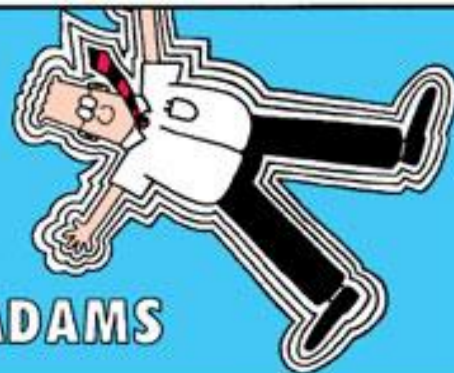# Basel II, Basel III Orientation

Understanding the

Evolution of bank capital regulation

FinanceTrainingCourse.com

Regulation

Regulation

Capital

Capital

Attribution

Core Issue

Capital Allocation
- Basis

Policy
- Process
- Distribution
- Appetite

Board and Management
- Involvement
- Awareness

Regulator
- Tracking indicators
- Intervention

Capital

Stand alone

Marginal

Diversified

Regulatory
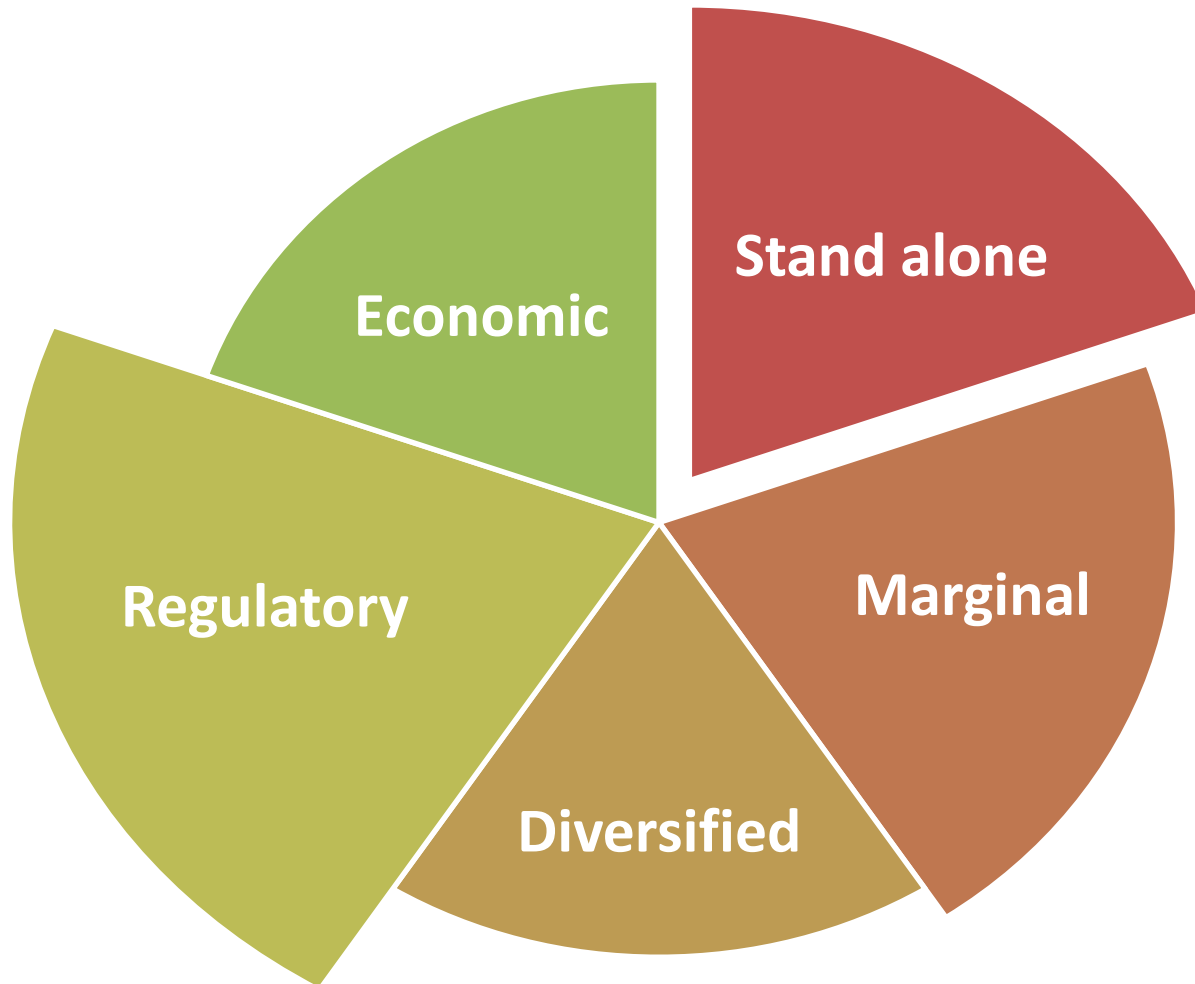
Economic

Capital & Distribution

Distribution of Portfolio Value

Then

Critical Barrier

Expected Value

Emergency Management Conditions

Normal Operating Conditions

Economic Capital

Frequency

50   70   90   110   130   150

Portfolio Value

Now
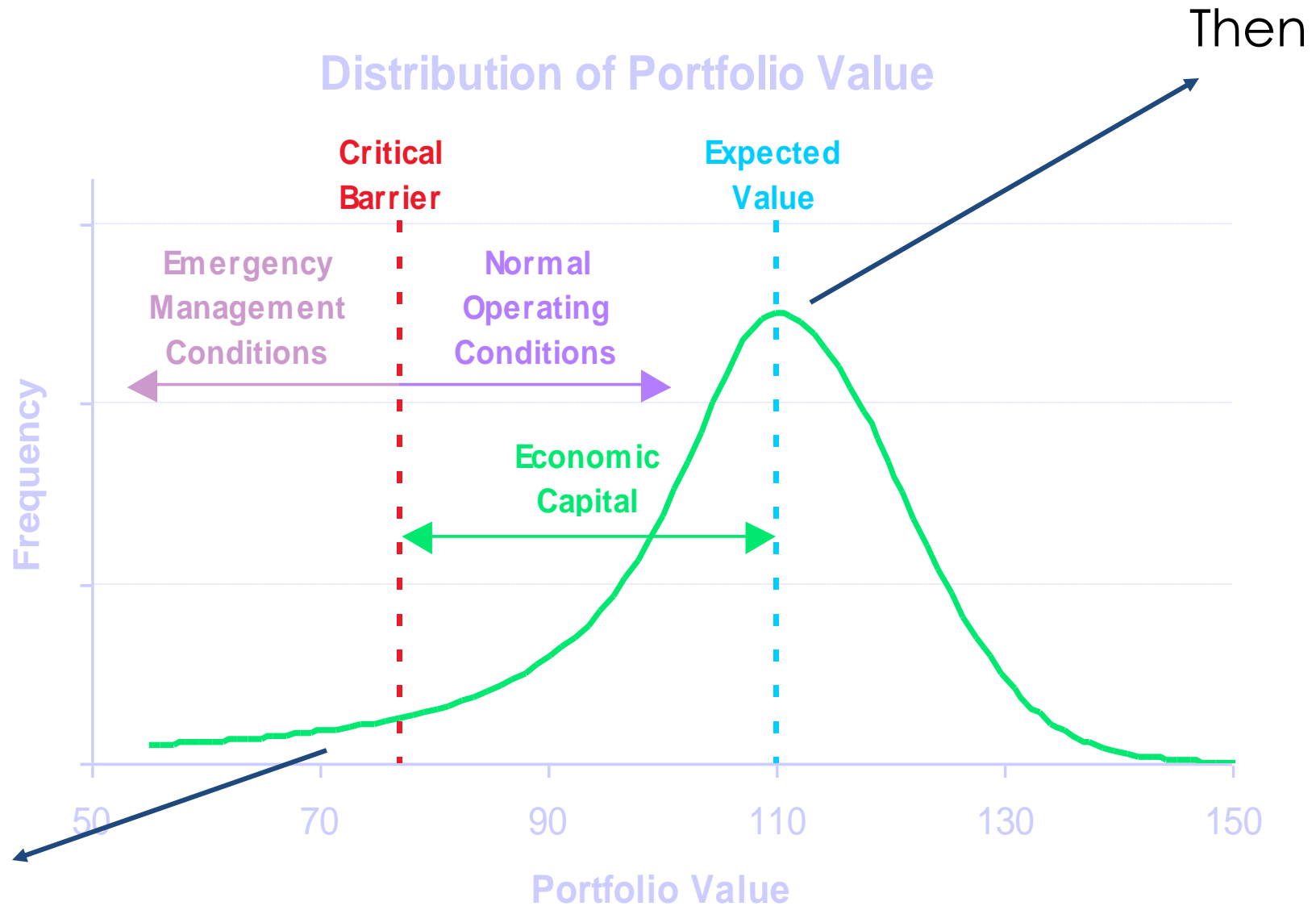
Capital & Distribution

Regulator, Shareholders

Depositors, Counterparties,

Rating Agencies

Distribution of Portfolio Value

Critical Barrier

Expected Value

Emergency Management Conditions

Normal Operating Conditions

Economic Capital

Frequency

50   70   90   110   130   150

Portfolio Value

Finance Training Course   FOURQUANTS DECODE FINANCE   alchemy Analysts. Actuaries.   iPad Risk Books finance rockstars
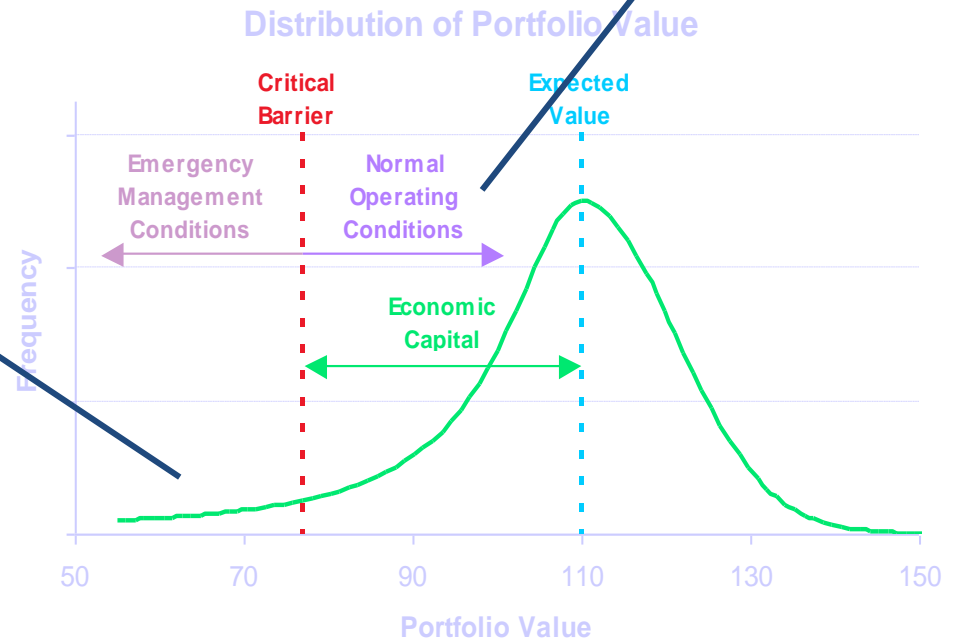
Implementation

- Which capital?
  - regulatory or economic or both
- Calculation engine
  - Data
  - Assumptions
  - Correlation
- Application
  - RAROC or not?

ICAAP - Framework
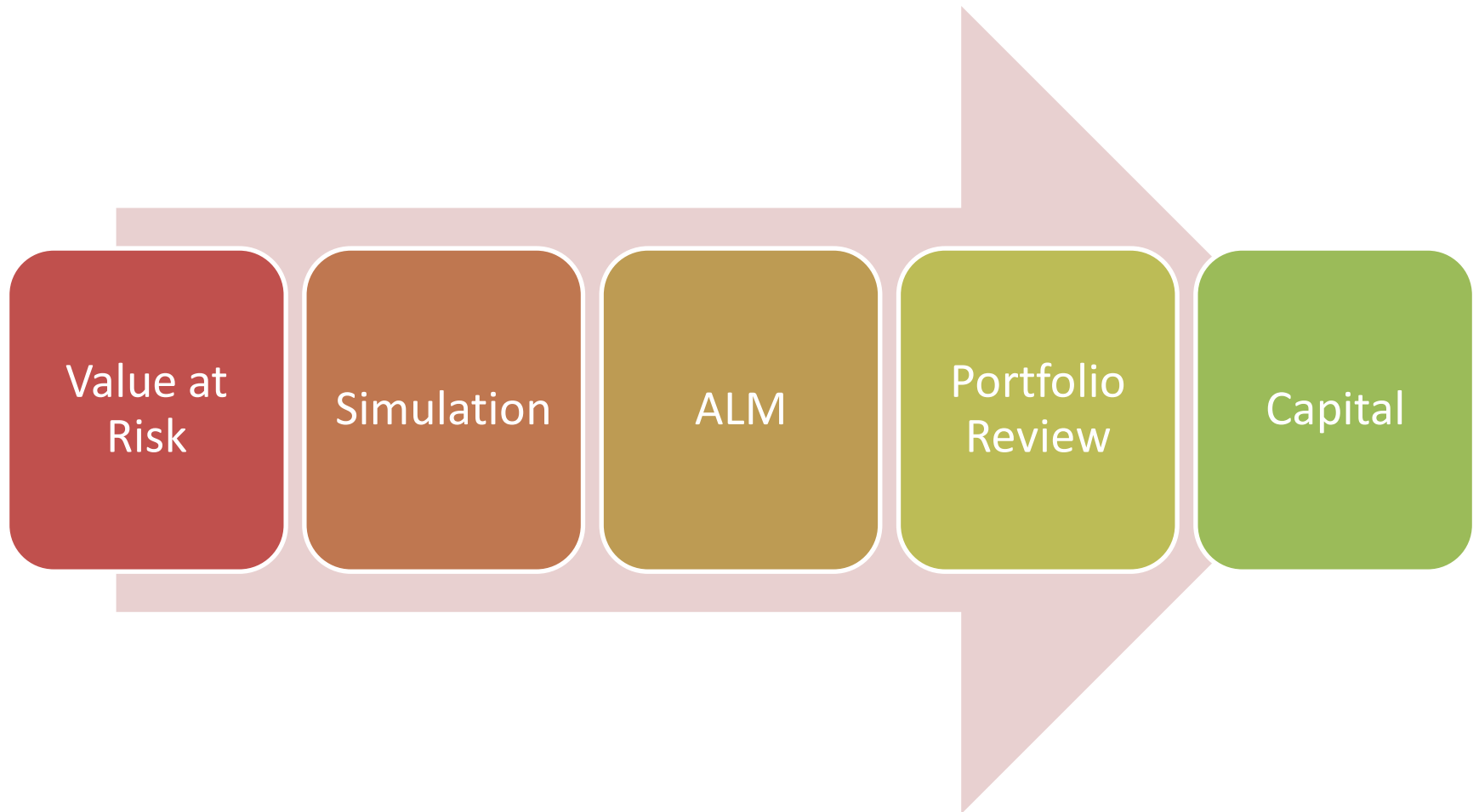
ICAAP Report Structure
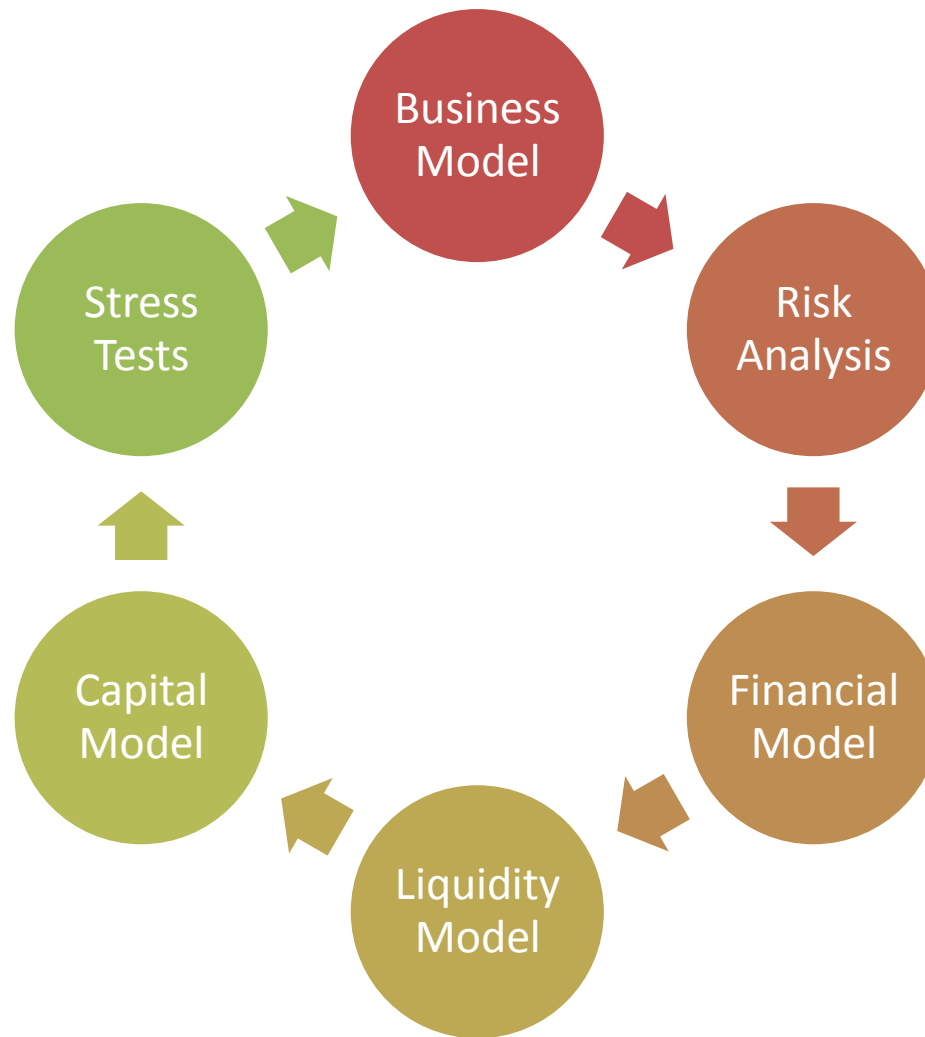
Challenges

The distribution
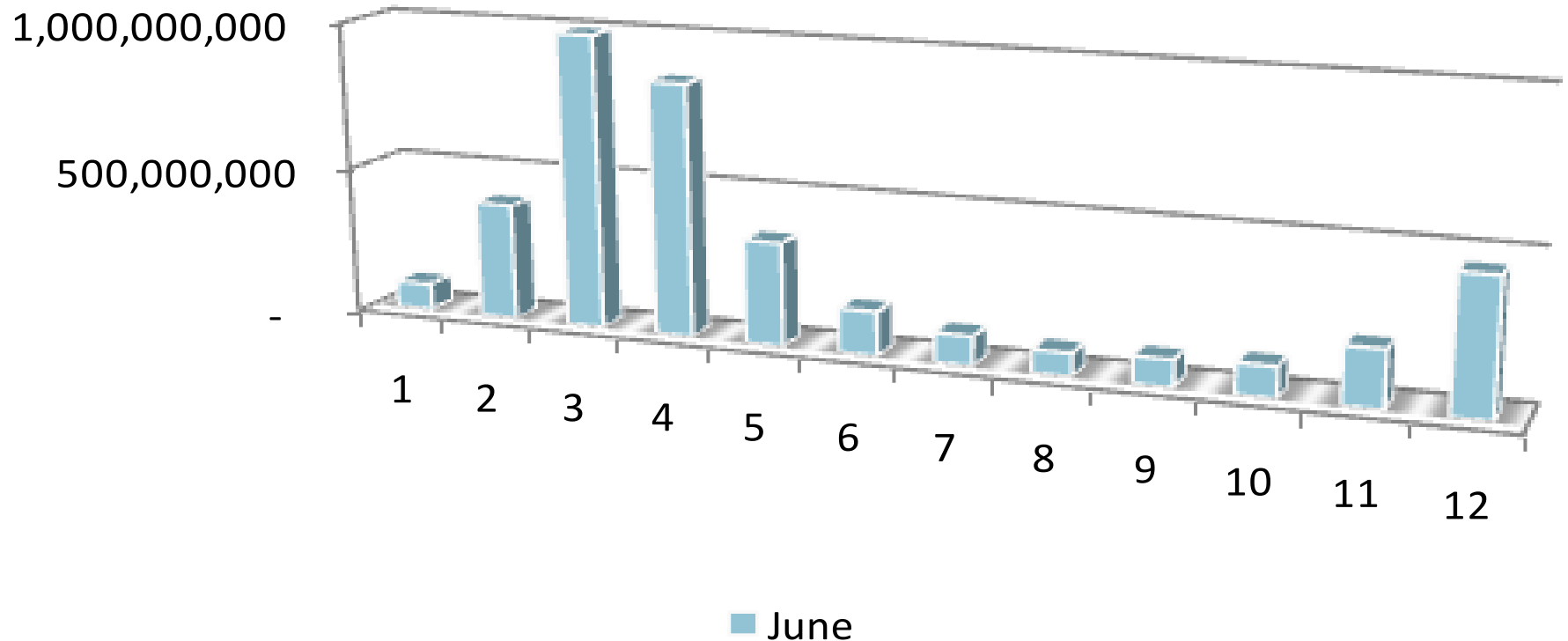
Effectiveness

Behaviour

Dissection

Legend: Lease Finance, Long Term, Short Term Finance, Medium Term

Categories: Auto, Cement, Chemicals, Communications, Construction, Electronics, Engineering, Finance, Food & Allied, Healthcare, Others, Paper, Board & Packaging, Petroleum, Pharmaceutical, Power, Sugar, Textile - Spinning/Weaving, Textile - Value Added, Transport
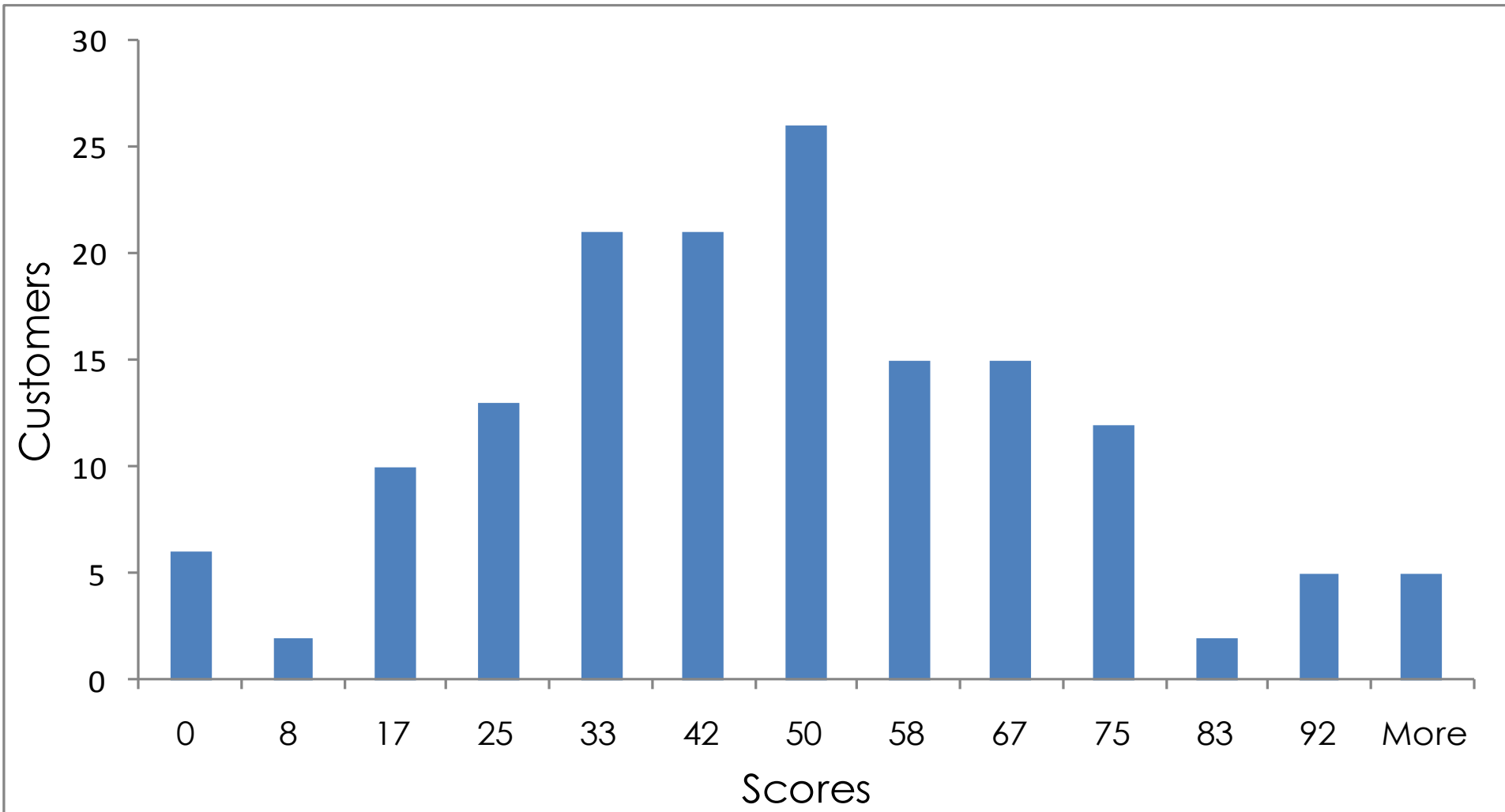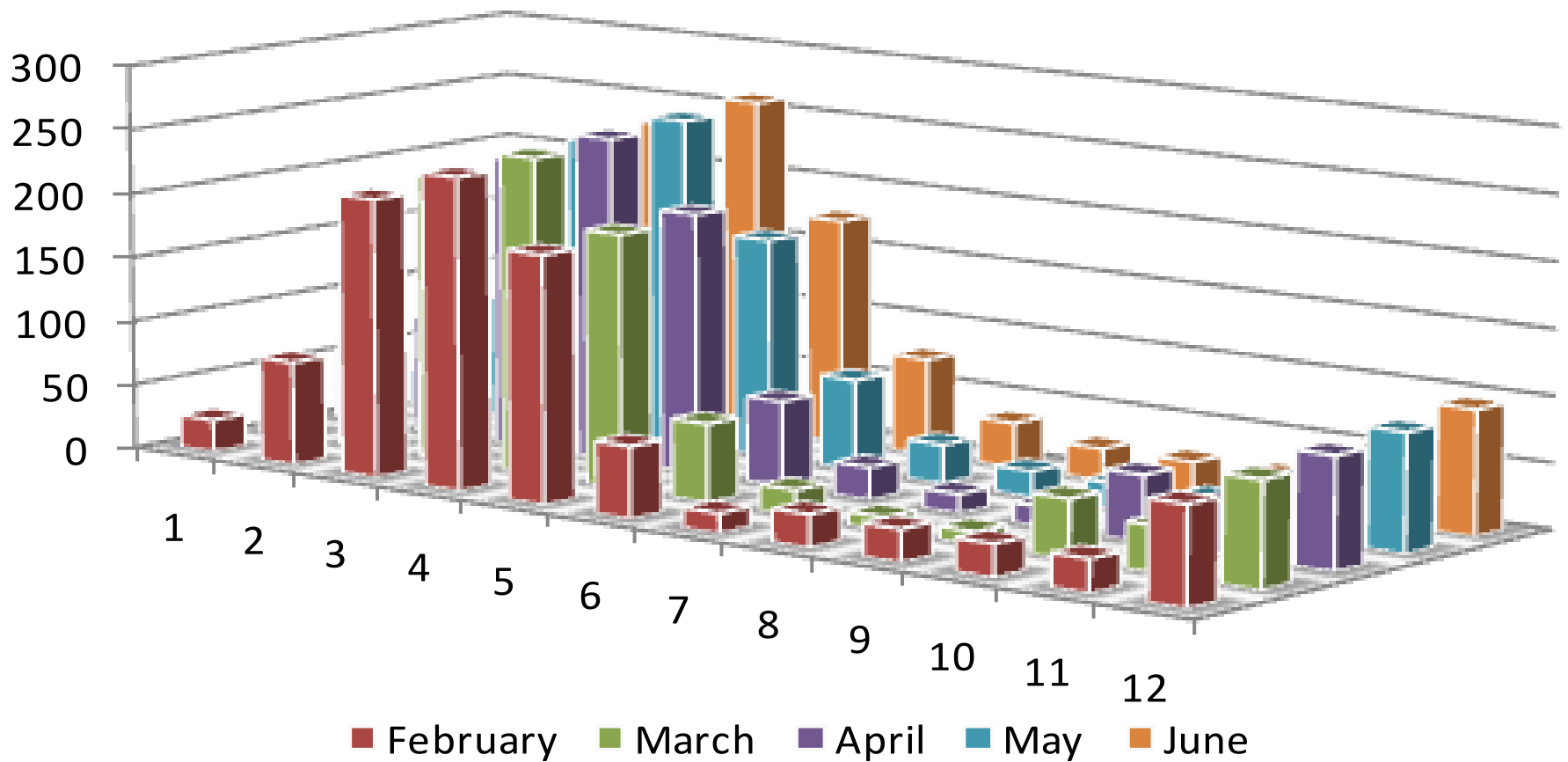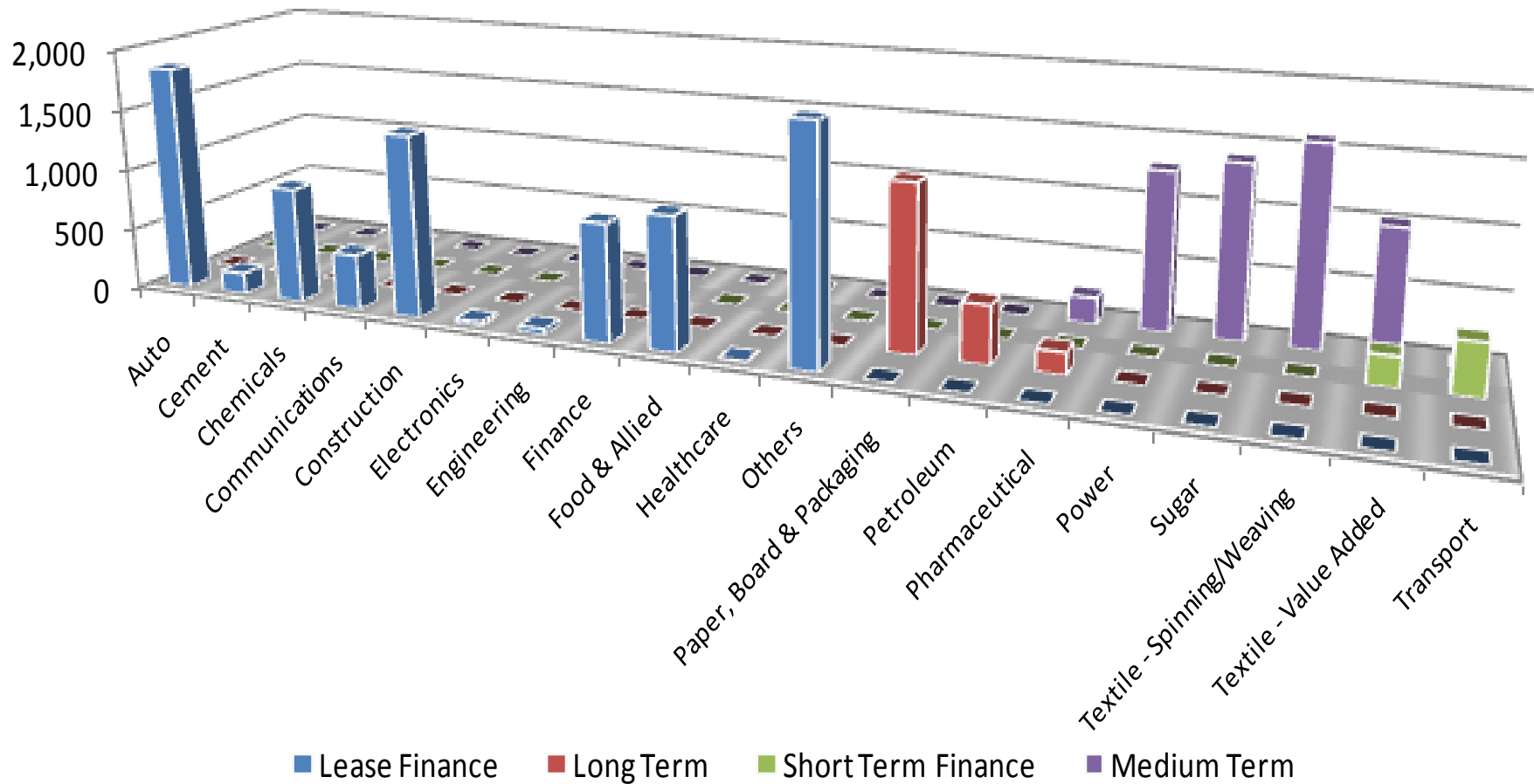
Issues

Policy

- Group structure

- Responsibility

- Process
  - Capital attribution
  - Risk Appetite

- Distribution List, Frequency

- Content

Capital = ?

- Credit risk

- Market risk

- Operation Risk

- Interest rate gap - ?

- Liquidity risk - ?

- Concentration - ?

- For strategic risk - ?

- For other residual risks - ?

Capital = Regulatory

- Credit risk ➜ Standardized or IRB

- Market risk ➜ Standardized or IMA

- Operation Risk ➜ Basic Indicator

Capital = Regulatory

- Interest rate gap - nil

- Liquidity risk - nil

- Concentration - nil

- For strategic risk - nil

- For other residual risks - nil

Capital = Economic

- Credit risk ➜ Earnings at Risk

- Market risk ➜ IMA

- Operation Risk ➜ Basic Indicator

Capital = Economic

- Interest rate gap – Earnings at Risk

- Liquidity risk – Exposure based

- Concentration – add on charge

- For strategic risk – scenario based

- For other residual risks - nil

Aggregation

- Additive

- Impact of correlation

- Across related areas

- Across unrelated areas

- Modeling correlation

- Top down approach

- Bottom up approach

Value addition

- Economic capital

- Loan pricing

- Risk Adjusted Return on Capital

- Transfer Pricing

- Risk appetite

- Risk is half the equation

Anatomy of a liquidity crisis
Basel III Adjustments

Name Crisis

Change in market conditions → Operational Loss → Asset related Loss → Regulatory scandal → Accounting Scandal

Liquidity Crisis

Liquidity driven Asset Sale → Name Crisis → Asset and share price under pressure → Rating Downgrade → Counterparty Limits Withdrawn or restricted → Margin and Collateral Calls → (back to Liquidity driven Asset Sale)
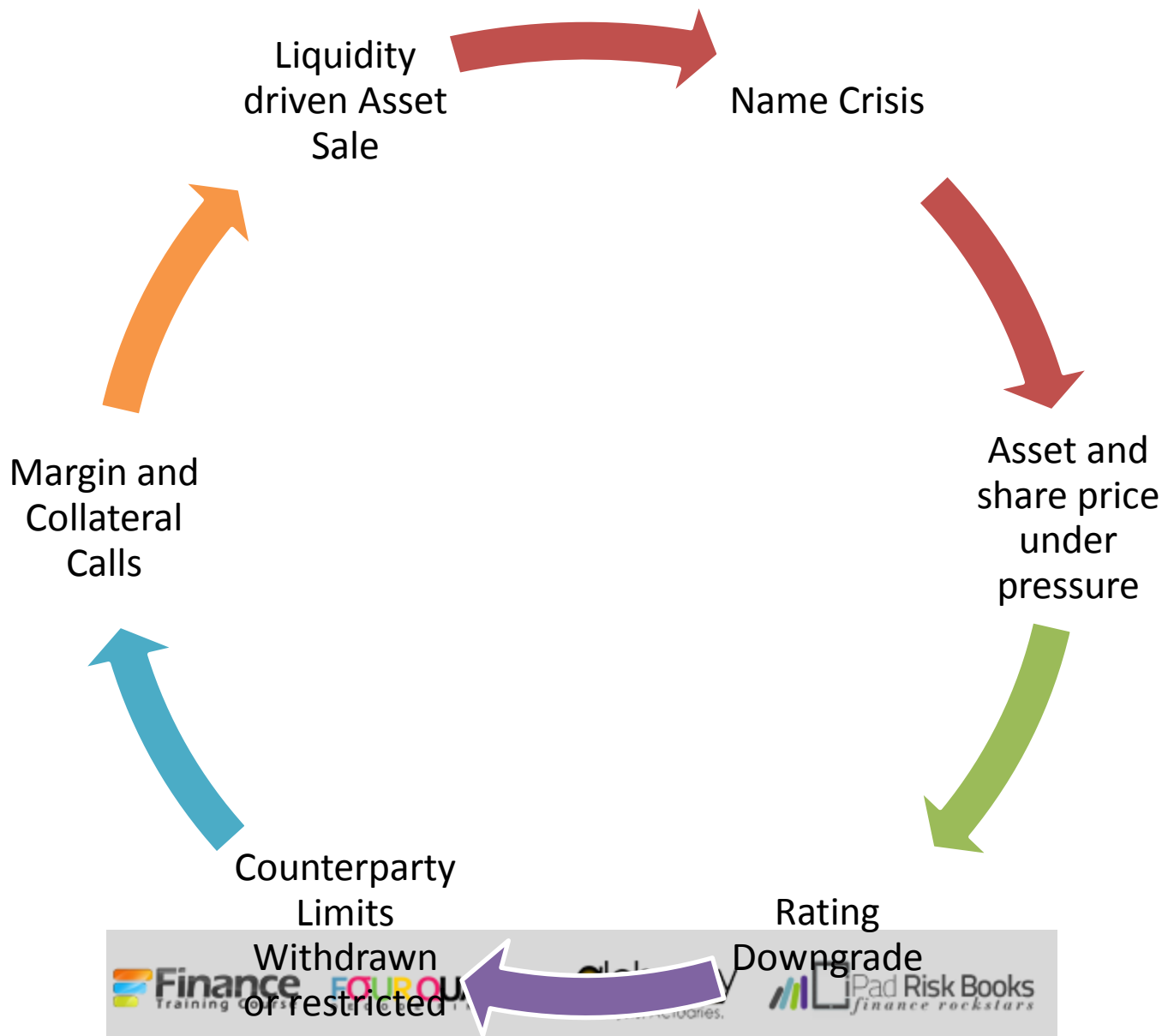
Financial Inst. Business Model
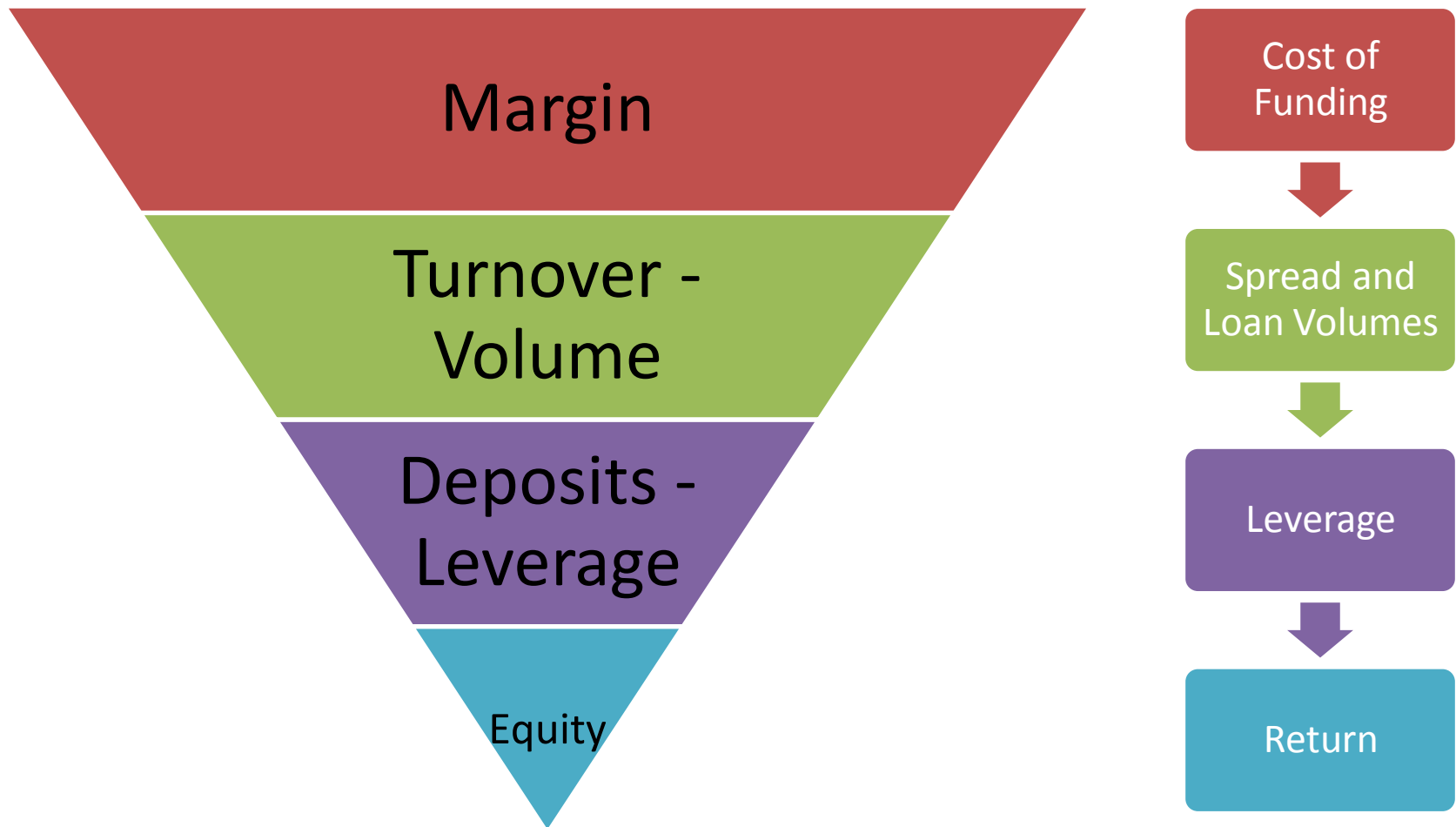
FI Business Model

Asset Sales

Name Crisis
- Positions disclosed
- Anticipated Asset Sales

Asset Sales
- Liquidity
- Defensive move by market
- Aggressive sale by short sellers

Limits Trouble
- Margin & Collateral Calls
- Restricted trading ability
- Net Settlement?

Liquidity Crisis

Liquidity driven Asset Sale → Name Crisis

Short Cut

Margin and Collateral Calls

Asset and share price under pressure

Counterparty Limits Withdrawn or restricted

Rating Downgrade

Cash Generation

Asset Sales
- Repurchase agreements
- Discount window
- Outright sale at depressed prices
- Off market settlement for netting off liabilities

Cash Generation
- Secured Term loans
- Equity Injection
- Asset Swap for Cash
- Regulatory driven cash injection or take over

Cash conservation
- Realignment and restructuring of resources
- Discontinued operations
- Limit management
- Centralization of cash management

Bear Stearns

Under 90 days

Crisis in full bloom 20th December 2007 – Q4 Loss

JP Morgan Takeover 16th March 2008 @ 2$ a share

Margin and Collateral Calls

Liquidity driven Asset Sale

Name Crisis

Asset and share price under pressure

Rating Downgrade

Counterparty Limits Withdrawn or restricted
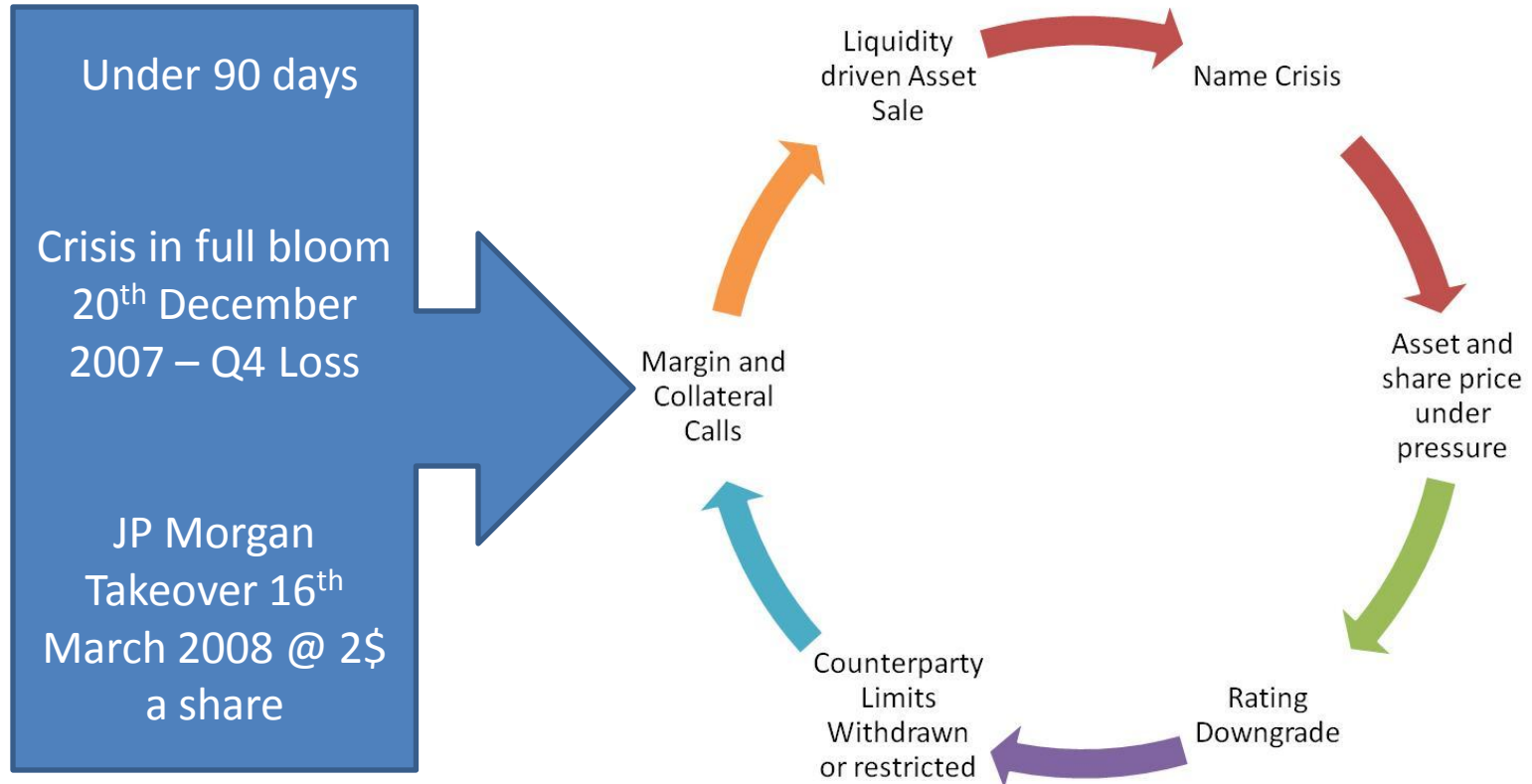
Lehman

9th June: $45 billion in liquidity, 20% reduction risky assets, leverage from 31:1 to 25:1. Survived March Bear fallout. Raised US$ 10 billion through capital issues in April/June

Under 30 days

Crisis in full bloom 19th August 2008 – Q3 Loss & write downs

Lehman Bankruptcy Filing 15th Sep 2008

Liquidity driven Asset Sale → Name Crisis → Asset and share price under pressure → Rating Downgrade → Counterparty Limits Withdrawn or restricted → Margin and Collateral Calls →
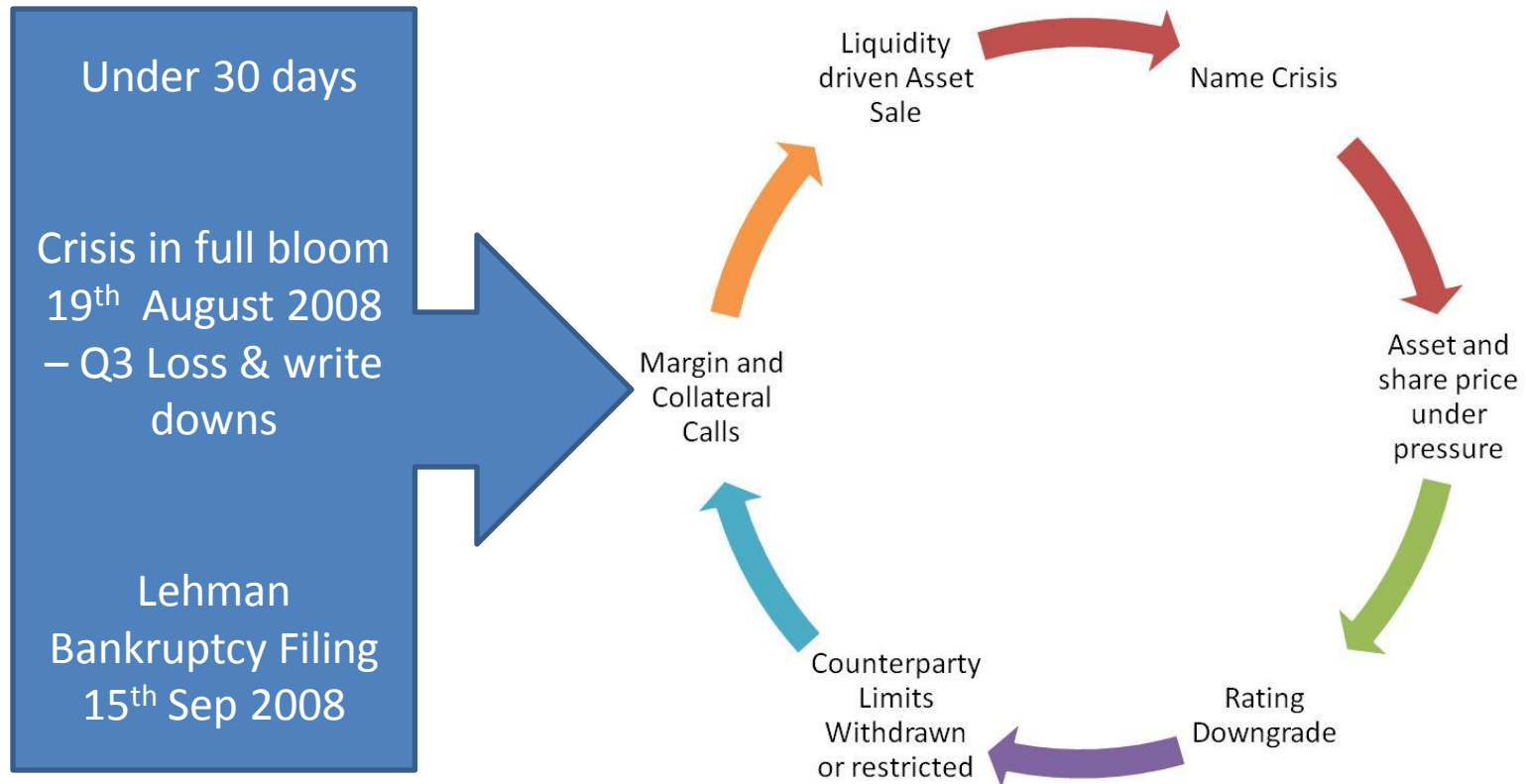
Bear Stearns Case Study

20 December 2007: BS records 4th quarter loss, writes down mortgage assets of $1.9 billion. Sued by Barclays

28 December 2007: Employees sell BS stock worth $ 20 million

Early January 2008: CEO James Cayne resigns. Moody's downgrade of MBS tranches issued by BS

Mid-January 2008: Over 20% fall in BS share price

7 March 2008: Shares of Carlyle Capital Corporation (CCC) (BS has significant exposure), suspended. **Triggers concerns regarding liquidity**

10 March 2008: BS Press Release to reassure investors that liquidity concerns are false. Rumors of loss of confidence and credit facilities.

11 March 2008: CFO says rumors false. Goldman Sach's says it will not stand in for it clients for derivative deals with BS

12 March 2008: CEO says no liquidity crisis on CNBC, quarter will show profit. Banks withdraw credit lines, clients stop using BS brokerage

13 March 2008: CCC hedge fund collapses. BS share price falls 17%. CEO announces all is well. Liquidity falls from $17 billion to $2 billion.

13 March 2008: CEO approaches JP Morgan for rescue package and clients to express confidence in BS publicly. Latter declined.

14 March 2008: BS says JP Morgan with Fed Reserve has agreed to provide funding. Share price falls 40%. S&P and Moody's cut BS ratings

16 March 2008: JP Morgan announces that they have acquired BS for $2 per share

Lehman Case Study

- **13th March 2007**: Stock market suffers largest one-day drop in 5 years on reports that Lehman's profitability would be significantly impacted because of rising subprime mortgage delinquencies.

- **14th March 2007**: Lehman reports record revenues and profits for its first fiscal quarter.

- **August 2007:** Announces closing of subprime mortgage originator BNC Mortgage cutting 1200 jobs. Also closes down offices of Alt-A originator offices in a number of states.

- **13th December 2007**: Reports record net income for the year of $4.2 billion and revenue of $19.3 billion.

- **17th January 2008:** Stops originating mortgages through its wholesale channels.

- **17th March 2008:** Share price declines sharply by more than 48% following the collapse of Bear Stearns

- **18th March 2008**: Reports better than expected reported profits for the first fiscal quarter. Share prices rise to recover value lost the previous day.

- **1st April 2008:** Announces that it has raised $4 billion in preferred stock.

- **15th April 2008**: Lehman's CEO Richard Fuld tells investors that worst of credit crisis is over but financial environment would remain challenging.

Lehman – Cont.

- **9th June 2008**: Lehman announces first quarterly loss of $3 billion since becoming a public company. Also announces sale of $6billion in stock to raise capital, an increased liquidity position of $45 billion, a 20% reduction in residential and commercial mortgages exposure and a reduced leverage ratio of 25 to 1.

- **19th August 2008**: Share price falls by 13% on reports that 3-quarter results would be impacted by significant asset write downs

- **22nd August 2008:** Stock price recovers on negotiations with state-controlled Korean Development Bank.

- **2nd September 2008**: New reports indicate that KDB would purchase a 25% stake in Lehman.

- **8th September 2008**: Lehman's share price falls sharply on reports that KDB talks are on hold.

- **9th September 2008**: New reports indicate talks with KDB have ended. Lehman's share price falls by 45%. Liquidity drys up as hedge fund clients start pulling out, lines of credit are withdrawn, calls for more margin/ collateral increase and trades with Lehman are cancelled.

- **10th September 2008**: Lehman reports third quarter results, a loss of $3.2 billion with asset write-downs amounting to $5.6 billion. Stock price declines by 7%. Moody's announces potential credit ratings downgrade.

- **11 - 12th September 2008**: Lehman's stock declines a further 42% as it struggles to find a buyer. BofA and Barclays comes forward.

- **13th - 14th September 2008**: Bids by both parties end as US government insists that it will not provide assistance.

- **15th September 2008**: Lehman files for bankruptcy protection. Dow Jones suffers its largest drop since 11th September 2001.

Group Assignment

The Libor Crisis and Probability of Default for LIBOR Banks

Due Wednesday 10 am

The Usual Suspects

Submitting Bank	Market Cap / Equity Base (USD Billions)	Pretax Income (USD Billions)
Bank of America	230	1
JP Morgan Chase	184	19
HSBC	136	22
The Royal Bank of Scotland Group	116	(1)
Bank of Tokyo-Mitsubishi UFJ Ltd	108	7
Barclays Bank plc	101	9
Citibank NA	77	11
Lloyds Banking Group	72	4
Deutsche Bank AG	69	6
Royal Bank of Canada	69	7
Credit Agricole CIB	64	(2)
Société Générale	61	3
Rabobank	58	4
UBS AG	57	4
The Norinchukin Bank	53	2
BNP Paribas	48	8
Credit Suisse	32	29
Sumitomo Mitsui Banking Corporation Europe Ltd (SMBCE)	2	0

Assignment – 48 hours

- Estimate trailing PD's using the structured approach for the following 6 banks
- Barclays
- BAML
- HSBC
- JP Morgan Chase
- Royal Bank of Canada
- RaboBank

Need

- Trailing Volatility estimates for last 2 years for the 6 banks

- Total Assets, Total Equity, Total Liability

- Due date. Wednesday 10 am

- Calculate Prob. Of Default using

- Structured Approach

BASEL III – LIQUIDITY RISK FRAMEWORK

Basel III reforms

Minimum liquidity risk standards → Liquidity Coverage Ratio (LCR) → Net Stable Funding Ratio (NSFR)

30 days → 12 months

Monitoring tools

Available unencumbered assets

Concentration of Funding

LCR by significant currency

Contractual Maturity Mismatch Profile

5 liquidity risk monitoring tools

Market Monitoring tools (Prices)
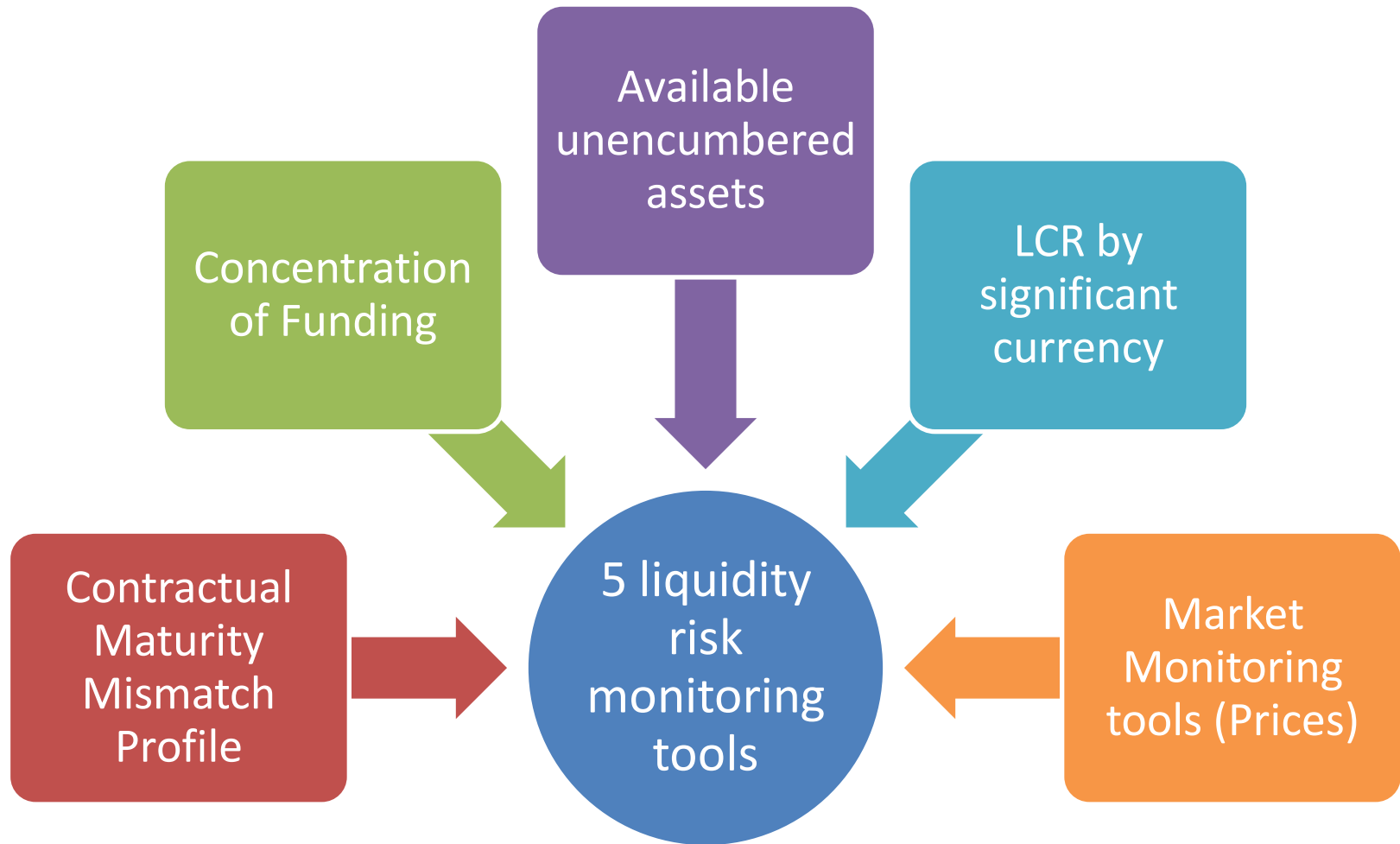
Basel III - Liquidity Framework
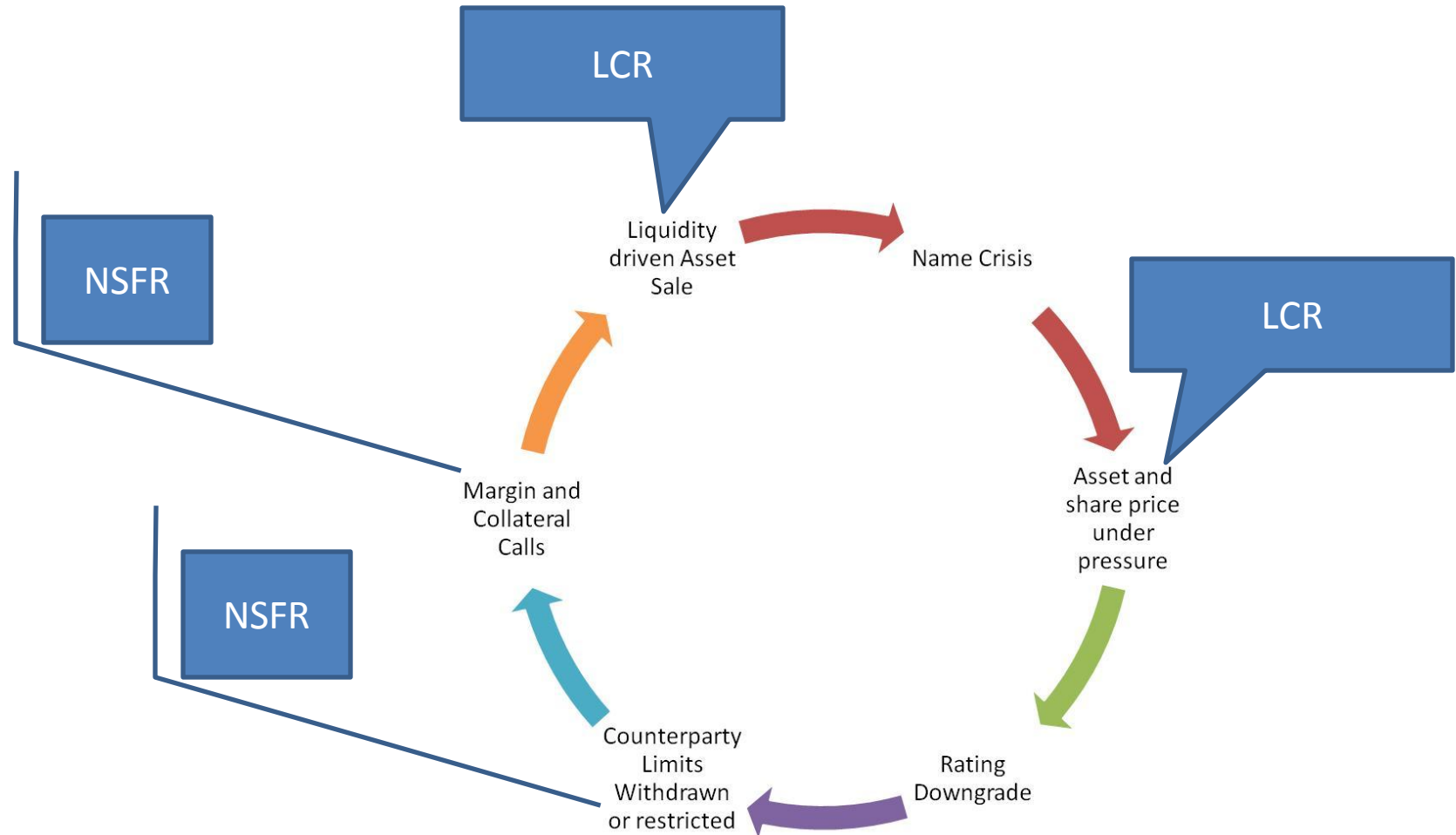
Basel III – Liquidity Framework
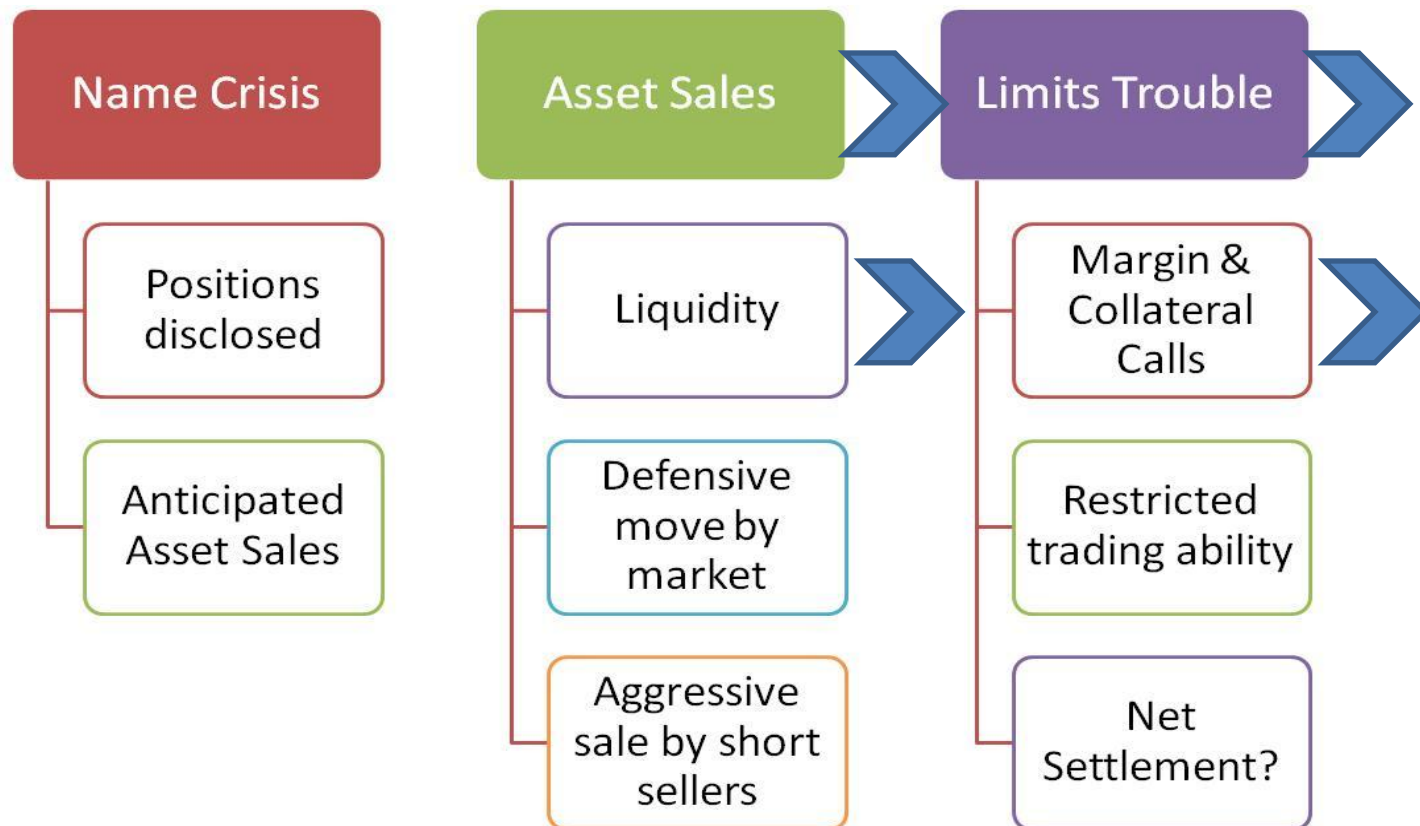
LCR Summary

LCR = Value of stock of high-quality liquid assets in stressed conditions / Total net cash outflows ≥ 100%

| Implementation date - 2015 | Inventory of liquid assets | 30 calendar day severe liquidity stress | Supervisory stress testing |

NSFR Summary

NSFR = Available amount of stable funding/ Required Amount of stable funding≥ 100%

Effective 2018	Longer term liquidity risk profile	1 year horizon under conditions of extended firm-specific stress	Short term structural funding liquidity mismatches

Metrics - Summary

Contractual maturity mismatch
- Maturity gaps for each maturity time band

Concentration of funding
- Whole sale funding concentration by significant counterparty, product/ instrument/ currency

Available unencumbered assets
- By amount, currency, type, location

LCR by significant currency

Market-related monitoring tools

IMPACT ASSESSMENT

Sample LCR's
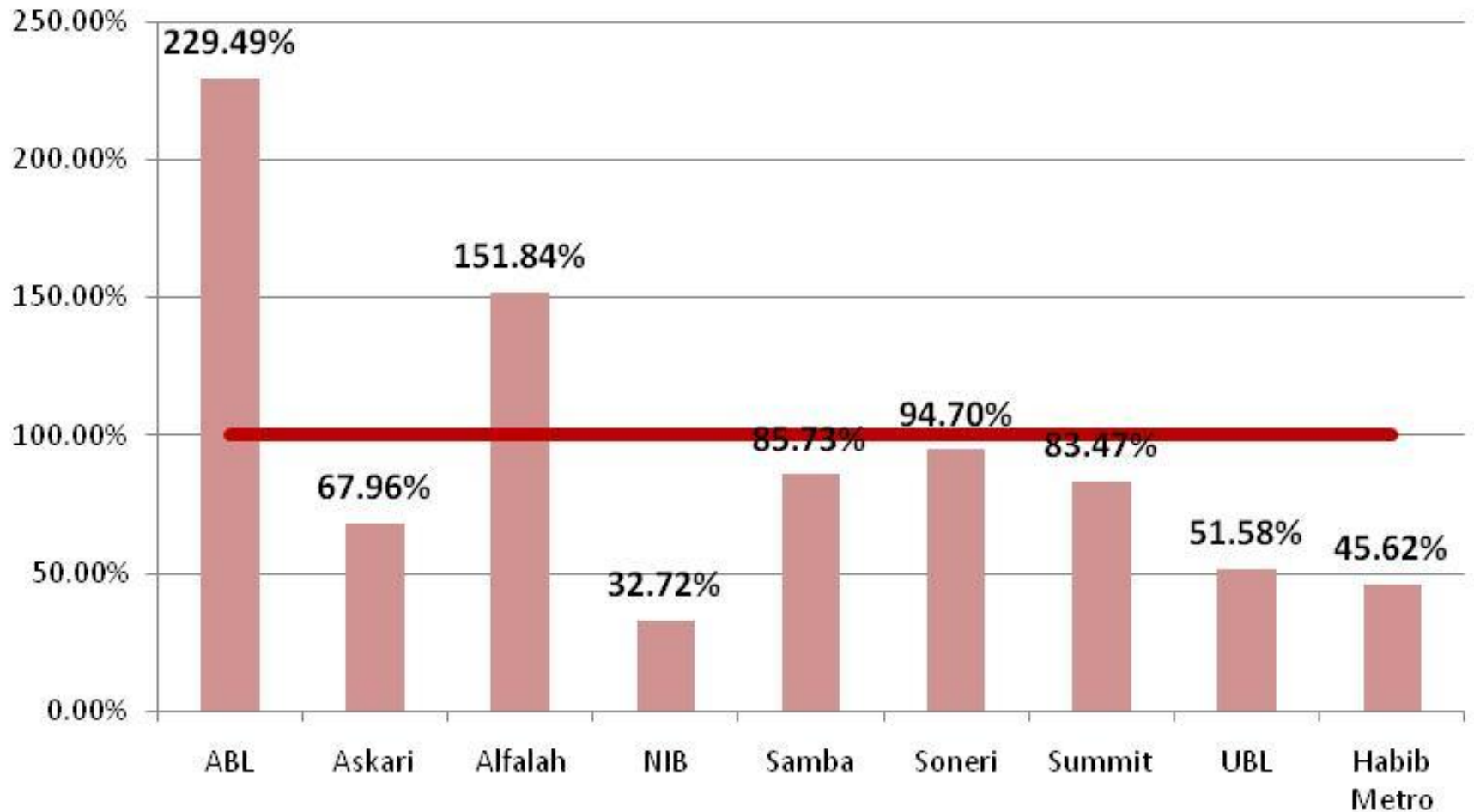
Sample NSFR
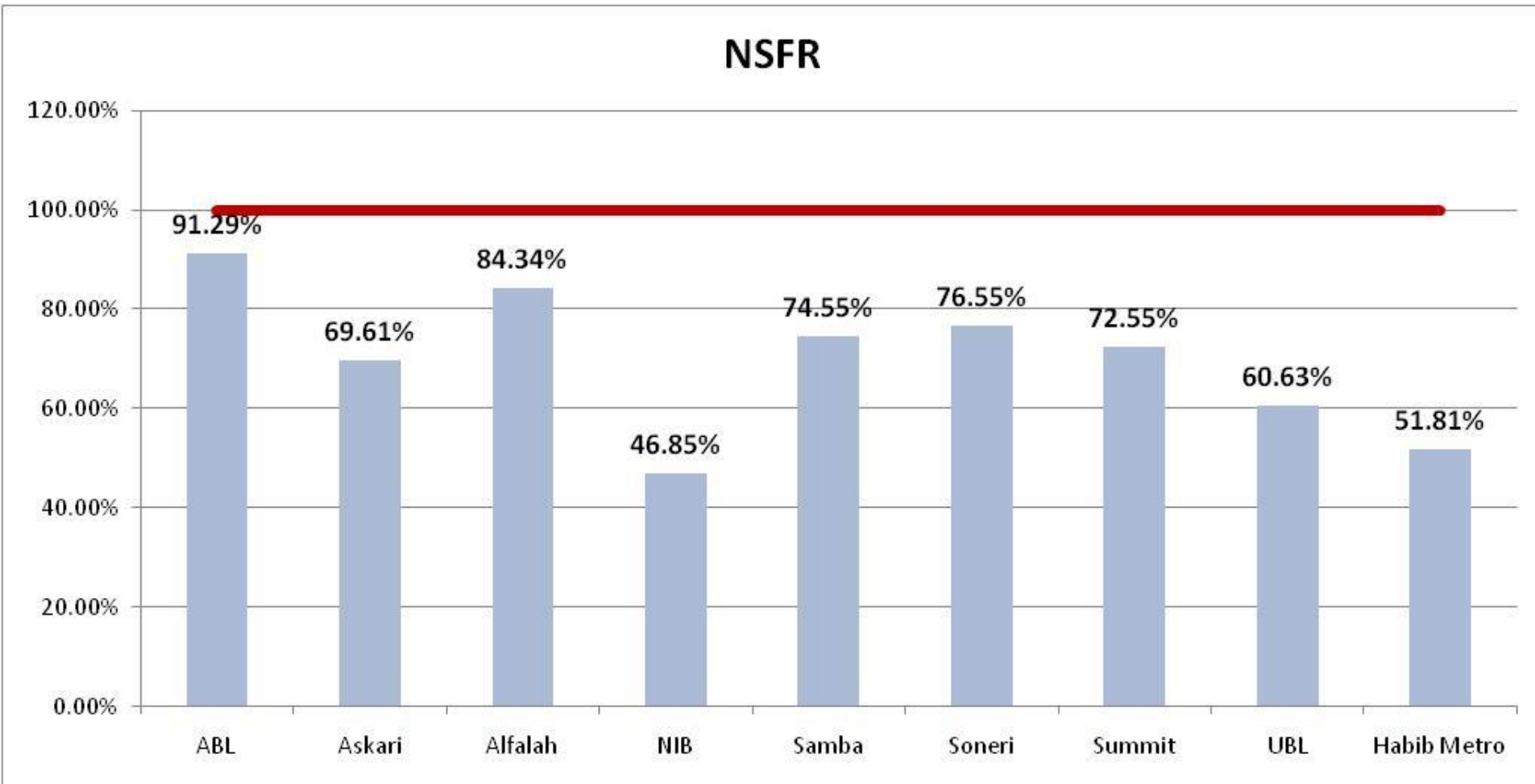
Liquid Stock / MCCO
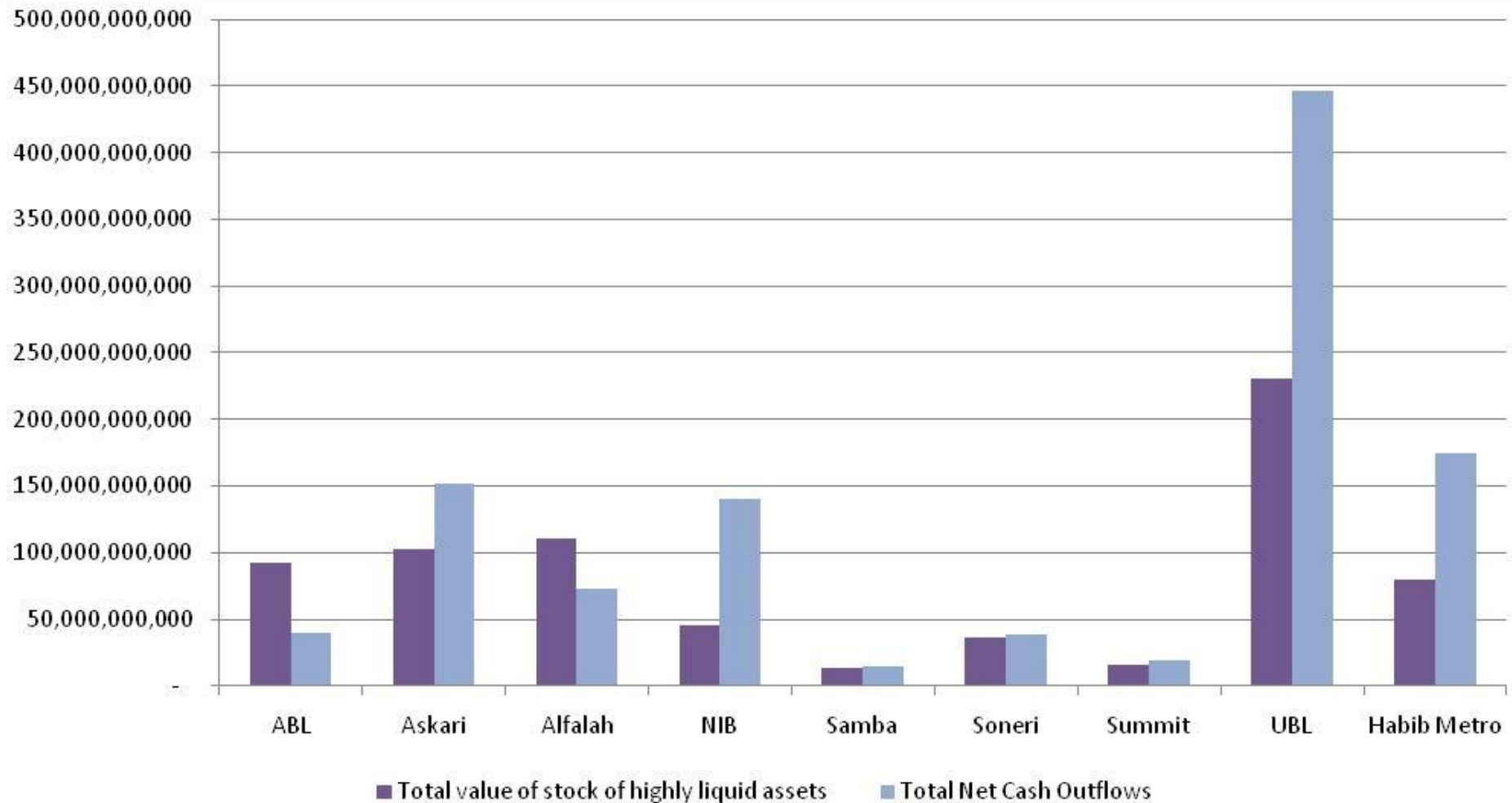
Stable funding/Required Funding
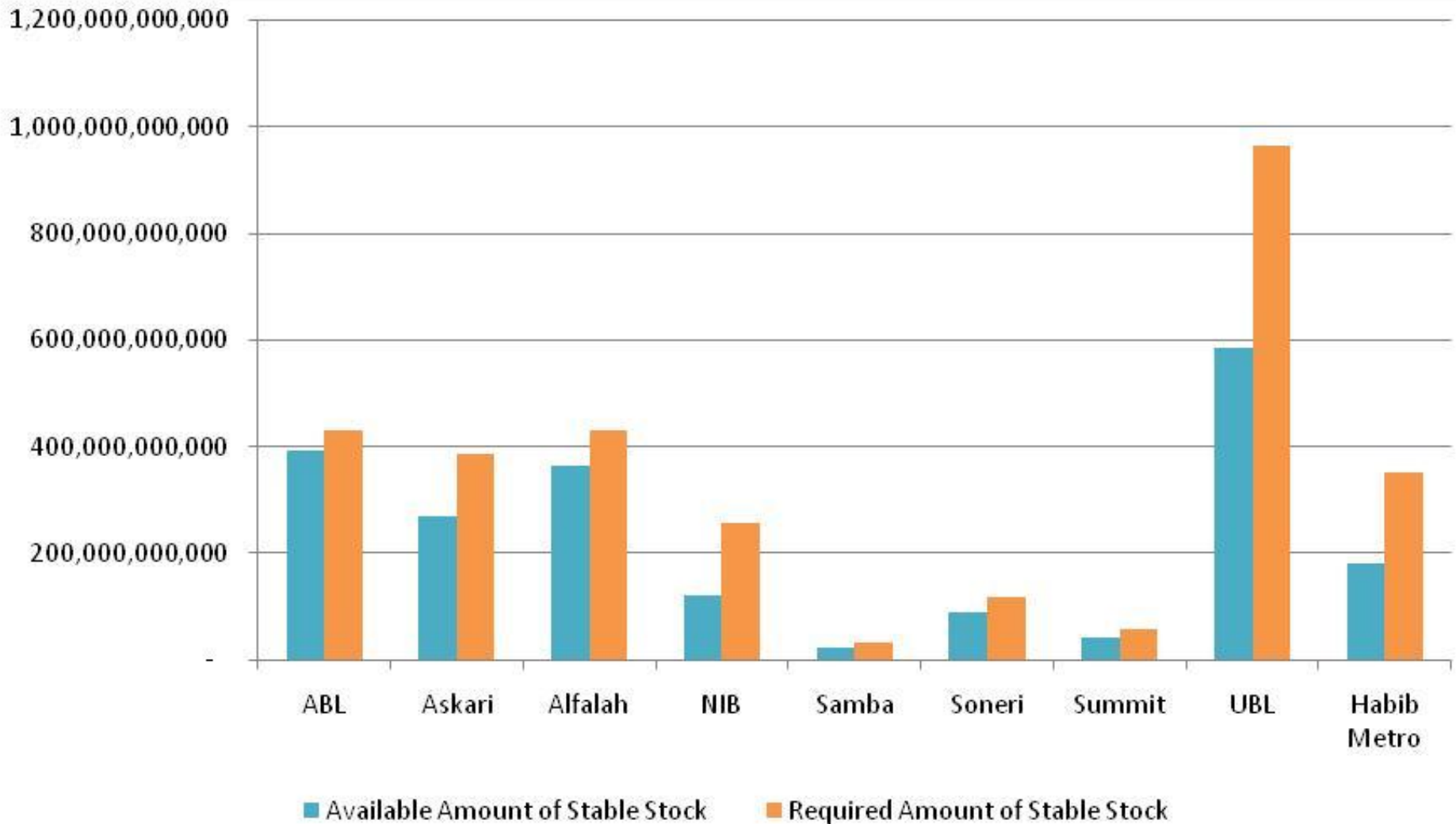
Breakdown of Gross Int. Inc.
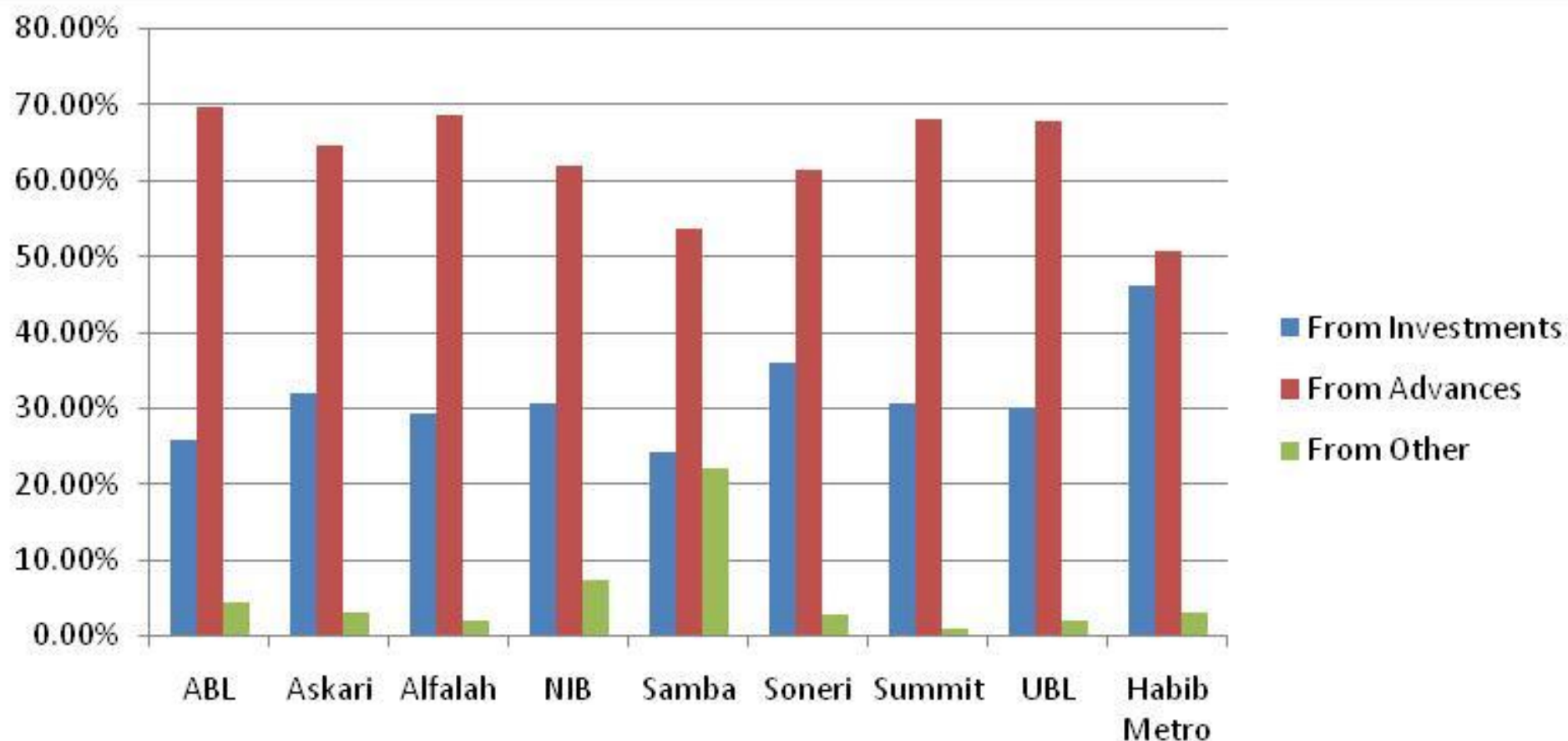
Side by side comparison
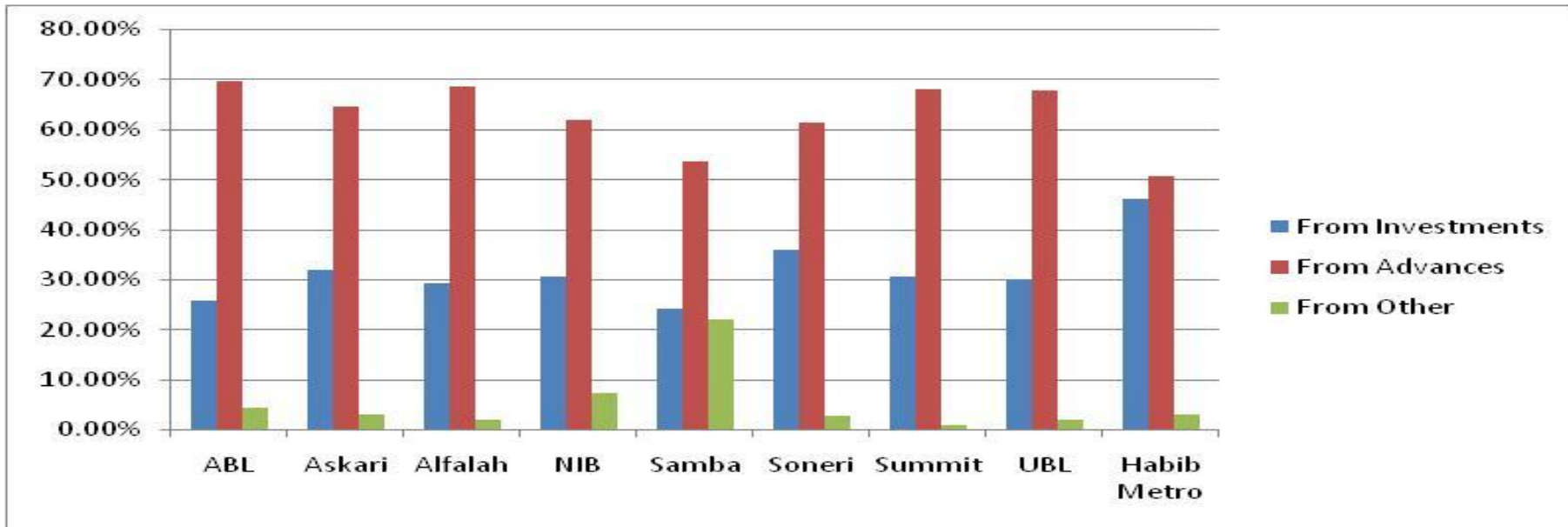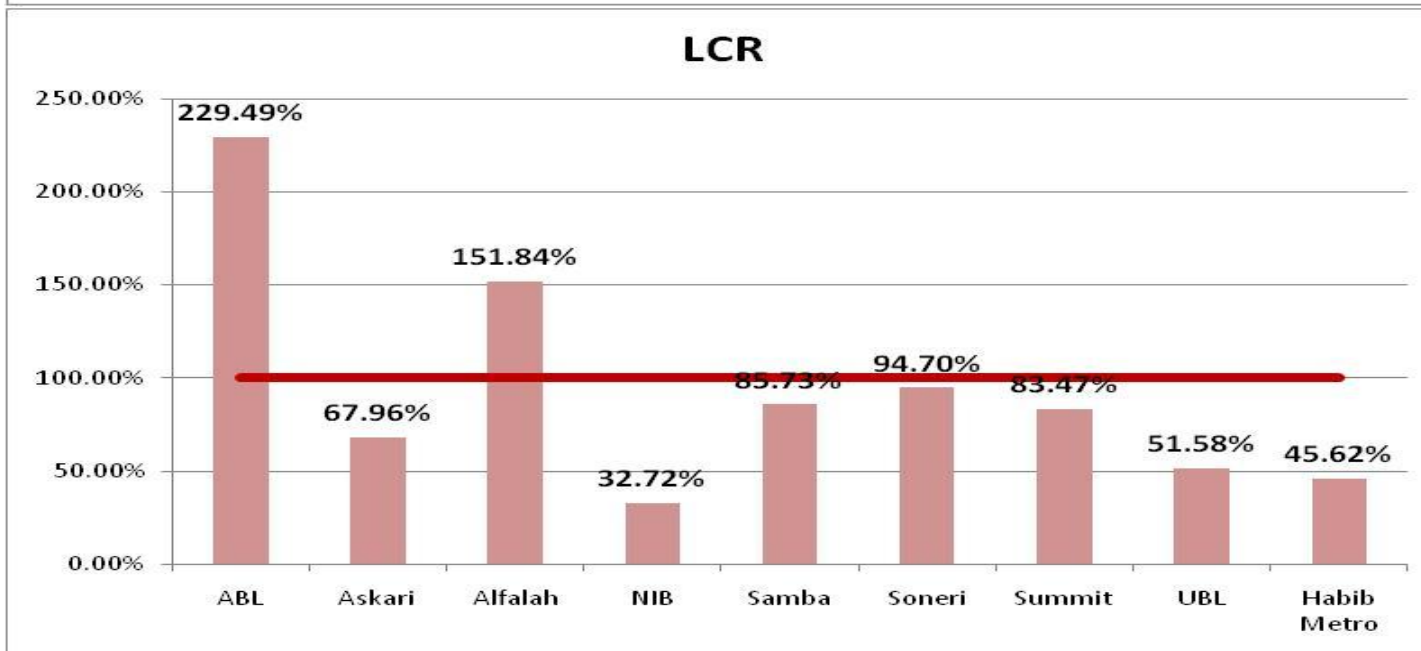
Side by side comparison
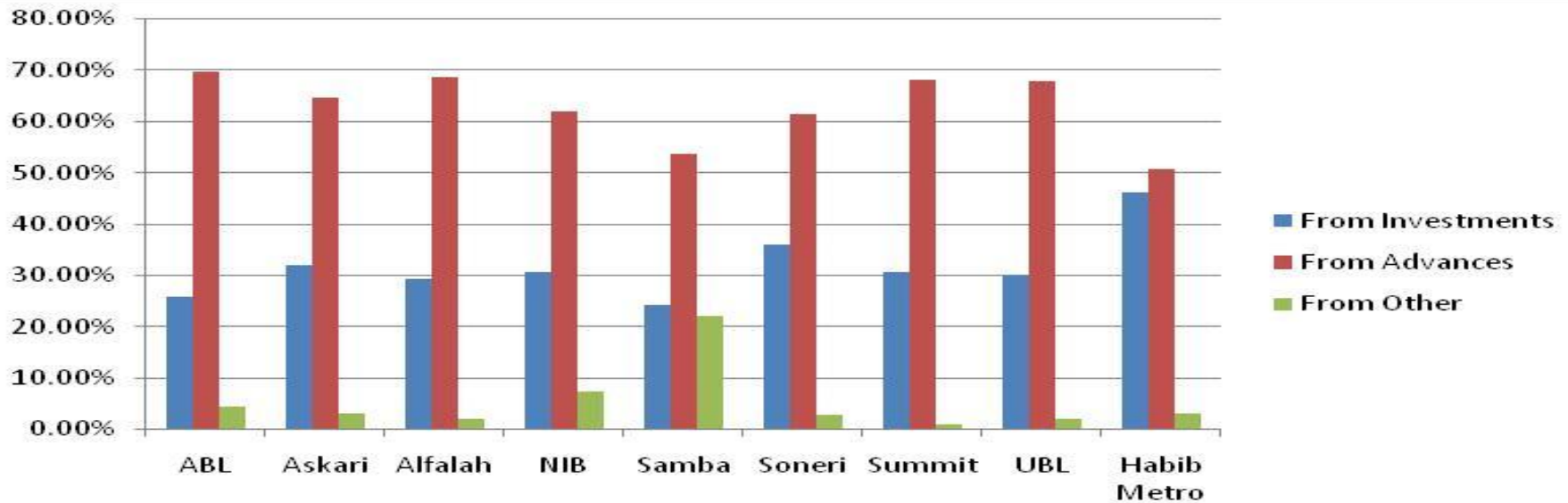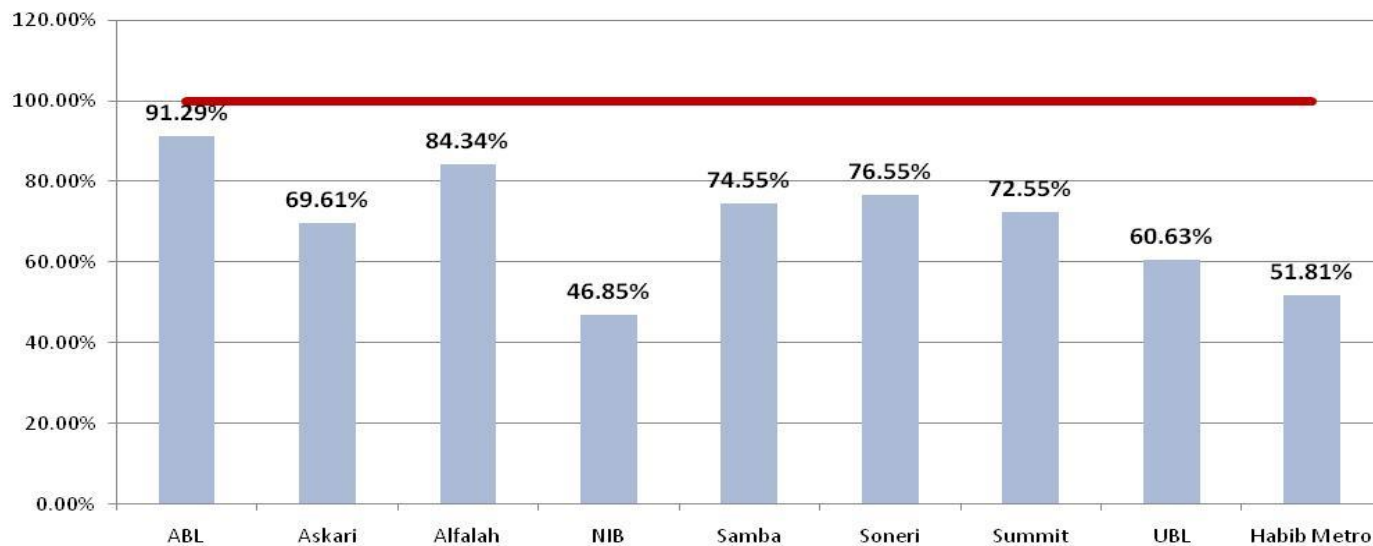
Conclusion

- LCR
  - High interest, low growth scenario
  - Implementation? Relative basis?
  - 2015 is/should be quite doable
  - Possibly push sooner
  - Reservations?

- NSFR
  - Hitting the core business model
  - Significant resistance
  - Alternate liquidity and funding instruments?
  - 2018 ?

Basel II – Technology

09 Sep 2005

Expectations

- Process
  - Questions – from the audience
  - Answers – from the panel

Vendor Challenges

- The skill set & expertise challenge

- The political challenge

- The system & technology challenge

- The interpretation challenge

The skill set and expertise challenge

1. Just Statistics & Modeling
2. Just Finance
3. Just Banking (traditional, core, non-core)
4. Just Change management
5. Just Regulation
6. Certification – bookish knowledge versus experience or intuition

The system & tech challenge

1. What was the price again?
2. When did you say you could implement this solution?
3. Competition?
4. Moving specs & Ongoing development
5. Part consulting, Part implementation, Part trouble shooting
6. Data set integrity
7. Number validation
8. Profile & Visibility

System & Tech challenges

- The stages
- Discovery & Analysis – 3 - 6 months
- Business Case – 8 - 12 weeks
- Change management – On going
- Product mapping – 4 - 8 weeks
- Data Interface – 6 - 8 weeks
- System configuration – 8 weeks
- Pre live run – 6 - 12weeks
- Live

System & Tech challenges

- Team structure
  - Domain expert
    - Basel expertise
    - Number validtor
    - Banking / Regulatory requirements
  - Development team
  - Client Partner / Account Manager
  - Implementation team
  - Quality Assurance

The political challenge

1. The business case challenge
2. Treasury Operations
3. Credit Risk Management
4. Firm wide Risk
5. New blood versus old team
6. Board interaction
7. Board responsibility
8. Reporting time frames, lines & mandate

The political challenge

1. Data ownership?

2. Regulatory Compliance or Risk Management?

3. Whose neck is it anyways?

4. Is it a step up or step down?

The interpretation challenge - II

1. How do I put them to work?
2. How much is enough?
3. How much is acceptable?
4. How do I explain these to my board?
5. Where do we go from here?
6. What is the worst that can happen?
7. What if I breach the numbers?

The interpretation challenge - I

1. What do the numbers mean?

2. Value at Risk?

3. Volatility?

4. Monte Carlo simulation?

5. Capital Adequacy?

Framework
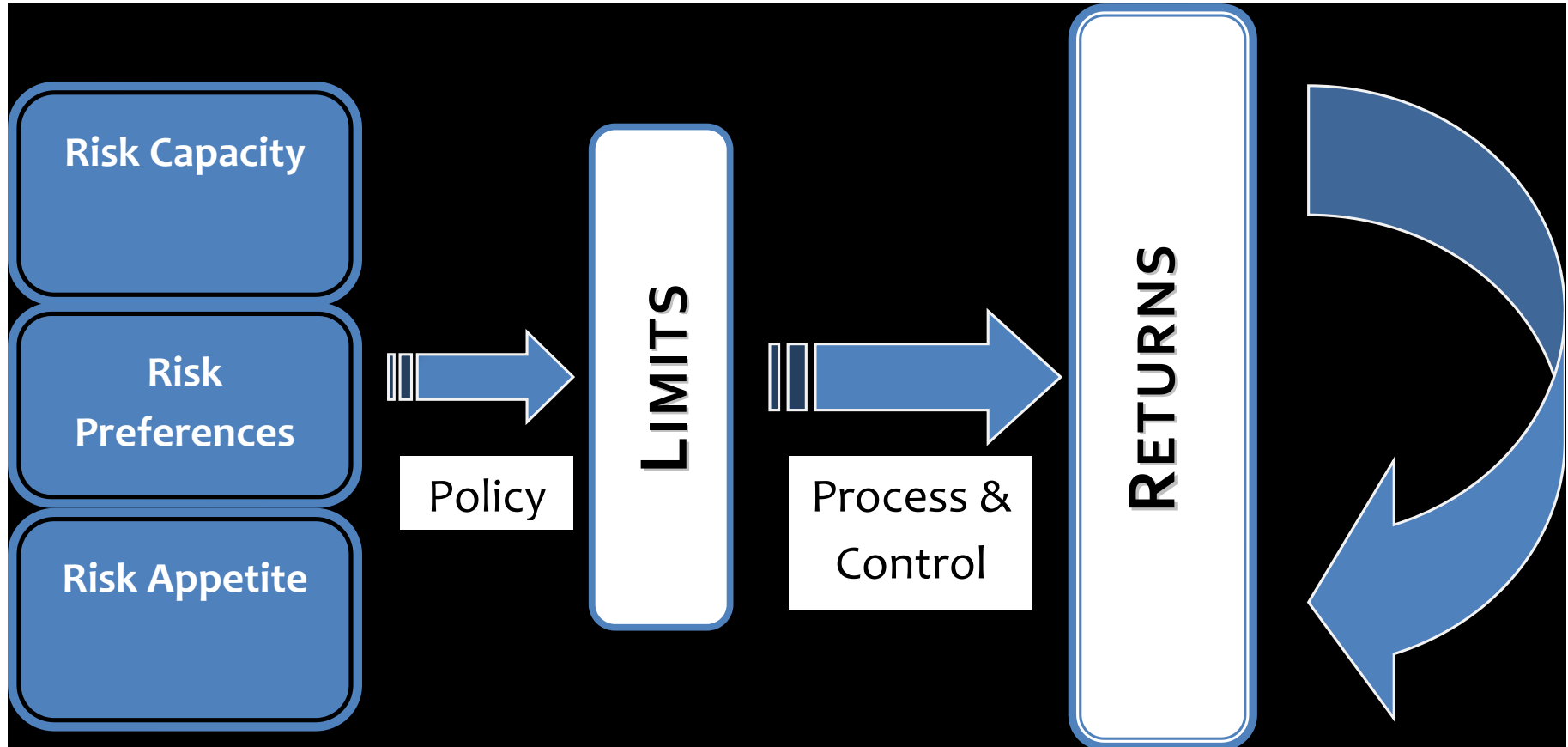
Game Plan

- Anatomy of a Liquidity Crisis
- The Basel III – Liquidity adjustments
  - Framework
- Impact and implications
  - Liquidity
  - Profitability
  - Stress Testing

PD Models

Overview of PD Models

1. KMV – Market Price Model / Merton Model

2. Z Score driven PD – Application Score

3. Credit Spread driven Loss Norms

4. Provisions Data based Loss Norms

5. **Payment Behavior – Cohort or Mortality Model**

Overview of PD Models

1. KMV – Market Price Model **(limited application)**

2. Z Score driven PD – **(data set specific)**

3. Credit Spread driven Loss Norms **(not PD)**

4. Market Data based Loss Norms **(not PD)**

5. **Payment Behavior – Cohort or Mortality Model**

Approach

Process

- Data set   (selection)
- Rescore   (standard)
- Pool   (bucket)
- Behavior   (Default event)
- Results / Test   (Robustness)
- Report   (Results)

Key Terms

- Credit Update

- Credit Event

- Probability of Default (PD)

- Internal PD

- Regulatory PD

- Credit Score

- Scoring Engine

- Feedback Loop

Key Concepts

- Probability of Default

$$P(Default) = \frac{Amount\ Outstanding\ for\ Credit\ Events}{Amount\ Outstanding\ for\ All\ Updates}$$

$$P(Default) = \frac{Number\ of\ Credit\ Events}{Number\ of\ Updates}$$

- Credit Event / Credit Updates

- Scoring Engine ⬅➡ PD

- Repayment data by product

Default / Credit Event

← Trackable with payment data →

```
┌─────────────┐   ┌─────────────┐        ┌─────────────┐        ┌─────────────┐
│ Non Payment │   │   Credit    │        │  Payment    │        │  Breach of  │
│             │   │  Downgrade  │        │   Delay     │        │  Covenant   │
└──────┬──────┘   └──────┬──────┘        └──────┬──────┘        └──────┬──────┘
       │                 │                      │                      │
       │                 │               ┌──────┴────────┐             │
       │                 │               │ User Configurable           │
       │                 │               │ Definition of Delay         │
       │                 │               └───────┬───────┘             │
       ▼                 ▼                ╱      │      ╲               ▼
┌─────────────┐   ┌─────────────┐   ┌───────┐┌───────┐┌───────┐ ┌─────────────┐
│ Non Payment │   │   Default   │   │Delay 1││Delay 2││Delay N│ │   Default   │
│             │   │   Credit    │   └───────┘└───────┘└───────┘ │             │
│             │   │   Event     │                               │             │
└─────────────┘   └─────────────┘                               └─────────────┘
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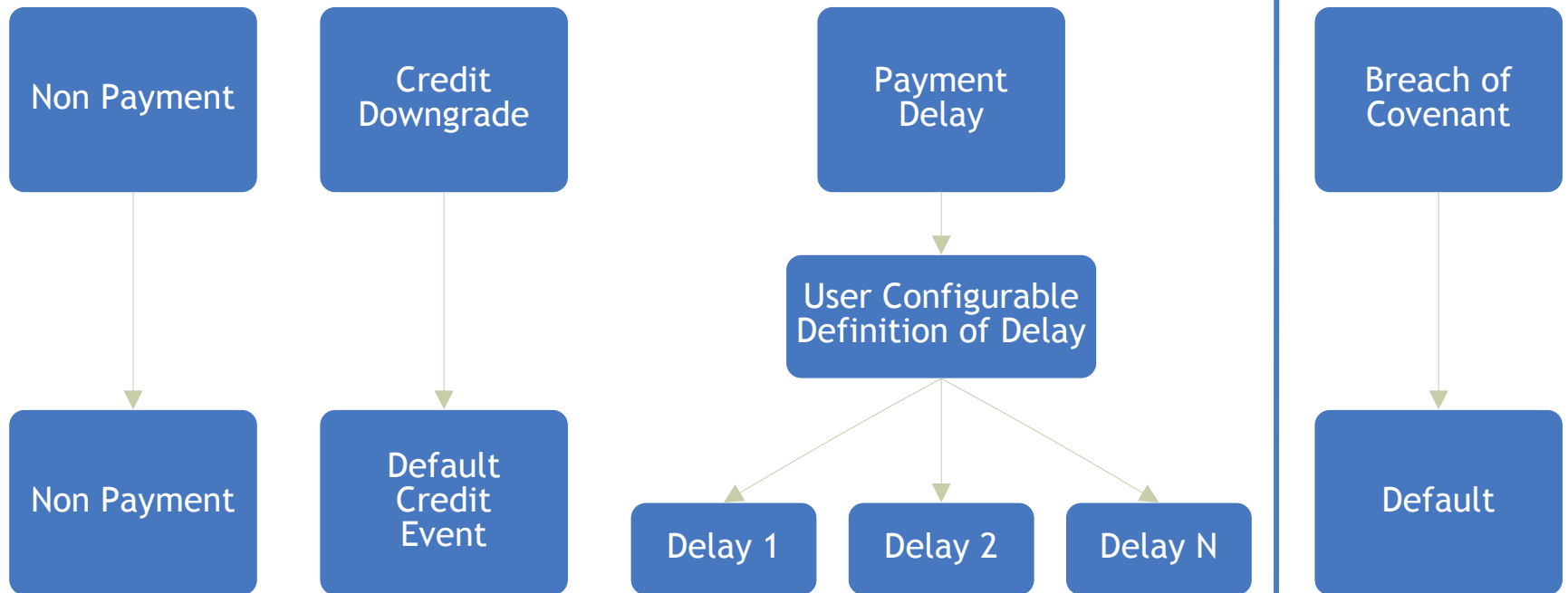
PD 1.0

Credit Events

Aggregate Score Range		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Total
90	100	-	2	2	1	1	1	3	6	3	2	2	1	24
80	90	-	3	5	2	2	2	3	3	3	4	4	5	36
70	80	-	7	3	4	4	5	3	2	3	2	3	4	40
60	70	-	5	5	6	5	7	4	2	3	5	2	3	47
50	60	-	7	4	5	7	7	4	2	3	5	6	7	57
40	50	-	9	6	8	9	9	3	5	8	5	8	5	75
30	40	-	10	5	6	9	11	9	10	6	7	8	9	90
20	30	-	11	9	6	8	11	6	13	9	7	6	8	94
10	20	-	11	13	12	9	15	5	8	9	9	13	11	115
-100	10	-	14	13	12	15	10	11	12	16	16	13	11	143

Total Updates

Aggregate Score Range		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Total
90	100	34	21	23	12	34	32	21	13	32	23	42	12	299
80	90	32	23	44	52	32	43	54	23	43	52	13	32	443
70	80	22	31	41	30	29	48	43	60	40	53	45	35	477
60	70	28	29	43	53	43	54	49	56	47	55	53	36	546
50	60	55	67	54	74	55	45	55	36	53	43	55	41	633
40	50	67	64	62	45	76	88	69	52	65	63	86	75	812
30	40	56	63	67	74	72	77	77	81	91	90	91	90	929
20	30	67	69	76	84	111	95	87	60	81	77	76	78	961
10	20	123	124	107	104	97	94	93	95	77	73	69	58	1,114
-100	10	99	93	96	68	93	107	89	94	128	125	113	76	1,181

PD 2.0

Probability of Default

Aggregate Score Range		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Total
90	100	0.00%	9.52%	8.70%	8.33%	2.94%	3.13%	14.29%	46.15%	9.38%	8.70%	4.76%	8.33%	8.03%
80	90	0.00%	13.04%	11.36%	3.85%	6.25%	4.65%	5.56%	13.04%	6.98%	7.69%	30.77%	15.63%	8.13%
70	80	0.00%	22.58%	7.32%	13.33%	13.79%	10.42%	6.98%	3.33%	7.50%	3.77%	6.67%	11.43%	8.39%
60	70	0.00%	17.24%	11.63%	11.32%	11.63%	12.96%	8.16%	3.57%	6.38%	9.09%	3.77%	8.33%	8.61%
50	60	0.00%	10.45%	7.41%	6.76%	12.73%	15.56%	7.27%	5.56%	5.66%	11.63%	10.91%	17.07%	9.00%
40	50	0.00%	14.06%	9.68%	17.78%	11.84%	10.23%	4.35%	9.62%	12.31%	7.94%	9.30%	6.67%	9.24%
30	40	0.00%	15.87%	7.46%	8.11%	12.50%	14.29%	11.69%	12.35%	6.59%	7.78%	8.79%	10.00%	9.69%
20	30	0.00%	15.94%	11.84%	7.14%	7.21%	11.58%	6.90%	21.67%	11.11%	9.09%	7.89%	10.26%	9.78%
10	20	0.00%	8.87%	12.15%	11.54%	9.28%	15.96%	5.38%	8.42%	11.69%	12.33%	18.84%	18.97%	10.32%
-100	10	0.00%	15.05%	13.54%	17.65%	16.13%	9.35%	12.36%	12.77%	12.50%	12.80%	11.50%	14.47%	12.11%

Feedback Loop

SCORING ENGINE

PROBABILITY OF DEFAULT

PDs by customer attributes

PDs by accounting ratios

PDs by raw financials
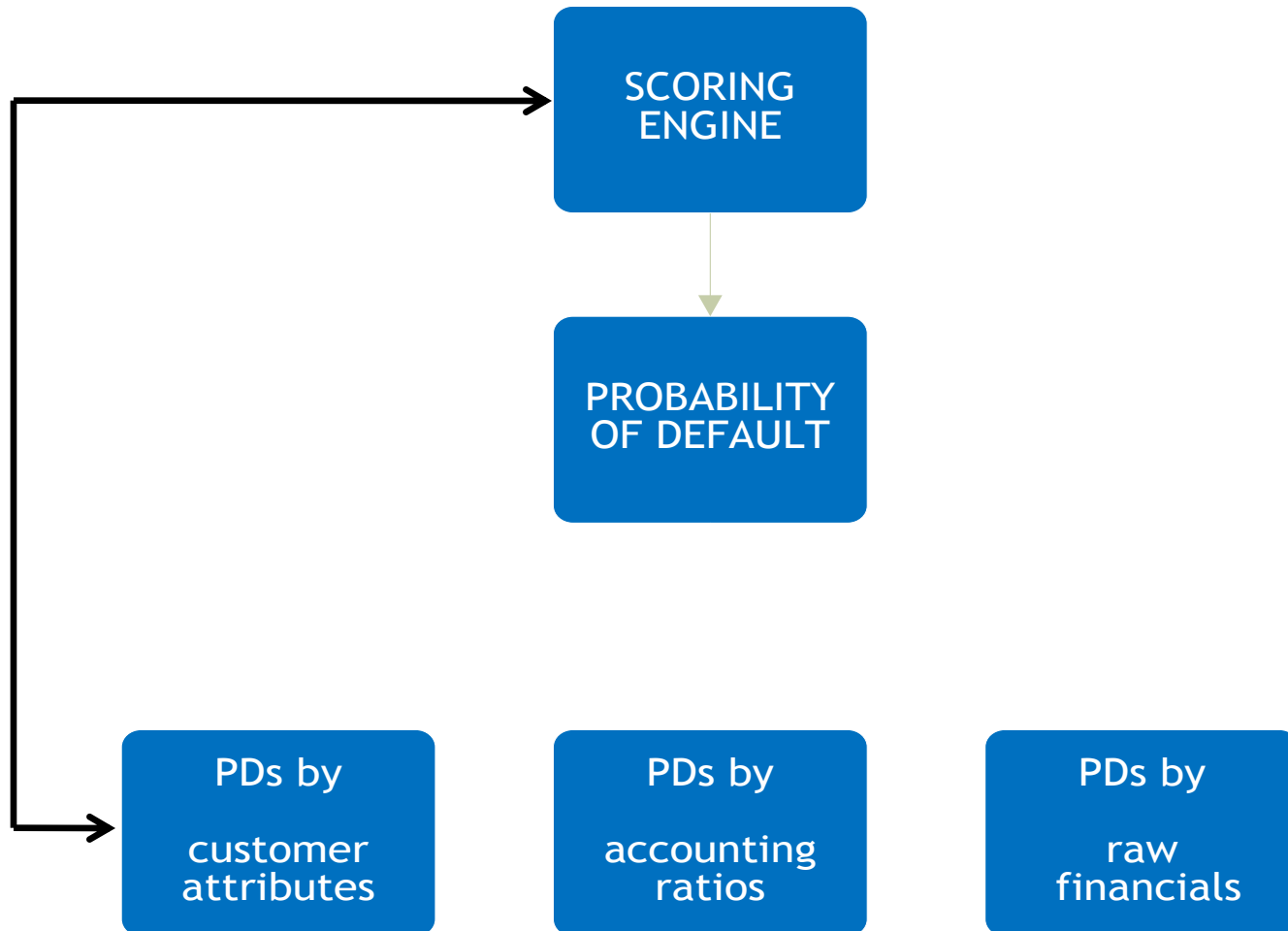
Feedback 1.0

Interest Coverage		PD		Sales Growth		PD		Leverage		PD
-10.00	-5.00	5.26%		-100.0%	0.0%	5.45%		-1.00	0.20	3.38%
-5.00	0.00	1.28%		0.0%	10.0%	6.18%		0.20	0.50	5.53%
0.00	5.00	6.48%		10.0%	20.0%	5.03%		0.50	0.70	5.93%
5.00	10.00	4.59%		20.0%	30.0%	8.97%		0.70	1.00	6.89%
10.00	15.00	5.99%		30.0%	40.0%	5.88%		1.00	1.20	10.00%
15.00	20.00	5.51%		40.0%	50.0%	0.00%		**Sector**		**PD**
20.00	25.00	1.49%		50.0%	70.0%	5.47%		SME		5.04%
25.00	30.00	1.33%		70.0%	100.0%	3.48%		Corporate		3.85%
30.00	35.00	0.00%		100.0%	200.0%	5.67%		**Current Ratio**		**PD**
35.00	40.00	9.09%		200.0%	300.0%	3.77%		0.00	2.00	5.44%
40.00	45.00	0.00%		300.0%	400.0%	2.00%		2.00	3.00	4.89%
45.00	50.00	0.00%		400.0%	500.0%	5.00%		3.00	4.00	3.35%
50.00	100.00	0.00%						4.00	5.00	3.10%
								5.00	7.00	2.50%

PD Snapshot

Score Range		Updates	Events	PD
81	100	574	14	2.40%
61	80	535	7	1.28%
41	60	2,679	53	1.98%
21	40	1,985	28	1.42%
0	20	604	3	0.42%

Score Distribution
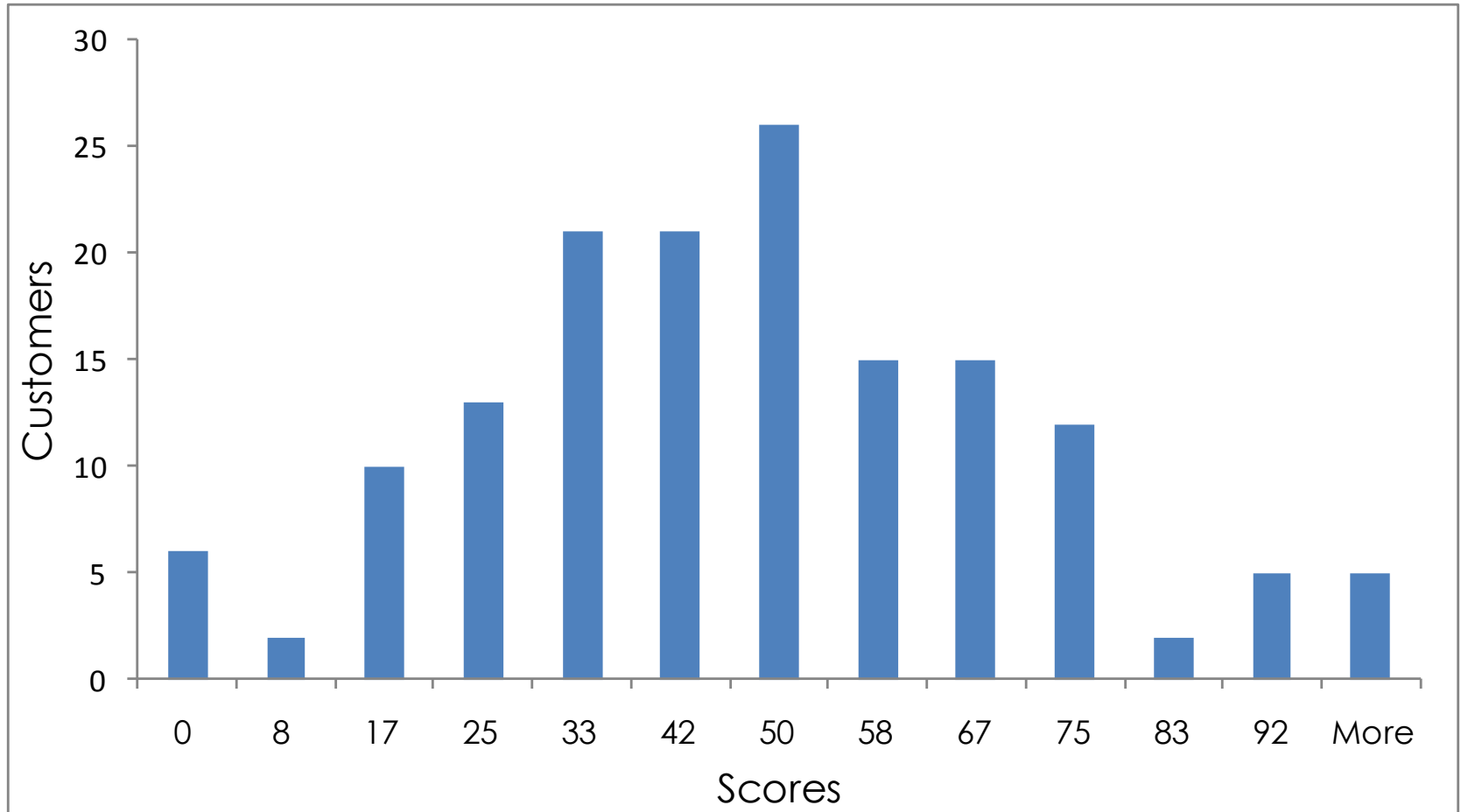
PD Distribution
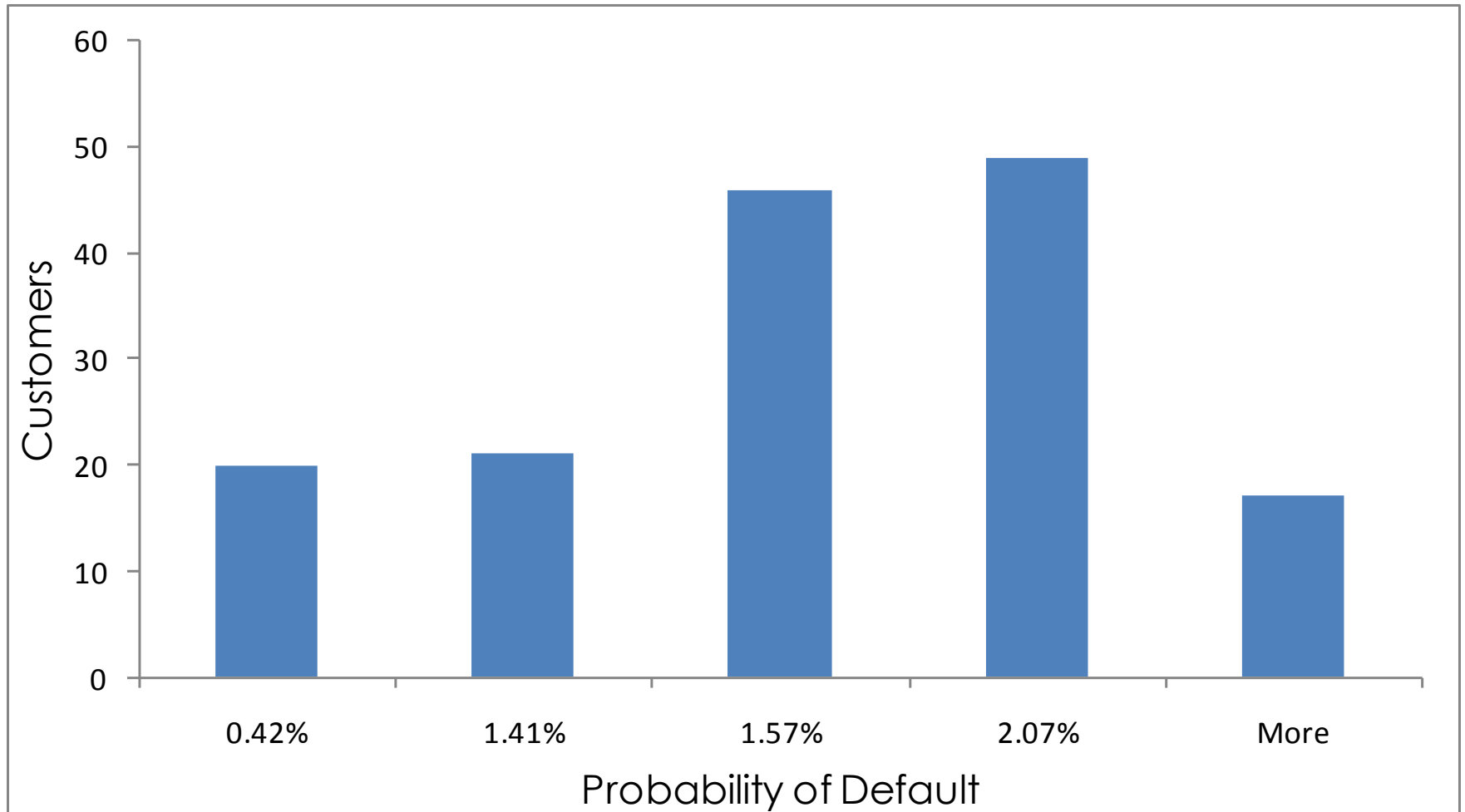
PD 3.0

CUSTOMER PROFILE

Basic Attributes & Financials

PAYMENT BEHAVIOR

Amounts & Status

Customer Score

Credit Event

Probability of Default

PD 4.0

CUSTOMER SNAPSHOT

CUSTOMER FINANCIALS

PAYMENT BEHAVIOR

FACILITY INFORMATION

Customer Score

Credit Event

Probability of Default

PD 5.0

CUSTOMER SNAPSHOT

CUSTOMER FINANCIALS

PAYMENT BEHAVIOR

FACILITY INFORMATION

Updates

Scoring Engine

Default Definition

Customer Score

Credit Event

Probability of Default

Re-scoring engine

Customer Financials

Customer Profile

Determine Scoring Elements

Assign Sector Specific Weights to Scoring Elements

Compute sector specific scoring elements for each customer

COMPUTE SCORING ELEMENTS

Map scoring elements to rating scores

Mapping

For elements 1 to n, Σ scores for all weighted elements

CUSTOMER SCORE

Transition Matrix

Others												
	1	2	3	4	5	6	7	8	9	10	11	12
1	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-
3	-	-	152.21	-	-	-	-	-	-	-	-	-
4	-	-	-	46.04	-	-	-	-	-	1.30	-	141.44
5	-	-	-	-	31.35	-	-	-	-	-	-	0.39
6	-	-	-	-	-	0.44	56.65	-	-	-	-	-
7	-	-	-	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	7.32

Challenges

Project Scope
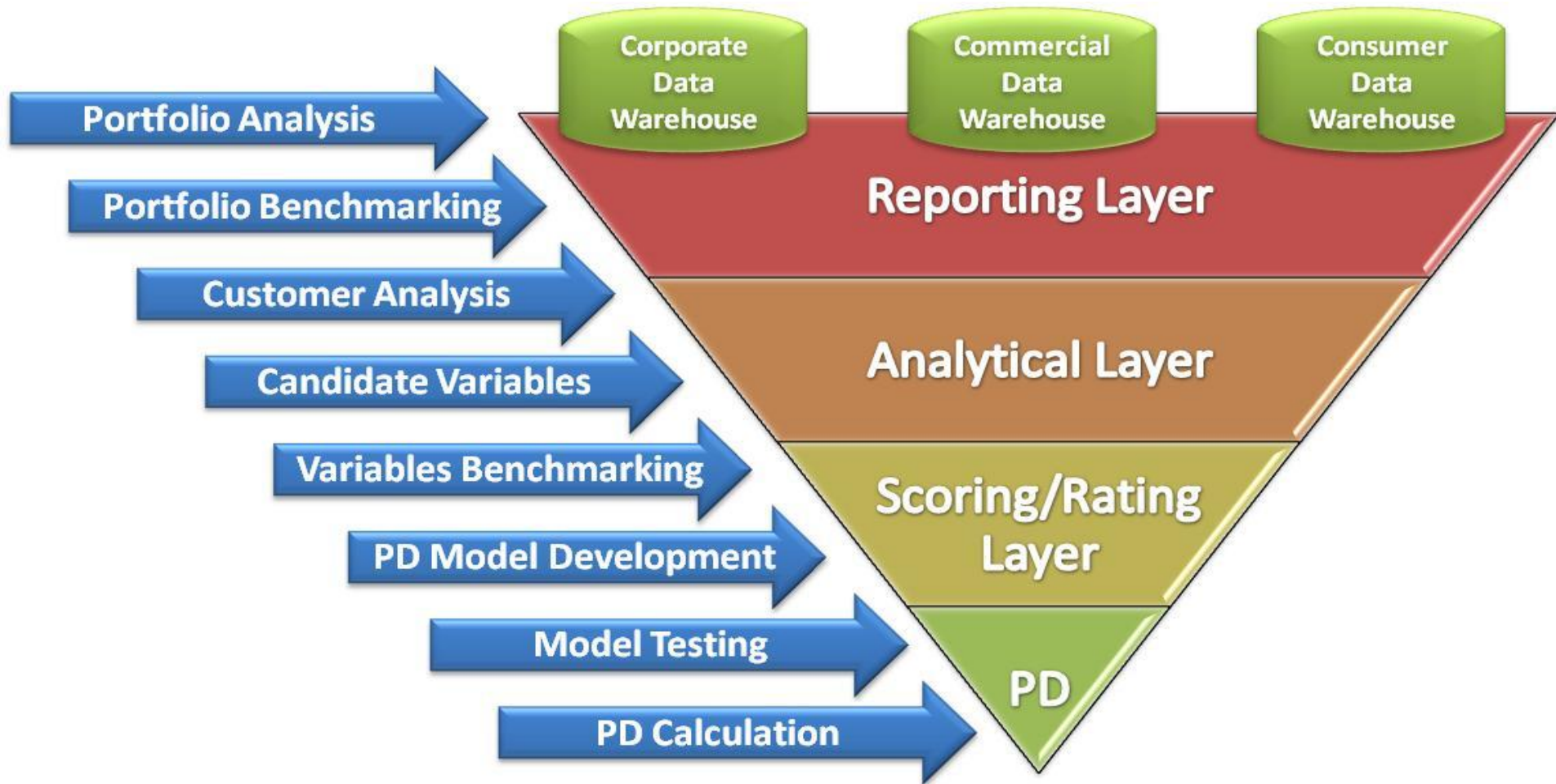
Variables Benchmarking

PD Model Development

Model Testing

PD Calculation

Scoring/Rating Layer

PD

The Pooled PD vision

Data & Process
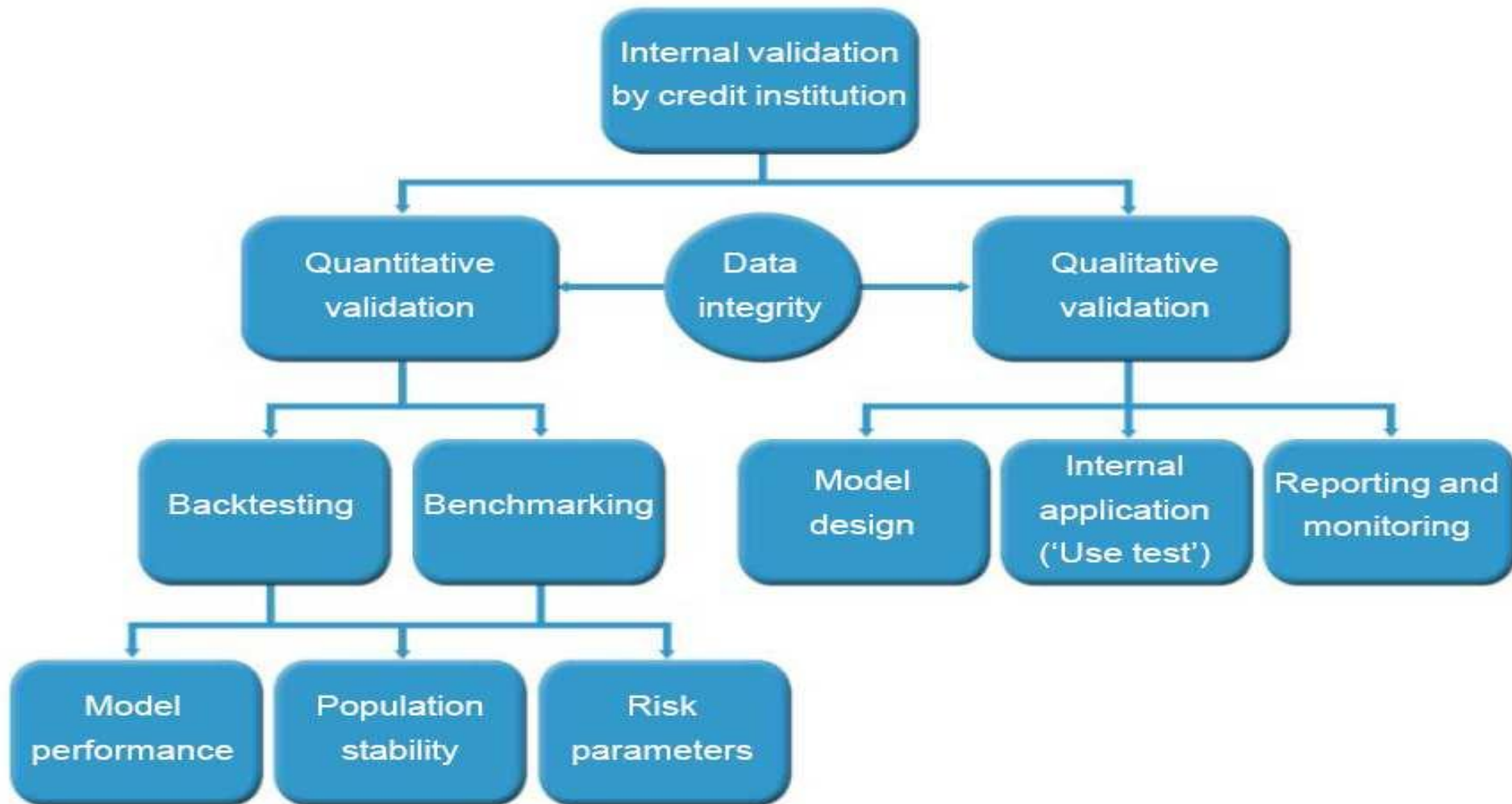
Merton's

Merton PD Model Mapping

Spot Price	• Spot price of Firm Assets • Market Value of Firm Assets

Strike Price	• Book Value of Firm Debt

Volatility	• Volatility of Assets • Volatility of Equities – MV of Equities

Time	• 1 year? Term of loan or firm liabilities

Risk Free Rate	• Risk Free Rate

?

$$c(S,t) = SN(d_1) - Xe^{-r(T-t)}N(d_2)$$

where: $N(\cdot)$ distribution function for a standard Normal (i.e. *N(0,1)*)

Merton's

Equity =

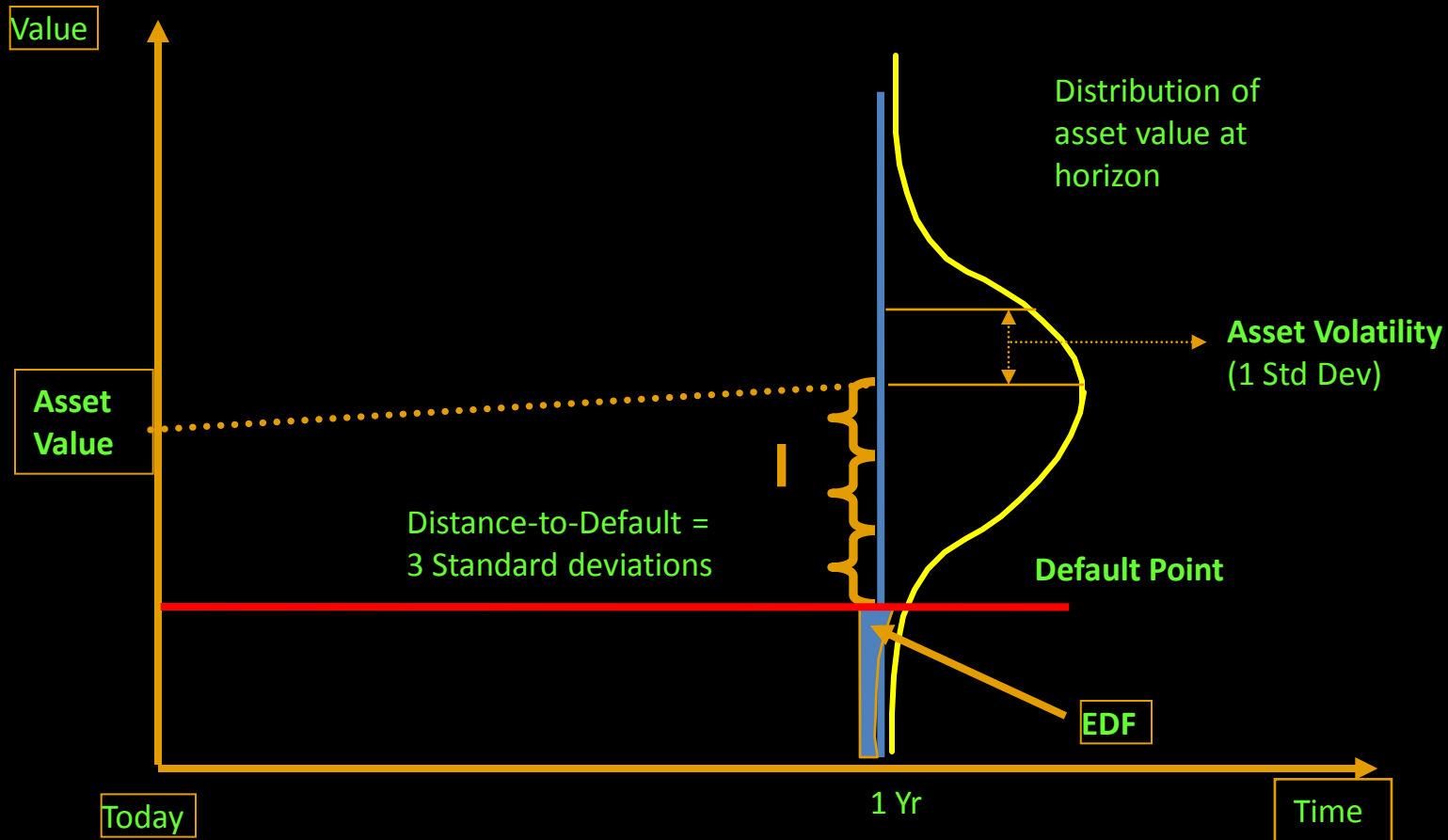$$V * N(d1) - \exp(-rt) * D * N(d2)$$

EDF/Structural Approach

Value

Distribution of asset value at horizon

Asset Volatility (1 Std Dev)

Asset Value

Distance-to-Default = 3 Standard deviations

Default Point

EDF

Today

1 Yr

Time

Merton PD Equation

$$V_E = V_A N(d1) - e^{-rT} X N(d2)$$

where

V_E is the market value of the firm's equity,

$$d1 = \frac{\ln\left(V_A / X\right) + \left(r + \frac{\sigma_A^2}{2}\right) T}{\sigma_A \sqrt{T}},$$
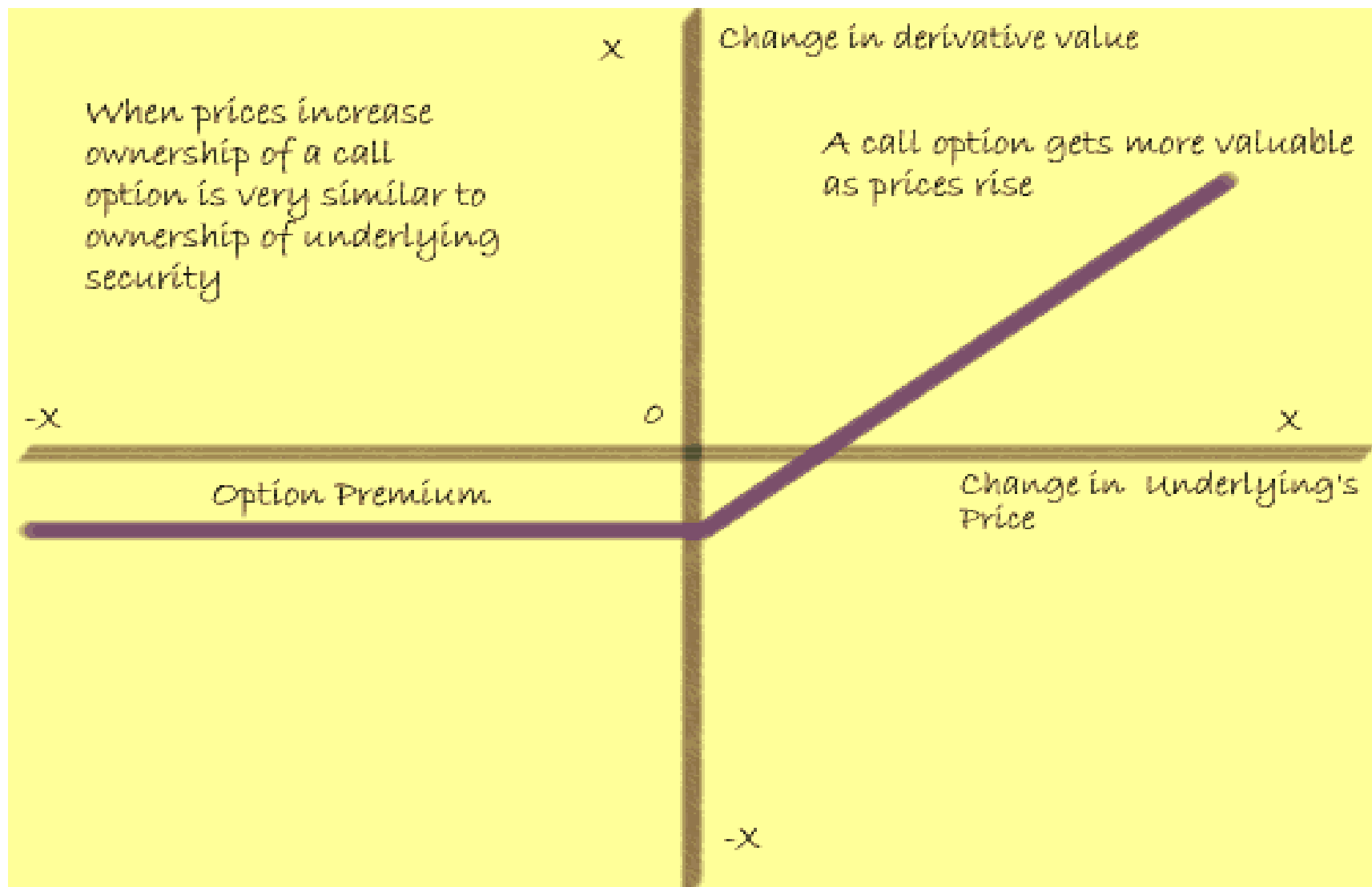
$$d2 = d1 - \sigma_A \sqrt{T}, \text{ and}$$

r is the risk free interest rate.

$$\sigma_E = \frac{V_A}{V_E} \Delta \, \sigma_A$$

Call Option

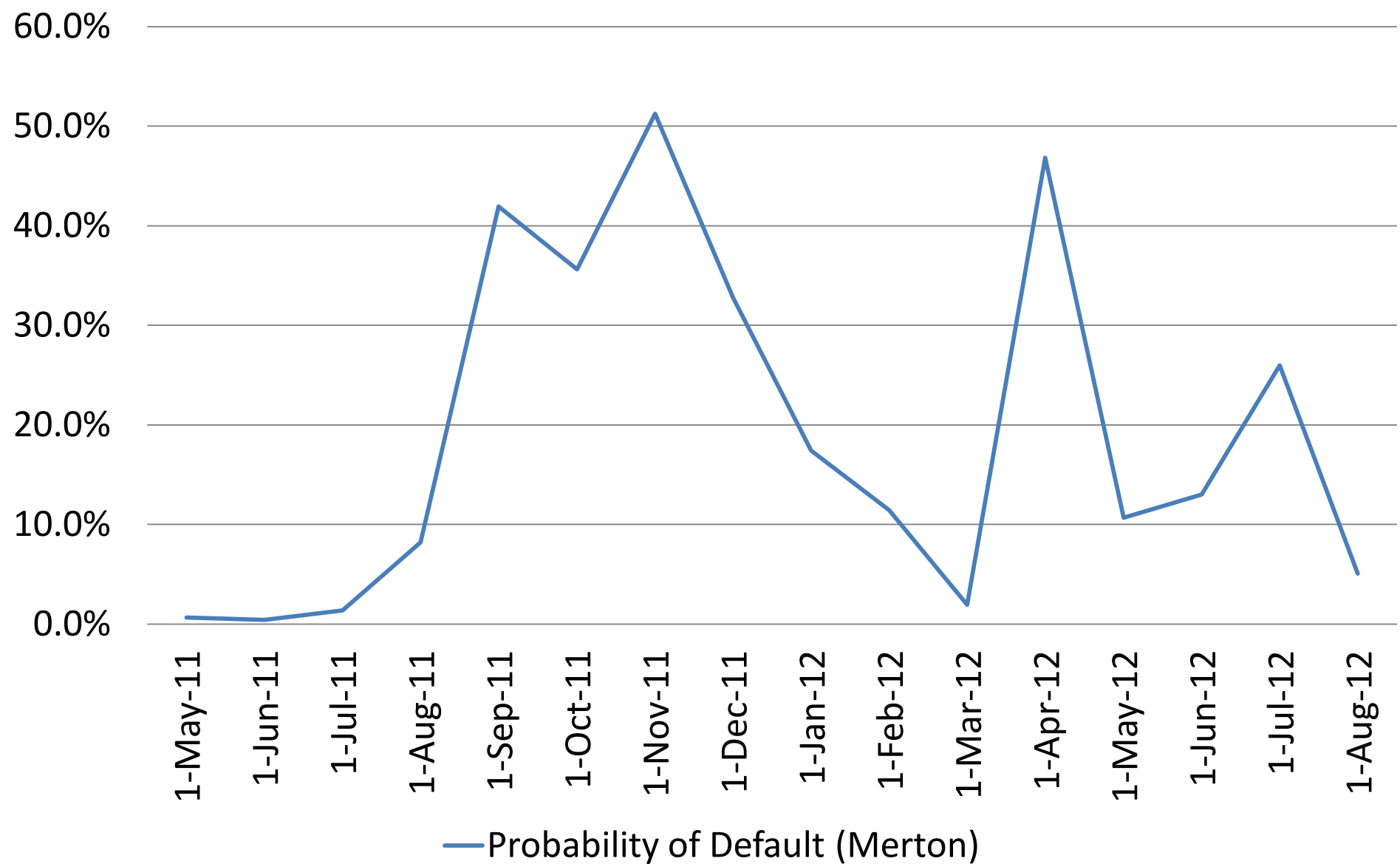When prices increase ownership of a call option is very similar to ownership of underlying security

Change in derivative value

A call option gets more valuable as prices rise

x

-x

0

x

Option Premium

Change in Underlying's Price

-x

The Usual Suspects

Submitting Bank	Market Cap / Equity Base (USD Billions)	Pretax Income (USD Billions)
Bank of America	230	1
JP Morgan Chase	184	19
HSBC	136	22
The Royal Bank of Scotland Group	116	(1)
Bank of Tokyo-Mitsubishi UFJ Ltd	108	7
Barclays Bank plc	101	9
Citibank NA	77	11
Lloyds Banking Group	72	4
Deutsche Bank AG	69	6
Royal Bank of Canada	69	7
Credit Agricole CIB	64	(2)
Société Générale	61	3
Rabobank	58	4
UBS AG	57	4
The Norinchukin Bank	53	2
BNP Paribas	48	8
Credit Suisse	32	29
Sumitomo Mitsui Banking Corporation Europe Ltd (SMBCE)	2	0

Assignment – 48 hours

- Estimate trailing PD's using the structured approach for the following 6 banks
- Barclays
- BAML
- HSBC
- JP Morgan Chase
- Royal Bank of Canada
- RaboBank

Probability of Default (Merton)

Probability of Default (Merton)

Probability of Default (Merton)

Probability of Default (Merton)