Spending, the Interest Rate, and Money

1. Introduction

Previously, changes in equilibrium GDP were caused by *exogenous* changes in planned autonomous spending (A_p). This chapter extends the simple deterministic model of the previous chapter by:

- first analysing the role interest rates play in determining the level of autonomous spending, and then by
- endogenising interest rates by introducing a role for *money* in the macroeconomy.

We maintain the assumption that prices are exogenously fixed.

If private planned spending depends partly on the interest rate (as we shall argue), then what determines the interest rate? *Monetary policy* is the government influencing the interest rate and hence the equilibrium level of income (Y) through its control over the money supply.

1.1 Why were interest rates in the 1980s higher than ever before?

This was the fourth puzzle of the early lecture. Four questions:

1. What factors make the interest rate for borrowing higher in some periods than in others?

2. What is the effect of government deficits on the interest rate? Once we relax the assumption of fixed, exogenous interest rates, does fiscal stimulus have the full multiplier effect of the previous chapter?
3. If an increase in the interest rate reduces the size of the multiplier, which components of spending are affected? Will planned private domestic investment be "crowded out", or will the main effect be to reduce net exports and net foreign investment?
4. If a stimulus to the economy is needed when actual real GDP is below natural real GDP, then should that stimulus be provided by monetary or by fiscal policy?

2. Interest Rates and Rates of Return

2.1 Functions of Interest Rates

As with other prices, interest rates help allocate resources (saving) among alternative uses. For savers, the interest rate is a reward; for borrowers, a cost. Higher interest rates will encourage saving and discourage borrowing. If the demand for borrowing exceeds the willingness to save, the interest rate tends to rise.

In deciding how much to invest, firms compare the interest rate charged on borrowed funds with the earnings of investment projects. They will do this even if they don't need to borrow, since lending might be preferable to using internal funds in such projects. The interest rate provides an *opportunity cost* for investment decisions. Higher interest

rates will cause planned investment (I_p) to fall.

Households will compare the interest payments on a loan with the desirability of possessing the house or car bought with borrowed money. Again, households might lend (to the bank) instead of borrowing. Higher interest rates will cause autonomous consumption (a) to fall.

By holding currency (which pays no interest), households forgo interest income. Since the government, through the Reserve Bank (RBA), can control the supply of currency, it can (*monetary policy*) influence the interest rate and thus indirectly the cost of borrowed funds.

2.2 Types of Interest Rates

As we know, there are many interest rates, depending on the "term" of the deposit and on the risk associated with the institution (ask Pyramid depositors!). There are short-term (less than three months) rates:

- on bank deposits
- on funds borrowed by the government (Treasury bills)
- on funds borrowed by firms (commercial paper)
- on funds borrowed by banks

Similarly there are long-term (at least a year) rates on funds borrowed by:

- the government (Treasury bonds)
- firms (corporate bonds)

- households (mortgages)

We ignore the differences between these interest rates here, and focus on *the* interest rate, an average (roughly) of all the above.

3. Private Autonomous Planned Spending and the Interest Rate

3.1 Planned autonomous investment (I_p)

Firms can only survive if their earnings on investments are sufficient to pay the interest on borrowed funds (or to attract enough investors to warrant a new issue of shares). They will attempt to rank investment opportunities by the rate of return[1] and choose to invest in those opportunities (projects) with a rate of return greater than the interest rate.[2]

There is a negative relationship between the interest rate and planned business investment (I_p): firms will only invest in projects that yield a rate of return at least as great as the interest rate. This condition holds true because firms usually finance their projects by borrowing, so that the projects with a rate of return lower than the interest rate will not be able to cover the interest payment on their loans. Even if the firm had

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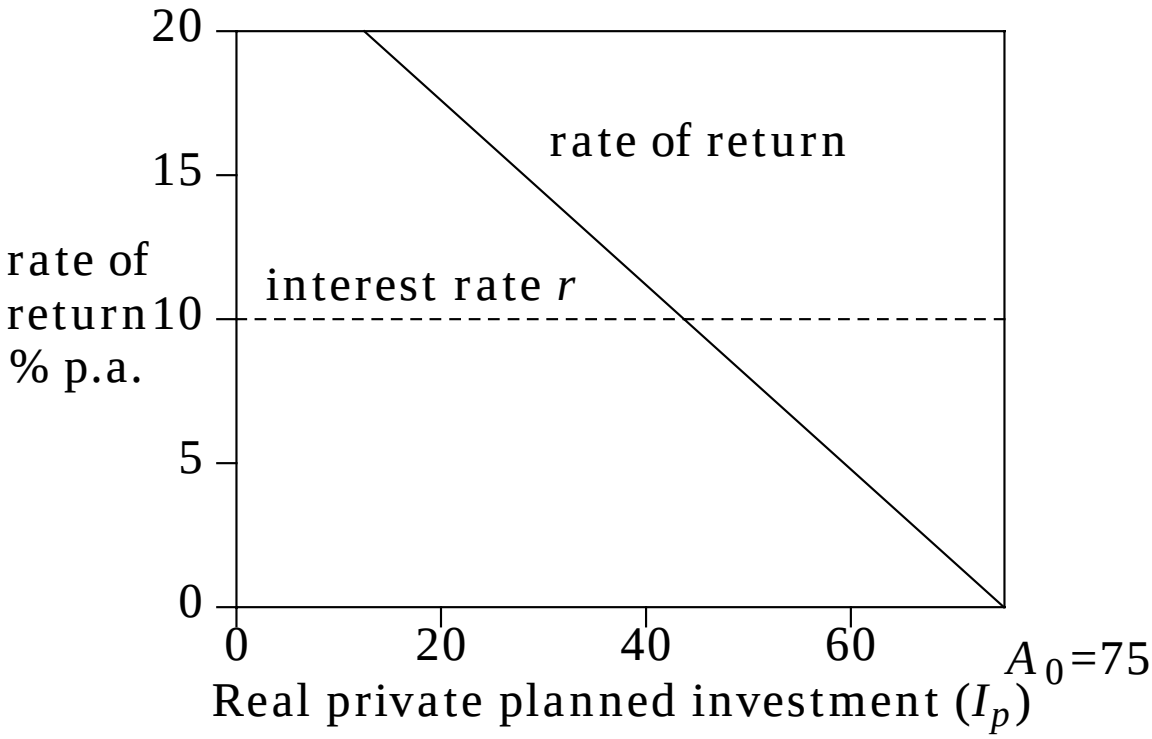
1. Or, more correctly, by net present value, calculated using the interest rate on borrowed funds to discount future costs and benefits.
2. Or with positive NPV.

sufficient internal funding, it would be more profitable to lend the funds out and earn the interest rate than invest in the lower-yielding project. Thus higher interest rates will reduce the relative profitability of investment projects.

Gordon (p.73) plots the rate of return and the interest rate against real private planned investment (I_p):



This figure shows the diminishing returns to such planned investment, where the first plane (say) is more profitable to the airline than is the second, which in turn is more profitable than is the third, and so on. At a level of investment with a rate of return greater than 10% p.a., projects will be profitable; less than 10% p.a., not profitable.

3.2 Autonomous consumption (a)

The interest rate affects not only autonomous investment decisions (I_p) but also autonomous

consumption decisions (a): consider the decision to buy a car, a fridge, or other consumer durables: such decisions are sensitive to the level of monthly repayments, which depends on the interest rate.

As with firms' investment decisions, each successive consumption good bought by the household provides less valuable services than the first (think of the second car), so the rate-of-return line is downwards-sloping for ($I_p + a$), as well.

Higher interest rates will reduce planned autonomous spending by discouraging both investment (I_p) and autonomous consumption (a). On the diagram, if the horizontal interest-rate line moves up, autonomous planned spending will fall.

3.3 Business and Consumer Sentiment

As well as movements along the rate-of-return line as the interest rate changes, it is possible that autonomous spending can change without a change in the interest rate. This will happen if there is a shift in the rate-of-return line to the right or the left: if firms and households become more optimistic about the expected payoffs of additional purchases, then for any unchanged interest rate, they will be prepared to spend more ($I_p + a$). This explains why business and consumer sentiment is measured and published, by, for instance, the Westpac/National Institute confidence series.

4. The IS Curve

The *IS curve* is the schedule that identifies the combinations of income (Y) and the interest rate at

which the commodity market is in equilibrium; at all points along the IS curve the demand for commodities (goods and services) equals the supply.

Total planned autonomous spending (A_p) depends on the interest rate. The total level of real GDP and real income (Y) depend on the total level of planned autonomous spending. So total real GDP and real income must depend on the interest rate. The IS curve shows the different possible combinations of the interest rate and real income compatible with a given state of confidence and a given marginal propensity to save (s).

4.1 Deriving the IS curve

[See Gordon's Figure 3-8.] The "A_p line" shows the demand for planned autonomous spending at different levels of the interest rate, as in the rate-of-return line above. (Assume here no government spending, tax revenue, or net exports, so $A_p \equiv I_p + a$.)

For any level of the interest rate, there is a level of A_p. In turn, as we have seen, for any level of A_p there is an equilibrium level of real income (Y):

$$Y = \frac{A_p}{\text{marginal leakage rate}} = \frac{A_p}{s}$$

The only difference between this model and the simple model of the last chapter is that, instead of taking the changes in planned autonomous spending as given, interest rates are now specified as the cause of these changes.

4.2 What the IS curve shows

The IS curve plots the relationship between the interest rate (r) and the equilibrium level of real income (Y), for a given marginal propensity to save (s) and so a given multiplier (k).

"Equilibrium" means that income equals planned spending, or that the economy's market for goods and services clears (no gluts and no shortages, or no unintended inventory investment I_u, positive or negative). At any point off the IS curve, the economy is out of equilibrium.

To tie the A_p line down, define A_0 as the value of planned autonomous spending that would take place at an interest rate of zero. (In the figure above $A_0 = 75$.) If interest rates had no effect on autonomous spending, then the A_p line would be vertical.

5. Shifting and Tilting the IS Curve

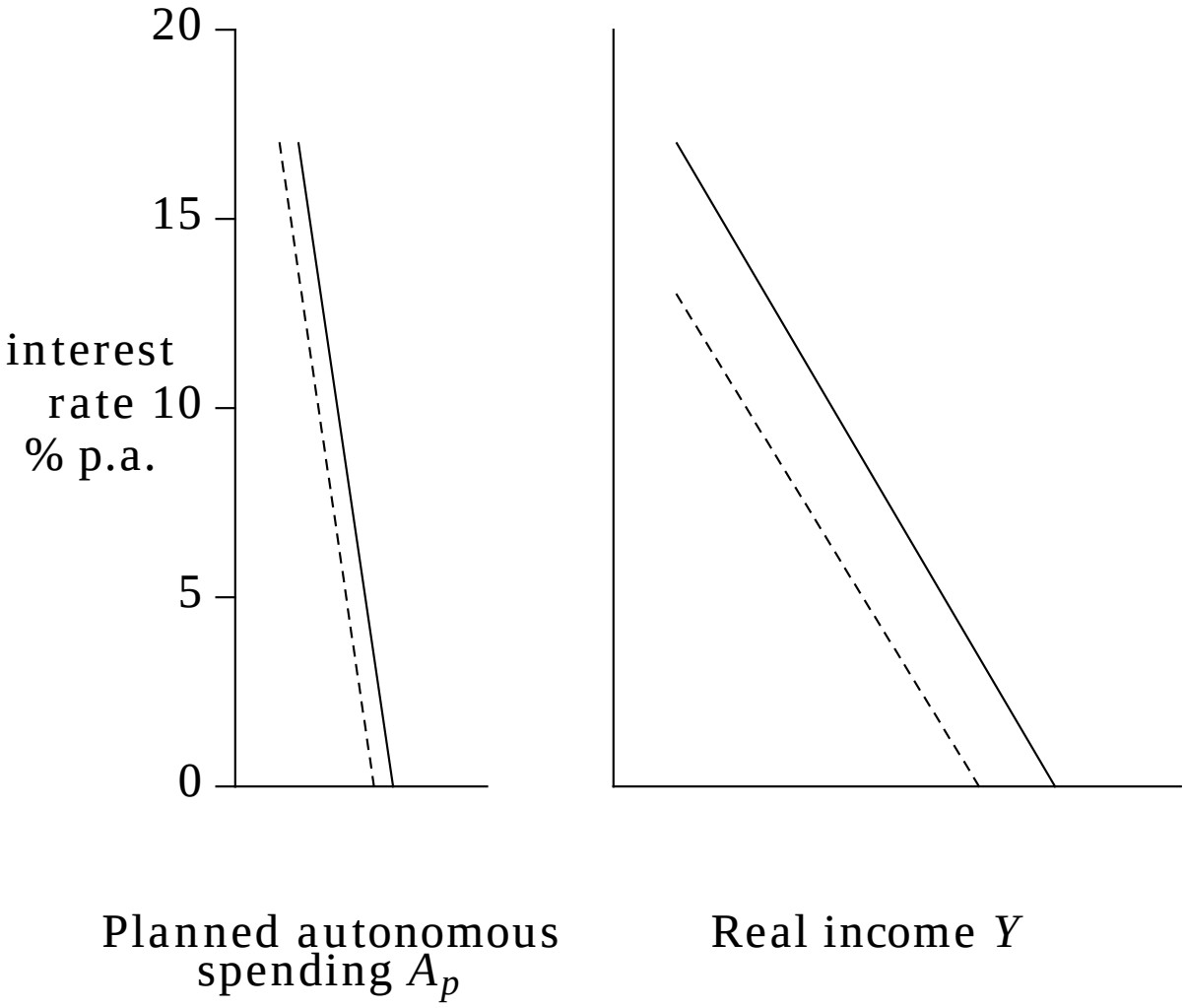
Note that despite its name, the IS curve has no unique connection with investment I or saving S.

The IS curve is downwards-sloping because a lower interest rate raises A_p, and a higher level of A_p raises equilibrium Y by k times as much.

5.1 What moves the IS curve?

- Anything that changes A_0 will *shift* the IS curve, such as changes in G, in tax rates, or in NX, as well as changes in confidence.
- Anything that changes the multiplier (k) will *rotate* the IS curve.

5.1.1 Confidence: If firms and households become more optimistic and choose to spend more at any given interest rate, then both the A_p line and the IS curve will shift.



In the figure the old A_p and IS lines are dashed, and the new ones — reflecting a higher level of confidence — are solid. With a multiplier of 4, an increase of A_0 of 12.5 is translated to a increase in Y at the intercept of 50, since this is equal to kA_0.

5.1.2 Government actions: Consider a \$12.5 billion increase in government spending (G). This raises planned autonomous spending by \$12.5 billion, which has the effect of shifting the A_p line and so the IS curve as above.

Indeed, *any* event which increases A_p for a given interest rate will cause a similar shift in the IS curve: an increase in business or consumer confidence, an increase in government spending, a reduction in autonomous tax revenue,a or an increase in autonomous net exports.

5.1.3 The multiplier: The IS curve will rotate (its slope will change) if the marginal leakage rate MLR (the marginal propensity to save s in the simple model) changes. For instance, an increase in s will reduce the multiplier ($k = 1/MLR$), thus rotating the IS curve clockwise for any given A_p line and any given level of A_0.

More generally, the marginal leakage rate is $[s(1 - t_0) + t_0 + n_0]$, and so the multiplier is also reduced by an increase in t_0 or in n_0. The position of the IS curve depends on both k and A_0.

5.2 What of points off the IS curve?

To the left of the IS curve, production is too low, there is undesired inventory decumulation, and *excess demand for commodities*. To the right, the opposite.

5.3 What changes the slope of the IS curve?

Spending responsiveness is the dollar change in planned autonomous spending (A_p) divided by the percentage-point change on the interest rate which causes it, or $-\Delta A_p/\Delta r$. In the previous chapter, with no interest rate effect, this was zero, but as seen in the figure above, it is now positive.

The IS curve becomes flatter either when k becomes larger or when A_p responsiveness

increases.

5.4 Scope for government

Two main questions:

- Will A_0 be at the right level to set actual GDP equal to its desired level (natural real GDP)? If not, can A_0 be influenced by government?
- Will the interest rate (r) be at the right level to achieve the desired level of income? If not, can r be influenced by government?

It's important to note that there is no single relationship between interest rate and income, despite the negative relationship of the IS curve: the particular relationship depends on which part of the economy is being examined. The IS curve represents the relationship between r and Y in the market for commodities, but another relationship also exists, because the *demand for money* also depends on both r and Y.