1. Describe the short-run and long-run effects of a decrease in the money supply on (a) the interest rate, (b) prices, (c) output, (d) investment, (e) the exchange rate, and (f) exports.

A decrease in the money supply ($M$) will cause the LM curve to shift to the left. This in turn causes a decrease in aggregate demand (AD shifts left) resulting in a lower output ($Y$) and lower price level ($P$). The lower price level somewhat offsets the decreased aggregate demand by shifting the LM curve slightly back toward it's original position (i.e., right). In the long-run, wages ($W$) will fall causing aggregate supply (AS) to increase (shift right). This increases output and further lowers the price level, once again shifting the LM curve to the right. Eventually the ratio between wage and price will return to its previous level (although at a lower price) to ensure full employment.

From the graphs, the interest rate ($i$), $P$, and $Y$ can be determined directly.

Investment ($I$) follows from the interest rate because $i\uparrow \Rightarrow I\downarrow$ and vice versa ($I' < 0$). The real exchange rate ($e$) is determined by the function $e(i - i^*)$. Since $e' < 0$, the real exchange rate will also move in the opposite direction as the interest rate (assuming $i^*$ is constant); in this case $i\uparrow \Rightarrow e\downarrow$. This determines the change in exports ($EX$) because having a falling exchange rate strengthens the dollar, hence lowering exports (i.e., $e\downarrow \Rightarrow EX\downarrow$ and vice versa). In order to find the nominal exchange rate, realize that $e = EP^*/P$. This can be rewritten $E = eP/P^*$. Assuming $P^*$ remains constant, $E\downarrow$ in the short-run because $e\downarrow$ and $P\downarrow$. In the long-run, $e$ is unchanged and $P\downarrow$ so $E\downarrow$. 
Summary: $M \downarrow \Rightarrow LM \downarrow \Rightarrow AD \downarrow \Rightarrow P \downarrow \Rightarrow LM \uparrow \Rightarrow W \downarrow \Rightarrow AS \uparrow \Rightarrow P \downarrow \Rightarrow LM \uparrow$

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\[ W/P \text{ or } F_N \]

\[ W_0/P_1 \]

\[ W_1/P_2 = W_0/P_0 \]

\[ Y_2 = Y \]

\[ Y_1 \]

\[ F(K,N) \]

\[ IS \]

\[ LM_1 \]

\[ LM_2 \]

\[ LM_0 = LM_3 \]

\[ P \]

\[ AS_0 \]

\[ AS_1 \]

\[ AD_0 \]

\[ P_0 \]

\[ P_1 \]

\[ P_2 \]

\[ Y_1 \]

\[ Y \]

\[ Y_1 \]

\[ Y_2 \]
2. Describe the short-run and long-run effects of a decrease in taxes on (a) the interest rate, (b) prices, (c) output, (d) investment, (e) the exchange rate, and (f) exports.

A decrease in taxes ($T$) effectively increases consumption ($C$) so it shifts the IS and AD curves to the right resulting in higher $P$. Output in this case can be viewed as increasing or remaining constant depending on the assumption of the shape of the AS curve. In order to be consistent with the other graphs, we'll assume suppliers can go beyond potential output in the short-run. The higher $P$ causes the LM curve to shift left. In the long-run $W$ will rise resulting in a similar sequence of events described in problem 1 (flip the green arrows). Determining the effects follows the same logic described in the second paragraph of problem 1.

Summary: $T \downarrow \Rightarrow IS \uparrow \Rightarrow AD \uparrow \Rightarrow P \Rightarrow LM \downarrow \Rightarrow W \uparrow \Rightarrow AS \downarrow \Rightarrow P \Rightarrow LM \downarrow$
3. Describe the short-run and long-run effects of an increase in the labor force on (a) the interest rate, (b) prices, (c) output, (d) investment, (e) the exchange rate, and (f) exports.

An increase in the labor force ($N$) increases potential output ($Y$) and shifts the vertical portion AS, but has no other effects in the short-run. In the long-run, $W$ will fall and the same sequence described in problem 1 will occur.

**Summary:** $N \uparrow \Rightarrow W \downarrow \Rightarrow AS \uparrow \Rightarrow P \downarrow \Rightarrow LM \uparrow$

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4. Describe the short-run and long-run effects of an increase in the demand for money on (a) the interest rate, (b) prices, (c) output, (d) investment, (e) the exchange rate, and (f) exports.

An increase in the demand for money \((L)\) will cause the LM curve to shift to the left. Everything else will now be the same as problem 1.

Summary: \(L \uparrow \Rightarrow LM \downarrow \Rightarrow AD \downarrow \Rightarrow P \downarrow \Rightarrow LM \uparrow \Rightarrow W \downarrow \Rightarrow AS \uparrow \Rightarrow P \downarrow \Rightarrow LM \uparrow\)

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5. Describe the short-run and long-run effects of an increase in the saving rate on (a) the interest rate, (b) prices, (c) output, (d) investment, (e) the exchange rate, and (f) exports.

An increase in the saving rate \( S \) effectively decreases consumption \( C \) so it shifts the IS and AD curves to the left. This mirrors problem 2 (flip the arrows over in the summary). The long long-run will have an increase in output (Solow Model).

**Summary:** \( S \uparrow \Rightarrow IS \downarrow \Rightarrow AD \downarrow \Rightarrow P \downarrow \Rightarrow LM \uparrow \Rightarrow W \uparrow \Rightarrow AS \uparrow \Rightarrow P \downarrow \Rightarrow LM \uparrow \)

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**Documentation**

Prof Bomberger helped me in many ways. He confirmed my hunch that problems 1 and 4 were basically the same. He confirmed that the causal flow in the summary for problem 1 was correct. He told me that \( Y \) could be treated as not changing or increasing depending on the assumption of the shape of AS in problem 2. He confirmed my hunch that there are no short-run effects to increasing the labor supply (problem 3). He discussed how to determine the effects on the exchange rate and exports. Jon Parker and J.C. Zannis both caught errors in problem 4.