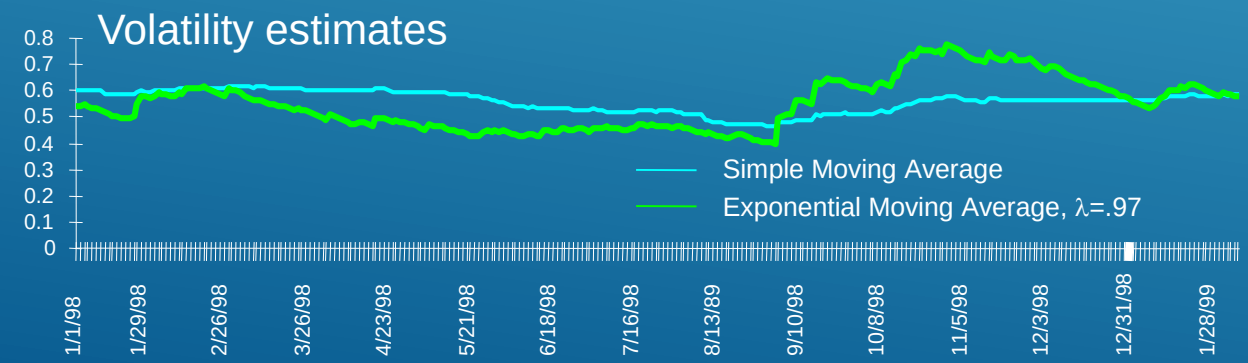
STRESS TESTING APPROACH



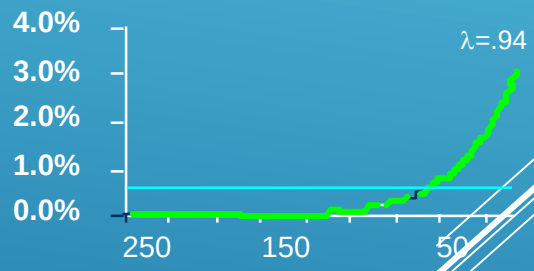
CLASSIC RISKMETRICS VALUE-AT-RISK APPROACH

RISKMETRICS IS BASED ON SHORT-TERM MARKET FORECASTS





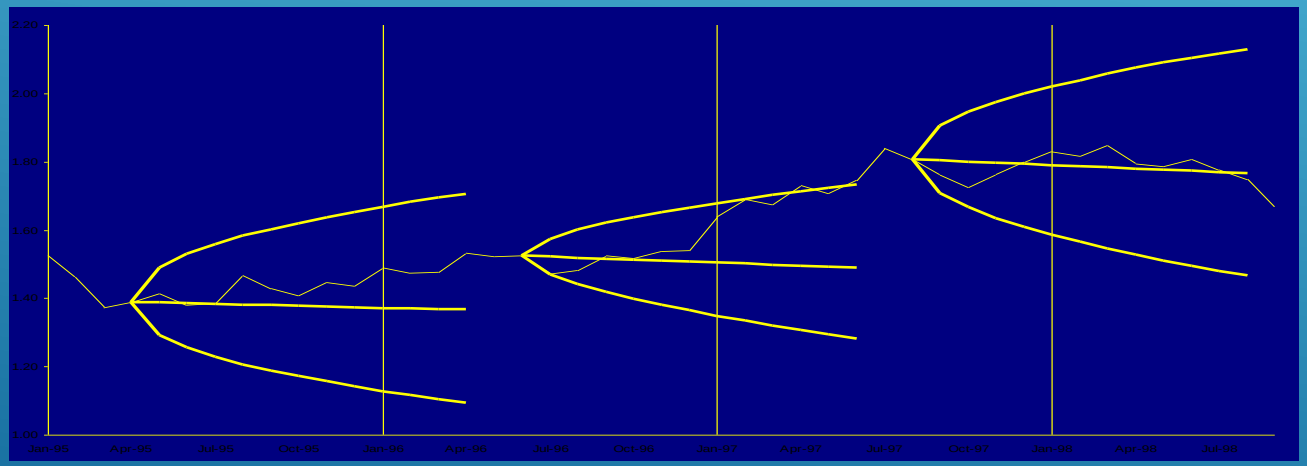
Weights for daily observations



CORPORATEMETRICS IS BASED ON LONG-TERM MARKET FORECASTS

- Ideal forecasting system for long-term VaR
  - No more zero-expected return assumption
  - Joint distribution of all relevant asset prices or market factors
  - Correlations among asset price: across asset classes, across time horizons, and across asset classes and time periods

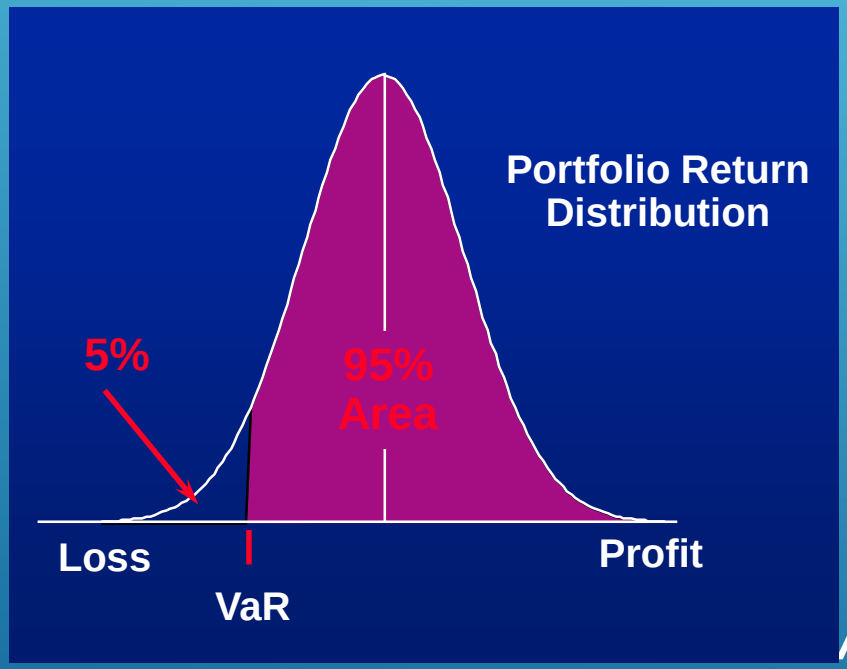
EUR/USD exchange rate



CorporateMetrics includes a long-term forecasting methodology called LongRun

VALUE-AT-RISK MEASURES

- **VaR is the maximum value that a portfolio will lose over a given time horizon with a given level of confidence**



Example

For a one month horizon, 95% confidence, a VaR of $10m means that there is a 5% chance that the portfolio will lose more than $10m over the next month.

CorporateMetrics uses VaR concept. However, its object is not portfolio value but earning and cashflow.

Parameter	Financial Environment	Corporate Environment
Framework	RiskMetrics	CorporateMetrics
Value Measures	Portfolio Value	Earnings, Cashflow, Balance Sheet Translation
Accounting Treatment	Mark-to-market	Accrual, MtM
Horizon	Daily, Monthly	Monthly, Quaters, Annual
Benchmark	Market Index	Specified Targets

WHAT NEEDS T
CORPORATES?

AGENDA

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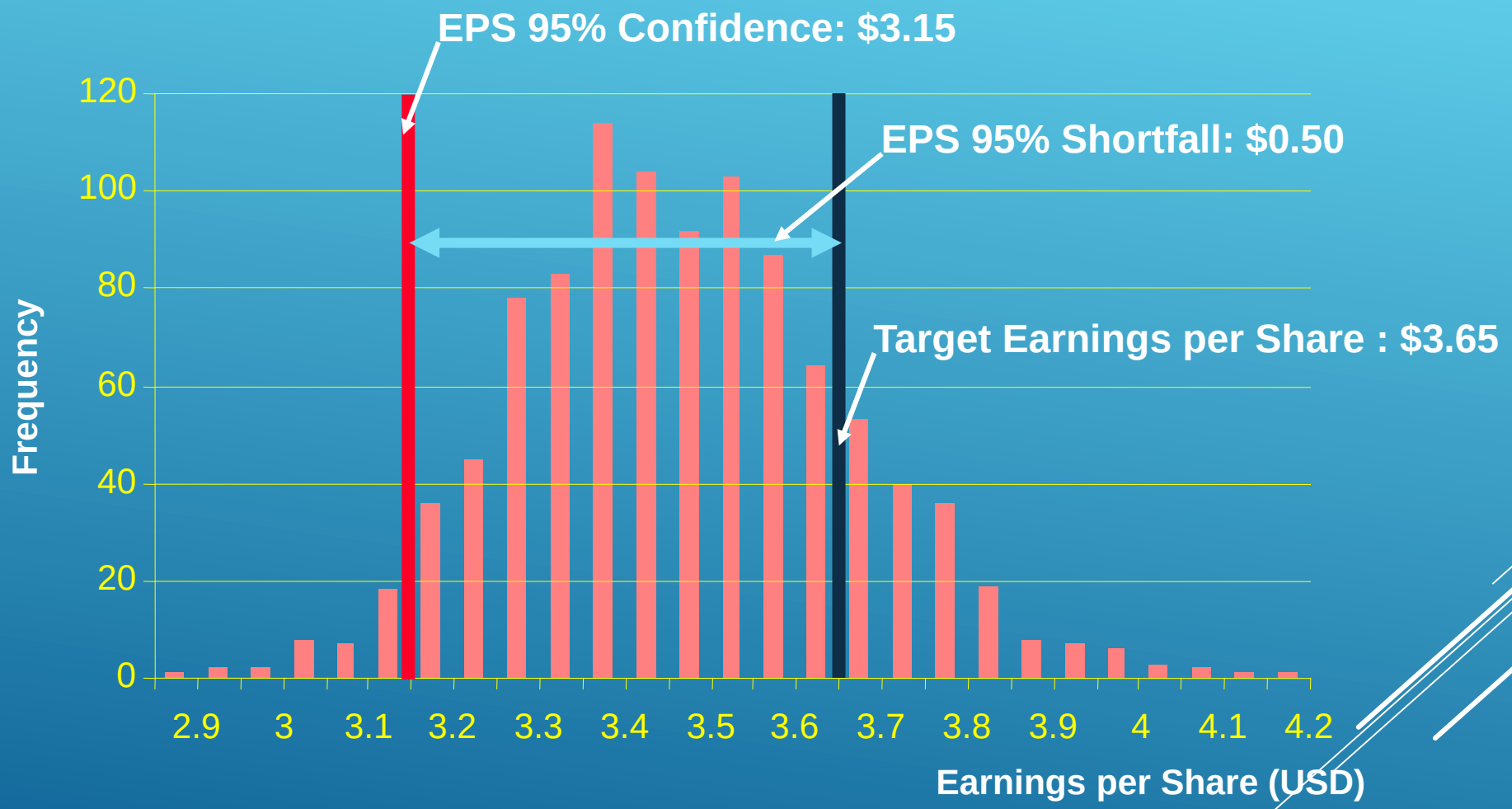
- **The CorporateMetrics Framework**
- Sample Applications
- Implementing CorporateMetrics

How does CorporateMetrics work?

FORECASTING FINANCIAL RESULTS



CorporateMetrics does this analysis in 5 steps...

CORPORATEMETRICS FRAMEWORK

CorporateMetrics Company Input

Metric Specification

- Determine which risk measures to calculate
- Specify time horizons and confidence intervals

Exposure Mapping

- **Define exposure maps: how defined market rates affect the financial results for which risk is to be calculated**

Scenario Generation

- Generate the possible values of each market rate at each horizon

Valuation

- **Using the scenarios and exposure maps, calculate the distribution of financial results**

Risk Analysis

- Use the distribution of financial results to calculate risk measures

Simulation based framework including long-term forecasting

STEP 1: METRIC SPECIFICATION

- **CorporateMetrics Risk Measure**
  - **Earnings-at-Risk (EaR)**
  - **Earnings per Share-at-Risk (EPSaR)**
  - **Cashflow-at-Risk (CFaR)**
  - **Balance Sheet Translation Risk (BSTR)**
- **Time Horizon**
- **Confidence Level**

- **Specify how financial results and market rates are related using:**
  - ***Pro forma* statements, or**
  - **Mathematical formulae**

e.g. you wish to model the relationship between earnings and foreign exchange rates:

- **if business volumes are fixed:**

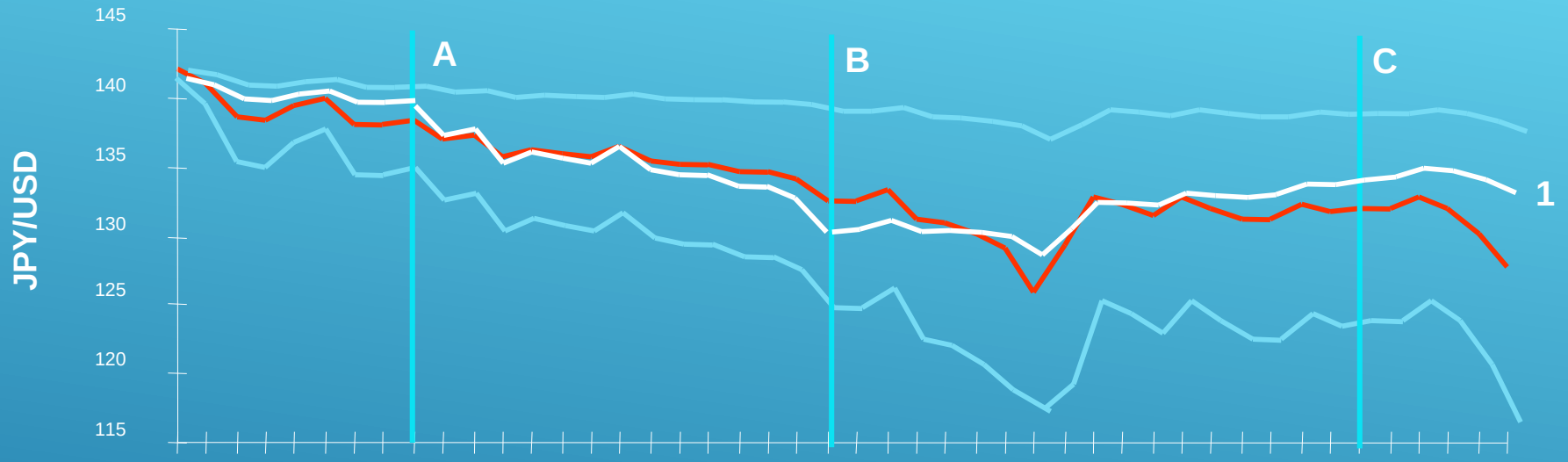
STEP 2: EXPOSURE MAPPING

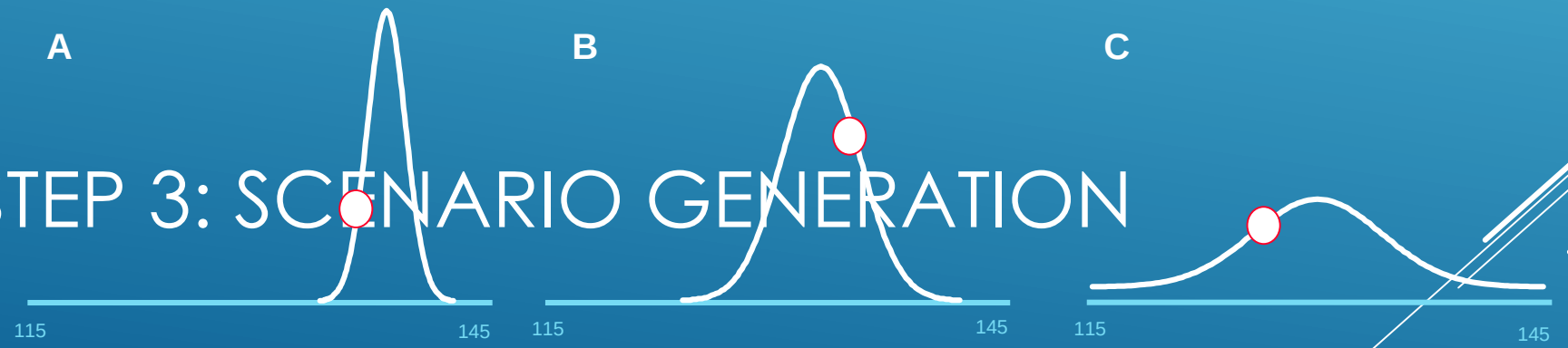
earnings = Number of sales * local price * FX Rate

- **if business volumes are dependent on exchange rates:**

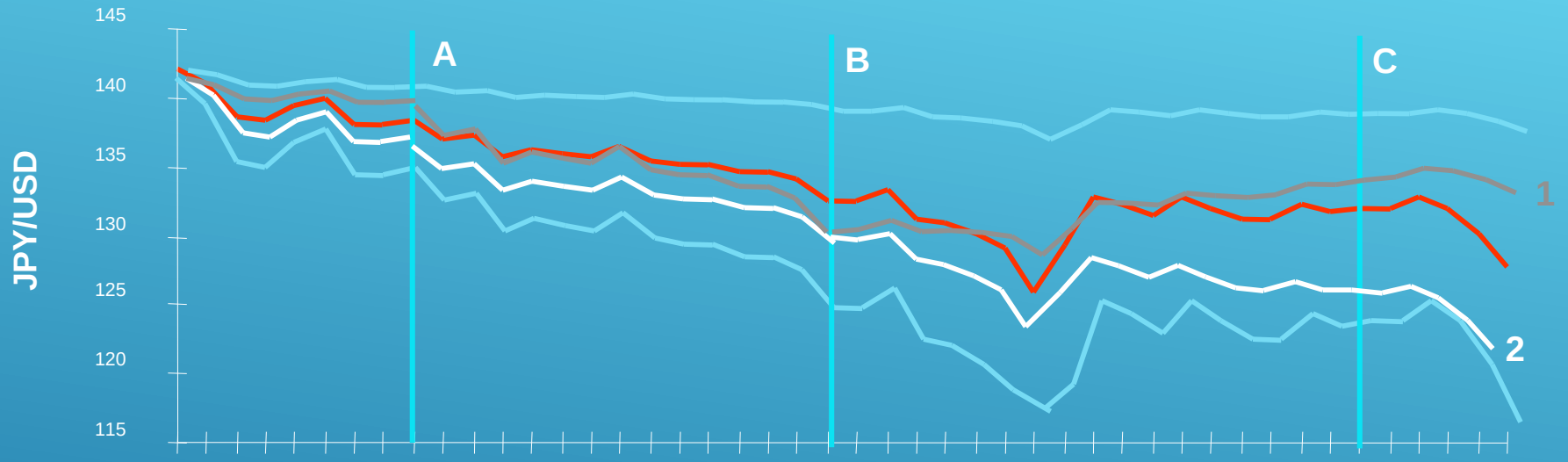
earnings = F(FX Rate) * nominal sales

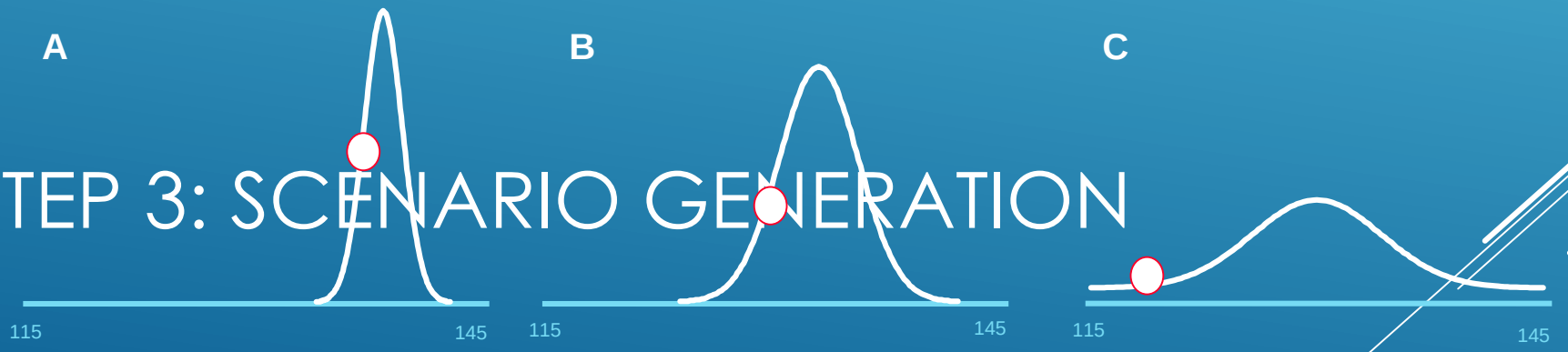
Scenario Generation





STEP 3: SCENARIO GENERATION





STEP 3: SCENARIO GENERATION

We need to build many thousands of these scenarios...

LongRun can generate these scenarios in a number of ways:

- **Simulation based on Historic Asset Price Only (RiskMetrics - random walk with zero expected return)**
- **Current Market Data (forward prices and implied volatility)**
- **Econometric forecasts based on macroeconomic fundamentals**
- **User defined scenarios**

STEP 3: SCENARIO GENERATION

LongRun is being released at the same time as CorporateMetrics, and is implemented in the CorporateManager software.

Valuation

	JPY/USD (A)	JPY/USD (B)	JPY/USD (C)
1	124.9570717	126.566362	107.4053432
2	123.7014092	119.4772218	114.2789867
3	147.8797427	110.0213827	120.2685346
4	123.2924987	124.2262142	113.6181269
5	121.9697284	129.8762776	109.9640894
6	121.0425844	119.1484015	103.6613345
7	135.5612193	120.6773	124.305713
8	133.0746649	115.9900724	102.7470617
9	132.6233638	122.7273226	115.2325434
10	140.3958121	129.2616144	125.148221
11	123.6102544	122.5412168	127.0182783
12	122.6486318	121.5164792	102.8514004
13	128.5524014	117.5683984	119.9431932
14	149.4739582	123.4670598	128.4406215
15	120.0835947	114.2208501	121.6837809
16	137.3237109	127.1951474	122.7522514
....	....	....	....
997	132.5041812	127.768785	116.2010147
998	139.9032666	121.4638695	126.5053602
999	146.321385	120.8887324	105.4823299
1000	148.6619099	112.4674005	128.3017071

Exposure Maps

	Earnings (USD mm)
1	109.73
2	139.59
3	112.19
4	150.13
5	107.11
6	150.85
7	164.32
8	155.47
9	129.54
10	120.93
11	126.45
12	120.40
13	144.40
14	107.67
15	100.98
16	140.07
....	....
997	131.30
998	149.31
999	125.26
1000	111.45

STEP 4: VALUATION

These simulation results can now be plotted...

STEP 5: RISK ANALYSIS

- Standard Deviation
- Confidence Levels
- Maximum Shortfall relative to target
- Average Shortfall
- Marginal Risk Measures

We can generate a variety of risk information from the simulation results

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What can you do with CorporateMetrics?

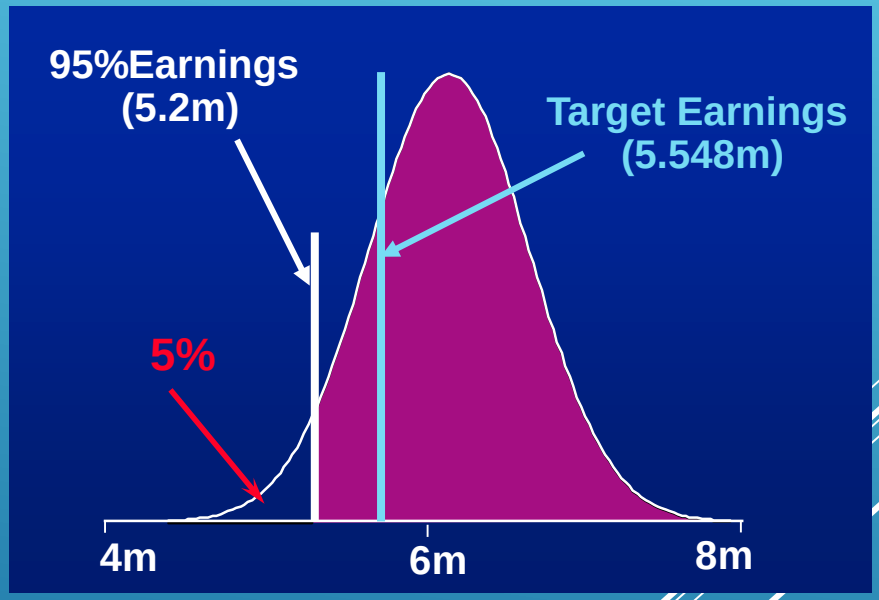
A SIMPLE EXAMPLE

- Your company sells products into Japan, translating sales revenues into USD at the end of each quarter
- Step 1: Metric Specification
  - EPSaR, 12 month horizon, 95% confidence level
  - The company has 5m ordinary shares
- Step 2: Exposure Mapping

	Q1	Q2	Q3	Q4
Revenue (JPY '000s)	200,000	199,800	199,800	200,200
Budget FX	140	142	145	150
Translated (USD '000s)	1,429	1,407	1,378	1,335
Target (USD '000s)				5,549

$$\text{Revenue} = \frac{200{,}000}{Fx_{usd,jpy,q1}} + \frac{199{,}800}{Fx_{usd,jpy,q2}} + \frac{199{,}800}{Fx_{usd,jpy,q3}} + \frac{200{,}200}{Fx_{usd,jpy,q4}}$$

- **Step 3: Time Series Simulation**
  - **Using LongRun, we generate 1000 possible sets of values for $Fx_{usd,jpy,q1}$, $Fx_{usd,jpy,q2}$, $Fx_{usd,jpy,q3}$, and $Fx_{usd,jpy,q4}$**
- **Step 4: Valuation**
  - **Plot the 1000 revenue projections**
- **Step 5: Risk Analysis**
  - **Find the 95% confidence in earnings**



A SIMPLE EXAMPLE

= 5.2m USD

  - **With 95% confidence, the maximum shortfall in earnings**

= 5.548m - 5.2m = 348,000 USD

= 0.07 USD EPSaR

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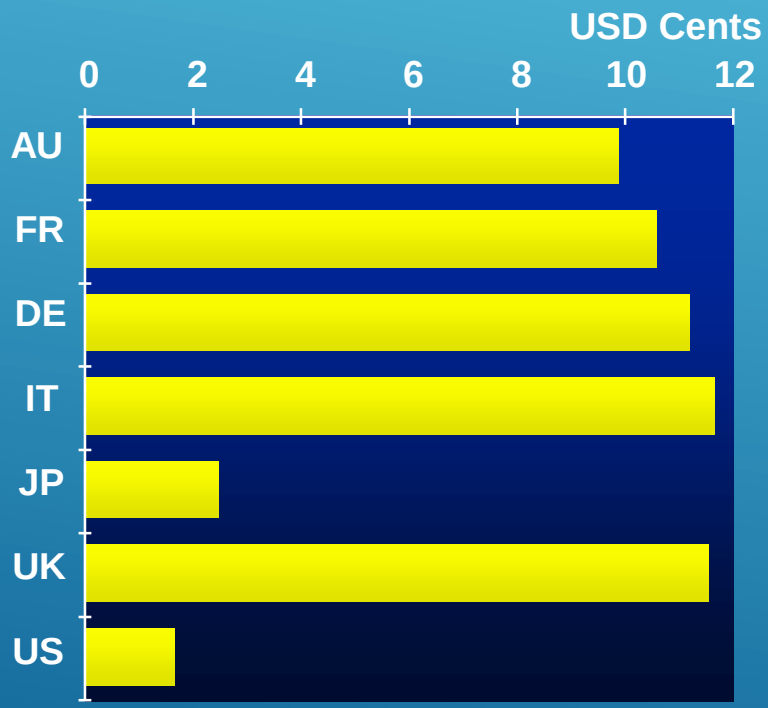
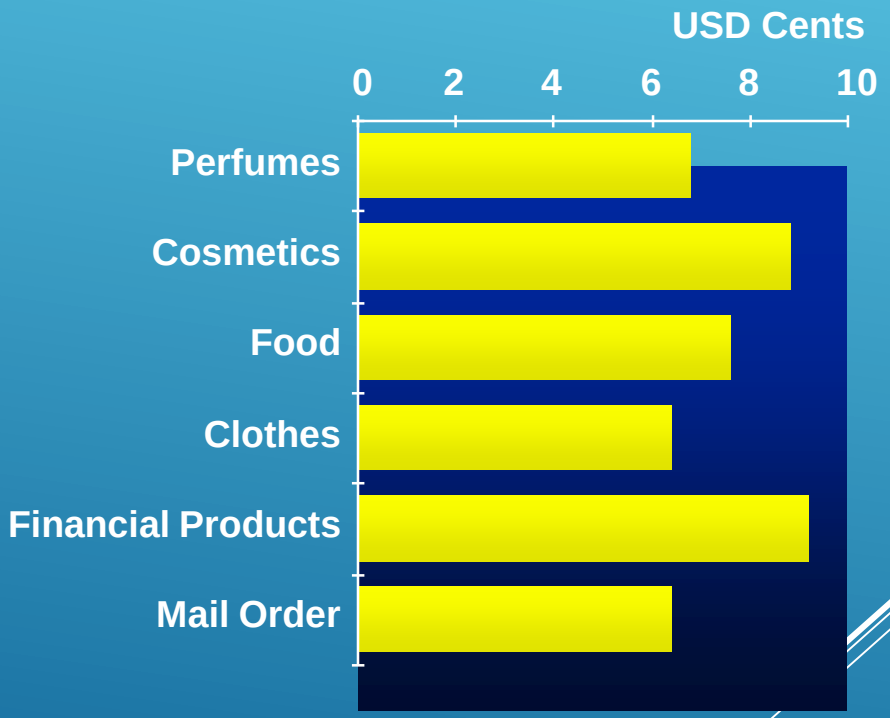
What can you do with CorporateMetrics?

ASSESSING COUNTRY AND BUSINESS LINE EXPOSURES

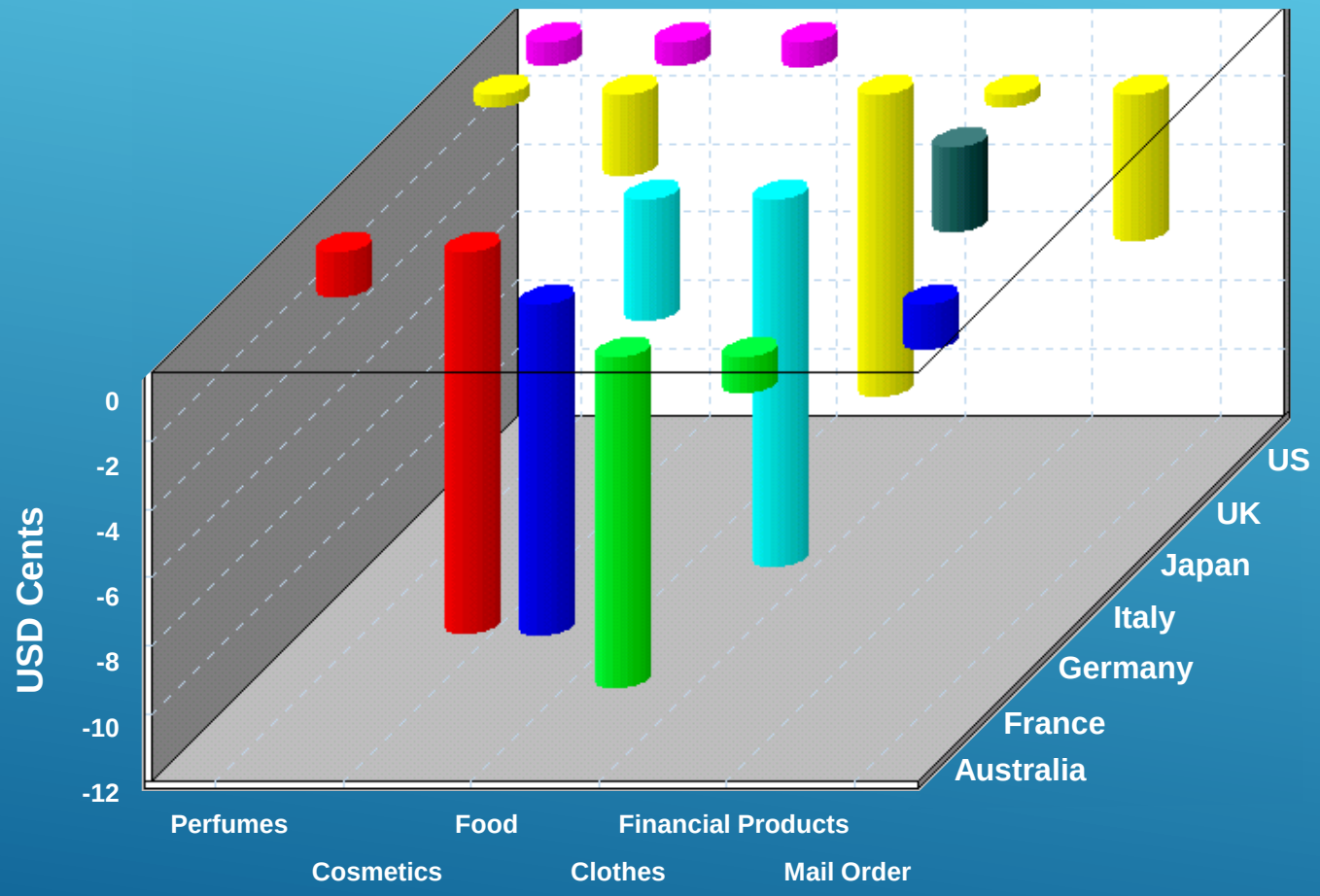
- **Examine the effect of Earnings Per Share at Risk by Market and Product line:**





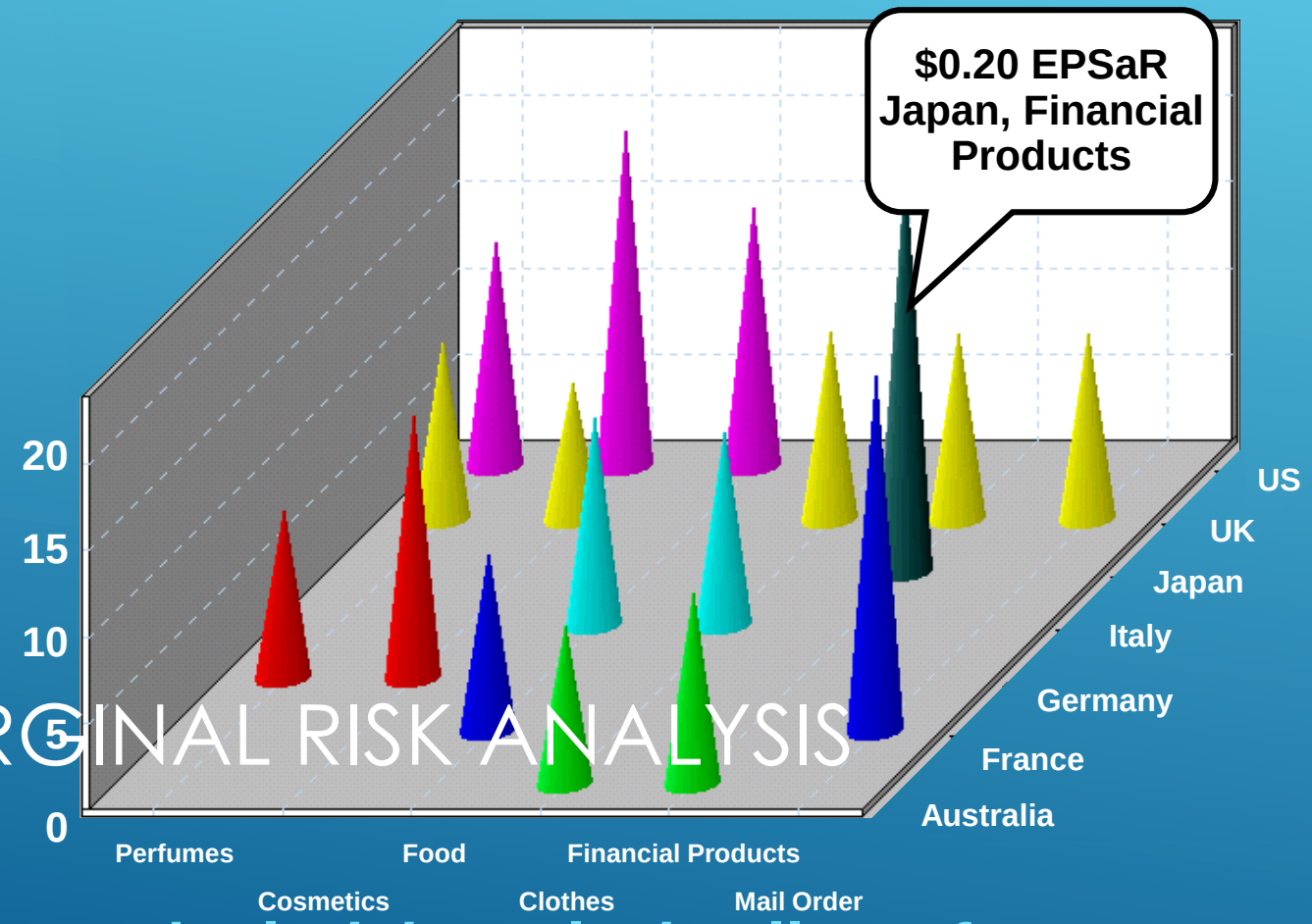
We could look at this in 2 dimensions...

ASSESSING COUNTRY AND BUSINESS LINE EXPOSURES



This analysis doesn't allow for diversification of risk...

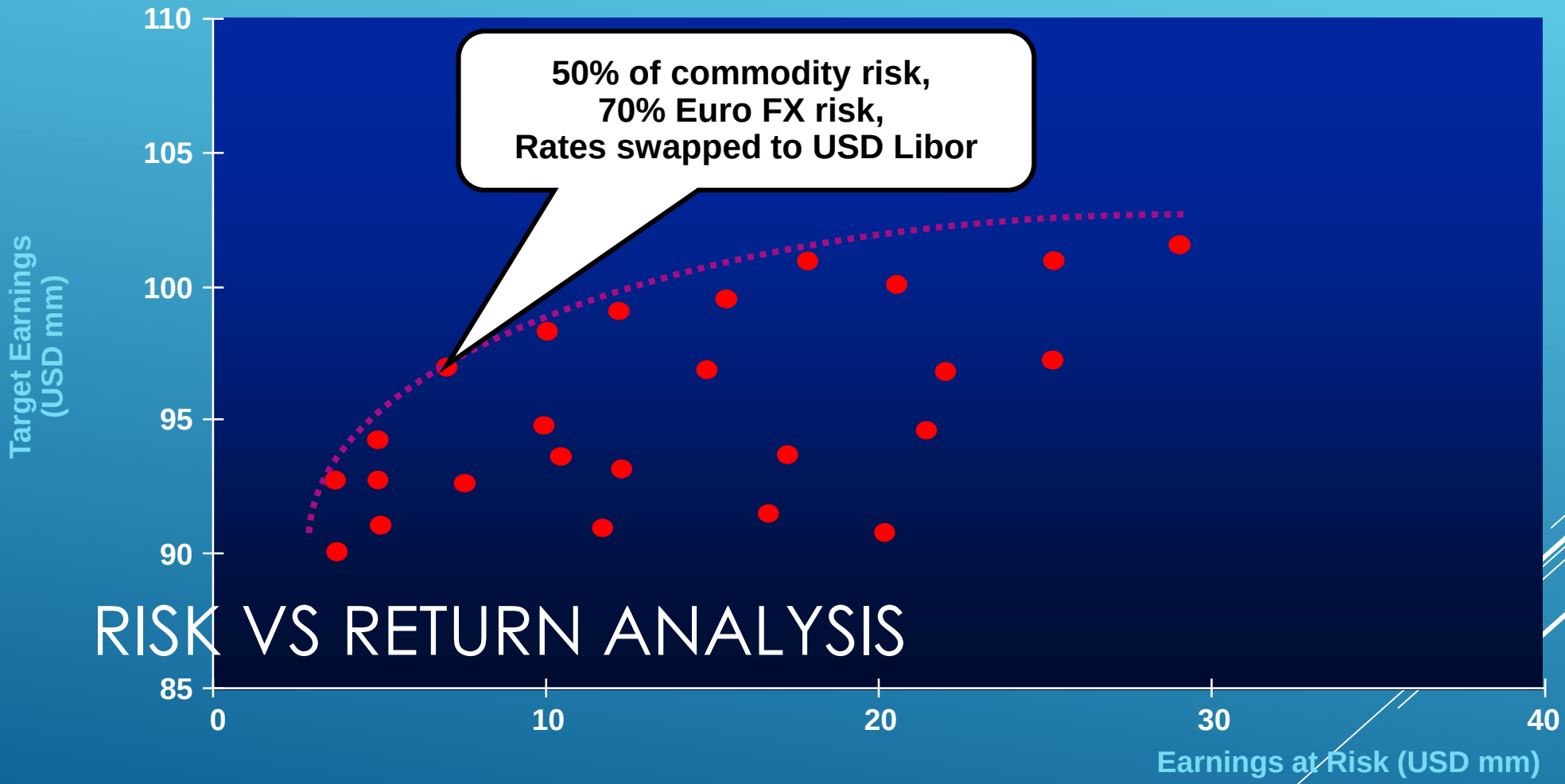
Marginal 95% Earnings per Share at Risk (USD Cents): Business Line by Market



MARGINAL RISK ANALYSIS

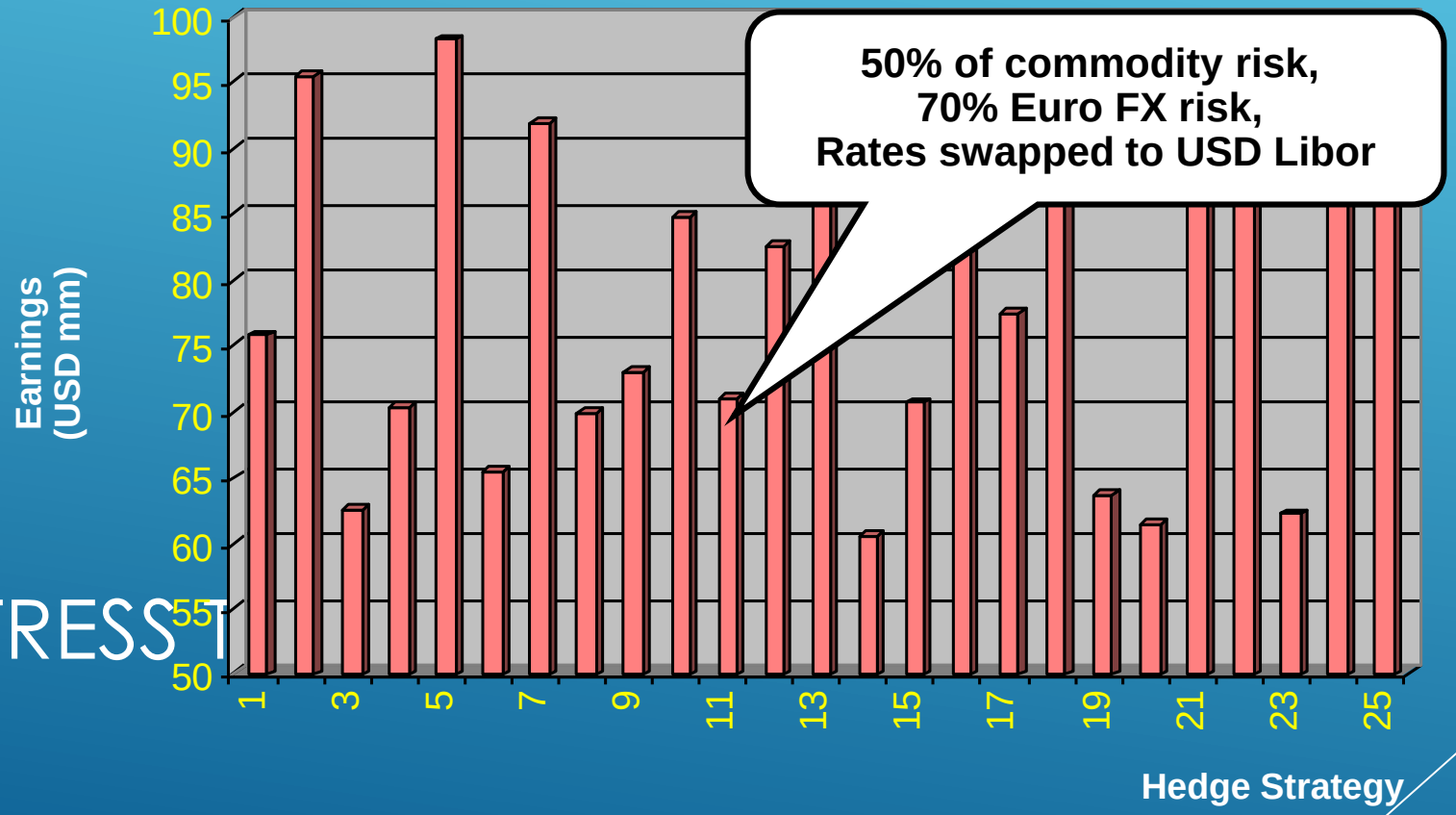
Marginal Risk analysis allows for concentration and diversification of risk

Risk vs Return for alternate hedging strategies:



Better trade-off analysis allowing for market risk factors

For a given set of market rates, you can assess the effectiveness of each hedge strategy:



STRESS T

CorporateMetrics compliments existing stress testing

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