Strategic And Tactical ALM In A Commercial Bank

Suresh Sankaran

Back To Basics – Risks And Economics

"In a strict sense, there wasn't any risk – if the world had behaved as it did in the past"

- *Merton miller, economist and Nobel laureate*

Unfortunately, we live in a world of **CHANGE**

Common Fallacies About Risk

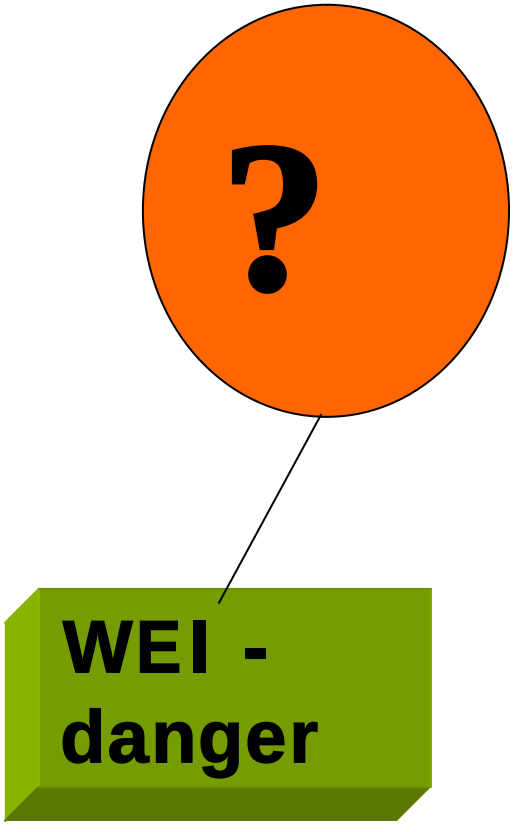
- Fallacy 1
- Fallacy 2
- Fallacy 3

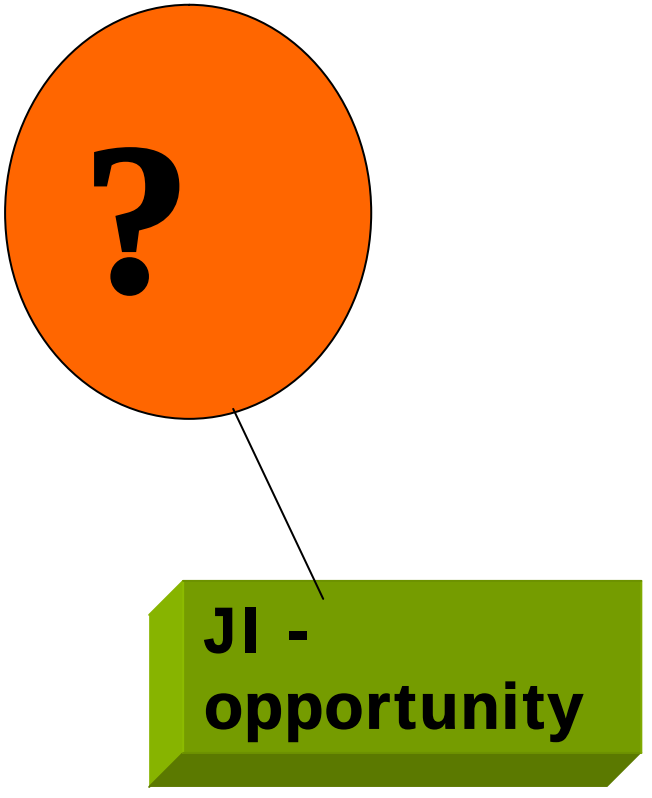
- Risk is always bad
- Some risks are so bad – they cannot be tolerated and must be eliminated at all costs
- Playing it safe is the safest thing to do

Common Fallacies About Risk

- Fallacy 1 risk is always bad
  - Is this so?
  - Risk can either be threat or opportunity
    - What is viewed as risk
      - Hurricane to home owners
    - Is an opportunity
      - Retailer of construction materials
    - However, should there be no damage from the hurricane, the retailer would face the risk of having larger stocks than necessary
  - Hence it depends on which side you are!

Common Fallacies About Risk



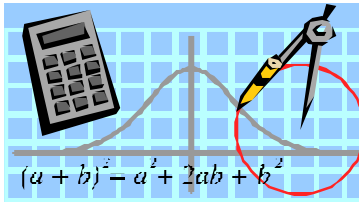


Common Fallacies About Risk

- Some risks are so bad – they must be eliminated at all costs
  - Should such risks be completely eradicated at all costs?
  - Some high risks which are probable but likelihood is low
    - Meteorite crash
  - Need to evaluate risk in probabilistic context
  - Need to assess the benefit of risk reduction vis-à-vis the cost of the performance at the margin
    - Instead of being eliminated, risk must be managed

Common Fallacies About Risk

- Playing safe is the safest thing to do
  - Generally a person is risk averse
  - Hence other things being equal
    - He/she prefers certainty to uncertainty when uncertainty includes potential outcome worse than a certain case
  - In statistical terminology, a risk averse person will reject a fair bet
  - An illustration ……

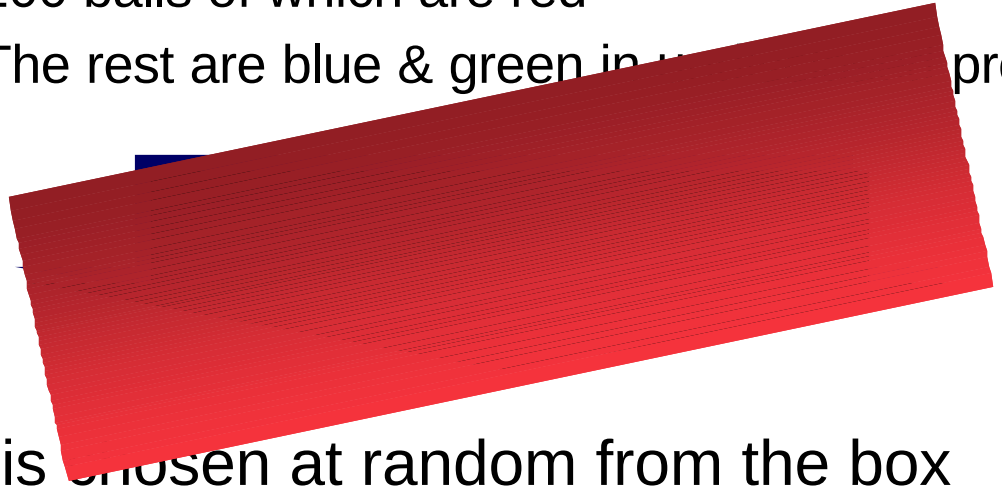


Common Fallacies About Risk

- Playing safe is the safest thing to do
  - A lottery where you will either receive CHF50,000 if a coin lands heads and get nothing if it lands tails [A = (50,000, 0.5 ; 0, 0.5)]
  - Compare this with getting CHF25,000 for sure with certainty [B = (25,000, 1.0)]
  - Which would you prefer?
    - A or B???

Common Fallacies About Risk

- An illustration of the Knightian dimension – through the Ellsberg paradox
  - Suppose we have a box of 300 balls
  - 100 balls of which are red
  - The rest are blue & green in [illegible] proportions

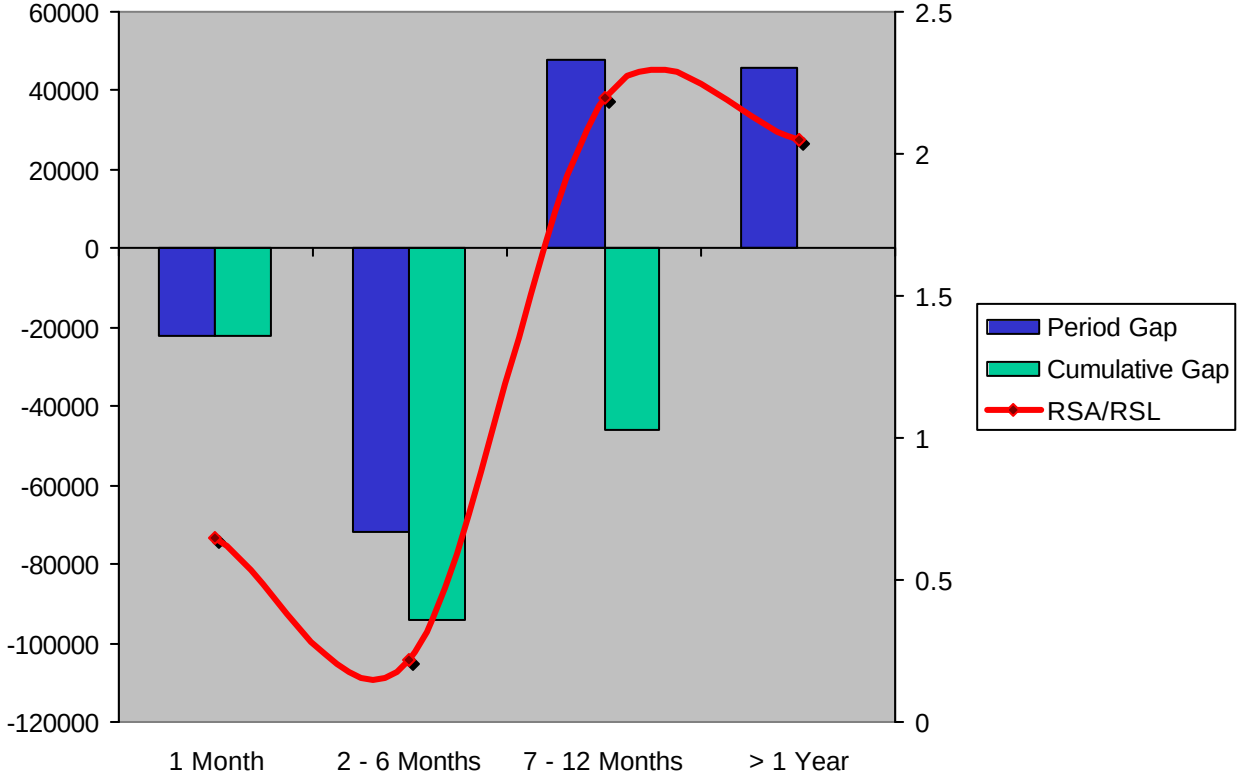


A ball is chosen at random from the box

- Suppose you are offered the choice of betting on whether a **red** or **blue** ball would be selected
- Which should you choose to gamble on?

Repricing Gap

- The mismatch between the amount of assets and liabilities repricing within a defined time period



Repricing Gap Report

	1 Month	2 - 6 Months	7 - 12 Months	> 1 Year
Assets	40,000.00	20,000.00	88,000.00	90,000.00
Liabilities	62,000.00	92,000.00	40,000.00	44,000.00
Period Gap	(22,000.00)	(72,000.00)	48,000.00	46,000.00
Cumulative Gap	(22,000.00)	(94,000.00)	(46,000.00)	0.00
Gap Ratio	(9.24%)	(39.50%)	(19.33%)	0.00%

Gap: Rules Of Thumb

If Gap Is Greater Than Zero: RSA > RSL

Change in Rates → **Asset Side Repricing** > **Funding Side Repricing** → **Change in Int. Income** > **Change in Int. Expense**

"Positively gapped"

- If rates rise, then net interest income will most likely rise
- If rates fall, then net interest income will most likely fall

Gap: Rules Of Thumb

If Gap Is Less Than Zero: RSA < RSL

Change in Rates → **Funding Side Repricing** > **Asset Side Repricing** → **Change in Int. Expense** > **Change in Int. Income**

"Negatively gapped"

- If rates rise, then net interest income will most likely fall
- If rates fall, then net interest income will most likely rise

Gap: Rules Of Thumb

If Gap is Close to Zero: RSA = RSL

Change in Rates → **Balanced Asset and Funding Side Repricing** → **Balanced Change in Int. Income and Expense**

"Evenly gapped"

- If rates rise or fall, then net interest income will most likely not change as much

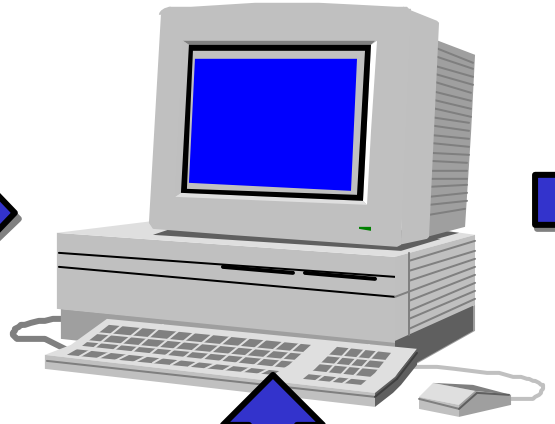
Inferences Based On Gap Analysis Are Often Wrong *Not Only* in Degree *But Even* in Direction!

Simulation Modelling

- Starts with current position data
- Combines with data
  - Reflects assumptions and anticipated decisions
- Simulates earnings and economic value
  - Under various future rate scenarios
  - For various balance sheet structures
- Analyses and composes simulated pro-forma financial performance reports
  - Provides information for board and management decisions

Future Interest Rates Scenarios
Key/Driver Rates
Yield Curves
Spread Relationships

Current Position
Volumes
Rates
Maturities
Repricing
Cash Flows
Caps/Floors
Options

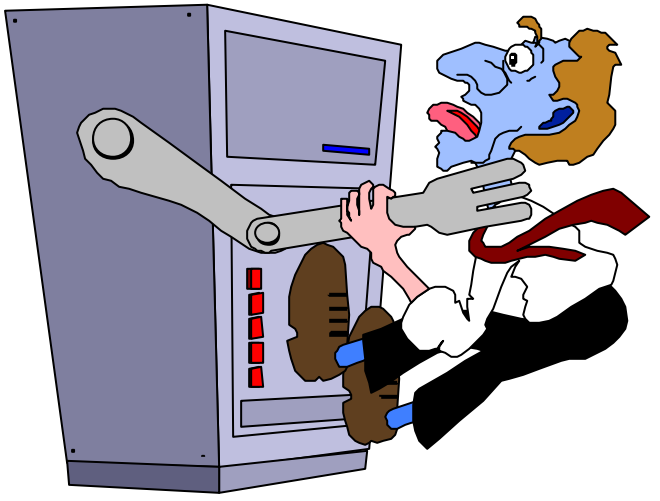


Simulated Reports
Balance Sheet
Income Statements
Maturity/Roll Off
Cash Flow
Economic Value
Gap/Duration
Risk Assessment

Future Business Plans
New Volumes
New Pricing Spreads
New Maturity Strategies

Modelling Assumptions

Represent A *Large Portion* Of Data In Simulations



No less crucial than accurate data input

Future Rate Scenarios

Type	*Realism*	*Risk To Earnings*	*Risk To Value*
Shocks	**Least**	**OK**	**Best**
Ramps	**Trends**	**Good**	**Good**
Cycles	**Better**	**Better**	**Limited**
Forecasts	**Best**	**Best**	**Least**

What Type of Assumptions Should Be Used?

Future Business Strategies

- Defeasance balance sheet
  - No replacement business
- Constant state balance sheet
  - New identical business replaces maturing business
    - At new rates
- Dynamic business plan balance sheet
  - Introduces new business at new rates
    - Independent of maturing business

Net Interest Income

	Rate Scenario			
	Most Likely	Rising	No Change	Fallin
Strategy 1	23,207.00	21,470.00	23,046.00	23,874.0
Budget	23,379.00	21,606.00	23,223.00	24,061.0
Strategy 2	23,640.00	25,295.00	23,083.00	20,197.0

Risk Assessment

To measure the amount and sources of interest-rate risk,
design tests that change

one variable at a time

to isolate the individual components of risk

Interest-rate Risk

The *potential* variability of earnings and

value of capital

resulting from changes in market rates of interest

Economic Value Of Capital

- The book value of capital does not necessarily equal the amount of capital remaining if all the bank's assets were sold at today's prices and all liabilities are repaid immediately at their market equivalent value

The Value Of Capital Often Cannot Be Measured Directly

- Economic value of equity
  - Net economic value
  - Net portfolio value
  - Market value of portfolio equity

EVE- NEV - NPV - MVPE

PV of Future Asset

Cash Inflows

Minus

PV of Future Liability

Cash Outflows

$$EVE = PV_A - PV_L$$

$$= PV\ (A_{cf} - L_{cf})$$

$$= PV\ (A_{pcf} - L_{pcf}) + PV\ (A_{icf} - L_{icf})$$

$$= PV\ (Capital) + PV\ (NII)$$

EVE Is A Barometer Of Long-term Earnings Capacity And Volatility

- Today’s value will flow into tomorrow's income statements
- Analysing changes in value due to interest rate changes provides a measure risk to long-term earnings

Example Of EVE Risk Effect On Earnings

- Asset: EUR1MM Loan Maturing in Five Years, 8% Annual Interest
- Liability: EUR1MM Deposit Maturing in One Year, 8% Annual Interest
- +150bps Instant Rate Shock

Economic Value	Base Case	+ 150 bps
PV_{Asset}	1,000,000.00	942,404.00
$PV_{Liability}$	1,000,000.00	986,301.00
Net Economic Value		(43,897.00)

Future Income Statements Reflect EVE Change

Rate Shock	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Interest Income	80,000	80,000	80,000	80,000	80,000	400,00
Interest Expense	80,000	95,000	95,000	95,000	95,000	460,00
Net Interest						
Income		(15,000)	(15,000)	(15,000)	(15,000)	(60,000
PV, NII		(12,510)	(11,425)	(10,434)	(9,528)	**(43,897**

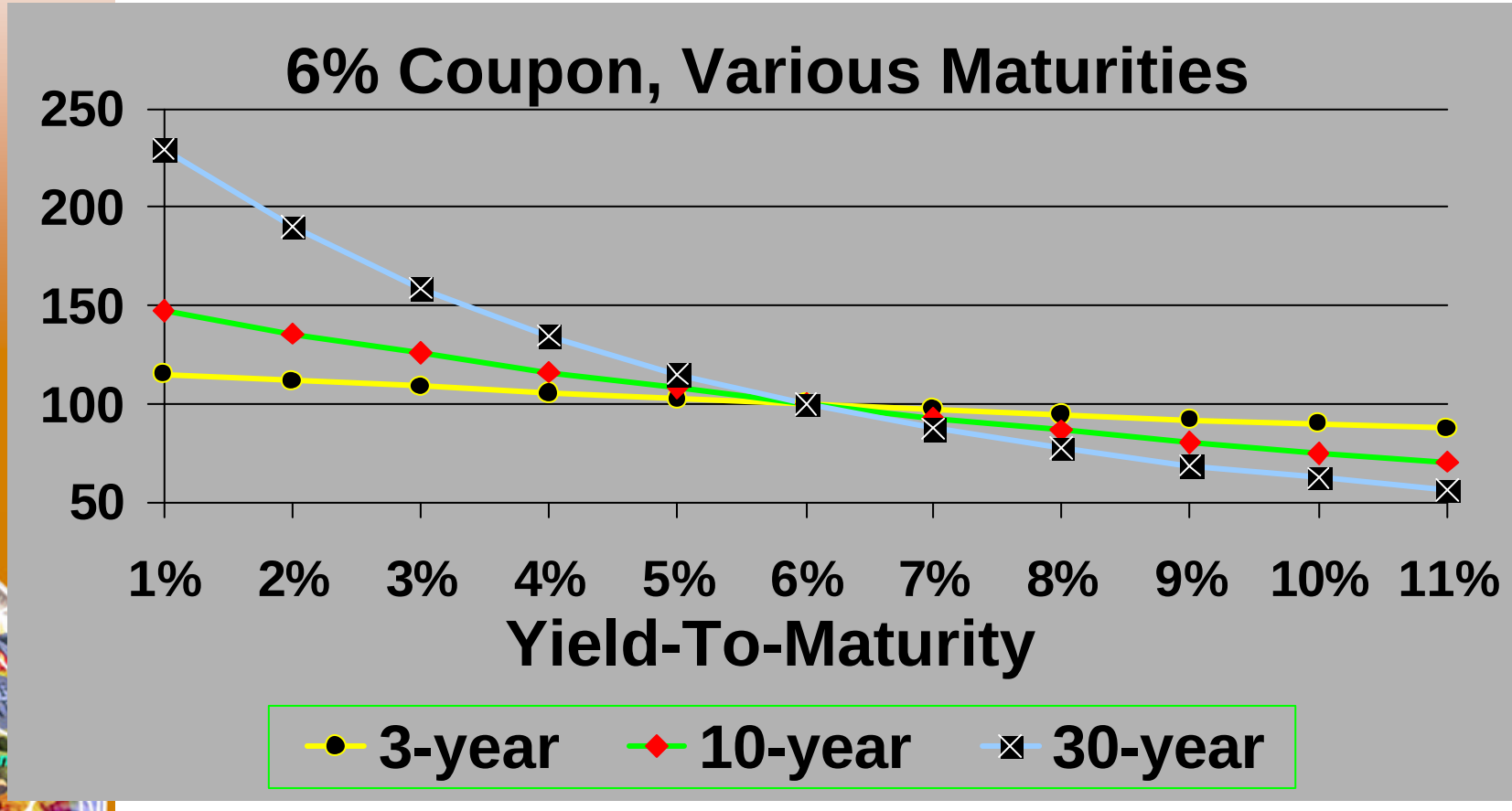
EVE Analysis Measures Long-Term Earnings Risk

Maturity Impacts Value Change

For A Given Rate Change,
Shorter Maturities Have Smaller Value Changes

Longer Maturities Have Larger Value Changes

Price / Yield Relationship Of Three Bonds



Duration Was Coined By Frederick Macaulay In 1938 As A Term To Describe The *Relative Maturity* Of Instruments Having Periodic Cash Flows

What Does Duration Explain?

- Benchmark proxy for “length” of instruments having dissimilar cash flows
- Ranking price sensitivity
- Estimation of price change (modified, effective duration)
- Additive property - can combine across portfolios

Duration And A/LM

Duration Gap --
Difference in Duration of Assets and Liabilities

Duration of Equity –
Duration Gap Weighted By Present Value of Assets and Liabilities

Duration Of EVE
Effect On Earnings

$$\text{Duration}_{EVE} = \frac{(PV_A \times D_A) - (PV_L \times D_L)}{(PV_A - PV_L)}$$

EVE Value Moves Directly With Rates

Negative

Rates Rise

Earnings Rise

Positive

Rates Rise

Earnings Fall

Zero

(Immunised From Rate Risk)

EVE Value Moves Inversely With Rates

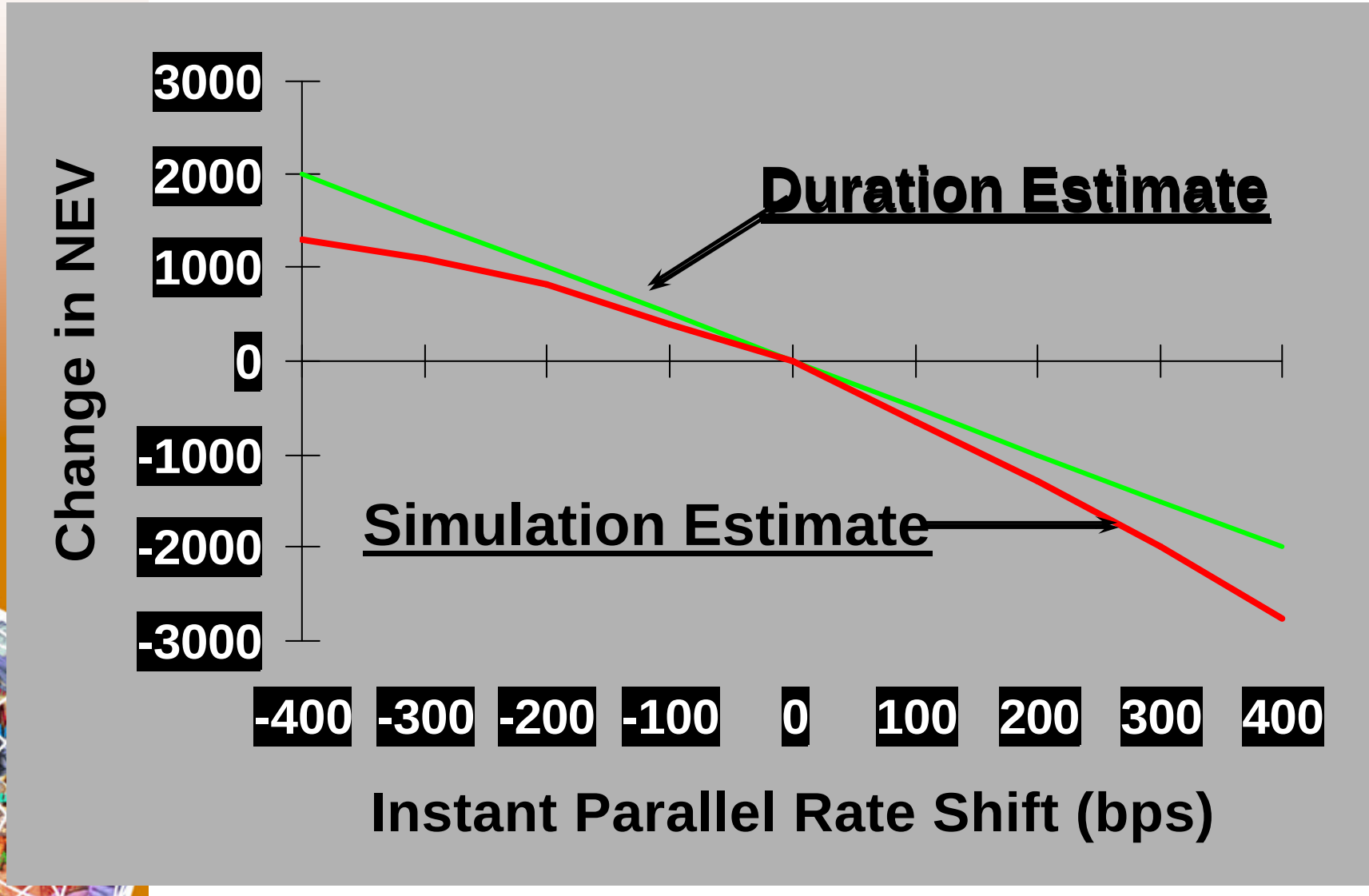
Key Rate-dependent Factors That Cause EVE Sensitivity

- Mortgage prepayments
- Adjustable rate instruments
- Other cash flow factors influenced by options
  - Callable bonds
  - Certificates of deposit
- Administered rate and indeterminate maturity accounts

Simulating EVE Volatility

- Calculate EVE under current rate environment
- Calculate EVE under different rate environments
  - Simulation should factor in all interest rate-dependent elements
- Subtract the difference
  - This difference when graphed against rates, provides “effective” duration

EVE Risk Profile



Accounting method	Net interest income *GAAP basis*	Economic value *fair value (MTM) basis*
Type of return	current margin	total return
Time horizon	accounting period	forever forward
Risk focus	short term performance	long term viability
Risk's influence	reflected over time	reflected immediately
Valuation viewpoint	going concern	liquidation/replacement
When to use	under 1 yr positions	over 1 yr positions

Simulation Models - Strengths

- Accurately measures effects of interest rate changes on net interest income and capital value
- Addresses complex balance sheet inter-relationships including options
- Test strategies for problems before they occur
  - Proactive not reactive

Simulation Models - Weaknesses

- Detail data intensive
- Computer run time intensive
- Incomplete data leads to inaccurate simulation
- Can provide any answer desired
- Does not provide solutions
- Need to have skilled analyst

- Managing risk requires risk and return measurement systems and processes

How Is Your Balance Sheet Performing?

- "…. Whilst our net interest income remains satisfactory, we anticipate that our margins will come under increasing pressure over the next two years…"

Financial Report, Wall Street Journa

How Much Risk Is In Your Balance Sheet?

- "…. The total mortgage portfolio of 687 million will decrease in value by 5.2 million (7.57%) if interest rates rise by 1%…"

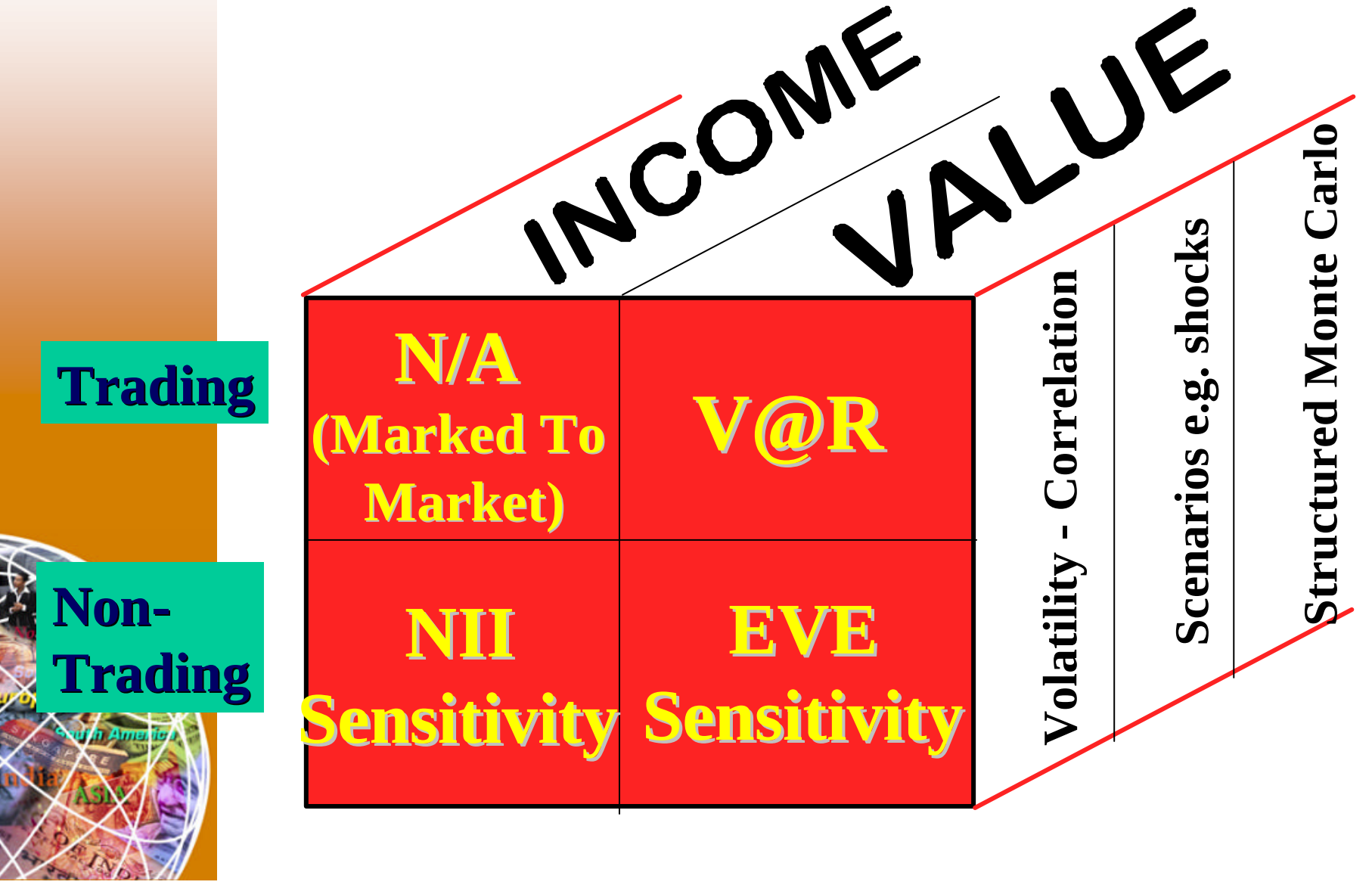
For Example, Do You Know….

- What will your income be over the next 2 years?
- What effect will a 2% fall in interest rates have on that income?
- Which products are profitable?
- Will those products continue to be profitable if the yield curve steepens?

A/LM Objective & Benefit

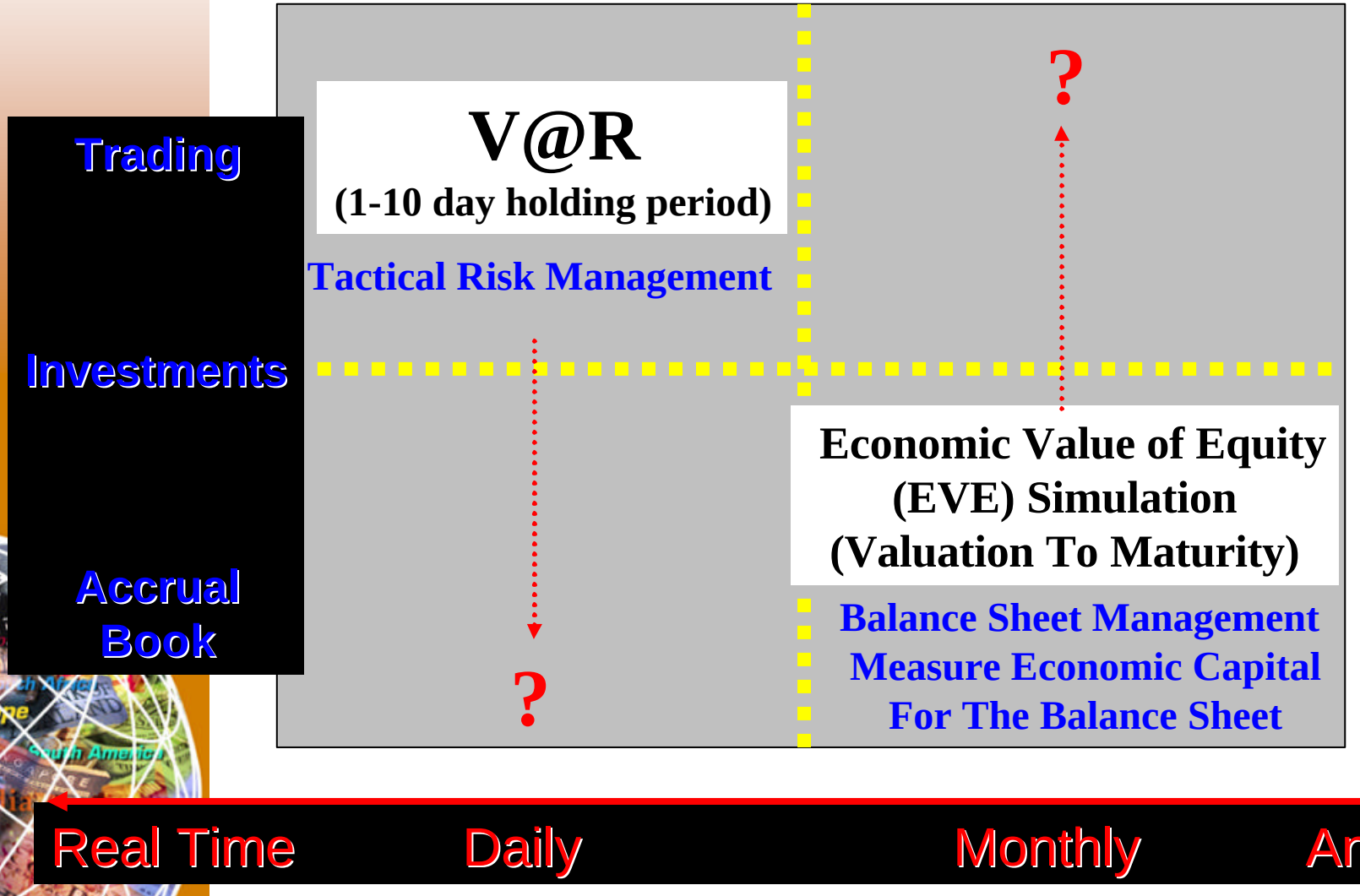
- To keep financial returns derived from the balance sheet
  - ↗ Positive and growing
    - Under all probable economic and rate environments
- Increased earnings and reduced volatility of earnings

Twin Measures Of IRR



Focus: Value@Risk Comparison

Frequency And Type Of Valuation

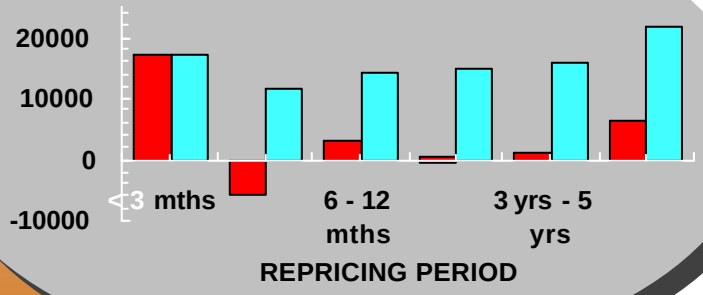


Basle Annex - Risk Measurement Techniques Circa 2001

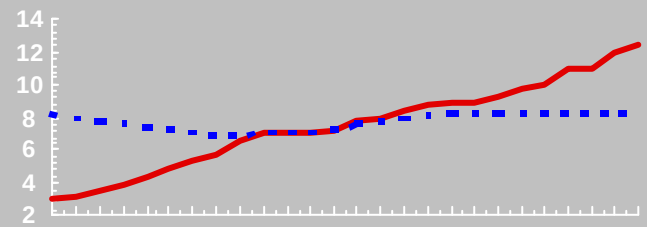
- Gap analysis
- Duration
- Static simulations
- Dynamic simulations

Treatment of positions with embedded options is a special concern: prepayment of loans and early withdrawal of deposits

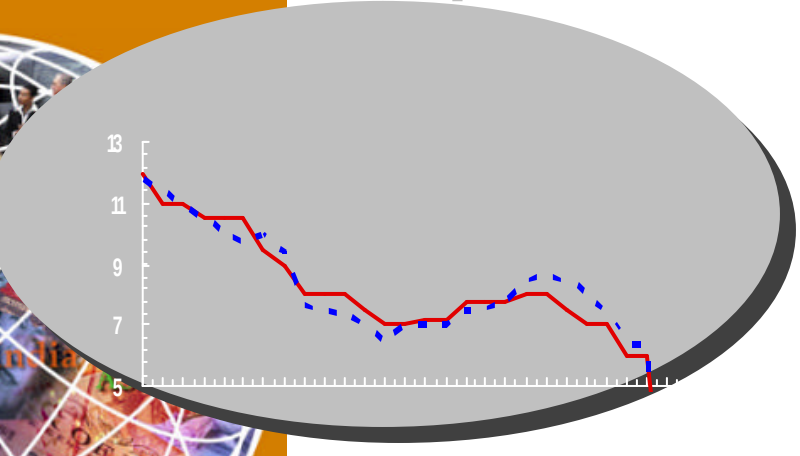
Core Mismatch



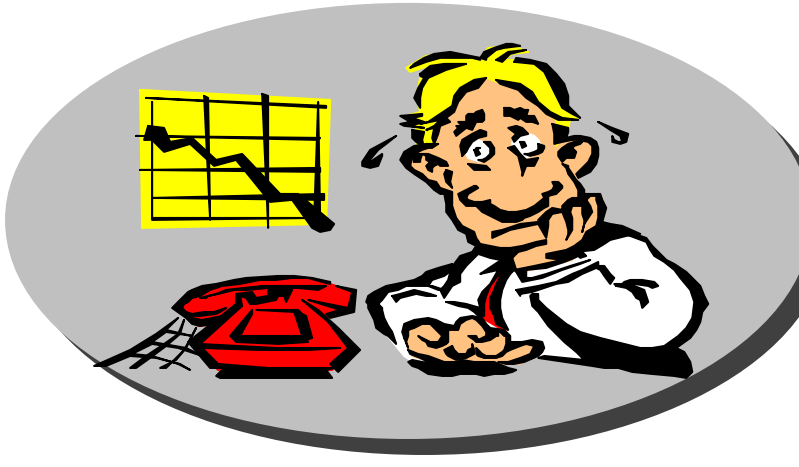
Yield Curve Twist



Basis / Spread



Optionality



Gap Analysis

- Exposure focus
- Understandability
- Calculated
- Usage

- Net interest income
- Very easy
- Aggregate assets and liabilities into time buckets to determine mismatches
- Very easy

Gap Considerations

- Currency, repricing or liquidity
- Behavioural analysis of “non-maturity” accounts
- Treatment of derivatives
- Basis risk
- Embedded options
- Future business

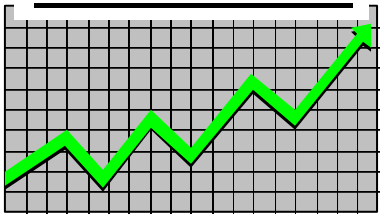
Analytical Continuum

History ***Snapshot*** ***Future***

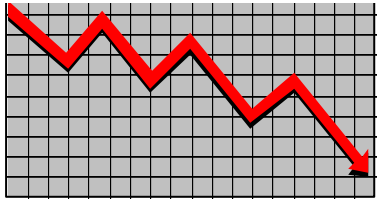
Profitability	**Gap**	**Simulation**
Performance	**Liquidity**	**What-if ?**
Behaviour	**Duration**	
Assumptions	**Market Value**	

Balance Sheet Simulation

Rate Forecast



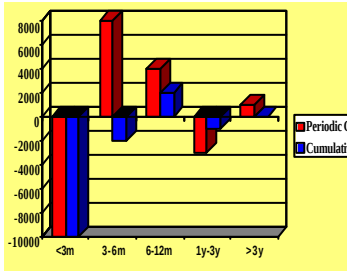
Other External Factors



Current Balance Sheet:
Balances, Yields, Run-offs, Repricing

Customer Behaviour:
Prepayments and Early Withdrawals

Cash Flows and Income Accruals



New Business:
Anticipated Balances

Characteristics:
Maturities and Pricing

Ten Rules Of Risk Management

1. There is no return without risks
   - Rewards go those who take risks
2. Be transparent
   - Risk should be fully understood
3. Seek experience
   - Risk is measured and managed by people, not by mathematical models
4. Know what you don’t know
   - Question the assumptions made
5. Communicate
   - Risk should be discussed openly

Ten Rules Of Risk Management

6. Diversify
   - Multiple risks will produce more consistent rewards
7. Show discipline
   - A consistent and rigorous approach will beat a constantly changing strategy
8. Use common sense
   - It is better to be approximately right, than to be precisely wrong
9. Return is only half of the equation
   - Decisions should be made only after considering the risks and returns of the possibilities
10. Oversight must be enterprise-wide
    - Risks cannot be managed in isolation

Strategic And Tactical ALM In A Commercial Bank

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