



THE BUSINESS SCHOOL

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Macroeconomic Theory and Policy
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Macroeconomic Theory and Policy

Additional Notes

Introduction

Classical economists such as Adam Smith (1776), Ricardo (1817), J. B. Say (1817), Malthus (1790) Mill (1844), Marshall (1922) and Pigou (1925) explained economic events using competitive market clearing models in which prices and wages were perfectly flexible. Foreign trade and payment were arranged under the self-correcting mechanism of the gold standard system. Quantity theory of money postulated a direct and proportional link between money supply and price level leaving no role for a monetary policy in determining real output, employment and income. Persistent unemployment and inflation were impossible in the classical analysis. They favoured free, open and liberal market policy and in which the main objective of the government was to keep law and order. Invisible hand of the price system allocated resources efficiently and effectively. The aggregate demand always equalled the aggregate supply and there was no gap between the savings and investment. Increasing level of investment activities, made possible by higher rate of saving, contributed towards capital accumulation and to the higher growth rate as seen throughout the 19th century in the majority of western countries.

The great depression of 1930s, with high level of unemployment rate and deflation, exposed serious limitations inherent in the classical system. John Maynard Keynes published the “General Theory of Employment, Interest and Money” in 1936 and argued that self-correcting mechanism propounded by the classical economist had serious flaws. He concluded that the aggregate demand is not always equal to aggregate supply, high rate of unemployment may persist for a long time if government does not step in for stabilising the economy. The market fails to guarantee the full employment and it is possible for the economy to remain under full employment if not corrected by active policy intervention. He strongly argued that it is important and often necessary to fine-tune the economy using the monetary and fiscal policies whenever output and employment remain out of their potential levels. Hicksian (1936) IS-LM model, that formalised the Keynesian idea remained the most popular tool for macroeconomic analysis, was believed to be one the major factors for correct policy action taken by governments that led to an unprecedented growth and stability in all western countries from 1940s to early 1970s. The trade off between unemployment and inflation as shown by the Phillips (1956) curve led policy makers to believe that higher level of output and employment were achievable by expansionary fiscal and monetary policies. However, that belief about the link between monetary and real sectors of the economy remained strong only until the emergence monetarism, particularly until the precise analysis of natural rate of unemployment hypothesis by Friedman in 1968.

The predictions of Keynesian model and belief on demand management policy gradually met with many more sceptics in 1970s. After hikes in oil prices in early 1970s, one after another economies entered in stagflationary period, with no trade-off between inflation and unemployment. The strength of Keynesian theories became questionable particularly regarding its unrealistic assumptions on the supply side of the economy. The rational expectation or the new classical school to the macroeconomics emerged under the intellectual leadership of Lucas, Sargent and Prescott, who were very critical about the economic policy prescription derived from the Keynesian analysis. Based on micro-

foundation, they brought together both the supply and the demand sides of the macro economy under the market clearing general equilibrium hypothesis. They, like the classical economists, argued for a minimal role of the government in favour of more competitive market oriented economic system. The name the New Classical school truly connotes their close links to the thinking of the classical economists. Using optimising methods with the representative household and firms they emphasised on the dynamics and business cycle in an economy in response to technology and productivity shocks. Not all macroeconomists, however, were happy with the New classical theories. Economists such as Blanchard, Mankiw, Romer and Taylor (Rankin, Dixon and others in the UK) known more as New Keynesian macro economists, still thought the relevance of the Keynesian theory in real life, and came to defend the Keynesian analysis using analytical tools developed by the New Classical economists. They incorporated micro foundation to macroeconomics with rational expectation but also used concepts such as the staggering wage contracts and union bargaining, menu cost, real rigidity and sticky wages and prices, market imperfections and information asymmetry to get the Keynesian results from the operation of fiscal and monetary policy. Analytically they are not far from the monetarists and new classical economists but in policy terms they value more role for an economic policy in the short run. They have proved propositions showing that the demand management policy were still relevant in containing the undesirable effects of business cycle in the economy. Despite these developments, the big controversy still remains about the role of economic policy in the short run and this issue is far from settled.

Surprisingly ideas of all economic schools converge about the growth and development in the long run. No serious dissimilarity exists among the macroeconomists about the analysis of economic growth over time. Classical economists had used market clearing models to analyse saving investment and capital accumulation issues in the long run. More recently, after Harrod-Domar and Solow models, new endogenous growth models that emphasise on research and development and human capital, have received considerable attention in the macroeconomic literature. Advancement in the computational technology has made it even more possible to compute more decentralised dynamic general equilibrium models for dynamic economic policy analysis with more realistic structure on consumption, production and trade in the small open economy or the interdependent economies in the global economy.

The main focus of this module will be to introduce students to standard tools of macro economic analysis particularly with a focus on impacts of fiscal, monetary and exchange rate policies in output, employment and prices in the short run and economic growth in the long run. Questions such as why the growth rate varies across countries, what are the optimal macroeconomic policies to contain recession or hyper inflation will be answered using these macroeconomic models.

Module Outline

The major objective of this module is to improve understanding of macroeconomic tools among students who would like to use them for analysing various issues in economic policy. It relies on intuitive, graphical, algebraic skills to study impacts of policies that influence aggregate demand and aggregate supply in the short run and role of accumulation capital and improvement in the production technology in economic growth in the long run. Some background in economics in the undergraduate level is quite helpful but the module will be pitched at a level to make it accessible also to those who had not done undergraduate degree in economics. Further readings will be assigned for those who would like to deepen their understanding in specific topics as module progresses.

Aims

This module aims to introduce students to modern macroeconomic analysis of economic fluctuations and growth with an emphasis on fiscal, monetary, labour market, exchange rate and balance of payment and trade policy issues. It will illustrate successes and failures of macroeconomic policies in a selected group of countries whenever it is possible. We aim to consolidate understanding of standard techniques used by the classical, Keynesian, monetarist, new classical and new Keynesian economists for analysing the impacts of policies designed to contain the demand and supply shocks in the economy in the short run and to promote the economic growth in the long run. Teaching activities in this module will demonstrate

- (a) how to choose an appropriate theory to analyse a given macroeconomic question.
- (b) how to formulate a macroeconomic question with due appreciation of different points of views on the functioning of the economy particularly regarding the importance of the behaviour of the household, firm, government and the external sector in determining the macroeconomic equilibrium.
- (c) how to select key macroeconomic variables and formulate a simple model using graphical or algebraic tools for analysing causes and effects for growth and fluctuations.
- (d) how to be able to diagnose a problem and analyse it critically.
- (e) how to follow key articles in important journals and be able to read more advanced text-books in the macroeconomics.

Learning Outcomes

After the successful completion of this module students should be able to

- (a) the nature of explain the macroeconomic equilibrium or disequilibrium.
- (b) appreciate the major differences among macroeconomists on effectiveness of demand management and supply oriented policies in an economy.
- (c) use the structural model to do comparative static analyses using the tax, government expenditure and money supply multipliers.

- (d) be able to find out the price system that is consistent with the demand and supply balances in goods, labour, capital markets and where the both government budget constraint and balance of payment conditions are satisfied.
- (e) choose appropriate model to analyse the impacts of fiscal, monetary, exchange rate and trade policies in the economy.
- (f) be familiar with the more decentralised structure of the economy.

Skills

Module requires understanding of the theory, analytical approach using diagrams and a few key equations and relevant macroeconomic time series data for analysis. Students will learn interaction between aggregate demand and aggregate supply and optimal policy choice for assuring internal and external stability in the short run and higher rate of economic growth in the long run. They will know how to diagnose a macroeconomic problem such as high inflation and unemployment rate and low growth rates systematically using these macroeconomic tools and find out economic policy options using those tools. They should be able to calculate evidence based policy scenarios.

Significance of the Module

This module fits well with other modules in the M.Sc. in economics degree programme. It uses knowledge and experience that students might have from their undergraduate studies. It focuses to build enough confidence to apply macroeconomic tools in a practical situation that confront a policy maker in the government or the private sector, a central banker or the general public regarding the economic stability and growth in an economy.

Structure of Teaching & Learning Activities

The module will be delivered by three 50 minutes lecture sessions each week (36 lectures in total) and by 10 problem based tutorial sessions. Topics for lectures and tutorials are included at the end. Attendance on both lectures and classes is compulsory. Students are expected to solve the assigned tutorial problem before they come to the class.

Assessment

The module will be assessed by following **two** components

- One final examination (60 marks): See last year's final exam questions at the appendix. It will have similar structure even in this year.
- Course work (40 marks). The course work will consist of one term paper (20 percent of marks) and two in-class mid-term exams. Each mid-term exam have the same weight. They will contain materials covered up to the time of the mid-term. The term paper should be more than 3000 words and not less than 2500 words. Module requires that you must have pass marks for the coursework and final exam separately.
- Method of Reassessment: A 100 percent two hours written exam.

- Prerequisite: There are no specific prerequisite. Minimum mathematical skills (logs, rules of differentiation, approximations, calculation of growth rates) required for the module will be covered during the lectures.

Guidelines for Course Work

Course work in this module consists of **two mid-term exams** (20 percent of marks) and one **term paper** worth 20 percent toward the module marks.

Question for the first in class midterm exam: Why do impacts of macroeconomic policies for growth and stabilisation vary across countries at a certain time and in the same country over time? Analyse this issue critically using the ISLM AS-AD and growth models studied in this module. Use relevant diagrams and equations as necessary and support analysis with your own judgement. A written essay on this topic should be produced just before the in-class mid-term exam.

Second mid-term exam: It will include an essay or model based question as in the tutorial problems sets. They relate to theory and policy issues on economic growth, impact of fiscal, monetary and exchange rate policies in containing fluctuation using the ISLM, AS-AD and open economy models, trade-off between inflation and unemployment. Your arguments should be supported using clearly labeled diagrams and equations as necessary.

Suggested Topics for the Term Paper

A Problem on Macro-economic Policy Making

Due before the lecture on December 1, 2003

This exercise on macro-economic policy making consists of an oral presentation in the class and a written essay on macroeconomic policy alternatives available to a country you are most familiar and interested in. This is a part of the assessed work as mentioned above (20 percent of the module marks). The major purpose of this exercise is to strengthen your knowledge on macroeconomic policy-making supported by theoretical arguments and empirical facts. You need to tell a clear story linking goods, money, financial and labour markets in the short-run and the long-run taking any one of the important policy questions of your choice.

Structure of the term paper is left open according to the nature of this module in this M.Sc. in Public Policy (econ) programme. You may take one of any issues listed below and analyse it using a macro economic model. An outline of the paper containing the issue of interest, method of analysis, sources of relevant empirical information, expected results should be submitted by **October 15**. The model could be presented using graphs, equations, numerical examples and empirical estimates. Lecture notes and class materials can be used for analysis. A list of references used for the essay need to be provided at the end of the paper. You should show a clear understanding of the basic structure and the major assumptions of the model while analysing this issue. The robustness of the analysis should be checked by a critical evaluation on applicability of the model in the real world with some tests for sensitivity of the models to changes in those assumptions. This term paper should not contain more than 3000 words (figures and graphs may be included in the appendix). You will lose stipulated marks for the assignment if you miss the deadlines except in extenuating circumstances.

The topic for the term paper can be one of the following:

- Why some countries are poor and others are rich in the global economy?
- Examination of the role of savings, investment and human capital and technology in economic growth.
- Critical assessment of financial sector policy for economic growth.
- Comprehensive analysis of contribution of fiscal, monetary and exchange rate policy for internal and external stability.
- A comparative analysis of demand and supply side policies to fight inflation and unemployment.
- Evaluation of the controversies among classical, Keynesian, new classical and New Keynesian economists about macroeconomic policy making.
- Why is the labour market rigid in some countries and more flexible in other countries?
- How to design macroeconomic policies for job creation, income redistribution and poverty alleviation? (public private sector partnership).
- Evaluation of the uses and abuses of deficit financing, seigniorage, public debt, and crowding out hypothesis.
- Analysis of consequences of market failures and need for government intervention for stability and growth
- Should macroeconomic policies based on rules or in discretion of policy makers?
- An assessment of policy game between private and public sector and time inconsistency problem in macroeconomic policy.
- Why should the central banks be independent in conducting monetary policy?
- How can trade and exchange rate policies contribute towards economic growth?
- Evaluation of macroeconomic impacts of the Structural Adjustment Programs (SAP) in developing economies.
- Analysis of convergence, regional integration and monetary union.

The term paper should start with a proper motivation for the selected issue. It should contain the diagnosis of the problem followed by a theoretical and empirical analysis with reference to the theory of macroeconomic fluctuations and long term economic growth. Key insights of the model should be supported by facts emerging from a careful review of time series data from national accounts and balance of payment accounts of the chosen economy. A summary of your judgements and policy prescriptions should be provided at the end. There are many sources for empirical data including the web pages: <http://www.statistics.gov.uk> <http://www.hm-treasury.gov.uk>. <http://www.bankofengland.co.uk> which have plenty of macroeconomic time series data for the UK. For other countries latest global and country specific dataset can be downloaded from the IMF Web page <http://imfStatistics.org> or from the World Bank CD installed in the Hull University network (Start/Applications/Economics/WDI 2002). More detailed macroeconomic data for OECD countries are at <http://www.OECD.org> <http://www.oecd.org/home/>; <http://www.ecb.int/>; for developing economics at <http://www.worldbank.org/research/growth/> <http://www.imf.org/external/pubs/pubs/per.htm>; <http://www.bris.ac.uk/Depts/Economics/Growth/> ; A good web page for working papers is <http://netec.mcc.ac.uk/NetEc.html>. The raw data need to be summarised and modified to make them suitable for putting in the paper and presentation.

Presentation

It would be helpful to outline major macroeconomic characteristics of your economy in the beginning (a page of key indicators: output (Y), consumption (C), investment (I), government spending (G), exports (X), imports (M), real and nominal interest rates (i,r), exchange rate or the trade weighted exchange rates with key trading partners (er), price level (P), GDP deflator (J), unemployment rate (u), money supply (MS), labour force (L), labour and capital income, capital stock (K), tax revenue (T), debt (D)). You might then discuss the goals and objectives of fiscal, monetary, exchange rate and growth policies, and long term and short term targets and instruments. A graphical or qualitative approach can be used to show linkages of macro policy in goods, money, labour, financial, foreign exchange markets using the IS-LM and AS-AD framework. A simple version of the Solow model with human capital or a simple version of endogenous growth model (AK model) may be used for analysing policies on economic growth. You need to contrast your arguments favouring either a) active policy view, or b) passive policy view, or c) intermediate view. These positions should be based on expected impacts of a particular policy on major macroeconomic variables i.e. a) output b) employment c) Price levels d) capital accumulation e) foreign trade and f) savings g) financial markets. You should outline a prudent strategy with proper consideration of national and international macroeconomic situations and conclude your presentation listing important factors that determine success or failures of the policy you are proposing.

Assessment method: The originality of the issue, critical analysis and clarity of organisation of information in oral and written presentation is the most important factor in assessment. Use of real world facts and figures to support the theoretical arguments and use of materials provided during this module including lecture notes, articles, books, solutions to class exercises and discussions, references and web pages as listed in the syllabus will also be important for the assessment.

Economic Policy Modelling:

If you have a strong research interest in developing an economic policy model you may start preliminary steps during the coursework. You may use materials prepared for assignments towards such model, which uses either of the following three approaches:

- a) Spread sheet based models.
- b) Econometric forecasting model of monetary and fiscal policy for a short and medium run using a standard econometric software such as Microfit, PCGIVE or Shazam (these software are accessible in the network Start\Applications\Economics or in the S:\Allshort folders).
- c) General equilibrium analysis of policy issues of economic growth and redistribution using GAMS. A set of GAMS and Shazam manuals are available at <http://www.gams.com/docs/gams/GAMSUsersGuide.pdf>
<http://www.gams.com/docs/gams/Tutorial.pdf>.

Academic Dishonesty and Plagiarism

All work which is submitted for assessment must be your own work. Academic dishonesty is an attempt to engage in deception or fraud and will be penalised accordingly. It is a **very serious** offence. It is important that you have read and thoroughly understood the section entitled 'Plagiarism' in the 'University of Hull Business School Student Handbook' and that you have read and understood the 'Code of Practice on the Use of Unfair Means' which is published on the University of Hull website

Study Programme

The main contents of this module include formal analysis of macroeconomic equilibrium and fluctuations around it in the short run and that of economic growth in the long run. Impact of economic policies in growth and stability will be assessed using these models.

Macroeconomic theory and policy in the short run

Keynesian analysis, Monetarist approach, New classical critique and New Keynesian synthesis. Major instruments and effectiveness of fiscal, monetary, trade and exchange rate policies in containing short run fluctuations in output, employment, prices and balance of payment, theories of inflation and unemployment, active and passive policy perspectives.

Macroeconomic theory and policy in the long run

Neoclassical and endogenous growth models, importance of saving and investment, technology, human capital over time, redistribution with growth.

Lectures introduce new materials and class exercises apply those concepts to deepen understanding of the theory and policy under discussion. Active participation in lectures and class exercises are expected. You should demonstrate this understanding in the assignments and exams.

Main Text

Blanchard, Oliver (B) *Macroeconomics*, Third Edition, Prentice Hall, Chs. 3-24. 2003. ISBN 0-13-033772-2; <http://www.prenhall.com/blanchard>
Burda Michael and Charles Wyplosz (2002) *Macroeconomics: A European Text* 3rd dition, Oxford University Press. <http://www.wiwi.hu-berlin.de/institute/wt2/>
Miles David and Andrew Scott (MS) *Macroeconomics: Understanding the Wealth of Nations*, John Wiley and Sons, Inc, 2002. ISBN 0-47084288-1.
Mankiw, G. N.(2003) *Macroeconomics*, Fifth Edition, Worth Publishers, New York.

You should have at least one of these text-books. None of them cover all things that is needed for the module but all of them have the basics though slightly in different styles. While reading chapters you should make effort to solve both theoretical and practical end of the chapter problems. Some copies of both of these books should be available from the short loan section in the library.

It is good practice for postgraduate students to browse through recent journal articles in the library. Our library keeps current issues of economic journals in the 1st floor and past issues in the 3rd floor. From policy and applied economic policy perspectives you may want to look at *Journal of Economic Perspective*, *Journal of Political Economy*, *Economic Letter*, *Applied Economic Letters*, *Journal of Public Finance*, *Journal of Money Banking and Credit*, *Journal of Development Economics*, *Journal of Development Studies*, *World Bank Economic Review*. Electronic database **Econlit** in the library is a good place to search articles in economics.

Annotation about the Key Text books in Macroeconomics

There are plenty of other good text books in the subject for those who like to deepen their understanding further. *Advanced Macroeconomics* by David Romer is a

good text, presents difficult concept using reasonable amount of technical tool but this text requires a thorough undergraduate degree in economics. For general more non-technical presentations read texts by Miles and Scott (2002) Mankiw (2002) and Blanchard (2003) Manfred (2003) and Burda and Wyplosz (2002). These texts also have good theoretical and applied problems at the end of the chapters and have good web pages for students. Stevenson, Muscatelli and Gregory (1988) has a good coverage of stabilisation policy but it is out of print. Sheffrin (1989) like K.A. Chrystal and Simon Price (1994) are easy reading. Jones(2002) provides good analysis of growth and Cooley (1996) is good for more recent advancement in the business cycle research. Minford and Peel (2002) contains plenty of algebra. Sargent and Ljungqvists (2000) and Sargent(1987) are more for post-graduate level. I will try to provide lecture notes based on my studies, which might be complemented by reading any of these text-books.

Supplementary texts and journal articles if you want to further concentrate in macroeconomics:

1. K. A.Chrystal and Simon Price (1994) *Controversies in Macroeconomics*, Harvester Wheatsheaf.
2. Shaw, McCrostie and Greenaway (2001) *Macroeconomics Theory and Policy in the UK*, Blackwell.
3. HM Treasury (2002) *Reforming Britain's Economic and Financial Policy*, Palgrave.
4. Sheffrin Steven M (1991) *Making of Economic Policy*, Blackwell.
5. F. T. Froyen (2002) *Macroeconomics Theories and Policies*, seventh edition, Prentice Hall.
6. N. Gregory Mankiw (MANK) *Macroeconomics* (5th edition -2002) New York Worth.
7. Blanchard Oliver (2000) *Macroeconomics*, 2nd edition, Prentice Hall.
8. J.M.Davis (1992) *Macroeconomic Adjustment: Policy Instruments and Issues*, IMF Institute. World Bank Publication, *Lessons of Tax Reform*, 1991.
9. Rudiger Dornbush, S.Fisher and R Startz, (2001) *Macroeconomics*, McGrawHill.
10. Gartner Manfred (2003) *Macroeconomics*, Prentice Hall.
11. Charles Jones (CJ) *Introduction to economic growth*, 2nd edition, 2002, Norton.
12. Gylfason Thorvaldur *Principles of Economic Growth*, Oxford, 1999.
13. David Romer (1996) *Advanced Macroeconomics*, McGraw Hill.
14. Oliver Blanchard and S. Fisher (19..) *Lectures in macroeconomics*, MIT Press.
15. R.Barro and Sala-I-Martin (1995) *Economic Growth*, McGraw Hill.
16. Auerbach and L. Kotlikoff (1986) *Dynamic fiscal policy*, Cambridge University Press.
17. Thomas Sargent (1987) *Macroeconomic Theory*, Academic Press.
18. Carl Walsh (1997) *Monetary Theory and Policy*, MIT Press.
19. P. Aghoin and P. Howitt (1998) *Endogenous Growth Theory*, MIT Press.
20. Ljungqvist L and T.J. Sargent (2000), *Recursive Macroeconomic theory*, MIT Press.
21. Krugman P and M. Obstfeld (1996) *International Economics Theory and Policy*, arper Collins.
22. *Economic Policy* (ed. Vols), Cambridge University Press.
23. Minford P and D. Peel (2002) *Advanced Macroeconomics: A Primer*, Edward Elgar Publishing.
24. McKinnon R I. (1993) *The order of economic liberalisation*, John Hopkins.
25. Bradley R. Schiller (2003) *Macro Economy Today*, McGraw Hill Irwin

Journal articles that will be referred in the lectures (most of them are available through the short loan section):

1. Bank of England (www.bankofengland.co.uk) The Transmission Mechanism of Monetary Policy.
2. Bhattarai K. (2001) Welfare Gains to the UK from a Global Free Trade, *European Research Studies Journal*, IV, 3-4, pp. 55-72.
3. Bhattarai and J Whalley (2000) "General Equilibrium Modelling of UK Tax Policy" in S. Holly and M Weale (Eds.) *Econometric Modelling: Techniques and Applications*, pp.69-93, the Cambridge University Press, 2000.
4. Bhattarai (1999) A Forward-Looking Dynamic Multisectoral General Equilibrium Model of the UK Economy, *Hull Economics Research Paper* no. 269.
5. Bhattarai K. and J. Whalley (1999) "Role of labour demand elasticities in tax incidence analysis with heterogeneous labour" *Empirical Economics*, 24:4, pp.599-620.
6. Bhattarai K. M Ghosh and J Whalley (1999) "On some properties of a trade closure widely used in numerical modelling" *Economic Letters*, 62 no. 1, pp. 13-21.

7. Blanchard, O.J. and L. Summers (1986), "Hysteresis and the European Unemployment Problem," NBER Macroeconomics Annual, the MIT Press.
8. Blanchard O.J. and Kiyotaki (1987) Monopolistic competition and the effects of aggregate demand, *American Economic Review*, 77: September, pp 647-66/
9. Barro, R. J. (1974), "Are Government Bonds Net Wealth?," *Journal of Political Economy* pp. 1095-1117.
10. Barro and Gordon (1983) A Positive Theory of Monetary Policy in a Natural Rate Model, *Journal of Political Economy*, 91:4: 589-610.
11. Canzoneri M. B. and J. A. Gray (1985) Monetary Policy Games and the Consequences of Non-Cooperatinve Behaviour, *International Economic Review*, 26:3:547-564.
12. Dornbush Rudiger (1976) Expectations and Exchange Rate Dynamics, *Journal of Political Economy*, 84:6: 1161-1176.
13. Goodhart C.E.A. (1994) What should central banks do? What should be their macroeconomic objective and operations?, *Economic Journal*, 104, November, 1424-1436.
14. Grossman and Helpman (1991) *Innovation and Growth in the Global Economy*, Cambridge Mass. MIT Press.
15. Friedman, M. (1968), "The Role of Monetary Policy," *American Economic Review*, No.1 vol. LVIII March
16. Fleming J. Marcus (1962) Domestic financial policies under fixed and under floating exchange rates, IMF staff paper 9, November , 369-379.
17. Hicks, J. R.(1937): Mr. Keynes and the "Classics"; A Suggested Interpretation, *Econometrica* 5: 1937.
18. Keynes (1936) *The General Theory of Employment, Income and Interest Rate*, Cambridge University Press.
19. King R.G. and Plosser C.I. (1984) Money Credit and Prices in a Real Business Cycle, *American Economic Review*, 64 (June) 263-380.
20. Kydland F.E. and E.C. Prescott (1977) Rules rather than discretion: the Inconsistency of Optimal Plans, *Journal of Political Economy*, 85:3: 473-491.
21. Lucas R.E. (1988) "On the Mechanics of Economic Development", *Journal of Monetary Economics*, 22, 3-42
22. Lucas R.E. Jr. (2000) Some macroeconomics for the 21st century" *Journal of Economic Perspectives* 14:1: Winter 159-168.
23. Lucas, Robert Jr. and Sargent (1979), *After Keynesian Macroeconomics*, Spring , Federal Reserve Bank of Minneapolis Quarterly Review.
24. Mankiw N.G. (1989) Real Business cycle: A New Keynesian Perspective, *Journal of Economic Perspectives*, vol. 3, no. 3 pp. 79-90.
25. Mankiw N.G., D. Romer and D. N. Weil (1992) "Contribution to the Empirics of Economic Growth" *Quarterly Journal of Economics*, 107 407-437.
26. Modigliani F (1986) Life cycle, individual thrift and the wealth of nations, *American Economic Review* 76, 279-313.
27. Mundell R. A (1962) Capital mobility and stabilisation policy under fixed and flexible exchange rates, *Canadian Journal of Economic and Political Science*, 29, 475-85.
28. Nickell, S. (1990), "Inflation and the UK Labor Market," *Oxford Review of Economic Policy*; 6(4) Winter.
29. Nordhaus W.D. (1994) Policy Games: Cooperation and Independence in Monetary and Fiscal Policy, *Brookings Papers on Economic Activity*, 2: pp. 139-216.
30. Phillips A W. (1958) The relation between unemployment and the rate of change of money wage rates in the United Kingdom, 1861-1957.
31. Phelps E. S. (1968) Money wage dynamics and labour market equilibrium, *Journal of Political Economy*, 76 , 678-711.
32. Prescott, E.C. (1986), "Theory Ahead of Business Cycle Measurement," Federal Reserve Bank of Minneapolis, *Quarterly Review*; Fall.
33. Ramsey, F.P. (1928) "A Mathematical Theory of Saving," *Economic Journal* 38, 543-559.
34. Phillips A W. (1958) The relation between unemployment and the rate of change of money wage rates in the United Kingdom, 1861-1957.
35. Phelps E. S. (1968) Money wage dynamics and labour market equilibrium, *Journal of Political Economy*, 76 , 678-711.
36. Plosser Charles I (1989) Understanding Real Business Cycle, *Journal of Economic Perspectives*, vol. 3, no. 3 pp. 51-77.
37. Rankin Neil (1992) Imperfect competition, expectations and the multiple effects of monetary growth, the *Economic Journal* 102: 743-753.
38. Rebelo S. (1990) Long run policy analysis and long run growth, *Journal of Political Economy* vo. 99 no. 3 pp. 500-521.
39. Rogoff, K (1999) "International institutions for reducing global financial instability", *Journal of Economic Perspectives*, 1999 or NBER WP 7265.

40. Romer Paul (1990) Endogenous Technological Change, *Journal of Political Economy*, 98:5:2, pp.s71-s102.
38. Romer, Paul "Capital Accumulation in the Theory of Long Run Growth" in Barro R. J. (1989) ed. *Modern Business Cycle Theory*, Harvard University Press.
39. Solow R.M. (1956) "A Contribution to the Theory of Economic Growth", *Quarterly Journal of Economics*, pp. 65-94.
40. Solow R.M. (2000) Towards a macroeconomics of medium run, *Journal of Economic Perspective* 14:1:Winter 151-158.
41. Tobin J (1969) A general Equilibrium Approach to Monetary Theory, *Journal of Money Credit and Banking* 1 (Feb) 15-29.
42. Taylor J (1993) Discretion versus policy rules in practice, *Carnegie Rochester Conference Series on Public Policy* 29 Amsterdam
43. Williamson J. and M. Miller (1987) *Targets and indicators: a blue print for international co-ordination of economic policies*, Institute of International Economics, Washington.
44. Yellen J. L. (1984) *Efficiency Wage Models of Unemployment*, *American Economic Review Papers and Proceedings*.
45. International Monetary Fund (1992), *Macroeconomic Adjustment: Policy Instruments and Issues*, IMF Institute, Washington D.C.

Other Sources:

For example: Econlit JSTOR databases (<http://www.hull.ac.uk/lib>) through the electronic services in the library should be useful for the literature search. Financial Times has plenty of day to day news and story about the macroeconomic events in real life.

The range of references and resources available throughout the University Library is increasing constantly on a daily basis. The list above should be thought of as an opening into the literature. You are strongly encouraged to browse through the stock and to pay particular attention to the New Periodicals shelves.

Programme Changes

Wherever possible, the programme timetables and content will be delivered as outlined in the Module Handbook. However, at times changes do have to be made but in the event of such changes occurring every effort will be made to re-schedule the activity, or replace it with work of an equivalent nature.

Attendance

The University has an Attendance Policy, which requires all students to attend all timetabled sessions for their programme of study. An Attendance Register will be kept for tutorial sessions and students with unauthorised absence will be subject to School and University disciplinary procedures. It is important that you have read and understood the section entitled 'General Attendance' in the Hull University Business School Student Handbook.

Student Support

All modules are supported by tutorial assistance. A list of tutorial sessions are listed below. More tutorial problems can be obtained upon request. In addition there will be office hours for this module. You may like to bring any specific question relating to this module during those hours. Enquiries of a general nature, which may range over a

number of modules, should be addressed to the Programme Leader of your registered degree.

Health and Safety

You are responsible for your own health and safety at all times. It is vitally important that you act sensibly and safely for both indoor and outdoor activities. You are required to follow all safety instructions and guidelines as laid down in your *'University of Hull Business School Student Handbook'*.

Module Evaluation

The module will be evaluated by means of the Business School Module Evaluation Questionnaire (MEQ), which all students are required to complete at the end of the module. The results of this formal evaluation will be forwarded to Student-Staff Committees and will be used to make alterations and improvements to the delivery of the module next year if these are deemed to be necessary. Additional module evaluation techniques may also be employed. Issues concerning the module can be forwarded to the School Student-Staff Committee. You may also have the opportunity to make informal comments and suggestions concerning the module in tutorial sessions.

The Module Staff hope that you enjoy studying this module and that it makes a valuable educational contribution to your Course Programme.

Problem 1

National Accounts, Balance of Payment and Basic Keynesian Macroeconomic Model

1. GDP and GDP components of the UK economy are as given in the following table.

National Account of the UK: Expenditure Approach (Billion pounds, quarterly data)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Househ.Cons.Expend.,incl.NPISHs	416	437.7	459.9	492.2	523	557.4	591.6	626.6	658.1	689
Government Consumption Expend.	131.5	136.3	141	146.8	149.2	154.9	166.6	177.8	191.5	208.9
Gross Fixed Capital Formation	101	108.4	117.3	125.6	134.1	151.3	153.7	158.9	164.3	164.7
Changes in Inventories	0.33	3.71	4.51	1.77	4.62	5.03	6.06	5.6	1.44	-0.7
Exports of Goods and Services	163.6	180.5	203.5	223.1	231.6	228.8	236.6	265.1	267.7	269.2
Imports of Goods and Services (-)	170.1	185.3	207.1	227.2	231.4	238	252.2	283.6	289.9	288.1
Gross Domestic Product (GDP)	642.3	681.3	719.2	762.2	811.1	859.4	902.5	950.4	993.1	1043
Net Primary Income from Abroad	-4.7	0.29	-2.83	-2.68	1.3	9.12	0.28	5.53	9.36	17.05
Gross National Income (GNI)	637.6	681.6	716.4	759.5	812.4	868.5	902.7	956	1002	1060
Net Current Transf.from Abroad	-0.73	-2.31	-2.65	-1.9	-3.21	-4.79	-4.44	-6.26	-3.43	-6.87
Gross Nat'l Disposable Inc.(GNDI)	636.9	679.3	713.7	757.6	809.2	863.7	898.3	949.7	1003	1053
Gross Saving	89.41	105.4	112.8	118.7	137	151.5	140.1	145.3	153.2	155.6
Consumption of Fixed Capital	83.52	85.16	86.96	89.64	93.53	96.07	99.5	106.1	111.2	114.3
GDP Volume 1995 Ref., Chained	667.8	698.9	719.2	738.1	763.5	785.8	804.7	829.5	847	862.3
GDP Volume (1995=100)	92.9	97.2	100	102.6	106.2	109.3	111.9	115.3	117.8	119.9
GDP Deflator (1995=100)	96.2	97.5	100	103.3	106.2	109.4	112.1	114.6	117.2	121

Source: <http://imfstatistics.org> (you may get a web account for International Financial Statistics in this web page).

- (a) What is the average annual rate of growth of real GDP between 1993 and 2002? What were those rates in 2000, 2001 and 2002?
- (b) What are the big ratios (ratios of consumption, investment, government expenditure, exports and imports for year 2002)? Have they changed over time?
- (c) What might be the possible reasons for slow down of the growth rate of output in 2001 and 2002? What must policymakers have done to correct them?
- (d) What is the inflation rate in year 2000?

2. Study the balance of payment account for the UK economy as given in the next page. Explain each item in this account. Explain what happens to the reserves if the deficit in the current account does not match the surplus in the capital account?

3. How is national income determined in the Keynesian model (provide a graphical analysis).

- (a) What would be the impact of changes in the interest rate in output, consumption and investment?
- (b) What would be the impact of devaluation on net-exports income and consumption?
- (c) Derive goods market equilibrium (IS-curve) and explain what happens to this line if government introduces a tax cut programme.

Balance of Payment Account of the UK (Billion US dollar)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Current Account, n.i.e.	-18	-10.2	-14.3	-13.4	2.85	-7.96	-31.8	-28.7	-17.9	-13
Goods: Exports f.o.b.	183.3	207.2	242.3	261.3	281.5	271.7	268.9	284.4	273.7	278.9
Goods: Imports f.o.b.	-203	-224	-261	-282	-302	-308	-313	-330	-322	-331
Trade Balance	-19.7	-17	-19	-21.2	-20.2	-36.1	-44.3	-45.9	-48.2	-51.8
Services: Credit	62.14	69.54	78.78	87.34	97.72	107.2	113.9	116.8	111.8	125.3
Services: Debit	-52.3	-59.8	-65.4	-72.3	-77.2	-86.3	-94.8	-98.7	-95.5	-102
Balance on Goods & Services	-9.82	-7.18	-5.64	-6.17	0.32	-15.2	-25.2	-27.8	-31.9	-28.5
Income: Credit	109.4	114	138.9	144.5	157.7	171.9	163.2	204.5	205.4	187
Income: Debit	-110	-109	-136	-143	-151	-151	-159	-190	-182	-158
Balance on Gds, Serv. & Inc.	-10.1	-2.08	-2.35	-4.39	6.66	5.68	-21	-13.5	-8.28	0.51
Current Transfers, n.i.e.:										
Credit	18.59	17.71	19.7	29.46	21.44	20.59	22.7	18.66	20.14	17.05
Debit	-26.5	-25.9	-31.6	-38.5	-31	-34.2	-33.5	-33.8	-29.8	-30.6
Capital Account, n.i.e.	0.46	0.05	0.84	1.14	1.32	0.79	1.52	2.76	2.17	1.66
Capital Account, n.i.e.:										
Credit	1.67	1.93	1.84	2.18	2.77	2.44	2.91	4.36	3.92	3.44
Debit	-1.21	-1.88	-0.99	-1.04	-1.45	-1.65	-1.38	-1.6	-1.75	-1.78
Financial Account, n.i.e.	22.68	4.71	7.47	7.98	-12.2	0.23	29.34	25.09	17.41	35.02
Direct Investment Abroad	-27.3	-34.9	-45.3	-34.8	-62.4	-122	-202	-266	-68.2	-36.8
Dir. Invest. in Rep. Econ., n.i.e.	16.52	10.73	21.73	27.39	37.38	74.65	89.53	119.9	62.03	25.43
Portfolio Investment Assets	-134	31.47	-61.7	-93.1	-85	-53	-34.2	-97.7	-124	1.65
Equity Securities	-11.9	-1.47	-13.2	-16.3	7.04	-4.65	-23.8	-28.4	-63.1	7.46
Debt Securities	-122	32.95	-48.6	-76.8	-92	-48.3	-10.4	-69.3	-61.1	-5.81
Portfolio Investment Liab., n.i.e.	43.63	47.01	58.79	67.98	43.46	35.28	185.5	255.1	58.46	91.96
Equity Securities	26.12	7.35	8.07	9.4	7.85	63.09	116	179.2	27.43	16.38
Debt Securities	17.52	39.66	50.72	58.58	35.61	-27.8	69.49	75.94	31.03	75.59
Financial Derivatives Assets										
Financial Derivatives Liabilities	0.37	3.67	2.63	1.52	1.9	-5.07	4.41	2.26	12.18	17.91
Other Investment Assets	-68.5	-42.5	-74.9	-215	-276	-26.8	-94.1	-412	-255	-196
Monetary Authorities										
General Government	-0.71	-0.69	-0.74	-0.53	-0.07	0.25	-1.93	-0.42	0.02	-0.63
Banks	6.48	-72.7	-34.9	-102	-241	-28.4	19.99	-292	-125	-111
Other Sectors	-74.2	30.9	-39.3	-113	-34.8	1.28	-112	-119	-130	-84.3
Other Investment Liab., n.i.e.	191.4	-10.8	106.2	254.4	328.4	97.24	79.7	423.2	332.2	130.8
Monetary Authorities	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
General Government	0.34	0.86	0.59	-1.06	-1.74	0.42	0.54	0	0.2	-1.09
Banks	59.49	76.62	41.95	111.5	243.1	78.16	16.41	308.9	182.4	141.2
Other Sectors	131.6	-88.3	63.68	144	87.09	18.66	62.75	114.3	149.6	-9.26
Net Errors and Omissions	0.27	6.98	5.13	3.66	9.79	6.68	-0.07	6.13	-6.14	-24.3
Overall Balance	5.44	1.5	-0.85	-0.65	-3.9	-0.26	-1.04	5.3	-4.46	-0.63
Reserves and Related Items	-5.44	-1.5	0.85	0.65	3.9	0.26	1.04	-5.3	4.46	0.63
Reserve Assets	-1.26	-1.48	0.9	0.65	3.9	0.26	1.04	-5.3	4.46	0.63
Use of Fund Credit and Loans	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Exceptional Financing	-4.17	-0.02	-0.04	n.a.	n.a.	n.a.	n.a.	0	n.a.	n.a.

 Source: <http://imfstatistics.org>

4. Consider a simple Keynesian model as following:

National income identity: $Y = C + I + G + X - M$

Consumption function: $C = 100 + 0.8(Y - T)$

Where Y is national income, C consumption, I investment, G government spending, X exports, M imports and T lump sum tax. Here Y and C are endogenous variables and I, G, X and M are exogenous variables. Assume that $I = 100$, $T = 100$; $G = 100$. Also consider that the trade is balanced, exports equal imports, $X = M$.

- (a) What is the equilibrium national income in this model? What is the size of government budget multiplier or investment multiplier?
- (d) What is the multiplier effect of a 10 percent increase in government spending, holding the amount of tax as constant at 100?
- (b) What would happen to equilibrium income and consumption in (a) above if both tax and government spending increase at the same rate?
- (c) Now consider a simple dynamic version of the above model as:

$$Y_t = C_t + I_t + G_t + X_t - M_t$$

$$C_t = 100 + 0.8(Y_{t-1} - T_{t-1})$$

assume the initial income to be 500, that is $Y_0 = 500$ and the tax revenue to be

$T_t = G_t = 100$ and $X_t = M_t$. Show how income and consumption change over time?

What would happen in this model if investment changes occur according the acceleration principle as: $I_t = 100 + 0.3(Y_{t-1} - Y_{t-2})$ or $I_t = 100 + 0.8(Y_{t-1} - Y_{t-2})$?

6. Propose a simple macroeconomic model that could be applied to evaluate monetary, fiscal and trade policy of an economy. Use this model to analyse following key policy issues:

- Impact of cut in the interest in output
- Impact of income tax cuts on output, consumption and saving
- Impact of reduction in government spending on employment
- Impact of devaluation on trade balance
- Increase in foreign assets on money supply
- Impact of an increase in money supply in output and employment

5. Is marginal propensity to consume higher in developed or developing countries?

Problem 2
IS-LM and AS-AD Model

National Income and the Role of Fiscal and Monetary Policy in a Keynesian Model

1. Assume that you are preparing strategic macro policy guidelines for a finance minister in a crisis-hit economy. In order to convince the minister to adopt a new policy you want to use aggregate demand and aggregate supply analysis based on goods and money market equilibrium in an open economy framework.
 - a) Show briefly how you would derive the aggregate demand curve that represents a short run macroeconomic equilibrium in the goods and money markets.
 - b) An aggregate supply curve shows the combination of prices and output in an economy in the short run. Explain how you may use Okun's law and the Phillip's curve to derive an aggregate supply curve for the entire economy.
 - c) Show how you could use the aggregate demand and aggregate supply curves derived in (a) and (b) to evaluate
 - (i) potential impacts of an adverse demand shock on the price level, employment and output associated with a fall in the volume of net exports.
 - (ii) Impacts of supply shock such as the breakdown of electricity or computing networks or the natural disasters such as floods or soil erosion.
 - d) Suppose that the Finance Minister is keen to propose an additional tax on fuel consumption by private individuals and business firms in order to raise revenue collections. For his reassurances he is interested to know the potential adverse impact of the additional fuel taxes on the aggregate supply. In order to satisfy members of the opposition parties in the parliament, the Minister wants to argue that addition revenue collected from higher taxes on fuel consumption will be used to improve the information technology that improves efficiency in production. Reduction in costs from such productive investment may more than over compensate for any adverse effects of increased costs due to higher taxes. However, opposition members are not entirely convinced of the minister's argument. They think economy will eventually slow down when new taxes come into effect. Highlight equilibrium points in aggregate demand and aggregate supply diagrams which the Minister is claiming to be true and which the members of the opposition parties believe will eventually happen.

2. You are asked to evaluate impacts of expansionary fiscal and monetary policies that a government is proposing in the parliament. From the training of macroeconomics you are considering a Keynesian macroeconomic model as following.

Goods-market

$$\text{Consumption demand} \quad C = 200 + 0.8(Y - T) \quad (1)$$

$$\text{Investment function:} \quad I = 100 - 200r \quad (2)$$

$$\text{Imports:} \quad Z = 0.2Y \quad (3)$$

$$\text{Exogenous variables} \quad T = 100 \quad G = 100 \quad \text{and} \quad X = 100 \quad (4)$$

$$\text{National income identity:} \quad Y = C + I + G + X - Z \quad (5)$$

Money market

$$\text{Demand for money:} \quad \frac{M}{P} = 0.5Y - 1000r \quad (6)$$

$$\text{Supply of money:} \quad M = 400 \quad ; \quad \text{price is constant at } 1. \quad (7)$$

where Y is output, C is consumption, T is tax rate, I is investment, r in the interest rate, Z is imports, G is government spending, X is exports, M is money supply, P is the price level.

- Find one single equation to represent the goods market equilibrium (IS curve) using the equations (1)-(5). Represent that equation in a correctly labelled diagram. Explain why points below and above this curve represent disequilibrium positions for this economy. If the interest rate is exogenously fixed at 5 percent ($r = 0.05$) what would be the values of consumption, investment, imports, trade and budget gaps in this economy consistent with the goods market equilibrium?
- Use money market equations (6) and (7) to determine the combination of output and the interest rates that are consistent with equilibrium in the money market. Represent your equation in the diagram and explain why only the points along this line represent equilibrium in the money market.
- Find the level of output and the interest rate that are consistent with equilibrium in both goods and money markets simultaneously. Represent this economy wide equilibrium with appropriate diagrams. Explain why the economy returns to this equilibrium if it is away from it, i.e. explain all other points in the diagram are away from this unique equilibrium using excess demand and excess supply concepts in the goods and money markets.
- Now relax the assumption that prices are constant. Instead consider three possible prices 1, 2 and 4. Derive aggregate demand (output) using this information. Show your results in a diagram.
- What sort of supply curve is assumed in this model? Is this relevant or not?

3. Employers and employees are involved in the production process. Assume that the labour is the only input in production. Prices charged by a firms (P) for a product include mark up θ over the labour cost (W) as given by :

$$P_t = (1 + \theta)W_t \quad (1)$$

Unions (or workers) also charge a mark-up γ over the expected price while negotiating the wage rate from the employer.

$$W_t = (1 + \gamma)P_t^e \quad (2)$$

(i) How does wage-price spiral occur in this model?

(ii) Derive an equation for actual inflation in terms of expected inflation and the mark ups by firms and unions.

These mark ups are normally higher in the boom periods and lower in the slump. This is reflected by the equation below.

$$\theta + \gamma = a(y - \bar{y}) = -b(u - \bar{u}) \quad (3)$$

Where the term $\theta + \gamma$ are the sum of the mark ups charged by the unions and firms, y is the actual output and \bar{y} is the trend output, thus the term $(y - \bar{y})$ reflects the deviation of output from the trend, $(u - \bar{u})$ reflects how the actual unemployment rate differs from the natural rate of unemployment. The parameters a and b are positive. Derive the expectation augmented Phillips curve using the above information.

- (iii) Derive the aggregate supply curve using above information and show the relation between the natural rate of output and inflation (AS curve) for this economy.
- (iv) How does the actual unemployment rate relate to the natural rate of unemployment in (iii) above?

Problem 3
Economic Growth

1. Economic growth is analysed in terms of rate of change in the output per year
 - a. What are the major variables that determine economic growth in an economy?
 - b. What are the stylised facts of economic growth?
 - c. Show per capita output relates to per capita capital stock, per capita investment and saving in the Solow model. Use diagrams and equations.
 - d. How does an economy reach to a steady state and what are the properties of the steady state?
 - e. Compare the per capita output and capital stock at the golden rule and the steady state.
 - f. How does Solow model explain the differences in the rates of economic growth across the countries in a global economy?
 - g. Why does a higher rate of saving lead to only to a higher level of output not to the higher rate of growth of output in a standard Solow model?
 - h. Show how adding human capital in the Solow model would make the accumulation capital still relevant in raising the rate of economic growth?
 - i. Show how unbounded growth is possible if an economy has an AK type production technology?
 - j. Which one of these above models are more appealing to you and why?

2. Ten new countries from the Eastern Europe are joining the European Union (EU) from the next year. The average per capita income in these new member countries is roughly one third of that in the existing 15 members of the EU. The average annual growth rate of per capita income in those ten Eastern European countries is around 5 percent in contrast to an average growth rate of 2 percent among the existing 15 members which permitted ten new members in their club in their December 2002 Summit. As a result of increased integration with the prosperous nations the new members expect to raise their own level of per capita income after joining the EU.
 - (a) If those growth rates of per capita income continue in coming years how many years will it take for the new members to catch up with other EU members in per capita income?
 - (b) Entry into the European union will reduce the technological gap because of improved flexibility in the mobility of labour and capital. If we assume that such improved technological transfers raises the growth rates in the new member states on average by 2 percent, how long will then take them to catch up with the rest of the EU?

3. An economy has a production function of the following form $Y = AK^\alpha L^\beta H^\gamma$. How much will be the contribution of technological progress in the growth rate of output in the economy if output (Y) is growing by 5 percent, physical capital (K) is growing at 3 percent, both human capital (H) and the labour force (L) grow by 2 percent, and $\alpha = 0.25$, $\beta = 0.6$ and $\gamma = 0.15$?

4. Will the disparity of income between the richest and the poorest countries decrease, remain the same or increase in the next 100 years? Analyse this issue using knowledge of growth theory and the experiences of various economies around the globe.
5. How fast the poorest country that has about 5 percent of the per capita income of the richest country should grow to catch up in per capita income with the richest country in 50 years' time?

Solow's Model of Economic Growth

6. Consider an economy using a simple version of the Solow Model

Production function with capital and labour as its inputs: $Y_t = A_t K_t^\alpha L_t^\beta$

Market clearing: $Y_t = C_t + I_t$ Saving $S_t = sY_t$

Investment requirement: $I_t = (n + \delta)K_t$ Saving investment identity: $S_t = I_t$

Capital accumulation: $K_t = (1 - \delta)K_{t-1} + I_t$

where Y = output, A = technology, L = Labour input, K = Capital input; α share of capital in output; β share of labour in output, s is the saving rate, I is the investment requirement, n is the population growth rate, (δ) is the depreciation rate. Assume that $\alpha + \beta = 1$. Drop the time subscripts for simplicity.

- (a) Write the production function in intensive form. For simplicity assume $A=1$ for this sub-question. Represent the above model using appropriate diagrams.
- (b) Find the steady state value of per capita capital and per capita output in terms of the rate of saving (s), the rate of depreciation (δ) and the rate of population growth (n).
- (c) What will be the value of per capita capital and per-capita output if the savings rate was 32%, the depreciation rate was 8%, the population was growing at 2% per annum and $\alpha = 0.3$?
- (d) If the technology grows by 2 percent per year what will be the growth rate of per capita output in the steady state?
- (e) Now assume that the computer hackers, terrorists or any other natural disaster destroys computing system and other infrastructure. The effective capital stock is virtually reduced to half of its previous stock. How does this affect the steady state obtained in (c) above?
- (f) Global warming causes floods that contaminates all food stocks and brings wide spread diseases. Many people die. As a result the labour force reduces by one quarter. How does this affect the income and capital stock in the steady state? Assume β to be 0.7 as above.
- (g) Show how the growth rate in output can be decomposed into the growth rate of technology, and the growth rates of labour and capital inputs. Also show how the growth rate of per capita income only depends on technical progress but not in the saving rate on the balanced growth path for this economy. What prevents a higher saving rate from leading to a higher growth rate in the model?
- (h) What is the golden rule of savings and consumption in the Solow model? How does it differ from the steady state?

7. Consider Key equations of a growth model with endogenous technical progress as in Jones (2002):

$$\begin{aligned}
 \text{Output:} & & Y &= K^\alpha (AL_Y)^\beta \\
 \text{Labour use:} & & L &= L_y + L_A \\
 \text{Change in the stock of knowledge:} & & \dot{A} &= \bar{\delta} L_A^\lambda = \delta A^\phi L_A^\lambda \\
 \text{Growth rate of knowledge:} & & g_A &= \frac{\dot{A}}{A} = \frac{\delta A^\phi L_A^\lambda}{A} \\
 \text{Saving:} & & S &= sY \\
 \text{Saving investment identity:} & & S &= I \\
 \text{Capital Accumulation:} & & K_t &= K_{t-1}(1 - \delta) + I_t \\
 \text{Market clearing:} & & Y &= C + I
 \end{aligned}$$

where Y = output, A = technology, L = Labour input, K = Capital input ; α share of capital in output ; β share of labour in output, s is the saving rate, I is the investment requirement, n is the population growth rate, δ is the depreciation rate, λ denotes is productivity of people in producing knowledge and ϕ shows how the stock of knowledge increases.

Answer following questions using appropriate diagrams and/or equations.

- (a) How does the productivity of capital differ in an endogenous growth model from that in the Solow growth model? What is its implication for the per capita output in the steady state?
- (b) Contrast how a higher rate of population growth limits the level of output in the steady state in an exogenous growth model but not in an endogenous growth model. Which one of these two growth models is more applicable in your opinion?
- (c) What is the meaning of σ and β convergence in the process of economic growth? What determines whether a low income country can catch up a high income country in per capita income over time or remains in the poverty trap?
- (d) Analyse why the market produces too little research to add to the stock of technical knowledge useful for production. Justify why a government should provide patents, trademarks, design or copyrights or subsidies to researchers in order to generate more technical knowledge required for a higher rate of economic growth.

7. Show how the efficiency of the financial system can promote growth rate in an economy.

8. Depletion of non-renewable natural resources has been growth-dragging factors in many developing economies (Jones (2002)). Take a production function with energy as one of the inputs

$$Y = AK^\alpha E^\gamma L^\beta$$

Initial stock of energy is R_0 . Stock of non-renewable energy at time t is $R(t)$ and is subject of a radio active decay $R(t) = R_0 e^{-s_e t}$. Energy use per time is fixed share of existing stock $E = s_e R$.

Show how the higher the rate of exploitation of non-renewable resources relative to the technological growth rate lowers the growth rate of per capita output in the steady state?

9. Modify the production function used in the previous tutorial by including human capital as following: $Y = AK^\alpha L^\beta H^\gamma$ where Y = output, A = technology, L = Labour input, K = physical capital, H = human capital and $0 < \alpha < 1$, $0 < \beta < 1$ and $0 < \gamma < 1$; assume that $\alpha + \beta + \gamma = 1$. Show how the growth rate of output can be decomposed into the growth rate of technology and the growth rates of labour, capital and human capital inputs in this case. Also show that a higher saving rate can generate a higher growth rate of output in the balanced growth path if one considers the complementarity between human can physical capital as in the human capital augmented Solow model. Which of these elements are more important for the higher growth rate of your country.

10. One stylised fact according to Robert Lucas is that both skilled and unskilled labour tends migrate from a low-income countries to high-income countries. Suppose country-1 represents high-income economies and country-2 represents low income economies. Country-1 has more capital stock than that in country-2. Again take a generic production function $Y_i = A_i K_i^\alpha L_i^\beta$. Consider three possible sets of parameters α and β as following:

- I. $\alpha + \beta = 1$ and $0 < \alpha < 1$ and $0 < \beta < 1$;
- II. $\alpha > 1$ and $0 < \beta < 1$
- III. $0 < \alpha < 1$ and $\beta > 1$

What would happen to stock of capital, labour, interest rate, real wage rate and output across these two countries if

(a) capital is mobile but labour is not (b) labour is mobile but capital is not.

Demonstrate results using diagrams and equations.

11. Many developing economies experience low growth rate because of the depletion of natural resources (land) and in (Jones (2002)) Consider a production function with technology, capital, labour and land inputs as:

$$Y = AK^\alpha N^\gamma L^\beta$$

where A = technology, N = land resource L = labour force.

Show how the growth rate of output is given by the difference between the rate of technical progress and the Malthusian type encroachment into the limited land resources due to higher population growth rate in this model. Is this model applicable to explain low growth rate in many sub-Saharan African economies?

Problem 4
Fiscal policy

1. Fiscal policy can be used to regulate the economy.
 - a) What are the major objectives of the fiscal policy?
 - b) What combinations of fiscal instruments are sustainable in the long run?
 - c) How can a huge budget deficit lead to higher inflation and imbalance in trade account?
 - d) What are the major ways of stabilising the public debt?
 - e) What is the golden rule of fiscal policy as proposed by the treasury in the UK?

2. Fiscal policy mainly involves raising revenue through taxes and spending it to provide public goods and services. Both the revenue and spending policies could also be used to stabilise the economy.
 - (a) How high should the effective tax rate in an economy be if the purpose of taxes is to maximise the public revenue? Use a diagram or equations like $R = 100t - 5t^2$ (you may assume that the revenue to be raised is 400) to illustrate this point. Use your answer here to discuss what kind of tax policy would be appropriate to promote economic growth rate in the long run.
 - (b) How can a government use counter-cyclical budgetary policy to stabilise the economy? What are the difficulties that this government might have to face in maintaining a cyclically balanced budget?
 - (c) A government can finance its deficit by borrowing from the private sector. Analyse the potential impact of such borrowing on the output, interest rate, saving and investment activities in the economy.
 - (d) If necessary, a government can finance the deficit by borrowing from the central bank. How does such borrowing affect the growth rate of money supply in the economy? What would the optimal rate of money supply be if the objective of the government is to maximise the revenue from the inflationary tax for the inflation rate and demand for real money balances are as given in the following table? Assume that in steady state inflation rate equals the growth rate of money supply.

Inflation rate, real balances and seigniorage (revenue from inflation tax)

π	0%	1%	2%	5%	10%	20%	25%	50%
Real balances (M/P)	1000	905	819	607	368	135	82	7
Revenue from inflation tax								

- (e) What is sustainable debt?
- (f) Does it matter whether the government finances its deficit by raising extra taxes or by borrowing from the private sector? Use Ricardian equivalence theorem to analyse this issue.

3. Consider a simple Keynesian model as presented in tutorial 1:

National income identity: $Y = C + I + G + X - M$

Consumption function: $C = 100 + 0.8(Y - T)$

Where Y is national income, C consumption, I investment, G government spending, X exports, M imports and T lump sum tax. Here Y and C are endogenous variables and I, G, X and M are exogenous variables. Assume that $I = 100$, $T = 100$; $G = 100$. Also consider that the trade is balanced, exports equal imports, $X = M$.

- What is the meaning of balance budget multiplier in this economy?
- Now suppose that the tax rates are proportional to income as $T = tY$, where the t is the tax rate, $0 < t < 1$. How would the multiplier in this case?
- Why is this called a automatic stabiliser for an economy?
- G remains fixed. Represent how the budget deficit or surplus arise when the output is below or above its natural rate in a diagram.

4. Consider the preferences, endowments and budget constraints and government policy for an economy as given by following equations.

Preference of households: $U(C_1, C_2) = \ln C_1 + \beta \ln C_2$

Endowments: $\{w_1, w_2\}$

Government policy: $\{G_1, G_2, \tau_1, \tau_2, B\}$

Budget constraint for households (in real terms)

Period 1: $C_1 + b \leq w_1 - \tau_1$

Period 2: $C_2 \leq w_2 - \tau_2 - b(1+r)$

The budget constraint of the government sector will be:

Period 1: $G_1 + B \leq N\tau_1$

Period 2: $G_2 \leq B(1+r) + N\tau_2$

where C_1 and C_2 are consumption in period 1 and period 2; G_1 and G_2 are government expenditure in period 1 and period 2; w_1 and w_2 are endowments in period 1 and period 2; τ_1 and τ_2 are tax collection in period 1 and period 2 and B is the borrowing by government in period 1. The economy is inhabited by N identical agents.

- Form the inter-temporal budget constraint for the household and the government for this economy.
- Represent the pre and post-tax budget constraints of the representative household in a diagram along with its preferences. Determine the optimal choice of consumption for both period 1 and 2.
- Illustrate the Ricardian equivalence theorem (RET) considering (i) tax only and (ii) borrowing now and taxing later strategies of the government.

Contrast the Ricardian Equivalence Theorem to the standard Keynesian automatic stabiliser analysis of fiscal policy during expansionary or contractionary phases of the business cycle in an economy.

Problem 5
Money supply and Monetary policy

- 1 Monetary policy has a role in regulating the financial markets.
 - a) How can monetary policy be used to regulate the financial markets?
 - b) How does the total supply of money relate to the reserve requirements?
 - c) Show how the price level depends upon current and expected money supply in the future.
 - d) What is the difference between Keynesian and rational expectation hypotheses on the role of monetary policy in regulating the economy?

2. The Monetary Policy Committee of the Bank of England, the Federal Reserve in the United States, the European Central Bank for the European Union meet regularly to decide on the monetary policy in their respective constituencies. Governments of many developing countries also entrust their central banks to advise on timely monetary policy issues.
 - a) Using one or more of these examples outline the major short-run and long run objectives that monetary authorities like to achieve by implementing a prudent monetary policy. How do they proceed in case of a conflict between alternative policy objectives?
 - b) Propose a very simple macro economic model to analyse the short run impact of a monetary policy on output and employment in the open economy framework.
 - c) What sort of monetary policy is good in the absence of a recession or overheating? What type of monetary policy do you recommend to fight against a recession and what type if you notice that economy is overheating?
 - d) If a certain monetary authority decides to reduce the interest rate in order to expand aggregate demand, how might it implement its decisions? What will happen if the economy is committed to a fixed exchange rate regime?

3. A central bank operates its monetary policy through open market operations. It changes the discount rate (base interest rate) at which commercial banks and other financial institutions can borrow from the central bank if their deposits are not enough to satisfy demand for loans.

(a) Discuss the transmission mechanism, explaining how a change in the interest rate affects the income, output, employment, price level and exchange rates in an economy. What do monetarists, such as Milton Friedman, regard as the strengths and weaknesses of a monetary policy like this?

(b) Consider a simple model for the interest rate policy rule which includes the following three equations

Output gap:
$$y_t - y^* = d(i_{t-1} - i_t^*) \quad (1)$$

Supply function:
$$\pi_t = \pi_t^* + c(y_{t-1} - y_{t-1}^*) \quad (2)$$

Interest rate rule:
$$i_t = i_t^* + a(y_t - y_t^*) + b(\pi_t - \pi_t^*) \quad (3)$$

where $(y_t - y^*)$ is the current output gap, $(i_{t-1} - i_t^*)$ the deviation of the interest rate one period earlier from the target interest rate of the monetary authority, y_t and y_t^* are the actual and natural level of output, i_t is the actual rate of interest in period t , i_t^* is the interest target of the monetary authority. π_t and π_t^* are actual and target inflation rates. How can such a rule be implemented by the monetary authority? How does such a rule help to stabilise the economy?

(c) Why has inflation targeting and central bank independence been more popular among the policy makers in recent years, when a money supply rule or exchange rate targeting has been popular in the past?

(d) What sort of monetary policy do the International Monetary Fund and the World Bank suggest for an economy which has experienced both budgetary and trade deficits? What sort of the exchange rate regime is necessary for monetary policy to be effective?

Problem 6

Labour Market and Phillips' Curve

1. On some issues on the labour market and unemployment.
 - a. Show how minimum wage regulations result in a higher rate of unemployment.
 - b. In the steady state how does the equilibrium unemployment rate relate to job separation and job finding rates?
 - c. Unemployment rates are higher in countries with more generous benefit programmes. Give an economic reason for such a phenomenon.
 - d. The impact of economic growth on additional employment depends upon the employment elasticity of output and elasticity of labour supply. Comment.
2. An economy is experiencing a relatively high inflation, which is reported to be 11 percent per year. It is creating uncertainty and is signalling towards a serious macroeconomic instability if it remains unchecked. Government is keen to bring a programme to assure macroeconomic stability by reducing inflation at 2% annual rate until it comes down to 3% annual rate. Once inflation reaches 3% annual rate the government would like to stabilise it at 3% rate for all following years. The current unemployment rate is at 6 percent per year. Econometric estimates suggest that this is also the natural rate of unemployment, u_n for this economy. Productivity is growing by 2% annually and labour force is growing at 1% per year. The basic economic relations between unemployment rate, inflation and growth rates of output and money supply that describe this economy are given by the following set of equations.

$$\begin{aligned}
 u_t - u_{t-1} &= -0.4(g_{yt} - \bar{g}_{yt}) && \text{Okun's law} \\
 \pi_t - \pi_{t-1} &= -(u_t - u_n) && \text{Phillips curve} \\
 g_{yt} &= g_{mt} - \pi_t && \text{aggregate demand}
 \end{aligned}$$

where g_{yt} is an actual growth rate of output, \bar{g}_{yt} is a trend growth rate of output, u_t is unemployment rate in period t , π_t is inflation in period t , g_{mt} is growth rate of money supply in period t .

- a. Provide a brief graphical illustration on how inflation, unemployment rate and growth rates of output and money supply are related to each other in this economy in the short run and in the medium run.
- b. From the information given above find the inflation rate before one year, π_{t-1} . Also find the growth rates of output and money supply given this inflation for the current year (the benchmark year of the inflation reduction programme). How far was the inflation last year away from the target inflation of 3%?
- c. Calculate u_t , g_{yt} , π_t and g_{mt} for all following years until the economy reaches 3% inflation rate if government is strict in its policy of reducing inflation by 2% annually. What are the values of u_t , g_{yt} , π_t and g_{mt} when the economy becomes stabilised after a successful implementation of the inflation reduction programme. What is the growth rate of money supply consistent with the target inflation and the trend growth rate of output in the long run?
- d. What is the meaning of sacrifice ratio in macroeconomics? What is its value for different years of the inflation reduction programme in (c)?

- e. Justify the required path of money growth in the inflation reduction programme that you have outlined in (c).
3. (12.12.T) A Phillips curve is represented by the following relationship:

$$\pi - \bar{\pi} = -10(U - \bar{U}) + s$$
 where s is a supply shock term.
- (a) Draw the curve when $\bar{\pi} = 4\%$ and $\bar{U} = 7\%$; when core inflation rises to 6%.
- (b) A reform reduces equilibrium unemployment to 5%. Explain the effect on inflation and unemployment in the short term, and then in the long term.
- (c) Okun's law is given by: $(U - \bar{U}) = -\frac{(Y - \bar{Y})}{10,000}$. Write down and draw the AS curve for the same values as (a); for $\bar{Y} = 10,000$.
4. Should increased pay come from modernisation or by a rise in the wage rates? Discuss this issue using the macroeconomic theory.

Problem 7

Exchange rate policy

1. The health of an economy is indicated by the degrees of investment and saving gaps, revenue and expenditure gaps and import and exports gaps.
 - a) Use the national income identity to show the accounting relationship between these three aggregate imbalances in the economy.
 - b) Assuming a given level of national savings show how changes in the interest rate could create a surplus or deficit in the current account.
 - c) Show how your answer in (b) changes due to an expansion in government spending financed through a rise in the tax rates.
 - d) How could real exchange rate policies be used to correct current account imbalances? How may a change in public spending policy lead inflows and outflows in of the capital?
 - e) Do you recommend a floating or flexible exchange rate regime? Provide arguments based on economic theory and empirical facts.
 - f) The basic haircut in India costs 35 Rupees. It costs £5 in the UK. You can buy 70 Rupees per Sterling Pound in the foreign exchange market. What is the real exchange rate between Indian Rupees and the Sterling Pound based on this information?

2. Consider an open economy described by the following equations as in Mankiw(2002):

Consumption function: $C = 25 + 0.75(Y - T)$

Investment function: $I = 100 - 5i$

Exogenous government spending: $G = 100$

Lump sum taxes: $T = 100$

Income: $Y = 500$

Net exports: $NX = 50 - 50\epsilon$

Financial integration line: $i = i^* = 1$

National income identity: $Y = C + I + G + NX$

Where C is consumption, Y output, T lump sum tax, I investment, G government spending, NX net exports ϵ exchange rate, i domestic interest rate and i^* is the foreign interest rate. Price level is assumed constant.

- a. What are the national saving, investment, the trade balance, and the equilibrium exchange rate in this economy?
- b. What will be the equilibrium national saving, investment, the trade balance, and the equilibrium exchange rate if G rises to 125.
- c. What will be the equilibrium national saving, investment, the trade balance, and the equilibrium exchange rate (with $G = 100$) if the world interest rate rises (i) to 5 and (ii) to 10?
- d. Present above results on investment, saving and net exports in an investment saving diagram in (i and I/S space) for interest rates 1, 5 and 10. Indicate the amount of trade surplus or deficit in that diagram.
- e. How can trade be an engine of growth? Discuss with some attention to negotiations at the WTO and regional trade arrangements such as NAFTA, EU, ASIAN and APECS.
- f. When should a country devalue its currency? Discuss this point in light of the monetary and the purchasing power parity theory of exchange rates determination.

What are the mechanism that assures realignment between real and nominal exchange rates in an economy.

- g. How can the exchange rate overshoot its long run equilibrium value? Discuss.

3. Answer the following in the context of an open economy:

- Surpluses or deficits in the current account should be met by outflow or inflow of capital stock. Illustrate this point using the fundamental identity for an economy and a diagram in interest rate and saving/investment space, ($i, S/I$).
- Analyse how the nominal exchange rate is determined in foreign exchange markets using purchasing power parity, uncovered interest parity and the demand for and supply of foreign exchange under the floating exchange rate system.
- Analyse the impact of fiscal policy on output and employment under the fixed and flexible exchange rate system.
- In light of your answers to (a) to (c) above examine whether the UK should adopt the Euro or not if the long run objectives are to increase output and generate more employment in the UK.

4. Consider a standard Keynesian macroeconomic model for an open economy

$$\text{National income identity: } Y = C(Y - T) + I(i - \pi) + G + NX(Y, Y^f, \lambda) \quad (1)$$

$$\text{Consumption: } C = 200 + 0.8(Y - T) \quad (2)$$

$$\text{Investment: } I = 50 - 20(i - \pi) \quad (3)$$

$$\text{Tax and spending: } T = 100 \quad G = 100 \quad (4)$$

$$\text{Net exports: } NX = -10 + 0.3Y^f + 0.1Y + 20\lambda \quad (5)$$

$$\text{Real exchange rate: } \lambda = \frac{EP^*}{P} \quad (6)$$

$$\text{Money Demand: } \frac{M}{P} = 200 - 50i + 0.5Y \quad (7)$$

$$\text{Financial integration condition: } i = i^* = 5 \quad (9)$$

where Y is output, C consumption, I investment, G government spending, NX net exports, T tax revenue, i nominal interest rate, π rate of inflation, Y^f foreign income, E nominal exchange rate, λ real exchange rate P^* foreign price level and P domestic price.

- What will be the value of national income (Y), consumption (C), net exports (NX), net national saving ($S-I$) in this model if foreign income (Y^f) is 500, foreign price level (P^*) is 2, nominal exchange rate (E) equals 1 and the inflation rate is 2. Show whether your solutions satisfy the national income identity as given by equation (1).
- How will be the new values of national income (Y), consumption (C), net exports (NX), net national saving ($S-I$) if the foreign income (Y^f) rises to 1000 and foreign price (P^*) reduces to 1?

Problem 8

Financial Market

Fisher equation

1. What is the relation between the real and nominal interest rate according to the Fisher equation? If the gross nominal return next year on P amount invested today is $(1+i)P_t$ and expected price next period is $P_{t+1}^e = (1+\pi^e)P_t$ then show that the gross real interest is given by $1+r = \frac{1+i}{1+\pi^e}$ or $r \approx i - \pi^e$. Illustrate how this approximation is valid for lower rates of inflation and interest rates $(r, \pi^e) \approx (0.04, 0.02)$ (as in the UK and Western countries in recent years) but not for trouble prone countries with $(r, \pi^e) \approx (0.84, 0.56)$ (as in Turkey or Zimbabwe in recent years)?

Value of bonds

What is the value of a console that pays 100 forever at the interest rates of (a) 5 percent and (b) 1 percent?

What is the yield to maturity of a £100 bond maturing in two periods if this bond is selling at 90 ($P_{2t}^B = 90$) in the market?

Show how the long run interest rate is approximated by the short term interest rates in the financial markets?

You borrow 20,000 from a bank today promising to pay back the principle in 12 instalments and the interest rate accrued for that month. The bank lends at APR of 8.9 percent. What is the amount of instalment for the seventh month?

Value of stocks

Derive the value of stock from the discounted values of expected stream of dividend payments and resale value of stock in the financial market? What will be the value of stock of a company that promises to pay 1000 every year if the growth rate of dividend is 3 percent, market interest rate is 5 percent and the risk premium on this stock equal 2 percent?

Role of financial sector in the economy

How is the efficiency of financial markets affected with a higher transaction costs of funds charged by the financial intermediaries in the market? How does it affect the steady state of an economy in the Solow model if θ amount is wasted away in the intermediation process?

What are the conditions on the inter temporal budget of households, firms, government and the economy as a whole for a sound financial system?

Problem 9

Macroeconomic Policy Problem

Main stay of a developing economy of Utopia is agricultural products, minerals and natural resources. From the Economic Survey of the Finance Ministry and other major statistical bulletins one can characterise current macroeconomic situation as following. Economic growth rate in Utopia has not been very impressive, it has varies between -3 and 6 percent during last 15 years. Average annual growth rate remained 2 percent during this period, and the amount of GDP in Uti (Currency of Utopia) was $Uti300$ billion in 1999. Population was 50 million in 1999 and has been growing by 2.5 percent annually in the last 15 years. The average and incremental capital output ratio was about $3:1$ and gross investment was 10 percent of the capital stock.

The Revenue and expenditure of the Utopia government were about 30 percent and 35 percents of the GDP respectively. Money supply was growing at the rate of 14 percent annually in last ten years and increase in the GDP deflator remained around 9 percent in comparison to a 4 percent in the global economy. It is a relatively open economy. It exports main agricultural products and imports machinery and construction materials. In 1999 exports and imports were about 25 percent and 35 percents of GDP respectively. The deficit in the current account is met by inflow of capital in the form of foreign aid and direct foreign investment. There have been a successive devaluation of Uti in last 10 years. Its exchange rate with the US dollars was $Uti2 = \$1$ in 1990 and has changed to $Uti20 = \$1$ in 1999.

The Utopia government is keen to promote the growth rate of the economy and bring a policy that guarantees internal and external stability. The government is negotiating a policy reform package in co-operation with the IMF and the World Bank.

- a) Using fundamental identity of the national income accounting find out what is the gap between savings and investment in the Utopia economy. What was the level of investment for 1999? What proportion of GDP constitutes its private consumption?
- b) Agriculture sector that dominates Utopia economy is very sensitive to the weather conditions as well as international market prices of agricultural products. Utopia economy is subject to shocks in both aggregate demands and aggregate supply sides. What sort of fiscal, monetary and trade policy should it choose if a bad weather hits this economy? What sorts policies would you suggest if both weather and market conditions are very positive for the economy (please label your diagrams and equations carefully)?
- c) Why were successive devaluation of Uti not enough to promote exports and spur the growth rate in Utopia? Illustrate your points with a theory of growth and devaluation.
- d) What sort of a growth model could be used to frame up a growth strategy for this economy?

Policy Game between public and private Sector

1. If the loss function of the monetary policy committee is given by $L(u, \pi) = u + \gamma\pi^2$, where u is unemployment and π is inflation. Suppose that the Phillips curve describes the relation between the unemployment rate and inflation. With u^n to be natural rate of unemployment and π^e the expected rate of inflation the trade off between inflation and unemployment is given by $u = u^n - \alpha(\pi - \pi^e)$.
 - (a) What will be the unemployment rate if the monetary authority operates under a fixed rule regime?
 - (b) Under discretionary policy private agents first form expectations about inflation π^e , monetary authority set actual inflation afterwards by minimising its loss function. What will be the unemployment rate if people are rational about their expected inflation π^e ?
 - (c) Based on your answers to (a) and (b) which one the policy rules would you choose?

2. Suppose you are writing a policy memo about an economy which had inflation of 3% and the unemployment rate equal to the natural rate during the last year. The Phillips curve took the following form $\pi_t = \pi_{t-1} - \alpha(u_t - u_n)$. If this government can use either monetary or fiscal policy or both to achieve the desired unemployment what inflation and unemployment rate should it try to achieve? How would your memo change if the Phillips curve is given by $\pi_t = \pi_t^e - \alpha(u_t - u_n)$ and there is evidence that people form a rational expectation from the government policy.

3. Explain how a dynamic inconsistency may arise when policy makers prefer low unemployment rate rather than low inflation rate and public prefers low inflation rate rather than low unemployment rate using the following pay-off matrix of inflationary expectation (refer to pp. 421-423 of Miles and Scott).

	Private Sector													
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H	-3,0	3,-3												
L	-5,-3	0,0												

4. Policy makers like stabilise the economy by managing aggregate demand and letting the economy grow at its natural rate as far as possible. Let their objective function take the following form

$$S(\pi) = b(y - y^*) - a\pi^2 \quad (1)$$

where y is actual output y^* is the natural level of output and $(y - y^*)$ is the output gap and π is the actual inflation rate. Further suppose a simple aggregate supply function of the following form in which that output responds to higher level of inflation as below

$$y = y^* + c(\pi - E(\pi)) \quad (2)$$

Given the is inflationary expectation of people, $E(\pi)$, policy makers may choose inflation π either using a discretionary policy or by committing themselves to a policy rule (by fixing a target rate of inflation).

- (a) Using both of above equations calculate the optimal inflation rate under the discretionary policy regime.

- (b) If policy makers were committed to a target rate of inflation and people knew that they would stick to that target (such as 2% rate by the ECB and 2.5 rate by the MPC of Bank of England) what would be the optimal rate of inflation?
- (c) Which one of the above regimes is Pareto efficient outcome?

Economic Policy Coordination problem

4. Both the monetary and fiscal authorities would like to achieve internal and external stability in the economy. Fiscal authorities prefer budget surplus or deficit and monetary authorities prefer the interest rate as the policy instrument. Analyse how it is impossible to achieve the macroeconomic stability without matching number of instruments and targets using nicely labelled diagrams.
5. Country 1 and country 2 are interdependent economies. Analyse the impact of expansionary fiscal and monetary policies of country 1 in output, interest rate and foreign asset reserves of both countries using two country Mundell-Fleming model under the fixed exchange rate system when the capital is perfectly mobile and when it is immobile. Justify your answer.

Or

Country 1 and country 2 are interdependent economies. Analyse the impact of expansionary fiscal and monetary policies of country 1 in output, interest rate and foreign asset reserves of both countries using two country Mundell-Fleming model under the flexible exchange rate system when the capital is perfectly mobile and when it is immobile.

6. The government and the central banks have two different policy objective (loss) functions as given by equation (1) and equation (2) below. Both of them face the same supply constraint as given in equation (3).

Governments objective function:
$$\underset{\pi_t}{Min} L^G = \frac{1}{2} \pi_t^2 + \frac{b}{2} (y_t - y_t^*)^2 \quad (1)$$

Central banks' objective function:
$$\underset{\pi_t}{Min} L^{CB} = \frac{1+\varepsilon}{2} \pi_t^2 + \frac{b}{2} (y_t - y_t^*)^2 \quad (2)$$

Constraints:
$$y_t = (\pi_t - \pi_t^e) + u_t \quad (3)$$

where L^G is the loss function of the government and the L^{CB} is the loss function of the central bank, π_t is the inflation rate, π_t^e is the expected inflation rate, y_t is the actual output, u_t is a supply shock (such as a rise in the oil price) y_t^* is the target output, b is a positive parameter. The parameter ε is an inflation aversion factor of the central bank.

- a) what would the target inflation rate if the government sets the inflation target independently minimising its loss function (1) subject to the constraint (3)?
- b) What is the inflation target if the central bank can set it on its own minimising its loss function (2) subject to the constraint (3)?
- c) Now assume that both central bank and the government co-operate to each other as given expressed in equation (4) .

$$M_t = \gamma L^{CB} + (1-\gamma)L^G \quad (4)$$

where γ is 1 if the central bank is fully independent and 0 if it is fully under the spell of the government and between 0 and 1 in the intermediate case.

What will be the inflation target if the monetary policy decision is taken with due account of government and the central bank as in (4), when $0 < \gamma < 1$?

d) discuss the importance of the central bank independence for economic stability with particular reference to recent policy developments in the Bank of England and the ECB.

7. There are two people living in an economy. For simplicity assume that a fixed amount of output of 200 is produced each year. Entire output is consumed in the same year. Utility of individual 1 and 2 is represented by $U_1 = \sqrt{Y_1}$ and $U_2 = \frac{1}{2}\sqrt{Y_2}$.

(a) What is the utility received by each individual if the output is divided equally between these two people? What is the output received by each if it is distributed so that each of them gets the same amount of the utility?

(b) What is the distribution of output that maximises the total utility for the whole economy?

(c) If person 2 needs utility 5 in order to survive how should the output be distributed?

(d) Suppose that the authorities like to maximise the social welfare function $W = U_1^{\frac{1}{2}}U_2^{\frac{1}{2}}$, how should the output distributed between them?

8. (From Blanchard) Suppose there are two major parties contesting for power in an economy. Peoples Party cares more about unemployment than inflation and Merchant's Party cares more about inflation than unemployment.

Phillips curve like above is given by $\pi_t = \pi_t^e - \alpha(u_t - u_n)$ where π_t^e denotes expectations held in year t-1 for inflation in year t. There are elections at the end of this year. Both Peoples Party and the Merchants Party have an equal chance of winning and being in power next year.

- Describe how people will form expectations of inflation for next year.
- Given these expectations, describe what happens to inflation and unemployment next year if the People's Party wins the election.
- Given these expectations, describe what happens to inflation and unemployment next year if the Merchant's Party wins the election.
- Suppose now that everybody expects People's Party to win the elections. Actually it happened that they won the election. What will happen to inflation and unemployment next year?
- Suppose that there is a need to cut the budget deficit. People's Party likes to cut the spending on defense and Merchants' Party likes to cut spending on welfare. The choices they have is represented in the following payoff matrix

		Welfare spending	
		Yes	No
Defense spending	Yes	(M =1, P =1)	(M =-2, P =3)
	No	(M =3, P =-2)	(M =-1, P =-1)

- If the Merchants' Party decide to cut the defense spending, what is the best response of the People's Party? Given this response, how much will Merchants' Party get ?
- If the Merchants decide not to cut defense spending what is the best response of the People's Party? Given this situation how much will the Merchants Party get?
- What will the Merchants do? What will the People's Party will do? Why or why not ? Is there a way to improve the outcome?

6. Analyse how the fiscal policy affects the output, employment, investment and exports and imports in an economy. Explain when the effects of fiscal policy are more effective than that of the monetary policy in a small open economy. How do these effects spill over to other economies in an interdependent global economy (for simplicity of analysis you may use a two country global economy model).

Problem 9
Determinants of Consumption and savings

1. Suppose that the European Central Bank (ECB) has decided to cut the interest rate of Euro Zone by a 0.75 percentage points bringing it down to 3.25 percent in order to save European economies from the fear of global recession.
 - a) Using a two period model explain how this increase in the interest rate is likely to affect allocation of resources by a representative optimising consumer regarding how much to consume today and how much to consume tomorrow. What would your analysis suggest about the aggregate consumption in over Euro Zone economies?
 - b) Does this decrease in the interest rate necessarily lead to less savings by households? Illustrate your answers by means of diagrams or algebra.
 - c) Interest payments are one of the components of the cost of the production of firms. When the interest rate falls it is likely that producers will substitute capital for other inputs such as labour. If so, how would the decrease in the interest rate affect the optimal amount of employment of labour by a representative producer?
 - d) If you believe in a simple Keynesian savings function where saving depends only on income, and a neo-classical investment function where the amount of investment depends upon the marginal productivity of investment, how would the increase in the interest rate of 0.25 percent by the ECB affect the trade balance of a representative European economy?

Consider a Simple Inter temporal model of consumption and saving

$$\begin{aligned} \text{Max } U(C_1, C_2) &= \ln C_1 + \beta \ln C_2 && (1) \\ \text{Subject to} &&& \\ C_1 + b &\leq W_1 && \text{budget constraint in period 1} \\ C_2 &\leq b(1+r) + W_2 && \text{budget constraint in period 2} \quad (2) \end{aligned}$$

C_1, C_2 are consumption in period 1 and period 2 respectively and W_1, W_2 are endowments in period 1 and period 2 respectively. To form an inter temporal budget constraint first by solving the second period budget constraint for b and substituting it in the period 1 constraint.

- a. formulate an inter-temporal budget constraint for this representative household and present this model using a diagram in C_1 and C_2 space.
- b. Find the optimal consumption and saving for this consumer
- c. How would you expect a change in the interest rate to affect the consumption and saving in two periods?
- d. How would tax on interest income affect consumption and saving

11. A person is 21 years old now and starts working from 22 with initial income of 20,000 and retires at 65 years and dies when he/she is 90.
- a. If his/her income grows continuously at 5 percent per year what would be her the life time income?
 - b. What would be the level of consumption implied by the life cycle model for this consumer?
 - c. Study the spread sheet and construct the debt-profile of this person over the life period.
 - d. How can this model be used to show how increasing the retirement age could solve the expected deficit in the pension system in the majority of Western economies in near future?

A consumer has a working life of 30 years and a consumption life of 56 years. Her initial income is 40,000 and is supposed to grow at 4 percent per year. The interest rate is 0. She has to pay 20 percent tax on her income. What should be the consumption per year if the consumer spends her entire life time income on consumption and the consumption is equal in every year.

Problem 10
Determinants of Investment

1. Show the law of motion of capital stock for an economy. How do the current and future capital stock relate to each other? What are the major determinants of investment?

2. Consider a profit maximisation problem of a representative firm for two period economy, which the firm buys capital stock today to produce goods and sell the entire capital in period 2.

Production: $F(K) = K^\alpha$

Profit: $\Pi_t = P_t \cdot \frac{F(K_1)}{1+r} - P_1^k K_1 - P_2^k (1-\delta)K_1$

where Π is the profit of the firm, P the price of goods, P_1^k the price of capital in period 1 and P_2^k the price of capital in period 2, K_t is the capital stock employed by the firm and δ is the rate of depreciation.

- a. Derive the first order condition for profit maximisation by the firm and represent it in a diagram.
- b. Show the relationship between the user cost of capital and the marginal productivity of capital using the above equation. Price of capital in period 2 equals P_1^k plus the capital gain, ie. $P_2^k = (1 + \pi)P_1^k$. What is the optimal capital stock if $F(K) = K^\alpha$?
- c. How would this optimal capital stock change if there is an investment tax credit equal to τ ? Use diagram to explain your results. Explain how the investment tax credit promotes investment activities?

3. A car manufacturer sells each car at 8000 and pays 2000 for capital equipment per car. The nominal interest rate is 6%, appreciation of value of capital stock (capital gain) is 3% and the depreciation of capital stock is 3% per year. The production function for this company is given by $Y = K^\alpha$ with $\alpha = 0.75$. What is the optimal capital stock for this manufacturer? (hint $P \cdot F'(K_1) = P_1^k (r + \delta)$). Show how the investment tax credit affect the optimal capital stock employed by a firm using an appropriate diagram.

4. If capital income tax is different for across sectors, it distorts allocation of investment? How can such distortions be eliminated? What would that imply to accumulation of capital in the economy?

5. The law of motion of the capital stock is $K_{t+1} = (1 - \delta)K_t + I_t$. Show how the current capital stock can be estimated using the perpetual inventory method with the given value of initial capital stock.

6. Consider a macroeconomic model of income determination of the following form

Consumption function: $C_t = \beta_0 + \beta_1(Y_t - T)$ (1)

Taxation function: $T_t = c_0 + c_1 Y_t$ (2)

Import function: $M_t = m_0 + m_1 Y_t$ (3)

Investment function $I_t = \mu_0 + \mu_1 R_t + \phi \Delta Y_t$ (4)

National income identity $Y_t = C_t + I_t + G_t + X_t - M_t$ (5)

Y_t, C_t, M_t, I_t, R_t and T_t are endogenous variables and G_t and X_t are predetermined or exogenous variables. The term Δ represents changes in a variable.

- What is the economic theory behind each of these equations?
- Use these equations to produce an IS curve.
- Calculate the government expenditure multiplier using equations (1) – (5).
- Show graphically how an expansionary fiscal policy may lead to increase in income. What are assumption underlying such analysis?

7. Now consider a simple model that gives the money market equilibrium.

Money demand function: $\left(\frac{\overline{MM}}{P} \right)_t = b_0 + b_1 Y_t + b_2 R_t$ (6)

Money supply \overline{MM}_t (it is fixed by the monetary authority) (7)

- Use these equations to find LM curve (assume that P is fixed, and equal to 1, so that you can equate the left hand side of (6) to \overline{MM}_t .
- Using equation (6) and (7) find the rate of interest consistent with equilibrium in the money market.
- Using equations (1)-(7) find the interest rate and income consistent with the equilibrium in the goods and money markets – to make simpler, you may leave out the term ΔY_t .

8. (30) Suppose you have a prior information on the following set of parameters:

$$\beta_0 = 200, \beta_1 = 0.8, c_0 = 200, c_1 = 0.2, m_0 = 100, m_1 = 0.2, \mu_0 = 500, \mu_1 = -1000, \\ b_0 = 500, b_1 = 0.25, b_2 = -5000, G = 1100, X = 700 \text{ and } \overline{MM}_t = 1000 .$$

For the purpose of this exercise take interest rate in decimal terms, use 0.1 for 10%.

- Calculate the equilibrium values of income, consumption, tax revenue, savings, investment, imports, and the interest rate – once again ignore the term ΔY_t .
- Does the government have a surplus of deficit?
- Does this economy have a balance of payments surplus or deficit?

NB: If you wish, for bonus marks (up to 10%), assume that the change in income ΔY_t was different to zero, and find the equations for the short-run solution.

THE UNIVERSITY OF HULL

Economics

Level M Examination

January 2003

MACROECONOMIC THEORY AND POLICY

Day and time of the exam

Answer any **TWO** questions. All questions are of equal value. Use diagrams and equations as appropriate. Each subsection of a question carries equal value.

Do not open or turn over this exam paper, or start to write anything until told to by the Invigilator. Starting to write before being permitted to do so may be seen as an attempt to use Unfair Means.

(10934) Page 1 of 5 (continued)

1. Consider a simple Keynesian Model with the following equations:

Goods-market

Consumption demand $C = 200 + 0.8(Y - T)$ (1)

Investment function: $I = 100 - 200r$ (2)

Imports: $Z = 0.2Y$ (3)

Exogenous variables $T = 100$ $G = 100$ and $X = 100$ (4)

National income identity: $Y = C + I + G + X - Z$ (5)

Money market

Demand for money: $\frac{M}{P} = 0.5Y - 1000r$ (6)

Supply of money: $M = 400$; price is constant at 1. (7)

where Y is output, C is consumption, T is tax rate, I is investment, r in the interest rate, Z is imports, G is government spending, X is exports, M is money supply, P is the price level.

- (f) Find one single equation to represent the goods market equilibrium (IS curve) using the equations (1)-(5). Represent that equation in a correctly labelled diagram. Explain why points below and above this curve represent disequilibrium positions for this economy. If the interest rate is exogeneously fixed at 5 percent ($r = 0.05$) what would be the values of consumption, investment, imports, trade and budget gaps in this economy consistent with the goods market equilibrium?
- (g) Use money market equations (6) and (7) to determine the combination of output and the interest rates that are consistent with equilibrium in the money market. Represent your equation in the diagram and explain why only the points along this line represent equilibrium in the money market.
- (h) Find the level of output and the interest rate that are consistent with simultaneous equilibrium in both the goods and money markets. Represent this economy wide equilibrium with appropriate diagrams. Explain why the system given by the above relationships converges to this equilibrium point and all other points in the diagram are away from the equilibrium using the conditions of excess demand and excess supply in both the goods and money markets.
- (i) Now relax the assumption that prices are constant. Instead consider three possible prices 1, 2 and 4. Derive aggregate demand (output) using this information. Show your results in a diagram.

3. Consider the growth experience of a number of economies around the world as illustrated Table 1.

Table 1
Variation in the growth Experience Across Different Countries

Countries	Growth Experience from 1965-1999					Size of aggregate and per capita GDP in 1999				
	GDP growth (annual %)		Population growth (annual %)		Population in '000	Size of GNP		Size of per capita GNP		Income based ranking out of 206 countries
	Total	Per Head	Total	Labour force		GNP billion of us \$ at 1999	GNP at PPP	Per capita GNP	Per capita GNP at PPP	
China	8.1	6.4	1.7	2.1	1250	980	4112	780	3291	128
Japan	4.1	3.4	0.7	1	127	4078	3043	32230	24041	14
Jordan	4.7	0.4	4.3	4.4	2.2	7.0	16.6	1500	3542	124
Singapore	8.3	6.3	1.9	3.1	3	95	87	29610	27024	7
Pakistan	5.6	2.7	2.8	2.9	135	64	237	470	1757	159
Nepal	3.7	1.2	2.4	2	23	5	29	220	1219	177
Nigeria	3.0	0.0	2.9	2.7	124	38	92	310	744	193
Kenya	4.7	1.2	3.3	3.3	29	10.6	29	360	975	185
Uganda	5.5	2.5	2.9	2.6	21	6.8	24	320	1136	179
Ghana	2	-0.7	2.6	2.6	19	7	34	390	1793	157
Greece	3.1	2.4	0.6	0.9	11	124	154	11770	14595	50
UK	2.2	2	0.3	0.5	59	1338	1234	22640	20883	27
USA	3	2	1.1	1.7	273	8351	8350	30600	30600	4
World	3.3	1.8	1.7	2.0	5,975	29232	38405	4890	6490	-
Low income	4.1	1.8	2.3	2.2	2,417	988	4315	410	1790	\$755
Middle inc.	4.2	2.4	1.7	2.1	2,667	5323	13022	2000	4880	-
High income	3.2	2.4	0.8	1.2	891	22921	21763	25730	24430	\$9266 or >

Source: Derived from the World Development Report, 2001, pp. 274-275.

- (a) Using the neo-classical (Solow) growth model explain why some economies grow faster than other economies in the steady state. Show how this model can explain variation in income levels across countries assuming a simple Cobb-Douglas production function of output in terms of labour and capital inputs.
- (b) A higher saving rate only affects the level of income but not the growth rate in the steady state in a simple version Solow model in which the growth rate is determined only by the exogenous rate of technical progress. Show how a higher saving rate can have a significant effect on the growth rate of output if the complementarity between physical and human capital is taken into consideration.
- (c) Using an endogenous growth model to demonstrate the contribution of human capital and technological progress in economic growth. Explain how these models can explain variation in growth rates across countries.
- (d) Critically discuss five key economic policy measures that economies with slower economic growth rates can adopt to achieve faster rates of economic growth.

4. Consider the shares of the trade-balance, consumption, exports, imports, saving, investment and government spending in GDP in a number of economies around the world in Table 2.
- (a) Using the macroeconomic fundamentals that can be derived from the purchasing power parity and uncovered interest parity theories of the exchange rates explain why some countries have trade deficits and other have trade surpluses as in Table 2?
- (b) Discuss the impact of a devaluation on the net trade balance of an economy using the Marshall-Lerner conditions and the J-curve hypothesis. Discuss one real world example where the devaluations have been effective in promoting net exports and another where they have not.
- (c) Some countries experience a higher trade/balance of payment (BOP) deficit with a rising level of income and other countries have trade/BOP surplus when the income level improves. How can these contradictory experiences be explained using economic theories? Use diagrams or equations to support your answer.
- (d) How can policy makers use monetary and fiscal policies in order to promote internal and external stability in an economy? Discuss the importance of matching number of instruments and targets in the case of macroeconomic policy making.

Table 2
**Trade balance, saving and investment, budget deficit and external debt
 (as a percent of GDP in 1999)**

	(X-M)/Y	C/Y	X/Y	M/Y	S/Y	I/Y	G/Y	Economic growth rate
China	2	50	22	-20	42	40	8	8.1
Hong Kong	8	57	132	-124	30	25	10	7.3
Japan	1	60	11	-10	30	29	10	4.1
Jordan	-21	65	49	70	6	27	29	4.7
Singapore	18	39	202	-184	52	33	10	8.3
Pakistan	-4	78	15	-19	11	15	11	5.6
Nepal	-9	80	22	-31	11	19	10	3.7
Nigeria	-11	88	17	28	0	11	12	3.0
Kenya	-8	77	25	33	7	15	16	4.7
Uganda	-11	84	40	-51	6	17	10	5.5
Tanzania	-3	72	20	-23	14	18	13	-
Ghana	-18	85	32	-50	4	22	11	2
Greece	-8	15	16	24	12	20	15	3.1
UK	0	64	29	-29	15	16	20	2.2
USA	-2	68	12	-14	17	19	15	3
World	1	62	22	-21	23	22	15	3.3
Low	-1	70	27	-28	19	20	11	4.1
Middle	2	62	28	-26	26	24	12	4.2
High	2	62	22	-20	22	21	15	3.2

Source: Compiled from World Development Report 2001/2001, World Bank.

Notations: X = exports, M = imports, C = consumption, S = savings, I = investment, G = Government spending, Y = GDP.

5. Most economies around the globe experienced a positive economic growth during 2002. The predictions for 2003 are mixed. Some economists are arguing that there may be a sudden drop in the overall consumer and investor confidence and the US economy might enter into another recession. Policy makers in Europe, Asia and Africa want to minimise the adverse consequences of the US recession in output and employment in their own economies.
- (a) Derive the appropriate IS-LM and aggregate demand (AD) diagrams to analyse this question using the Keynesian model of goods and money market equilibrium. Give three reasons why the AD demand you derived here is downward sloping.
 - (b) Using the Phillips and Okun curves derive the aggregate supply diagram to analyse the above question in the short run.
 - (c) Use both the IS-LM and aggregate demand aggregate supply (AD-AS) models you derived above to analyse briefly the fiscal, monetary and exchange rate policy options available to these policymakers to counter balance the negative consequences of the potential US recession.
 - (d) Based on your theoretical arguments in (c) show how economic growth resulting from good economic policies in the Rest of the World can pull the US economy out of recession.
6. Fiscal policy mainly involves raising revenue through taxes and spending it to provide public goods and services. Both the revenue and spending policies could also be used to stabilise the economy.
- (g) How high should the effective tax rate in an economy be if the purpose of taxes is to maximise the public revenue? Use a diagram or equations like $R = 100t - 5t^2$ (you may assume that the revenue to be raised is 400) to illustrate this point. Use your answer here to discuss what kind of tax policy would be appropriate to promote economic growth rate in the long run.
 - (h) How can a government use counter-cyclical budgetary policy to stabilise the economy? What are the difficulties that this government might have to face in maintaining a cyclically balanced budget?
 - (i) A government can finance its deficit by borrowing from the private sector. Analyse the potential impact of such borrowing on the output, interest rate, saving and investment activities in the economy.
 - (j) If necessary, a government can finance the deficit by borrowing from the central bank. How does such borrowing affect the growth rate of money supply in the economy? What would the optimal rate of money supply be if the objective of the government is to maximise the revenue from the inflationary tax?

7. Macroeconomists disagree about the impacts of economic policy in the short rather than in the long run.
- (a) Using an expectations augmented Phillips curve critically analyse whether there exists a trade-off between unemployment and inflation in the short run.
 - (b) What are the implications of the Friedman-Phelps natural rate of unemployment hypothesis for such a trade-off? Briefly discuss any three theories that explain variation in the natural rate of unemployment across countries.
 - (c) Explain how the inflation rate is related to the natural rate of output and unemployment using aggregate supply curves for an economy. Show how the mark-up of prices by firms and mark-up of wage rates by workers' union affect the slope of such aggregate supply line.
 - (d) Under the rational expectation hypothesis when does only unanticipated money supply affect output in the economy? What are constraints in forming rational expectations?

1. Consider the following Keynesian model for an economy

Goods Market:

$$\text{Supply-demand: } Y = C + I + G \quad (1)$$

$$\text{Consumption: } C = 250 + 0.75(Y - T) \quad (2)$$

$$\text{Investment: } I = 200 - 25r \quad (3)$$

$$\text{Balanced budget: } T = G = 100 \quad (4)$$

Money market:

$$\text{Money demand: } (M/P)^d = Y - 100r \quad (5)$$

$$\text{Money supply } \bar{M} = 1000 \quad (6)$$

where Y is output, C is consumption, T is the tax rate, I is investment, r is the interest rate, G is government spending, M is money supply and P is the price level.

Price is assumed to remain constant in the short run.

- (a) Illustrate the goods market equilibrium using appropriate diagrams. Determine the level of income that is consistent with the goods market equilibrium.
 - (b) Determine the interest rate that is consistent with equilibrium in the money market. Show this equilibrium line using an appropriate diagram. Explain why points off the line do not represent equilibrium positions.
 - (c) Use both (a) and (b) to find the output and the interest rate that represent overall equilibrium in the economy. Represent this overall macroeconomic equilibrium in a correctly labelled diagram. What are the values of output, interest rate, consumption and investment in this equilibrium?
 - (d) Explain how the values of output, investment and the budget deficit change if government spending rises from 100 to 150.
2. Consumption and investment constitute about 80 percent of GDP in most economies.
- (a) Compare the absolute income, permanent income and life cycle income hypotheses of consumption for an economy. What are the implications of these theories for the average and marginal propensities to consume?
 - (b) Households are constrained by their life time income. The present value of their expenses cannot be greater than the present value of their income. Illustrate this point using diagrams or equations. Assess whether a lump sum tax of T_1 and T_2 on endowments W_1 and W_2 will have any effect on consumers' choice between current and future consumption in an economy.
 - (c) The central bank reduces the interest rate. How does this cut in the interest rate affect the optimal capital stock in an economy? Would an interest rate tax credit have the same effect as a reduction in the interest rate?

- (d) How does the interest rate affect (i) the saving decisions of households and (ii) investment decisions. Does a reduction in the interest rate necessarily mean a lower level of saving, investment and capital accumulation in an economy? Illustrate your arguments using appropriate diagrams.
3. A central bank operates its monetary policy through open market operations. It changes the discount rate (base interest rate) at which commercial banks and other financial institutions can borrow from the central bank if their deposits are not enough to satisfy demand for loans.
- (e) Discuss the transmission mechanism, explaining how a change in the interest rate affects the income, output, employment, price level and exchange rates in an economy. What do monetarists, such as Milton Friedman, regard as the strengths and weaknesses of a monetary policy like this?
- (f) Consider a simple model for the interest rate policy rule which includes the following three equations
- Output gap:
$$y_t - y^* = d(i_{t-1} - i_t^*) \quad (1)$$
- Supply function:
$$\pi_t = \pi_t^* + c(y_{t-1} - y_{t-1}^*) \quad (2)$$
- Interest rate rule:
$$i_t = i_t^* + a(y_t - y_t^*) + b(\pi_t - \pi_t^*) \quad (3)$$
- where $(y_t - y^*)$ is the current output gap, $(i_{t-1} - i_t^*)$ the deviation of the interest rate one period earlier from the target interest rate of the monetary authority, y_t and y_t^* are the actual and natural level of output, i_t is the actual rate of interest in period t , i_t^* is the interest target of the monetary authority. π_t and π_t^* are actual and target inflation rates. How can such a rule be implemented by the monetary authority? How does such a rule help to stabilise the economy?
- (g) Why has inflation targeting and central bank independence been more popular among the policy makers in recent years, when a money supply rule or exchange rate targeting has been popular in the past?
- (h) What sort of monetary policy do the International Monetary Fund and the World Bank suggest for an economy which has experienced both budgetary and trade deficits? What sort of the exchange rate regime is necessary for monetary policy to be effective?
4. Write short notes in any four of the following
- Neutrality and non-neutrality of money
 - Capital augmenting, labour augmenting and neutral technical progress
 - The wage price spiral and natural rate of unemployment
 - Leading and lagging indicators in an economy
 - Bubbles in financial markets
 - Three ways to measure GDP

5. Explain how countries with higher population growth rates might end up with a lower level of per capita income in the steady state. If labour augmenting technological change effectively reduces the number of hours required for production to one half of the hours required previously, how would it affect the level of output in the steady state? Analyse this question using Solow's model of economic growth. How can an increase in the stock of human capital contribute to the rate of growth of per capita output and the stock of technical knowledge in an economy?
6. An economy is experiencing a relatively high rate of inflation, reported to be 11 percent per year, which is creating uncertainty and signalling the prospect of macroeconomic instability if it remains unchecked. Government is keen to introduce a programme to assure macroeconomic stability by reducing inflation by 2% per year, until it is 3% per year. Once inflation reaches 3% the government wishes to stabilise it at that rate for all future years. The current unemployment rate is 6 percent. Econometric estimates suggest that this is also the natural rate of unemployment, u_n for this economy. Productivity is growing by 2% annually and the labour force is growing by 1% per year. The basic economic relations between the unemployment rate, inflation and the growth rates of output and money supply are given by the following set of equations.

$$\begin{array}{ll}
 u_t - u_{t-1} = -0.4(g_{yt} - \bar{g}_{yt}) & \text{Okun's law} \\
 \pi_t - \pi_{t-1} = -(u_t - u_n) & \text{Phillips curve} \\
 g_{yt} = g_{mt} - \pi_t & \text{aggregate demand}
 \end{array}$$

where g_{yt} is the actual growth rate of output, \bar{g}_{yt} is the trend growth rate of output, u_t is the unemployment rate in period t , π_t is inflation in period t and g_{mt} is the growth rate of the money supply in period t .

- f. Provide a graphical illustration showing how inflation, the unemployment rate and the growth rates of output and money supply are related to each other in both the short run and the medium run.
- g. From the information given above, find π_{t-1} , the inflation rate in year $t-1$ and the rates of growth of output, g_{yt} , and money supply g_{mt} in the current year, which is the benchmark year of the inflation reduction programme. How far was inflation in the previous year from the target inflation rate of 3%?
- h. Calculate u_t , g_{yt} , π_t and g_{mt} for all subsequent years, until the economy reaches the 3% inflation rate, if government is strict in its policy of reducing inflation by 2% annually. What are the values of u_t , g_{yt} , π_t and g_{mt} when the economy is stabilised. What rate of growth of the money supply is consistent with the inflation target and the trend rate of growth of output in the long run?
- i. What is the meaning of the sacrifice ratio in macroeconomics? What is its value for each of the years of the inflation reduction programme in (c) above? Justify the required path of money growth in the inflation reduction programme that you have outlined in (c).

Macroeconomic Theory and Policy (M.Sc. Econ) Semester I, 2003-04

Lecture schedule and Topics and References (Mon.(TR6) 9:15-10:05 Tues (S18) 9:15 -10:05 Fri. (S18,S3) 9:00-11:05 Lecture Theatre)

Lecture	Week	Lecture topics	Burda & Wyplosz	Miles and Scott	Blanchard	Mankiw	Key References available in the short loan section
1	1	Introduction: Macroeconomics, Macro Economic Models and Macroeconomic Policies	1,2	1,2	1, 27	1, 3	Solow-Lucas (2000)
2	1	National Accounts and BOP	1,2	1,2	2	2	Manual of National Accounts and BOP (ONS)
3	1	Keynesian theory of aggregate demand	10	3	3	10	Keynes (1936)
4	2	IS-LM Model: Goods and Money markets	11	3	4, 5	11	Hicks (1937)
5	2	Exercises in deriving aggregate demand	11	13,14	6	11 appendix	King and Plosser (1990)
6	2	New Keynesian theory of aggregate supply	12	3	7	9, 13,19	Mankiw (1989)
7	3	Macroeconomic equilibrium: Aggregate Demand and aggregate supply Analysis	13	16	7, 22	9	Wallis (1989), Lucas and Sargent (1979)
8	3	Output, inflation and unemployment	13,17	8	8,9	4, 6	Phillips (1958); Phelps (1968)
9	3	Growth Facts and Growth Accounting			10	8 appendix	Mankiw-Romer and Weil (1992)
10	4	Neo-Classical Solow Growth Model	3	4,5	11	7	Solow (1956)
11	4	Steady State and Golden Rule of Saving	3	5-6	11	7	Domar (1947); Cass (1965)
12	4	Why endogenous growth? AK Model	18	7	12	8.4	Grossman and Helpman (1991)
13	5	Human capital and economic growth	18	6	13		Lucas(1988)
14	5	Technology and economic growth	18	7	13	8	Romer (1989)
15	5	Convergence and Divergence			13		Parente and Prescott (1993)
16	6	Fiscal policy	15,16	11	26		King and Rebelo (1990)
17	6	National debt and Ricardian equivalence			26	15	Barro(1974)
18	6	Monetary policy; Interest rate rule Central Bank independence	8,9	12,17	25	18	Friedman (1968); MPC; Goodhart (1994)
19	7	Mid-term 1					
20	7	Role of adaptive and rational expectation	13	12	14		Sargent and Wallace (1975)
21	7	Financial Market: Value of Bonds and stocks	19	21-22	15	17	Gertler (1988);
22	8	Role of Financial Markets in an Economy	20	23	16, 17	17	Agenor, Pierre-Richard et al. eds. (1999); Diamond and Dybvig (1983)
23	8	Open economy macro economic model	13	9	19	5, 12	Mundel (1962) Fleming (1962)

Macroeconomic Theory and Policy (M.Sc. Econ) Semester I, 2003-04
Lecture schedule and Topics and References (Tues. 0:00-0:00 Lecture Theatre)

24	8	Exchange rate theories: PPP, UIP	19, 20	18,19,20	20	5	Williamson and Miller (1087); Dornbusch (1976)
25	9	BOP problems and Financial Crises and international monetary system	7	9	21	5	Rogoff (1999),
26	9	Mid-term 2					
27	9	Rules or Discretion or credibility in economic Policy coordination	14, 16	16	24	14.2	Nordhaus W.D. (1994); Canzoneri and Gray (1985) HM Treasury (2002); Kydland and Prescott (1977)
28	10	Structure of labour market	4	8	8		Manning (1995); Nickel (1990)
29	10	Theories of unemployment	4,17	8	22	6	Blanchard and Summer (1986); Yellen (1984)
30	10	Theories of consumption	5, 6	13, 14	16	16	Modigliani (1986)
31	11	Theories of Investment			16	17	Tobin (1969)
32	11	Theories of inflation and deflation			22, 23		
33	11	General equilibrium impacts of tax and trade policy reforms					Bhattarai (2000, 2001); Bhattarai and Whalley (2003)
34	12	General equilibrium impacts of growth policy					Weal (2003), Ramsey (1928), Bhattarai (1999)
35	12	Review 1					
36	12	Review 2					
	Dec 8-15	Exam Week 1 and 2					

Macroeconomic Theory and Policy (M.Sc. Econ)
Tutorial schedule and topics (S15 WF, Friday 12:15)

Calss #	Weeks	Class topics
1	1	National and BOP accounts
2	2	IS-LM model
3	3	Economic growth
4	4	Fiscal policy
5	5	Monetary policy
6	6	Labour market and the Phillips curve
7	7	Exchange rate policy
8	8	Financial Markets
9	9	Macroeconomic Policy coordination
10	10	Determinants of Consumption
11	11	Determinants of Investment

