III Potential GDP and the Business Cycle

We now begin our discussion of business cycles, chapter 11.

**Definition 58** POTENTIAL GDP is the economy’s long run growth trend for real GDP.

**Definition 59** The BUSINESS CYCLE are short term deviations of GDP from potential GDP.

Real GDP fluctuates above and below potential. In order for this to happen, we must have increases in labor, capital, or technology. We are looking at the supply side of booms and recessions. Given that GDP is above or below potential, which of labor, capital, or technology is changing?

A Total hours

The total population evolves in a rather stable way, but we can still have fluctuations in total hours worked:

- Cyclical unemployment. As we saw earlier, demand for labor rises in a boom and thus unemployment falls.

- Fluctuations in hours per person. Demand for labor can raise the real wage and thus increase hours. About 2/3 of hours fluctuations is due to the EXTENSIVE MARGIN: retirees and others not participating will jump in if wages are good enough. 1/3 is due to the INTENSIVE MARGIN. People working overtime and the like.
B Capital

The capital stock changes slowly from year to year, but utilization rates fluctuate.

**Definition 60** *CAPACITY UTILIZATION is the percent of capital being used.*

Normal capacity utilization is about 80%. In booms 90% and in recessions 70%. Normal capacity utilization is analogous to the natural rate. Currently, capacity utilization in April 2010 is 73.7%, up from 69.2% a year ago, but a long way still from the normal of 80%.

C Technology

Technology may also rise and fall. Increases in technology correspond to new inventions. Decreases in technology are usually attributed to disasters such as hurricanes and floods.

**Definition 61** *REAL BUSINESS CYCLE THEORY (RBC) attributes booms and recessions to changes in technology.*

Criticisms of RBC:

1. ‘Loss’ of technology is difficult to understand. Do hurricanes really reduce output? Hurricanes might have too small of an effect to really change economy wide real GDP.
2. Technology grows too smoothly to account for all of the short run business cycle volatility.

IV Potential GDP and Inflation

Note for later: a change in inflation does not affect $N$, $K$, or $T$ and thus does not affect the long term growth rate.

No substitution effects: As the price of tomatoes rises, firms stop producing carrots and produce more tomatoes (increased supply). On the other hand, consumers demand less tomatoes and start consuming carrots. In macro, there are no substitution effects. A price increase is typically an increase in the price of all goods, one cannot substitute to another good that is lower priced.
I Sources of Aggregate Demand (chapter 11)

Definition 62 AGGREGATE DEMAND (AD): is the relationship between real GDP demanded and inflation.

Aggregate demand is much different than micro demand.

• No substitution effects. All goods are in the GDP. When the price of tomatoes goes up and we buy carrots, the GDP is unchanged and aggregate demand does not fall.

• We are talking about real variables. Why should changes in a price index affect real things?

Sources of AD:

\[ Y = C + I + G + X - M \]  

(70)

AD is the sum of consumption demand, investment spending demand, government spending demand, and net export demand. Aggregate demand looks at GDP from the spending side (expenditure approach). Let us look at each component of demand individually. We will see that several components of expenditures are affected by interest rates. In turn, interest rates are affected by inflation which will lead to the downward sloping AD curve. Hence the ‘substitution’ will be between consuming and saving rather than consuming one good or another.

A Consumption Demand

Definition 63 CONSUMPTION: Purchase of finished goods and services by households.

1 Income and Consumption Demand

Even those with no income consume something. Let that amount of consumption be denoted by \( a \). Then suppose that we consume \( b \) units for each dollar of income. We then have the consumption function:

\[ C = a + bY \]  

(71)
Definition 64 The marginal propensity to consume (MPC) is the fraction of income spent on consumption.

The MPC may also be calculated via the slope formula:

\[ b = \frac{\Delta C}{\Delta Y} \]  

(72)

The MPC as shown above is about 0.6.

2 Taxes and Consumption Demand

In reality consumption depends on DISPOSABLE INCOME \( (Y^D) \): Income after all taxes and transfers.

\[ Y^D = Y - T + TR \]  

(73)

The standard consumption function proposed by Keynes in 1936:

\[ C = a + bY^D \]  

(74)

The after tax mpc is typically around .95. So of the 40 cents not consumed, about 37 cents goes to taxes and only about 3 cents is saved. See graph.

3 Interest Rates and Consumption

The income not used for consumption is saved. As interest rates rise, consumers save more and consume less.

Figure 19: Consumption as a function of interest rates.
4 The Spending Balance

An increase in $C$ causes and increase in income for someone via:

\[ Y = C + I + G + X - M \]  \hspace{1cm} (75)

We also know that an increase in $Y$ generates an increase in $C$ via the consumption function:

\[ C = a + bY^D \]  \hspace{1cm} (76)

So an increase in $C$ results in an increase in $Y$ which results in an increase in $C$..... Where does it end?

Examples:

1. Tax cut. One might be tempted to think a $100 tax cut generates $95 in extra $C$ and therefore $95 in income, which is the benefit to the GDP. But instead we must trace out the entire effect: that $95 in income increases someone else’s consumption, which generates more income and so on.

2. Superbowl and the Miami economy. Purchases are made by tourists generating income for the local economy, but also income for the local economy generates more consumption at restaurants, which generates income for restaurant employees and owners, which generates income for coffee shops, where the employees hang out, etc.

3. Company locating a new plant in a community.

Here is how we do it graphically. First plot spending as a function of income.
Figure 20: Keynesian Cross Diagram.

Now suppose we have zero income. According to the consumption function $a$ is spent. Even college students with no income have some spending.

Figure 21: Convergence to Spending Balance.

Here is how to do it mathematically. Combine these two equations:

\[ C = a + bY \]  \hspace{1cm} (77)

\[ Y = C + I + G + X - M \]  \hspace{1cm} (78)

\[ Y = a + bY + I + G + X - M \]  \hspace{1cm} (79)
\[ Y = \frac{1}{1 - b} (a + I + G + X - M) \]  

(80)

So to compute the final change in income from a change in spending, multiply by \( \frac{1}{1 - b} \). If the superbowl generates $5 million in spending, and the MPC is 0.5, then we have $5 \times \frac{1}{1 - 0.5} = $10 million increase in income at the end of the day. This is because the $5 million that is spent generates $5 million in income for local merchants, who spend the money, which generates more income, and so on.

5 Forward Looking Models of Consumption Demand

One might question the idea that the MPC does not change with income. Your professor’s MPC was greater than one in his college years, now it is less than one. For some reason, his MPC changed.

**Definition 65** *CONSUMPTION SMOOTHING*. People borrow when income is low and save when income is high because they prefer consumption to be stable over time.

Examples:

1. Students consume more than their income via college loans and repay the loans after college.

2. workers save for retirement.

3. Waiters or other workers with erratic income have relatively stable consumption.

Including consumption smoothing makes the model more realistic, but also harder to work with. The predictions of a model with consumption smoothing are similar to a model with a constant MPC, except when income changes are temporary.

Two models of consumption that feature consumption smoothing are the permanent income hypothesis (due to Milton Friedman) and the life cycle hypothesis (due to Francis Modigliani).

**Definition 66** The *PERMANENT INCOME HYPOTHESIS* proposes that individuals will spend a proportion of the present value of their expected lifetime consumption.

Suppose we live for \( N \) years. Then:

\[ PV = \sum_{t=1}^{N} \frac{Y_t^d}{(1 + r)^t} \]  

(81)
\[ C_t = bPV \quad \text{for all } t \] (82)

Suppose you as students will live for 60 more years. Add up the present value of your lifetime income over 60 years, and divide by 60. This is how much you consume each year, borrowing or saving if income is to low or too high. Your consumption is then perfectly smooth.

Consider now an unexpected change in income. If the change is one time or temporary, consumption will change very little relative to the change in income, because you have to save most of the change to keep consumption smooth. On the other hand, if the change in income is permanent, most of the change can be spent.

Example: a 20 year old waiter gets an unexpected extra $100 in tips one night. He expects to live 50 more years. Ignoring interest, he would consume \( \frac{100}{50} = \$2 \) per year for the rest of his life. Thus he must save \$98 of the \$100 and only consumes \$2. Consumption increases only slightly and the rest of the income is saved.

Suppose instead the waiter got a job at a more expensive restaurant that paid on average \$100 more per year. Over his lifetime, he earns an extra \( 100 \cdot 50 = \$5,000 \). Dividing by 50, we see that his consumption rises by \$100. He consumes all of the increase in current income. Consumption stays smooth because he can consume more in the future with future earnings.

Thus the permanent income hypothesis predicts that a temporary tax cut or tax rebate will cause little change in spending. Permanent tax rate cuts will change spending significantly, however.

**Definition 67** The LIFE CYCLE HYPOTHESIS says that consumption is related to our situation in life, whether we are growing, working, or retired.

During our student years we borrow against future expected income (negative saving \( MPC > 1 \)). During our working years we save (\( MPC < 1 \). Finally, during our retired years we spend our saving (again negative saving \( MPC > 1 \)). Furthermore, another implication is that we smooth consumption. When our income is low we go into debt, but when our income is high we save more.

The life cycle model also implies temporary income changes will have little effect on spending. From this point on, we will use the model with a constant MPC, taking care to make clear that income changes we are thinking about are permanent.

**Definition 68** The CONSTANT MPC MODEL says households consume a constant fraction \( b \) of current income.
B Investment Demand

1 Interest rate

The primary determinant of investment spending demand is the interest rate. Recall our definition of savings implies housing and purchases of new plants and equipment are done with borrowed money. If interest rates fall, then buying new houses plants and equipment is cheaper, and so investment spending rises.

2 Taxes

Taxes on investment reduce investment spending. These include:

1. Changes in Depreciation allowance.
2. Investment tax credits.
3. Capital Gains tax cut.

3 Expectations

An important factor in the decision to start a new business or expand an existing one is the economic outlook. If the economy is doing well and people have lots of income to spend, they are more likely to spend money on a new product. Similarly, before purchasing a new house, buyers think about the economic outlook: is there a chance they will be laid off, for example? Thus increased confidence increases investment spending. Expectations are quite volatile, which Keynes called “animal spirits.”

C Government Spending Demand

Government spending is determined primarily by the demand for public goods: National defense, roads, schools, etc. Our assumption is that the provision of public goods does not depend on the interest rate.

Definition 69 A POLICY VARIABLE is a variable under control of the government.

$G$ is a policy variable. The government may raise or lower $G$ in an attempt to improve the performance of the economy.
D Net Export Demand

If domestic interest rates rise, our investments become more attractive to foreigners. Thus foreigners demand our dollars to buy our assets:

![Diagram showing the foreign exchange market and shifts in demand and supply curves due to an increase in interest rates.](image)

Figure 22: Effect of an increase in $r$ on the foreign exchange market.

The shift (labeled ‘1’ on the graph) is caused by the increase in interest rates. To maintain equilibrium the nominal exchange rate $E$ must rise. It now takes more foreign dollars to buy 1 US dollar. The value of the dollar rises. A higher exchange rate implies that US exports are more expensive and US imports are cheaper. Thus exports fall (2a on the graph), and imports rise (2b on the graph). Thus net exports fall. In effect, foreigners buy more US assets and less US goods. The increase in US asset purchases are traded for imports.

Overall we have:

$\uparrow R \Rightarrow \uparrow E \Rightarrow \downarrow X \uparrow M \Rightarrow \downarrow (X - M)$ \hfill (83)

All three effects of an increase in interest rates:
Consumption falls, because savings is more attractive (labeled ‘1’ on the graph below). Investment spending falls, because it is more expensive to borrow to buy new houses and new businesses (‘2’ on the graph). Net exports fall because the increased demand for US assets and driven up the exchange rate, making exports more expensive and imports cheaper (‘3’ on the graph). These are all shifts of the spending line, because they are caused by \( r \) changing, not \( Y \).

Next the decline in spending means store owners and workers have less income (‘4’ on the graph), which means store owners and workers spend less (‘5’ on the graph), and so on until we converge to the new equilibrium with lower \( C, I, X - M, Y \), and spending.

II Aggregate Demand and Inflation

Recall, it is NOT TRUE that inflation makes things more expensive, so aggregate demand falls. Aggregate demand includes all goods, so we cannot substitute to a lower priced good when prices rise. Instead, we will see that inflation affects interest rates, which in turn affects aggregate demand.

Two ideas exist for how inflation affects interest rates.

A Taylor Rules

According to this idea, the FED’s primary goal is to keep inflation at some target level. When inflation rises above the target level, the FED reduces the money supply and increases interest rates (recall \( MV = PY \), so a decrease in the growth of \( M \) reduces inflation). If inflation is
below the FED’s target, the FED will increase the money supply and lower interest rates.

**Definition 70** TAYLOR RULE. *A formula for determining the FED’s policy on \( M \) and \( r \) from macroeconomic conditions.*

Our rule is very simple, it depends only on one macro variable, the inflation rate. The FED sometimes claims to have no rule: it votes periodically to decide what to do about interest rates. But studies have shown FED behavior is very similar to a rule. Thus:

\[
\uparrow \pi \rightarrow \text{FED raises } r \rightarrow \downarrow C, I, X - M \rightarrow \downarrow AD
\]

So aggregate demand is downward sloping.

**B Liquidity idea**

According to this idea an increase in inflation causes households to hold less cash (in wallets and checking). Why hold cash when it is quickly losing value? Less checking accounts in turn means banks have less cash to loan out which reduces the supply of loans and raises \( r \). Same effect, different cause.

**III Equilibrium**

Let’s put everything together.

**A Potential GDP**

Long run production depends only on capital, labor, and technology, not inflation. Remember that on average the economy grows by about 2 percent per capita per year.
B Inflation Adjustment Line

How does production change in the short run in response to change in aggregate demand? In response to an increase in AD, firms may either raise prices or increase production. Our assumption is that in the short run, firms increase production and do not raise prices, because of:

1. Menu costs: costs to quickly changing prices, associated with printing new menus and catalogs.

2. Contracts: some prices are fixed by contract for a period of time.

Firms increase production in the short run by increasing capacity utilization (running factories more hours or bringing idle factories on line) and by hiring extra workers, which decreases unemployment.

Definition 71 INFLATION ADJUSTMENT LINE (IA). Short run aggregate supply curve.
C Short run equilibrium

Aggregate Demand: increased inflation causes the FED to raise $R$. Increased $R$ causes lower $C, I, X - M$.

Together we have a short run equilibrium where:

- Equilibrium exists in that $\pi$ is such that the short run supply of goods equals aggregate demand.
• Equilibrium exists in that \( r \) balances demand and supply of loans.

• Equilibrium exists in that \( E \) is such that supply equals demand in the foreign exchange market.

• Equilibrium exists in that the quantity of labor demanded is set at the wage floor.

• Spending, Income, and short run production are equal.

D Proof of Long run equilibrium

We also have a long run equilibrium where:

• Long run aggregate supply equals aggregate demand.

Suppose potential GDP exceeds aggregate demand. GDP is below potential and hence the economy is in a recession:

![Figure 27: Short run equilibrium with short run aggregate supply equal to aggregate demand.](image-url)

In this case capacity utilization is low and unemployment is high. Firms have an incentive to cut prices and increase production, since it is relatively cheap to bring some factories online and produce more goods. This causes the inflation adjustment line to shift down ('1' on the graph below):
Inflation falls, so the FED is less concerned about inflation and lowers $r$. But then $C$, $I$, and $X - M$ rise, increasing aggregate demand up to potential ('2' on the graph). The process continues until we reach a point where aggregate demand is at potential.

### E Recessions and Booms

Suppose a reduction in aggregate demand.
Always start in a long run equilibrium (point 1 on the graph). Suppose AD shifts to the left (point 2 on the AD-AS graph). Spending falls, which means less income for store owners and workers, which means store owners and workers reduce consumption, and so on. Income and spending fall to point two on the Keynesian Cross Diagram. Note that point 2 on the AD-AS graph represents the entire fall in AD, including both the initial reduction and subsequent reductions due to the fall in income. On the supply side, firms do not raise prices but reduce capacity and hiring, causing higher unemployment. GDP growth is below potential, so the economy is in a recession (point 2 on the GDP graph). Point two indicates the economy is in a short run equilibrium, since the IA line intersects the AD line (SR AS=AD).

In the long AD is less than long run aggregate supply or potential GDP. Firms have surplus capacity and workers, and will thus lower prices. The IA line thus shifts down. The FED responds to the lower inflation by decreasing interest rates. Consumption (savings is less attractive), Investment spending (cheaper to borrow for a new house), and Net Export
spending (decrease in $r$ reduces demand for dollars, decreasing the nominal exchange rate, making US exports cheaper and US imports more expensive, raising net exports) rise in response. Spending rises, which generates more income, more consumption spending, and so on. Eventually we end up at point 3, and the economy recovers from the recession.

IV Application: Fiscal Policy

A Increase in Government Spending, financed by borrowing

The increase in $G$ has to come from somewhere. The government borrows it from a consumer. The consumer only spends a part ($b$) of the income, whereas the government spends all of it. Thus spending goes up.

The increase in spending is not caused by a change in inflation. Therefore, we shift AD to the right (point 2 on the AD-AS graph).

![Graph showing the impact of government spending on the economy](image)

Figure 30: Increase in government spending, financed by borrowing.
In the short run, the increase in $G$ causes an increase in spending, which causes more income for stockholders and workers. This causes an increase in $C$ by the store owners and workers (point 2 on the Keynes cross diagram). Firms increase capacity and hire more workers, this is a boom and the economy is in a short run equilibrium (point 2 on the AD-AS graph).

In the long run, firms will see costs rise due to high capacity and difficulty finding workers. Inflation rises. The FED responds by raising interest rates. Consumption (savings is more attractive), Investment spending (more expensive to borrow for a new house), and Net Export spending (rise in $r$ increases demand for dollars, increasing the nominal exchange rate, making US exports more expensive and US imports cheaper, lowering net exports) fall in response. Spending falls, which generates less income, less consumption spending, and so on. Eventually we end up at point 3, and the economy returns to potential after the boom. Overall,

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Table 1: An increase in government spending, financed by borrowing

Notice that the long run part of the table is relative to the initial position, not relative to the short run.

The difficult one here is the short run behavior of $C$. The government borrows $\delta G$ from consumers. However, households current income is unchanged. So, despite the increase in borrowing, households still consume $b \cdot Y$ and just moves savings from loans to private consumers and firms to government loans. Consumption then increases as incomes rise from the increase in $G$.

In the long run, income is back to potential, so there is no effect of a change income on $C$. We do have the effect of the increase in interest rates reducing $C$. So $C$ falls in the long run.

**Definition 72 CROWDING OUT.** Government spending tends to replace private spending.

In the short run, an increase in $G$ can cause a boom, but in the long run, an increase in $G$ simply replaces private spending.

**Definition 73 TWIN DEFICITS.** Budget deficits cause trade deficits.
Here the twin deficits occurs because the increase in $G$ caused the budget deficit. The government had to increase borrowing, and the rise in $r$ caused a rise in $E$ which made US exports more expensive and imports cheaper, worsening the trade deficit.

B Permanent increase in income taxes, financed by less borrowing

The increase in taxes comes from household income, in the form of reduced consumption and savings. The government saves all of the tax increase, thus overall spending falls.

The decrease in spending is not caused by a change in inflation. Therefore, we shift AD to the left (point 2 on the AD-AS graph).

Figure 31: Permanent increase in income taxes, financed by less borrowing.

In the short run, the increase in $T$ causes a decrease in consumption spending, which causes less income for stockholders and workers. This causes a further decrease in $C$ by the store owners and workers (point 2 on the Keynes cross diagram). Firms decrease capacity and fire workers, this is a recession and the economy is in a short run equilibrium (point 2.
In the long run, firms will see costs fall due to low capacity and surplus of workers. Inflation falls. The FED responds by lowering interest rates. Consumption (savings is less attractive), Investment spending (less expensive to borrow for a new house), and Net Export spending (fall in $r$ decreases demand for dollars, decreasing the nominal exchange rate, making US exports less expensive and US imports more expensive, raising net exports) rise in response. Spending rises, which generates more income, more consumption spending, and so on. Eventually we end up at point 3, and the economy returns to potential after the recession. Overall,

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Table 2: Permanent increase in income taxes, financed by less borrowing.

Notice that consumption changes for 3 reasons: taxes are up (down), income is down and then up (neutral), and because interest rates fall (up). Since income returns to potential, there is no long run income effect on consumption. Since income remains the same, and $I$ and $X - M$ are up, we must have $C$ decreases because $Y = C + I + G + X - M$.

### C Increase in Government Spending, financed by an increase in taxes

Overall spending still rises, because the government spends all of the increase in taxes, while the consumer only spends a fraction. The increase in spending is not caused by a change in inflation. Therefore, we shift AD to the right (point 2 on the AD-AS graph).
Figure 32: Increase in government spending, financed by higher taxes.

In the short run, the increase in $G$ more than offsets the decrease in $C$ which causes an increase in spending, which causes more income for stockholders and workers. This causes an increase in $C$ by the store owners and workers (point 2 on the Keynes cross diagram). Firms increase capacity and hire more workers, this is a boom and the economy is in a short run equilibrium (point 2 on the AD-AS graph).

In the long run, firms will see costs rise due to high capacity and difficulty finding workers. Inflation rises. The FED responds by raising interest rates. Consumption (savings is more attractive), Investment spending (more expensive to borrow for a new house), and Net Export spending (rise in $r$ increases demand for dollars, increasing the nominal exchange rate, making US exports more expensive and US imports cheaper, lowering net exports) fall in response. Spending falls, which generates less income, less consumption spending, and so on. Eventually we end up at point 3, and the economy returns to potential after the boom. Overall,
Table 3: An increase in government spending, financed by higher taxes

The hard one here is the short run change in $C$. Suppose government spending rises by $\Delta G$. Then taxes also rise by $\Delta G$, so consumption falls by $b \cdot \Delta G$ (the rest was moved from saving to government consumption). Now $C$ rises due to the increase in income. Income rises one for one with spending, so income rises by $(1 - b) \Delta G$. So spending rises by $b \cdot (1 - b) \Delta G$. In general:

$$\Delta C = b \cdot (1 - b) \Delta G + b^2 \cdot (1 - b) \Delta G + \ldots - b \Delta G$$  \hspace{1cm} (84)

$$= b \frac{1 - b}{1 - b} \Delta G - b \Delta G = 0$$  \hspace{1cm} (85)

So consumption is constant in the short run.

V Application: Monetary Policy

Suppose the FED decides to TARGET A HIGHER INFLATION RATE. At the current equilibrium, the the interest rate is just low enough to generate the given inflation rate $\pi$. To raise the inflation rate, the FED must reduce interest rates. By loaning printed money in the FED Funds market, the money supply rises and the FED Funds rate falls.

The FED is lowering $r$, but not because of a change in $\pi$. Therefore, we shift AD to the right (point 2 on the AD-AS graph).
In the short run, the decrease in $r$ causes an increase in $C$, $I$, and $X - M$. Thus spending rises and $AD$ rises. This causes more income for stockholders and workers. This causes an increase in $C$ by the store owners and workers (point 2 on the spending diagram). Firms increase capacity and hire more workers, this is a boom and the economy is in a short run equilibrium (point 2 on the AD-AS graph).

In the long run, firms will see costs rise due to high capacity and difficulty finding workers. Inflation rises. The FED responds by raising interest rates. Consumption (savings is more attractive), Investment spending (more expensive to borrow for a new house), and Net Export spending (rise in $r$ increases demand for dollars, increasing the nominal exchange rate, making US exports more expensive and US imports cheaper, lowering net exports) fall in response. Spending falls, which generates less income, less consumption spending, and so on. Eventually we end up at point 3, and the economy returns to potential after the boom. Overall,
In the long run, only inflation is affected by the change in FED policy.

**Definition 74**  *NEUTRALITY OF MONEY.* Changes in monetary policy do not affect real variables.

Inflation is a nominal variable so the model implies money is neutral in the long run but not in the short run.

Now a loose monetary policy has short run benefits (an increase in $Y$), but long run costs (an increase in $\pi$). Thus the model predicts that an independent central bank with a longer term view should propose lower inflation than a central bank which is less independent. See graph.

There is evidence for the long run neutrality of money (see graphs), long run growth and money supply are relatively uncorrelated across countries.

Interest rates were below the Taylor rule for 2002-6. The extra low interest rates seemed to result in a misallocation of capital and labor to the housing industry. When interest rates subsequently rose, the housing market collapsed. Because so many resources were locked into housing, growth suffered.

**VI  Application: Price Shock**

Suppose an increase in the price of oil increases the price of most goods. This is called a positive price shock in that prices go up, even though it is a bad thing.

The FED responds to the increase in $\pi$ by raising $r$. Therefore, we move along AD to point 2 on the AD-AS graph.

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Table 4: An increase in the inflation target.
In the short run, the increase in $r$ causes a fall in $C$, $I$, and $X - M$. Thus spending falls and $AD$ falls. This causes less income for stockholders and workers. This causes a fall in $C$ by the store owners and workers (point 2 on the spending diagram). Firms decrease capacity and hire less workers, this is a recession and the economy is in a short run equilibrium (point 2 on the AD-AS graph).

In the long run, $AS > AD$ so inflation falls. The FED responds by lowering interest rates. Consumption (savings is less attractive), Investment spending (less expensive to borrow for a new house), and Net Export spending (fall in $r$ decreases demand for dollars, decreasing the nominal exchange rate, making US exports less expensive and US imports more expensive, raising net exports) rise in response. Spending rises, which generates more income, more consumption spending, and so on. Eventually we end up at point 3, and the economy returns to potential after the recession. Overall,
Table 5: A price shock.

In the long run, nothing changes, but price shocks can be unpleasant in the short run.

Definition 75 STAGFLATION. Simultaneous high inflation and a recession

The model predicts a price shock causes stagflation in the short run.

VII Application: Counter-Cyclical Policy

Since the 1960s and especially since 1980, the average length of a recession is less than a year. Previously (eg. the great depression) it was not uncommon to have recessions lasting 3 years or more. Can the government act to smooth the business cycle?

A Counter-Cyclical Monetary Policy

Definition 76 COUNTER CYCLICAL POLICY. Changing government policy so that spending moves in the opposite direction as GDP.

Suppose a fall in business expectations. FED uses a counter cyclical policy of increasing the inflation target. The fall in expectations leads to a fall in investment spending, which causes a fall in income, and thus a fall in consumption. Overall, spending and income fall. Firms respond by decreasing capacity and firing workers, leading to higher unemployment (point 2 on the graphs). The economy is in a recession.
Figure 35: Counter Cyclical Monetary Policy.

The FED now responds in the short run. The FED raises the inflation target or lowers $r$ regardless of $\pi$. Therefore, we shift AD to the right. Suppose the FED is precise enough to increase $Y$ back to its original level. Then, $C$, $I$, and $X - M$ rise, income rises, causing $C$ to rise. Capacity and unemployment return to normal (point 2b on the AD-AS graph).

In the long run, $AD = AS$ so no inflation adjustment occurs. The economy pulls out of a recession in the short run rather than the long run. The FED has dampened or smoothed the business cycle (2b not 3 on the GDP graph). Overall,

<table>
<thead>
<tr>
<th>Y</th>
<th>C</th>
<th>I</th>
<th>G</th>
<th>X - M</th>
<th>r</th>
<th>$\pi$</th>
<th>cap</th>
<th>$u$</th>
</tr>
</thead>
<tbody>
<tr>
<td>SR</td>
<td>↓</td>
<td>↓</td>
<td>↓</td>
<td>-</td>
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<td>-</td>
<td>↓</td>
<td>↑</td>
</tr>
<tr>
<td>LR</td>
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<td>↑</td>
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<td>-</td>
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</tr>
</tbody>
</table>

Table 6: Counter Cyclical Monetary Policy.
We have a fall in consumption due to a fall income, followed by a rise in consumption due to a rise in income. These effects cancel. Since consumption also goes up due to a decrease in $r$, overall $C$ increases. For $I$ we must use the tie breaker of $Y = C + I + G + X - M$. Since $C$ and $X - M$ rise, $I$ must fall.

B Counter Cyclical Fiscal Policy

We can also use $G$ and $T$ to smooth the cycle. Suppose the same recession due to a decrease in business expectations. The Government counters by increasing $G$. The fall in expectations leads to a fall in investment spending, which causes a fall in income, and thus a fall in consumption. Overall, spending and income fall. Firms respond by decreasing capacity and firing workers, leading to higher unemployment (point 2 on the graphs). The economy is in a recession.

The government now responds in the short run. $G$ rises. Therefore, we shift AD to the

Figure 36: Counter Cyclical Fiscal Policy.
right. Suppose the FED is precise enough to increase $Y$ back to its original level. Then, income rises, causing $C$ to rise. Capacity and unemployment return to normal (point 2b on the AD-AS graph).

In the long run, $AD = AS$ so no inflation adjustment occurs. The economy pulls out of a recession in the short run rather than the long run. The FED has dampened or smoothed the business cycle (2b not 3 on the GDP graph). Overall,

\[
\begin{array}{l|l|l|l|l|l|l|l}
 & Y & C & I & G & X - M & r & \pi & \text{cap} & u \\
\hline
\text{SR} & \downarrow & \downarrow & \downarrow & - & - & - & - & \downarrow & \uparrow \\
\text{LR} & - & - & \downarrow & \uparrow & - & - & - & - & - \\
\end{array}
\]

Table 7: Counter Cyclical Fiscal Policy.

We have a fall in consumption due to a fall income, followed by a rise in consumption due to a rise in income. These effects cancel.

These counter-cyclical policies must be both timed perfectly and have perfect magnitude. If the timing is too late or if the size of the recession is underestimated, the economy may overshoot the long run equilibrium, causing some long run inflation.

**Definition 77** AUTOMATIC STABILIZERS. Counter cyclical policies which take effect automatically.

Policies such as income taxes are automatic stabilizers. When income falls, households pay less taxes automatically.