

**A NEW MODEL TO MEASURE THE EFFECTS OF PRICE TO BOOK RATIO
AND INTEREST RATE ON SHARE PRICE VOLATILITY OF FINANCIAL
INSTITUTIONS IN EMERGING MARKETS**

**A THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE
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ABSTRACT

The development of studies in the field of trading activities in emerging markets are taking relevance in the last time (Leite, Klotzle, Pinto & Ferreira da Silva, 2018). This study attempts to be part of existing literature on the topic of trading opportunities in developing nations. The present research objective was to design a new model to measure the effects of price to book ratio as a financial indicator related to bank share prices and interest rates on share price volatility of financial institutions in emerging economies. The data analysis method used in this academic work was regression analysis. This was done by developing multiple regression models in Microsoft Excel to find relationships between variables of the study. The model includes three variables: one dependent variable (share price volatility) and two independent variables (price to book ratio and interest rates). Secondary sources such as journal articles and the publicly available online database for the Central Bank of Brazil were used to collect information. The model designed was implemented to test its validity in the Central Bank of Brazil for the period December 2016 to September 2018. The researcher found no relationship between price to book ratio and interest rates and share price changes in the Central Bank of Brazil from December 2016 to September 2018. The researcher interpreted this to mean that changes in the price of shares of the Central Bank of Brazil were not predicted by price to book ratio and yields in the period from December 2016 up to September 2018. It is considered that financial institutions must have instruments to measure and control financial and macroeconomic indicators in the banking sector, such as share prices and yields indicators, to contribute to increase financial growth by making informed decisions. This is an academic professional tool to be used by researchers, students, financial managers, investors, policymakers and shareholders as a source of literature for studies. This research has contributed to existing literature on trading activities in emerging countries, and how to

study financial and macroeconomic variables that can influence stock price direction in developing nations, such as price to book ratio and yields.

Keywords: price to book ratio, interest rates, share price volatility, emerging markets, business model.

TABLE OF CONTENTS

ABSTRACT	i
TABLE OF CONTENTS	ii
LIST OF TABLES	vii
LIST OF FIGURES	vii
LIST OF ABBREVIATIONS.....	viii
ACKNOWLEDGEMENTS	xi
DECLARATION	xii
CHAPTER ONE: INTRODUCTION	1
1. Chapter one introduction	1
1.1 Background of the study	3
1.2 Problem statement	13
1.2.1 Thesis statement	15
1.2.1.1 Research rationale	15
1.2.1.2 Problem identification	16
1.2.2 Research aim	17
1.2.3 Specific objectives	17
1.2.4 Hypothesis of the study	18
1.2.5 Motivation for the study	18
1.2.6 Significance of the study	21
1.3 Study foundation.....	21
1.4 Methodology.....	24
1.4.1 Data collection.....	24
1.5 Benchmark	25
1.6 Research ethics	25
1.7 Limitation of the study	25

1.8 Delimitation of the study	26
1.9 Thesis paper structure	26
1.10 Chapter one summary	28
CHAPTER TWO: LITERATURE REVIEW	29
2. Introduction	29
2.1 Literature review	29
2.2 Price to book ratio	30
2.3 Interest rates studies	31
2.4 Share price volatility.....	33
2.5 Emerging markets overview.....	36
2.5.1 Brazil, Russia, India, China and South Africa (BRICS) emerging economies...	39
2.6 Business model.....	41
2.7 Chapter two summary.....	43
CHAPTER THREE: METHODOLOGY	44
3. Introduction	44
3.1 Research methods.....	45
3.2 Research designs	46
3.2.1 Limitation.....	47
3.2.2 Variables of the investigation	47
3.2.3 Model	48
3.2.3.1 Model specification	48
3.2.3.2 Diagnostic test	50
3.2.4 Research hypothesis	50
3.2.5 Data collection	51
3.2.6 Data analysis	52

3.3 Research instruments	52
--------------------------------	----

3.4 Research ethics	53
---------------------------	----

3.5 Summary	53
-------------------	----

CHAPTER FOUR: A NEW MODEL TO MEASURE THE PRICE TO BOOK RATIO AND INTEREST RATE EFFECTS ON SHARE PRICE VOLATILITY OF DEVELOPING NATIONS FINANCIAL INSTITUTIONS. MODEL DESIGNS AND SPECIFICATIONS.....	54
---	-----------

4. Introduction	54
-----------------------	----

4.1 Model designs	56
-------------------------	----

4.2 Model specifications	58
--------------------------------	----

4.2.1 Phase I of the model.	58
----------------------------------	----

4.2.2 Phase II of the model.	60
-----------------------------------	----

4.2.3 Phase III of the model	61
------------------------------------	----

4.2.4 Phase IV of the model.	66
-----------------------------------	----

4.2.5 Phase V of the model.	67
----------------------------------	----

4.3 Advantages and disadvantages of the model designed	69
--	----

4.4 Summary	71
-------------------	----

CHAPTER FIVE: IMPLEMENTATION OF THE NEW MODEL TO MEASURE THE EFFECT OF PRICE TO BOOK RATIO AND INTEREST RATES ON SHARE PRICE VOLATILITY FOR FINANCIAL ORGANISATIONS IN DEVELOPING NATIONS.....	72
---	-----------

5. Introduction	72
5.1 Model implementation	72
5.1.1 Phase I of the model implementation	73
5.1.2 Phase II of the model implementation.....	74
5.1.3 Phase III of the model implementation	77
5.1.4 Phase IV of the model implementation	79
5.1.5 Phase V of the model implementation	92
5.2 Summary	97
CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS.....	98
6. Introduction	98
6.1 Study conclusions	98
6.2 Study recommendations	100
6.3 Suggestions for future studies.....	102
6.4 Summary	103
REFERENCES	105
ANNEXURE A	123
ANNEXURE B	124
ANNEXURE C	125
ANNEXURE D	128
ANNEXURE E	131
ANNEXURE F	136

LIST OF TABLES

Table 1.1 Study gap	8
Table 1.2: Summary of the study keywords	22
Table 2.1: List of emerging nations	37
Table 3.1: Variables of the study to develop the multiple regression analysis	47
Table 4.1: Advantages and disadvantages of the model designed	69
Table 5.1: Interest rates table	75
Table 5.2: Share price changes table	77
Table 5.3: Variables of the study to develop the simple regression analysis	80
Table 5.4: Improvement policy actions table	95
Table 6.1: Model implementation planning example	101

LIST OF FIGURES

Figure 1.1: Thesis paper structure illustration.....	27
Figure 2.1: Literature review framework illustration..	30
Figure 2.2: Illustration of a Business model structure with its phases and steps.....	42
Figure 4.1: A new model to measure the interest rate effect on the share price volatility of emerging markets financial organisations	57
Figure 4.2: Share price volatility calculation formula illustration....	64
Figure 5.1: Brazil nation map	73
Figure 5.2: Microsoft Excel Book page with the list of the share price changes values, interest rates values and price to book ratio values	81
Figure 5.3: Data Analysis / Analysis Tools Microsoft Excel window	82
Figure 5.4: Regression window in Microsoft Excel	83
Figure 5.5: Summary Output table in Microsoft Excel	84

Figure 5.6: T. Statistics and the T. Critical illustration	88
Figure 5.7: Relationship between Share price volatility (Y_1) and Interest rates (X_1) illustration.....	90

LIST OF ABBREVIATIONS

ABQM: Advanced Business Quantitative

Methods.

AMAD: Adjusted Mean Absolute Deviation.

ARDL: Asymmetric Autoregressive Distributed

Lag.

BCB: Central Bank of Brazil.

BEKK: Baba, Engle, Kraft, and

Kroner.

BMI: Business Model Innovation.

BRICS: Brazil, Russia, India, China

and South Africa.

BRL: Brazilian Real.

CMN: National Monetary Council.

CSREM: Cross random effect

model.

DIVP: Dividend Payout.

DOW: Day of the Week.

DPS: Dividend Per Share.

EGARCH: Exponential Generalized Autoregressive Conditional

Heteroskedasticity.

EPS: Earnings Per Share.

ESMs: Emerging Stock Markets

EVA: Economic Value Added.

FDI: Foreign Direct Investment.

GARCH: Generalized Autoregressive Conditional Heteroskedasticity.

GARCH – BEKK: generalized autoregressive conditional heteroscedasticity - Baba, Engle, Kraft.

GDP: Gross Domestic Product.

GMM: generalized methods of moments.

H_a: Alternative Hypothesis.

H₀: Null Hypothesis.

IFC: International Finance Corporation.

IPCA: National Consumer Price Index.

IR: Interest Rates.

MLR model: multiple linear regression model.

MODWT: Maximum Overlap Discrete Wavelet Transform.

MOY: Month Of the Year.

OECD: Organisation for Economic Cooperation and Development.

OLS: Ordinary Least Square.

P/B: Price to Book.

P value: probability value.

RBV: Realized

Bipower Variation.

SPV: Share Price

Volatility.

STD: Standard Deviation.

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TVP-VAR: Time Varying Parameter- Vector Auto

Regression.

UNISA: University of South Africa.

USA: United States of America.

USD: American dollar.

VaR: Value at Risk.

VAR: Vector Auto Regression.

VECM: Vector Error Correction Model.

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Yansy Caridad Odio Lopez

DECLARATION

I Yansy Caridad Odio Lopez, hereby declares that this study entitled: "**A new model to measure the effects of price to book ratio and interest rates on share price volatility of financial institutions in emerging markets**" is my own work and is a true reflection of my research, and that this work, or any part thereof has not been submitted for a degree at any other institution.

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CHAPTER I

INTRODUCTION

1. Introduction

Nowadays, the exchange of financial, natural and material resources has become a need for all nations in the world. This has put emerging markets in an advantageous position, because they have natural resources that attract foreign investment. In turn, the investment leads to development for both emerging and developed economies. Trading activities in nations call for experts on the topic to come together to study and propose development ideas. This was the motive for carrying out this investigation and the idea to design a model that can promote instruments to develop trading activities in developing countries.

A model is an instrument needed by every organization. It must not only be created and implemented when there exists an issue, but it must also exist as a proactive management tool to plan and to implement activities. The present research designed a financial tool to help financial managers and stockholders to have a measurable instrument to know the direction of share prices to make important informed decisions, as well as to know how the price to book ratio, relates to the price of the shares and how the macroeconomic variable interest rate can impact the price of the shares. This paper considered the need to design an instrument that could be useful to financial organisations. The statement by Naik & Padhi (2015) on the existence of a problem in developing nation's stock markets motivated this study. Naik & Padhi (2015) said that, recently, stock markets around the world have been experiencing volatility and emerging and rapidly developing countries are no exception. This stimulated the researcher to identify a problem to resolve.

The present investigation considered it relevant to investigate possible factors creating volatility in stock markets in emerging markets, one of them being interest rates. Stock prices are generally believed to be determined by some fundamental macroeconomic variable such as interest rates (Prempeh, 2016). The instrument designed in the present study was considered a way of giving possible solutions to the share volatility problem argued by Naik & Padhi (2015). According to Naik & Padhi (2015) there is volatility in the price of the shares in emerging stock markets, been that issue a topic to study. Proposing possible solutions, the present report considered a possible solution to the volatility issue: to study causes creating the changes, and thus the need for measurable instruments. This investigation designed a tool to measure the effects of the price to book ratio and interest rates on the share price volatility of financial institutions in developing countries.

The model designed as a result of this research was considered new because, according to the knowledge of the researcher, up to the time of the study there was no model like the one designed in this report. That is a model with not only econometric techniques to measure the relationship between the variables, but also incorporating economic indicators as part of the measurable techniques to take into consideration when measuring the link between the variables of the study.

The research aim was to design a new model to measure the effects of the price to book ratio and interest rates on share price volatility for emerging nation's financial organisations. It would allow the financial organisation to have financial instruments to measure the movement of share prices and the possible financial (price to book ratio) and macroeconomic (yields) indicators influencing the changes in the price of the shares; as well as to study the real issue of emerging stock markets experiencing volatility.

The purpose of this chapter was to bring out the elements of the introduction of the study, which were: background; problem statement; research objectives; significance; limitation and delimitation; briefly giving a definition of the study keywords; investigation methods; research ethics; outputs; benchmarks and the research structure and concluding with the summary of the chapter.

1.1 Background of the study

The aim of this research was to design a new model to measure the link between price to book ratio and yields with share price volatility in developing countries financial institutions. Therefore, it is important to refer to emerging markets, financial institutions, yields and prices in the background of this research.

Emerging markets are markets that are mostly aligned with developed economies, because of great possibilities of increasing capital due to their human and natural resources. This investigation used economies in transition because experts said that trading activities in developing nations are and shall be the most important investment theme to develop in the coming years (Investment Conference Madrid, 2017). With the growing integration of world stock markets, the importance of emerging markets as a field of research constantly rises (Leite, Klotzle, Pinto & Ferreira da Silva, 2018).

Trading and exchange in developing markets cannot be possible without financial institutions acting as intermediaries in the trading process. That is why it is important to study banks when conducting research about trading activities in emerging economies.

Interest rate risk affects decision making, performance, and the growth potential of financial institutions. A percentage change in interest rate significantly increases profit in emerging market banks by between 0.079 % and 0.09 % (Akpomiemie & Ojah, 2017). Akpomiemie & Ojah (2017) emphasised on the relevancy of controlling yields in the financial sector of emerging countries.

Dissanayake & Wickramasinghe (2016) said that stock price volatility is the platform for investment decisions of investors. Therefore, studying share price volatility as a topic becomes relevant for financial managers, investors and stockholders into the banking sector.

The price to book ratio variable was included in this academic work because it is assumed as the financial variable related to share price volatility of financial institutions. Share price value is needed when computing price to book ratio. Patel (2018) explained that price to book ratio is related to share price and it is relevant when forecasting price, suggesting the development of studies that measure the relationship in emerging markets.

The yields variable is included in the present research because they are an essential indicator to consider when studying economies in transition. It is what investors and the representatives of developing countries negotiate when making investment decisions. Interest rates influence investor sentiment, so, it must be studied as a relevant variable when negotiating the shares of a financial institution.

Akpomiemie & Ojah (2017) explained the importance of creating instruments to control yields and its influence on other variables, such as share price volatility, demonstrating the relevancy of considering interest rates as a variable that influences share price volatility, and this justifies this study.

A statement supporting the relevancy of investigating interest rates versus share price volatility is the one argued by Prempeh (2016) that said stock prices are generally believed to be determined by some fundamental macroeconomic variable such as interest rates. Zainudin, Mahdzan & Yet (2018) explained that one of the macroeconomic variables to take into consideration when trying to understand the behavior of stock prices are yields, supporting the importance of considering interest rate relationship with share price volatility in the financial sector as a relevant topic of study.

Emerging economies were chosen to be studied in the present academic work because the researcher felt the model would be more applicable in this context of developing financial markets and would help emerging economies to improve their financial sectors. Naik & Padhi (2015) explained that studies in emerging markets are relevant and are on the rise. Naik & Padhi (2015) also stated that the existence of share price volatility in emerging countries is a reality that affects those nations. The present thesis attempts to contribute to change that volatility issue by designing an instrument that can help to take proactive actions based in informed decisions about the direction of yields and share prices to minimise the occurrence of those changes thereby resulting in more stability. Current models such as (Dewasiri & Banda, 2015; Camilleri, Grima & Grima, 2018; English, Van den Heuve & Zakrajsek, 2018) measured the relationship between the research variables, however, they did not proposed recommendations to minimise the volatility issue due to yields direction in emerging markets. The present research proposes actions or recommendations based on the model implementation to minimise the share price movements occurrence in emerging financial markets (see recommendations in chapter 5 of the present study).

The banking sector in developing countries plays a critical role in spurring economic growth because it becomes the dominant factor facilitating financial investment for economic and social growth. Banks, as the financial intermediary, play an essential role in the growth of impact investment (Ralphada & Horne, 2017). This investigation chooses the banking sector to study because of its importance for the economic growth of countries as financial intermediaries. Effective management of interest rate risk is central to banking. Understanding bank exposure to interest rate risk is important for bank risk managers, shareholders, creditors, counterparties and for policymakers (English, Van den Heuvel & Zakrajsek, 2018). The present study chooses the financial sector based on English, Van den Heuvel & Zakrajsek (2018) who brought out the importance of studying yields linked to stock price volatility in the financial sector for the development of nations. Nearer, home, in an attempt to contribute to the Master's Degree of Business Administration with specialisation in Finance course the researcher thought it prudent to come up with a model as proposed in this research. As part of the Master's Degree of Business Administration with specialisation in Finance course the researcher was required to develop a research on financial topics, such as shares, yields, financial institutions and financial management tools topics.

This research is based on volatility in emerging financial stock markets and instruments to measure the changes. It will also look at possible causes of the fluctuations and propose solutions based on the findings found after the model designed in the present study implementation.

There are studies measuring the relationship between price to book ratio and yields with share price volatility (Dewasiri & Banda, 2015; Camilleri, Grima & Grima, 2018; English, Van den Heuve & Zakrajsek, 2018). However, they did not considered as part of their models, economic indicators such as country situation analysis, which is considered relevant when studying interest rates and share price direction of economies in transition.

This report incorporates the economic analysis as a different approach to use when studying the financial sector of developing countries. This investigation considers it is important to understand the economic situation of countries in transition when analyzing the influence of macroeconomic indicators such as yields in the price of the shares of banks.

This study designed a new model to measure the relationship between the study variables that include both, econometric and economic analysis as part of the instrument. It also includes qualitative and quantitative phases and steps, as a way of proposing solutions to the stock volatility problem of those countries (see model in chapter four). The investigation is based on prior studies that investigated the relationship among the variables but did not included the economic analysis indicator as part of the model.

The rationale for the research is supported by the following **research gap**:

Table 1.1 Study gap.

Title	Year	Keywords	Methodology	Variables	Contributions
Dividend Policy and Stock Price Volatility: An Error Corrected Approach.	2015	Pakistan, Business performance, Finance and banking, Share price, Banks, Price fluctuations.	Fixed effect regression model.	Dependent: share price. Independents: Dividend yield, asset growth, return on asset and Company size.	There exists a positive relationship of size with share price and a negative relationship of Dividend Yield, asset growth and return on asset with share price.
Dividend Policy and Stock Price Volatility: An Error Corrected Approach.	2015	Cross-section random effect model, dividend policy,	The cross-section random effect model (CSREM).	Dependent: share price volatility. Independents: Dividend	There exists a negative impact from dividend pay - out, a positive impact from

		Granger causality test and stock price volatility.		yield, Dividend Pay - out and Company size.	company size and a no evidence of significant impact from dividend yield (DY) on Stock Price Volatility.
Impact of dividend policy on stock price volatility and market value of the firm: evidence from Sri Lankan manufacturing companies.	2015	Dividend policy, Market price volatility, Panel data regression	Regression model.	Dividend policy, Market price volatility, Panel data regression	There exists a negative relationship between Dividend Yield Ratio and Share Price Volatility and the Dividend Pay - out ratio has a positive effect on Share Price Volatility.

Macroeconomic variables and Stock Price Volatility in Ghana.	2016	GSE -All Share Index, inflation, interest rate, Real Gross Domestic Product growth rate, Ghana.	The Granger causality test.	Dependent: share price volatility. Independents: inflation rate, real gross domestic product growth rate and interest rate.	There exists a positive relationship between real domestic product rate and stock price volatility and a negative relationship between inflation rate and interest rates with stock price volatility.
Financial instability, integration and volatility of emerging South	2017	Market integration, South Asia, Conditional volatility, Dow Jones	Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model.	Dependent: emerging South Asian stock markets. Independents:	Significant short- and long-run spillover impacts of international

Asian stock markets		Global, GARCH/T-GARCH, Net volatility change.		short and long-run spillover of international financial instability.	financial instability on the Asian stock returns.
Volatility in equity markets and monetary policy rate uncertainty.	2018	Equity indices, Monetary policy rate uncertainty, Option implied volatility, Realized volatility, Risk-free interest rates and Volatility forecasting.	Regression-based projections for realized variance.	Dependent: equity prices variation. Independent: short term interest rates.	There exists a relationship between interest rates and asset price movements.
The effect of dividend policy on share price	2018	Corporate finance, Banks, Stock	Dividend yield and dividend pay - out ratios as	Dependent: stock price volatility.	There exists a positive relationship

volatility: an analysis of Mediterranean banks' stocks.		markets, Dividends, Share price volatility.	proxies of dividend policy and Ordinary Least Square (OLS) regression model.	Independents: Dividend Yield and Dividend Pay - out.	between Dividend Yield, Dividend Pay - out and Stock Price Volatility.
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Source: Author’s own creation from literature reviewed.

Table 1.1 shows studies that investigated the relationship between macroeconomic variables such as interest rates and share price volatility as part of this study gap.

Study gap: the studies mentioned in table 1.1 investigated the relationship between dividend policy (interest rates and financial indicators) and share price volatility, explaining the relevance of considering dividend policy analysis to avoid unexpected fluctuations in stock prices and the importance of prices for financial organisations.

The models cited on table 1.1 are considered the **family of models** from where the new model designed in this investigation was extracted, because of the common feature with the present report of using regression analysis. However, there are studies supporting the need for including economic analysis when studying emerging markets volatility and not only the econometric analysis, they are: (Aras & Yilmaz, 2008; Kumar, 2017; Kumar & Dhankar, 2017; Kumar, MoonHaque & Sharma, 2018). The present study supports them and adds new knowledge to existing literature by incorporating a new approach (economic analysis indicator) into the model designed, developing both, the econometric and the economic analysis; as

relevant indicators to take into consideration when studying the financial sector of economies in transition. The emerging market specific characteristics such as lack of financial resources creates a scenario that requires the study of the direction of interest rates as an economic indicator and stock prices to be financially successful, which, can be done by including the economic analysis in measurement instruments, as was done in the present report.

1.2 Problem statement

Al-Khouri & Abdallah (2012) stated that financial instability may create uncertainty which can negatively affect the growth potential of countries. Therefore, to investigate economic factors affecting financial indicators becomes essential for the nation's economic growth. The present study adds the economic analysis indicator to the measurement of the relationship between price to book ratio and interest rates with share price volatility. This is because the researcher agrees with Akpomiemie & Ojah (2017) and Herrera & Herrera (2018) studies that explain that stable economic situation positively influences the behaviour of shares prices and yields.

The present researcher agrees with Akpomiemie & Ojah (2017) and Herrera & Herrera (2018) who argued the importance of understanding the developing country situation when analysing variables such as interest rates and stock price changes, because in unstable periods volatility increases, causing continuous changes in interest rates hereby negatively affecting the liquidity of financial institutions. The present research considers the economic country analysis relevant to develop the model designed in this study. The difference of this research with Akpomiemie & Ojah (2017) and Herrera & Herrera (2018) studies is that the present investigation includes the price to book ratio variable as an important indicator when studying the price of the share of financial institutions.

According to Herrera & Herrera (2018) to avoid volatile markets is important, because volatile markets increase changes in yields and prices affecting investors decisions, which is negative for bank profitability and a result of uncertainty. Therefore, avoiding volatile markets is essential to nation's economic growth. The present research agrees with Herrera & Herrera (2018) thought and understands the importance of developing markets that are not volatile, because volatility creates movements of share prices, which affect investment decisions of investors whether to invest or not, ending in a loss for the financial organization if investors decide not to invest, affecting the bank profitability.

Al-Khouri & Abdallah (2012) stated that being able to make predictions about financial market volatility is of special importance to investors and policy makers since it makes a measure available for risk exposure in their investment decisions. Therefore, an instrument to measure share price volatility as well as possible factors (price to book ratio and yields) creating that changes is essential to financial risk specialists and stockholders.

Recently, stock markets around the world experienced volatility and emerging and fastest developing countries are no exception (Naik & Padhi, 2015). This brings the problem to be studied to reality. Meaning, creating tools to measure the relationship between price to book ratio as a variable related to share prices, and interest rates with share price volatility of banks, including econometric and economic analysis, becomes relevant in emerging economies.

The study gap in table 1.1 shows different studies that investigated the relationship between macroeconomic indicators such as interest rates and stock price movements, however, they did not considered economic situation analysis as an important indicator to measure stability of those countries.

Economic situation analysis is considered relevant when researching countries in transition and their financial markets. The present academic work incorporates the economic situation indicator when analysing the financial market of developing economies.

1.2.1 Thesis statement

According to Prempeh (2016) interest rate is the cost of capital, and an increase or decrease in interest rate may affect investment decisions of investors. Prempeh (2016)'s study stated that if yields increase and the investor decides not to invest, it is a loss for the firm in share investment activities, the stock prices can increase or decrease causing volatility and affect the price of stock and its return. Therefore, designing instruments to measure the relationship between price to book ratio and interest rates with share price volatility of financial institutions becomes relevant. An essential reason that justifies why the researcher decided to include the macroeconomic variable interest rate into the study was the fact that yields influence shareholders' investment sentiment about the decision of to invest in the shares of the bank or not depending on the yield's direction.

1.2.1.1 Research rationale

Most papers reviewed on the interest rates versus share price volatility topic (Dewasiri & Banda, 2015; Gunarathne, Priyadarshanie & Samarakoon, 2015; Prempeh, 2016) show the relationship between variables using econometric models such as the Exponential Generalized Autoregressive Conditional Heteroskedasticity model. This study contributes to that literature by designing a new model to measure the relationship between research variables that include both, econometric and economic analysis as part of the instrument. The tool includes qualitative and quantitative phases and steps as part of the instrument designed.

1.2.1.2 Problem identification

There are papers arguing the existence of share price volatility in emerging markets, and that it is a reality hardly understood by many researchers, that needs to be studied. Rao (2008) found persistent volatility in emerging markets and suggested the need for further investigations on other factors influencing market's volatility, such as yields. Mollah & Mobarek (2009) found long-term persistent volatility in emerging markets and suggested the need for researching more on factors affecting developing markets' volatility. Emerging markets are characterized by high average return and volatility (Mayur, 2015). Misra & Mohapatra (2015) found that factors such as yields and price to book ratio affect investor sentiment. Recently, stock markets around the world experienced volatility and emerging and fastest developing countries are no exception (Naik & Padhi, 2015). Yavas & Rezayat (2016) found volatility in developing markets and suggested considering examining equity prices related to interest rates by investors. Kumar (2017) explained the relevancy of considering economic analysis when studying emerging stock market's volatility.

The papers mentioned above helped the researcher to identify a real existent issue to be studied: volatility in emerging markets. That is the real issue that motivated the present study: there is volatility in the price of the shares in emerging stock markets Naik & Padhi (2015). The researcher considers a way to contribute to solve that volatility issue, by designing an instrument that can measure the relationship between that volatility with other possible factors creating that volatility, such as the two independent variables price to book ratio and yields, as a way of knowing causes creating that volatility and proposing possible solutions to minimize the volatility occurrence based on informed decisions.

Based on the scenario explained above, the **Problem Statement** is:

There is a need for a new academic-professional model, with qualitative and quantitative phases to measure the price to book ratio and interest rate effect on share price volatility of financial institutions in emerging markets, as a way of minimising the volatility issue in those nations by studying factors such as price to book ratio and yields possibly causing those changes in the price of the shares in the financial institutions of emerging countries.

1.2.2 Research aim

- **Study aim:** to design a new model for the measurement of the effects of price to book ratio and interest rates on share price volatility of financial institutions in emerging economies.

1.2.3 Specific objectives of the study

To achieve the aim of the study the following **specific objectives** were developed:

- To explain the new model designed to measure the relationship between price to book ratio and interest rates with share price volatility.
- To develop the new model designed to measure the relationship between price to book ratio and interest rates with share price volatility of emerging markets' financial institutions in the Central Bank of Brazil to test its validity by developing it in a developing financial institution.
- To determine the relationship between price to book ratio and interest rates with share price volatility.
- To discuss the findings after the model implementation as part of the model designed.
- To recommend improvement policy actions based on the findings after the model designed implementation.

1.2.4 Hypothesis of the study

The null and alternative hypotheses are:

$H_0: \beta_1 = \beta_2 = 0 \Rightarrow$ The price to book ratio and interest rates have no effect on bank share price volatility.

$H_a: \beta_1 = \beta_2 \neq 0 \Rightarrow$ The price to book ratio and interest rates have an effect on bank share price volatility.

Where H_0 is the null hypothesis and H_a the alternate hypothesis which will be taken if the null hypothesis is rejected. $\beta_1 = \beta_2$ represents the relationship between the variables, therefore, when $\beta_1 = \beta_2$ is equal to zero the relationship between the report variables does not exist; and when $\beta_1 = \beta_2$ is different from zero there is a relationship between the study variables.

1.2.5 Motivation for the study

A motivation to conduct this research was that in recent years meetings have been taking place where experts have been coming together to exchange new ideas and experiences about share prices and the development of emerging economies through investment activities, promoting innovation and demonstrating the importance of trading activities in emerging markets. For instance, the Investment Conference that took place in Madrid in October of 2017, where experts were agreed that trading activities in emerging markets present the most relevant topic of study in the coming years: 2018 and 2019. The latest of the topic was an essential motivation for conducting the present study.

A motivation to conduct the present study was the fact that the research is regarding to topics learnt in the modules of Advanced Business Quantitative Methods and Equity Investments of the Master's Degree of Business Administration (Finance) course studied by the researcher. This integration of knowledges from the course is a positive thing because it is a way of practicing what the researcher learnt in the course, which motivated to the researcher immensely. It was a motivation for the researcher when choosing the topic, to know that the topic is regarding contents learnt in the Master's Degree of Business Administration (Finance) course modules Equity Investments and Advanced Business Quantitative Methods. The topic is also in connection with the career goal regarding to the development of Global Socioeconomic topics in research.

Al-Khouri & Abdaallah (2012) said that Stock market volatility has become a subject of mutual concern to investors, policymakers and financial intermediaries and is considered of great importance, especially in emerging economies, explaining the relevancy of developing research on emerging stock markets. The researcher is agreed with Al-Khouri & Abdaallah (2012) statement about the need of developing research in emerging economies and that motivated the developing of the present study. Another motivation to conduct the present research was the fact that the researcher was motivated with the idea of designing a model that can be useful to bank managers because will help them to make informed decisions. The instrument will help bank managers to know the direction of the yields, and if interest rates and price to book ratio are affecting the behaviour of the price of the shares of their banks. It is considered a relevant tool because knowing if the variables price to book ratio and yields affect the price of the bank shares will allow them to know from where the volatility issue is coming and to make improvement actions to minimise the changes in the price of the bank shares, as well as to know how that relationship

is influenced or not by the country situation. The researcher believes that it is important for financial organisations to have academic instruments that can help them to measure relationships between relevant indicators such as yields, price to book ratio and share prices to make important informed decisions about investment activities. Been that fact a motivation to conduct the study in the present topic.

It is important to develop a new model to measure the relationship between price to book ratio and interest rates with the share price volatility of financial institutions in emerging markets because it is a new instrument that can be used by those countries in their effort of increasing quality in investment activities where banks play an essential role as financial intermediaries. The instrument can be used by academicians and bank managers. The model designed is considered new because not only uses econometric technique such as multiple regression analysis to measure the relationship between the variables, but also analyses the country situation as a relevant indicator when studying economies in transition. The model also proposes policy recommendations based in the experiences earned after the model implementation. The model is considered new because of the its unique structure, the integrated content it has based on the variables used and the economic analysis included together, this makes of the tool a new model because according to the researcher knowledge was not found a model like the one designed in the present study. The idea of designing something new that can be useful to researchers and bank managers was a motivation to develop the present study.

1.2.6 Significance of the study

The stock market is an important concern for economists, researchers, investors, governments and policymakers. The stock market is the barometer for financial growth of a country which reflects the changes in the economy and direction in which it is moving (Patel, 2016). Boamah (2017) argued that Emerging stock markets (ESMs) assume an increasingly important role in global asset allocation decisions and that ESMs are potential areas to achieve high diversification of benefits by creating policies that incentivise foreign investments to their economies, such as interest rate policies to maintain fiscal discipline. Patel (2016) and Boamah (2017)'s studies argued the importance of developing studies related to trading activities in the financials' firms of developing economies. Also, the analysis of macroeconomic and financial variables that influence trading activities in developing markets, such as, yields and stock prices were equally important. The contribution of this thesis to knowledge on the subject is in the design of a new model with both, econometric and economic analysis indicators to measure the yield effect on share price volatility of financial organisations in emerging markets. It is believed this academic work could positively impact society because it will provide them with an academic-professional instrument to be used as a source of literature by researchers, policymakers and bank managers. The tool could inform financial managers about interest rates direction and its influence in the price of shares, as well as help stockholders to make informed investment decisions based on the price of shares and yields related to the price.

1.3 Study foundation

A summary of the thesis keywords definitions is exhibited in the following table:

Table 1.2: Summary of the study keyword concepts.

Keywords	Concepts	Authors	Year
Interest rates	Interest rates involve interbank market rate, the central-bank rate and the bank-level lending rate.	Geng, Grivoyannis, Zhang & He	2016
	Formally defined, interest rates represent the cost of borrowing and/or the return from fund lending action.	Akpomiemie & Ojah	2017
Share price volatility	Market volatility can be estimated using historical volatility and implied volatility measures. Historical volatility (or realized volatility) is a measure of past price movements of the underlying asset, whereas implied volatility reflects market expectations regarding the asset's future volatility.	Sehgal & Garg	2016
	Volatility is defined as the variation or deviation of an asset's returns from their mean (Kotze, 2005).	Zainudin, Mahdzan, & Yet	2018
Business model	A business model is the design of a plan to introduce better business model into an existing market, process named disruptive innovation.	Ovans	2015

	A business model embodies nothing less than the organisational and financial “architecture” of a business.	Philipson	2016
	A business model's contents as leading to keeping the promise of service, the satisfaction of needs and profitability, and providing the assurance of a long-term competitive advantage.	Khumalo & Lingen	2017
Emerging markets	Emerging markets are more integrated with the world market than amongst them. This indicates a potentially high diversification benefits for portfolios that diversify across Emerging markets.	Boamah	2017
	Developing nations represent a large share of the world's population as well as economic growth.	Sharma, Luk, Cardinali & Ogasavara	2018
Price to book ratio (P/B)	Price-to-book ratio (P/B) is often used as a proxy for corporate growth because there is a positive relationship between P/B and P/E, given the return on equity (ROE) of the company.	Amoako Adu & Smith	2002

1.5 Benchmark

The model designed in the present academic work was tested by implementing it in a developing country to prove its validity (see model implementation in chapter 5).

1.6 Research ethics

This paper uses publicly available data in order to avoid privacy issues. The information used to develop the present report is publicly available to everybody on databases, therefore, there is no need for permission to utilize that data. Appropriate citations are made in order to avoid plagiarism.

Approvals, requirements, regulations, procedures and guidelines from the University of Namibia for the writing of Masters' Degree thesis were respected during the writing of this report.

The information shown in this research is real. It is an academic work and it does not attempt to criticize other researchers' work or any institution.

Approval from the University of Namibia Business School to conduct the present investigation is attached (see annexure A of this study).

1.7 Limitation of the study

The model implementation is in only one developing country. This is a study limitation because the model must be implemented in more than one emerging country in order to use probability sampling techniques using a large sample size to justify study generalizability. This makes this investigation a modelling study type, which uses a small sample size. In the present report, the main objective was to design the model, that is the reason why its implementation in more than one developing country is given as a recommendation and suggestion for future studies.

1.8 Delimitation of the study

The demarcation of this study is the banking sector of developing countries. The financial sector was chosen to conduct this paper due to its importance for the development of emerging countries growth as intermediaries. The financial sector was considered relevant to conduct the investigation due to its content, as a discipline, is in line with the researcher's field of study: Master of Business Administration (Finance) Degree.

Emerging markets were chosen because of their relevance in the global economic development due to their features of having natural and material resources that can raise capital through investment activities development.

1.9 Research structure

The present academic work is structured as follows:

- Chapter 1: presents the elements of the thesis introduction: background, problem statement, motivation, significance, study foundation, methodology, research output, benchmark, research ethics, limitation and delimitation, paper structure and chapter summary.
- Chapter 2: reviews existing literature about the study keywords.
- Chapter 3: explains the report methodology.
- Chapter 4: designs the new model to measure the price to book ratio and yields effect on share price variations of developing nation's financial institutions, with the explanation of its phases and steps.
- Chapter 5: develops the model designed in an emerging country to measure the relationship between the study variables to prove the instrument validity.

- Chapter 6: presents the conclusions and recommendations of the investigation, as well as suggestions for the development of future studies.
- References and annexures of the thesis: are presented.

The thesis structure is illustrated in figure 1.1:

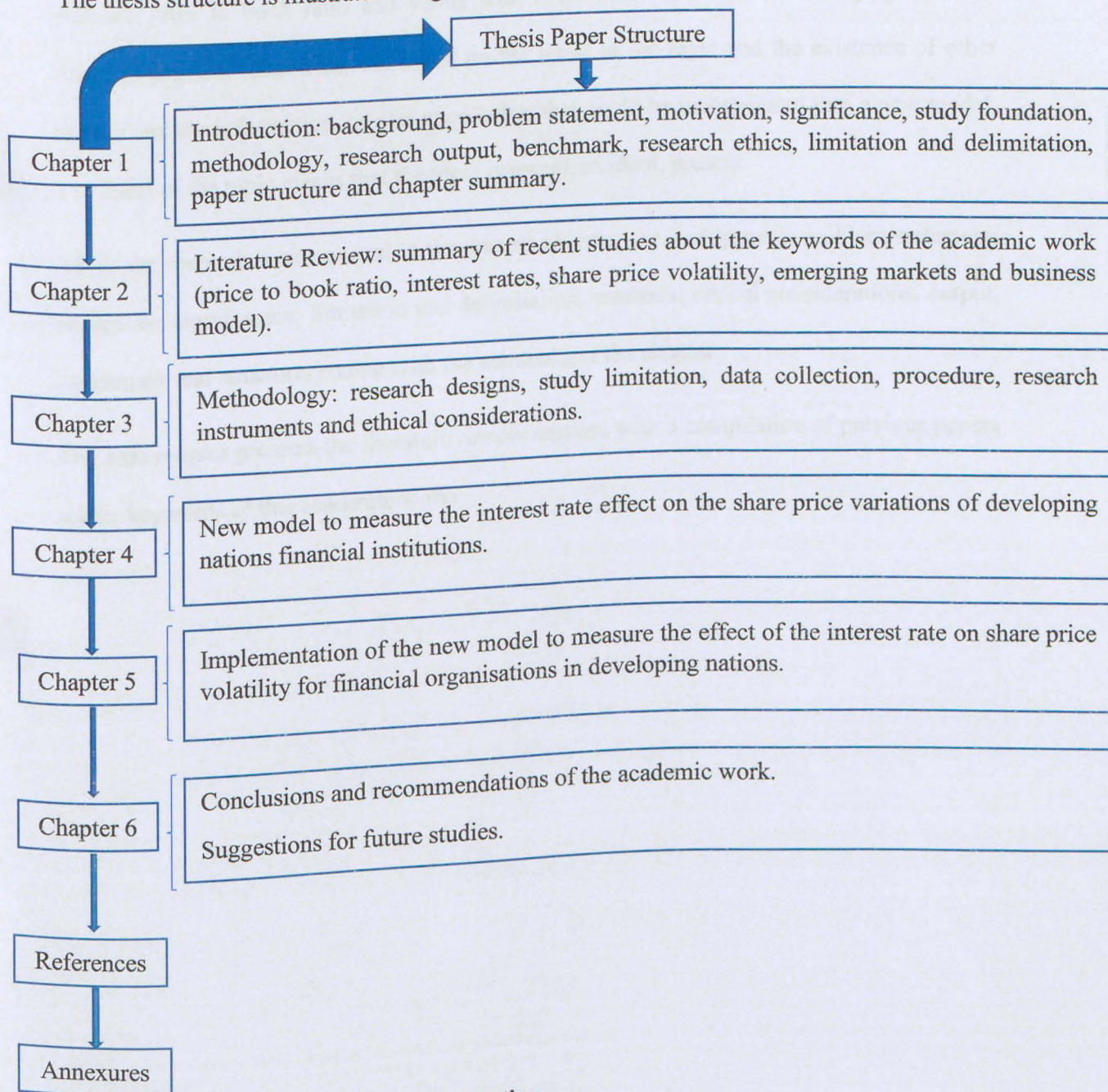


Figure 1.1 Thesis paper structure illustration.

Source: Author's own compilation.

Figure 1.1 exhibits the structure of the present investigation.

1.10 Chapter one summary

Chapter one justified the need for the creation of a new model to measure the relationship between price to book ratio and yields with share price variations in emerging markets' financial organisations. This was based on the latest of the topic and the existence of other papers, and the information, or new approaches that could be incorporated into a new model. The latest of the topic means that the topic is recent, modern, present.

About the research were covered in the present chapter: the background; problem statement; objectives; significance; limitation and delimitation; methods; ethical considerations, output, benchmark and structure, ending with the summary of the chapter.

The next chapter presents the literature review section, with a compilation of previous papers on the keywords of this academic work.

CHAPTER II

LITERATURE REVIEW

2. Introduction

As explained in chapter one, problem subheading of this research, volatility in emerging markets is a reality to be studied. Therefore, to find factors (price to book ratio and yields) creating those changes in order to minimize the price movements, becomes essential. It is relevant to understand the concept of variables such as price to book ratio, interest rates and share prices; as well as coming up with a model which can be used as an instrument to solve the volatility issue. The conceptual framework of the present study covered the price to book ratio, interest rates, share prices and business model definitions.

The present chapter reviews existing literature about the keywords of this investigation. Its objective being to review previous studies regarding price to book ratio, interest rates, share price volatility, emerging markets, and business model topics as indicated in the thesis first specific objective.

2.1 Literature review

To review literature is to study sources to understand a topic, and the purpose, to summarise the content reviewed and emphasise the gap in the body of knowledge. Literature review is an essential feature of academic research. Fundamentally, knowledge advancement must be built on prior existing work (Xiao & Watson, 2019). The present study reviews literature on the price to book ratio, interest rates, share price volatility, emerging markets, and business models topics.

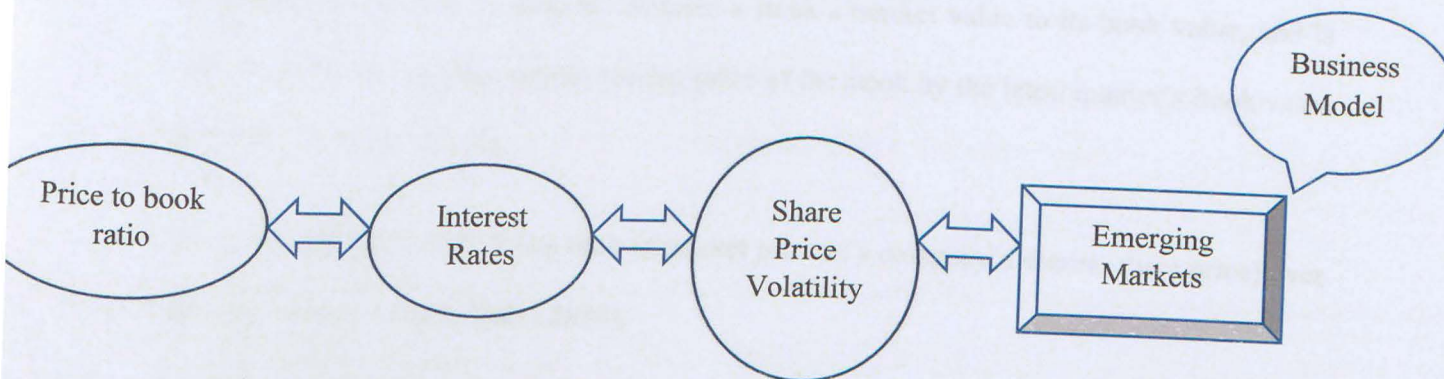


Figure 2.1 Literature review framework illustration.

Source: Author's own creation.

Figure 2.1 illustrates the investigation keywords sequence in chapter two, from the review of the price to book ratio up to the review of the business model as the research idea proposed in the present study.

The researcher cited the authors ordered by dates (years) in the literature, following the content the researcher learnt in the Research Methods module of the Master's Degree of Business Administration (Finance) course studied by the researcher.

2.2 Price to book ratio

The price to book (P/B) ratio is the same as the Market to book (M/B) ratio. Roux & Lowies (2009) defined price to book ratio as the Market/Book (M/B) ratio related to the firm's market value measured by its current share price to certain accounting values, which gives an indication on what investors in the marketplace feel the firm is doing in terms of return. Market-to-book is a synthetic equity market and accounting data-derived indicator, ideally informative on firms' economic standing and prospects (Ahmed, Hillier & Tanusasmitta, 2011).

The price-to-book ratio is used to compare a stock's market value to its book value, and is calculated by dividing the current closing price of the stock by the latest quarter's book value per share (Nkabinde, 2015).

Price-to-book value (P/B) is the ratio of market price of a company's shares (share price) over its book value of equity (Patel, 2018).

2.3 Interest rates studies

Stock and Watson (2003) found that share prices are linked to yields and that stock prices reflect expected future earnings and yield variations depending on the economic behaviour. They illustrated this by developing a Fisher Model. Stock and Watson (2003) explained that an economic slowdown could make interest rates increase. Stock and Watson (2003) research has similarity with the present report because it showed the relationship between interest rates and share prices, proving the relationship based on the economic environment influence (economic situation), which is the same approach used in the present study. Moschitz (2004) defined the overnight interest rate as the price paid for a one-day loan. Shousha (2007) studied the relationship between macroeconomic variables and the term structure of the interest rates by using the recent macro-finance approach adapted to an emerging economy. On the other hand, Kassim & Manap (2008) explained the relevancy of interest rates for the economy of countries. From the point of view of a borrower, interest rate is the cost of borrowing money (borrowing rate). From a lender's point of view, interest rate is the fee charged for lending money (lending rate) (Alam & Uddin, 2009). Alam & Uddin (2009)'s paper studied the relationship between yields and share prices by using time series and panel regression methods, a similarity with the present report's methodology. Akram & Christophersen (2010) studied the overnight interest rate by using an econometric model.

Mallik & Bhar (2011) revealed a positive relationship between inflation uncertainty and interest rates by using a time - varying parameter model with a Generalised Autoregressive Conditional Heteroskedasticity (GARCH) specification, explaining how financial institutions can control yields by controlling the structural uncertainty indicator. In addition, Meurer, Santos & Turatti (2015) used GARCH-jump to measure changes in interest rates and explained the importance of stability to reduce changes in yields – linked asset prices. According to Singh (2015) changes in interest rate can affect asset prices because there can be a rise in asset prices due to a decrease in interest rates. Gomes da Silva & Cavalcanti de Araújo (2016) explained that there are three types of interest rates: the basic real interest rate, set by the Central Banks when they define their basic interest rate. The second is the long-term equilibrium real interest rate, which is a result of macroeconomic fundamentals (e.g. productivity, population growth, and savings). The third one is the neutral real interest rate, or the natural rate of interest, which is related to macroeconomic fundamentals and is used when central banks make use of short-term interest rates as the main instrument to conduct monetary policy. Gomes da Silva & Cavalcanti de Araújo (2016) suggested the need of paying attention to interest rates behaviours to improve and maintain a correct monetary policy. Understanding the overnight interbank rate is therefore important for the implementation of monetary policy (Green et al., 2016). Saeed (2016) found a negative relationship between yields and investment by using Ordinary Least Squares and defined the element that equates savings and investment. Benchmark interest is the kind of interest to be easily and directly regulated and controlled at the time when the central bank formulates policies, such as benchmark interest rate of the central bank and bank deposit interest rate, while other interest rates are those that fluctuate subject to adjustment of supply and demand in the market, on the base of reference to the benchmark interest rates (Zhang, Chen & Liu, 2016).

Ajaz, Nain, Kamaiah & Sharma (2017) found a positive relationship between changes in interest rates and share prices by developing the asymmetric autoregressive distributed lag (ARDL) model. Bidabad & Hassan (2017) divided bank activities into two markets (deposits interest rates and loans interest rates). They said that bank activities influence the business cycle based on interest rate structure. Jayashankar & Rath (2017) concluded that there is a negative relationship between exchange rate, stock return and interest rates by using the maximum overlap discrete wavelet transform (MODWT) model. Jayashankar & Rath (2017) explained the importance of measuring macroeconomic variables due to financial markets respond to macroeconomic variables changes quickly. Obeng & Sakyi (2017) examined the relationship between yields and other macroeconomic variables by using the autoregressive distributed lag bounds test approach to cointegration and error correction analysis to find a positive reaction of yields from macroeconomic variables such as economic growth. Tumwine, Sejjaaka, Bbaale & Kamukama (2018) revealed the determinants of interest rates linked to other variables, giving a diversity of definitions and findings about the yields topic.

Interest rates are factors to be considered when making investment negotiations or banking activities. Yields are of great importance because they influence the investment sentiment of investors and stockholders in their decisions on whether to invest or not.

2.4 Share price volatility

Giot (2003) found a negative relationship between stock returns and implied volatility by using regression analysis. Tan & Hooy (2004) developed the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model to determine volatility of bank assets. Ederington & Guan (2006) defined volatility as an historical standard deviation of daily returns.

Ederington & Guan (2006) came up with three essential methods to compute historical volatility: the historical standard deviation (STD), the adjusted mean absolute deviation (AMAD) and the generalized autoregressive conditional heteroskedasticity (GARCH). Rao (2008) defined volatility as large to small changes or continuous disturbances of market returns, suggesting paying attention to monetary policy and pricing policies in emerging financial markets. Koopman, Jungbacker & Hol (2004) explained that there are three types of volatility: historical volatility (normally collected from daily return series), implied volatility (usually extracted from option pricing data) and realised volatility (computed as the sum of squared high frequency returns within a day). On the other hand, Benavides (2009) identified two types of volatility: the historical volatility and the implied volatility of financial assets. Benavides (2009) used the univariate generalized autoregressive conditional heteroskedasticity (GARCH) and the Baba, Engle, Kraft, and Kroner (BEKK) models to compute the historical asset price variations. Adjasi (2009) found a positive relationship between yields and asset price changes by developing the exponential generalized autoregressive conditional heteroskedasticity (EGARCH) model, and conditional mean equation to compute stock volatility. According to Ismal (2010) variations in the asset return of financial institutions can be estimated by Value at Risk (VaR). The study of Ismal (2010) found a well-managed risk of investment and a decreasing trend of expected losses of bank financing and suggested the need for developing more equity studies. Hussainey, Mgbame, & Mgbame (2011) used multiple least square regression analyses to find a positive relationship between dividend yield and stock price changes, and a negative link between dividend pay-out ratio and stock price variations. Hussainey, Mgbame, & Mgbame (2011) defined share price volatility as the change in the price of a security over a given time: the greater the volatility, the greater the chance of a gain or loss in the short run.

Volatility has to do with the variance of a security's price. Thus, if a stock is labelled as volatile, its price would greatly vary over time, and it is more difficult to say with certainty what its future price will be (Hussainey, Mgbame, & Mgbame, 2011). Joshi (2011) used a six-variable asymmetric generalised autoregressive conditional heteroscedasticity–Baba, Engle, Kraft, and Kroner (GARCH-BEKK) model to study the return and volatility spillover of emerging stock markets. Joshi (2011) found that there exists a relationship between the countries studied in terms of return and volatility. Hashemijoo, Ardekani, & Younesi (2012) used multiple regression analysis to find a negative relationship between dividend yield and share price volatility. Ghauri (2014) found a positive relationship between size and share price volatility, and a negative relationship between dividend, profitability and asset growth with asset price volatility. Omorokunwa & Ikponmwosa (2014) defined volatility as the statistical measure of the gyration (fluctuation) of the price or returns of financial market instruments like stocks and stock market indexes. Zhang & Lan (2014) used Realised Bipower Variation (RBV) to calculate realised volatility. Aye, Gupta & Modise (2015) found a positive relationship between yields and share price movements by using the time varying parameter vector autoregressive three variables (TVP-VAR) model. Huang (2016) found a positive relationship between implied volatility and stock price realised volatility by using the regression analysis. Lee, Hsu & Chien (2016) found that continuous fluctuations on yields can influence the stock market. That paper found a positive relationship between the total volatility spillover of swap markets and the stock markets by using the generalized Vector Auto Regression Model (VAR) and the granger-causality tests. The positive effect of interest rate volatility is present only in case of conditional volatility measure.

This positive relationship is expected due to the fact that interest rates discount expected dividends in a fundamental stock pricing model (Papadamou, Sidiropoulos & Spyromitros, 2017). Papadamou, Sidiropoulos & Spyromitros (2017) explained that stock market volatility can be measured by the standard deviation of quarterly stock prices. Nautiyal & Kavidayal (2018) developed the multiple regression model to link earnings per share (EPS), dividend pay - out (DIVP), dividend per share (DPS) and Economic value added with asset price variations. According to Zainudin, Mahdzan & Yet (2018) there is a positive relationship between dividend policy and stock price changes. That report suggests the relevancy of considering dividend policy in forecasting stock price volatility.

The papers covered above in subheading 2.4 are a compilation of studies on the relationship between macroeconomic variables and stock price volatility, all giving different definitions and findings on the share price changes topic. In agreement with the studies cited above in subheading 2.4 the present research recognises share price volatility as the changes in the value of the shares, movements that can be measured by calculating the standard deviation of share prices.

2.5 Emerging markets overview

El-Wassal (2005) noted that economic growth, financial liberalisation policies and foreign portfolio investments are factors influencing the development of asset markets in developing economies. El-Wassal (2005) used a Two Stages Least Squares combined with Fixed Effect method. With a huge population and increasing income, emerging economies provide a big market for goods and services. Also, with talented manpower and low costs, emerging economies are supplying more and more goods and services to the world (Pillania, 2009).

Emerging markets received considerable attention for foreign investment and international diversification due to the possibility of higher earnings and a low level of integration with global equity markets (Chowdhury, Uddin & Anderson, 2018). The Economist (2017) said that Emerging Markets is a popular term now but it was introduced in 1981, by Antoine van Agtmael, an economist at the International Finance Corporation (IFC), to represent a set of countries with promising stock-markets that could grow rapidly with investment (Sharma, Luk, Cardinali & Ogasavara, 2018). Emerging Markets (EMs) have become the growth engines of the world. Driven by demographics, economic liberalization, an expanding middle class, and better capitalization of resources, these markets now represent 36% of the global gross domestic product (GDP). They are expected to offer a USD 30 trillion market potential by 2025, of which China and India may generate as much as USD 10 trillion in annual revenue by 2020 itself (Sinhaa & Sheth, 2018).

Developing markets are nations with economies in transition, with great features and opportunities for the development of investment activities. Emerging nations are markets that investing on them, on return, they can produce large benefits for investors and for their own development. These are nations that due to their natural and human resources attract foreign investment through investment opportunities.

Table 2.1: List of emerging markets.

South American continent countries	Index name
Brazil	Ibovespa Brazil Sao Paulo Stock Exchange Index
Chile	Santiago Stock Exchange IPSA Index
Colombia	Índice General de la Bolsa de Valores de Colombia
Mexico	Mexican Bolsa IPC Index
Peru	Índice General Bolsa de Valores
Middle East and Africa continent countries	Index name
Egypt	Egyptian EGX 30 Price Return Index
Qatar	Qatar Exchange Index
South Africa	FTSE/JSE Africa All Share Index
United Arab Emirates (UAE)	UAE ADX General Index
Europe continent countries	Index name
Hungary	Budapest Stock Exchange Budapest Stock Index
Poland	Warsaw Stock Exchange WIG Total Return Index
Russia	Russian Traded Index
Turkey	Borsa Istanbul 100 Index
Greece	The Athens Stock Exchange General Index
Czech Republic	Prague Stock Exchange Index

Asian continent countries	Index name
China	Shenzhen Stock Exchange A Share Index
India	S&P CNX Nifty Index
Indonesia	Jakarta Stock Exchange Composite Index
South Korea	Korea Exchange 100 Index
Malaysia	Kuala Lumpur Composite Index
Philippines	Philippines Stock Exchange PSEi Index
Taiwan	Taiwan Stock Exchange Weighted Index
Thailand	Thailand SET Index
TOTAL 23 countries	TOTAL 23 indexes

Source: Author's own compilation based on Kayal & Maheswaran (2018) study.

Table 2.1 shows a list of the emerging countries by continent and their index name.

2.5.1 Brazil, Russia, India, China and South Africa (BRICS) emerging economies

The emerging market group of Brazil, Russia, India, China and South Africa (BRICS) is gaining global recognition following significant changes and shifts in BRICS development, trade, technology improvements, financial market liberalization, financial market openness and increasing capital market expansion. The BRICS economies are considered as the dominant emerging market economies in terms of GDP growth rates, with some of the members having the highest growth rates in the world.

The group also has low average inflation rate, with Brazil and South Africa the only inflation targeting BRICS members. The inflation rate is important economically as it affects the cost of goods and services and thereby consumers. Notice that Brazil and South Africa are the only inflation targeting countries, while Brazil, Russia and South Africa are categorized in the “upper middle income” group, with India and China falling in the “lower middle income” group (Fadiran, 2014). Fadiran (2014)’s research demonstrated the important role the BRICS countries play in developing the global economy. Singh (2014) studied the BRICS economies to find changes in stock market returns by using the dummy regression model to examine the existence of ‘Day of the Week’ (DOW) and Month of the Year (MOY) effects of stock market returns of BRIC countries. Singh (2014) found no variations in either day of the week or months of the year in Brazil, Russia and India. DOW effect is present in Chinese Stock Markets, explaining that the results of the investigation prove a development stage and competitiveness in trading activities of those markets. BRIC countries represent a relatively larger class of middle-income group of emerging markets economies accounting for two-fifths of the total gross domestic product (GDP) of emerging economies. Brazil and Russia dominate supply of raw materials and India and China are dominant global suppliers of services and manufacturing goods. They are among the global investment destinations in the world as the foreign direct investment stocks of BRIC increased significantly (Naik & Padhi, 2015). Khatun (2016) found a positive relationship between trade in financial services (TIFS) and economic growth in BRICS by developing the Pedroni’s panel cointegration methodology. Nadeem, Gan & Nguyen (2017) argued that the term BRIC was expanded to BRICS with the inclusion of South Africa in 2010. Nadeem, Gan & Nguyen (2017)’s investigation supports the idea that the BRICS are relevant markets that play a relevant role in GDP development. Prakash, Nauriyal & Kaur (2017) found cointegration among BRICS equity markets by using the Johansen

cointegration test, the vector error correction model (VECM), and Granger causality test. According to Rani & Kumar (2018) there is a relationship between foreign direct investment (FDI) inflow and trade openness with economic growth in BRICS economies. Rani & Kumar (2018) came to this conclusion by using the Pedroni's panel cointegration method to link variables. Rani & Kumar (2018) said that over the last two decades, BRICS economies have become the most important emerging economies of the world because of the continuous increase in share of trade, trade openness, foreign reserves, economically active labour forces, and foreign direct investment (FDI) inflow and outflow.

2.6 Business model

An established business always tweaks its business model to become more competitive (Philipson, 2016). Furthermore, always creating or improving business models in organisations become essential at any time. According to Sainio, Saarenketo, Nummela & Eriksson (2011) there are three relevant business model elements to take into consideration when creating a business model: value creation driver, elements of model design and exchange of value, explaining that a business model is a way of value creation, not only for customers and owners, but also for staff members of the institution. Cavelaars & Passenier (2012) defined business model as a simplified representation of activities that a bank performs to make money. Traditionally, management scholars conceptualized business model as a locus of innovation, planning tool, heuristic logic, or market device. Business model represents a concept that recently entered scholarly discussions within the fields of strategic management, innovation, and entrepreneurship. (Hacklin & Wallnöfer, 2012). That study defined a business model as a tool with a clear sequence of steps: see figure 2.2.

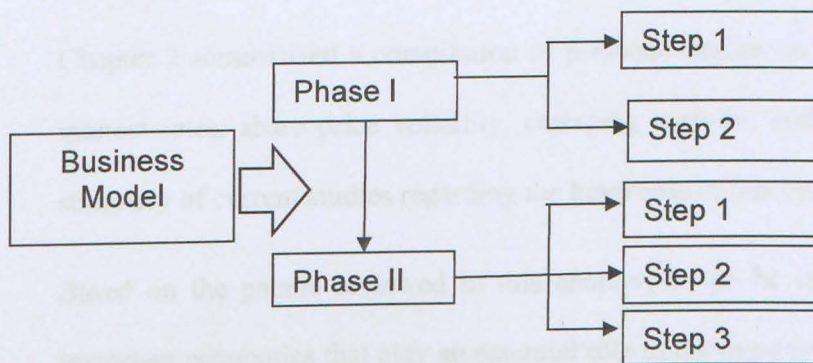


Figure 2.2 Illustration of a Business model structure with its phases and steps.

Source: Author's own creation based on the concept of business model by Hacklin & Wallnöfer (2012).

Figure 2.2 shows a business model structure based on Hacklin & Wallnöfer (2012). It is important to note that a business model can be designed with different structures, depending on the purpose of the model and creativity of the designer. According to Hossain (2017) an innovative business model is very important for the creation of profit in organisations, explaining that in the process of creating and implementing business model innovation (BMI) the participation and acceptance of the new instrument by management is relevant. The innovative idea and later tool must be accepted as an instrument that helps to develop strategies in order to achieve firm efficiency. Snihur & Tarzijan (2018) suggested that the business model portfolio must be linked to organisational design in order to use an instrument that can facilitate taking of decisions, defining business model as an activity system, and explained the importance of activities planning participation in business model creation. According to Tauscher & Laudien (2018) attributes of business models in a marketplace are value capture, value delivery and value creation dimensions.

2.7 Chapter 2 Summary

Chapter 2 summarised a compilation of previous studies on the topic of price to book ratio, interest rates, share price volatility, emerging markets, and business models. It covered a summary of current studies regarding the keywords of this research.

Based on the papers reviewed in this chapter, it can be said that emerging countries are important economies that play an essential role in the development of the global economy.

With the above in mind, to study financial (price to book ratio) and macroeconomic (yields) indicators as part of the training process becomes relevant. No investment decision can be taken without negotiating prices, that is why financial institutions as intermediaries in the trading process and its share price are important when studying developing markets. Becoming yields, price to book ratio, emerging markets, share price volatility and business models essential concepts reviewed in this academic work.

The next chapter presents the methodology section of this thesis.

CHAPTER III

METHODOLOGY

3. Introduction

The importance of research, as a strategy for new knowledge production, cannot be overemphasised. In practically every discipline that is known today, research has become an important practice for describing, exploring or explaining a given phenomenon or situation. The goal of creating new knowledge, or understanding existing problems or situations better, through research critically depends on, among other things, the integrity and quality of the entire research process from the identification and articulation of the research problem to the clarity of the aim, objectives, hypothesis or research questions, the identification of the target population, the methods of sampling, the conceptualisation and design of the data collection instruments and also the methods of data analysis (Moyo, 2017). Nakano, Barreira e Oliveira & Jorente (2018) explained that a research methodology more than an approach becomes a mindset when it is studied and understood by researchers.

The objective of chapter 3 in the present study was to explain the essential elements of the investigation's methodology, such as the research design, limitations, research instruments, research validity, data collection, data analysis and ethical considerations. Ending the chapter with its summary.

3.1 Research Methods

According to Abutabenjeh & Jaradat (2018) research methods are based on data collection and the approaches, such as quantitative approach, the researchers decide to use to conduct their studies.

The present study used a quantitative approach to collect and analyse numerical data. It developed the documentary analysis by reviewing secondary data such as journal articles to capture and study information about price to book ratio, yields, business models and share price changes, as well as to collect data from the official online database of the Brazil's Central Bank as a secondary source to conduct the study.

The method used to develop and to test the new model designed in this thesis was multiple linear regression analysis. The researcher developed a multiple regression model to find the relationship between the study variables. Multiple regression analysis involves identifying the relationship between dependent variables and one or more independent variables. A model of the relationship is hypothesized; estimates of the parameter values are used to develop an estimated regression equation (Dissanayake & Wickramasinghe, 2016). The model helps to find if there is or not a relationship between price to book ratio and interest rates with share price volatility, which is the aim of this report (see the multiple linear regression model analysis in chapter 5).

The instrument designed was developed by explaining phases and steps in detail in chapter 4 showing its designs and by implementing it in the Brazil Central Bank to test its validity (see model development in chapter 4 and its implementation and discussion of findings in chapter 5).

The model was tested by implementing it in the Brazil's Central Bank as an emerging country financial organisation. Implementing the model is a way of developing it and testing if it can be used. If the tool can be implemented (tested), giving outcomes, it means it can be used, it is real, it is valid.

The present research was an explanatory investigation due to designs a new model to measure the relationship between a dependent variable as explained by two independent variables. It was explanatory because as part of the model designs explained in detail the phases, steps, advantages and disadvantages of the model for a better instrument understanding and usefulness. Explanations about how to uses the tool were well exhibited in the present study, making it an explanatory research.

3.2 Research designs

According to Abutabenjeh & Jaradat (2018) research design is a plan for the study's methodology, which exhibits the study objectives or questions to achieve the main goal of the research. It must to bring out the following study information: data collection; variables; population; sample and data analysis.

This paper used a quantitative descriptive approach to analyse the numerical variables part of the model, to prove the relationship between them. The aim was to design a new model to measure the relationship between price to book ratio and interest rates with share price volatility for the banking sector of developing economies by using multiple regression analysis.

The current study was an explanatory research that gave detailed information about the new model design specifications. Explanatory designs provide researchers with useful models of how to conduct research to establish causal links between independent and dependent variables.

These designs are used not only to describe change in value of the dependent variable but also to help explain those changes (Abutabenjeh & Jaradat, 2018).

This academic work used one dependent variable and two independent variables as explained in subheading 3.2.2. It analysed secondary data from publicly available online websites and journal articles. It displayed information by using tables and figures.

3.2.1 Limitation

The instrument designed for implementation in one developing country was considered a limitation of the present report. The academic work recognises that fact as a limitation of the study and gives recommendations and suggestions about how to continue implementing the tool in other emerging nations as part of future studies. It is considered a limitation of the investigation because it does not allow use of probability sampling techniques due to the uses of a small sample size. It is believed that with implementation of the instrument designed in other developing economies in future studies it will no longer be a limitation. Therefore, the model is designed for continuous implementation in other developing nations in future studies.

3.2.2 Variables of the investigation

Table 3.1 Variables of the study to develop the multiple regression analysis.

Variables	Abbreviation	Dependent variable symbol	Independent variable symbol
Share price volatility	SPV	Y ₁	
Price to book ratio	P/B ratio		X ₁
Interest rates	IR		X ₂

Source: Author's

Compilation.

Table 3.1 exhibits the variables of this study. The goal of the tool was to measure the effects of price to book ratio and interest rates on share price volatility. Share price volatility was the dependent variable represented by Y₁ and Price to book ratio and Interest rates were the two explanatory variables represented by X₁ and X₂ respectively. The Price to book ratio variable was included in the analysis due to it being a financial indicator in connection with share prices. The variables of this study were defined in chapter one in the terminology table and in chapter two as part of the literature reviewed.

3.2.3 Model

The family of models that supports the study's rationale from which the new model was extracted from: Adjasi (2009); Gunaratne, Priyadarshanie & Samarakoon (2015); Dewasiri & Banda (2015); Kaminska & Roberts-Sklar (2018); all of them using regression analysis as a method of investigation, a common feature with the present academic work.

The present study used multiple linear regression method to prove the relationship between price to book ratio and interest rates with share price volatility.

3.2.3.1 Model Specification

The present report uses the multiple linear regression analysis. The present investigation developed the following multiple regression model to find relationship between the study variables and used the T. Statistics Diagnostic Test to know the acceptance or not of the null hypothesis. The model used in the present research is based on the MLR model developed in Muganiwa & Lambrechts (2017) study.

1. Y_1 (Share price volatility) = $-\beta_0$ (Intercept) + $\beta_1 X_1$ (Price to book ratio) + $\beta_2 X_2$ (Interest rates)

Where Y₁ represents the share price volatility variable; - β₀ was the intercept value in the output table; X₁ represented the Price to book ratio variable and X₂ represented the Interest rates variable, β₁ and β₂ are the coefficients to the independent variables to be computed and collected from the output summary table (see the multiple linear regression analysis in chapter five of the present research).

2. The T. Statistic diagnostic test equation following helped to measure the existence or not of a relationship between the study variables and to know if the null hypothesis is accepted or not:

T. Statistics equation (1):

$$T. Statistics = \frac{\hat{\beta}_1 - \beta_1}{SE(\hat{\beta}_1)} \quad (1)$$

Source: Author's own creation.

Where:

$\hat{\beta}_1$

β₁ is the value of the variable X₁ and X₂.

β₁ is the value of the null hypothesis (H₀) = 0.

$\hat{\beta}_1$

SE β₁ is the standard error of X₁ and X₂ variables, which can be found in the summary output table in the standard error column, in the independent variable rows.

It was considered the model represents a diagnostic test due to it being able to measure or to test if there exists a link or not between the study variables by developing multiple linear regression analysis.

3.2.3.2 Diagnostic test

The diagnostic test used in the present report was T. Statistic test. The multiple linear regression analyses helped to test the relationship between the study variables and to answer the question about the null hypothesis about to reject or not the null hypothesis. The T. Statistic diagnostic test helped to test the acceptance or failure of the null hypothesis in the present study. The interpretation of the R. Square also gave an idea of the goodness of fit of the regression model used in the present academic work.

3.2.4 Research hypothesis

In management research, as in other empirical fields, researchers use substantive theory to derive testable predictions or hypotheses. These hypotheses are then tested in the sense that they are confronted with empirical data that may either contradict or support the hypotheses of interest (Andraszewicz et al., 2015).

To test the hypothesis of the present investigation, the researcher developed the multiple linear regression method to find a correlation between the study variables and the T. Statistic formula to know the acceptance or not of the null hypothesis.

The null and alternative hypotheses were:

$H_0: \beta_1 = \beta_2 = 0 \Rightarrow$ The price to book ratio and interest rates have no effect on bank share price volatility.

$H_a: \beta_1 = \beta_2 \neq 0 \Rightarrow$ The price to book ratio and interest rates have an effect on bank share price volatility.

Where H_0 is the null hypothesis and H_a the alternative hypothesis to take if the null hypothesis is rejected. $\beta_1 = \beta_2$ represents the relationship between the variables, therefore, when $\beta_1 = \beta_2$ is equal to zero the relationship between the report variables do not exist; and when $\beta_1 = \beta_2$ is different from zero there is a relationship between the study variables.

The hypothesis was tested by developing a multiple linear regression model in Microsoft Excel to find if there is or there is not a relationship between the study variables (see multiple linear regression model and hypothesis test result discussions in chapter 5).

3.2.5 Data

collection

According to Caniato et al. (2018) data can be collected from online platforms. This investigation studied secondary sources to collect data, such as journal articles and the publicly available online database Brazil Central Bank tool to collect data about the study variables. The document analysis, by studying journal articles as a secondary source of literature covering the issue helped to identify the study problem. For instance: Recently, stock markets around the world have been experiencing volatility and the emerging and fastest developing countries are no exception (Naik & Padhi, 2015). The study of documents allowed the researcher to identify the presence of volatility in the financial developing markets as a problem to be investigated as well as to collect data to develop the multiple regression method.

Multiple linear regression model was developed by using the statistical software Microsoft Excel as the statistical tool to find the relationship between the research variables as part of the model steps.

3.2.6 Data

analysis

The most important part of a research study, therefore, is not data collection—the focus of research methods textbooks—but data analysis. Data analysis is where a researcher uncovers the relationships and gains an understanding of what the stuff from the data collection really means and how it is relevant (Albers, 2017).

The technique used in this report to analyse data was regression analyses by developing a multiple regression model in Microsoft Excel. The present study used quantitative data analysis technique since it used quantitative data (numerical variables) to make the multiple regression analysis to find a relationship between the research variables. The technique is multiple regression analyses in Microsoft Excel 2016 Software. The investigation was written in Microsoft Word 2016 Software page. This study used quantitative data analysis to develop a multiple regression model in Microsoft Excel to find a link between the research variables. The investigation was written in Microsoft Word Software package. Statistical summary tables and figures helped to illustrate and interpret data in Microsoft Excel Software.

3.3 Research instruments

According to Moyo (2017) research instruments are tools help to collect data and they are essential to the knowledge production. The research instrument used in this academic work is the document review, to study data about price to book ratio, interest rates and share prices from the publicly available online database Brazil Central Bank official online website, which was reviewed to collect information for the study.

3.4 Research ethics

The integrity in research is recognized when correspondence (the study is according with the ideas of the researcher's discipline), coherence (to choose the best method to answer the research question, precision in the flow of ideas), and pragmatics (exploring, mapping, synthesizing, and interpreting throughout the research process.) are considered (Parse, 2016). Chapter one explained the ethical considerations of this academic work. However, it is considered relevant to repeat that the essential ethical considerations of this investigation are the use of publicly available data to avoid privacy issues and the making of appropriate citations to avoid plagiarism. The contents cited in this study from other authors' work can only be found inside the complete articles, by opening and reading the full article, which means the full articles were downloaded and were publicly available in the time they were used. The researcher received permission to conduct the study from The University of Namibia Business School.

3.5 Summary

This chapter explained the research methods of this academic work, for instance, research designs, limitation, research instruments, research validity, data collection, data analysis and ethical considerations.

It was explained that this study used a quantitative approach to analyse numerical data to develop the multiple regression model as a statistical technique to find a link between the report variables in Microsoft Excel. The uses of secondary sources of data such as the online database Brazil's Central Bank and journal articles were essential to develop this thesis. The next chapter presents the designing of the new model created in this study.

CHAPTER IV

A NEW MODEL TO MEASURE THE PRICE TO BOOK RATIO AND INTEREST RATE EFFECT ON SHARE PRICE VOLATILITY IN DEVELOPING NATIONS'S FINANCIAL INSTITUTIONS

MODEL DESIGNS AND SPECIFICATIONS

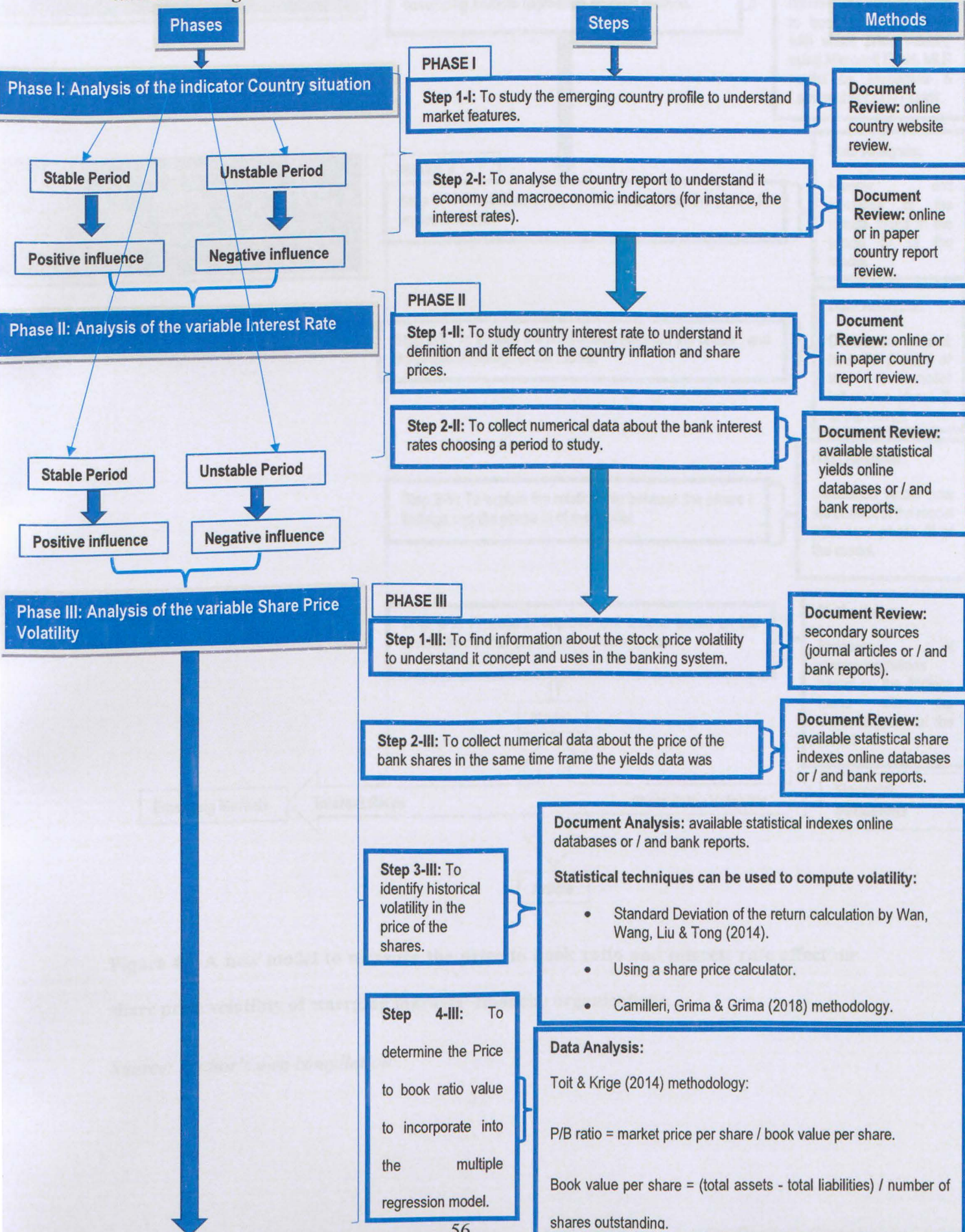
4. Introduction

In more practical terms, new bank models would be a new basis for improving the public and private interpretation and discussion of bank risk and performance. The creation of common and public knowledge regarding bank business models, and the creation of new bank theory closely matched to this phenomenon may be one of the means to bring together different social systems and their shared and differing social logics and understandings of banks and markets. Practitioners can develop new business models which are based on their own learning and strategic aims (Chen, Danbolt & Holland, 2014). New bank theory can be understood as new knowledges and new financial topics and ideas introduced into the banking industry, for instance, new theory can be the new model designed in the present study, which it is an academic professional tool with academic information which could be new knowledge to be learnt by the bank staff.

Chen, Danbolt & Holland (2014) explained the importance of creating a business model to improve bank performance. As explained in chapters one and two of this report, interest rate is a crucial indicator to measure banking sector efficiency and is relevant to investment activity decisions. That is why the creation and implementation of instruments to measure the yields behaviour and its influence in important financial institutions indicators such as stock prices becomes relevant.

This chapter explains in detail the phases and steps of the new model designed in the present study to measure the price to book ratio and interest rates effect on share price volatility of emerging markets' financial institutions. The tool has qualitative and quantitative phases and steps. In the qualitative phases and steps are included for instance, country economic analysis and improvement actions after model implementation. The objective being that of achieving a more complete, valid and representative image of emerging markets' financial institutions features. There will also be an analysis and presentation of results. Furthermore, when analysing economies such as nations in transition, it is important to consider the features of those countries and their economies, and how they influence the financial environment. This is known as economic analysis in this model.

4.1 Model design



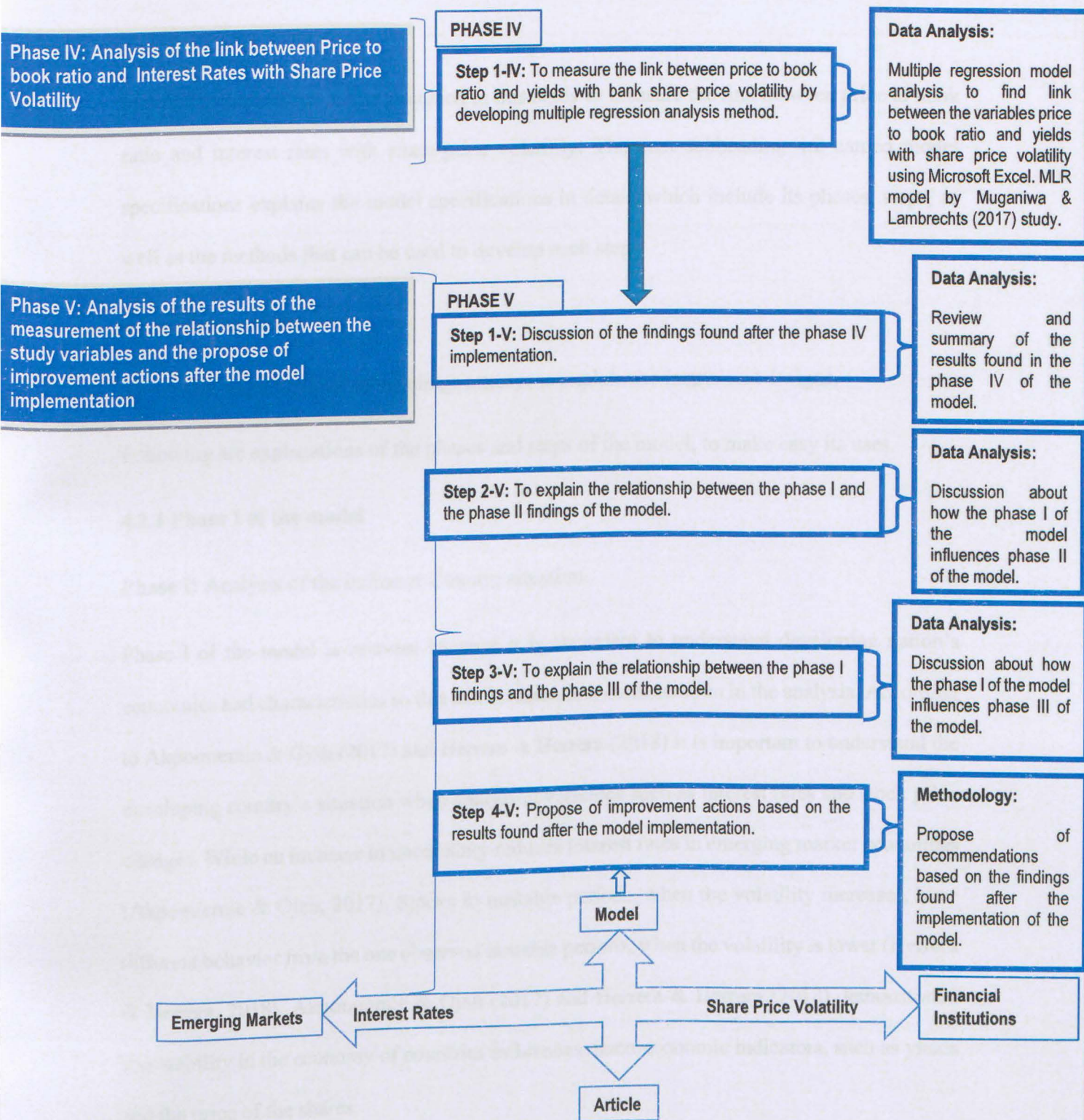


Figure 4.1 A new model to measure the price to book ratio and interest rate effect on share price volatility of emerging markets' financial organisations.

Source: Author's own compilation

Figure 4.1 exhibits the model designed in this study to measure the link between price to book ratio and interest rates with share price volatility. The next subheading 4.2 named model specifications explains the model specifications in detail, which include its phases, steps, as well as the methods that can be used to develop each step.

4.2 Model specifications

The model specifications subheadings attempt to explain the instrument designs.

Following are explanations of the phases and steps of the model, to make easy its uses.

4.2.1 Phase I of the model

Phase I: Analysis of the indicator Country situation.

Phase I of the model is relevant because it is important to understand developing nation's economies and characteristics so this can be taken into consideration in the analysis. According to Akpomiemie & Ojah (2017) and Herrera & Herrera (2018) it is important to understand the developing country's situation when analysing variables such as interest rates and stock price changes. While an increase in uncertainty reduces interest rates in emerging market economies (Akpomiemie & Ojah, 2017). Stocks in unstable periods, when the volatility increases, have different behavior from the one observed in stable periods, when the volatility is lower (Herrera & Herrera, 2018). Akpomiemie & Ojah (2017) and Herrera & Herrera (2018) demonstrated that stability in the economy of countries influences macroeconomic indicators, such as yields and the price of the shares.

Steps of phase I of the model:

Step 1- I: to study the emerging country profile to understand the developing nation's features.

According to the researcher who designed the model, in step 1, the user of the model must study and summarise the country characteristics and general information, especially the national economy summary, which includes information about its macroeconomic variables, stability's overview, its sectors, trading activities, culture, essential products, economic decisions, and its monetary policy. It can be by researching data from the online country's website (for instance, <https://www.gfmag.com/global-data/sources/source-for-country-pages>) or from the online or in paper country reports.

Step 2 – I: To analyse the emerging country's economy.

According to the researcher who designed the model, in step 2, the user of the model must, from the country report, study and summarise the economic environment of the emerging nation, to know its macroeconomic indicators, one of it being the country interest rates. In this step, it is important to analyse the economy of the nation under study and its influence in the financial sector, as well as the monetary policy adopted and its effects on macroeconomic indicators such as yields and the price of the shares. The analysis of the link between the national economy's situation (stable or unstable) and the yields and share price volatility must be based on how the economy's stability or instability influences the yields and the share price volatility of the developing country under study. Based on the statements explained by Akpomimie & Ojah (2017) and Herrera & Herrera (2018) 's researches, when a nation's economic situation is stable, there exists a reduction in the volatility of asset prices, and an increase in the interest rates following an opposite direction between them.

Furthermore, that means, that when studying interest rates, and the stock price changes, it is relevant to analyse and summarise the economic situation of the emerging country in the study. Also, its characteristics, as well as its potential areas of inversion, so as to include them in the analysis. For this purpose, this research can be used as a source of literature to review online information from the country digital website, for instance, the Global Finances online portal or from the country report.

4.2.2 Phase II of the model

Phase II: Analysis of the variable Interest Rate.

Next, the steps of **phase II** of the model are explained:

Step 1 - II: To study country interest rates.

According to the researcher who designed the model, in this step the concept of interest rates must be studied to know its use and relevancy in banking activities. This can be done by reviewing secondary sources of literature, such as, yields websites and journal articles, to be able to summarise that content. It is important to study and summarise from the country report, information about the yields related to inflation targets and the price of the shares, so as to be able to make an economic analysis based on the opposite or negative relationship between variables. It is known that when inflation rises, the prices rise and the interest rates decrease. The data can be collected from online sources or in paper country reports of the nation of study.

Step 2 - II: To collect numerical data about bank interest rates and choosing a period to study. According to the researcher who designed the model, in this step the user of the tool must collect numerical data about bank yields. It is important to choose a time frame to analyse and list the interest rates data in Microsoft Excel.

Also, to have organised the information to use when developing the regression analyses method in Microsoft Excel. The period chosen must be the same as the one chosen when collecting the share price data. The period can be daily, weekly, monthly, quarterly or yearly. The yields data can be found in available statistical yields online databases such as the websites: globalrates.com; Bankrate.com, and / or from bank reports.

4.2.3 Phase III of the model

Phase III: Analysis of the variable Share Price Volatility.

Following are explained the steps of **phase III** of the model:

Step 1 - III: To find information about the stock price volatility.

According to the researcher who designed the model, in this step, data must be studied from secondary sources of literature, such as journal articles, books, reports, thesis papers. This should help one to understand the definition of share price volatility and its uses. Information about the share prices can be collected from the country in study bank report.

Step 2 - III: To collect numerical data about the price of bank shares in the same time frame yields data was collected.

According to the researcher who designed the model, in this step, the user of the model must collect data from secondary sources of literature, available databases, for instance: SHAREPRICES.com, McGregor database, Bloomberg database, World bank database – DataBank, from the Emerging Stock Markets Factbook. Also information can be collected from the World Trade Statistical Review, and from the Organisation for Economic Cooperation and Development (OECD) databases.

Furthermore, data on the price of the shares needs to be collected and also to list the statistical information in columns for each period in the study. One needs to have organised the information to be able to use it when developing the regression analyses method in Microsoft Excel Software in the phase IV of the model. The period chosen must be the same as the one chosen when the researcher collected the interest rates information in phase II of the model. This is so as to establish the relationship between the variables in the same time frame. The period can easily be daily, weekly, monthly, quarterly or yearly.

Step 3 - III: To identify historical volatility in the price of the shares.

According to the researcher who designed the model, in this step, the user of the model must, by using the data collected in step 2 of this phase on share prices, to compute the volatility in the price of the bank shares, by using any of the academic methods exhibited below:

Statistical techniques can be used to calculate share price changes:

Standard Deviation of the return calculation (Microsoft Excel).

Using a share price calculator.

Camilleri, Grima & Grima (2018) methodology.

Below the statistical techniques mentioned above are explained:

Standard Deviation of the return calculation.

According to Wan, Wang, Liu & Tong (2014), the general way of computing standard deviation is by calculating the square root of the sample size.

Using a share price calculator. 18) methodology.

According to the researcher who designed the model, in this step the user of the instrument must review from online tools a share price calculator, and to choose any of the stock price calculator options offered by the website. From there directions or steps given by the website must be followed by only entering the information in the available spaces and to enter calculate, the online tool will do all the work. This is one of the easy ways, to have the information requested available.

Most of the share price volatility calculators can be found online, as tools to make easy the calculation by only entering the information required in the blank cells of the tool and to press the button calculate, and the result should show. It is an easy way of computing the changes in the prices of the stocks. For instance, see: <http://www.fintools.com/resources/online-calculators/volatilitycalc/>, where normally the system demands as information the value of the prices, the volatility (standard deviation), periods, and then one needs to press the calculate button to obtain the share price volatility value. Also, to show a graph with the prices and the value of the volatility could be good to illustrate data. Directions can also be seen on: <https://www.bp.com/en/global/corporate/investors/investor-tools/share-price-calculator.html>

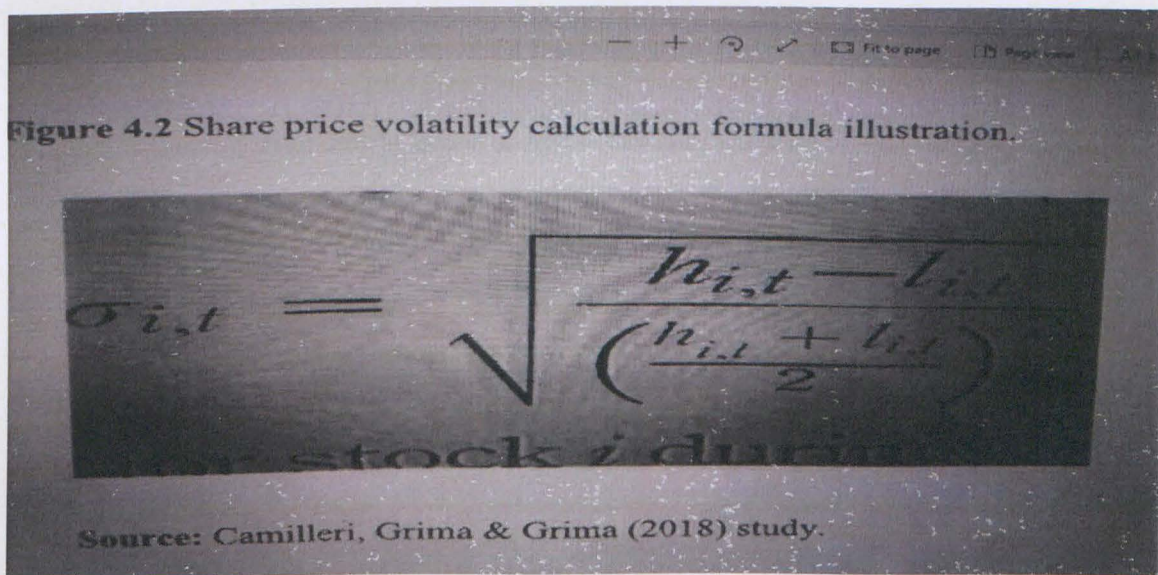
or

<https://www.btplc.com/Sharesandperformance/Investmentoverview/Sharepriceinformation/Sharepricecalculator/Index.htm>

Camilleri, Grima & Grima (2018) methodology.

According to the researcher who designed the model, in this step, the user of the model must research the Camilleri, Grima & Grima (2018) study to review, from the data and methodology subheading of that paper, the technique used by them to calculate the volatility of bank shares. Camilleri, Grima & Grima (2018) used the Baskin (1989) study formula to compute share price volatility exhibited in the following figure:

Figure 4.2 Share price volatility calculation formula illustration.


$$\sigma_{i,t} = \sqrt{\frac{h_{i,t} - l_{i,t}}{\left(\frac{h_{i,t} + l_{i,t}}{2}\right)}}$$

Source: Camilleri, Grima & Grima (2018) study.

Where $\sigma_{i,t}$ is the share price volatility for stock i during year t , while $h_{i,t}$ and $l_{i,t}$ are the highest and lowest prices for stock i during year t , respectively. (Camilleri, Grima & Grima, 2018).

Step 4-III: To determine the Price to book ratio value to incorporate into the multiple regression model.

The present academic work suggests the uses of the Toit & Krige (2014)'s methodology that computes the price to book ratio as follows:

$$\text{P/B ratio} = \text{market price per share} / \text{book value per share}.$$

Where:

Market price per share is the present price of the share in the market.

$$\text{Book value per share} = (\text{total assets} - \text{total liabilities}) / \text{number of shares outstanding}.$$

$$\text{Number of shares outstanding} = \text{Issued shares} - \text{Treasury shares}.$$

The total assets - total liabilities, which is the same as owners' equity account can be collected from the company balance sheet.

Nkabinde (2015) explained that a P/B ratio less than 1.0 indicates that the price of the share is undervalued; a P/B ratio greater than 1.0 indicates that the price of the share is overvalued and a P/B ratio of 1.0 indicates that a share is fairly valued. Information must help financial managers to know the value of the shares they offer.

The Price to book ratio variable is incorporated into the present study and in the phase 3 of the model designed because is the financial independent variable regarding share prices. It includes the value of current shares in its calculation, which demonstrates its connection with shares.

4.2.4 Phase IV of the model

Phase IV: Analysis of the link between Price to book ratio and Interest Rates and Share Price Volatility.

Next is an explanation of step 1 of **phase IV** of the model:

Step 1 - IV: To measure the link between price to book ratio and yields with bank share price volatility by developing multiple linear regression model method explained by Muganiwa & Lambrechts (2017) in their study.

In this step, the link between the variables is analysed by developing multiple linear regression method:

This step can be developed by considering the following bullets:

- To present variables of the model.
- To establish the model hypothesis to validate.
- To introduce in the Microsoft Excel page, the data about price to book ratio, yields and share price changes to obtain the regression statistics table needed it to develop the multiple regression model.
- To write out the multiple linear regression model.
- To discuss the overall fitness of the model.
- To test the hypothesis by using the 5 percent level of significance.
- To interpret coefficients of the regression model.
- To explain the relationship between price to book ratio and Interest rates with share price volatility.

The points in the bullets above are explained in chapter five of the present study, where the model designed is implemented to prove its validity.

4.2.5 Phase V of the model

Phase V: Analysis of the results of the measurement of the relationship between the study variables and propose improvement actions after the model implementation.

Steps of phase V of the model are following:

Step 1 - V: Discussion of the findings found after phase IV implementation.

In this step the researcher must discuss the results of the relationship found or not between the variables after the multiple regression model implemented in phase IV.

Step 2 - V: To explain the relationship between phase I findings and phase II findings of the model.

This step links phase I with phase II of model. According to the researcher who designed the model, in this step the user of the model, based on the economic analysis studied in phase I of the model from the country report, must explain how the country situation influences the Interest rate variable. The analysis must be made based on the Akpomiemie & Ojah (2017) and Herrera & Herrera (2018) studies, which explained that when a country's situation is stable, the interest rates increase, due to an expansionary policy adopted, and the volatility decreases. This is favourable for financial organisations. Even if interest rates increase, the availability of funds facilitates investment and banking activities, which are observed in stable periods.

Contrary, in unstable periods, the monetary policy adopted is contractionary, and even if the yields decrease, there exists a limitation in the amount of funds in supply and the changes in the price of share increases.

Step 3 - V: To explain the relationship between phase I and phase III findings of the model.

This step links phase I with phase III of the model. According to the researcher who designed the model, in this step the user of the model, based on the economic analysis in phase I, must explain how the developing country situation influences the share price volatility variable. The analysis must be made based on the Akpomiemie & Ojah (2017) and Herrera & Herrera (2018) studies, which explained that when a country's situation is stable, the volatility decreases, which is favourable for both, the banks and for shareholders.

Step 4 - V: Proposes improvement actions based on the results found after the model implementation.

According to the researcher who designed the model, in this step, the user of the model must propose improvement actions based on the experiences, and findings after the model implementation. The model implementation is explained in the next chapter and after its implementation are proposed improvement actions.

4.3 Advantages and disadvantages of the new model designed

Table 4.1 Advantages and disadvantages of the model designed.

Model advantages	Model disadvantages
It is not a requirement for one to be in the emerging country to implement the model.	Most of the information to analyse must be collected from online databases depending on the availability of the data exhibited publicly.
The tool can be used in any developing country as an academic instrument to measure the effects of price to book ratio and yields in bank share price volatility of financial organisations.	
Knowing the relationship between the variables based on the country's economic situation can help to estimate economic and financial indicators (yields and bank share prices) directions and to take proactive informed actions to create financial growth and stability.	
Helps to know if the value of the share is undervalued or overvalued to make important decisions about the price of the shares.	

Source: author's own creation.

It is considered with continued implementation of the instrument designed new experiences will be created resulting in the improvement of the model.

Price to book ratio influences manager decisions regarding the establishment of share prices due to the Price to book ratio informing them on is the price of the shares: whether undervalued or not, helping them to evaluate share prices. Therefore, having instruments to compute the price to book ratio and its influence in bank relevant variables such as share price volatility becomes important at all times.

Interest rates and their impact on share price changes can influence investor sentiment and decisions. Therefore, to have measurable tools to measure the relationship between yields and share price changes, systematically, becomes essential to bank managers and shareholders.

It is considered the instrument can help financial institutions by using an academic professional tool to have measurable results from the model implementation. It should help in the making of plans, future estimations and investment decisions based on continuous tests. Investors must pay attention to bank financial instruments and decisions in order to make important investment decisions.

4.4 Summary

This chapter exhibited the design of a new model to measure the effects of price to book ratio and interest rates on share price volatility of emerging market financial organisations. Each phase and step of the model was explained in detail to make it easy to use and in order to conduct an explanatory study. The next chapter presents the model implementation in a developing nation to test its validity.

100% Exclusive around Business Model Innovation (BMI) focus on how firms exploit
existing new technologies or business ideas into new business models (Christensen, Bower
& Poppo, 2016). New business models which must be designed and implemented into firms
as a tool to help to increase efficiency into organisations.

The objective of this chapter is to implement the new model to measure the Price to book ratio
and interest rates effect on Share price volatility of emerging markets financial institutions in
the developing country of Brazil as an emerging financial organisation to test the model
validity.

4.1 Model Implementation

According to the literature reviewed in subchapter 2.3.1 of chapter two of the present
investigation, the BRICS play an important role in the development of emerging nations. That
is the reality which motivated the researcher to choose the BRICS nations as the target
population of the present study. Brazil Central Bank is the financial developing country
institution chosen to implement the model designed. This study was done during the period
from December 2016 to September 2018.

CHAPTER V

IMPLEMENTATION OF THE NEW MODEL TO MEASURE THE EFFECTS OF PRICE TO BOOK RATIO AND INTEREST RATES ON SHARE PRICE VOLATILITY FOR FINANCIAL ORGANISATIONS IN DEVELOPING NATIONS

5. Introduction

Most discussions around Business Model Innovation (BMI) focus on how firms should translate new technologies or business ideas into new business models (Broekhuizen, Bakker & Postma, 2018). New business models which must be designed and implemented into firms as a tool to help to increase efficiency into organisations.

The objective of this chapter is to implement the new model to measure the Price to book ratio and Interest rates effect on Share price volatility of emerging markets' financial institutions in the developing country of Brazil as an emerging financial organisation to test the model validity.

5.1 Model implementation

According to the literature reviewed in subheading 2.5.1 of chapter two of the present investigation, the BRICS play an important role in the development of emerging nations. That is the reality which motivated the researcher to choose the BRICS nations as the target population of the present study. Brazil Central Bank is the financial developing country institution studied to implement the model designed. This study was done during the period from December 2016 to September 2018.

Following is the model implementation:

5.1.1 Phase I of the model

Phase I: Analysis of the indicator country situation.

Step 1 - I: To study the emerging country profile to understand the developing nation features.

Emerging markets develop faster than developed markets, and as a consequence, they become increasingly more powerful and account for a larger percentage of the gross domestic product growth in world production. When a market like Brazil attracts foreign direct investments, it welcomes dynamic cultural encounters and international business negotiations (Fang, Schaumburg & Fjellstrom, 2017). According to Martins et al., (2018) the Federative Republic of Brazil is a country that occupies half of the continent landmass of South America. It is the fifth largest country in the world. The population is 207,721,000 people. Its official language is Portuguese. The country has natural resources such as mines and fertile farmlands. The official money used in Brazil is the Brazilian Real (BRL).



Figure 5.1 Brazil nation map.

Source: <https://www.britannica.com/place/Brazil>

Figure 5.1 exhibits a geographic map of the country of Brazil.

Step 2 - I: To analyse an emerging country's economy.

The Banco Central Do Brazil's (BCB) performance in 2017 brought major benefits to Brazilian society. Three positive phenomena have simultaneously occurred: reduction in inflation, decreased interest rates and economic recovery. The official Extended National Consumer Price Index (IPCA) fell from 10.7 percent per year in December 2016 to 2.95 percent per year in 2017, evidencing the lowest inflation rate since the implementation of the inflation targeting regime in 1999. With inflation under control, there was room to reduce the Selic rate, which has closed the year at 7.00 percent per year. The consequent increase in confidence induced a reversal in the declining path of the economy, which resumed growth again in 2017 (Banco Central Do Brazil, Administration Report, 2017).

5.1.2 Phase II of the model

Phase II: Analysis of the variable Interest Rate.

Step 1 - II: To study the country's interest rates.

Inflation declined markedly from 10.67 percent in 2015 to 6.29 percent in 2016, and to 2.95 percent in 2017, as measured by the annual variation of the Extended National Consumer Price Index (IPCA). In an open letter to the president of the National Monetary Council (CMN), the Governor of the Banco Central Do Brazil (BCB) justified the noncompliance with the target, as inflation reached a rate below the lower limit of the tolerance interval. As a result, the base interest rate (Selic) decreased by 725 basis points in less than a year. The Selic rate ended 2017 at 7 percent per year, the lowest level since the adoption of the inflation targeting regime in 1999. When this rate falls, the cost of credit also reduces. For individuals, it encourages consumption, while for corporations, it reduces costs – stimulating investment and production.

Consequently, economic activity and labour market boost. The Gross Domestic Product is expected to grow (Banco Central Do Brazil, Administration Report, 2017). Furthermore, from an economic - financial approach, which is the aim of this study, it can be said that Brazil enjoy of stability due to in the period in study there exist politic, financial and economic stability.

Step 2 - II: To collect numerical data about bank interest rates choosing a period to study.

Table 5.1 Interest rates table.

Period: months	Interest rates values list
2016 December	1.02
2017 Jan	0.99
Feb	0.78
Mar	0.96
Apr	0.72
May	0.84
Jun	0.72
Jul	0.76
Aug	0.72
Sep	0.55
Oct	0.59
Nov	0.50

Dec	0.47
2018 Jan	0.52
Feb	0.43
Mar	0.50
Apr	0.47
May	0.47
Jun	0.49
Jul	0.51
Aug	0.53
Sep	0.44

Source: <https://www.bcb.gov.br/pec/Indeco/Ingl/indecoi.asp>, effective interest rate section website information.

Table 5.1 shows a table with Brazil Central Bank Interest rates on a monthly basis. The table was designed using information from the original table in the website mentioned above exactly from the financial basic rate column from December 2016 up to September 2018 (see table in annexure C of the present study).

5.1.3 Phase III of the model

Phase III: Analysis of the variable Share Price Volatility.

Step 1 - III: To find information about the stock price volatility.

In this step can be introduced the stock price volatility definition for the user of the model to know about the topic of this step: share price volatility (see definitions in subheading 1.3, table 1.2 of the present report).

Step 2 - III: To collect numerical data about the price of bank shares.

Table 5.2 Share price changes table.

Period: months	Share price changes values list
2016 December	6.54
2017 Jan	0.32
Feb	- 0.08
Mar	0.14
Apr	0.61
May	- 0.05
Jun	0.05
Jul	- 0.01
Aug	0.10
Sep	0.02

Oct	0.32
Nov	0.29
Dec	0.55
2018 Jan	0.46
Feb	- 0.42
Mar	0.00
Apr	- 0.03
May	0.19
Jun	1.01
Jul	0.23
Aug	0.41
Sep	0.39

Source: <https://www.bcb.gov.br/pec/Indeco/Ingl/indecoi.asp>.

Table 5.2 shows an example of Brazil Central Bank indices.

To develop this example the researcher used the values in the percentage change of prices column from the table in the website mentioned above, (see table in annexure D of the present study), studying the period from December 2016 up to September 2018, the same period the

yields data was collected. The Microsoft Excel page with the multiple regression analysis is presented.

Step 3 - III: To identify historical volatility in the price of the shares.

Following this example, the changes in the price of the bank shares are already exhibited in table 5.2.

Step 4 – III: To determine the Price to book ratio value to incorporate in the multiple regression model.

In the present report the data used to calculate the P/B ratio is chosen from the Brazil Central Bank website in Bloomberg 2018: <https://www.bloomberg.com/quote/BBAS3:BZ>. The Brazil's Central Bank website from Bloomberg shows the data about financial indicators, for instance, the P/B ratio value of 1.09 on October of 2018 is the value assumed in this example as the constant P/B ratio for the period under study. In this example it is assumed the P/B ratio value of 1.09 from December 2016 up to September 2018, which indicates that the price of the shares is overvalued due to it being greater than 1.0.

5.1.4 Phase IV of the model

Phase IV: Analysis of the link between Price to book ratio and Interest rates with Share Price Volatility.

Step 1 - IV: To measure the link between price to book ratio and yields with bank share price volatility by developing the multiple regression model explained by Muganiwa & Lambrechts (2017) in their study.

- To present the variables of the model:

Table 5.3 Variables of the study to develop the multiple regression analysis.

Variables	Abbreviation	Dependent variable symbol	Independent variable symbol
Share price volatility	SPV	Y ₁	
Price to book ratio	P/B ratio		X ₁
Interest rates	IR		X ₂

Source: Author's

Compilation.

Table 5.3 presents the variables of the report. In the present study the researcher used three variables to develop the multiple regression analysis, one dependent or predictor variable (Share price changes) and two independent or explanatory variables (Price to book ratio) and (Interest rates) to find the relationship among them.

- To establish the model hypothesis to validate:

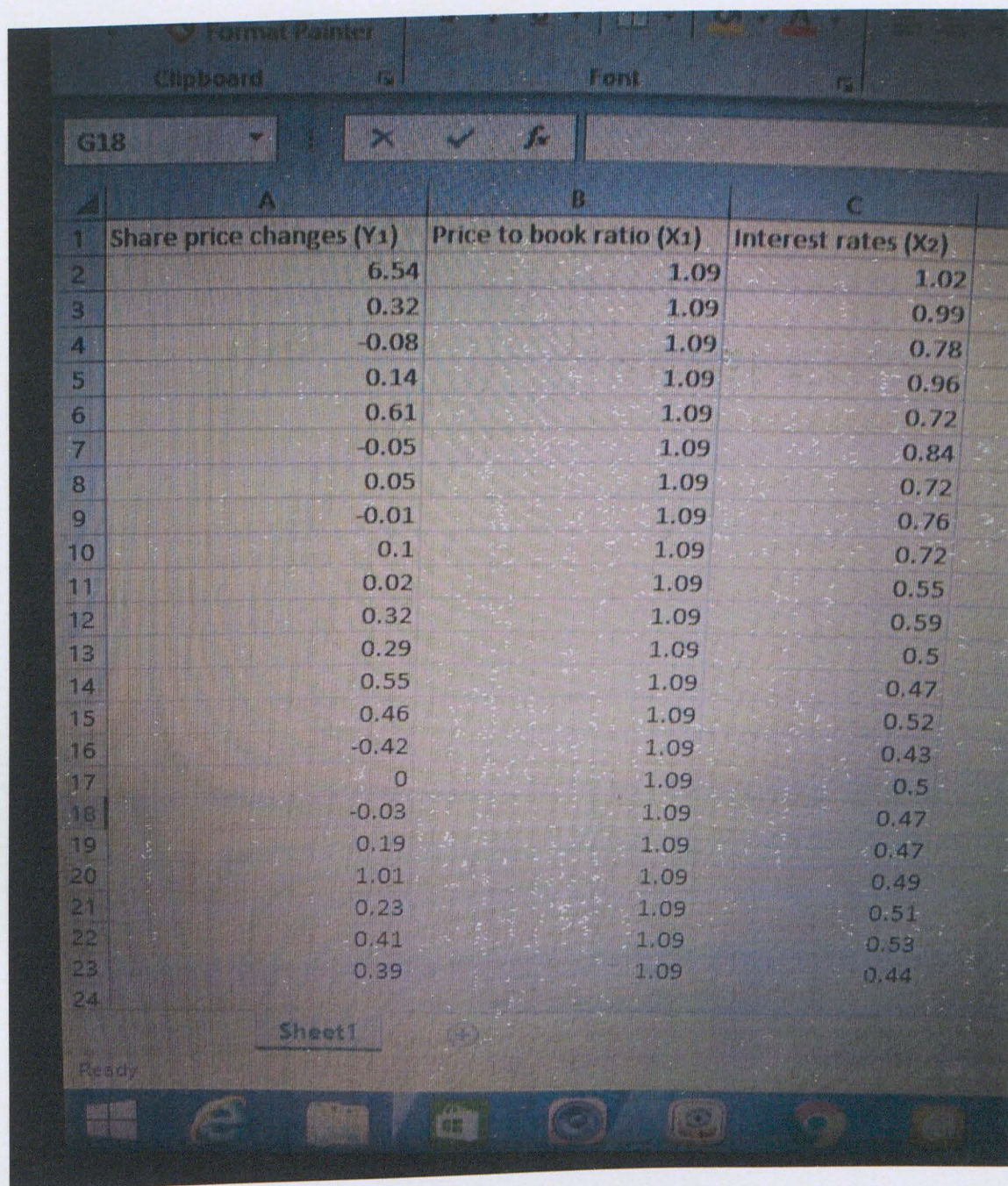
The null and alternative hypotheses were:

$H_0: \beta_1 = \beta_2 = 0 \Rightarrow$ The price to book ratio and interest rates have no effect on bank share price volatility.

$H_a: \beta_1 = \beta_2 \neq 0 \Rightarrow$ The price to book ratio and interest rates have an effect on bank share price volatility.

Where H_0 is the null hypothesis and H_a the alternative hypothesis to take if the null hypothesis is rejected. $\beta_1 = \beta_2$ represents the relationship between the variables, therefore, when $\beta_1 = \beta_2$ is equal to zero the relationship between the variables does not exist; and when $\beta_1 = \beta_2$ is different from zero, there is a relationship between the variables.

- To introduce in Microsoft Excel page the data about price to book ratio, yields and share price changes values.



The screenshot shows a Microsoft Excel spreadsheet with three columns: A (Share price changes (Y1)), B (Price to book ratio (X1)), and C (Interest rates (X2)). The data is organized in rows 1 through 24. The spreadsheet interface includes the 'Format Painter' ribbon, a formula bar with 'G18', and a taskbar at the bottom with various application icons.

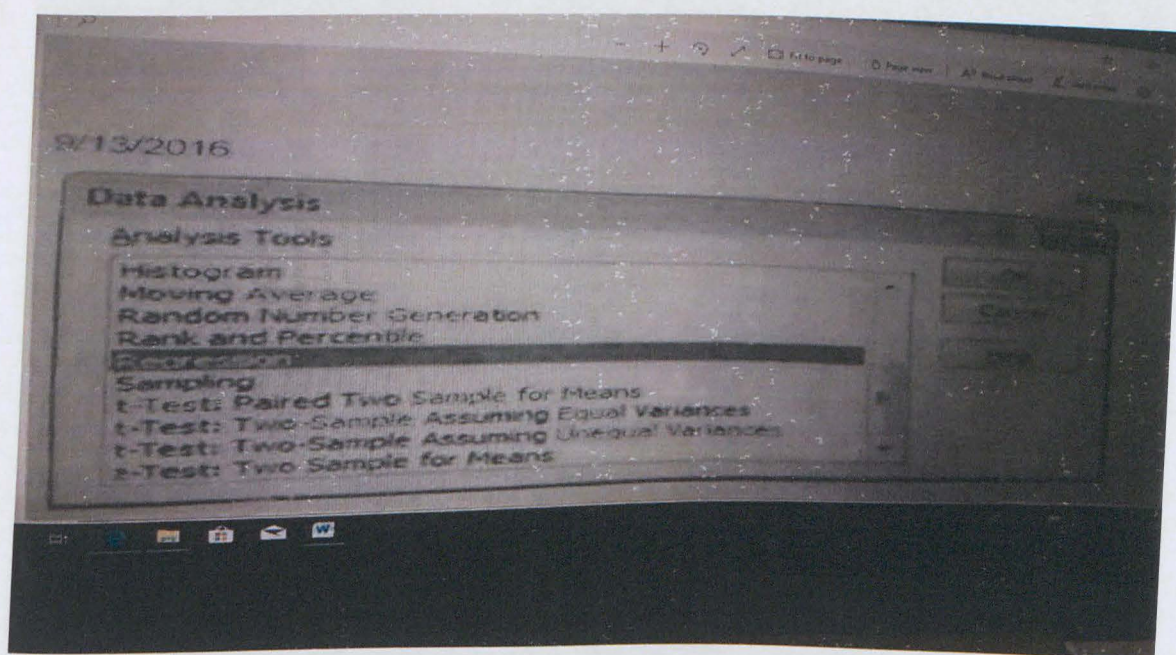
	A	B	C
1	Share price changes (Y1)	Price to book ratio (X1)	Interest rates (X2)
2	6.54	1.09	1.02
3	0.32	1.09	0.99
4	-0.08	1.09	0.78
5	0.14	1.09	0.96
6	0.61	1.09	0.72
7	-0.05	1.09	0.84
8	0.05	1.09	0.72
9	-0.01	1.09	0.76
10	0.1	1.09	0.72
11	0.02	1.09	0.55
12	0.32	1.09	0.59
13	0.29	1.09	0.5
14	0.55	1.09	0.47
15	0.46	1.09	0.52
16	-0.42	1.09	0.43
17	0	1.09	0.5
18	-0.03	1.09	0.47
19	0.19	1.09	0.47
20	1.01	1.09	0.49
21	0.23	1.09	0.51
22	0.41	1.09	0.53
23	0.39	1.09	0.44
24			

Figure 5.2 Microsoft Excel book page with the list of the price to book ratio, interest rates and share price changes values.

Figure 5.2 exhibits the Microsoft Excel workbook with an example of share price volatility and interest rates values used in this example, values collected from the tables 5.1 and 5.2 above.

When data is in Excel, the researcher must follow the following: go to File / Options / Add – ins / Analysis Tool Pak / OK. After doing so, on the Data option of the Microsoft Excel page window, click on Data Analysis, there will appear a window named Analysis Tool, and there, from the tools, choose regression and to press the bottom OK.

Figure 5.3 Data Analysis / Analysis Tools Microsoft Excel window illustration.



Source: <http://www.excel-easy.com/examples/regression.html>

Figure 5.3 shows the Data Analysis / Analysis Tools Microsoft Excel window from where the regression tool option must be chosen. After so, will appear a regression window where the researcher must select in the excel book the column of input y Range the dependent variable

share price changes Y (\$A\$1: \$A\$23), from there to select the independent variable column Output X Ranges Price to book ratio (X1) and Interest rates X2 (\$B\$1: \$C\$23), from there to click in labels in the regression window, to click in output range and to choose the cell where the researcher would like to receive the result (\$D\$24), from there to click in residuals, and to click in the OK button.

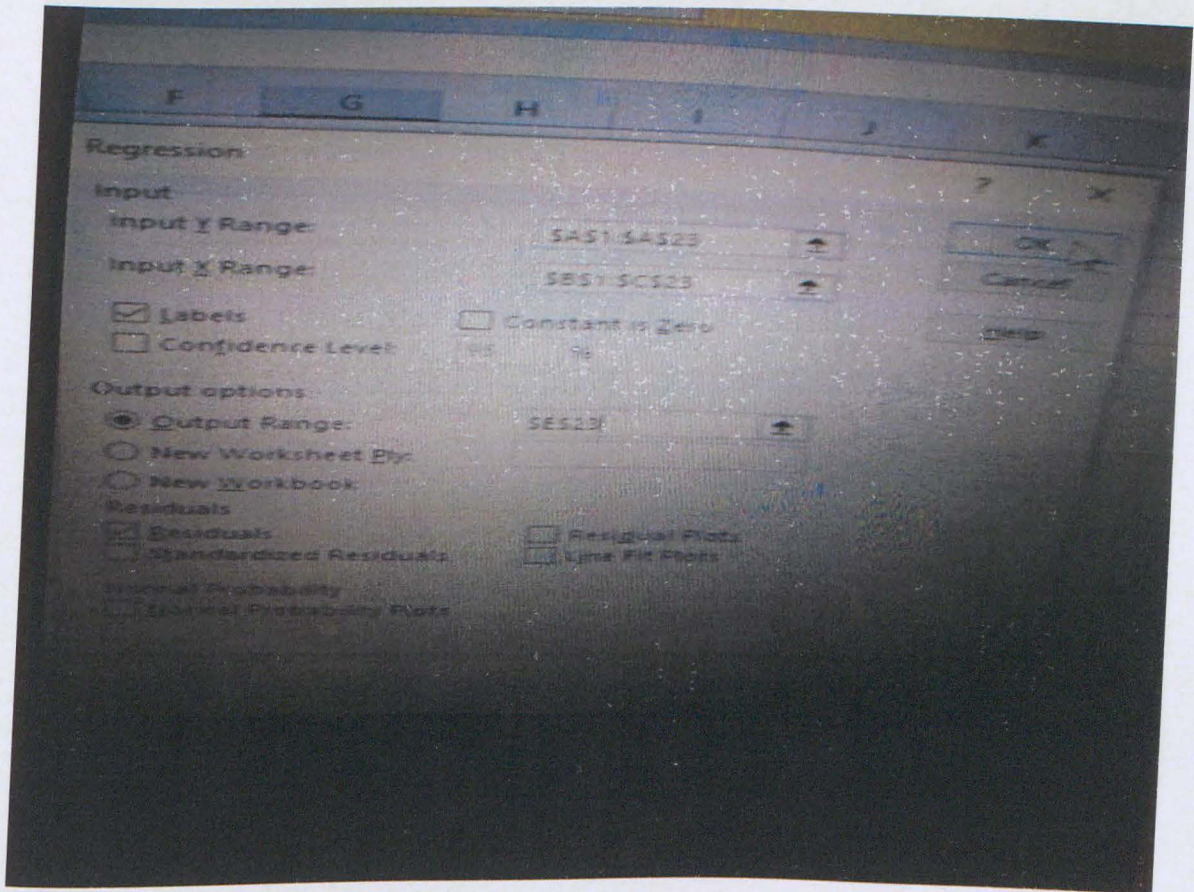


Figure 5.4 Regression window in Microsoft Excel illustration.

Source: Author's own creation.

Figure 5.4 presents the regression table in the Microsoft Excel Book.

After pressing the OK button as is shown in the figure above, the summary output table will appear in the output range cell chosen (in this example \$C\$24), with the information needed to continue with the rest of the bullets part of the multiple linear regression analysis.

SUMMARY OUTPUT

Regression Statistics

Multiple R	0.498609
R Square	0.248611
Adjusted R	0.169518
Standard E	1.258585
Observatio	22

ANOVA

	df	SS	MS	F	ignificance F
Regression	2	9.95806	4.97903	3.143257	0.066178
Residual	19	30.09667	1.584035		
Total	21	40.05473			

	Coefficients	andard Err	t Stat	P-value	Lower 95%	Upper 95%	ower 95%	Upper 95%
Intercept	-1.4337	0.962553	-1.48948	0.152774	-3.44835	0.580945	-3.44835	0.580945
Price	0	0	65535	#NUM!	0	0	0	0
Interest rate	0.045883	1.4547	2.093823	#NUM!	0.001162	8.096604	0.001162	8.096604

Figure 5.5 Summary output table with the results in Microsoft Excel page illustration.

Source: Author's own creation.

Figure 5.5 exhibits the summary output table in Microsoft Excel page from where the data to write the multiple regression model is collected.

- **To write out the multiple regression model.**

Data:

Dependent variable: Share price changes = Y_1 .

Independent variable: Price to book ratio = X_1 .

Independent variable: Interest rates = X_2 .

5 percent level of significance: $\alpha = 0.025$ each tail, it is a two tails test model.

$5\% / 2$ or $0.05 / 2 = 0.025$ each tail.

$n = 22$. (see summary output table in figure 5.5)

Degrees of freedom = $22 - 1 = 21$

Degrees of freedom = 21

T. Critical = 2.080

Estimated multiple regression model:

Y_1 (Share price volatility) = $-\beta_0$ (Intercept) + $\beta_1 X_1$ (Price to book ratio) + $\beta_2 X_2$ (Interest rates)

Y_1 (Share price volatility) = $-1.4337 + 0 X_1 + 3.045883 X_2$

Y_1 (Share price volatility) = 1.612183

Y_1 (Share price volatility) = 1.612

Information that is collected from the Summary Output Table to develop the multiple regression analysis.

- To discuss the overall fitness of the model.

R Square = 0.248611 = 24.86 % = 25 %.

It was found that 25 % of the variations in the price of the shares are explained by the Price to book ratio (X1) variable and Interest rates (X2) variable. The model is representative in a 25 %. X1; X2 and Y1 variables are related in a 25 %, which is justified by the not significant relationship between the study variables.

- To test the hypothesis by using the 5 percent level of significance.

T. Statistics test formula is following:

$$T. Statistics = \frac{\hat{\beta}_1 - \beta_1}{SE(\hat{\beta}_1)}$$

Where: $\hat{\beta}_1$ is the mean value of the variables from the summary output table in the coefficient's column, in the independent variable's rows.

β_1 is the value of the null hypothesis (H_0) = 0.

$SE(\hat{\beta}_1)$ is the standard errors of X1 and X2 variables, which can be found in the summary output table in the standard error column, in the independent variable rows.

$$T. Statistics = \frac{\hat{\beta}_1 - \beta_1}{SE(\hat{\beta}_1)}$$

$$T. \text{ Statistics} = (0 + 3.045883/2) - 0$$

$$(0 + 1.4547/2)$$

$$T. \text{ Statistics} = 1.5229415 / 1.4547$$

$$T. \text{ Statistics} = 1.046911047$$

$$T. \text{ Statistics} = 1.0469$$

T. Statistic value (1.0469) can be compared with the T. Critical value (2.080) collected from the T. Distribution table, to establish if the null hypothesis is accepted or rejected.

Hypothesis test:

$$T. \text{ Statistics} = 1.0469 < T. \text{ Critical} = 2.080$$

Based on the hypothesis test result above, the study failed to reject the null hypothesis $H_0: \beta_1 = \beta_2 = 0$ which is accepted and the alternative hypothesis $H_a: \beta_1 = \beta_2 \neq 0$ is rejected, because the T. Statistic value (1.0469) is less than the T. critical (2.080), which put the T. Statistics value into the accepted area accepting the null hypothesis (see figure 5.6). Moreover, the P value of 0.06 is greater than 0.05 level of significance, which indicates that price to book ratio and interest rates don't statistically predict share price volatility.

The relationship between the study variables does not exist, it is not statistically significant due to the probability value of 0.06 is greater than 0.05 level of significance. There is not a relationship between Price to book ratio and interest rates with Bank share price volatility in Brazil Central Bank from December 2016 up to September 2018.

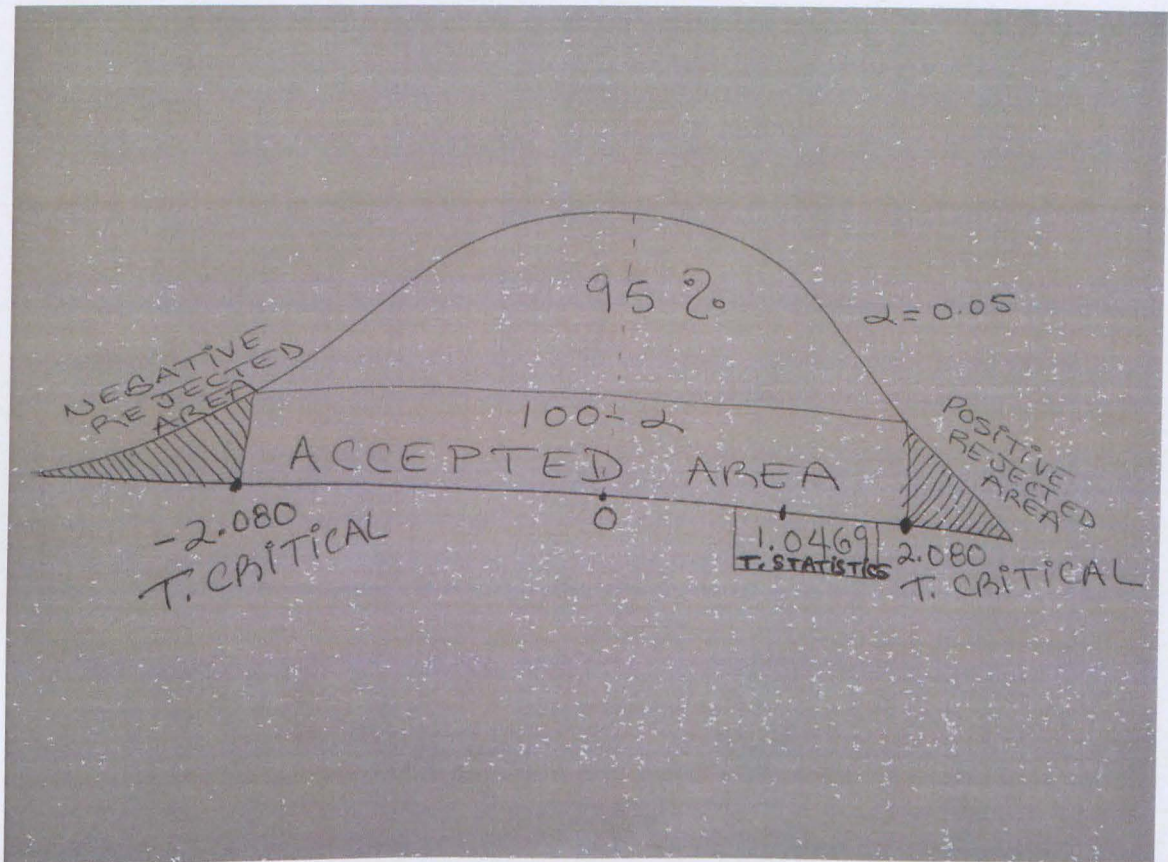


Figure 5.6 T. Statistics and T. Critical illustration.

Source: Author's own construct.

Figure 5.6 shows the T. Statistics (1.0469) and T. Critical (2.000) illustration. The 95% comes from the level of significance of 5%, where $100\% - 5\% (0.025 + 0.025) = 95\%$ level of confidence exhibited in figure 5.6. The T. Statistics is in the accepted area, that is why the null hypothesis is accepted, and the alternative hypothesis is rejected, which means that there is no relationship between Price to book ratio and interest rates with Bank share price volatility. The findings can be different in every financial emerging country organization where the tool is implemented.

- **To interpret coefficients of the multiple regression model.**

Analysis of β_0 :

β_0 is the value of the intercept, in this example is equal to -1.4337 when Price to book ratio (X_1) and Interest rates (X_2) variables are equal to zero.

Analysis of β_1 :

In this example β_1 is equal to 0, which means that when Price to book ratio (X_1) variable increases by 1%, Y_1 (Share price volatility) will increase 0, nothing, demonstrating that there is not a relationship between price to book ratio and share price volatility.

Analysis of β_2 :

In this example β_2 is equal to 3.045883, which means that when the Interest rates (X_1) variable increases by 1%, Y_1 (Share price volatility) will increase by 3.045883, going both variables in the same direction.

- **To explain the relationship between Price to book ratio and Interest rates with Share Price volatility.**

To explain the relationship between the investigation variables, one must take into consideration the T. Statistics value. In this example the null hypothesis is accepted and the alternative hypothesis is rejected, which means that there is no relationship between Price to book ratio (X_1) and Interest rates (X_2) with Share price volatility (Y_1) in Brazil Central Bank during the period of December 2016 up to September 2018. The Significance F. value of 0.06 is greater than 0.05 level of significance, indicating for one to accept the null hypothesis and that there is no relationship between price to book ratio and interest rates with share price volatility.

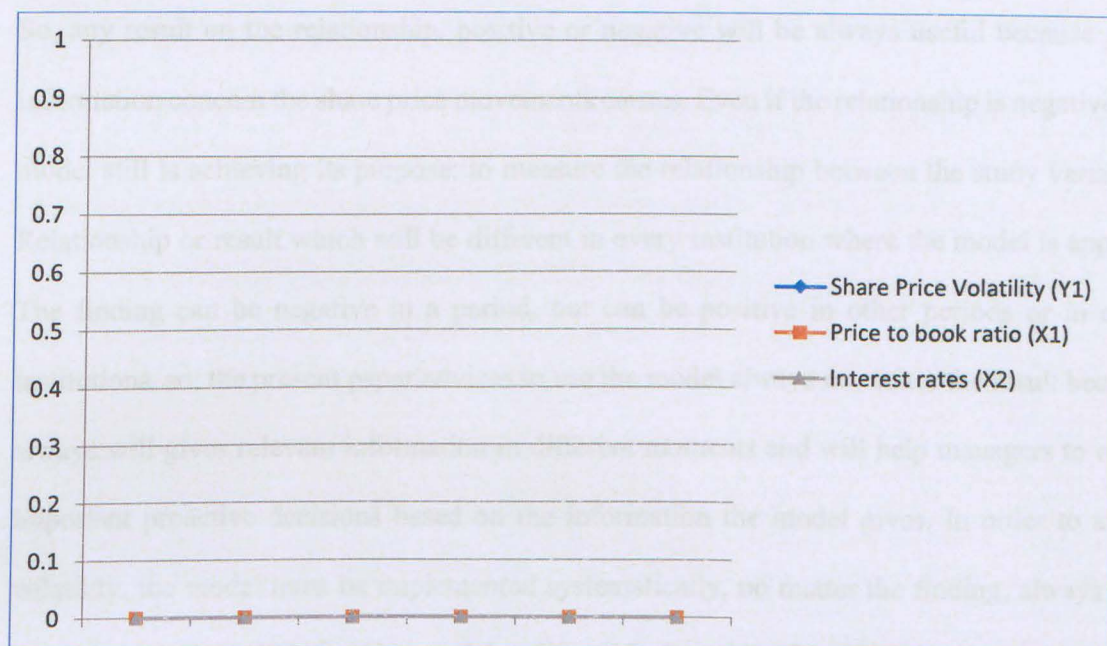


Figure 5.7 Relationship between Price to book ratio (X1) and Interest rates (X2) with Share price volatility (Y1) illustration.

Source: Author's own construct.

Figure 5.7 exhibits a graphic with the illustration of the relationship between Price to book ratio (X1) and Interest rates (X2) with Share price volatility (Y1), showing that the value of the variable Price to book ratio is constant and when the values of interest rates increase, the values of share price volatility do not increase, demonstrating no relationship between the study variables. The instrument was designed to measure the relationship between the study variables. Even if the relationship is negative or positive, that information becomes relevant information to be used by bank managers for they to be able to know if the dependent variable is explained or not by the independent variables. For bank managers to know if changes in the price of the shares are caused by price to book ratio and interest rates.

So, any result on the relationship, positive or negative will be always useful because gives information concern the share price movements causes. Even if the relationship is negative, the model still is achieving its purpose: to measure the relationship between the study variables. Relationship or result which will be different in every institution where the model is applied. The finding can be negative in a period, but can be positive in other periods or in other institutions, so, the present paper advices to use the model always no matter the result because always will gives relevant information in different moments and will help managers to make important proactive decisions based on the information the model gives. In order to avoid volatility, the model must be implemented systematically, no matter the finding, always will be a measurer that will help to know if the changes in the price of the shares are caused by price to book ratio and interest rates, so from that point, can be taken important informed proactive investment decisions.

Moreover, sometimes there exists volatility but not relationship between the variables, this means that always will be important to implement the model because sometimes there exist volatility but not caused by price to book ratio and yields variables, so the managers of banks can know that they must study other factors causing that volatility and to make proactive improvement actions based in informed decisions after the model implementation.

No matter the result from the instrument implementation, the model will always help to avoid volatility because always will help bank managers to know from where the issue of changes in the share prices is coming from. If the changes are not coming from price to book ratio and yields, that will help to bank managers to know that they must consider other factors, and that is a way of avoiding volatility because they will know in which direction to study the volatility problem and which improvement actions to take.

5.1.5 Phase V of the model

Phase V: Analysis of the results of the measurement of the relationship between the study variables and propose improvement actions after the model implementation.

Step 1 - V: Discussion of the findings found after the phase IV implementation.

In this example of the Central Bank of Brazil, the study fails to reject the null hypothesis. The null hypothesis is accepted and the alternative hypothesis is rejected, which means that there was no relationship between Price to book ratio (X_1) and Interest rates (X_2) with Share price volatility (Y_1) in Brazil Central Bank during the period of December 2016 up to September 2018. Due to the T. Statistics value (1.0469) being inside the accepted area (see figure 5.6).

It is considered important to explain that the model was designed to measure the relationship between the study variables. That relationship will be different in every organisation where the tool is implemented, because the type and amount of data change between organisations, so the results of the model implementation also change.

In the case of the Central Bank of Brazil from December 2016 to September 2018 the country enjoyed of stability, which means that price to book ratio and yields are stables as well as the price of the shares. So, is normal that there not exists a relationship between the study variables because everything is favourable due to stability in the situation of the country, so the result from the model implementation in that period is understandable.

Step 2 - V: To explain the relationship between phase I findings and phase II findings of the model.

In this example, the analysis is made based on Akpomiemie & Ojah (2017) and Herrera & Herrera (2018) studies, which explained that when a country's situation is stable, interest rates increase, due to an expansionary policy adopted, and the volatility decreases, which is favourable for financial organisations. Even if interest rates increase, the availability of funds make it possible for people to invest and that facilitates investment and banking activities, which is observed in stable periods. Based on the findings of this example using Brazil's Central Bank, it can be said that Brazil was a country enjoying stability in the period of study, which made possible the adoption of an expansionary policy, which made possible availability of funds to invest even if interest rates increased, making possible no need for changing share prices due to stability in the country's economy.

Furthermore, even if interest rates increase under an expansionary policy, the prices of the shares don't change, which can be explained by stability in the economy of Brazil, demonstrating that there is no relationship between the study variables in the period from December 2016 up to September 2018.

Step 3 - V: To explain the relationship between phase I findings and phase III of the model.

This step 3 links phase I with phase III of the model. In this step the researcher, based on the economic analysis studied in phase I, explained how the developing country situation influences the share price volatility variable in phase III.

The analysis must be made based on Akpomiemie & Ojah (2017) and Herrera & Herrera (2018), who explained that when a country situation is stable, volatility decreases, which is favourable for both, the bank institutions and investors. Based on the information researched in this example, it can be said that Brazil's Central Bank enjoys stability, assuming an expansionary monetary policy, which stimulates investment activities by clients that observe stability in the price of the shares. In the present investigation there is no relationship between Price to book ratio and Interest rates with Share price volatility. The dependent variable Share price volatility is not affected by study independent variables. It can be said that the economic situation influences positively the share prices due to Brazil enjoying stability, which made it possible not to have large changes in the share prices in Brazil Central Bank from December 2016 up to September 2018. The economic analysis is part of the new model and is considered important because in developing nations the country situation influences a lot the financial environment. So, even if the model measures the relationship between the study variables also in on of its steps analyses how the country situation in the moment in study influences the movements in the share prices and yields. The researcher considers important to link, as part of the model designed, the result form the relationship measurement between the study variables and the situation of the country. To be able to understand that the country situation is an important economic indicator influencing prices and yields behaviours of developing countries according to Akpomiemie & Ojah (2017). The present research is different from Akpomiemie & Ojah (2017) paper because incorporates the price to book ratio variables into the model but agrees with them in the importance of including the economic analysis when studying the share price volatility of developing financial markets.

Step 4: Propose improvement actions based on results found after model implementation.

In step 4, the researcher must, after knowing the results of the relationship between the variables, and the country situation and its influences in the link, propose improvement actions that can positively influence the link between the variables and bank performance.

Table 5.4 Improvement policy actions table.

Propose of improvement actions for financial organisations based on the model implementation findings:
1. To implement the model systematically (can be quarterly) as an academic tool helper to make decisions, to analyse share price, price to book ratio value and yield behavior and its link with the country economy of the developing nation in study, in order to make important informed decisions regarding share prices and investments by managers and stockholders and to improve the model uses after continuous implementation.
2. To share model findings and estimations with employees (to promote a team work environment by informing to the staff), with shareholders and investors (in order to help them to make important decisions), with risk managers (to provide them with data to manage interest risk), students and researchers (as a source of literature to review). Can be by using reports, meetings, journal articles or online websites.
3. If no link is found between the variables, and there are changes in price of the shares, to study other factors can create those changes.
4. To evaluate the possibility of using option share prices by shareholders based on the interest rate direction, which will increase shareholder satisfaction. The issues of volatility forecasting are also needed for risk management, hedging against risk using derivatives like option pricing (Mollah & Mobarek, 2009).

5. When the price to book ratio value is less than 1.0, the share price is considered undervalued. So, if the nation economic situation is favorable and there is an expansionary economy, can be analyzed the share prices in order to change its value from undervalued at least to fairvalue.
6. When the price to book ratio value is greater than 1.0, the share price is considered overvalued, in this case it is recommended to evaluate to reduce the price to fairvalue to attract stockholder investment in company shares.
7. To compute systematically the price to book ratio to know the direction (undervalued, fairvalue or overvalued) of the price of the shares in order to know how the share prices are related to the market prices to have relevant information to negotiate prices with shareholders.
8. To control the price of the share movements by financial institutions in order to know its behavior, if the movements are increasing to study possible causes causing those changes by using academic professional financial tools such as the one designed in the present study.
9. If there exist a relationship between price to book ratio and interest rates with share price volatility, means that the changes in the value of stock prices are caused by price to book ratio and yields behavior, therefore, the financial managers can focus in to study interest rates and price to book ratio in order to know how they are causing volatility in the price of the shares in order to make improvements actions to try to minimize those negative effects.

Source: Author's own creation.

Table 5.4 shows a list of improvement actions based on the results found after the instrument implementation can be considered by future researchers and business world figures.

After the model implementation the results can be used by academics, bank managers to make estimations and to create proactive financial plans based on informed decisions. The findings can be explained to employees in meetings, to shareholders, to investors before they make their decisions, and to be used in the bank research department as an academic instrument to be studied by researchers.

5.2 Summary

This chapter presented the implementation of the new model designed to measure the link between price to book ratio and interest rates with share price volatility in emerging markets financial institutions, developing it in Brazil Central Bank to test the instrument validity.

The findings show that there is no relationship between the price to book ratio and interest rates with share price volatility in Brazil Central Bank from December 2016 up to September 2018. The most relevant of this section is that exhibited in the example which shows how to use the model and explains its phases and steps in detail, as well as proposes improvement actions based on informed decisions after the model implementation.

The next chapter presents the conclusions, recommendations and suggestions for future studies of this academic work.

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

6. Introduction

The objective of this chapter was to explain the conclusions, recommendations and suggestions for future studies of this academic work. The conclusions are given based on the achievement of the research objectives presented in chapter one of this study. The recommendations are given based on the findings of this investigation after the instrument implementation to be used as policy recommendations. Proposals on new ideas or topics for research in future studies are given based on the experiences of the researcher. This is considering what was not developed in this study and still needs to be studied in future research.

6.1 Study conclusions

Kozak & Hartley (2011) suggested the use of bullets when writing conclusions. They explained that a way of making clear and easy to read the conclusions is by using bullet points. The conclusions of this thesis paper are given based on the aim and specific objectives of the study. These are exhibited below:

Research aim and specific objectives:

- **Study aim:** to design a new model for the measurement of the effects of price to book ratio and interest rates on share price volatility of financial institutions in emerging economies.

To achieve the research's aim the following **specific objectives** were developed:

- To explain the new model designed to measure the relationship between price to book ratio and interest rates with share price volatility.
- To develop the new model designed to measure the relationship between price to book ratio and interest rates with share price volatility of emerging markets' financial institutions in the Central Bank of Brazil to test its validity by developing it in a developing financial institution.
- To determine the relationship between price to book ratio and interest rates with share price volatility.
- To discuss the findings after the model implementation as part of the model designed.
- To recommend improvement policy actions based on the findings after the model designed implementation.

Based on the information on the bullets exhibited above showing the aim and specific objectives of the present academic work, the **study conclusions** are:

- The main conclusion of this paper is that the researcher designed a new model to measure the effect of price to book ratio and interest rates on share price volatility of financial institutions in emerging markets.
- Literature about price to book ratio, interest rates, share price volatility, emerging economies and business models as the study keywords were reviewed to understand the research topic.
- The methodology used in the present investigation was explained.
- The model designed was explained phase by phase and step by step to understand its uses.

- The model designed was implemented to test its validity in Brazil Central Bank in the period from December 2016 up to September 2018. Finding that there is no relationship between the study variables (see model implementation details such as country, financial institution in study, period of study, methodology used and discussions of findings in chapters four and five of this academic work).
- The findings after the model implementation were discussed and it was found that there not exists a relationship between price to book ratio and yields with share price volatility in the Central Bank of Brazil from December 2016 up to September 2018 due to the country enjoy of stability which influences positively the study variables.
- Improvement policy actions were proposed based on the model implementation findings.
- It was explained, as part of the designed academic tool, the relevancy of including the country situation analysis in the measurement of the relationship between the study variables as a way of minimising share price volatility occurrence.

6.2 Study recommendations

The recommendations of this investigation are:

- To implement the model designed in different emerging countries' financial organisations in order to improve its uses and to get new experiences and improvement ideas after its implementation.
- To promote the existence and the uses of the tool to banking sector institutions, based on its importance for the financial institution liquidity and the making of important informed decisions.

- To make the publication of the model and implementation of its findings in a journal as an article to be used as a source of literature by academics and financial managers.
- To use the step 4 of the phase V of the model as a recommendation.
- To discuss in a brainstorm meeting or workshop with employees, shareholders, clients, the existence of the model, importance for the institution and shareholders, implementation results, how it can benefit them and to ask for the incorporation, as part of the brainstorm, of new improvement ideas.
- In case the financial organisation manager decides to use the instrument designed, a plan similar to the following one must be created:

Table 6.1 Model implementation planning example.

Activities	Dates	Participants	Resources	Person responsible of organizing the meeting
Step 1	Monthly	# of participants	Technology (computer, WIFI services).	Employee
Step 2	Quarterly	# of participants	Meeting salon	Risk manager
Step 3	Annually	# of participants	Topic expert	Secretary

Source: author's own creation.

Table 6.1 presents an example of a model implementation plan. Every organisation must have a plan for the development of activities, in order to achieve objectives efficiently. In this example the plan includes activities or moments of the implementation, periods, estimated number of participants, possible resources needed and the person responsible for organising the activity. This is a way of linking financial strategies (financial tool designed) with management strategies (planning, execution and control in the model implementation plan).

6.3 Suggestions for future studies

This academic work achieved its main objective of designing a new model to measure the relationship between price to book ratio and interest rates with share price volatility in emerging markets financial institutions. However, it is considered the tool is not perfect and always accepts improvements and new ideas after its continuous implementation in different developing financial markets. Therefore, its implementation in different developing countries and periods is the main suggestion of this academic work.

- If after the model implementation a link is not found among the variables, and there exist changes in the price of the shares, **other factors will need to be studied** (by taking into consideration other variables) that can be creating the changes. This can be done by making the appropriate regression analyses.
- **To design** a new model by incorporating into the same model new variables and by changing the sector, which will need the incorporation of new variables to study, depending on the sector under study, making it a new instrument and topic.
- **To design** a new software to use the tool designed. The software will be an online tool to make easy the uses of the model. It will include the model phases and steps in online windows to make use of the software easy by only making a click in the indicated

buttons and the software will use regression analysis. Software that will have a new name, a user manual, and, depending on its quality, and owner decision, a price. This suggestion will require the knowledge of two disciplines, finance and informatics or IT.

6.4 Summary

Chapter six presented the conclusions and recommendations of this investigation, as well as the proposed topics for future research, based on the findings after the tool implementation. The conclusions were given based on the objectives of the research.

Recommendations were given based on the findings from the academic instrument implementation. Possible topics to investigate were proposed based on which new information can be included into the designed model.

The essential conclusion of this academic work is that the instrument designed to measure the link between price to book ratio and yields with share price volatility of financial institutions in emerging markets was designed and implemented in Brazil Central Bank, an emerging country financial organisation, in the period from December 2016 to September 2018. Finding no existence of a relationship between price to book ratio and interest rates with share price volatility, not observing significant changes in the price of the shares due to the country enjoying stability.

The present academic work recommends the systematic implementation of the new model designed into different emerging countries and periods, to make important informed decisions, and to propose improvement actions after its continuous implementation. This will improve the model after continuous implementations.

It is believed the instrument could help academics as a source of literature to review and to stock market analysts and financial managers to make important investment decisions based on the use of an academic financial tool. It is very important because if the instrument proves that there exists a relationship between price to book ratio and interest rates with share price volatility, that means that the changes in the price of the shares are explained by the price to book ratio and yields behaviours. This should give to bank managers an idea of possible factors causing share price volatility, allowing them to work on improvement actions to minimise changes.

Source: Authors' research. "Linkages between China's P/B Ratio and Share Price Volatility", *The Journal of East African Studies*, 10(2), 1-19.

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<https://www.btplc.com/Sharesandperformance/Investmentoverview/Sharepriceinformation/Sharepricecalculator/Index.htm>

<http://www.excel-easy.com/examples/regression/html>

<http://www.statisticshowto.datasciencecentral.com/tables/t-distribution-table/#two>

<https://www.britannica.com/place/Brazil>

<https://www.bcb.gov.br/pec/Indeco/Ingl/indecoi.asp>

ANNEXURES

ANNEXURE A

QBS
NAMIBIA BUSINESS SCHOOL
UNIVERSITY OF NAMIBIA

30th October 2018

RESEARCH PERMISSION LETTER

Student full name: Yansy Caridad Odio Lopez.
Student number: 201716811.
Programme: Master of Business Administration (Finance).
Approved research title: "A new model to measure the effect of price to book ratio and interest rate on share price volatility of financial institutions in emerging markets".

TO WHOM IT MAY CONCERN

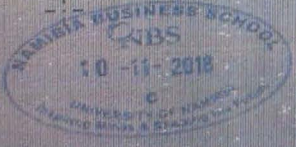
I hereby confirm that the above-mentioned student is registered at the University of Namibia Business School for the programme indicated. The proposed study met all the requirements as stipulated in the University guidelines and has been approved by the relevant committees. Permission is hereby granted to carry out the research as described in the approved proposal.

Best regards,

Your kind assistance is highly appreciated.

Yours sincerely


Dr. Greenfield Mwakipesile
Head of Research
Namibia Business School
University of Namibia
Tel: +266 61 413 500
Fax: +266 61 413 512
Email: research@unam.na



ANNEXURE B

DECLARATION

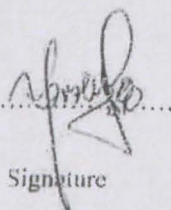
I Yansy Caridad Odio Lopez, hereby declare that this study entitled " **A new model to measure the effect of the interest rates on the share price volatility of financial institutions in emerging markets** " is my own work and is a true reflection of my research, and that this work, or any part thereof has not been submitted for a degree at any other institution.

No part of this thesis/ dissertation may be reproduced, stored in any retrieval system, or transmitted in any form, or by means (e.g. electronic, mechanical, photocopying, recording or otherwise) without the prior permission of the author, or The University of Namibia in that behalf.

I Yansy Caridad Odio Lopez, grant The University of Namibia the right to reproduce this thesis in whole or in part, in any manner or format, which The University of Namibia may deem fit.

Yansy Caridad Odio Lopez.....

Student name



Signature

2018 - 11 - 06

Date

ANNEXURE C

Photo of Banco Do Brazil Interest rates list.

III.1 - Interest rates

Period	Federal funds rate		Money market interest rate		Reference rate		Financial basic rate		Long-term interest rate	
	% p.m.	% p.y.	% p.m.	% p.y.	% p.m.	% p.y.	% p.m.	% p.y.	% p.m.	% p.y.

2016	Dec	1.12	13.65	1.12	13.63	0.18	2.14	1.02	12.28	0.60	7.50
2017	Jan	1.09	13.17	1.08	13.15	0.17	1.96	0.99	11.96	0.60	7.50
	Feb	0.87	12.82	0.86	12.80	0.03	0.42	0.78	11.50	0.60	7.50
	Mar	1.05	12.15	1.05	12.13	0.15	1.68	0.96	11.07	0.60	7.50
	Apr	0.79	11.59	0.79	11.57	0.00	0.00	0.72	10.58	0.57	7.40

143% Buscar										
May	0.93	11.15	0.93	11.13	0.08	0.88	0.84	10.02	0.57	7.00
Jun	0.81	10.15	0.81	10.14	0.05	0.65	0.72	9.04	0.57	7.00
Jul	0.80	10.01	0.80	10.00	0.06	0.75	0.76	9.55	0.57	7.00
Aug	0.80	9.15	0.80	9.14	0.05	0.56	0.72	8.19	0.57	7.00
Sep	0.64	8.35	0.64	8.34	0.00	0.00	0.55	7.19	0.57	7.00
80										

143% Buscar										
Oct	0.64	8.01	0.64	8.00	0.00	0.00	0.59	7.34	0.57	7.00
Nov	0.57	7.40	0.57	7.39	0.00	0.00	0.50	6.51	0.57	7.00
Dec	0.54	7.00	0.54	6.99	0.00	0.00	0.47	6.14	0.57	7.00
2018 Jan	0.58	6.90	0.58	6.89	0.00	0.00	0.52	6.15	0.57	7.00
Feb	0.47	6.72	0.46	6.71	0.00	0.00	0.43	6.19	0.57	7.00

Mar	0.53	6.58	0.53	6.57	0.00	0.00	0.50	6.15	0.55	6.75
Apr	0.52	6.40	0.52	6.39	0.00	0.00	0.47	5.72	0.53	6.59
May	0.52	6.40	0.52	6.39	0.00	0.00	0.47	5.75	0.53	6.60
Jun	0.52	6.40	0.52	6.39	0.00	0.00	0.49	5.99	0.53	6.60
Jul	0.54	6.40	0.54	6.39	0.00	0.00	0.51	5.96	0.53	6.56
Aug	0.57	6.40	0.57	6.39	0.00	0.00	0.53	5.94	0.53	6.56

Sep	0.47	6.40	0.47	6.39	0.00	0.00	0.44	6.02	0.53	6.56
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<https://www.bcb.gov.br/pec/Indeco/Ingl/indecoi.asp>, effective interest rate session

Source: <https://www.bcb.gov.br/pec/Indeco/Ingl/indecoi.asp>, effective interest rate session website information.

ANNEXURE D Price indices

table

Percentage

change

Period	INPC	IPCA	IPCA-15	IPCA-E	IGP-10	IGP-DI	IGP-M			IPC-Fipe			
							1st. 10-day period	2nd. 10-day period	Month	1st. 4-week period	2nd. 4-week period	3rd. 4-week period	Month
2005	5,05	5,69	5,88	5,88	1,47	1,22	...	...	1,21	...	...	...	4,53
2006	2,81	3,14	2,96	2,96	4,05	3,79	...	...	3,83	...	...	...	2,54
2007	5,16	4,46	4,36	4,36	7,38	7,89	...	...	7,75	...	...	...	4,38
2008	6,48	5,90	6,10	6,10	10,27	9,10	...	...	9,81	...	...	...	6,16
2009	4,11	4,31	4,19	4,19	-1,68	-1,43	...	...	-1,72	...	...	...	3,65
2010	6,47	5,91	5,79	5,79	11,16	11,30	...	...	11,32	...	...	...	6,40
2011	6,08	6,50	6,56	6,56	5,33	5,00	...	...	5,10	...	...	...	5,81
2012	6,20	5,84	5,78	5,78	7,42	8,10	...	...	7,82	...	...	...	5,10
2013	5,56	5,91	5,85	5,85	5,39	5,52	...	...	5,51	...	...	...	3,88
2014	6,23	6,41	6,46	6,46	3,88	3,78	...	...	3,69	...	...	...	5,20
2015	11,28	10,67	10,71	10,71	10,54	10,70	...	...	10,54	...	...	...	11,07
2016	6,58	6,29	6,58	6,58	6,95	7,18	...	...	7,17	...	...	...	6,54
2017 Jan	0,42	0,38	0,31	0,31	0,88	0,43	0,86	0,76	0,64	0,75	0,69	0,58	0,32

2018	Feb	0,24	0,33	0,54	0,54	0,14	0,06	0,22	0,02	0,08	0,18	0,02	-0,05	-0,08
	Mar	0,32	0,25	0,15	0,15	0,05	-0,38	0,25	0,08	0,01	-0,09	0,02	0,06	0,14
	Apr	0,08	0,14	0,21	0,21	-0,76	-1,24	-0,74	-0,99	-1,10	0,31	0,43	0,56	0,61
	May	0,36	0,31	0,24	0,24	-1,10	-0,51	-0,89	-0,89	-0,93	0,58	0,30	0,11	-0,05
	Jun	-0,30	-0,23	0,16	0,16	-0,62	-0,96	-0,51	-0,61	-0,67	-0,10	0,05	0,04	0,05
	Jul	0,17	0,24	-0,18	-0,18	-0,84	-0,30	-0,95	-0,71	-0,72	0,00	-0,15	-0,11	-0,01
	Aug	-0,03	0,19	0,35	0,35	-0,17	0,24	-0,03	0,03	0,10	0,04	0,22	0,22	0,10
	Sep	-0,02	0,16	0,11	0,11	0,39	0,62	0,34	0,41	0,47	0,05	-0,04	-0,02	0,02
	Oct	0,37	0,42	0,34	0,34	0,49	0,10	0,32	0,30	0,20	0,10	0,16	0,22	0,32
	Nov	0,18	0,28	0,32	0,32	0,24	0,80	-0,02	0,37	0,52	0,31	0,34	0,32	0,29
	Dec	0,26	0,44	0,35	0,35	0,90	0,74	0,73	0,88	0,89	0,39	0,46	0,52	0,55
	Jan	0,23	0,29	0,39	0,39	0,79	0,58	0,75	0,82	0,76	0,55	0,49	0,52	0,46
	Feb	0,18	0,32	0,38	0,38	0,23	0,15	0,16	0,03	0,07	0,25	0,03	-0,23	-0,42
	Mar	0,07	0,09	0,10	0,10	0,45	0,56	0,60	0,59	0,64	-0,42	-0,23	-0,12	0,00
	Apr	0,21	0,22	0,21	0,21	0,56	0,93	0,18	0,40	0,57	0,06	-0,01	-0,02	-0,03
	May	0,43	0,40	0,14	0,14	1,11	1,64	1,12	1,20	1,38	-0,03	-0,01	0,01	0,19
	Jun	1,43	1,26	1,11	1,11	1,86	1,48	1,50	1,75	1,87	0,57	0,84	1,07	1,01
	Jul	0,25	0,33	0,64	0,64	0,93	0,44	0,41	0,53	0,51	0,63	0,37	0,26	0,23
	Aug	0,00	-0,09	0,13	0,13	0,51	0,68	0,70	0,67	0,70	0,37	0,47	0,37	0,41
	Sep	0,30	0,48	0,09	0,09	1,20	1,79	0,79	1,34	1,52	0,40	0,30	0,36	0,39
	Oct	0,40	0,45	0,58	0,58	1,43	0,26	1,06	0,97	0,89	0,43	0,52	0,52	0,48
	Nov	-0,25	-0,21	0,19	0,19	-0,16	-1,14	-0,11	-0,35	-0,49	0,40	0,37	0,28	0,15
	Dec	0,14	0,15	-0,16	-0,16	-1,23	-0,45	-1,16	-1,15	-1,08	0,15	0,05	0,06	0,09

2019 Jan	...	...	...	...	-0,26	...	0,03	...	...	0,06	...	...	...
Acum. year 12 months	...	...	...	...	-0,26	...	0,03	...	...	0,06	...	...	...
	3,43	3,75	3,86	3,86	6,81	7,10	5,38	6,98	7,55	2,90	3,25	3,12	3,01

Source: <https://www.bcb.gov.br/pec/Indeco/Ingl/indecoi.asp>

ANNEXURE E

Table D. T. Distribution table.

T-Distribution Table (One Tail and Two-Tails)

T-Distribution Table (One Tail)

DF	A = 0.1	0.05	0.025	0.01	0.005	0.001	0.0005
∞	$t_a = 1.282$	1.645	1.960	2.326	2.576	3.091	3.291
1	3.078	6.314	12.706	31.821	63.656	318.289	636.578
2	1.886	2.920	4.303	6.965	9.925	22.328	31.600
3	1.638	2.353	3.182	4.541	5.841	10.214	12.924
4	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	1.476	2.015	2.571	3.365	4.032	5.894	6.869
6	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	1.372	1.812	2.228	2.764	3.169	4.144	4.587

11	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	1.333	1.740	2.110	2.567	2.898	3.646	3.965
18	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	1.325	1.725	2.086	2.528	2.845	3.552	3.850
21	1.323	1.721	2.080	2.518	2.831	3.527	3.819
22	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	1.319	1.714	2.069	2.500	2.807	3.485	3.768
24	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	1.316	1.708	2.060	2.485	2.787	3.450	3.725

26	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	1.314	1.703	2.052	2.473	2.771	3.421	3.689
28	1.313	1.701	2.048	2.467	2.763	3.408	3.674
29	1.311	1.699	2.045	2.462	2.756	3.396	3.660
30	1.310	1.697	2.042	2.457	2.750	3.385	3.646
60	1.296	1.671	2.000	2.390	2.660	3.232	3.460
120	1.289	1.658	1.980	2.358	2.617	3.160	3.373
1000	1.282	1.646	1.962	2.330	2.581	3.098	3.300

Two Tails T Distribution Table

DF	A = 0.2	0.10	0.05	0.02	0.01	0.002	0.001
∞	$t_a = 1.282$	1.645	1.960	2.326	2.576	3.091	3.291
1	3.078	6.314	12.706	31.821	63.656	318.289	636.578
2	1.886	2.920	4.303	6.965	9.925	22.328	31.600
3	1.638	2.353	3.182	4.541	5.841	10.214	12.924
4	1.533	2.132	2.776	3.747	4.604	7.173	8.610

5	1.476	2.015	2.571	3.365	4.032	5.894	6.869
6	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	1.333	1.740	2.110	2.567	2.898	3.646	3.965
18	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	1.328	1.729	2.093	2.539	2.861	3.579	3.883

20	1.325	1.725	2.086	2.528	2.845	3.552	3.850
21	1.323	1.721	2.080	2.518	2.831	3.527	3.819
22	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	1.319	1.714	2.069	2.500	2.807	3.485	3.768
24	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	1.316	1.708	2.060	2.485	2.787	3.450	3.725
26	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	1.314	1.703	2.052	2.473	2.771	3.421	3.689
28	1.313	1.701	2.048	2.467	2.763	3.408	3.674
29	1.311	1.699	2.045	2.462	2.756	3.396	3.660
30	1.310	1.697	2.042	2.457	2.750	3.385	3.646
60	1.296	1.671	2.000	2.390	2.660	3.232	3.460
120	1.289	1.658	1.980	2.358	2.617	3.160	3.373
8	1.282	1.645	1.960	2.326	2.576	3.091	3.291

Source: <https://www.statisticshowto.datasciencecentral.com/tables/t-distribution-table/#two>



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CONTACT

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LANGUAGE & COPY-EDITING CERTIFICATE

7th June 2019

RE: LANGUAGE, COPYEDITING AND PROOFREADING OF YANSY CARIDAD ODIO LOPEZ's THESIS FOR THE MASTER OF BUSINESS ADMINISTRATION DEGREE OF THE NAMIBIA BUSINESS SCHOOL OF THE UNIVERSITY OF NAMIBIA

This certificate serves to confirm that I copyedited and proofread YANSY CARIDAD ODIO LOPEZ's Thesis for the MASTER OF BUSINESS ADMINISTRATION DEGREE entitled: **A NEW MODEL TO MEASURE THE EFFECTS OF PRICE TO BOOK RATIO AND INTEREST RATE ON SHARE PRICE VOLATILITY OF FINANCIAL INSTITUTIONS IN EMERGING MARKETS**

I declare that I professionally copyedited and proofread the thesis and removed mistakes and errors in spelling, grammar, and punctuation. In some cases, I improved sentence construction without changing the content provided by the student. I also removed some typographical errors from the thesis and formatted the thesis so that it complies with the University of Namibia's guidelines.

I am a trained language and copy editor and have edited many Postgraduate Diploma, Masters' Thesis, Dissertations and Doctoral Dissertations for students studying with universities in Namibia, Zimbabwe, eSwatini, South Africa and abroad. I have also copy-edited company documents for companies in the region and abroad.

Please feel free to contact me should the need arise.

Yours Sincerely,

The Rev. Dr. Greenfield Mwakipesile



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