Unfogging the Future:

What would Harry Do in the Stock Market?

Key Stage 4 Programme

Pupil Name	
Handbook Designed by	Dr. Wu

Timetable and Assignment Submission

Timetable – Tutorials

1			
2			
3			
4			
5			
6 (Feedback)			

Timetable – Homework Assignments

Tutorial 1		
Tutorial 2		
Tutorial 3		
Tutorial 4		
Tutorial 5		

Assignment Submission – Lateness and Plagiarism

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

The Brilliant Club KS4 Programme – Pupil Feedback Report

Grade	Marks	What this means
1st	70+	Performing to an excellent standard at A-level
2:1	60-69	Performing to a good standard at AS level
2:2	50-59	Performing to an excellent standard at GCSE-level
3rd	40-49	Performing to a good standard at GCSE-level
Working towards a pass	0-39	Performing below a good standard at GCSE-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	Dr. Wu		
Title of Assignment	2 Asset Optimised Stock Portfolio Report		
Name of Pupil			
Name of 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 *Enter feedback here*	How you could improve in the future *Enter feedback here*
Learning Feedback Comment 2 – *Enter Key Learning Priority Here*	
What you did in relation to this Key Learning Priority *Enter feedback here*	How you could improve in the future *Enter feedback here*
Learning Feedback Comment 3 – *Enter Key Learning Priority Here*	
What you did in relation to this Key Learning Priority *Enter feedback here*	How you could improve in the future *Enter feedback here*
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*

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Course Rationale

Stock market asset prices appear to be elusive and unpredictable matters. Why do stock prices move up and down? What factors influence changes to companies' values as represented by stock prices? If only we had a crystal ball like our wizard Harry to "unfog" the future! ... or can we?

This course introduces pupils to the concepts and practices of financial asset valuation and management. During the course, you will learn and discuss fundamentals of the financial asset valuation model DCF, explore theoretical and practical factors that affect asset prices, discuss the opportunities and challenges in an efficient market, and apply the knowledge to construct mock stock portfolios using real data from FTSE 100 companies.

The course will be delivered using a hands-on approach; it will challenge you to explore many new concepts and ways of thinking. You will be given assignments that deal with real-world problems such as house mortgages and student loans. These will gradually build up your independent ability to answer questions and critically think about the assumptions and limitations of valuation models. The assignments from early on are designed to prepare skills as well as resources which you will use for the final portfolio construction project.

In preparation for the final assignment, you are to give a mini-presentation to the group about your research findings and develop your presentation skills. The course project will use Excel as one of the main tools for analysis and presentation. Prior experience with Excel is not a pre-requisite but will be very helpful. Your PhD tutor will provide help during tutorials and in office hours. While not the main purpose of this course, you will gain vital skills and fluency in this must-have tool in business professional fields such as accounting, finance, sales & marketing and general management.

Icons used in this handbook

Watch a video clip

Think, pair, share

Group discussion / brainstorm

Think deeply, concept check

Hands on (Excel)

Write it down

Contents from the internet, or you need to do some researh yourself

Presentation

Mark Scheme Table

	Skills	1st (70-100)	2:1 (60-69)	2:2 (50-59)
Subject knowledge	Knowledge and Understand-ing	o All content included is relevant to the general topic and to the specific question/title o Good understanding of all the relevant metrics. o Financial terms are used accurately throughout o Clear justification on how the content included is related to the specific issues that are the focus of the assignment	o Most of the content included is relevant to the general topic and to the specific question/title o Good understanding of most the relevant metrics o Financial terms are used accurately but not always accurately. o Adequate justification on how the content included is related to the specific issues that are the focus of the assignment	o Some of the content included is relevant to the general topic and to the specific question/title o Good understanding on some of the relevant metrics but occasional confusion on others. o Financial terms are used. o Some justification on how the content included is related to the specific issues that are the focus of the assignment

Critical thinking	Research and Evidence	o Inclusion of rich sources of research findings, data, quotations or other sourced material as evidence for the claims/ ideas o Use evidence/ calculations to support claims/assertions /ideas, consistently clearly and convincingly o Evidence of further reading beyond materials provided which were used in an appropriate context o Data is effectively analysed and appropriate assumptions/ conclusions are reached	o Inclusion of adequate sources of research findings, data, quotations or other sourced material as evidence for the claims/ ideas o Use evidence/ calculations to support claims/assertions/ideas, mostly clearly and convincingly o Evidence of further reading beyond materials provided o Data is analysed and assumptions/ conclusions reached are mostly appropriate	o Inclusion of some sources of research findings, data, quotations or other sourced material as evidence for the claims/ ideas o Use evidence/ calculations to support claims/assertions/ideas, at times clearly and convincingly o Limited evidence of further reading beyond materials provided o There is an attempt to analyse data is and draw assumptions/ conclusions
	Developing an Argument	o Argument exceptionally well-developed and well-justified o Uses concepts from the tutorials, and does so accurately and confidently. o Content is analysed effectively to support the argument	o Argument clear and well-developed and position justified o Use some concepts from the tutorials, but not always accurately. o Analysis of content to support the argument	o Argument clear but not well-developed o Limited use of concepts from the tutorials o Some analysis of content to support the argument
	Critical Evaluation	o Moved beyond description to an assessment of the value or significance of what is described o Effective critiques on the reliability of assumptions of the chosen models	o Mostly description but some assessment of the value or significance of what is described o Some evidence of critiques on the reliability of assumptions of the chosen models	o Only description with minimal assessment of the value or significance of what is described o Limited evidence of critiques on the reliability of the chosen models

Written communication	Structure and Presentation	o Ideas are presented in paragraphs and arranged in a logical structure that is appropriate for the assignment o All calculations, formulas and methods are clearly structured, clear to follow and correct o Tables and graphs are effectively constructed including appropriate headings, units and scales. o All sources are referenced correctly in an agreed format	o Ideas are presented in paragraphs and arranged in a structure that is mostly appropriate for the assignment o Calculations, formulas and methods are mostly structured, clear to follow and correct o Most tables and graphs are well constructed o Most sources are referenced correctly in an agreed format	o Ideas are presented in paragraphs and arranged in a structure o Calculations, formulas and methods are not always structured, clear to follow and correct. o Some tables and graphs are well constructed but contains some errors o Some sources are referenced correctly in the agreed format with occasional errors
	Language and Style	o No spelling, grammar or punctuation errors o Writing style consistently clear, appropriate for scientific documents and easy to follow o Accurate and consistent use of technical language and vocabulary	o Minimal spelling, grammar or punctuation errors o Writing style mostly clear, appropriate for scientific documents and easy to follow o Some attempts of using technical language and vocab alary, but not always accurate	o Some spelling, grammar or punctuation errors o Writing style moderately clear, appropriate for scientific documents and easy to follow o Use of simple language and vocabulary effectively but struggles to use technical language

Glossary of Keywords

Word	Definition	Example / Further Information
Accounting	The process of recording company's activities which involves the flow of cash and resources	Accounting is a subject of study in business schools or MBA programs
Alpha research	The research in the fund management industry with the aim to find excess returns (better than expected returns)	
Balance sheet	The accounting report which shows the values of company's various assets, debts and capitals	Because the values of all assets add up to equal the values of all debts plus capitals, i.e. the accounts have to "balance", this report is traditionally called the "Balance Sheet". Another way to think of this is that capitals and debts are two ways a company could source the money to run its business, and assets are all the things the company has bought using such money to run its business. So source and use of the same money have to equal each other.
Cash flow	The receipt or outgoing of cash from the perspective of the subject (person or company)	I've experienced negative cash flow when I had to pay the fine to a parking ticket.
Cell reference	The name of a box inside an Excel spreadsheet. For example, the top-left most corner in the Excel spreadsheet is "A1"	
Claim	The right to receive money	If he gets injured doing his job, he has a claim against the work-safety insurance policy.
Company accounts	The records of a company's financials (balance sheet and income statement)	
DCF (discounted cash flow model)	The valuation model which sets the current value or price to equal to the sum of future cash flows each discounted by their respective time frames	
Debt	Money borrowed	If you borrow money from the bank to buy a house, it is arranged as a mortgage. You have a mortgage debt.
Default	The act of refusing (or being unable) to repay part or all of the loans as set out in the conditions of the loan	
Deposit (*verb*)	The act to put more money into an account (usually savings account)	
Discount rate	The percentage rate used in the DCF	Note this concept may not the same as "return" or "interest rate" even though they are both expressed as a % and frequently represented by the letter r in financial formulae
Diversification	The reduction of risk (standard deviation) when two value series are not perfectly correlated	

Dividend	The money that publicly traded companies distribute to its shareholders. It is distributed on a per-share basis; each share is entitled to the same amount of money in the same distribution event	Companies are not required to pay dividends to its shareholders. Many fast-growing companies do not pay a dividend because they re-invest their profits into buying more resources to expand the business. However, for established companies already paying a dividend on a regular basis, reductions in dividend payment may be seen as a signal of poor performance of its business.
Equity	Shares or stocks of capital paid into to a company. The company owns this capital and does not need to pay it back to its shareholders. However the ultimate ownership of equity of a publicly traded firm belongs to its shareholder	This is in contrast with debt, which the company borrows and has to pay back at the schedule set out in the debt terms.
Financial Assets	Claims that are of monetary value to the holder, and it does not take a physical form	A car is a real asset. A savings account is a financial asset.
Forecast	v. to predict, n. prediction	
Future value (FV)	The monetary value at a future date of a claim or cash flow	The FV of 1-year savings account is principal plus interest
Growth	The expansion or increase of value	
Growth rate	The percentage rate of value change from one period to another. Growth rate can be positive or negative. When growth rate of something is positive, it gets bigger. When growth rate of something is negative, it gets smaller.	Kiki was 140cm tall when she was in year 7 and one year later she was 147cm tall. The annual growth rate of her height is (147-140)/140 = 0.05 = 5%
Income or earnings	The difference between revenue and cost of a company's activities. It is sometimes referred to as profit.	
Income statement	An accounting report showing the revenues (sales), expenses (costs), and income (profit) of a company over some period of time, usually over a quarter or over a year	Quarterly income statement; annual income statement
Industry Group / Sector	The category describing a company's main business activity	British Petroleum operates in the Oil & Gas industry
Interest and interest rate	Interest is the money paid to the lender (depositor) in addition to the amount of money lent (deposited). Interest rate is the % rate of interest over amount lent over a period of time. Interest rate is usually quoted as an annual figure.	A 3% interest rate for your 1-year fixed savings account means if you deposited £100 at the beginning of the 1-year period, you will receive £100 + (100x3%) = £103 at the end of the year from your bank. You will have earned £3 interest on your deposit.

Invest	The act of putting money into a business or financial assets in order to obtain future inflow of money. The hope is that the money coming back will be more than the money put in. Such is true for a risk-free (or nearly risk-free) investment (e.g. a bank deposit or savings account), but this not always achieved with risky investments such as bonds and stocks.	It is very risky for individuals to invest in the stock market because they usually cannot achieve sufficient diversification.
Market cap (= price * # of shares)	Market capitalisation is the total market value of a company's outstanding equity shares	
Momentum	The phenomenon that a random value seems to follow some trend in a certain time-frame	The analogy is physics momentum, where motion will stay constant motion without external forces. The difference here is that the momentum concept in forecasting usually is not permanent and has limited time-frame.
Portfolio	A basket or a collection of financial assets	
Present value (PV)	The current monetary value of cash flow(s) that will occur in the future	
Principal	The original monetary value of the loan (or deposit)	If I deposit £100 in my savings account, my principal is £100.
Profit and Profit margin	Profit is the earnings over and above the cost of a transaction. It is calculated as (Revenue - Cost). Profit margin is the percentage rate of profit as of total revenue	
Re-invest the interest	Put the interest earned back into the same account; and thus from then on, the interest forms part of the principal for the next period	
Return	% growth or increase of the value of a financial asset	Note return can be positive or negative. When it is negative the value has shrunk.
Return on assets	Income as a % of total assets	It is a measure of profitability
Revenue	The total receipt of money for selling goods/services	The stalls in the Christmas Fair last year took in £2000. That's the revenue, minus the cost of sweets, crisps, coffee and small toys, the PTA made £1500 profit.
Risk	The extent to which the value of an investment in the future can be uncertain	Any measure of statistical dispersion can be used to quantify risk. Standard deviation is the most commonly used metric.
Savings account	A deposit account held with a bank or credit union that pays interest	
Shareholders	Owners of a company's shares	

Shares	Certificates or book entries representing ownership in a company. A company usually issues many shares, each of which can be owned by individuals to represent a fraction of the ownership of the company	If a company has 50 shares, and the main shareholder holds 20 shares. This main shareholder owns 2/5 or 40% of the company.
Stock Analysts	Professionals who analyse companies in detail: analyse financial statements, interview corporate executives, and attend trade shows, in order to write reports recommending either purchasing, selling, or holding stocks of these companies	
Stocks	Publicly traded company shares on a stock exchange (e.g. London Stock Exchange)	
Ticker	A symbol (usually 3 or 4 letters) used by a stock exchange to identify the financial asset listed and traded	
Total assets	Total value of the resources a company has as recorded on its accounting record. This includes (but not limited to): cash, inventory, machinery, building, land, intellectual property/trade mark	Because the value of total assets is a record of historic value of the company's resources (i.e. the value the company has paid to obtain such resources), it does not take into account of the potential future output or value from such resources, total assets is not an accurate measure of how much money a company is worth. (consider the concept of PV and FV)
Valuation	The act of assigning a monetary value to an asset	
Valuation ratios	The ratios of market value of a company's shares relative to an accounting measure of equity, asset or earnings	
(Fill Your Own ...)		

Tutorial 1 – Forecasting and Efficient Market

What is the Purpose of Tutorial 1?

- Discuss the act of forecasting: similarities and differences between financial market forecasts and forecasts in other settings
- Define financial assets
- Discuss market information, types and sources of information (public versus non-public information), and how information is used.

Activities

1. Brainstorm examples

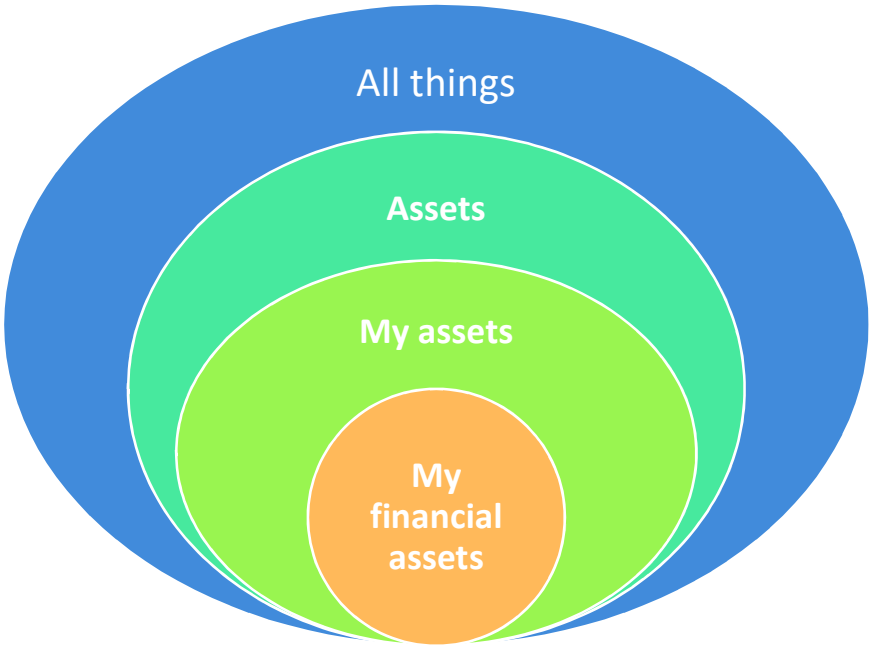
what and how we may try to forecast (predict)(15 min)

What do we forecast	How? What tool/information we use?

2. Defining financial assets

In pairs, fill the relevant choices in the Venn Diagram below.

a. Something we own	b. Something we owe
c. Something of value	d. Something of monetary value
e. The £2 I borrowed from my friend to buy snacks last week	f. My pocket money
g. My intellectual powers	h. My clothes
i. My mum promised me £200 if I get 3 A's in my GCSE exams	j. My old trainers which I dumped in the bin last night



- Concept check – why do banks view mortgages as assets while clearly they are debts to us?

3. Video clip: "Trading Places"

https://www.youtube.com/watch?v=RLySXTIBS3c

Information and efficient market (15 minutes)
Discussion:

- Why did everyone suddenly go quiet when the OJ production announcement by the Department of Agriculture started on the TV?
- Why is it so hard to forecast stock prices? (critical thinking to reach the grasp of key concepts about efficient market)
- What type of information did Valentine and Winthorpe had?
- Brain teaser: What is the plot/con in the movie?

Key Questions you should attempt to answer at the end of this Tutorial:

1. What are financial assets?
2. What happens to prices in an efficient market when new information is revealed?
3. What do we mean by "information"? How can you classify information in the financial markets?
4. What is "insider trading" defined in relation to information?

Homework Assignment 1 - Baselining

Complete the assignment as best as you can independently. Refer to your past maths books or work if you want to. You are encouraged to look up resources yourself to answer these questions. Don't worry if you cannot find answers for all of them. This is to show your PhD tutor how much you can already do.

1. Calculate the percentage (%) increase from 60 to 63.

2. Savings account (show your maths)
   At the beginning of the year, if you deposit £100 in your savings account which has a 2.5% interest rate, and leave it there (no more money to deposit or withdraw) how much money will your account have at the end of the year?

   If you leave your money there for 5 years, assuming this account automatically re-invest your interest in the same account every year (put the interest back into your account), how much money will your account have at the end of the 5 years?

3. Calculate the mean, standard deviation of the following groups of numbers, show details of your work. Calculator is allowed; however, you will need to write down the calculations (equations and/or formulae) you performed, not just the final answer.

   a. 20, 5, 23, 10, 0

   b. 3%, 5%, 6.5%, -9%, -13%

4. Calculate the covariance of the two series of numbers in question 3, show your work

5. Can you write down the algebraic formula for covariance of two number series?
   a. $A_1, A_2, A_3, \ldots, A_n$
   b. $B_1, B_2, B_3, \ldots, B_n$

6. Calculate the following sums, show your working out (calculators allowed)

a. $\frac{1}{1.1} + \frac{1}{1.1^2} + \frac{1}{1.1^3}$

b. $\frac{1}{1.05} + \frac{1}{1.05^2} + \frac{1}{1.05^3} + \cdots + \frac{1}{1.05^{100}}$

(Hint: this shouldn't take more than 20 or 30 button-presses on your calculator)

c. $\frac{1}{1.07} + \frac{1}{1.07^2} + \frac{1}{1.07^3} + \cdots + \frac{1}{1.1^{\infty}}$

(Hint: the symbol "∞" means "infinity".)

7. Calculate the average score for the whole class (boys and girls together) using the information in the table below. Show your work.

	Boys	Girls
Headcount as % of class	40%	60%
Average Marks on GCSE Maths	78	73

8. Browse through "Glossary of Keywords" (located just before Tutorial 1). You do not have to understand or remember all of them for now. We will discuss some of these in detail in later tutorials. This exercise puts some idea behind the key terms we'll use in this course and familiarize you with the language of the field.

9. (Optional) You may be able to access the movie "Trading Places" from one of the links below

https://www.youtube.com/watch?v=QgXHwn-v2mU
https://www.youtube.com/watch?v=HSC9tYS0J60

Tutorial 2 – Valuation Basics: Greed, Fear and Impatience

What is the Purpose of Tutorial 2?

- Introduce the fundamentals of the financial asset valuation model DCF
- Practice basic valuation problems with a few case scenarios: savings account, mortgages, bond, stocks
    - Extras: why is the interest higher for people with high default risk? Break-even analysis with default scenarios

Activities:

1. **Review assignment 1 (getting the mathematics right)**

   Savings account, geometric series

2. **Three fundamentals of human behaviour in valuation**

   (10-15 min)
   Fill the labels for the following formula

$$PV_0 = \frac{FV_T}{(1+r)^T}$$

Re-arrange the formula – what does it look like? (Hint: Assignment 1)

$$PV_0 \times (1+r)^T = FV_T$$

Additional formula: multiple cash payments in the future

$$PV_0 = \frac{FV_1}{(1+r)^1} + \frac{FV_2}{(1+r)^2} + \cdots + \frac{FV_T}{(1+r)^T}$$

3. Hands-on (45min)

Valuation scenarios in Excel (materials will be distributed in class)

1) How much do I get back in my savings account with regular deposits? (FV calculation)

2) Mortgages: calculate mortgage payments (Goal-Seek or built-in formula)

3) Stretch the understanding (optional):
   a. Mortgages with default – what rate should be bank charge to break-even?

4) Stocks (Discounted Dividend Model, not in Excel)
   a. Constant dividends (recall your Assignment 1)

   b. Constant growth model

Concept check

Test your understanding of DCF: If Google will never pay a dividend, what's its stock price?

Homework Assignment 2

All exercises except question 2 should be done in Excel. Please email in the spreadsheet.

1. Finish the Excel valuation exercises in the tutorials (if you haven't)

2. Power of compounding (not in Excel)

   It was said that when the colonists bought Manhattan from the Indians in 1626, they paid $24[1]. Assuming the real estate and general market price appreciation (meaning: increase) was a moderate 8% per year*. How much is Manhattan worth in 2005 according to the original purchase price?

   According to some sources, Manhattan is worth about $32Trillion in 2005[2]. Was the original price a horrible rip-off?

   *** Did you know?** The average compound growth rate of the S&P 500 index[1] between 1950 and 2005 is 8.09% a year. Unfortunately, while there were early forms of stocks and stocks trading in the 1600's, no such index existed to measure the possible growth of investment opportunities available then.

   Bonus credit +5 (counts towards final assignment): what are some important assumptions in your calculation? How would your answers change if some of these assumptions are changed?

3. Mortgages (spreadsheet is set up in the Excel file you worked on in class)

   Choose either question a or b below. An empty sheet of mortgage calculation is set up, but there are some mistakes in the cells highlighted in **Red.** You need to fix the mistakes before you can use the sheet. Also to note that your mortgage length and other terms will likely to be different. So you will need to adjust them. You can refer to the in-class sheet as an example.

   a. Family mortgage: If your family has a mortgage, ask a parent to tell you these three numbers:
      1) Total £ amount of the mortgage loan borrowed (this will be the purchase price of the house minus the down payment)
      2) Total number of years of the loan
      3) Monthly mortgage payment

      Using Excel trial and error, or Goal Seek, **find the interest rate** that the bank charges (do not use the built-in formula)

   b. If your family doesn't have a mortgage or feel uncomfortable to use this information in class, make up these numbers:
      1) Total £ amount of the mortgage loan borrowed (this will be the purchase price of the house minus the down payment)
      2) Total number of years of the loan

[1] https://worldhistoryproject.org/1626/5/4/algonquin-indians-sell-island-of-manhattan-to-dutch-colonist-peter-minuit-for-sixty-guilders
[2] https://uk.answers.yahoo.com/question/index?qid=20070813051213AAjUWpa

3) Monthly mortgage payment. This number has to be bigger than
(total loan ÷ number of months)
otherwise your calculations will fall apart → ask yourself why?

Using Excel trial and error, or Goal Seek, **find the interest rate** that the bank charges (do not use the built-in formula)

4. Student loan (in the Excel file you worked on in class)

   You are an A* student and have been admitted into University. Your excellent academic performance has secured you £5000 in scholarships. You took out a student loan of £4000 to bridge the gap of tuition fees because you want to be independent. You expect to earn £25,000 a year in the first few years after graduation and the student loan policy indicates that you will need to repay 9% of your salary each year. The interest estimated on these loans are 3%[3]. How much is the annual payment? In how many years will you finish repaying your student loan?

   (You can either use trial-and-error or the Excel built-in formula for this question. Note the answer may not be a whole number)

5. Watch the following Deal/No Deal video on YouTube, ask yourself the question: why did she accept the deal in the beginning? This exercise prepares for the next tutorial.
   https://www.youtube.com/watch?v=gTRvSfb7xes

   If you don't know what the game is about, either watch a few more clips of the same show, or read about it on Wikipedia

[3] These are current realistic figures for student loans:
https://www.gov.uk/repaying-your-student-loan/how-you-repay
http://media.slc.co.uk/repayment/qsg/how-much-do-i-repay.html#s2-5

Tutorial 3 – Fear

Portfolio Theory – Risk and Diversification

What is the Purpose of Tutorial 3?

- This tutorial addresses "risk" aspect of the valuation model, and explores mathematically and experimentally how risks can be reduced through diversification.

Activity

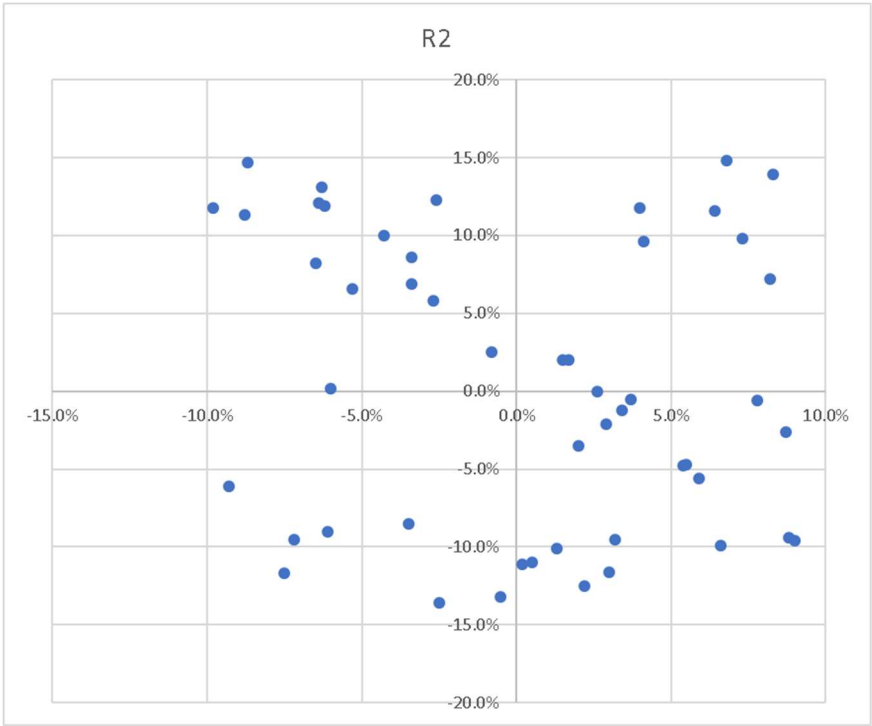
1. Risks: why don't we like them?

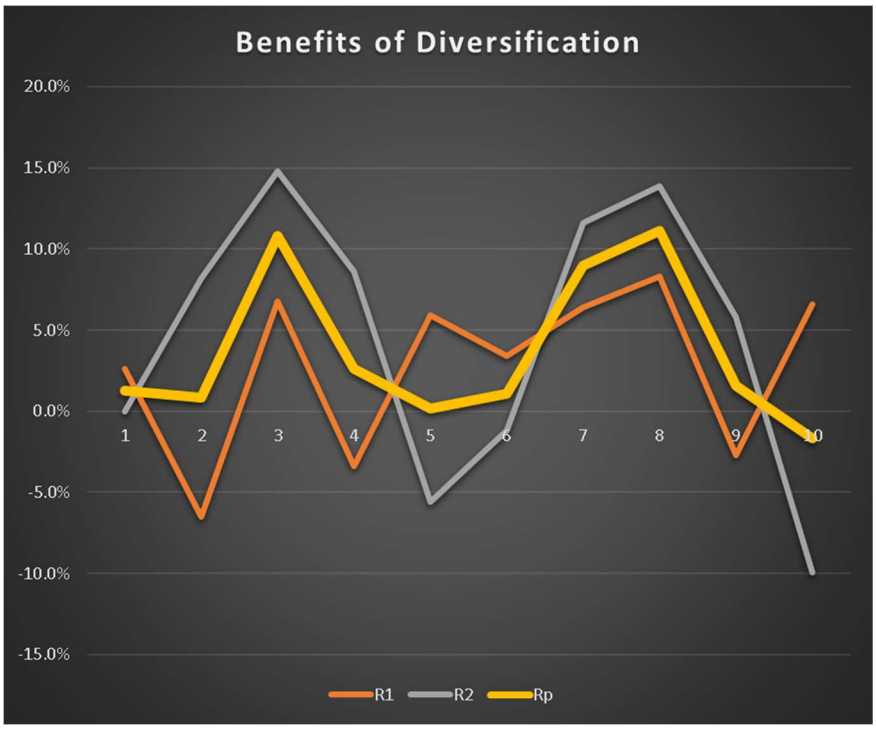
Briefly discuss last homework question: Deal / No deal

2. Diversification

Why do we not put all our eggs in one basket?

3. Mathematical argument – experimentally





In Excel, 2 asset models

i. Simple diversification
ii. Optimised diversification
iii. (optional) Explore how diversified is enough?

4. Start off HW Assignment 3
   Make sure you understand the tasks and have the Excel skills to complete the assignment

Homework Assignment 3

1. Finish the 2-asset example in class

2. Replicate the 2-asset example using FTSE100 company stocks data (details below). This exercise should be completed in Excel (Data to be provided by Tutor).
   You need to fill in all the high-lighted cells

   Pick an industry you like (randomly then trade amongst yourselves)

   a. calculate industry equal-weighted portfolio return series

   b. calculate individual firm and industry risk (standard deviation).

   c. Give reason why you can or cannot achieve better (lower) risk than the equal-weighted industry portfolio by picking a subset of companies? Can you achieve lower risk by changing the weights? (Reason only, no calculation needed)

3. Choose any 2 firms, calculate optimum weights that minimises the risk of the portfolio (hint: solver, use "minimum").

4. (Optional) In Excel, complete the sheet "HowDiversified"
   a. Fill in all high-lighted cells
      You are to calculate the equal-weighted portfolio returns. The 1st portfolio includes the 1st asset; the 2nd portfolio includes the 1st and the 2nd; the 3rd portfolio includes the first 3 assets; and so on; until you have the 50th portfolio with all 50 assets in it. Two cells are already done for you.

      Tip: explore how you can do this fast in Excel by formula copying. However, be very careful to always check your formula after copy/pasting, because Excel will try to be smart and guess what you are trying to do, which is not always what you want to do

   b. Make a line graph or scatterplot graph using the results of portfolio risk to demonstrate the incremental effect of diversification. Plot the portfolio number of assets on the x-axis, and the portfolio risk on the y-axis. (Explore using "Insert" on top menu bar to make graphs in Excel. Or you could do it manually on graph paper. Consider your choice of scales.)

The tasks below prepare for the next tutorial

5. Watch these stock analysis clips
   https://www.youtube.com/watch?v=UTf__7lDQd8
   https://www.youtube.com/watch?v=Fq42Q-ZCHGY

6. Company Reports: BP (to be provided by tutor)
   a. High-light as many glossary terms as possible on these reports. Browse through other new terms and see if you can guess the meaning of some of those not on the glossary. You will contribute to dissecting of the company reports in the next tutorial.

7. Read the pre-reading links for the next Tutorial

Tutorial 4 – "Efficient Market" - Opportunities and Challenges

What is the Purpose of Tutorial 4?

- Revisit efficient market concept, introduce concept of under and over-reaction, discuss the opportunities and challenges of alpha research.
- Explore factors / metrics that may be informative of future asset prices

Pre-reading

https://en.wikipedia.org/wiki/Efficient-market_hypothesis

http://www.econ.yale.edu/~shiller/data/peratio.html

http://observationsandnotes.blogspot.co.uk/2011/01/start-pe-10-year-stock-market-return.html

Activity

1. Discussion - efficient market on the motorway

Traffic is jammed on the motorway. Give reasons why you will or will not change lanes?

2. Discuss video clip

Analysts talking about stock valuation of BP.
https://www.youtube.com/watch?v=UTf__7lDQd8

3. Company report dissection

Which metrics are related to company stock prices? Are they positively or negatively related to stock prices?

BP PLC:

a. Value (expensive or cheap?)
Value ratios – why are they important (hint: pre-reading)

Market Cap[4] / Total Asset _____

P/E ratio _____

b. Momentum (trend?)
Past 12-month average return _____

Ask: why should this relate to future prices? What kind of information efficiency does this imply?

c. Efficiency and effectiveness (productivity? Profitability?)

Return on assets _____

Return on equity _____

Profit margin _____

Operating margin _____

d. Analyst (experts' or other people's opinions? Do you agree?)

EPS (current) _____

EPS estimate for next year _____

What is the % difference? _____

Ask: Why is Earnings important? How does that relate to DCF model?

e. Anything else?
Example of sources of info:
http://www.telegraph.co.uk/business/companies/
http://uk.reuters.com/
Use search tool on these website, search company names

[4] Market Capitalization = Share price (stock price) x Total number of shares outstanding

Tips: be sure to look at the publication DATE of the story – what comes up in search engines could be really old news (and not "news" any more). Aim to look at news no older than early 2017.

4. **Concept Check:**

Which metrics are + / - related to future stock price movement

Homework Assignment 4

In the industry you calculated returns for from Assignment 3, find the following key information (data and company report to be provided by tutor) and fill the grid below. State your reason why each metric may be positively or negatively linked to future asset price movement? You can see a fictional example is done for you. Based on MarketCap/TotalAsset, Company 3 was given the highest rank 1 because Company 3 has the lowest (MarketCap/TotalAsset) ratio amongst the four companies, meaning this company is the cheapest to buy.

You will present your findings to the group in the next tutorial. You can prepare additional presentation materials but are not required to. You can use your completed grid to present.

1. Value: what are the key ratios you want to look at? Which companies appear expensive and which appear cheap?

2. Momentum: which companies have got positive momentum, which one is best?

3. Efficiency / Productivity?

4. Analysts: what do industry experts say about them?

5. Any news about the company in the past half-year? What are the overall sentiment (positive/negative) of these news stories?

   You can use the Reuters news source we talked about, or you can be imaginative and use any other sources. Be sure to finish the 4 basic metrics first. For this item, you are encouraged to be creative and resourceful. However, it's ok if you do not find much anything else too interesting.

6. Rank these companies using each of the metrics from strongest to weakest (or most positive to least positive) (i.e. you will produce 1 set of ranking from 1 to 4 for each metric). Do your rankings differ for different metrics?

7. Reconcile these rankings using any of the following to give your companies a final ranking:
   a. Take an average ranking
   b. Use the strongest or most consistent indicator
   c. Combination of a and b

Industry:		(Company Name 1 in this box)		(Company Name 2 in this box)		(Company Name 3 in this box)		(Company Name 4 in this box)	
	Fill this column: ☐Metric Name / Formula ☐Rationale:(is the metric +/- related to stock prices?)	Company 1 Metric value	Com 1 Rank (1-4) For this metric	Company 2 Metric value	Com 2 Rank (1-4) For this metric	Company3 Metric value	Com 3 Rank (1-4) For this metric	Company 4 Metric value	Com 4 Rank (1-4) For this metric
Value Ratios	☐ metric: Market cap / Asset ratio ☐ rationale: High = too expensive	12	3	15	4	9	1	11	2
	☐metric: ☐rationale:								
Momentum	☐metric: ☐rationale:								
Efficiency/ Productivity	☐metric: ☐rationale:								
	☐metric: ☐rationale:								
Analyst View	☐metric: ☐rationale:								
Other info?	news story & sentiment of the story								
	Overall Rank								

Tutorial 5 – Putting it all together

What is the Purpose of Tutorial 5?

- Summarize key points in the valuation model and portfolio diversification model
- Clarification of misconceptions
- Launch the final assignment

Activity

1. Mini-presentations

Present your key findings from the stock selection homework from tutorial 4
5 minute each, 5-minute feedback from peers and tutor

You should talk about:

- Which 2 companies you chose
- Within each selection metric, how do your selected companies compare to its industry?
- How do your chosen companies compare to industry overall?
- Any other information to justify your choice?

(40 minute)

2. Launch the final assignment

Explain the final assignment expectations (and prize)
Tweak and clarify concepts: what is the optimising objective?

c. Min risk?
d. Max (future return)/risk? (Which risk? Which return?)

Final Assignment

Using the information and ranking data you have gathered in Assignment 4, construct a 2-asset portfolio in the industry you've chosen. (You will also need the risk data, not the results, from Assignment 3 to calculation your portfolio risks). Prepare a report on this portfolio. Your report should be 1500 words (+/- 10%), excluding words in tables or graphs. Your report should present relevant data and graphs to support your portfolio construction and analysis. Address the following questions in your report, but you do not have to structure your report in the exact sections as the questions (you may need to conduct some more research in addition to what you have done in the previous sessions, especially for question 1)

1. Industry background and its bigger economic climate. What information gives indication whether it is a good time to invest in this industry? (10 pts)

2. How do you address the issue of risks? Use formula and data in your industry to support your choice of weights. (30 pts)
    a. Demonstrate your understanding of benefits of diversification by appropriate graph(s).
    b. Explain the key measures and calculations of risk. Show how risk changes with added diversification in your chosen industry.

3. Stock selection. Your rationale for choosing these 2 companies. Use various metric to back up your choice. Use graphs if needed to present the ideas clearly (30 pts)
    a. You need to explain what metrics you are using and the economic theory behind how this metric is related to future price movement
    b. Give reasons behind how you put these metrics together. Usually just taking the simple average is not the best answer. Justify your case with additional research about your companies.

4. Present a back test[5] line-chart of your portfolio. How did its performance compare to the equal-weighted industry portfolio you calculated in assignment 3? (10 pts) Why do you think your portfolio had done better or worse?

5. Discuss the limitations and assumptions of your portfolio construction (20 pts).
    a. Important assumptions to the valuation and diversification model
    b. What other information, if available, would you like to have used to improve performance?
    c. If you have an intuition about some other information may drive future stock prices, how would you test it? What may be the data you would like to collect and how do you plan to examine it?

"Best Portfolio" Prize

(Just for fun. This will not form part of your final grades)

Once all pupils have submitted their portfolio, the PhD Tutor will track their performance against the industry benchmark starting from the point of 2017.08[6]. This will form a realistic view of how your investment portfolio has performed if you were to have invested accordingly. A best performing portfolio will be chosen to be the winner.

Caveat & Disclaimer:
A lot more information and thorough analysis is needed for robust diversified investment decisions. Successful performance of stocks in this project should not be used as a basis for personal investment choices.

[5] We use the term "back test" loosely here. Industry back test usually would require all data used to construct the portfolio were from sources dated before the portfolio were put together, then performance data dated after the portfolio are put together are used to judge how well the trading strategy have performed. This is to avoid the "perfect hindsight" problem.

[6] This is the date when all data used in this course were collected

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.

"Best Portfolio" Competition Results Revealed

Final assignment feedback

What I did well…	What I could have improved on…
•	•
•	•
•	•

My target for future work is…

Reflecting on Uni Pathways

What did you most enjoy about Uni Pathways?
• • •

What did you find challenging about the programme?	How did you overcome these challenges?
• • •	• • •

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 to 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 is 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) 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)

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 – References

Image sources:
Cover: http://harrypotter.wikia.com/wiki/Crystal-gazing?file=DivinationHarryRon.jpg
Weather: https://c1.staticflickr.com/8/7231/7176857290_a1157cc298_b.jpg
Crystal ball: https://c1.staticflickr.com/1/621/21523294814_ddd84475e2_b.jpg
FTSE 100 Chart:
https://upload.wikimedia.org/wikipedia/commons/thumb/6/6d/FTSE_100_index_chart_since_1984.png/640px-FTSE_100_index_chart_since_1984.png
A-level results:
https://www.expressandstar.com/news/education/2017/08/17/a-level-results-day-2017---live-updates-as-grades-are-revealed/
Palm reading
https://c1.staticflickr.com/4/3021/2371326815_9bf6c00930_b.jpg
Deal No Deal
https://upload.wikimedia.org/wikipedia/en/e/e9/Dondgameboard.jpg
https://c1.staticflickr.com/4/3114/2714908473_e5ab0b3ec3.jpg
Fear
https://pixabay.com/p-1958283/?no_redirect
Greed
https://upload.wikimedia.org/wikipedia/commons/d/d1/Avarice.jpg
Impatience
https://pixabay.com/p-1743479/?no_redirect
Graduation
https://upload.wikimedia.org/wikipedia/commons/8/86/Governor_Delivers_Commencement_Address_at_the_University_of_Maryland_Graduation_Ceremony_%2814096445947%29.jpg

Notes

Notes

Notes

Unfogging the Future

Key Stage 4 Programme

researchersinschools.org