



Dear all,

welcome to the module 'Financial markets', which I am teaching. This module aims to give you an overview of the theory of financial markets; the intention is to allow you to understand how traders behave in financial markets and what the consequences of their actions are. We will also look at the properties of a range of specific financial markets, such as stock markets, bond markets, credit markets, and foreign exchange markets.

This module outline explains to you in detail what to expect from my teaching, the contents that is covered, the resources available to support your learning, and information on the assessment; please read this information carefully. If you have any questions about the module, whether it is about its organisation, you require additional support to understand some of its contents, or you seek additional feedback on seminar problems, please feel free to attend my office hours.

I look forward to teaching this module and working with you to achieve your best.

Andreas Krause

Dr Andreas Krause

The module ES520064 Financial markets is available to all students on postgraduate programmes of the Department of Economics in semester 2 of their degree. It is compulsory for students on the MSc Applied Economics with Banking & Financial Markets and optional for students studying towards an MSc Economics, MSc Economics and Finance and MSc Applied Economics.

Students successfully passing the assessment will gain 5 credits at FHEQ level 7 towards their degree. The module is taught during semester 2 and requires a total of 100 notional study hours, of which 25 notional study hours are allocated to lectures and seminars, while 75 notional study hours are allocated to independent study, mostly comprising the preparation of lectures and seminars. Taking into account revision time, students are expected to study independently for approximately 5 hours per teaching week for this module.

1 Aims and objectives

This module aims to introduce students to the basic concepts in financial markets. It will cover the fundamental theories of trading in financial markets, the implications such trading has for prices in financial markets, and how to determine the fundamental value of securities that are traded.

The learning objectives of this module go beyond learning about key theories in financial markets. Apart from learning about such theories, this module will also develop transferable skills that prepare students for the workplace in general, not only in finance and banking. It is therefore not only of essence to learn the details of the models discussed, but gain an overall understanding of their implications for the behaviour of markets and investors.

Knowledge

An important part in this module is, of course, to learn about financial markets. We will look into the key theories explaining how traders behave in financial markets, what the implications of such behaviour for market prices are, and how financial assets are valued. Our main focus will be on understanding the key theories and why they are fundamental, even if much simplified from reality. This will give students a deeper understanding and knowledge of financial markets overall, allowing them to actively participate in discussions about implications such theories have in the economy. Another part of the knowledge base for this module is the ability to apply models in asset pricing to determine the value of such assets using the available information.

Understanding

Apart from the specific knowledge in financial markets, by working through the models students will also be able to gain a better understanding of economic models in general. While the specific elements of the models relate to financial markets, many approaches can easily be transferred to other areas in economics and beyond. There are general principles common from economics applied, especially how to address asymmetric information, but also considerations for risk.

Analysis

We will look at many realistic problems which can be addressed using the economic models discussed in this module, in addition to conducting calculations. Students will learn how economic models can be used to explain realistic scenarios without having to resort to a detailed mathematical analysis. Using intuition and economic reasoning, informed by the models we discuss, students will learn how to approach such problems and provide a meaningful answer.

Communication

All too often economic ideas are only communicated using mathematical formulae based on abstract ideas. In this module students will be required to express their ideas in plain English that can be communicated to a non-specialist audience; students will have to provide an analysis of practical problem sets and instead of relying on a mathematical analysis they will have to use a non-technical approach in its solution, not least as specific quantitative information is not provided, making a mathematical analysis impossible.

Subject specific knowledge is essential in this module, but students need to be able to properly understand, apply and communicate their subject-specific knowledge.

2 Teaching arrangements

| Key information | |
|------------------------|---|
| Lecturer | Dr Andreas Krause |
| Email contact | mnsak@bath.ac.uk |
| Lecture | Thursdays, 9.15-10.45 in room 8W2.13 |
| Seminar | Fridays, 10.15-11.05 in room CB4.8 |
| Office hours | Wednesdays, 8.30-10.00 in room 3E4.26 |
| Webpage | https://people.bath.ac.uk/mnsak/ |

This module is taught over ten weeks with two hours of lectures each week and one hour of seminars bi-weekly. During lectures, the key concepts and ideas of the topics in this module are presented. In each lecture a new topic is covered. Having acquired the necessary knowledge during lectures, students are then offered seminars in which this knowledge is applied to problem sets. Students are expected to attempt the problem sets prior to the seminar and discuss any problems they faced solving them. The problems discussed during seminars are representative of exam questions and attendance at seminars is an essential part of preparing for the assessment.

Prerequisite knowledge

Students are required to have a basic knowledge of microeconomics as provided in our first semester modules; no knowledge of econometrics beyond basic statistics is required. While most topics will involve the use of theoretical models and the associated use of mathematics, no advanced mathematical knowledge is needed. Emphasis will be laid upon an intuitive understanding of the model, its derivation and the interpretation of results rather than their mathematical derivation and detailed mathematical analysis. To fully comprehend the models discussed, students will be required to understand the ideas behind constrained optimisation as well as basic matrix algebra, however, there is no requirement for students to conduct such mathematical operations themselves. The module has been designed to provide an overview of the theory of financial markets and as such no detailed knowledge of finance is required.

Lectures

Lectures are used to convey the main theories used in financial markets. During lectures we will discuss the motivation of these theories, the idea how to derive the main results and discuss the main results, the intuition behind them and their implications. It is essential to attend all lectures as these provide students with the knowledge necessary to understand and critically evaluate problems in financial markets.

As lectures are quite fast-paced and cover different aspects within a topic, it is beneficial if students have familiarised themselves with the material beforehand. This might be through consulting the readings provided for each topic and thereby gaining some knowledge of the context and main ideas, helping them to understand the context of the topic better. After each lecture students should carefully work through the material covered, consulting their notes as well as the readings required to deepen their understanding. Only once students have obtained a good understanding of the theory, are they able to apply their knowledge to solve actual problems; the application of the theory is then practiced in weekly seminars.

Each lecture lasts for two hours and there will be one such lecture in each week; lectures will be recorded through Re:View and recordings will be made available to students shortly after the lecture, subject to technical availability. The schedule of lectures and seminars shown below shows the topic that will be covered in each of these lectures.

Seminars

Seminars are taught bi-weekly and last approximately 50 minutes. In each seminar problems are discussed that relate to topics which have previously been presented in lectures. Students should attempt these problems before attending the seminar; there are benefits even if not succeeding with solving the problem completely. Furthermore, having engaged with the problem beforehand, allows students to understand the suggested solutions more easily. Where problems are requiring a calculation, sketches of solutions will be provided in class, which should allow students to work through the problem step-by-step independently after the seminar and obtain the solution, but it will not always be possible to show all steps required in a calculation. If the problem discussed, or a part of the problem, is not quantitative, the solutions will be discussed in class.

For quantitative and non-quantitative problems student input is required. It is expected that students make suggestions that lead towards a solution, or provide parts of a solution. By providing their suggestions, or comparing the suggestions of other students with their own ideas, students can obtain feedback on their progress in the module. This feedback will allow them self-assess whether they have obtained sufficient knowledge from the lectures and where any deficits might be found.

It is strongly advised that after each seminar students reflect on their solutions and the solution discussed in class. If their solutions were incorrect, it might be necessary to revisit the corresponding lecture to deepen the understanding of the material. Attendance at seminars and engagement with the problems are an essential preparation for the examination. The questions in the examination will be similar in nature and style to the problems discussed in seminars.

Which problems are discussed for each topic in seminars is listed together with the

reading list below. While indicative answers to all problems will be provided to allow students comparing their answers at a later stage, these might not cover all aspects or go beyond the contents covered in lectures. Students are responsible for taking their own notes and are strongly advised to not rely on the indicative answer instead of attending seminars as the learning effect will be significantly diminished.

Seminars will not be recorded to allow students to provide wrong answers without having these answers replayed by other students. Students who are unavoidably absent during a seminar, can attend my office hours, as outlined below, to gain feedback on their solutions if the indicative answers provided are not sufficient.

More problems than can be discussed in seminars are provided to students, this is due to time constraints in seminars. Having additional problems allows students to practice their knowledge in preparation of the assessment; they can compare their solutions with the indicative answers provided and for any additional clarifications attend office hours.

Lecture and seminar schedule

| | Lecture | Seminar |
|--------------|---------------|-------------------|
| Week 19 | Topic 1 | <i>No seminar</i> |
| Week 20 | Topic 2 | <i>No seminar</i> |
| Week 21 | Topic 3 | Topics 1 & 2 |
| Week 22 | Topic 4 | <i>No seminar</i> |
| Week 23 | Topic 5 | Topics 3 & 4 |
| Week 24 | Topic 6 | <i>No seminar</i> |
| Week 25 | Topic 7 | Topics 5 & 6 |
| Week 26 | Topic 8 | <i>No seminar</i> |
| Week 27 | Topic 9 | Topics 7 & 8 |
| Easter break | | |
| Week 30 | Topic 10 | Topics 9 & 10 |
| Week 31 | Revision week | |
| Week 32 | | |

Office hours

Office hours are available weekly during teaching weeks and revision week. Office hours allow students to clarify questions they have regarding lectures or seminars on a one-to-one basis. Students are expected to have worked through the relevant lectures, associated readings, and seminars to resolve their question through self-study. If this is not leading to a question being resolved, students can attend office hours to obtain individual support on this specific question. It provides them with an opportunity to obtain individual feedback on their progress and identify gaps in their knowledge or

skills. Students are expected to come prepared and ask specific questions, office hours are not designed to provide private tuition.

Students who are unavoidably absent from a seminar, for example due to illness, are invited to visit the office hours with their proposed solutions, or attempts at finding a solution, for a brief discussion that will help them to catch-up with the material covered. For lectures missed for the same reason, students are referred to the recordings that are provided.

Office hours are normally in-person, but in special circumstances where a student cannot reasonably attend in person, a meeting through Teams can be arranged during office hours, please contact the lecturer a few days in advance if this applies; please note that students must join the Teams meeting using their university username. For in-person office hours, no time slots can be booked, students can attend at any time during the office hours. Should the office hours fall into a time where students have other lectures or seminars, please contact the lecturer in advance to make alternative arrangements.

Short questions, for example a clarification, can also be addressed directly after the lecture or seminar in the room by approaching the lecturer. Similarly, questions can be asked by emailing the lecturer and an answer would normally be provided by the next office hours. However, in most cases asking questions by email is not effective and students might be asked to attend office hours instead; usually only questions of clarification are suitable, while providing explanations of theories or solutions to problems is in most cases not effective.

Resources available

Students are provided with the following resources to help them learn and achieve the learning outcomes:

- module outline (*this document*),
- recordings of lectures through Re:View,
- lecture slides with extensive notes,
- problems for seminars with indicative answers,
- readings accompanying the lecture and seminar material.

The recordings of lectures are provided through Re:View and can be accessed through Moodle only, while all other resources are available from the module webpage at people.bath.ac.uk/mnsak/, a link to the module webpage has also been placed in Moodle.

On the module webpage, students will find all resources as listed above, apart from lecture recordings, which can only be accessed through Moodle. The lecture slides are available in two versions, one consists of the final version of each slide, while the other version includes the dynamic uncovering and colouring of text as used during lectures. Each topic has its own set of files, consisting of a file providing some context to the topic and the files for each model.

3 Topics covered

The area of financial markets encompasses such a wide range of topics that it is impossible to cover them even rudimentarily in a single module. It is therefore necessary to focus on a small number of key concepts, and the selection of these will necessarily be subjective. For this module we will focus on gaining an understanding of financial markets in terms of how market participants affect security prices and what the role of information in this process is. This will then in the second part of this module be complemented by a more detailed discussion of individual securities and their specific properties.

Topics that have been excluded deliberately include the pricing of derivatives, the decision in which securities to invest (portfolio selection), the discussion of trading strategies, the impact of trading rules, and regulatory constraints. We will also not cover the topic of behavioural finance, which discusses the impact non-rational decision-making has on the behaviour of market participants and security prices. This module is focussing on the theory of financial markets to gain an understanding of the key concepts and therefore empirical work will not feature prominently.

Basic concepts of financial markets

The first part of this module will explore some key concepts applicable to all financial markets. The focus will be in the role of information in financial markets and how the behaviour of investors can affect security prices.

Topic 1: Market efficiency Financial markets are commonly seen as efficient in the sense that prices accurately reflect available information. In this topic we will define market efficiency and discuss the implications market efficiency has on the incentives of investors to obtain information in financial markets as well as the performance of portfolios. If investors claim to have used their skills and information access to exploit market inefficiencies, these returns need to be assessed in the context of the risks investors take.

Topic 2: Strategic trading Not all market participants have the same information on the value of a security, but it is common that some market participants are better informed than others; such market participants can exploit their informational advantage. We will discuss how all market participants, those with superior information and those without, trade optimally and what the implications for prices as well as market efficiency are. Information is revealed not only by prices, but also trading volume and we will see what additional information trading volume can provide.

Topic 3: Speculation Most market participants are not actually concerned about the intrinsic value of a security, but buy and sell securities with the aim to benefit from price fluctuations. Such behaviour is commonly referred to as speculation. We will explore how such speculation can be rational and why market participants might purchase a security, despite knowing that the price paid exceeds its fundamental value. Such behaviour, although rational, can lead to periods of securities being overvalued.

Topic 4: Market crashes We often observe that securities are trading well above their intrinsic value and while in most cases the price might slowly reduce towards this intrinsic value or the intrinsic value catches up with the price, in some instances price adjustments are sudden. If the size of this adjustment is sufficiently large, this is commonly referred to a crash. We will see how such a crash can occur and what might be triggering a crash in some situations, but not in other instances.

Topic 5: Risk management Trading in financial markets is inherently risky as the prices might develop differently from the expectations of market participants, or information they had obtained was wrong or incomplete. We will look at the way risks are measured, with Value-at-Risk as the key risk measure used by financial institutions, and how this measure can be used to determine maximal positions in securities as well as adjustments to positions in individual securities. In some instances it might be desirable to protect the portfolio of securities from losses. For such cases immunisation strategies might be desirable to ensure a minimum value can be guaranteed.

Applications to specific types of assets

Each type of asset has its own characteristic that market participants need to understand in order to successfully invest or trade. In this second part, we will look at some of the key assets that are traded in financial markets. We will determine their valuation and thereby see on which variables information is valuable and how it will affect the value of the asset.

Topic 6: Stock valuation models Building on the asset pricing models from the previous topic, we will use the asset pricing models to determine the value of stocks. We will compare different assumptions on the future prospects of companies and how they impact the value of stocks. If market prices correctly reflect the available information, thus its value, markets are said to be efficient. We will look at the implications of efficient markets for the properties of asset prices. Based on these ideas, we will also look at how companies should be making investment decisions.

Topic 7: Fixed income securities Fixed-income securities, more commonly known as bonds, issued by governments are often regarded as risk-free. Yields of bonds with different times to maturity vary and we will look at how these differences can be explained. While government bonds are often regarded as risk-free, this can only be true for the default risk, they are exposed to the risk of changing interest rates. We will see how this risk can be assessed and how bond investors can use different bonds to eliminate such risk.

Topic 8: Credit markets Rather than assuming that fixed-income securities are risk-free, we will explore how the possibility of the issue of such securities not making the promised payment affects the terms of the security, most notably the size of the payment required (the interest rate). This will then directly lead to the value of credit derivatives, such as credit default swaps (CDSs), which we also derive. We will then look at the value of a portfolio of risky bonds in what is known as a collateralised debt obligation (CDO).

Topic 9: Foreign exchange markets The exchange rate between two currencies is driven by differences in the underlying economies of the countries concerned. We will explore what differences might be important by considering a number of parities, but also a macro-economic model that determines exchange rates as one of the equilibrium outcomes.

Topic 10: Currency crises In particular for developing countries, but not only for them, a sudden change of the exchange rate can have a significant impact on the wider economy. It is essential to understand what causes such currency crises and how they can be distinguished from market crashes. Such knowledge is not only useful for macroeconomists, but also anyone who seeks to invest in different currencies as it allows an assessment of the risks involved in such investments.

4 Reading list

As emphasised above, for meeting the learning outcomes of this module, students do not need to go beyond the contents provided in the lectures and seminar. Readings here are provided such that students can deepen their understanding of the material covered in lectures and seminar, as well as becoming aware of the context and relevance of the topics discussed.

1. John Y. Campbell, Andrew W. Lo, and A. Craig MacKinlay: *The Econometrics of Financial Markets*, Princeton University Press, Princeton NJ, 1997
2. Edwin J. Elton, Martin J. Gruber, Stephen J. Brown, and William N. Goetzmann: *Modern Portfolio Theory and Investment Analysis*, 9th edition, Wiley, 2014
3. Maureen O'Hara: *Market Microstructure Theory*, Blackwell, Oxford, 1995
4. Harry G. Johnson: *Speculation: A General Equilibrium Approach*, *Journal of Political Economy*, Vol. 84, No. 1, pp. 101-108, 1976
5. Kenneth A. Froot, David S. Scharfstein, and Jeremy C. Stein: *Herd on the Street: Informational Inefficiencies in a Market with Short-Term Speculation*, *Journal of Finance*, Vol. 47, No. 4, pp. 1461-1484, 1992
6. Gerard Genotte and Hayne Leland: *Market Liquidity, Hedging, and Crashes*, *American Economic Review*, Vol. 80, No. 5, pp. 999-1021, 1990
7. Phillipe Jorion: *Value at Risk*, 3rd edition, McGrawHill, New York NY, 2007
8. Fischer Black and André F. Perold: *Theory of constant proportion portfolio insurance*, in: *Journal of Economic Dynamics and Control*, Vol. 16, No. 3-4, pp. 403-426, 1992
9. Craig C. Mounfield: *Synthetic CDOs*, Cambridge University Press, Cambridge, 2009
10. Giancarlo Gandolfo: *International Finance and Open-Economy Macroeconomics*, 2nd edition, Springer Verlag, Cham, 2016
11. Xavier Vives: *Information and Learning in Markets*, Princeton University Press, Princeton NJ, 2008

For each topic specific papers or chapters from books are relevant as outlined in the table below. These readings also provide some context of the theories and discuss them in more practical terms than the lectures and seminars, which provide students with a more economic and theoretical approach. Students are not required to know the context and practical implications of these topics, nor are they expected to know of any methods to actually perform an empirical investigation. The readings may nevertheless help students to understand the context of the topic better and is therefore valuable.

Detailed reading list and problems by topic

| | Reading | Problems |
|----------|--|----------------|
| Topic 1 | [1, Chs. 1.5], [2, Ch. 26], [11, Ch 4.2.2] | 1, 2, 3, 4 |
| Topic 2 | [3, Chs. 4, 6.2] | 5, 6, 7, 8 |
| Topic 3 | [4], [5] | 9, 10, 11, 12 |
| Topic 4 | [1, Ch. 7.1], [6] | 13, 14, 15, 16 |
| Topic 5 | [7, Chs. 5.1, 7], [8] | 17, 18, 19, 20 |
| Topic 6 | [2, Chs. 17-19] | 21, 22, 23, 24 |
| Topic 7 | [2, Chs. 21, 22] | 25, 26, 27, 28 |
| Topic 8 | [9, Chs. 3, 6] | 29, 30, 31, 32 |
| Topic 9 | [10, Chs. 4, 15] | 33, 34, 35, 36 |
| Topic 10 | [10, Ch. 16] | 37, 38, 39, 40 |

5 Assessment

The assessment consists of an in-person examination lasting two hours during the assessment period. The examination will be open-book and students are allowed to take any non-electronic material into the examination. Students will not be provided with any other material beyond the questions paper, an answer booklet and a calculator; anything else students may want to or need to rely on are to be brought to the examination by the student. Students are only allowed to use university calculators and their own calculators are not permitted.

The exam paper will cover the entire contents of this module and students are not given a choice of questions to answer, all questions are compulsory. The exam will consist of questions requiring calculations based on formulas derived in lectures and questions requiring to solve an applied problem using their knowledge from this module. While the exact weighting of questions in the examination will vary in each exam paper, students can expect that approximately 20-30% of questions will require calculations and 70-80% the solving of applied problems.

The style of questions in the exam paper will be similar to the problems discussed during seminars; it is therefore that seminar attendance is an integral part of preparing for the examination. As in the problem sets, students will not be asked to derive a formula, whether a formula we have discussed in lectures or a new formula. Instead,

students are required to apply a formula and the results of models to the problem on hand, by choosing the correct formula and parameters where calculations are required and by choosing the right model(s) to answer the applied problem.

Knowing and understanding the contents of the lectures is sufficient for the examination and students can achieve any mark. It is not necessary to read beyond the contents of the lectures, although this can be beneficial as it will help students to gain a better and deeper understanding of the topic; this may make answering exam questions easier. Students wishing to go beyond the contents of this module are free to do so in the examination, but there is no inherent advantage in doing so, nor is there a disadvantage; the answer will be assessed in the same way and to the same standards as for students who restrict themselves to answers based on the module contents. When answering questions and using exclusively contents from the module, no referencing is required; however should a student go beyond the contents of the module and appropriate reference must be provided.

Assessment preparation

Although the examination is open-book, allowing students to make use of any non-electronic material they wish, students are strongly advised to prepare in the same way they would prepare for closed-book examinations. Students are required to identify the correct models to apply to the questions given, and they will only be able to do this successfully if they have a good overview of these models. Knowledge of the framework used for each model and its key result are also essential to assess whether a model is useful in the context of the question and to develop initial ideas on how to apply this model. Where the use of notes and other material will be useful is obtaining the details of model assumptions and more specific aspects of the insights these models provide; these aspects can be looked up during the exam rather than be memorised beforehand. Notes are also useful for quantitative questions where formulae do not need to be memorised but can be looked up.

By experience, if students decide that due to the open-book examination they can rely completely on looking up models to decide which one(s) are applicable and then read up on the key results of these models, they will not have sufficient time to answer all questions adequately. The number of questions is chosen such that students who are well prepared and have knowledge of all models and their key results will be able to finish all questions by working continuously throughout the length of the examination; this includes looking up any details of the models they are required to apply. Time is, however, not sufficient to read up on the models themselves in the first place. Therefore, as part of their revision, students should have a sound understanding of all models discussed in the lectures and seminars.

It is also essential that students practice answering problems prior to the examination. While attendance at the seminars will allow them to gain an understanding of the

approach to be taken and how to structure an answer, how to make the argument they apply more sound, and how much detail to provide, it is the practice of writing answers to seminar problems that have not been discussed in the seminars and then comparing these answers with the indicative answers provided, that gives students the skills required and confidence for the examination. The same holds for quantitative questions, where the ability to select the correct formulae and parameters to insert into the formulae are essential and by experience students that have not practiced to answer such questions, will find it difficult to do so in exam conditions. It is strongly suggested that students initially attempt seminar problems without having looked at the indicative answers to maximize the learning effect; it is for this reason that a separate file of seminar problems without indicative answers is provided.

Exam technique

The exam will last two hours and consist of six questions; students are not given a choice of questions to answer. The questions are not ordered by difficulty and also not ordered by topic; thus no inferences can be made from the position of the question in the exam paper about the level of difficulty or which models are applicable to it. In order to maximize the marks, students may answer questions in any order they wish. With eight questions, the average time spent on each question will be 20 minutes and while some questions might be answered in less time and others may take a little bit longer, students should make sure they are not significantly outside of this time frame. Students taking considerably more than 20 minutes answering a question (this would not include excessive time spent thinking about a solution) might consider that they either have taken a wrong approach or provided levels of detail that are not necessary; in the examination, please focus on the key ideas and arguments only. If, on the other hand, students spend considerably less than 20 minutes on a question, they might want to consider whether they have covered all aspects relevant to this question and gone into sufficient depth and detail in their answer.

In terms of the length of an answer, again from experience, it is sufficient to write approximately two paragraphs (200-300 words) for non-quantitative questions. Where a non-quantitative question is included as a sub-question in an otherwise quantitative question, the answer will usually be considerably shorter at around 50 words. This is not a guideline of how much students should write, but might give you an indication of the typical length; some problems might require a much shorter answer while others might necessitate a longer reply. These differences arise from a variety of factors, for example a more difficult problem might not require much detail, but a very succinct solution, while other, sometimes, but not always, easier questions might require more aspects to consider, which are more straightforward. The indicative answers to the seminar problems are approximately half the length of what students typically write. The reason is that students tend to be less succinct and provide more evidence from the problem itself to support their analysis of the problem than has been done in the indicative answers, where this evidence is merely hinted at; for this reason, they are

not labelled 'solutions' but instead 'indicative answers'.

When providing an answer to a question, students must make sure they answer the question asked, it is not sufficient to describe a model (even if the correct model). Students must address the specific question asked, using an appropriate model to apply to the circumstances and support their analysis with evidence from the problem to show that key assumptions of the model are met (or not). It is then essential to show how the results of the model are answering the question and provide a rationale for this result. Students are not required to derive a model, and there is no benefit in doing so, nor are they required to reproduce formulae from these models in their answer. What is required is that students use these results, apply the appropriate formulae as part of their answer. The answer should be in plain English and be comprehensible to a non-specialist audience, which has knowledge of basic economics, finance, and banking. References to models do not need to be made as long as these models were discussed in this module; students using models not discussed in this module are required to provide an adequate reference. How to provide an answer to exam questions will be practiced extensively in the seminars.

For quantitative questions, students may have to work backwards and identify information that is not directly given in the question. In all cases, there should be sufficient information from which this missing information can be inferred. Students who are not able to determine the missing information, or those believing that essential information is genuinely missing, should make a reasonable assumption about this information, clearly state that they did make such an assumption due to missing information or they do not know how to obtain the information, and then use their assumed information in any further calculations. For calculations it is strongly advised to show intermediate steps such that any mistakes made during calculations can be identified; this allows to distinguish numerical errors from other errors. When marking, the emphasis will be laid on the correct steps being taken to obtain the result, not numerical accuracy, hence students should not be overly concerned about any numerical values they obtain; spending time checking for purely numerical errors is usually not productive as the marks lost will be minimal. If a result, whether intermediate or final, is unrealistic or impossible, students should indicate this with a brief note to this effect, showing that they have identified a potential numerical error. It is advisable to try and correct this error only if there is sufficient time to do so and all other questions have been completed.

Marking criteria for non-quantitative questions

When marking the exam, attention will be paid to the following aspects, in no particular order of importance:

- choice of an appropriate model/framework that can be used to address the prob-

lem, with additional well justified assumptions being made as appropriate and needed,

- presence of a coherent argument being made (within the framework of the model chosen) that leads from observations to meaningful results on any particular point being made, as far as relevant to the problem,
- a well-argued overall conclusion that brings together the different arguments made throughout the answer into a single final result, or two opposing results conditional upon certain aspects discussed before, as appropriate,
- avoidance of the discussion of irrelevant aspects that do not directly contribute to the answer,
- consideration of alternative explanations and approaches to the one chosen and justification of the chosen approach.

The marking of answers like these is necessarily subjective, thus no firm rules or right/wrong answers can exist. If students make a mistake, for example using an incorrect model, giving a wrong solution, students will only lose marks for the initial mistake and any subsequently wrong outcomes ('follow-up mistakes') will attract full marks, provided they are correct conditional on their initial mistake. Roughly answers might be characterized as follows:

Fail Students choose the wrong theory or model and typically do not apply it to the problem at hand, but rather describe the theory itself. It may also be a case of choosing the correct theory or model but not showing how it and its results relate to the problem in the problem or misinterpreting its relevance.

Pass Students choose a theory or model that is wrong but make an effort to show its relevance. Alternatively, students might choose the correct model but fail to argue its relevance convincingly or make substantive mistakes in its application. Another possibility is that students choose the correct theory or model, but the arguments to its relevance are incomplete or partially wrong. Students may have all elements in place, but not connected to form a coherent argument for your analysis.

Merit Students use theories and models well to support their arguments, but they may not properly consider alternative theories and other explanations that do not directly emerge from conventional theories. The explanations using models and theories show some gaps or inconsistencies.

Distinction Students support their arguments well with existing theories or models, consider alternatives to the models you chose as well as look beyond the models themselves by considering alternative explanations.

Marking criteria for quantitative questions

When marking the exam, attention will be paid to the following aspects, in no particular order of importance:

- choice of the appropriate model and formulae within that model,
- identification of the parameters used in the formulae,
- ability to identify missing parameters and determine these from different formulae, including formulae used when discussing different topics,
- solving the equation for the correct variable.

In most cases, there will be only a single correct answer, making an answer correct or wrong. However, mistakes have a different degree of severity. Numerical accuracy is secondary to using the correct formulae, identifying parameters correctly and being able to solve the model for the correct variable. If students make a mistake, for example identifying a variable incorrectly, and then use this variable in subsequent calculations, giving a wrong result, students will only lose marks for the initial mistake and any subsequently wrong results ('follow-up mistakes') will attract full marks, provided they are correct conditional on the initial mistake. This will also apply to any instances where students have to interpret their numerical results; students will be assessed on interpreting the numerical result they present.

Roughly answers might be characterized as follows:

Fail Students do not identify the correct model or formula to use or only state the formula without showing how they would use it, for example by not identifying most of the parameters correctly.

Pass Students identify the correct model, but fail to identify most parameters correctly or do not solve for the required variable or solve for the wrong variable. Alternatively students might have used the wrong formula in the circumstances, although the formula could be used for a similar problem. Using information from the question, students have attempted to provide an answer, but have failed to do so correctly.

Merit Students are able to fully solve the model using the correct formulae, but might have made some mistakes, such as misidentified some parameters of lesser importance or made minor errors while deriving their result. If students made a numerical error in their calculation and their results are unrealistic, the student will have identified them as such and provided a brief comment to this effect.

Distinction Students have identified the models and formulae correctly, as well as all parameters. Students have been able to solve their model correctly and in the case of minor numerical errors have identified any unrealistic results by providing a short comment to this effect.

In some cases a question might require a calculation to be performed and this result to be interpreted. In this case, the marking will be based on a combination of the assessment criteria for quantitative and non-quantitative questions.

Assessment criteria

The above marking criteria are applied to determine the extent to which the assessment criteria have been fulfilled. The below table shows the assessment criteria which are relevant to the assessment of this module, together with a descriptor for certain mark ranges.

| Criteria | Distinction (85-100%) | Distinction (70-84%) | Merit (60-69%) | Pass (50-59%) | Marginal Fail (40-49%) | Fail (20-39%) | Low Fail (0-19%) |
|---|--|---|--|---|--|---|--|
| Subject knowledge <i>(Weight 50%*)</i> Applying appropriate and relevant concepts, models, and ideas to address the assessment question. Ability to extract relevant information from the assessment question. | Demonstrates an exceptional depth/breadth of knowledge via exceptional engagement with independent learning outside of unit materials. | Demonstrates an excellent depth/breadth of knowledge of relevant material via significant engagement with independent learning outside of unit materials. | Demonstrates a good/comprehensive depth/breadth of knowledge of relevant material via good engagement with independent learning outside of unit materials. | Demonstrates a sufficient depth/breadth of knowledge of relevant material, although some gaps are evident. Sufficient evidence of engagement with independent learning outside of unit materials. | Demonstrates a superficial knowledge of relevant material. Some but insufficient evidence of engagement with independent learning outside of unit materials. | Demonstrates limited knowledge of relevant material and extremely limited evidence of engagement with independent learning outside of unit materials. | Demonstrates very limited/no knowledge of relevant material and no evidence of independent learning outside of unit materials. |

| Criteria | Distinction (85-100%) | Distinction (70-84%) | Merit (60-69%) | Pass (50-59%) | Marginal Fail (40-49%) | Fail (20-39%) | Low Fail (0-19%) |
|--|--|--|--|--|---|--|--|
| <p>Critical Thinking (<i>Weight 15%*</i>)</p> <p>Ability to synthesise, analyse and/ or evaluate to demonstrate criticality of thought. Synthesis refers to integrating multiple information to generate insights to address the assessment question. Analysis refers to the deconstruction of information and understanding the interrelationships between complementary, contradictory, and substitutive information. Evaluation refers to making reasoned judgements about the quality and significance of the analysed information.</p> | <p>Demonstrates an exceptional understanding of relevant information sources from which an exceptionally clear, balanced and a well-substantiated argument has been developed. There are no inaccuracies and/ or omissions. Overall, the work contains an exceptional level of criticality and/ or originality and develops new and innovative insights. This work is of exemplar quality.</p> | <p>Demonstrates an excellent understanding of relevant information sources from which an extremely clear, balanced and well-substantiated argument has been developed. There are almost no inaccuracies and/ or omissions. Overall, the work contains a very high level of criticality and/ or originality, demonstrating new insight.</p> | <p>Demonstrates a good/ comprehensive understanding of relevant information sources from which a clear, balanced and a well-substantiated argument has been developed. There are no significant inaccuracies and/ or omissions. Overall, the work is of a good critical and/ or original nature, demonstrating some new insight.</p> | <p>Demonstrates sufficient understanding of relevant information sources from which a clear, balanced, and substantiated argument has been developed, albeit rather limited in scope. The work contains a few inaccuracies and/ or omissions. Overall, the work is of a descriptive nature, but elements of criticality and/ or originality are present.</p> | <p>Demonstrates some understanding of relevant information sources although the argument presented has not been clearly or sufficiently developed. The work contains some inaccuracies and/ or omissions. Overall, the work contains limited criticality and/ or originality.</p> | <p>Demonstrates limited understanding of relevant information sources. Consequently, whilst there is an attempt to articulate an argument, this lacks clarity and balance and is largely unsubstantiated. The work contains significant inaccuracies and/ or omissions. Overall, the work contains very limited criticality and/ or originality.</p> | <p>Demonstrates very limited or no understanding of relevant information sources and consequently no obvious/ credible argument has been presented. The work contains significant inaccuracies and/ or omissions. Overall, the work does not convey criticality and/ or originality.</p> |

| Criteria | Distinction (85-100%) | Distinction (70-84%) | Merit (60-69%) | Pass (50-59%) | Marginal Fail (40-49%) | Fail (20-39%) | Low Fail (0-19%) |
|--|--|---|---|---|--|---|---|
| Problem-solving (Weight 20%*) Ability to effectively identify, analyse and solve problems through the application of appropriate models. | Demonstrates an exceptional and nuanced understanding of the problem; employs an appropriate but highly sophisticated methodology/ approach to problem solving; demonstrates exceptional critical thinking and the ability to evaluate complex information critically and creatively; the identified solution(s) demonstrates extremely high potential for positive real-world impact. | Demonstrates a comprehensive understanding of the problem; employs a well-structured and appropriate methodology/ approach to problem solving; provides a thorough analysis with significant critical evaluation and a strong ability to synthesise information and draw well-supported conclusions; the identified solution(s) demonstrates high potential for positive real-world impact. | Demonstrates a clear understanding of the problem; employs an appropriate methodology/ approach to problem solving; provides a sound analysis with critical evaluation and an ability to identify relevant data and draw conclusions; the identified solution(s) demonstrates potential for positive real-world impact. | Demonstrates a basic but sufficient understanding of the problem with some misconceptions; employs a simplistic but appropriate methodology/ approach to problem solving; provides some but limited analysis with superficial and limited critical evaluation; the identified solution(s) demonstrates some potential for positive real-world impact. | Demonstrates some but an insufficient understanding of the problem with clear misconceptions; employs an overly simplistic and/ or inappropriate methodology/ approach to problem solving; provides insufficient analysis and critical evaluation; the identified solution(s) demonstrates minimal potential for positive real-world impact. | Demonstrates limited understanding of the problem with significant misconceptions; employs an inappropriate methodology/ approach to problem solving; provides extremely limited analysis and no critical evaluation; the question/ problem remains unresolved. | Demonstrates very limited or no understanding of the problem with significant misconceptions. No attempt to resolve the problem which remains unresolved. |

| Criteria | Distinction (85-100%) | Distinction (70-84%) | Merit (60-69%) | Pass (50-59%) | Marginal Fail (40-49%) | Fail (20-39%) | Low Fail (0-19%) |
|--|--|--|---|---|--|--|---|
| Communication (Weight 15%*) The answer is communicated in such a way that a non-specialist audience can understand the answer, as well as the arguments used that lead to answer provided. | The communication of work to the intended audience is exceptional. There are no errors or areas for development, and the work is of exemplar standard. | The communication of work to the intended audience is excellent. There are no errors or significant areas for development. | The communication of work to the intended audience is good. There may be minor areas for development, but this does not detract from the overall quality of the work. | The communication of work to the intended audience is acceptable. Some areas require further development as these detract from the quality of the work. | The work has not been communicated to the intended audience despite overall communication being relatively good. | The work has not been communicated to the intended audience and overall communication is poor. | The work has not been communicated to the intended audience and the communication is very poor. |

* Assessments will be graded holistically, and therefore the assigned weightings should be considered as indicative rather than absolute. Please also note that the weights are relevant for the entire assessment only and each individual question may have weightings that differ substantially from these averages and not all assessment criteria may apply to all questions.

Illustration of an answer not meeting the learning outcomes

Good answers can be found in the indicative solutions to the seminar problems. Here is an example for an answer to a non-quantitative problem that would not meet the learning outcomes of this module. Consider problem 23 from topic 6 and the following answer which has been generated by ChatGPT:

- a. Your conclusion that the market cannot be efficient based on your observations is not necessarily correct. To understand why, let's break down the scenario:
 - **Observation:** After an increase in the stock price, the next price change is more likely to be positive than negative. After a decrease in the stock price, the next price change is also more likely to be positive than negative.
 - **Implication for Market Efficiency:** The EMH asserts that asset prices fully reflect all available information. If markets are efficient, price changes should be unpredictable and random, meaning past price movements should not provide any reliable information to predict future price movements.

However, the scenario you describe does not necessarily violate market efficiency:

- **Positive Drift:** The stock market could have a positive drift, meaning that, on average, prices tend to increase over time due to factors like economic growth, inflation, or investor optimism. In such a market, observing that the next price change is more likely to be positive after both increases and decreases in the stock price is consistent with an upward-trending market rather than evidence of inefficiency.
- **Bias in Interpretation:** If you have observed a consistent pattern statistically and this pattern persists over a significant period, it could suggest some form of market inefficiency. However, it's important to distinguish between short-term patterns and long-term trends. The observed behavior could simply be a reflection of the overall positive trend in the market rather than a violation of market efficiency.

Therefore, your conclusion that the market cannot be efficient based on the observed pattern might be premature. The pattern could simply reflect a market with a general upward trend rather than inefficiency.

- b. If you observed that after a decrease in the stock price, the next price change is more likely to be negative than positive, this could be more indicative of market inefficiency, particularly if this pattern is consistent and statistically significant.
 - **Negative Momentum:** This would suggest a momentum effect, where prices continue to move in the same direction after an initial move. In an efficient market, price changes should be random, and such a predictable pattern would imply that traders could potentially exploit this information to earn above-average returns, which contradicts the EMH.
 - **Market Inefficiency:** If such a pattern holds consistently, it could indicate that prices do not fully reflect all available information immediately, allowing for predictable price movements based on past data. This would be a stronger indication of market inefficiency.

In summary, observing that prices are more likely to continue moving in the same direction after a decrease could provide stronger evidence of market inefficiency compared to the scenario where prices are more likely to increase regardless of the previous move. However, even in this case, further analysis would be needed to conclusively determine the presence of inefficiency, considering factors like transaction costs, market dynamics, and potential external influences.

This answer, while overall correct, does not make use of specific models and explores

how they are relevant to this case. Instead, the answer lacks depth and makes statements that are not justified by economic reasoning. The answer also does not address the specifics of the observations in the problem itself, thus is just a generic discussion of the benefits of market efficiency. In contrast, the indicative answer makes explicit reference to models discussed in this module and goes into more depth rather than staying generic as in the answer shown here.

6 Disability adjustment

Any student with a disability, whether formally diagnosed or not, is invited to contact the lecturer at the earliest possibility to discuss any adjustments that might help the student to participate fully in this module, as long as these can reasonably be made. Such adjustments might be in addition to any provisions in the Disability Access Plan.



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