Macroeconomics

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Contents

Part I

Macroeconomics

Chapter 1

Measuring inflation

1.1 Introduction

Chapter 2

Unemployment

2.1 Introduction

Chapter 3

Monetary and fiscal policy

3.1 Monetary policy

3.1.1 Policy goals

Targets

Central banks can use monetary policy to achieve goals. Monetary policy directly affects inflation and exchange rates, but also losses in output which result from the stickiness of prices.

Due to the interaction of each of these targets, there are trade-offs in pursuing multiple goals. Reducing output volatility could require volatile inflation, and stabilising the exchange rate could destabilise inflation and output.

Export promotion

The theory behind currency manipulation is that by devaluating a currency exports are more competitive and so GDP will rise.

If a currency is devalued by printing large amounts of money, this will make exports cheaper temporarily if they take time to adjust their nominal prices upwards.

If a currency is devalued by imposing capital controls and intervening in capital markets, then the relative price of exports can be maintained below the level it would otherwise be at.

Chapter 4

Neoclassical economics

4.1 Introduction

4.1.1 Walras equilibrium

4.1.2 The Arrow–Debreu model

4.1.3 The input-output model

4.2 Classical dichotomy

4.3 Neoclassical exogeneous growth models

4.3.1 The Harrod-Domar model

Introduction to growth models

We have output as a function of capital.

$Y = f(K)$

We also have capital dynamics.

$\dot{K} = I - \delta K$

$I = S = sY$

This gives us:

$\dot{K} = sY - \delta K$

Introduction

The production function is:

$Y = cK$

This gives us:

$\dot{K} = (sc - \delta)K$

Growth

$\dot{Y} = c\dot{K}$

$\frac{\dot{Y}}{Y} = c\frac{\dot{K}}{Y}$

$\frac{\dot{Y}}{Y} = c\frac{(sc - \delta)K}{cK}$

$\frac{\dot{Y}}{Y} = sc - \delta$

Per-capita growth

Per capita income is:

$y = \frac{Y}{L}$

$k = \frac{K}{L}$

4.3.2 The Solow-Swan model

Recap of growth models

As with the Harrod-Domar model we have output as a function of capital:

$Y = f(K)$

Capital dynamics:

$\dot{K} = I - \delta K$

$I = S = sY$

This gives us:

$\dot{K} = sY - \delta K$

Recap of the Harrod-Domar model

The production function of the Harrod-Domar model is:

$Y = cK$

And long-term growth of:

$\frac{\dot{Y}}{Y} = sc - \delta$

The Solow-Swan production function

We use a new production function:

$Y = K^\alpha (AL)^{1-\alpha}$

We add dynamics for technology and labour.

$A_t = A_0 e^{gt}$

$L_t = L_0 e^{nt}$

$Y_t = K_t^\alpha (A_0 e^{gt} L_0 e^{nt})^{1-\alpha}$

Effective captial

$k_t = \dfrac{K_t}{A_t L_t}$

$Y_t = \dfrac{Y_t}{A_t L_t}$

The dynamics of effective capital is:

$\dot{k}_t = s k_t^\alpha - (n + \delta + g) k_t$

Steady state

In equilibrium effective capital is stable.

$\dot{k}_t^* = s k_t^\alpha - (n + \delta + g) k_t^8 = 0$

$s k_t^{*\alpha} = (n + \delta + g) k_t^8$

$k_t^* = \left(\dfrac{s}{n + g + \delta} \right)^{\dfrac{1}{1-\alpha}}$

4.3.3 The Mankiw-Romer-Weil model

We add human capital to the Solow-Swan model.

4.3.4 The Golden Rule savings rate

The Golden Rule savings rate is the rate which maximises long term consumption per capita.

If the savings rate is 0 there is no capital and no income. If the savings rate is 1 then then there is no consumption.

4.3.5 The Ramsey-Cass-Koopmans model

This is based on the Solow-Swan model, with an endogeneous savings rate.

4.4 Neoclassical endogeneous growth models

4.4.1 The AK model

Recap of growth models

As with the Harrod-Domar model we have output as a function of capital:

$Y = f(K)$

Capital dynamics:

$\dot{K} = I - \delta K$

$I = S = sY$

This gives us:

$\dot{K} = sY - \delta K$

Recap of the Harrod-Domar and Solow-Swan models

In the Solow-Swan model the production function was:

$Y = K^\alpha (AL)^{1-\alpha}$

In the Harrod-Domar model the production function was:

$Y = cK$

In the Solow-Swan model we also added population and technology growth

The AK model

In the AK model the production function is:

$Y = AK$

We keep population growth from the Solow-Swan model.

Per-capita income

$\dot{K} = sAK - \delta K$

$\dot{K} = (sA - \delta)K$

$k = \frac{K}{L}$

$\dot{k} = \frac{\dot{K}}{L} - \dot{L}\frac{K}{L^2}$

$\dot{k} = \frac{(sA - \delta)K}{L} - \dot{L}\frac{K}{L^2}$

$\dot{k} = (sA - \delta)k - k\frac{\dot{L}}{L}$

$\dot{k} = (sA - \delta - n)k$

$\frac{\dot{k}}{k} = sA - \delta - n$

4.5 Overlapping generations model

4.5.1 Introduction

Chapter 5

Neo-Keynesian economics and the neoclassical synthesis

5.1 Motivation

5.1.1 Output gaps

5.1.2 Phillips curve

5.1.3 Okun's law

5.2 Investment Saving - Liquidity preference - Money supply (IS-LM)

5.2.1 The Fisher equation

The Fisher equation shows the relationship between the real and nominal interest rates.

$(1 + i) = (1 + r)(1 + \pi)$

For small values:

$i \approx r + \pi$

5.2.2 The Keynesian cross and the Investment Saving (IS) curve

The Keynesian cross

We have:

$Y = C(Y - T(Y)) + I(r) + G + NX(Y)$

Where:

- Y is output
- C is consumption
- T is taxes
- I is investment
- r is the real interest rate
- G is government spending
- NX is net exports

The Keynesian cross plots:

Y

Against:

$C(Y - T(Y)) + I(r) + G + NX(Y)$

This identifies an equilibrium level of output.

The IS curve

The IS curve plots the equilibrium level of output from the Keynesian cross against the real interest rate.

As the real interest rate rises, investment and therefore output falls.

The slope of the IS curve

The slope of the IS curve depends on taxes and net exports.

5.2.3 The Liquidity preference - Money supply (LM) curve

Liquidity preference

Money demand is:

$L = L(i, Y)$

As income rises, demand for money rises.

As the nominal interest rate rises, the demand for money falls, due to the opportunity cost.

Money supply

Money supply is:

$$\frac{M}{P}$$

The LM curve

In equilibrium money supply and demand match. We have:

$$\frac{M}{P} = L(i, Y)$$

We can plot the level of output which corresponds to the nominal interest rate.

This is the LM curve.

The slope of the LM curve

5.2.4 The Investment Saving - Liquidity preference - Money supply (IS-LM) model

The IS curve plots output against the (real) interest rate. As (real) interest rates rise, investment and therefore output falls.

The LM curve plots output against the (nominal) interest rate. As output rises, (nominal) interest rates fall to ensure clearing.

As prices are fixed in the IS-LM model, we can use the real and nominal rates interchangably.

The IS-LM model identifies the intercepts of the two curves and the equilibrium output and interest rate.

This model takes prices, money supply, taxes and government spending to be exogenous.

Effect of monetary expansion

In the LM model a monetary expansion lowers interest rates.

In the IS-LM model this effect is lessened. The lower interest rates cause higher output, increasing money demand, and raising interest rates.

Effect of fiscal expansion

Is the IS model a fiscal expansion caused a corresponding increase in output.

In the IS-LM model this is lessened because the increase also causes more real money demand, raising interest rates, and lowering output.

5.3 Aggregate Demand - Aggregate Supply (AD-AS)

5.3.1 Aggregate Demand (AD)

For any given price level there is a corresponding IS-LM equilibrium, with an output level.

The Aggregate Demand curve models the relationship between the price level and equilibrium output.

As the price level rises, the real money supply falls. This means nominal interest rates rise to ensure LM equilibrium.

This rise in interest rates causes the IS curve to shift inwards, reducing output.

$Y_d = Y_d(\frac{M}{P}, G, T)$

The slope of the Aggregate Demand curve

5.3.2 Aggregate Supply (AS)

Aggregate Supply in neoclassical models

In neoclassical models Aggregate Supply does not depend on price.

Aggregate Supply in neo-Keynesian models

The Aggregate Supply curve is informed by the Phillips curve.

As prices rise, so too does output.

Firms could increase production as nominal prices rise, as nominal contracts on wages mean that real costs have fallen.

Slope of the Aggregate Supply curve

5.3.3 The Aggregate Demand - Aggregate Supply (AD-AS) model

5.3.4 The fiscal multiplier

5.4 Extentions

5.4.1 The Mundell-Flemming model

5.4.2 The Dynamic Aggregate Demand - Surprise Aggregate Supply (DAD-SAS) model

Chapter 6

New classical economics

6.1 Movitation

6.1.1 The Lucas critique

6.2 Microfoundations for the Aggregate Supply curve

6.2.1 The Lucas islands model

6.2.2 Adaptive expectations

6.2.3 Rational expectations

6.2.4 The Lucas Aggregate Supply (AS) function

6.2.5 The new classical Phillips curve

6.3 Microfoundations for the Aggregate Demand curve

6.3.1 Gorman polar form

6.3.2 Representative agents

Income inequality

The use of representative agents means that the model cannot incorporate effects of income inequality.

6.4 Real Business-Cycle (RBC) Dynamic Stochastic General Equilibrium (DGSE) models

6.4.1 Real Business-Cycle (RBC) Dynamic Stochastic General Equilibrium (DGSE) models

6.4.2 Estimating RBC DGSE models

6.4.3 The policy-ineffectiveness proposition

6.4.4 DGSEs as VARs

Chapter 7

New Keynesian economics and the new neoclassical synthesis

7.1 Monetary policy

7.1.1 Monetary policy rules

7.1.2 The Taylor rule

7.2 New Keynesian Phillips curve

7.2.1 The new Keynesian Phillips curve

7.3 Market failures

7.3.1 Efficiency wages

7.3.2 Staggered Calvo contracts

7.3.3 Menu costs

7.3.4 Imperfect competition

7.4 New Keynesian Dynamic Stochastic General Equilibrium (DGSE) models

7.5 Heterogenous agent models

7.6 Models with financial sectors