

# The Mathematics of Investing in Stocks

## Key Stage 4 Programme

Pupil Name

Handbook  
Designed by

Olalekan Aladesanmi



# Timetable and Assignment Submission

## Timetable – Tutorials

Tutorial	Title of Tutorial	Date	Time
1	Understand How Stock Market Works		
2	Case Studies of Countries		
3	Portfolio Theory		
4	Stock Market Analysis		
5	Portfolio Diversification		
6 (Feedback)			

## Timetable – Homework Assignments

Assignment	Description	Due Date
Tutorial 1	After reading the article below, write a 300-word essay on the benefits of diversification strategy as an investor.	
Tutorial 2	After reading "Causes of the Financial Crisis" by Mark Jickling, write a 500-word essay on the "Causes of the 2008 Stock Market Crash."	
Tutorial 3	In a 300-word essay, List and explain the different types of market risk investors are exposed to.	
Tutorial 4	Determine portfolio return and portfolio risk of combining FTSE 100 and S & P 500 indices.	
Tutorial 5	Produce a 1000-word essay about your investment of £10,000 in a simulated two-asset portfolio with diversification opportunities.	



## Assignment Submission – Lateness and Plagiarism

Lateness	
Submission after midnight on 9 <sup>th</sup> August	10 marks deducted
Plagiarism	
Some plagiarism	10 marks deducted
Moderate plagiarism	20 marks deducted
Extreme plagiarism	Automatic fail

# The Brilliant Club KS5 Programme – Pupil Feedback Report

Grade	Marks	What this means
1 <sup>st</sup>	70+	Performing to an excellent standard at undergraduate level
2:1	60–69	Performing to a good standard at undergraduate level
2:2	50–59	Performing to an excellent standard at A-level
3 <sup>rd</sup>	40–49	Performing to a good standard at A-level
Working towards a pass	0–39	Performing below a good standard at A-level
Did not submit	DNS	No assignment received by The Brilliant Club

Lateness	
Any lateness	10 marks deducted
Plagiarism	
Some plagiarism	10 marks deducted
Moderate plagiarism	20 marks deducted
Extreme plagiarism	Automatic fail

Name of PhD Tutor	Olalekan Aladesanmi		
Title of Assignment			
Name of Pupil			
Name of School	Chaucer School		
ORIGINAL MARK / 100		FINAL MARK / 100	
DEDUCTED MARKS		FINAL GRADE	

If marks have been deducted (e.g. late submission, plagiarism) the PhD tutor should give an explanation in this section:

### Learning Feedback Comment 1 – Enter Key Learning Priority Here

What you did in relation to this Key Learning Priority <i>Enter feedback here</i>	How you could improve in the future <i>Enter feedback here</i>
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### Learning Feedback Comment 2 – Enter Key Learning Priority Here

What you did in relation to this Key Learning Priority <i>Enter feedback here</i>	How you could improve in the future <i>Enter feedback here</i>
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### Learning Feedback Comment 3 – Enter Key Learning Priority Here

What you did in relation to this Key Learning Priority <i>Enter feedback here</i>	How you could improve in the future <i>Enter feedback here</i>
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Resilience Comment

How you showed learning resilience during the course

*Enter feedback here*

How you could build learning resilience in the future

*Enter feedback here*

# Contents

<b>Course Rationale</b>	<b>7</b>	
<b>Mark Scheme</b>		<b>8</b>
<b>Glossary of Keywords</b>	<b>12</b>	
<b>Tutorial 1</b>	<b>14</b>	
Activity 1	14	
Activity 2	15	
Activity 3	15	
<b>Tutorial 2</b>	<b>21</b>	
Activity 1	21	
Activity 2	23	
<b>Tutorial 3</b>	<b>24</b>	
Activity 1	24	
Activity 2	25	
<b>Tutorial 4</b>	<b>27</b>	
Activity 1	28	
Activity 2	30	
<b>Tutorial 5</b>	<b>33</b>	
Activity 1	34	
Activity 2	34	
<b>Tutorial 6</b>	<b>38</b>	
Reflection on feedback	39	
<b>Appendices</b>	<b>40</b>	
Referencing correctly	40	

## Course Rationale

The growing connection between financial markets in the globe has raised serious challenges to investors seeking to maximise returns and minimise risks. This course is about mapping the diversification benefits that UK investors can reap by combining domestic securities with foreign assets from developed, emerging and frontier markets around the globe. In this course, you will be acting as a UK investor with an objective of applying mathematical skills to minimising the risk of holding a UK-foreign stock portfolio while maximising your expected returns or keeping it the same at best.

As an investor you will be allocated fictitious money to simulate investment in a stock portfolio with potential diversification opportunities. This course gives you an authentic learning situation where you are thinking, feeling and doing what practising professionals do in the financial markets. Overall, it simply teaches you how the stock market works using financial mathematical models.

# Mark Scheme Table

	Skills	1 <sup>st</sup> (70-100)	2:1 (60-69)	2:2 (50-59)
Subject knowledge	Knowledge and Understanding	<ul style="list-style-type: none"> <li>o <u>All</u> content included is relevant to the general topic and to the specific question/title</li> <li>o Good understanding of <u>all the relevant topics</u>.</li> <li>o Scientific terms are defined and used <u>accurately throughout</u></li> <li>o <u>Clear justification</u> on how the content included is related to the specific issues that are the focus of the assignment</li> </ul>	<ul style="list-style-type: none"> <li>o <u>Most</u> of the content included is relevant to the general topic and to the specific question/title</li> <li>o Good understanding of <u>most the relevant topics</u></li> <li>o Scientific terms are used accurately but <u>not always</u> clearly defined.</li> <li>o <u>Adequate</u> justification on how the content included is related to the specific issues that are the focus of the assignment</li> </ul>	<ul style="list-style-type: none"> <li>o <u>Some</u> of the content included is relevant to the general topic and to the specific question/title</li> <li>o Good understanding on <u>some of the relevant topics</u> but occasional confusion on others.</li> <li>o Scientific terms are used mostly accurately with <u>occasional confusion</u> and often not defined.</li> <li>o <u>Some</u> justification on how the content included is related to the specific issues that are the focus of the assignment</li> </ul>

Critical thinking	Research and Evidence	<ul style="list-style-type: none"> <li>○ Inclusion of <u>rich sources</u> of research findings, data, quotations or other sourced material as evidence for the claims/ ideas</li> <li>○ Use evidence/calculations to support claims/assertions/ideas, <u>consistently</u> clearly and convincingly</li> <li>○ <u>Evidence of further reading</u> beyond materials provided which were <u>used in an appropriate context</u></li> <li>○ Data is <u>effectively analysed</u> and appropriate assumptions/conclusions are reached</li> </ul>	<ul style="list-style-type: none"> <li>○ Inclusion of <u>adequate sources</u> of research findings, data, quotations or other sourced material as evidence for the claims/ ideas</li> <li>○ Use evidence/calculations to support claims/assertions/ideas, <u>mostly</u> clearly and convincingly</li> <li>○ <u>Evidence of further reading</u> beyond materials provided</li> <li>○ Data is <u>analysed</u> and the assumptions/conclusions that are reached are mostly <u>appropriate</u></li> </ul>	<ul style="list-style-type: none"> <li>○ Inclusion of <u>some sources</u> of research findings, data, quotations or other sourced material as evidence for the claims/ ideas</li> <li>○ Use evidence/calculations to support claims/assertions/ideas, <u>at times</u> clearly and convincingly</li> <li>○ <u>Limited evidence of further reading</u> beyond materials provided</li> <li>○ There is an <u>attempt to analyse data</u> and draw assumptions/conclusions</li> </ul>
	Developing an Argument	<ul style="list-style-type: none"> <li>○ A point of view or position in relation to the title or question is <u>consistently clear</u></li> <li>○ Argument/proof <u>exceptionally</u> well-developed and well-justified</li> <li>○ A position is clearly established in relation to the question, and is developed <u>effectively and consistently</u> throughout the essay</li> <li>○ Makes links <u>effectively</u> between subjects that have not previously been associated</li> <li>○ Uses concepts from the tutorials in an unfamiliar context, and does</li> </ul>	<ul style="list-style-type: none"> <li>○ A point of view or position in relation to the title or question is <u>adequately clear</u></li> <li>○ Argument/proof <u>clear and well-developed</u> and position justified</li> <li>○ A position is established in relation to the question, and is <u>well-developed in most of the essay</u></li> <li>○ <u>Some evidence of linking</u> subjects that have not previously been associated</li> <li>○ Use some concepts from the tutorials in an unfamiliar context, but not always accurate</li> <li>○ Analysis of content to support the argument</li> </ul>	<ul style="list-style-type: none"> <li>○ A point of view or position in relation to the title or question is <u>somewhat clear</u></li> <li>○ Argument/proof <u>clear but not well-developed</u></li> <li>○ A position is established in relation to the question, and is <u>well-developed in parts of the essay</u></li> <li>○ <u>Limited evidence of linking</u> subjects that have not previously been associated</li> <li>○ Limited use of concepts from the tutorials in other contexts</li> <li>○ Some analysis of content to support the argument</li> </ul>

		<ul style="list-style-type: none"> <li>o so accurately and confidently.</li> <li>o Content is analysed effectively to support the argument</li> </ul>		
	Critical Evaluation	<ul style="list-style-type: none"> <li>o Moved <u>beyond description</u> to an assessment of the value or significance of what is described</li> <li>o Evaluative points are <u>consistently</u> explicit/systematic/reasoned/justified</li> <li>o <u>Effective critiques</u> on the reliability of sources provided</li> </ul>	<ul style="list-style-type: none"> <li>o <u>Mostly description but some assessment</u> of the value or significance of what is described</li> <li>o Evaluative points are <u>mostly</u> explicit/systematic/reasoned/justified</li> <li>o <u>Some evidence of critiques</u> on the reliability of sources provided</li> </ul>	<ul style="list-style-type: none"> <li>o <u>Only description with minimal assessment</u> of the value or significance of what is described</li> <li>o Evaluative points are <u>at times</u> explicit/systematic/reasoned/justified</li> <li>o <u>Limited evidence of critiques</u> on the reliability of sources provided</li> </ul>
Written communication	Structure and Presentation	<ul style="list-style-type: none"> <li>o Ideas are presented in paragraphs and arranged in a logical structure that is appropriate for the assignment</li> <li>o <u>The introduction clearly outlines</u> how the essay/report will deal with the issues</li> <li>o The conclusion summarises <u>all the</u> main points clearly and concisely</li> <li>o <u>All calculations, formulas and methods are clearly structured,</u> clear to follow and correct</li> <li>o <u>Tables and graphs are effectively constructed</u> including appropriate headings, units and scales.</li> <li>o <u>All sources are referenced correctly</u> in an agreed format</li> </ul>	<ul style="list-style-type: none"> <li>o Ideas are presented in paragraphs and arranged in a structure that is mostly appropriate for the assignment</li> <li>o <u>The introduction adequately</u> describes how the essay/report will deal with the issues</li> <li>o The conclusion summarises <u>most</u> of the main points clearly</li> <li>o Calculations, formulas and methods are <u>mostly structured,</u> clear to follow and correct</li> <li>o <u>Most tables and graphs are well constructed</u></li> <li>o <u>Most sources are referenced correctly</u> in an agreed format</li> </ul>	<ul style="list-style-type: none"> <li>o Ideas are presented in paragraphs and arranged in a structure</li> <li>o <u>The introduction mentions</u> how the essay/report will deal with the issues</li> <li>o The conclusion summarises <u>some</u> of the main points clearly</li> <li>o Calculations, formulas and methods are not always structured, clear to follow and correct.</li> <li>o <u>Some tables and graphs are well constructed</u> but contains some errors</li> <li>o <u>Some sources are referenced correctly</u> in the agreed format with occasional errors</li> </ul>

	<p>Language and Style</p>	<ul style="list-style-type: none"> <li>○ <u>No</u> spelling, grammar or punctuation errors</li> <li>○ <u>Units and significant figures</u> are presented accurately throughout</li> <li>○ Writing style <u>consistently</u> clear, appropriate for scientific documents and easy to follow</li> <li>○ <u>Accurate and consistent use of technical language</u> and vocabulary</li> </ul>	<ul style="list-style-type: none"> <li>○ <u>Minimal</u> spelling, grammar or punctuation errors</li> <li>○ <u>Units and significant figures</u> are presented accurately throughout</li> <li>○ Writing style <u>mostly</u> clear, appropriate for scientific documents and easy to follow</li> <li>○ <u>Some attempts of using technical language</u> and vocabulary, but not always accurate</li> </ul>	<ul style="list-style-type: none"> <li>○ <u>Some</u> spelling, grammar or punctuation errors</li> <li>○ <u>Units and significant figures</u> are presented accurately throughout with <u>occasional errors</u></li> <li>○ Writing style <u>moderately</u> clear, appropriate for scientific documents and easy to follow</li> <li>○ <u>Use of simple language and vocabulary</u> effectively but struggles to use technical language</li> </ul>
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## Glossary of Keywords

Word	Definition	In a sentence
Financial Markets	A financial market is a marketplace where prospective buyers and sellers engage in the trading of financial assets such as stocks, bonds, currencies, commodities and derivatives	
Developed markets	Developed markets are markets with minimum restrictions on foreign ownership of assets and liabilities, well-functioning financial system and better integrated with world financial markets.	
Statistics	A branch of mathematics dealing with the collection, analysis, interpretation, and presentation of masses of numerical data	
Index	An index is a statistical measure of the changes in a portfolio of stocks representing a portion of the overall market.	
Portfolio	It is a range of investments e.g. stocks held by a person	
Diversification	Diversification is a technique that mixes a wide variety of investments within a portfolio	
Investor	An investor is a person or organisation that puts money into financial schemes with the expectation of profits or financial returns	
Policymakers	Policymakers are people responsible for formulating policies and policy decisions.	
Financial assets	Financial assets are intangible assets such as stocks, bonds, bank deposits, loans etc.	
Stock market turnover ratio	It measures the value of stock transactions relative to the size of the market (i.e. market capitalisation) and is commonly used as proxy for market liquidity.	
Stock market capitalisation to GDP ratio	It is used as an indicator of stock market size in terms of undervaluation or overvaluation of the overall market	

The gross portfolio equity assets to GDP ratio	It is used as an indicator of total ownership of equity and may be used as a proxy for financial development.	

# Tutorial 1 – Understanding How the Stock Market Works

What is the Purpose of Tutorial 1?

- To know the meaning of stocks/shares/stock indices.
- To understand why you as an investor can buy and sell shares.
- To understand the basis for diversification.

If the thought of investing in the stock market scares you because of the frequent public news of investors striking it rich or losing all, then you are not alone. However, understanding a little more about the stock market and how it works will change your perception into seeing it as viable investment opportunities that can be exploited.

## What is a Stock or Shares?

A stock is a type of security that indicates ownership in a company and represents a claim on part of the company's asset and earnings. When you buy a stock, you are buying a piece of the company. When a company needs to raise money, it issues shares. This is done through an initial public offering (IPO), in which the price of shares is set based on how much the company is estimated to be worth, and how many shares are being issued. The company gets to keep the money raised to grow its business, while the shares (also called equity) continue to trade on an exchange, such as the London Stock Exchange (LSE).

### Activity 1:

Question 1: Synergy Ltd wants to raise £15 billion through the issue of 1,000,000 new shares. How much will the share sell for?

Question 2: Mr Andrew bought 1000 shares of Synergy Ltd at £5.00 per share on 5<sup>th</sup> August 2014. As a result of Central bank quantitative easing program, the share price has risen to £35.00 per share as at 20<sup>th</sup> October 2017. What will be his capital gain if he decides to sell his shares?

## What is stock market index?

A stock market index is a measurement of the value of a section of the stock market. It is computed from the prices of selected stocks (typically a weighted average). It is a tool used by investors and financial managers to gauge the performance of the economy.

### Activity 2:

Why is stock market index important to investors and policymakers?

#### Why Buy or Sell Shares?

Traders and investors continue to trade a company's stock after the IPO because the perceived value of company changes over time. Investors can make or lose money depending on whether their perceptions are in agreement with "the market." The market is the vast array of investors and traders who buy and sell the stock, pushing the price up or down. Trying to predict which stock will rise or fall, and when, is very difficult. Traders and investors continue to buy and sell the stock of the company on the exchange, although the company itself no longer receives any money from this type of trading.

### Activity 3:

Are there risks to buying or selling shares?



Why should people invest in stocks?

The only reason is the expectation of higher profits (also called returns). The expected profit from the dividend must exceed the interest rates from the bond investment; this will influence the price investors are willing to pay for shares and thus determine the stock value of companies in the market. The stock price thus represents the sum of the (expected) future returns plus a premium for the higher risk that a business may do badly/worse than expected in the future.

### Why diversify?

Over time stocks as a whole tend to rise, which is why many investors choose to buy a basket of stocks in various sectors and across markets, and hold them for the long-term. This is called the principle of diversification. The primary aim of international diversification is to enhance the risk-return benefit for investors. As an example, when two stock indices have the same returns, a risk-averse investor will choose the index with the lowest risk. Likewise, an investor will choose a stock index with the highest stock returns when two stock indices have the same risk.

#### Homework:

After reading the article below, write a 300-word essay on the benefits of diversification strategy to an investor.

#### Article on "The Benefits of Diversification"

by CUMIS Insurance Society, Inc.

Diversification is one investment strategy that truly is easy to understand, and can provide important benefits for all investors.

"Diversification", for the layman, simply means not having all of your eggs sitting in the same basket. By spreading out your eggs among two or more baskets, the risk is diminished that one bad egg, or one dropped basket, will ruin all of your eggs. For investing, the same principle applies. By having a mix of investments in different asset classes, such as fixed income (money market and bond funds) or equity (stock) investments, you reduce the risk that all of your investments will suffer if one specific class of investments is not performing well.

The advantage of spreading your investments between more than one asset classes is that each class contains a different level of risk, and potential for returns. Fixed income investments are typically lower risk investments and can help bolster your overall returns when

equities are not performing well, and vice versa. Thus, risk is managed by reducing the impact that one poor performer could have on your entire retirement savings.

Research has shown that that different asset classes, such as bonds, money market funds, stocks, and equity investments, perform differently at any given time. Bonds have historically done well when interest rates are falling and inflation is low. When interest rates are low, stocks are usually thriving. The fact that stocks and bonds historically flourish under differing market conditions is why the benefits of diversification can be attributed.

So when there is a general downturn in the stock market, bonds often are good investments—and vice-versa. Another example of how diversification can create benefits is by investing in various economies. An economic downturn in the Canadian economy may not affect Japan's economy in the same way; therefore, having Japanese investments would allow an investor to have a small cushion of protection against losses due to a Canadian economic downturn.

By spreading your investments among a variety of asset alternatives, you can reduce the effect of any one negative result on your whole portfolio so you end up with lower overall investment risk. The structure of a well-diversified portfolio is designed to perform reasonably well in nearly all circumstances. Over time, that kind of performance will lead to a secure retirement.

But is diversification truly a valid approach that every investor should take advantage of? If we look at an example of someone with retirement on the horizon, who has no other source of income, they are not usually willing to take much risk. Their need is not to increase wealth, but to preserve it, while living on the income it produces. The retirement years may be as much as one-third of our lifetimes, so the soon-to-be-retiree will still want investments to grow, but the need to preserve wealth will require a low-risk outlook that will dictate how to allocate the assets. They'll want to place a significant portion of assets in bonds to generate a steady source of retirement income for the remainder of their life.

By contrast, a young person wants to build savings, and because of the longer time-line until those assets will be needed, they can afford to take on more risk than the almost-retired person. Younger investors will typically allocate most of their savings into equities because this asset class, under reasonable market conditions and based on history, will provide the greatest opportunity for growth over the long term. However, even though the younger person is able to take more risk, they would still like to smooth out those inevitable periods when the stock market is down. Using diversification, they are therefore wise to allocate some

money to fixed income investments, but a much smaller portion than the almost-retired person.

So you have now taken the time to review your investments, spoken to your financial advisor, and made changes to diversity your portfolio. Now what? It's a good idea to periodically review your investment plan. Because different investments grow at different rates, and as markets change, so will your percentages change over time. As the percentages change in each fund, they may no longer match the risk profile that you were striving for. You then have to "re-balance," or bring your target fund mix back in line with your original objectives. For instance, let's say you had a target fund mix that was 30% Canadian Equities, 20% in Foreign Equities and 50% Bonds. A year later, you found that the mix had changed because Canadian Equities and Foreign Equities had performed better than Bonds. Your fund mix is now 40% Canadian Equities, 25% Foreign Equities and 35% Bonds. You will want to bring this fund mix back in line with your target mix.

Diversifying investments is an investment strategy that has many pros, and few cons, for investors of any age. It is inevitable that the stock markets will, at one time or another, experience turbulence, but it is the depth and height of those peaks and valleys that investors can have a degree of control over through diversification. To summarize, you can achieve the following potential benefits by using this strategy:

- Create more stability and protect your investments against downturns
- Provide more opportunity for growth at a lower level of risk
- Preserve wealth for those who are approaching retirement
- Peace of mind that you are not ignoring your retirement

## Baseline Assessment

Use your knowledge of statistics to answer the following questions:

1. Which branch of statistics deals with the techniques that are used to organise, summarize and present the data?  
(a) Advanced Statistics (b) Probability Statistics (c) Inferential Statistics (d) Descriptive Statistics
2. The data which have already been collected by someone are called?  
(a) Raw data (b) Array data (c) Secondary data (d) Fictitious data
3. Which of the statistics is unaffected by outliers?  
(a) Mean (b) Mode (c) Variance (d) interquartile range
4. Which of the following divides a group of data into four subgroups  
(a) Median (b) Quartiles (c) Percentiles (d) Deciles
5. The standard deviation of a sample of 100 observations equals 64. The variance of the same equals  
(a) 8 (b) 6,400 (c) 4,096 (d) 64

Take a look at the stock series:

01/10/2017 - £12.25

02/10/2017 - £12.39

03/10/2017 - £12.32

04/10/2017 - £12.90

05/10/2017 - £13.45

06/10/2017 - £13.10

07/10/2017 - £12.32

6. What is the mean?

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7. What is the range?

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8. What is the variance?

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9. What is the standard deviation?

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## Tutorial 2 – Case Studies of Countries

### What is the Purpose of Tutorial 2?

- To know the history of stock markets.
- To know the classification of financial markets.
- To understand the 2008 stock market crash.

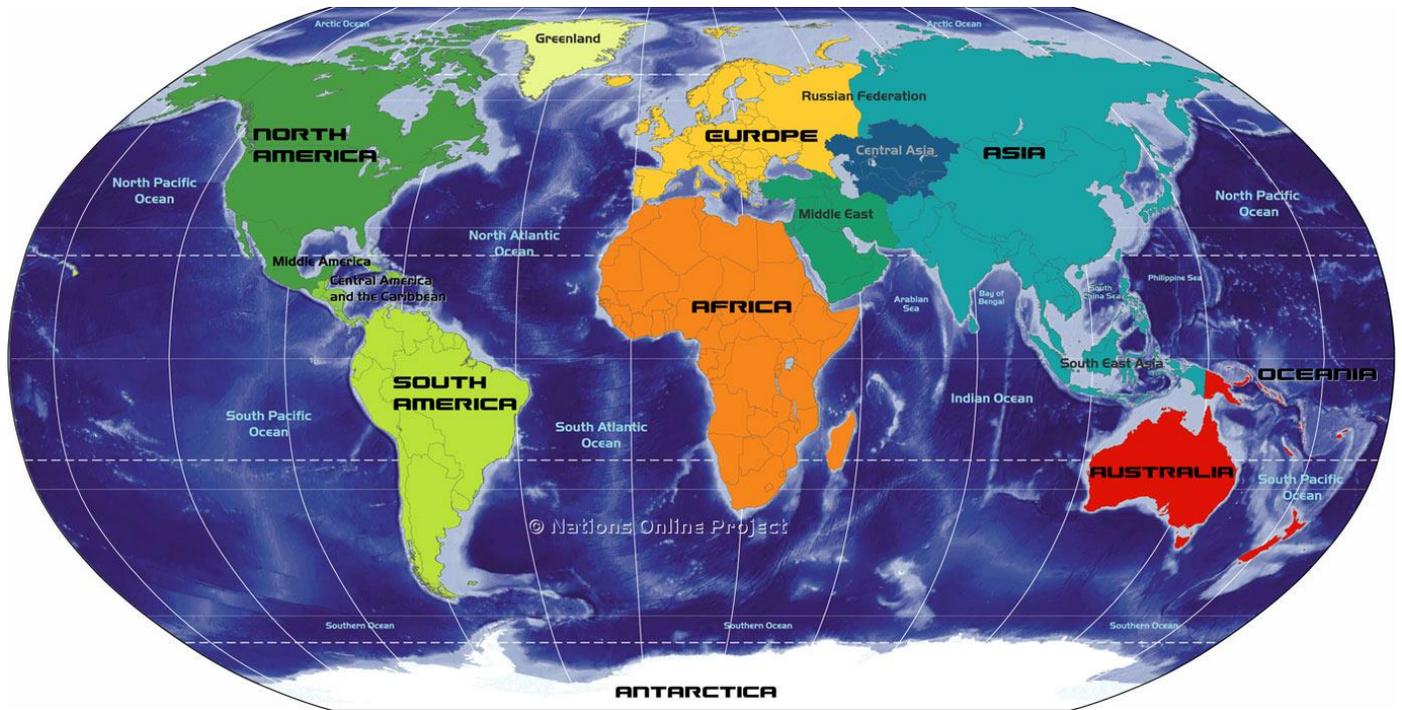
### History of Stock Markets

The history of the stock markets started with the birth of Amsterdam stock exchange in 1611. The exchange in the UK was launched with the establishment of the London Stock Exchange (LSE) in 1801. Securities trading in the US officially started with the setting up of New York Stock Exchange (NYSE) in 1817. Consequently, the international financial markets have experienced monumental development in the last four decades especially after the collapse of the Bretton Woods system in 1971. This brought about widespread financial liberalisation and globalisation in the developed countries from 1970s and developing countries from 1990s. Amongst the oldest stock markets, the US and UK financial markets have gained prominence leading to London and New York being designated as the top financial capitals of the world.

In the last three decades, the financial markets around the world have experienced revolutionary changes attributed to factors such as privatisation of state-owned enterprises, economic deregulation, financial liberalisation, influence of stock exchanges, foreign ownership of assets and liabilities, improved macroeconomic environment, growth of multinational corporations, cross-border capital flows, cross-listing of stocks, improved institutional framework of investors, and advancement in information and communication technology.

### Activity 1

Since the 1970s, different factors have culminated in the remarkable development of global financial markets. Describe how these factors impact on global financial market development.



## Classification of financial Markets

Financial markets exist in almost every country in the world and can be classified into developed, emerging and frontier markets.

### A. Developed Markets

The developed market is a country that is most developed in terms of its economy and capital markets - money market, stock market, bond market, derivative market, currency market and commodity market. These markets have minimum restrictions on foreign ownership of assets and liabilities, well-functioning financial system and better integrated with world financial markets.

### B. Emerging Markets

The emerging markets fall into the low to middle income per capita category. The more established emerging markets that formed the BRIC nations (Brazil, Russia, India and China) are characterised by having a better fiscal accounts, trade balances and growth prospects than their counterparts in the developed countries. For instance, Russia is the largest established emerging markets in Eastern Europe, Brazilian economy has become stronger despite relatively high interest rates and China has become the second largest economy in the globe.

### C. Frontier Markets

The frontier market is described as an underdeveloped market with features which include lower market capitalisation, less accessibility, less transparency, restricted foreign ownership, poor regulation, lower standard of corporate governance, inadequate financial reporting, less competition, high transaction costs, low liquidity and high volatility. In recent times, frontier market countries appear to be one of the fastest growing economies in the world with abundant natural resources for future development.

#### 2008 Stock Market Crisis

Since the last 100 years, the global stock markets have witnessed periods of bubble, panics and crashes. The most recent was the 2008 stock market crash triggered by the housing bubble in the UK and US. The stock market crashed when it reached its peak in 2008. The crisis spilled over to Europe, America and Asia. The crisis led to the collapse of major global financial firms such as Lehman Brothers, AIG Merrill Lynch etc.

#### Activity 2:

Are there other financial assets to invest in?

#### Homework:

After reading "Causes of the Financial Crisis" by Mark Jickling, write a 500-word essay on the "Causes of the 2008 Stock Market Crash." (See appendix 3)

Your essay should follow the guidelines below;

- Background to Stock market crash
- Causes of Stock market crash e.g. bank failures
- Arguments supporting the Stock Market Crash of 2008

## Tutorial 3 – Portfolio Theory

What is the Purpose of Tutorial 3?

- To understand the theory underpinning portfolio diversification.
- To know the risk exposure of investors trading in the financial markets.

### Markowitz portfolio theory

Different investments have different risks. Investors would only invest with higher risk if they are offered higher profits in return. Risks have different origins – for shareholders it is both the general economy and the business's performance, for real-estate risks include regional development and natural disasters and for government bonds one risk is inflation.

One of the assumptions upon which portfolio theory is based, is that investors are rational, although many practitioners find this assumption hard to concede.

A rational investor is a person who prefers a higher return for a given risk and prefers a lower risk for a given return

### Activity 1

Are investors rational, irrational or normal?

### Key strategy: Diversification

If risks are uncorrelated, then, investing in a diversity of assets can reduce the total portfolio risk.

Mathematically, this can happen even by adding assets with higher individual risks, as long as they are uncorrelated.

### Market Risk

Market risk is the possibility for an investor to experience losses due to factors that affect the overall performance of the financial markets in which he is involved. Market risk, also called "systematic risk," cannot be eliminated through diversification, though it can be hedged against. Sources of market risk include recessions, political turmoil, changes in interest rates, currency crisis, commodity shocks, natural disasters and terrorist attacks.

### Market capitalisation

As at 10th September 2000, ITguru Inc initial public offering of 2 million shares was purchased by investors at a price of £12.50 per share. As at 12th November 2002, the stock was trading at £4.50 per share.

Calculate the percentage decline in market capitalisation between the two periods.

Market capitalisation 10/09/2000: 2 million x £12.50 = £25 million

Market capitalisation 12/11/2002: 2 million x £4.50 = £9 million

$$\% \text{ decline} = \frac{9-25}{25} \times 100 = -64\%$$

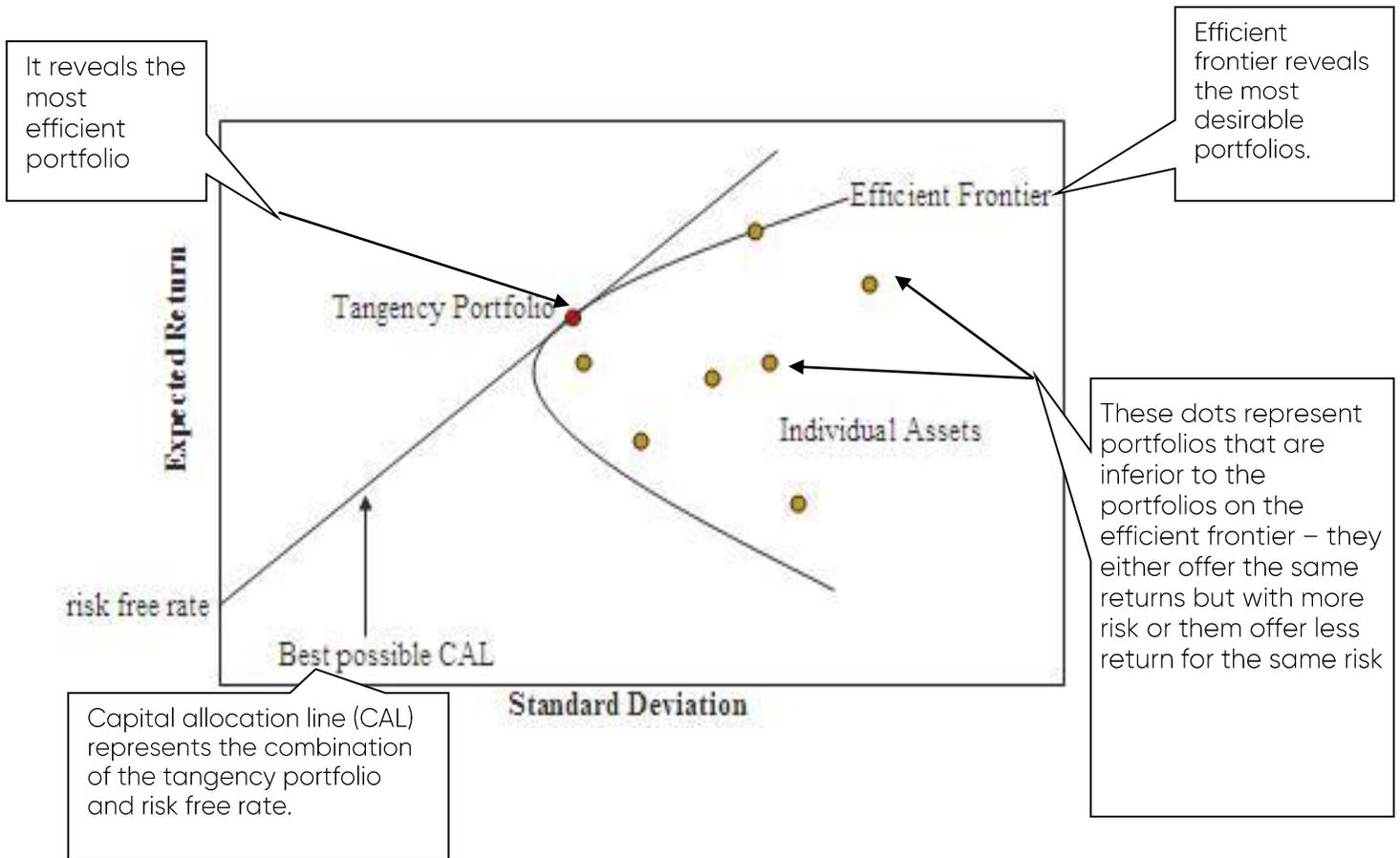
## Activity 2

As at 10<sup>th</sup> September 2000, Young-shall-grow enterprise initial public offering of 2 million shares was purchased by investors at a price of £15 per share. As at 31<sup>st</sup> December 2012, the stock was trading at £90 per share.

Calculate the percentage increase in market capitalisation between the two periods.

The diagram below demonstrates the relationship between expected return and standard deviation. Fundamentally, it shows that holding a diversified portfolio (represented by the red dot) performs better than holding an individual asset (represented by the yellow dot).

Efficient frontier reveals the most desirable portfolios. For example, assume Portfolio A has an expected return of 8.5% and a standard deviation of 8%, and that Portfolio B has an expected return of 8.5% and a standard deviation of 9.5%. Portfolio A would be deemed more "efficient" because it has the same expected return but a lower risk.



### Homework:

List and explain the different types of market risk investors are exposed to.

The structure of the 300-word essay should follow as:

1. Definition of market risk
2. Discussion on types of market risk
3. Conclusion

## Tutorial 4 – Analysis of Case Studies

This session analyses the case studies of stock markets you will be investing in.

What is the Purpose of Tutorial 4?

- To understand the economic features of developed, emerging and frontier stock markets.
- To identify the statistical features of the developed, emerging and frontier stock markets.
- To understand the financial mathematical models applicable to portfolio diversification

### Economic Features of Stock Markets

There are 7 markets selected each from developed, emerging and frontier countries. The selection of national stock indices follows the MSCI market classification into developed, emerging and frontier markets based on the criteria of economic development, market size and liquidity as well as market accessibility and investment restrictions.

In this analysis, the daily dataset covers the period from 5th March 2007 to 5th March 2015.

Table 1 shows the salient economic characteristics of the stock markets under scrutiny. The UK economy is the fifth largest national economy measured by nominal GDP with a share of world GDP of 3.2%. In the last two decades, the world's equity markets have experienced an unprecedented growth of 172% from £24.5 trillion in 1995 to \$66.5 trillion in 2014. In the same period, the UK stock market capitalisation has grown by 139% from \$1.32 trillion to \$3.18 trillion.

The UK stock market capitalisation to GDP is approximately 115% by current data, which suggests that the UK stock market is large in comparison with its national economy. Apart from UK's overvalued financial markets, the markets in US, Canada, South Africa are overvalued as well. Also, the stock turnover ratio of the UK market portrays that it is one of the most liquid markets in the world.

## Activity 1:

From your reading of Table 1, discuss how UK stands out as an important global financial centre.

Table 1: Features of the case studies of stock markets

Countries/ Markets	Stock Indices	Market	Gross portfolio equity assets to GDP (2012)	Market cap. (%) of GDP 2012	Stocks traded, turnover ratio (%) (2012)	GDP, (Current International US\$tn) (2013)	PPP
<b>Developed Markets</b>							
UK	FTSE 100		57.77	115.5	96.05	2.450	
Germany	DAX 30		25.28	42.06	91.77	3.540	
France	CAC 40		24.43	67.99	66.43	2.480	
Italy	FTSE MIB 40		29.13	23.15	54.63	2.110	
US	S&P 500		29.98	115.5	84.04	16.80	
Canada	S&P/TSX		15.67	110.0	61.58	1.510	
Japan	NIKKEI 225		14.49	61.82	99.85	4.610	
Australia	S&P/ASX 200		22.85	83.84	84.65	0.990	
<b>Emerging Markets</b>							
Russia	RTS		0.306	43.48	87.64	3.590	
Poland	WIG		2.178	35.18	42.56	0.910	
Mexico	IPC		N/A	44.25	99.85	2.000	
Brazil	BVSP		0.753	54.69	67.88	3.210	
India	CNX NIFTY 50		0.092	68.97	54.63	6.780	
China	SSE		1.616	44.92	164.4	16.60	
South Afr.	FTSE/JSE		44.17	154.1	78.46	0.680	
<b>Frontier Markets</b>							
Argentina	MERV		0.017	6.470	3.750	0.310	
Romania	BET		0.630	9.400	11.45	0.380	
Ukraine	PFTS		0.045	11.78	5.210	0.390	
Kenya	NSE 20		N/A	29.34	8.070	0.120	
Nigeria	NSE ASI		3.250	12.23	8.780	0.970	
Pakistan	KSE		0.091	19.44	31.30	0.840	
Sri Lanka							

	CSE	4.382	28.70	9.180	0.190
--	-----	-------	-------	-------	-------

### Descriptive Statistics of Stock Markets

The descriptive statistics for the developed, emerging and frontier stock markets are set out in **Table 2**. The UK stock market yields the highest daily return of 0.025% in the developed markets. In contrast, the Italian stock market yields a negative return of -0.012% and a volatility of 1.5%, suggesting a poor risk-return profile.

For the emerging markets, the volatility (as measured by standard deviations) is highest in Russian market and lowest in Mexican market. Whereas, the Argentine market has the highest volatility in the frontier markets compare to very low volatility in Nigerian and Kenyan markets. In a similar fashion, Table 2 displays the graphical representation of risk-return profile of the markets. With the exception of Ukraine, Romania and Argentina, the frontier markets show considerably lower risk level than the emerging and developed markets. The UK and US markets show higher returns but at the cost of increased volatility. As a result of the different level of risk-return performance, there are possibilities of exploiting these opportunities from the standpoint of portfolio diversification.

**Table 2: Descriptive Statistics**

Developed Markets			Emerging Markets			Frontier Markets		
Country	Mean (*10 <sup>-3</sup> )	Std dev.	Country	Mean (*10 <sup>-3</sup> )	Std dev.	Country	Mean (*10 <sup>-3</sup> )	Std dev.
UK	0.251	0.012						
Germany	0.208	0.015	Russia	0.607	0.023	Argentina	0.778	0.021
France	0.041	0.015	Poland	0.334	0.013	Romania	0.695	0.017
Italy	-0.124	0.015	Mexico	0.553	0.014	Ukraine	0.765	0.018
US	0.119	0.012	Brazil	0.401	0.018	Kenya	0.144	0.009
Canada	0.021	0.011	India	0.507	0.015	Nigeria	0.415	0.009
Japan	0.055	0.015	China	0.253	0.015	Pakistan	0.844	0.014
Australia	0.180	0.009	South Africa	0.530	0.017	Sri Lanka	0.596	0.011

#### Activity 2:

Write down inferences from the two tables above by comparing the economic features and preliminary statistics of frontier markets and UK market.

### Methodology

The modelling of volatility is fundamental to understanding portfolio diversification and risk management. The asymmetric BEKK (Baba, Engle, Kroner and Kraft) model is used to estimate conditional volatility and correlation of UK and foreign stock indices.

### Conditional Variance and Covariance

The two-asset, one-lag BEKK model is defined as;

$$\mathbf{H}_t = \mathbf{C}\mathbf{C}' + \mathbf{A}'\varepsilon_{t-1}\varepsilon'_{t-1}\mathbf{A} + \mathbf{B}'\mathbf{H}_{t-1}\mathbf{B} + \mathbf{D}'\eta_{t-1}\eta'_{t-1}\mathbf{D} \quad (1)$$

To estimate conditional variance ( $\mathbf{h}_{11,t}$  and  $\mathbf{h}_{22,t}$ ) and covariance ( $\mathbf{h}_{12,t}$ ) of UK and foreign stock indices, STATA econometric software was used.

### Correlation

The conditional correlation is computed as follows;

$$\rho_{12,t} = \frac{\mathbf{h}_{12,t}}{\sqrt{\mathbf{h}_{11,t} \cdot \mathbf{h}_{22,t}}}, \quad (1 = \text{UK}; 2 = \text{foreign}) \quad (2)$$

where  $\rho_{12,t}$  is the estimated time-varying conditional correlation between UK and foreign stock markets.

### Portfolio Weights

The optimal portfolio weight of UK stock index is given by;

$$w_t^{12} = \frac{h_t^2 - h_t^{12}}{h_t^1 - 2h_t^{12} + h_t^2} \quad (3)$$

The following constraint on the optimal weight of UK stock index is imposed;

$$w_t^{12} = \begin{cases} 0 & \text{if } w_t^{12} < 0 \\ w_t^{12} & \text{if } 0 \leq w_t^{12} \leq 1 \\ 1 & \text{if } w_t^{12} > 1 \end{cases} \quad (4)$$

where  $w_t^{12}$  is the weight of UK stock index in £1.00 of two assets (UK and foreign stock indices) at time  $t$ . The term  $h_t^{12}$  represents the conditional covariance between the UK and foreign stock indices at time  $t$ . The optimal weight of foreign stock index in the portfolio holding is  $1 - w_t^{12}$ .

In order to construct the portfolio of two risky assets (i.e. UK and foreign stock portfolio), we use the optimal weights in estimating the portfolio return and risk.

### Portfolio Returns

The rate of return on this two-asset portfolio is given as;

$$R_P = W_{1,t}R_{1,t} + W_{2,t}R_{2,t} \quad (5)$$

The expected return of the portfolio is calculated as a weighted sum of the individual assets' returns. If a portfolio contained two equally-weighted assets with expected returns of 10% and 14%, the portfolio's expected return would be:

$$(10\% \times 50\%) + (14\% \times 50\%) = 12\%$$

### Portfolio Risk

The variance of the two-asset portfolio is given as;

$$\sigma_{P,t}^2 = W_{1,t}^2\sigma_{1,t}^2 + W_{2,t}^2\sigma_{2,t}^2 + 2W_{1,t}W_{2,t}\text{Cov}(R_{1,t}, R_{2,t}) \quad (6)$$

where  $\text{Cov}(R_{1,t}, R_{2,t}) = \rho_{12,t}\sigma_{1,t}\sigma_{2,t}$ . The correlation values range from -1 to +1. The standard deviation of the two-asset portfolio measures the portfolio risk. It can be found out if portfolio of less than perfectly correlated assets offers better risk-return opportunities than highly correlated portfolio.

### Example of two-asset portfolio

Two stock indices, DAX 30 and CAC 40, have the following expected return and standard deviation of return over the next year.

Stock indices	Expected rate of return	Standard deviation
DAX 30	19%	14%
CAC 40	21%	16%

Additionally, assume that the correlation coefficient of returns on the two securities +0.75. For a portfolio consisting of 65 percent of the funds invested DAX 30 and the remainder in CAC 40, determine the

- Expected rate of return on the portfolio
- Standard deviation of the rate of return

Workings

Hints:

Markets	DAX 30	CAC 40
Expected return	$R_1 = 19\%$	$R_2 = 21\%$
Standard deviation	$\sigma_1 = 14\%$	$\sigma_2 = 16\%$
Correlation	$\rho_{12} = 0.75$	
Weight	$W_1 = 65\%$	$W_2 = 35\%$

Then, use equations 5 and 6 to calculate portfolio return and portfolio risk

- Expected rate of return on the portfolio

$$R_p = W_1R_1 + W_2R_2$$

$$R_p = (0.65 \times 19\%) + (0.35 \times 21\%)$$

$$R_p = 12.35\% + 7.35\% = 19.80\%$$

- Standard deviation of the rate of return

$$\sigma_p^2 = W_1^2\sigma_1^2 + W_2^2\sigma_2^2 + 2W_1W_2\text{Cov}(R_1, R_2)$$

Where  $\text{Cov}(R_1, R_2) = \rho_{12}\sigma_1\sigma_2$

$$\sigma_p^2 = (0.65^2 \times 14^2) + (0.35^2 \times 16^2) + (2 \times 0.65 \times 0.35 \times 0.75 \times 14 \times 16)$$

$$\sigma_p^2 = 82.81 + 31.36 + 76.44$$

$$\sigma_p = \sqrt{190.61}$$

$$\sigma_p = 13.81\%$$

### Home work

Two stock indices, FTSE 100 and S&P 500, have the following expected return and standard deviation of return over the next year.

Stock indices	Expected rate of return	Standard deviation
FTSE 100	12%	6%
S&P 500	20	15

Additionally, assume that the correlation coefficient of returns on the two securities is +0.50. For a portfolio consisting of 75 percent of the funds invested in FTSE 100 and the remainder in S&P 500, you are to determine in this task the

- c. Expected rate of return on the portfolio
- d. Standard deviation of the rate of return

## Tutorial 5 – Portfolio Diversification

What is the Purpose of Tutorial 5?

- To enable you understand optimal portfolio allocation
- To make you understand the dynamics of portfolio diversification

### Portfolio Diversification

The dynamics of financial markets require that investors rebalance their asset portfolios periodically. Surprisingly, most investors tend to weight their asset portfolios disproportionately towards domestic assets, hence sacrifice the potential gains from international diversification.

Table 3 below demonstrate the portfolio weights, returns, risks and correlations between the UK and partner economies. For instance, the average weight for UK/Germany portfolio indicates that for a £1.00 portfolio, £0.831 should be invested in the UK market, and £0.169 should be invested in the German market. The weight for the UK/Italy portfolio indicates that £0.847 should be invested in the UK market and £0.153 should be invested in the Italian market. For the Asian-Pacific stock markets, the average weight for the UK and US/Canada/Japan/Australia portfolios indicate that £0.519/£0.391/£0.633/£0.455 should be invested in the UK market and £0.481/£0.609/£0.367/£0.545 should be invested in these foreign markets.

The UK investors exercise equity home bias in at least two-third of the optimal portfolio allocation. It can be argued that UK investors have limited information about foreign markets and may be unwilling to diversify more internationally despite the potential benefits.

The stock correlation of 0.879 between UK and France is higher than other markets suggesting that geographically contiguous markets have higher co-movement. The risk-return profile of holding UK/Italy portfolio is the most inefficient among European markets. The risk-return profile of holding UK/US portfolio is the most efficient among Asia-Pacific markets.

The stock correlations between UK and Eurozone countries market (Poland) are higher than non-Eurozone countries (Russia, Romania and Ukraine). This suggests that Eurozone markets are more integrated with the UK than non-Eurozone countries, hence less potential diversification benefits.

### Activity 1:

Use the table below and write further explanation on the optimal portfolio weights between the UK and emerging/frontier markets.

**Activity 2:**

Discuss other potential reasons why UK investors might be unwilling to diversify more internationally.

Table 3: Optimal Portfolio Weights, Returns, Risk and Correlation

Developed Markets					
	$W_{UK}$	$W_{FOREIGN}$	Return	Risk	Correlation
Germany	0.831	0.169	0.087	0.010	0.849
France	0.947	0.053	0.039	0.011	0.879
Italy	0.847	0.153	-0.245	0.012	0.774
US	0.519	0.481	0.124	0.009	0.592
Canada	0.391	0.609	0.076	0.009	0.542
Japan	0.633	0.367	0.061	0.009	0.243
Australia	0.445	0.555	0.043	0.008	0.324
Emerging Markets					
Russia	0.878	0.122	-0.271	0.013	0.557
Poland	0.558	0.442	0.063	0.010	0.591
Mexico	0.524	0.576	0.157	0.009	0.506
Brazil	0.809	0.191	0.075	0.009	0.491
India	0.593	0.407	0.225	0.008	0.146
China	0.603	0.397	0.069	0.009	0.154
South Africa	0.528	0.472	0.186	0.010	0.672
Frontier Markets					
Argentina	0.798	0.202	0.138	0.009	0.440
Romania	0.604	0.396	0.034	0.009	0.336
Ukraine	0.616	0.384	-0.029	0.009	0.252
Kenya	0.343	0.657	0.032	0.006	-0.034
Nigeria	0.424	0.576	-0.044	0.007	0.056
Pakistan	0.491	0.509	0.315	0.008	0.061
Sri Lanka	0.384	0.616	0.291	0.007	0.063

Notes:

$W_{UK}$  represents the average optimal weight of UK market;

$W_{FOREIGN}$  represents the average optimal weight of each foreign market;

## Final Assignment

Produce a 1000-word essay on investing £10,000 in a simulated two-asset portfolio with diversification opportunities. The benchmark strategy is that you will invest by combining your UK stock index with another foreign stock index based on the portfolio weight provided in tutorial 4. You will further rank your investment strategy from best portfolio to worst portfolio based on the stock market analysis provided in tutorial 4.

Your hypothetical stock portfolios start from 1<sup>st</sup> January 2018 and ends on 31<sup>st</sup> June 2018. At the end, you will re-evaluate your investment choices based on your initial ranking.

This hypothetical stock portfolio teaches you how the stock market works.

The structure of the essay should be as follows;

1. Introduction
2. Portfolio Theory
3. Portfolio Analysis

Developed Markets						
	$W_{UK}$	$W_{FOREIGN}$	correlation	Risk	Return	Rank
Germany	0.831	0.169	0.849			
France	0.947	0.053	0.879			
Italy	0.847	0.153	0.774			
US	0.519	0.481	0.592			
Canada	0.391	0.609	0.542			
Japan	0.633	0.367	0.243			
Australia	0.445	0.555	0.324			
Emerging Markets						
Russia	0.878	0.122	0.557			
Poland	0.558	0.442	0.591			
Mexico	0.524	0.576	0.506			
Brazil	0.809	0.191	0.491			
India	0.593	0.407	0.146			
China	0.603	0.397	0.154			
South Africa	0.528	0.472	0.672			
Frontier Markets						
Argentina	0.798	0.202	0.440			
Romania	0.604	0.396	0.336			
Ukraine	0.616	0.384	0.252			
Kenya	0.343	0.657	-0.034			
Nigeria	0.424	0.576	0.056			
Pakistan	0.491	0.509	0.061			
Sri Lanka	0.384	0.616	0.063			

4. Conclusion

## Tutorial 6 – Feedback tutorial



### What is the Purpose of Tutorial 6?

- To receive feedback on final assignments.
- To share examples of best practice with the other pupils in your group.
- To write targets for improvement in school lessons.
- To reflect on the programme including what was enjoyed and what was challenging.

### Final assignment feedback

What I did well...	What I could have improved on...
<ul style="list-style-type: none"><li>•</li><li>•</li><li>•</li></ul>	<ul style="list-style-type: none"><li>•</li><li>•</li><li>•</li></ul>

My target for future work is...

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### Reflecting on Uni Pathways

What did you most enjoy about Uni Pathways?
<ul style="list-style-type: none"><li>•</li><li>•</li><li>•</li></ul>

What did you find challenging about the programme?	How did you overcome these challenges?
<ul style="list-style-type: none"><li>•</li><li>•</li><li>•</li></ul>	<ul style="list-style-type: none"><li>•</li><li>•</li><li>•</li></ul>

# Appendix 1 – Referencing correctly

When you get to university, you will need to include references in the assignments that you write, so we would like you to start getting into the habit of referencing in your Brilliant Club assignment. This is really important, because it will help you to avoid plagiarism. Plagiarism is when you take someone else's work or ideas and pass them off as your own. Whether plagiarism is deliberate or accidental, the consequences can be severe. In order to avoid losing marks in your final assignment, or even failing, you must be careful to reference your sources correctly.

## What is a reference?

A reference is just a note in your assignment which says if you have referred to or been influenced by another source such as book, website or article. For example, if you use the internet to research a particular subject, and you want to include a specific piece of information from this website, you will need to reference it.

## Why should I reference?

Referencing is important in your work for the following reasons:

- It gives credit to the authors of any sources you have referred to or been influenced by.
- It supports the arguments you make in your assignments.
- It demonstrates the variety of sources you have used.
- It helps to prevent you losing marks, or failing, due to plagiarism.

## When should I use a reference?

You should use a reference when you:

- Quote directly from another source.
- Summarise or rephrase another piece of work.
- Include a specific statistic or fact from a source.

## How do I reference?

There are a number of different ways of referencing, and these often vary depending on what subject you are studying. The most important thing is to be consistent. This means that you need to stick to the same system throughout your whole assignment. Here is a basic system of referencing that you can use, which consists of the following two parts:

1. **A marker in your assignment:** After you have used a reference in your assignment (you have read something and included it in your work as a quote, or re-written it your own words) you should mark this in your text with a number, e.g. [1]. The next time you use a reference you should use the next number, e.g. [2].
2. **Bibliography:** This is just a list of the references you have used in your assignment. In the bibliography, you list your references by the numbers you have used, and include as much information as you have about the reference. The list below gives what should be included for different sources.
  - a. **Websites** – Author (if possible), title of the web page, website address, [date you accessed it, in square brackets].  
E.g. Dan Snow, 'How did so many soldiers survive the trenches?', <http://www.bbc.co.uk/guides/z3kgjxs#zg2dtfr> [11 July 2014].
  - b. **Books** – Author, date published, title of book (in italics), pages where the information came from.  
E.g. S. Dubner and S. Levitt, (2006) *Freakonomics*, 7-9.
  - c. **Articles** – Author, 'title of the article' (with quotation marks), *where the article comes from* (newspaper, journal etc.), date of the article.  
E.g. Maev Kennedy, 'The lights to go out across the UK to mark First World War's centenary', *Guardian*, 10 July 2014.

## Appendix 2 – Using the VLE

VLE username	
VLE password	

Please remember the following key details...

- You are able log into the VLE either through the link on our website ([www.thebrilliantclub.org](http://www.thebrilliantclub.org)) or going directly to the VLE site at (<https://portal.thebrilliantclub.org/sign-in>).
- Please update your profile with your full name and email address- this will allow you to retrieve forgotten passwords or usernames
- If you forget your log-in details you can request them to be emailed to you by clicking the link on the VLE home page. (If you are still having problems you can email: [schools@thebrilliantclub.org](mailto:schools@thebrilliantclub.org))

### What is the VLE?

The VLE is a virtual learning environment for all pupils on Uni Pathways it is used for:

- messaging your tutor
- submitting homework
- submitting your final assignment
- accessing resources for your tutorials
- finding out more information about university and careers

### How should I use the VLE?

The VLE is a professional academic environment in which pupils are able to message their PhD Tutor. Here are a few things to consider:

- Ensure you keep a professional tone in the messages you send to your tutors.
- Ensure you always reply to your tutors in a timely manner.
- Thank your tutor for the effort they are putting in to give you your feedback etc.
- Submit all homework to your tutor on time.

### IMPORTANT: Final assignment

- When you submit your final assignment, please remember that you need to do so through the 'My Activities' tab and not as an attachment to a message.

## Appendix 3



# Causes of the Financial Crisis

Mark Jickling

Specialist in Financial Economics April 9, 2010

# Summary

The current financial crisis began in August 2007, when financial stability replaced inflation as the Federal Reserve's chief concern. The roots of the crisis go back much further, and there are various views on the fundamental causes.

It is generally accepted that credit standards in U.S. mortgage lending were relaxed in the early 2000s, and that rising rates of delinquency and foreclosures delivered a sharp shock to a range of U.S. financial institutions. Beyond that point of agreement, however, there are many questions that will be debated by policymakers and academics for decades.

Why did the financial shock from the housing market downturn prove so difficult to contain? Why did the tools the Fed used successfully to limit damage to the financial system from previous shocks (the Asian crises of 1997-1998, the stock market crashes of 1987 and 2000-2001, the junk bond debacle in 1989, the savings and loan crisis, 9/11, and so on) fail to work this time? If we accept that the origins are in the United States, why were so many financial systems around the world swept up in the panic?

To what extent were long-term developments in financial markets to blame for the instability? Derivatives markets, for example, were long described as a way to spread financial risk more efficiently, so that market participants could bear only those risks they understood. Did derivatives, and other risk management techniques, actually increase risk and instability under crisis conditions? Was there too much reliance on computer models of market performance? Did those models reflect only the post-WWII period, which may now come to be viewed not as a typical 60-year period, suitable for use as a baseline for financial forecasts, but rather as an unusually favorable period that may not recur?

Did government actions inadvertently create the conditions for crisis? Did regulators fail to use their authority to prevent excessive risk-taking, or was their jurisdiction too limited and/or compartmentalized?

The multiple roots of the crisis are mirrored in the policy response. Two bills in the 111th Congress—H.R. 4173, passed by the House on December 11, 2009, and Senator Dodd's Restoring American Financial Stability Act, as ordered reported by the Senate Banking Committee on March 22, 2010—address many of the purported causal factors across the entire financial system. The bills address systemic risk, too-big-to-fail, prudential supervision,

hedge funds, derivatives, payments systems, credit rating agencies, securitization, and consumer financial protection. (For a summary of major provisions, see CRS Report R40975, Financial Regulatory Reform and the 111th Congress, coordinated by Baird Webel.)

This report consists of a table that presents very briefly some of the arguments for particular causes, presents equally brief rejoinders, and includes a reference or two for further reading. It will be updated as required by market developments.

## Introduction

The financial crisis that began in 2007 spread and gathered intensity in 2008, despite the efforts of central banks and regulators to restore calm. By early 2009, the financial system and the global economy appeared to be locked in a descending spiral, and the primary focus of policy became the prevention of a prolonged downturn on the order of the Great Depression.

The volume and variety of negative financial news, and the seeming impotence of policy responses, has raised new questions about the origins of financial crises and the market mechanisms by which they are contained or propagated. Just as the economic impact of financial market failures in the 1930s remains an active academic subject, it is likely that the causes of the current crisis will be debated for decades to come.

This report sets out in tabular form a number of the factors that have been identified as causes of the crisis. The left column of Table 1 below summarizes the causal role of each such factor. The next column presents a brief rejoinder to that argument. The right-hand column contains a reference for further reading. Where text is given in quotation marks, the reference in the right column is the source, unless otherwise specified.

## Causes of Financial Crises

Cause	Argument	Rejoinder
Imprudent Mortgage Lending	Against a backdrop of abundant credit, low interest rates, and rising house prices, lending standards were relaxed to the point that many people were able to buy houses they couldn't afford. When prices began to fall and loans started going bad, there was a severe shock to the financial system.	Imprudent lending certainly played a role, but subprime loans (about \$1-1.5 trillion at the peak) were a relatively small part of the overall U.S. mortgage market (about \$11 trillion) and of total credit market debt outstanding (about \$50 trillion).
Housing Bubble	With its easy money policies, the Federal Reserve allowed housing prices to rise to unsustainable levels. The crisis was triggered by the bubble bursting, as it was bound to do.	It is difficult to identify a bubble until it bursts, and Fed actions to suppress the bubble may do more damage to the economy than waiting and responding to the effects of the bubble bursting.
Global Imbalances	Global financial flows have been characterized in recent years by an unsustainable pattern: some countries (China, Japan, and Germany) run large surpluses every year, while others (like the U.S and UK) run deficits. The U.S. external deficits have been mirrored by internal deficits in the household and government sectors. U.S. borrowing cannot continue indefinitely; the resulting stress underlies current financial disruptions.	None of the adjustments that would reverse the fundamental imbalances has yet occurred. That is, there has not been a sharp fall in the dollar's exchange value, and U.S. deficits persist.
Securitization	Securitization fostered the "originate-to-distribute" model, which reduced lenders' incentives to be prudent, especially in the face of vast investor demand for subprime loans packaged as AAA bonds. Ownership of mortgage-backed securities was widely dispersed, causing repercussions throughout the global system when subprime loans went bad in 2007.	Mortgage loans that were not securitized, but kept on the originating lender's books, have also done poorly.
Lack of Transparency and Accountability in Mortgage Finance	<p>"Throughout the housing finance value chain, many participants contributed to the creation of bad mortgages and the selling of bad securities, apparently feeling secure that they would not be held accountable for their actions. A lender could sell exotic mortgages to home-owners, apparently without fear of repercussions if those mortgages failed. Similarly, a trader could sell toxic securities to investors, apparently without fear of personal responsibility if those contracts failed. And so it was for brokers, realtors, individuals in rating agencies, and other market participants, each maximizing his or her own gain and passing problems on down the line until the system itself collapsed.</p> <p>Because of the lack of participant accountability, the originate-to-distribute model of mortgage finance, with its once great promise of managing risk, became itself a massive generator of risk."</p>	<p>Many contractual arrangements did provide recourse against sellers or issuers of bad mortgages or related securities.</p> <p>Many non-bank mortgage lenders failed because they were forced to take back loans that defaulted, and many lawsuits have been filed against MBS issuers and others.</p>

Rating Agencies	The credit rating agencies gave AAA ratings to numerous issues of subprime mortgage-backed securities, many of which were subsequently downgraded to junk status. Critics cite poor economic models, conflicts of interest, and lack of effective regulation as reasons for the rating agencies' failure. Another factor is the market's excessive reliance on ratings, which has been reinforced by numerous laws and regulations that use ratings as a criterion for permissible investments or as a factor in required capital levels.	All market participants underestimated risk, not just the rating agencies. Purchasers of MBS were mainly sophisticated institutional investors, who should have done their own due diligence investigations into the quality of the instruments.
Mark-to-market Accounting	FASB standards require institutions to report the fair (or current market) value of securities they hold. Critics of the rule argue that this forces banks to recognize losses based on "fire sale" prices that prevail in distressed markets, prices believed to be below long-term fundamental values. Those losses undermine market confidence and exacerbate banking system problems. Some propose suspending mark-to-market; EESA requires a study of its impact.	Many view uncertainty regarding financial institutions' true condition as key to the crisis. If accounting standards—however imperfect—are relaxed, fears that published balance sheets are unreliable will grow.
Deregulatory Legislation	Laws such as the Gramm–Leach–Bliley Act (GLBA) and the Commodity Futures Modernization Act (CFMA) permitted financial institutions to engage in unregulated risky transactions on a vast scale. The laws were driven by an excessive faith in the robustness of market discipline, or self-regulation.	GLBA and CFMA did not permit the creation of unregulated markets and activities; they simply codified existing markets and practices. ("There is this idea afloat that if you had more regulation you would have fewer mistakes," [Gramm] said. "I don't see any evidence in our history or anybody else's to substantiate it." Eric Lipton and Stephen Labaton, "The Reckoning: Deregulator Looks Back, Unswayed," New York Times, Nov. 16, 2008.)
Shadow Banking System	Risky financial activities once confined to regulated banks (use of leverage, borrowing short-term to lend long, etc.) migrated outside the explicit government safety net provided by deposit insurance and safety and soundness regulation. Mortgage lending, in particular, moved out of banks into unregulated institutions. This unsupervised risk-taking amounted to a financial house of cards.	Regulated banks—the recipients of most of the \$700 billion Treasury TARP program—have not really fared much better than investment banks, hedge funds, OTC derivatives dealers, private equity firms, et al.
Non-Bank Runs	As institutions outside the banking system built up financial positions built on borrowing short and lending long, they became vulnerable to liquidity risk in the form of non-bank runs. That is, they could fail if markets lost confidence and refused to extend or roll over short-term credit, as happened to Bear Stearns and others.	Liquidity risk was always present, and recognized, but its appearance at the extreme levels of the current crisis was not foreseeable.

Off-Balance Sheet Finance	Many banks established off-the-books special purpose entities (including structured investment vehicles, or SIVs) to engage in risky speculative investments. This allowed banks to make more loans during the expansion, but also created contingent liabilities that, with the onset of the crisis, reduced market confidence in the banks' creditworthiness. At the same time, they had allowed banks to hold less capital against potential losses. Investors had little ability to understand banks' true financial positions.	Beginning in the 1990s, bank supervisors actually encouraged off-balance sheet finance as a legitimate way to manage risk.
Government-Mandated Subprime Lending	Federal mandates to help low-income borrowers (e.g., the Community Reinvestment Act (CRA) and Fannie Mae and Freddie Mac's affordable housing goals) forced banks to engage in imprudent mortgage lending.	The subprime mortgage boom was led by non-bank lenders (not subject to CRA) and securitized by private investment banks rather than the GSEs.
Failure of Risk Management Systems	Some firms separated analysis of market risk and credit risk. This division did not work for complex structured products, where those risks were indistinguishable. "Collective common sense suffered as a result."	Senior management's responsibility has always been to bridge this kind of gap in risk assessment.
Financial Innovation	New instruments in structured finance developed so rapidly that market infrastructure and systems were not prepared when those instruments came under stress. Some propose that markets in new instruments should be given time to mature before they are permitted to attain a systemically significant size. This means giving accountants, regulators, ratings agencies, and settlement systems time to catch up.	In a global marketplace, innovation will continue and national regulators' attempts to restrain it will only put their countries' markets at a competitive disadvantage. Moreover, it is hard to tell in advance whether innovations will stabilize the system or the reverse.
Complexity	The complexity of certain financial instruments at the heart of the crisis had three effects: (1) investors were unable to make independent judgments on the merits of investments, (2) risks of market transactions were obscured, and (3) regulators were baffled.	Standard economic theory assumes that investors act rationally in their own self-interest, which implies that they should only take risks they understand.
Human Frailty	Behavioral finance posits that investors do not always make optimal choices: they suffer from "bounded rationality" and limited self-control. Regulators ought to help people manage complexity through better disclosure and by reinforcing financial prudence.	Since regulators are just as human as investors, how can they consistently recognize that behavior has become suboptimal and that markets are headed for a crash?
Bad Computer Models	Expectations of the performance of complex structured products linked to mortgages were based on only a few decades worth of data. In the case of subprime loans, only a few years of data were available. "[C]omplex systems are not confined to historical experience. Events of any size are possible, and limited only by the scale of the system itself."	Blaming models and the "quants" who designed them mistakes a symptom for a cause—"garbage in, garbage out."

Excessive Leverage	<p>In the post-2000 period of low interest rates and abundant capital, fixed income yields were low. To compensate, many investors used borrowed funds to boost the return on their capital.</p> <p>Excessive leverage magnified the impact of the housing downturn, and deleveraging caused the interbank credit market to tighten.</p>	Leverage is only a symptom of the underlying problem: mispricing of risk and a credit bubble.
Tail Risk	<p>Many investors and risk managers sought to boost their returns by providing insurance or writing options against low-probability financial events. (Credit default swaps are a good example, but by no means the only one.) These strategies generate a stream of small gains under normal market conditions, but cause large losses during crises. When market participants know that many such potential losses are distributed throughout the system (but do not know exactly where, or how large), uncertainty and fear are exacerbated when markets come under stress.</p>	Dispersal of systematic risk via financial innovation was believed to make the financial system more resilient to shocks.
Black Swan Theory	<p>This crisis is a once-in-a-century event, caused by a confluence of factors so rare that it is impractical to think of erecting regulatory barriers against recurrences. According to Alan Greenspan, such regulation would be "so onerous as to basically suppress the growth rate of the economy and ... [U.S.] standards of living." Testimony before the House Oversight and Government Reform Committee, Oct. 23, 2008.</p>	<p>"Some might be tempted to see recent events in the financial markets as just such black swans. But this would be quite wrong, in our view. Many of the flaws that have led to current turbulent conditions have not ridden on the back of a black swan. Instead, they are the result of weaknesses and failings in the interpretation of risk analysis and the process of oversight." (Booth and Mazzawi)</p>



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## Notes

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