



Risk Measurements Techniques for Treasury

11 May, 2009

ADVISORY

Agenda

- KPMG UAE
- Financial Risk Measures
- VaR Strategy
- VaR Testing
- Hedging Strategy

KPMG in the GCC – Advisory Services

- KPMG has a strong presence in the GCC with offices in all the major cities
 - KPMG is a single unified entity across the GCC and has built an unrivalled track record in the region for providing high quality services over the past 35 years
 - KPMG in the Lower Gulf has a team of around 600 professional specialists dedicated to the region.
 - We have worked in major public and private industry sectors including Telecom, federal and local government, manufacturing, trading (including electronics and automotive), oil and gas, banking and financial services, health, tourism and leisure.
- The **Financial Risk Management (FRM)** Practice of the Advisory Function of KPMG has been founded in 1998
 - In 2008, it is in a market leading position and consists of an overall number of 1.800 risk professionals in 49 countries
 - In the region EMA (Europe, Middle East & Africa), FRM has 900 risk professionals with its strongest bases in Germany and the UK
 - FRM covers all industries, focusing on Banking, Insurance and Asset Management, Corporates - Treasury Services.

Typical Financial Risk measures

VaR

- Value-at-Risk - VaR represents the worst likely **portfolio** value loss under normal market conditions and user defined assumptions
- Pros:
 - 👍 Good loss indicator for portfolios that are marked-to-market
 - 👍 Best indicator for short-term price moves in portfolios that are actively managed
- Cons:
 - 👎 Short time horizon (e.g., 1-10 days)
 - 👎 Does not match well with other corporate performance metrics
 - 👎 Difficult to explain to non-financial management

EaR

- Earnings-at-Risk – EaR represents the worst likely **earnings** loss under normal market conditions and user defined assumptions
- Pros:
 - 👍 Results match key internal financial benchmarks and external stakeholder expectations
 - 👍 Easily understood by management
 - 👍 Can incorporate certain accounting and tax issues
- Cons:
 - 👎 Requires complex modeling and data collection
 - 👎 Long-term focus – Does not address short-term market fluctuations

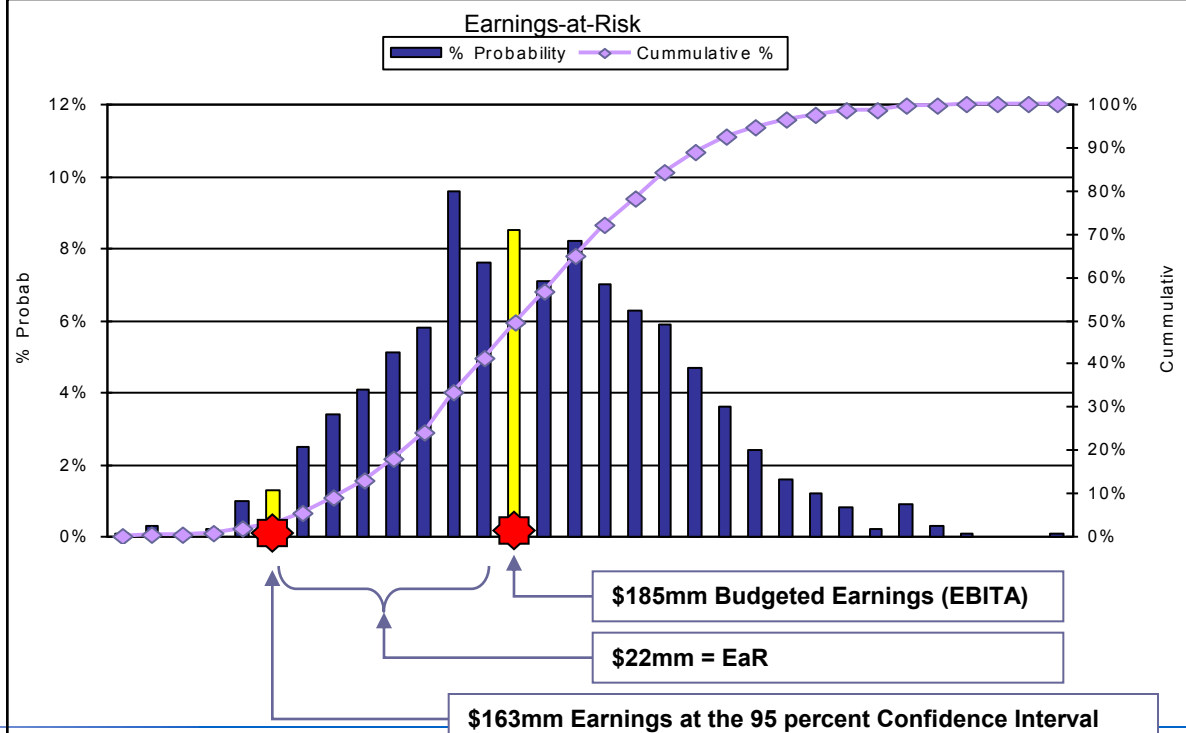
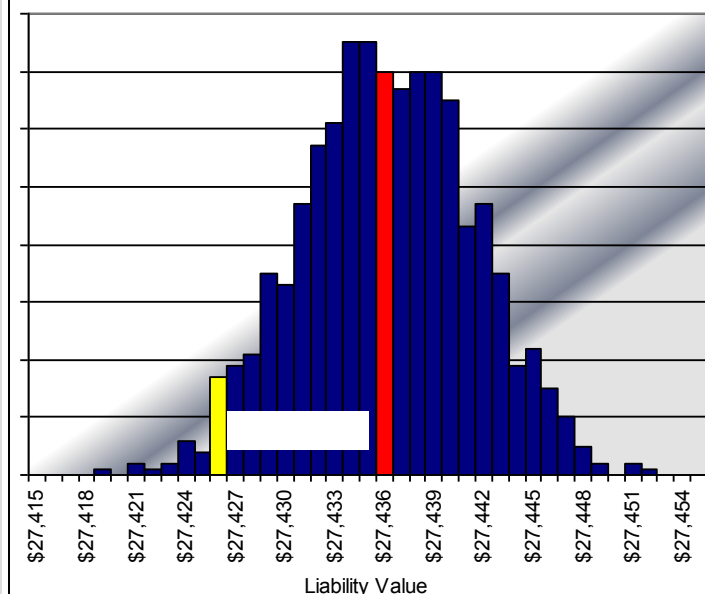
CFaR

- Cash-Flow-at-Risk – CFaR represents the worst likely **cash flow** loss under normal market conditions and user defined assumptions
- Pros:
 - 👍 Results match key internal financial benchmarks and external stakeholder expectations
 - 👍 Supports liquidity management planning
- Cons:
 - 👎 Requires complex modeling and data collection
 - 👎 Long-term focus – Does not address short-term market fluctuations
 - 👎 Difficult to integrate collateral requirements

VaR, EaR, CFaR

- VaR and EaR metrics provide insight into balance sheet value and the income statement volatility, respectively
- VaR is particularly valuable for firms that mark-to-market assets and actively manage portfolio value over the short-term
- EaR or CFaR metrics are used by firms that focus on budgeted earnings

Value-at-Risk Example



Value at Risk (VaR)

- VaR is a tool for measuring an entity's exposure to market risk
- VaR estimates/quantifies the potential level of gain/loss on portfolio over a given period of time:
 - VaR attempts to answer the question: “How much (income) could we lose in the future if we experience adverse market movements?”
 - VaR results should be interpreted as follows: There is a 95 percent probability that FX gains/losses will not exceed the VaR number (there is a 5 percent probability FX gains/losses will exceed the VaR number) in a one year period of time
- There are three key methods used by market practitioners for the evaluation of VaR, namely:
 - Historical simulation
 - Variance- Co-variance
 - Monte Carlo

VaR Methods

Historical Simulation

- All VaR calculations involve statistically calculating the expected value of a portfolio of assets/ derivatives
- With the historical simulation method, the portfolio is expected to behave in a similar manner in the future as it has in the past
- Using this historical data, the movements can be ranked
- The movement relating to the 95th percentile can then be applied to the fair value of the portfolio
- **Pros:**
 - 👍 Simple for management to understand the theory
 - 👍 Easy to implement due to historic data being widely available
 - 👍 Flexible
- **Cons:**
 - 👎 Is historical data the best estimate of future movements?
 - 👎 Length of estimation period can affect reliability of VaR number
 - 👎 Computer intensive when portfolios are complex

Variance Covariance (VCV)

- Assumes that risk factor returns are always (jointly) normally distributed and that the change in portfolio value is linearly dependent on all risk factor returns
- Additional data is required on asset return variances and correlations
- **Pros:**
 - 👍 Fairly simple to implement
 - 👍 Reasonable amounts of data required; as products are broken down to standardized risk factors
- **Cons:**
 - 👎 The assumption is made that asset prices/ returns are normally distributed- this does not accurately model "fat tails"
 - 👎 Options; this method maps options into delta equivalents, which ignores the second order risks

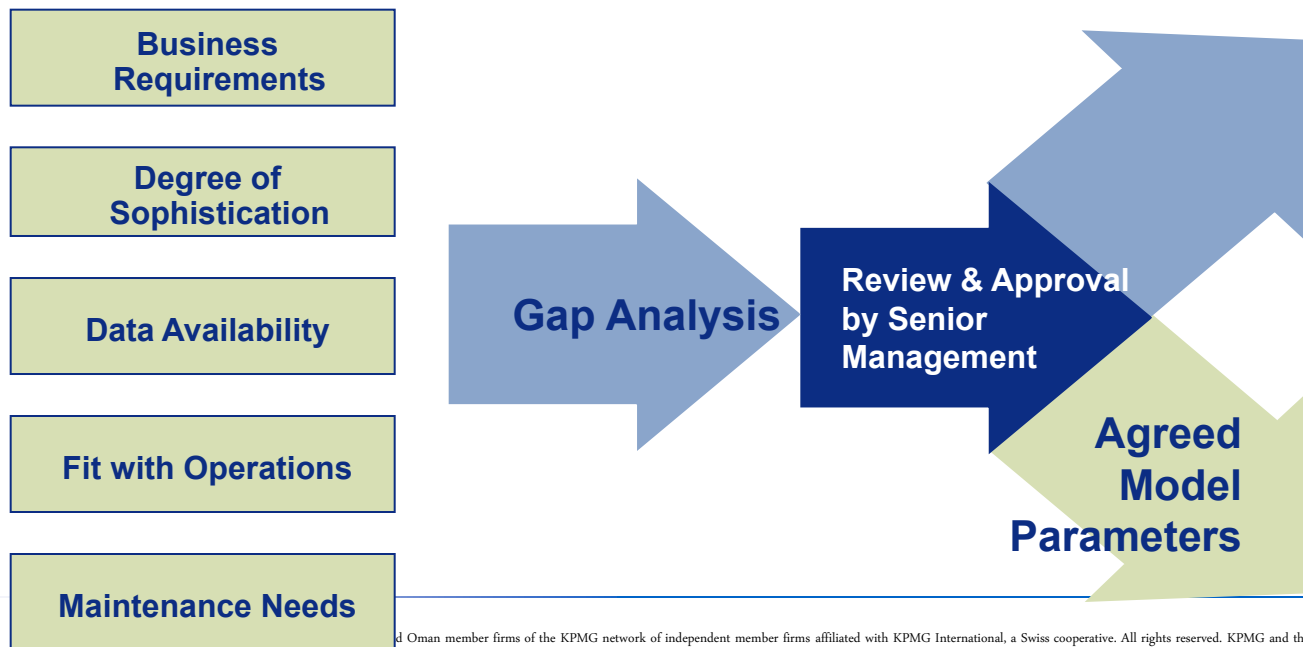
Monte Carlo

- Monte Carlo simulation can be used to simulate many thousands of possible scenarios and map the results to the required confidence level
- This method gives the flexibility of modeling positions where asset returns are not normally distributed
- **Pros:**
 - 👍 It is possible to specify any distributional assumption about asset prices/returns (i.e. not necessarily normal)
 - 👍 Not reliant on the availability of historical information
 - 👍 Complex portfolios including optionality can be handled
- **Cons:**
 - 👎 Significant investment in hardware / software and personnel required
 - 👎 Time consuming; a large number of simulations are required to obtain the requisite level of accuracy
 - 👎 Model risk; a choice must be made regarding the distribution used and price paths (stochastics)
 - 👎 Complexity means that management may not fully understand this technique

VaR & Hedging Strategy

- VaR implementation should be linked with Hedging Strategy
- A gap analysis should be performed to identify a number of alternative approaches to developing both the hedge strategies and the VaR model
- The analysis should consider the pros & cons of each approach, taking into account factors such as core business requirements, the ability of existing systems/operations to support the approach, the degree of sophistication and effort to maintain and operate the approach.
- Once the gap analysis of alternatives is complete, the senior management of a company should be presented with the possible solutions and decide on the way forward
- While the primary outputs will be agreed parameters for the model and hedge objectives, the gap analysis will also be useful to inform the Policy and Systems work efforts

**Hedge
Strategy
Objectives**



Developing Mark to Market (MtM) & VaR exposure measurement

- One of the first steps of the VaR project implementation would be the assessment of the correctness and completeness of the relevant data sets. Relevant data sets will comprise of all transaction data and the price data used for valuation purposes. The following steps are:
 - Determine the volume of exposure of every transaction (by commodity and FX);
 - Map the commodity/FX exposure to related market price sources;
 - Define limit exposure per product/instrument/market/trader/counterparty;
 - Design position reports defining exposures and limits over time;
 - Incorporate the reporting and the report evaluation in the company's Risk Management cycle.
- Once all above mentioned tasks are completed, the same structure can be used to develop the correct MtM exposure reports
- All steps of the Exposure Reporting should be documented and formalized as part of the Trading / Risk Management Policy and Processes



Developing Value at Risk Model

- **High Level Requirements**

Gather and document the high level requirements for the Value at Risk Model

- **VaR Approach**

The selection of the approach underlying the Value at Risk Model

- **Functional and Technical Design**

Functional and technical design for the Value at Risk Model; development of the user cases to be used in the UAT and software development process

- **Development of beta version**

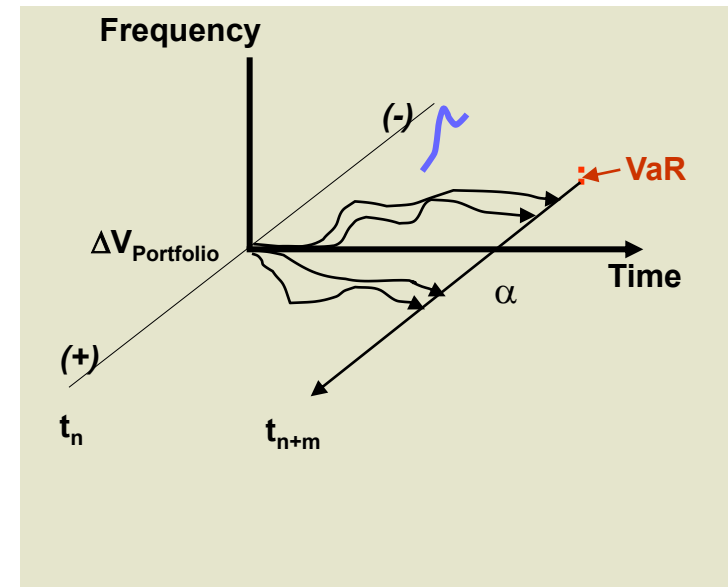
Implementation of the agreed upon requirements; debugging based upon the agreed upon user cases

- **User Acceptance Test**

Assist XX in the execution of the UAT; fix possible issues that come out of the UAT and release final version of the Value at Risk Model

- **Embedding**

Technical guide and the user guide for the Value at Risk Model; training XX staff on the use of the Value at Risk Model



High level
requirements

VaR
Approach

Design

Beta version

UAT

Embedding

Process for development Value at Risk Model

Scenario Testing

- In addition to calculating a VaR figure it is important that Risk Management understand the effects of unusual market conditions
- This can be very important when considering portfolios for which it is very difficult to calculate a VaR figure (e.g. credit derivative portfolios)
- E.g. A Swap Book- possible scenarios could include:
 - Parallel shift in the yield curve - a 50 bps movement across the curve.
 - Yield curve steepening – a decrease in the 6mth rate by 50 bps and an increase of 50 bps in the five year and longer maturities.
 - Yield curve flattening – an increase of 50 bps in 3mth, 6mth and 1 yr rates with a decrease of 10 bps in rates after 3yrs.
 - Short term spike – an increase in 3mth, 6mth and 1 yr rates of 100 bps with the rest of the curve remaining unaffected.

Stress Testing

- Extreme scenarios/ stress tests:

- Simulate the effect on the value of the portfolio of a “tailevent” for example current economic crisis, the World Trade Centre attack on 11 September 2001
- The scenarios should be well defined and granular against a range of events
- The market conditions of these events can be applied to the portfolio and the P&L impact calculated, this P&L can then be compared with specific limits
- A continual process not a one-off piece of analysis as markets and business profile changes
- Flexible and interactive so scenarios can be rapidly changed and updated
- Judgement versus business sense - not spitting out dozens of unchecked data sheets
- Risk Management should periodically review the scenarios used to ensure that they are appropriate

Back Testing

- Management should regularly compare the realized trading profits/ losses versus the amounts estimated by the VaR limit
- This can be done in two ways:
 - Theoretical P&L basis- apply the change in market data to the positions held at the beginning of the day. This is the preferred methodology, but requires the recording of a considerable amount of data
 - Actual P&L basis- look at the actual trading P&L for the day (will incorporate changes in position)
 - In its simplest form, the back-testing procedure consists of calculating the number of times that the calculated P&L exceeds the VaR, and comparing that number to the confidence level used. For example, if the confidence level used is 95%, we would expect trading losses to exceed VaR on around 5% of the periods chosen

Consideration for developing Hedging Strategies

- Hedging is the process of minimizing exposure to an unwanted business risk, while still allowing the business to profit from an investment activity.
- Generally, hedging strategies are designed to either lock in a particular financial outcome, or alternatively to prevent or reduce adverse outcomes. In this case one could say that Hedging Strategies are used as an instrument to manage the (market) risk appetite for the different commodity portfolios of the company. These alternatives imply different approaches to hedging.
- Hedging strategies may focus on “economic” outcomes, or may be only concerned with “accounting” outcomes. This distinction is critical in determining which types of hedging strategies XX wishes to employ. Similarly, there will be tax considerations to different types of hedge strategies, and these should also be considered.
- In order to maintain exposures within risk limits, XX will require a relevant means of measuring risk. This might include more than one measure – for instance it may include: term limits, volume limits, VaR limits and stop loss limits, all of which will be applicable in implementing a hedge strategy. These are also important to the criteria used in the system selection.
- By reporting the current exposures against the different relevant risk limits, the company will define and execute their hedging activities for every risk category.
- The Hedging Strategy & Procedures should be documented and formalized as part of the Trading / Risk Management Policy and Process.

Developing Hedging Strategy

Risk Appetite Definition

Transaction Data

Portfolio Exposure

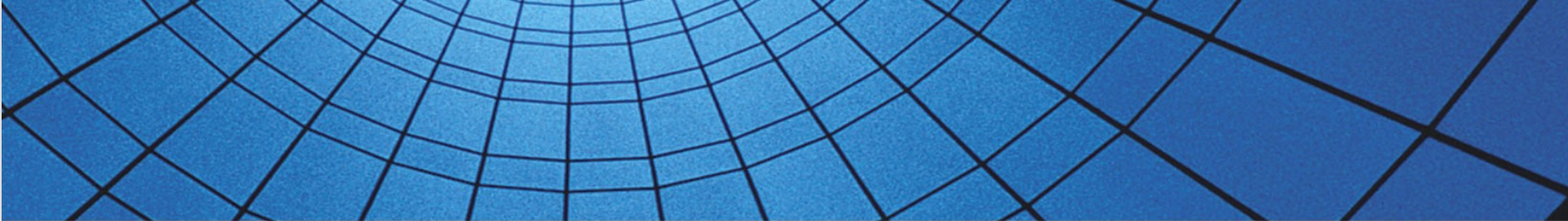
Market Risk Limits

Hedging Strategy

Hedging Execution

Risk Management Process

	Exposure Inputs	Exposure Definition	Develop Hedge Strategies
Key Activities	<ul style="list-style-type: none"> • Incorporate Business Requirements information gathered during VaR & Hedging Gap Analysis • Assess market data sources used for forward prices and volatilities; consider liquidity and price transparency and alternate price sources • Test and assess correlation of sources of price exposure 	<ul style="list-style-type: none"> • Assess volume positions • Assess MtM positions • Test VaR and Stress Test positions • Develop recommended limit structure 	<ul style="list-style-type: none"> • Investigate sources of hedge counterparties/markets • Assess liquidity • Consider accounting implications of alternate hedge strategies • Consider Tax impacts at high level • Recommend range of hedge strategies
Deliverables	<ul style="list-style-type: none"> • Input to following activities 	<ul style="list-style-type: none"> • Report on exposures, test results (VaR/Stress) and suggested limit structures 	<ul style="list-style-type: none"> • Report on Hedge Strategies, including instrument types and markets to be used



Joanna Declercq-Zelechowska



Name	– Joanna Declercq-Zelechowska
Position	– Partner, Head of Financial Risk Management
Qualifications	<ul style="list-style-type: none">– Master of Science (MSc) – Applied Mathematics – Warsaw Technical University (Poland)– Research Fellow – University of York (UK)– PRMIA member
Experience	<ul style="list-style-type: none">– Before joining KPMG UAE in 2008, during last 13 years, Joanna worked in other Big 4 and international consulting firms in the field of enterprise and financial risk management for international financial institutions and corporates.– Joanna's areas of competence include financial risks (credit, market liquidity and operational, economic capital) measurement, modeling, and management; ERM (Enterprise Risk Management) design and implementation; treasury management.– She has been advising top international banks in Europe, Canada, North America, local financial institutions in UAE and one of the largest oil & gas, energy and industrial companies in Russia. She brings a wealth of sector expertise in financial services, oil & gas, energy and industrial markets.
Sector Experience	– Financial Services; Oil and Gas; Energy