Multiplier effect /1

***AD* function** $AD = C + I = (4 + 0.8 \cdot Y \quad \pi) + 10 =$

$$= 14 + 0.8 \cdot Y \quad \pi$$

***AS* function** $Y = 30 \cdot \pi$

Macroeconomic equilibrium condition $Y = AD$

- In equilibrium, $Y = 4 + 0.8 \cdot Y \quad \pi$, with $Y = 30 \cdot \pi$. Hence, $0.2 \cdot Y = 14 \quad \pi$. Amb $Y = 30 \cdot \pi$, $0.2 \cdot 30 \cdot \pi = 14 \quad \pi$. That is, $6 \cdot \pi = 14 \quad \pi$, so $\pi^* = 2$ is the equilibrium inflation rate. Given $\pi^* = 2$, the AS function yields the equilibrium production level $Y^* = 30 \cdot 2 = 60$.

Multiplier effect /2

- The impact on $Y*$ of a change in the AD function is the result of an expenditure multiplier effect.
- Since expenditure AD depends on income Y and, in equilibrium $Y = AD$, the sequence

$$\Delta AD \rightarrow \Delta Y \rightarrow \Delta AD \rightarrow \Delta Y \rightarrow \ldots$$

  is generated, so a change in AD multiplies itself.
- Example. Let the AD function only depend on C and I, so $AD = C + I$. Let I be constant. Specifically, $C = 4 + 0.8Y \quad \pi$ and $I = 10$ (the 0.8 is the marginal propensity c to consume: which fraction of an additional unit of income is consumed).

Multiplier effect /3

- The AS function is $Y = 30 \cdot \pi$. The macroeconomic equilibrium is obtained from the condition $Y = AD$. That is, $Y = 4 + 0.8 \cdot Y \quad \pi + 10$. Thus, $0.2 \cdot Y = 14 \quad \pi$. As $Y = 30 \cdot \pi$, $\pi = 2$ (π is a percentage).

- Imagine now that there is an increase in investment, from 10 to 17 (for instance, businessmen become more optimistic).

- To better illustrate the multiplier effect, assume that the inflation rate does not change and remains at 2% (it is as if the AS function were horizontal at $\pi = 2$: the economy absorbs any increase in planned expenditure without fuelling inflation).

Multiplier effect /4

- The state of the economy is described by equations $Y = AD$ and $\pi = 2$. Hence, $Y = 4 + 0.8 \cdot Y \quad \pi + 17 = 19 + 0.8Y$. That is, $0.2Y = 19$, so $Y = 95$.

- To sum up, expenditure has only been increased 7 units (from $I = 10$ to $I = 17$), but production and income have risen 35 units (from $Y = 60$ to $Y = 95$). This is caused by the <u>multiplier effect</u>. In this case, the multiplier is 5, which equals $1/(1 \quad c)$.

- When the AS function enters the picture, <u>part of the expenditure is transformed into inflation</u>. With $Y = 30 \cdot \pi$ and $AD = 4 + 0.8 \cdot Y \quad \pi + 17$, $\pi^* = 3$ and $Y^* = 90$ (inflation eats up 5 units of income).

Temporary shock

temporary shock on I

$\pi = 2$

time	Y	$C = 4 + 0.8 \cdot Y \quad \pi$	I	$AD = C + I$
0	60	$4 + 0.8 \cdot 60 - 2 = 50$	10	60
1	60	$4 + 0.8 \cdot 60 - 2 = 50$	17	$50 + 17 = 67$
2	67	$4 + 0.8 \cdot 67 - 2 = 55.6$	10	$55.6 + 10 = 65.6$
3	65.6	$4 + 0.8 \cdot 65.6 - 2 = 54.48$	10	$54.48 + 10 = 64.48$
4	64.48	$4 + 0.8 \cdot 64.48 - 2 = 53.58$	10	$53.584 + 10 = 63.58$
5	63.58	$4 + 0.8 \cdot 63.58 - 2 = 52.86$	10	$52.86 + 10 = 62.86$
. . .	. . .	. . .	10	. . .
∞	60	$4 + 0.8 \cdot 95 - 2 = 78$	10	$50 + 10 = 60$

$\Delta Y_2 = 7$

$\Delta Y_3 = 1.4$

$\Delta Y_4 = 1.12$

$\Delta Y_5 = 0.896$

equilibrium

Permanent shock

$\pi = 2$

permanent shock on I

time	Y	$C = 4 + 0.8 \cdot Y \quad \pi$	I	$AD = C + I$
0	60	$4 + 0.8 \cdot 60 - 2 = 50$	10	60
1	60	$4 + 0.8 \cdot 60 - 2 = 50$	17	$50 + 17 = 67$
2	67	$4 + 0.8 \cdot 67 - 2 = 55.6$	17	$55.6 + 17 = 72.6$
3	72.6	$4 + 0.8 \cdot 72.6 - 2 = 60.08$	17	$60.08 + 17 = 77.08$
4	77.08	$4 + 0.8 \cdot 77.08 - 2 = 63.66$	17	$63.66 + 17 = 80.66$
5	80.66	$4 + 0.8 \cdot 80.66 - 2 = 66.53$	17	$66.53 + 17 = 83.53$
...	...	...	17	...
∞	95	$4 + 0.8 \cdot 95 - 2 = 78$	17	$78 + 17 = 95$

$\Delta Y_2 = 7$

$\Delta Y_3 = 5.6$

$\Delta Y_4 = 4.48$

$\Delta Y_5 = 3.58$

multiplier effect

equilibrium

Shock with inflation adjustement

time	Y	$C = 4 + 0.8 \cdot Y \quad \pi$	I	$AD = C + I$	$\pi = \frac{Y}{3\ 0}$
0	60	$4 + 0.8 \cdot 60 - 2 = 50$	10	60	2
1	60	$4 + 0.8 \cdot 60 - 2 = 50$	17	$50 + 17 = 67$	2.23
2	67	$4 + 0.8 \cdot 67 - 2.23 = 55.37$	17	$55.37 + 17 = 72.37$	2.41
3	72.37	$4 + 0.8 \cdot 72.37 - 2.41 = 59.48$	17	$59.48 + 17 = 76.48$	2.54
4	76.48	$4 + 0.8 \cdot 76.48 - 2.54 = 62.64$	17	$62.64 + 17 = 79.64$	2.65
5	79.64	$4 + 0.8 \cdot 79.64 - 2.65 = 65.06$	17	$65.06 + 17 = 82.06$	2.73
...	...	...	17	...	...
∞	90	$4 + 0.8 \cdot 90 - 3 = 73$	17	$73 + 17 = 90$	3

multiplier effect

$\Delta Y_2 = 7$

$\Delta Y_3 = 5.37$

$\Delta Y_4 = 4.11$

$\Delta Y_5 = 3.16$

equilibrium