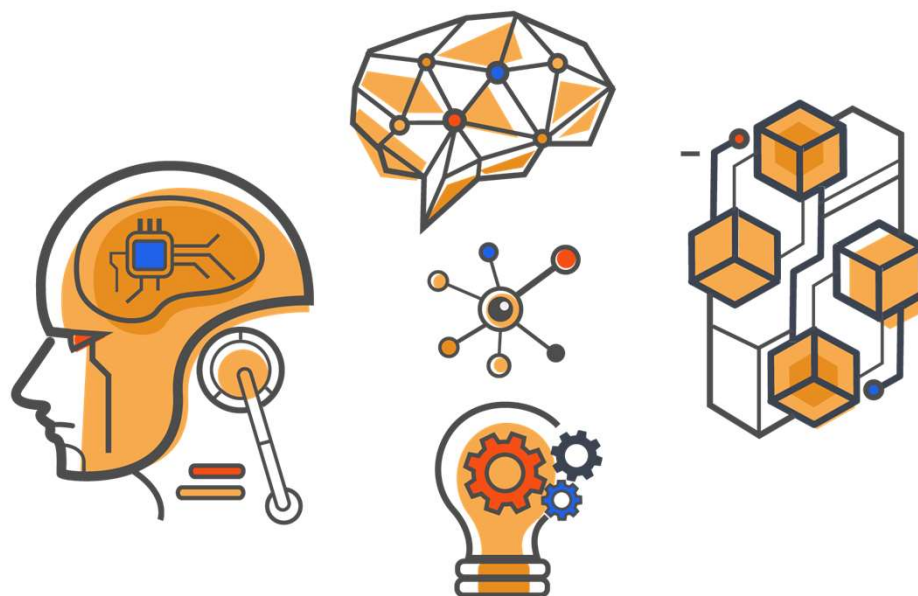




Thesis Proposal Outline and Structure

Terence Creighton

Student Number: 1922498



Progressing Financial Risk Management: Theoretical base study on the application of Artificial Intelligence and Machine Learning in Liquidity, Credit and Market Risk Management

Abstract

Purpose

- To develop a theoretical model for the application of machine learning in Liquidity, Credit and Market Risk with in Banking
- Increase the scope of data sources that a bank can analyse to address the challenges that affecting financial institutions

Originality and Value

- There is no model or implementation of Artificial Intelligence or Machine Learning in Liquidity, Credit and Market Risk with in Banking.
- The inclusion of data external to the bank into the Risk management models allowing for more accurate and real-time liquidity and exposure reporting



Research Problems and Objectives

Background



Financial Institutions

- Financial institutions are critical to the operation of the economy
- The financial institutions engages in products and services that impact the financial markets, positively and negatively
- The practice of liquidity, credit and market risk management ensures the negative impact is minimised and controlled
- In response to the financial crisis of 2007/2008 the Basel Committee on Banking Supervision agreed to the 3rd instalment of Basel – Basel III (2010)

What this meant was Banks had

- Higher capital requirements
- Minimum leverage ratios
- Additional two liquidity ratios
- Additional reporting requirements

Problem Statement



Current Process

- The banking institution have implemented several systems to enable the required reporting.
- The process of data gathering, reviewing and reporting is a manual process, limited data sources and partly supported by the systems

Problem

- The practice of liquidity, credit and market risk management is manual and does not give the bank flexibility for real time exposure reporting or understanding their investment constraints.
- The process is mostly reactive versus proactive
- The process relies on human intervention for decision making, reporting and understanding investment constraints
- The process lacks the use of data outside of the bank that affects the market and banks market risk exposure

Research Objectives



- Understand the role of Artificial Intelligence and Machine Learning in operations of Financial Institutions
- The evaluation of risk management factors to provide clear guidelines for the study and expected results
- The effect of predictive AI on Financial Risk Management, Bank Liquidity, Banking Market, Bank Operations
- To understand the machine learning technique that will be utilised in the management of banking liquidity, credit and market risk

Research Questions



- How can credit risk be managed using artificial intelligence/ machine learning through regulation?
- How can new and existing markets be accessed using artificial intelligence/ machine learning and the existing risks be mitigated?
- How can bank liquidity be managed using artificial intelligence/ machine learning?



Research Design

Definition of Variables

The three variables involved in this study are:

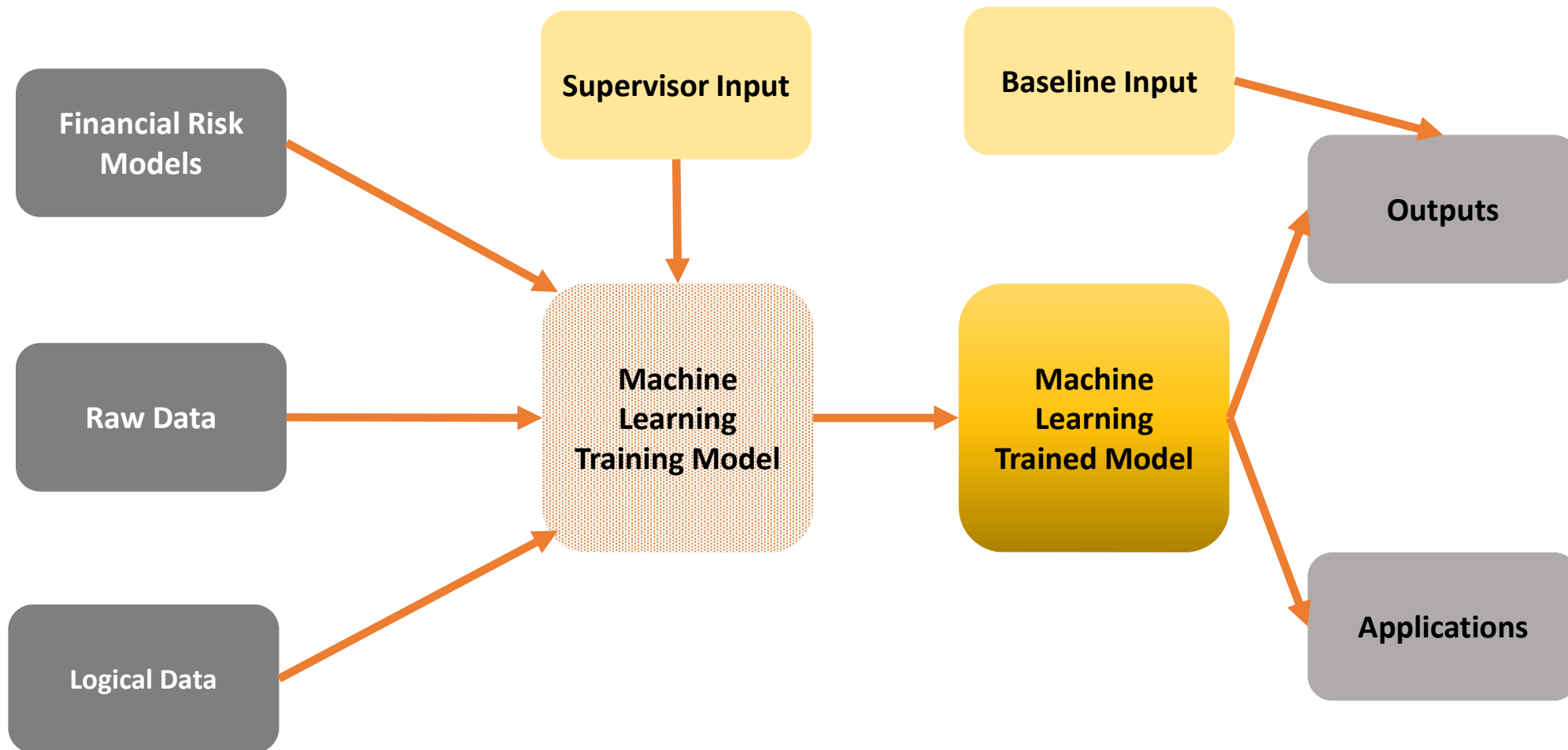
- **Dependant Variable**

- Variable 1: The risk factors affected by the machine learning and AI.
- Variable 2: The Liquidity Coverage Ratio, Net Stable Funding Ratio and Capital requirements reporting values affected by the machine learning and AI.
 - The dependent variable can either increase or reduce depending on the effectiveness of machine learning is making a difference in the study.

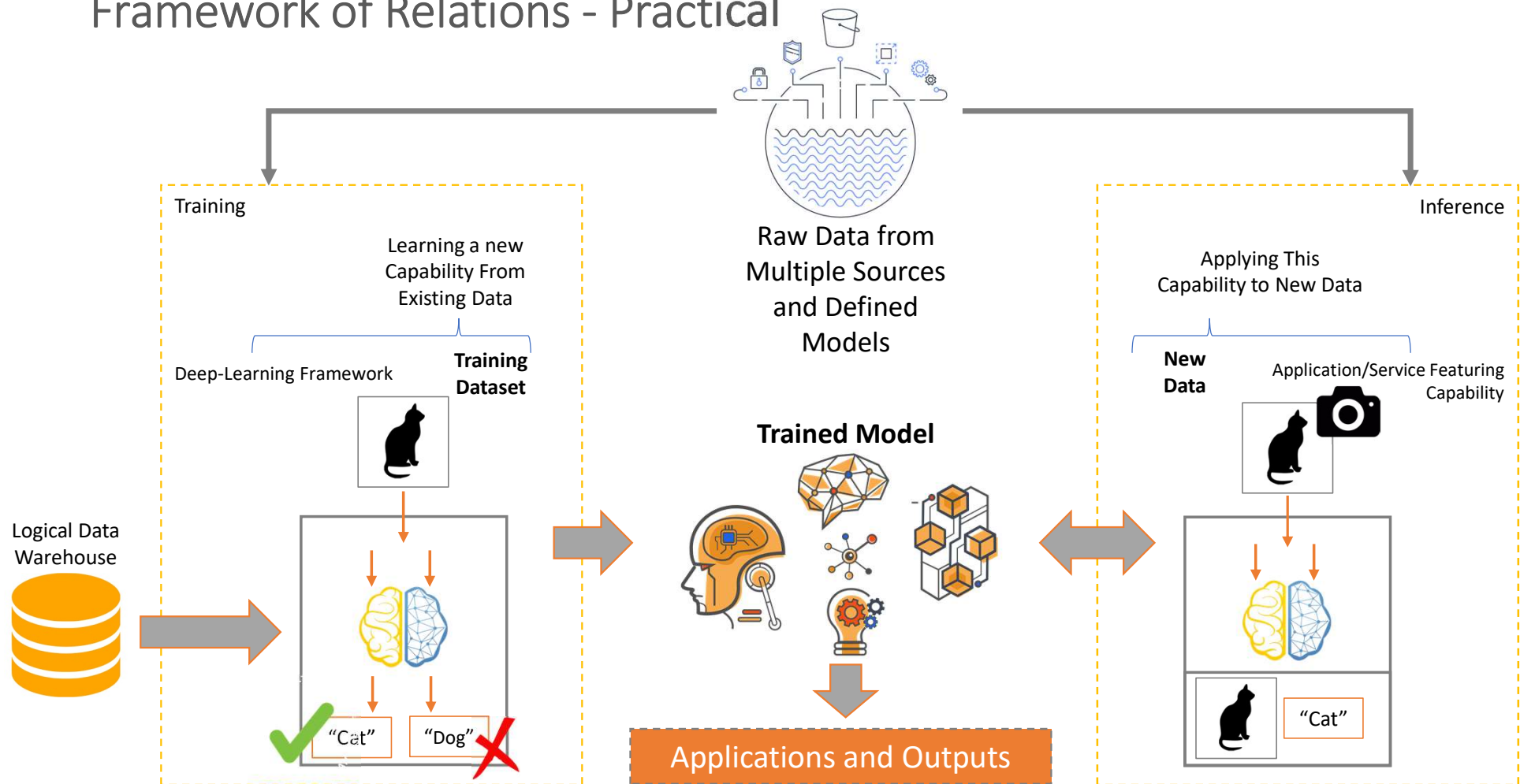
- **Independent Variable**

- The independent variable in the study is considered to be the use of machine learning in the study.
- This variable seems to be consistent throughout the research

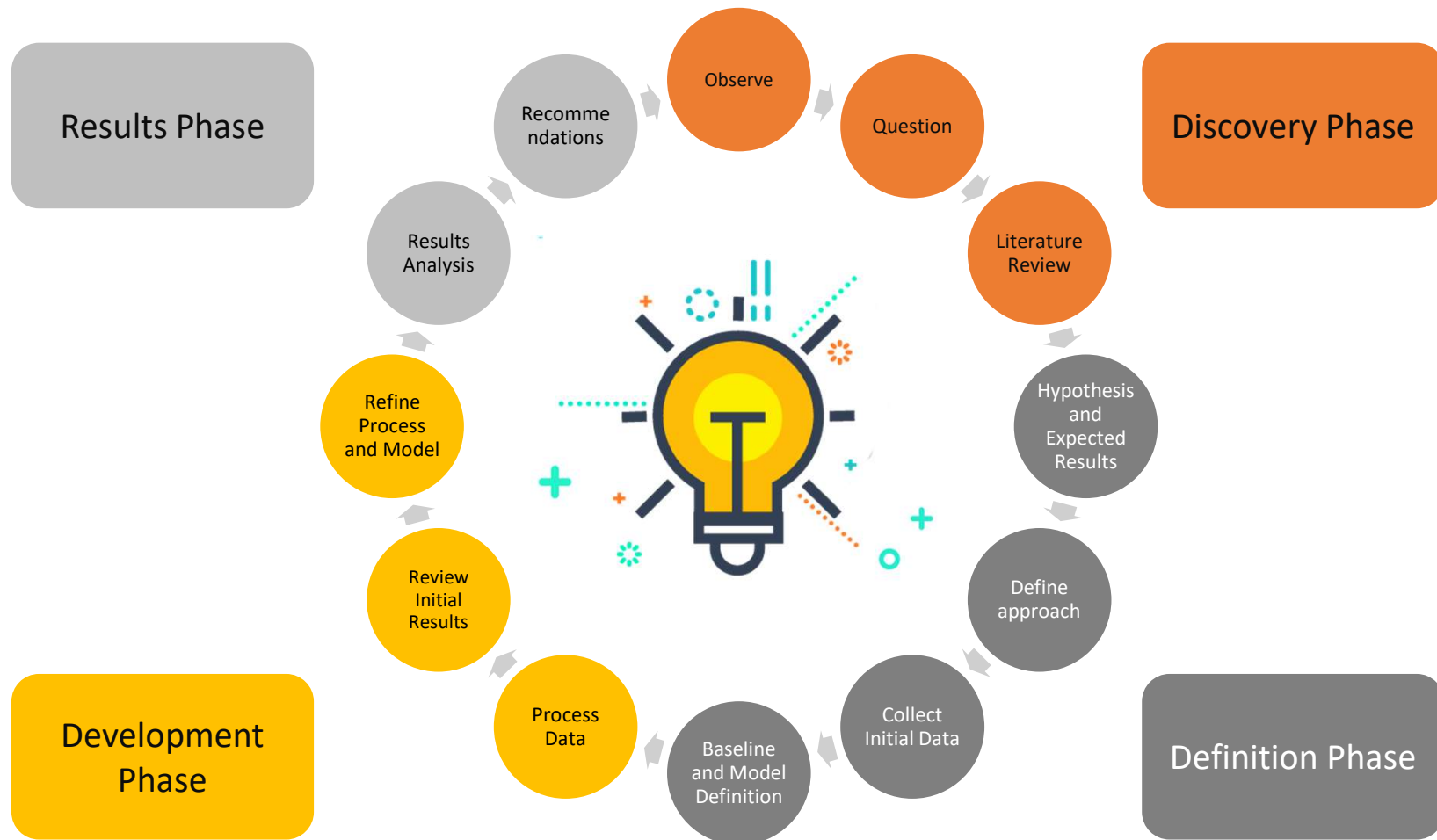
Framework of Relations



Framework of Relations - Practical



Research Method



Sampling

- The research will collect data at three points within the study these being
 1. **Definition Phase** - Collection of data to shape the approach and to get a better understanding of the models and how they are used.
 - This will be done by non-probability sampling from a group of respondents with in the Asset Liability Management business unit. These respondents will be Subject Matter Experts (SMEs) with in the area
 2. **Design Phase** - Collection of data for the initial training of the model
 - This will be done by non-probability sampling from a group pre-existing data that has been used to report current liquidity. This will allow for the supervised training of the machine learning model
 3. **Development Phase** - Collection of data for the application of the new learnt capability
 - This will be done by simple probability sampling from a large selection of data sources. This will allow the research to validate the model learning and as well as extend the learning further
 4. **Results Phase** – Collection of data on the final results of the Trained Model

Sampling

Target Population

HSBC

Data Sampling Size

Discovery Phase

SME in ALM BU within
the Bank

Definition Phase

Reporting Data for the
last Financial Year

Development
Phase

Reporting Data since
the inception of Basel
3 and New Data

Results Phase

All data output from
ML Trained Model

Limitations

- The study will theoretical framework instead of a practical aspect base
- Since the information provided is theoretical, not all aspects of the research will be accessible and as such broad research is needed.
- Limited time frame requires a broad scope of research and narrowing down of specific information.

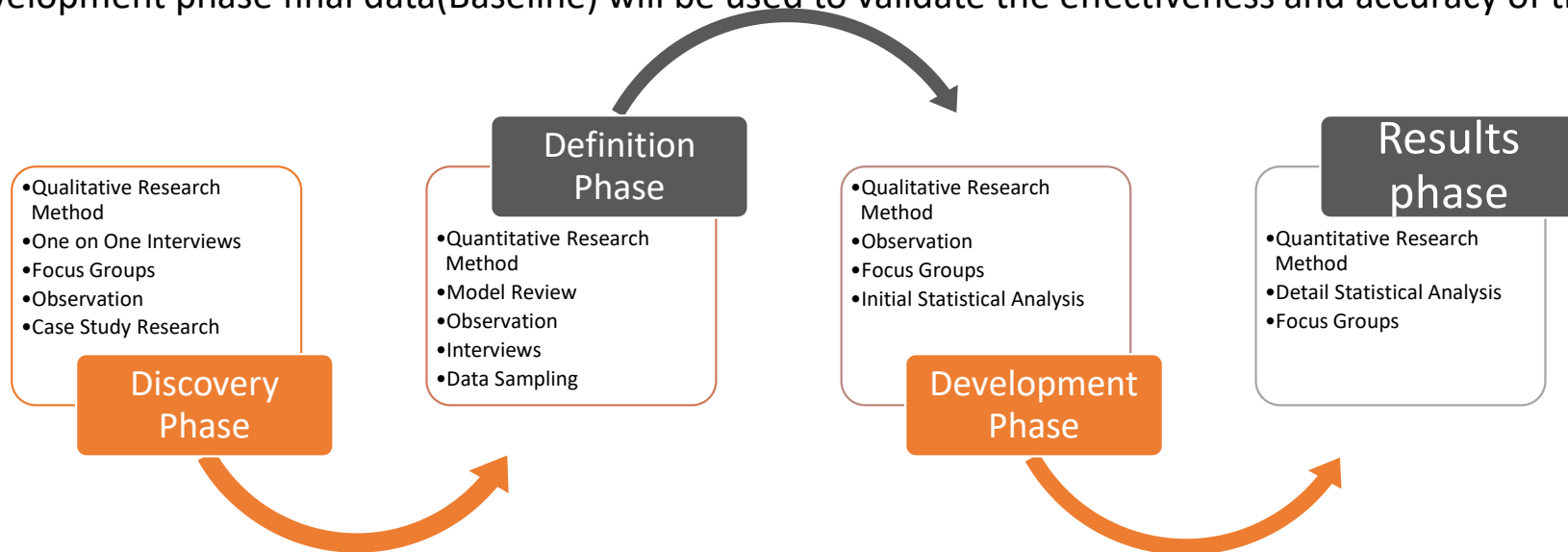
All three of these limitations are a result of limited studies within the Liquidity, Credit and Market Risk in the Machine Learning space



Data Collection, Analyses and Reporting

Data Collection and Processing

- Data output of each phase will be used as the input or refinement into the next phase
- Data collected in in each phase will be used as follows
 - Discovery phase data will be used to define the approach, document the expected results to define the initial machine learning model
 - Definition phase data will be used to collect the initial data(Baseline), conduct initial runs of the ML model and refine any expected results
 - Development phase final data(Baseline) will be used to validate the effectiveness and accuracy of the model



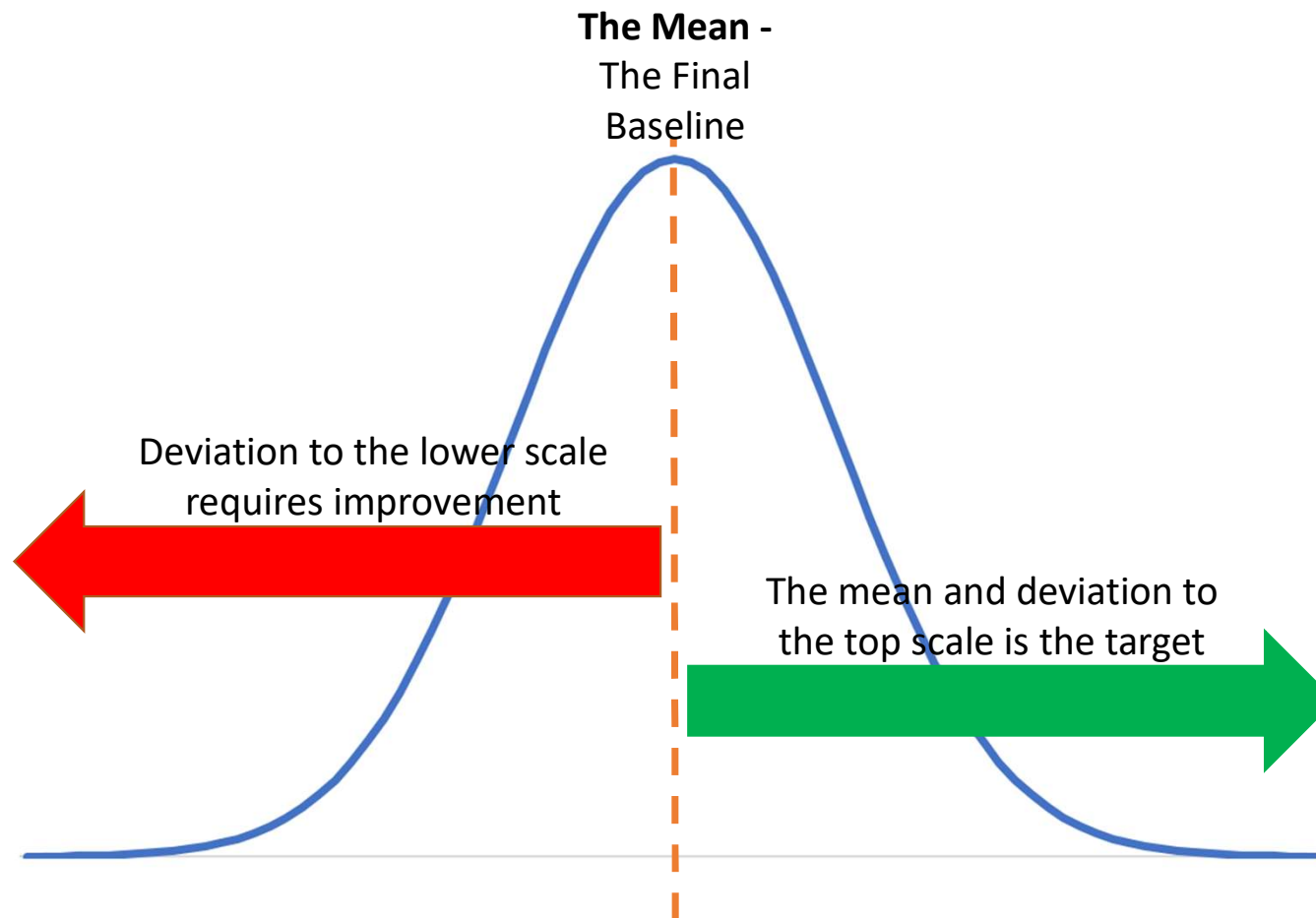
Baseline Creation – Variance from the Baseline (Mean)

Basel Baseline		2015	2016	2017	2018	2019	Minimum Standard
Basel Baseline		A ↑	B	C ↑	D ↑	E	
Bank Baseline		V	W ↑	X	Y	Z ↑	
Initial Baseline		A	W	C	D	Z	The Baseline is the initial Mean
Basel Baseline		2015	2016	2017	2018	2019	
ML Baseline		AA ↑	BB ↓	CC ↑	DD ↓	EE ↑	The Baseline is the Final Mean
Initial Baseline		A	W	C	D	Z	
Final Baseline		AA	W	CC	D	EE	

The highest value becomes the initial baseline

The highest value becomes the final baseline

Deviations from the Mean



Summary

- Financial institutions are fundamental to our economy, as demonstrated in the recent Covid-19 crisis
- Regulations are required to ensure that the financial institutions are functioning with in standards and the impact of a system crash is minimised and controlled
- It is important to ensure that the Basel Regulatory requirements are adhered to as a minimum, but this can be done better, smarter and faster to achieve
- The incorporation of technology into the operations increases performance and competitiveness
- Machine Learning plays a major role in Financial Institutions
- This study will enable this to happen making the financial systems safer and easier to react

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Questions