Problem Set 3: Answer Key

1. An unexpected, temporary decrease in U.S. money supply (exchange rate between dollar and British pound).

   (a) Short-run Analysis:
   In the upper left panel of Fig. 4, the decrease in money supply is depicted as a leftward shift in the real money supply function from $MS^A$ to $MS^B$, causing an increase in nominal interest rates from $i^A$ to $i^B$. This rise shifts the DR curve upward in the upper right panel, from $DR^A$ to $DR^B$. Since the money supply change is temporary, traders do not revise their expectations regarding future deprecation rate of the dollar, leaving the FR curve unchanged at $FR^A$. Due to the shift in the DR schedule, the exchange rate falls from $E^A$ to $E^B$, a dollar appreciation. Since prices are sticky in the short run, the price level $P$ is fixed.
   
   Long-run Analysis:
   In the long-run, nominal money supply goes back to its original level since the decline in money supply was only a temporary one. The price level remains unchanged from its short-run level. As a result, the MS curve shifts back to its original position at $MD^A$ causing the interest rate to shift back to $i^A$, as shown in the lower left panel of Fig. 4. In the FX market, the DR curve shifts back to its original position at $DR^A$ causing the exchange rate to move back to its original value at $E^A$.

   (b) Short run changes:
   - US interest rate: increases
   - British interest rate: unchanged
   - $E$: falls (dollar appreciates against pound)
   - $E^e$: unchanged
   - US price level: fixed

   (c) Long-run changes (Long-run equilibrium C compared to short-run equilibrium B):
   - US interest rate: falls
   - British interest rate: unchanged
   - $E$: rises (dollar depreciates against pound)
   - $E^e$: unchanged
   - US price level: unchanged
Figure 1: Temporary decrease in money supply, short- and long-run analysis

\[ MS_B \quad MS_A \]

\[ \text{MB} \quad \text{E} \]

\[ i^B \quad i^A \]

\[ i^A = i^C \]

\[ MD^A \]

\[ \text{FR}^A \]

\[ DR^B \]

\[ DR^A \]

\[ E^B \quad E^A \]

\[ E^A = E^C \]
2. An unexpected, permanent increase in India’s money supply (exchange rate between Indian rupee and US dollar).

(a) Short-run Analysis:
In the upper left panel of Fig. 5, the increase in money supply is depicted as a rightward shift of the money supply function from $MS^A$ to $MS^B$, causing a fall in nominal interest rates from $i^A$ to $i^B$. This fall shifts the DR curve downward in the upper right panel, from $DR^A$ to $DR^B$. In addition, as traders revise their expectations upward to reflect the higher level of dollar depreciation in the long run, the FR curve shifts upward from $FR^A$ to $FR^B$. The shifts in the DR and FR schedules cause an increase in $E$ from $E^A$ to $E^B$, a dollar depreciation. Since prices are sticky in the short run, the price level $P$ is fixed.

Long-run Analysis:
In the long-run, the price level rises to bring the real money supply into line with real money demand. As a result, the MS curve shifts to the left until it reaches its original position at $MS^A$. This causes the interest rate to move back to its initial level at $i^A$, as shown in the lower left panel of Fig. 5. Also, in the FX market (lower right panel) the DR curve shifts back to its original position at $DR^A$. The exchange rate falls from $E^B$ to $E^C$, a dollar appreciation. However, the long-run equilibrium value of the exchange rate ($E^C$) is still higher than its original level, $E^A$. Thus, compared to its original value, the dollar depreciates as the result of the rise in money supply.

(b) The time plots of the variables are shown in Figure 6 below.

(c) Short run changes:
   - India’s interest rate: falls
   - $E$: rises (rupee depreciates against USD)
   - $E^c$: rises
   - India’s price level: fixed

(d) Long-run changes (long-run equilibrium C compared to short-run equilibrium B):
   - India’s interest rate: rises
   - $E$: falls (rupee appreciates against USD)
   - $E^c$: unchanged
   - India’s price level: rises

(e) Overshooting occurs since the short-run depreciation of the rupee (from $E^A$ to $E^B$) exceeds the long-run depreciation (from $E^A$ to $E^C$).
Figure 2: Permanent increase in money supply, short- and long-run analysis

\[ MS^A = MS^B \]

\[ MS^A = MS^C \]

\[ MD^A \]

\[ DR^A = DR^C \]

\[ FR^B = FR^C \]
Figure 3: Time plots of major variables from Fig. 5