Econ 522: Intermediate Macroeconomics, Fall 2017
Business Cycle Problem Set 1: Expenditure \& the Keynesian Cross

1. Assume that the consumption function $\mathbf{C}$ is given by $C=300+0.75(Y-T)$, and that $I=100, G=100$, and $T=100$.
(a) Graph expenditure as a function of income.

Expenditure $E$ is made up of consumption $C$, government purchases $G$, and investment $I$ (referred to in the text as planned investment in the expenditure context). Described as an equation: $E=$ $C+I+G$. To find an expression for expenditure as a function of income, plug what's given into that equation. Doing this will allow you to eliminate all of the variables on the left hand side of the equation other than income $Y$.

$$
\begin{aligned}
& E=C+I+G \\
& E=300+0.75(Y-T)+I+G \\
& E=300+0.75(Y-100)+100+100 \\
& E=500+0.75 Y-(0.75) \times 100 \\
& E=500+0.75 Y-75 \\
& E=425+0.75 Y
\end{aligned}
$$

The equation for expenditure is in $y=m x+b$ form, where expenditure $E$ is the vertical axis variable, and income $Y$ is the horizontal axis variable. The vertical intercept is 425 , and the slope is 0.75 .

(b) Based on the consumption function given above and the definition of marginal propensity to consume, what does the marginal propensity to consume equal here?

The MPC is 0.75 .
(c) What is the equilibrium level of income $\left(Y_{e 1}\right)$ ? (Hint: write out the expenditure function, plugging in the information given above, then set it equal to $Y$, and solve for $Y$ ).

We have the expenditure function from part (a): $E=425+0.75 Y$. Set that equal to $Y$, and then solve for $Y$.

$$
\begin{aligned}
Y & =E=425+0.75 Y \\
Y & =425+0.75 Y \\
Y-0.75 Y & =425 \\
Y(1-0.75) & =425 \\
Y(0.25) & =425 \\
Y & =\frac{425}{0.25} \\
Y_{e 1} & =1,700
\end{aligned}
$$

(d) For the equilibrium level of income found in part (b), find disposable income ( $Y_{e 1}-T$ ), consumption $\left(C_{e 1}\right)$, and savings $\left(S_{e 1}\right)$. To find savings, assume all disposable income not used for consumption becomes private savings, and that the difference between tax revenue ( $T$ ) and government spending $(G)$ becomes public savings. Is savings equal to investment?

When $Y=1,700$ :
Disposable income $=Y-T=1,700-100=1,600$
Consumption $=300+0.75(Y-T)=300+0.75(1,700-100)=300+1,200=1,500$
Private Savings $=(Y-T)-C=1,600-1,500=100$
Public Savings $=T-G=100-100=0$
Total Savings $=$ Priv.S + Pub.S $=100+0=100$
Savings is equal to investment. ( $I=100$ was specified by the problem).
(e) Calculate the government spending multiplier and the tax multiplier.

The government purchases multiplier is: $\frac{1}{(1-M P C)}=\frac{1}{(1-.75)}=4$.
The tax multiplier is: $\frac{-M P C}{(1-M P C)}=-3$.
(f) If $G$ increases to 125 , what is the new equilibrium income?

Starting from $Y=1,700$, equilibrium $Y$ increases to 1,800 . This can be found by going through the through the same steps used in part (c), with $G=125$, or by applying the government purchases multiplier. The multiplier tells you that an increase in $G$ of 25 ( $G$ was 100 initially) increases $Y$ by $\$ 100$. Adding that 100 onto the original value of $Y(1,700)$ gives 1,800 .
(g) What level of $G$ would needed to get equilibrium income up to $\mathbf{2 , 0 0 0}$ ?

Again you can use the equilibrium income equation or the multiplier. Now though, you know what you want $Y$ to be and need to find the $G$ that gets you that $Y$. Using the original $Y$ and $G$ values, to get $Y$ equal to 2,000 , it needs to increase by $2,000-1,700=300$. The government purchase multiplier is 4 , indicating that government purchases would need to increase by 75 to get that increase in $Y$. The total level of $G$ needed is the initial level plus the increase, $100+75=175$.

