Exam # 1

Answer Key

Answer the following questions. You can use a (1 page) notes sheet and a calculator (but no other devices).

Choose 5 questions to answer. Include at least either of question 5 or 7 in your selection. Your grade will be calculated as a percentage of the sum of possible points in your choice.

1. (20 points) FX transactions basics.

   (a) Your Canadian friend owes you USD 200. The current USD/CAD exchange rate is at 0.80. You are OK with being paid in CAD. How many CAD do you request from your friend?

   we want to convert USD to CAD. However, the exchange rate given is for USD/CAD, so we cannot simply multiply 200 by 0.80. Instead, we need to find the CAD/USD rate, which is (1/0.80) = 1.25.

   So we will request $1.25(CAD/USD) \times 200(USD) = 250(USD \times CAD/USD) = 250\ CAD$.

   (b) If the JPY/EUR exchange rate is 132.00 JPY/EUR and it takes 40.00 THB (Thai Baht) to purchase one EUR, what is the price of a Baht expressed in Yen (i.e., JPY/THB rate)?

   $E_{THB/EUR} = 40$ and $E_{JPY/EUR} = 132$, we want $E_{JPY/THB}$.

   $$E_{JPY/EUR} \times 1/E_{THB/EUR} = 132\ JPY/EUR \times 1/40\ EUR/THB = 3.30\ JPY/THB$$

   The implied JPY/THB exchange rate is 3.30.

   (c) You observe the USD/EUR exchange rate at 1.23 today, while it was 1.40 several years ago. Which currency has appreciated, which has depreciated? By how much?

   Previously you needed 1.40 USD in order to purchase 1 EUR.
   Now you only need 1.23 USD in order to purchase 1 EUR.
   Therefore the USD has appreciated and the EUR has depreciated.
   The EUR has a value change of (1.23 – 1.40)/(1.40) = -0.1214 or -12.14%
   The USD has a value change of (1/1.23 – 1/1.40)/(1/1.40) = 0.1382 or 13.82%.

   (d) Last year, you invested USD 20,000 in a European Hedge Fund which is denominated in EUR. The fund's performance has been OK, with a return (in EUR) of +10%. But the USD/EUR exchange rate went from 1.3600 a year ago to 1.2850 USD/EUR today. If you sold your investment today, how many USD would you be able to collect?

USD 20,000 x EUR/USD 1/1.3600 x 1.10 x USD/EUR 1.2850 = USD 20,787.

Your USD return is + 3.934% (= 1.10 x 0.94485 – 1), even though your investment in EUR had a +10% return and the EUR returned –5.515% relative to the USD.

(e) Starbucks must pay KES 480,000,000 to its Kenyan coffee supplier. Citibank quotes Starbucks a bid and ask of 96.00–100.00 KES/USD. One is the price at which they buy and the other at which they sell the currency. They follow the "rip-off" rule which implies they use the most unfavorable price to Starbucks. Given this, what is the USD amount of the payment?

Starbucks needs to sell USD and buy KES. Citibank will sell KES to Starbucks at 96.00 KES/USD (giving fewer KES for each US Dollar to Starbucks compared to the other price).

Therefore, The USD amount of the payment is:

480,000,000 KES /[96 KES/USD] = 5,000,000 USD

2. (15 points) UIP and CIP

(a) What is a forward contract? What theory provides a formula for the forward rate of the home (h) currency per unit of foreign (f) currency? Provide the formula and define its variables

A forward contract is an agreement to buy/sell a currency in the future at a predetermined price. The price is called the forward rate. Covered interest parity (CIP) allows us to price this contract:

$$F_{h/f} = \frac{(1+i_h)}{(1+i_f)} E_{h/f}$$

$F_{h/f}$: forward rate
$E_{h/f}$: spot exchange rate
i_h home interest rate, or return on home-currency denominated assets
i_f foreign interest rate, or return on foreign-currency denominated assets
The total return on the foreign asset is the foreign rate plus the depreciation.

(b) What theory provides a formula for the spot rate of the home (h) currency per unit of foreign (f) currency? Provide the formula and define its variables

The theory giving us the spot exchange rate is the Uncovered Interest Parity (UIP):

$$E_{h/f} = \frac{(1+i_f)}{(1+i_h)} E^e_{h/f}$$

$E_{h/f}$: spot exchange rate
$E^e_{h/f}$: expected future exchange rate

i_h home interest rate, or return on home-currency denominated assets
i_f foreign interest rate, or return on foreign-currency denominated assets
The total return on the foreign asset is the foreign rate plus the expected depreciation.

(c) Why do we say that one of the options is "covered" and the other is "uncovered"? to what type of risk is being covered and by which parity?

The Covered parity refers to the one in which the exchange rate depreciation risk is being fully hedged (or covered). In that case, the future rate is pre-negotiated with a forward contract. In the uncovered case investors take a "wait and see" approach instead and use a guess of the future exchange rate to make their decisions

3. (15 points) Forward Contracts: Assume CIP holds.

(a) You observe the following market conditions:

$E_{t,CHF/USD} = 0.9534$ (Swiss francs per Dollar in period t)

The 1-year USD interest rate is 1.20% p.a. (per year)
The 1-year CHF interest rate is 0.35% p.a.

What is the 1-year forward rate between CHF/USD, $F_{t+1,CHF/USD}$?

(you can treat either location as home, but as the exchange rate given denotes the price of the Dollar, it may be convenient to treat the Switzerland as "home" and the US as "foreign". The "$t+1$" in the forward rate denotes that the rate is valid one period ahead from today, t)

$$F_{t+1,CHF/USD} = E_{t,CHF/USD}\frac{1+i_{chf}}{1+i_{usd}} = 0.9534\frac{1.0035}{1.0120} = 0.9454$$

(b) You observe the following market conditions:

$F_{t+1,JPY/USD} = 102.80$ (forward rate)

1-year USD interest rate = 0.8% p.a.
1-year JPY interest rate = 0.0% p.a.

What is the spot price of the USD in terms of JPY ($E_{t,JPY/USD}$)?

From the CIP implied forward:

$$F_{t+1,JPY/USD} = E_{t,JPY/USD}\frac{1}{1.008}$$

Solving for $E_{t,JPY/USD}$ and plugging the numbers from above:

$$E_{t,JPY/USD} = F_{t+1,JPY/USD}\frac{1.008}{1} = 103.622$$

(c) You observe the following market conditions:

$E_{t,USD/GBP} = 1.42$, $F_{t+1,USD/GBP} = 1.38$
$E_{t,USD/CAD} = 0.78$, $F_{t+1,USD/CAD} = 0.83$

What is the forward rate for CAD/GBP, i.e., $F_{t+1,CAD/GBP}$?

$$F_{t+1,CAD/GBP} = \frac{F_{t+1,USD/GBP}}{F_{t+1,USD/CAD}} = \frac{1.38}{0.83}$$

4. (10 points) Consider the quantity theory of money with interest-sensitive liquidity demand: $L(i)$.

What does the theory predict should happen to the nominal interest rate if real income increases? Assume that the central bank does not change the money supply and that prices are fixed. Explain your answer and provide a plot for that money market.

The demand for money curve shifts up as it depends on the real income: $L(i)Y$. As a result, the interest rate increases for the same level of money supplied in equilibrium. Intuitively, real income is higher which pushes the demand for money up and given a fixed supply, the interest rate should increase (as it captures the cost of acquiring more money, e.g., at a bank).

See plots at the end

5. (20 points) Consider a world with two countries, home and foreign. Prices are sticky in the short run, but flexible in the long run. At time T there is a *permanent decrease in the home money supply*, assume nothing else changes.

(a) What happens to $E_{h/f}$, the home-foreign spot exchange rate, in both the short and long- run? Explain your answer using whatever figures and equations you find suitable.

We start with the long-run. In the long run P matches the change in M leading to a shift to the left in the FR curve in the FX market as the foreign return is lower given the expected exchange rate appreciates (lowers). This decrease is explained by the PPP that expresses the future exchange rate as the ratio of home to foreign prices.

In the short run, P is sticky and thus $\frac{M}{P}$ falls, leading to a higher home interest rate. This shfits up the DR curve (domestic return) in the FX market. As a result, the instantaneous exchange rate appreciates further. This short-run effect dies out over time as prices accommodate.

In summary, the spot exchange rate has a strong appreciation at first and then it converges up to its long-run value which is lower than the initial equilibrium (before the policy)

(b) Is the short-run exchange rate $E_{h/f}$ above or below the expected long-run exchange rate? Will it stay this way forever? [Hint: think about overshooting]

The exchange rate at first will be lower than it's long run new equilibrium. As the prices accommodate and home interest rate lowers, the exchange rate goes up until it reaches its long-run equilibrium (which is lower than the exchange rate before the policy change).

6. (10 points) How would a fixed exchange rate regime help a country control inflation? Use at least one of the equations discussed in class in your answer.

By implementing a fixed exchange rate regime the depreciation is set at zero, implying that a country adopts the interest rate of the foreign economy, importing its monetary policy and inflation.

By UIP (approximated): $i_h = i_f + \cancelto{0}{d^e_{h/f}}$

Similarly, by PPP (in growth rates): $0 = d^e_{h/f} = \pi^e_h - \pi^e_f$

If the foreign economy enjoys from lower inflation rates the home country will lower their own inflation as well in this regime.

7. (20 points) Consider a world with two countries, home and foreign. For the questions below, use the quantity theory of money with interest-sensitive liquidity demand. Assume that prices are flexible.

The home country was holding a money supply growth at 5% per year. At time T, a *permanent* change of the money supply growth to 3% is announced. Nothing else changes.

(a) By how much the interest rate changes at time T? explain your answer by using the model and parities discussed in class

Prices are flexible, we can use parities involving inflation changes. We can use the Fisher equation and global rate convergence result to get the new interest rate:

$$i = \pi^e + r^*$$

r^* does not depend on the actions of the economy, thus i follows the changes in π^e.

Now, we can link the expected inflation to the growth of money by using the quantity theory model equation (in growth rates):

$$\pi^e = \mu^e - g^e$$

We know nothing else changes, thus, the inflation increases as much as the new money growth, i.e., 2%, that leads to an increase in the interest rate of 2% (notice the growth rates of inflation and interest rates after the change are lower than before).

(b) Plot the paths of M_h, $E_{h/f}$, M_h/P_h, and P_h over time (with "time" on the x-axis)

See plots at the end

Figure 1: Plots for 4

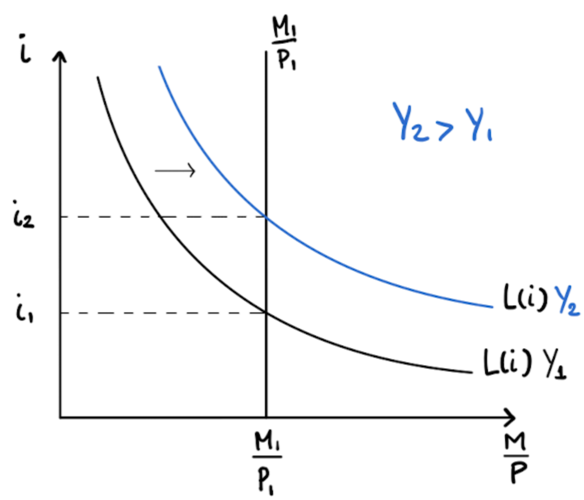

Figure 2: Plots for 5

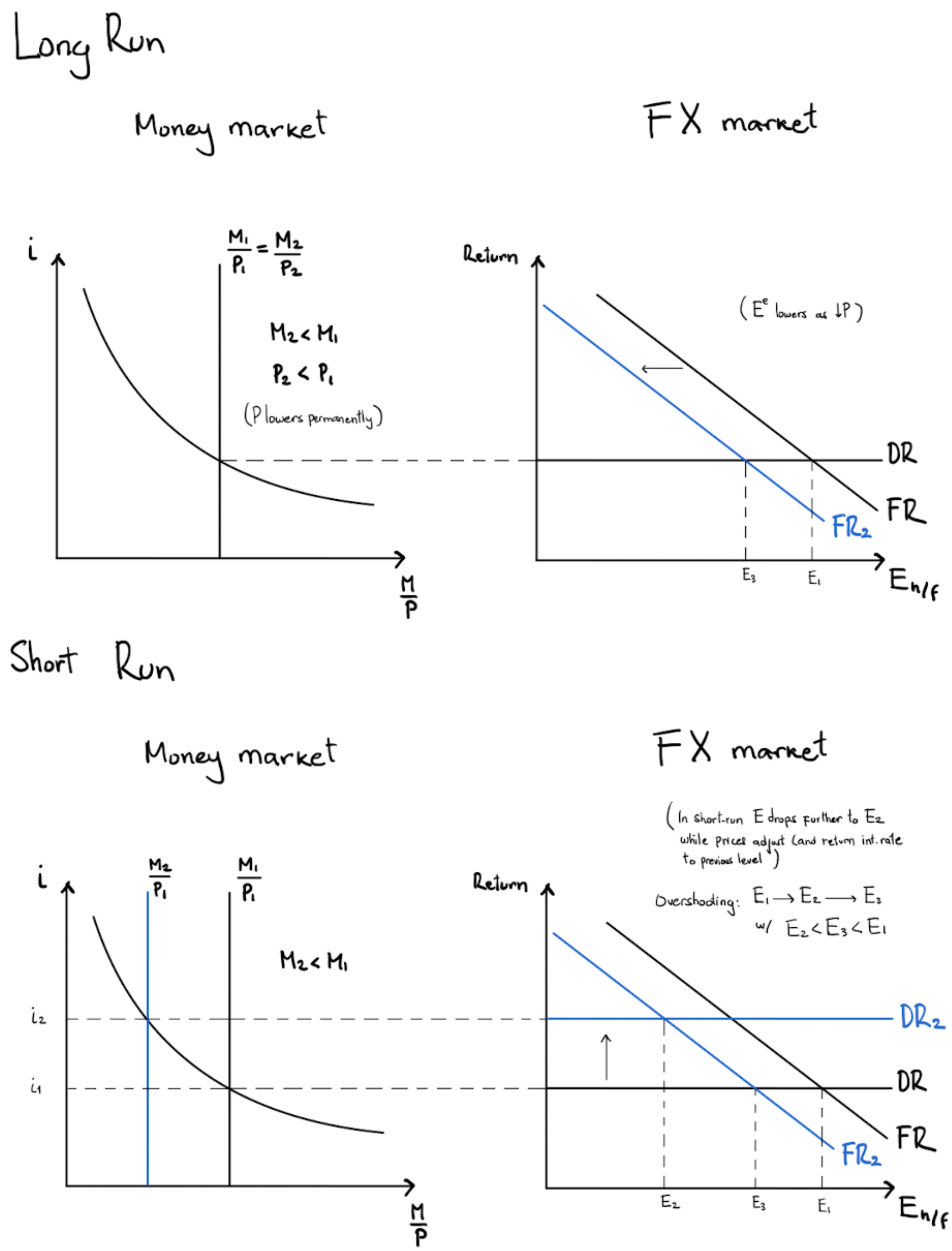

Figure 3: Plots for 7B