Chapter 13 Portfolio Theories of Exchange Rate Determination

Quiz Questions

Read each phrase below and decide whether it corresponds with Balance of Payments Theory (BOP), Monetary Theory (MT), or Portfolio Theory (PT).

_____ 1. The long-run equilibrium exchange rate follows from the equilibrium in the markets for the demand and supply of domestic money and foreign money and the PPP model.
_____ 2. All else being equal, an in real economic activity in the home country results in an appreciation of the home currency.
_____ 3. The spot rate is affected by the release of new information.
_____ 4. To know the equilibrium exchange rate, it suffices to know the demand and supply for domestic and foreign goods.
_____ 5. All else being equal, an increase in the return on a risk-free foreign asset leads to a depreciation of the home currency.
_____ 6. A monetary expansion weakens the value of the home currency, but has little or no effect on real activity.
_____ 7. All else being equal, an increase in real economic activity in the home country results in a depreciation of the home currency.
_____ 8. The equilibrium exchange rate is the one that equates the demand and supply of domestic and foreign and risk-free and risky assets.
_____ 9. If there is a domestic capital account surplus, foreign investors are purchasing more of the country's assets. This leads to a depreciation of the domestic currency.
_____ 10. Excessive government spending financed by a monetary expansion stimulates an economy, resulting in greater real output and a depreciation of the home currency.

Ans. 1. MT; 2. MT; 3. MT & PT; 4. BOP; 5. BOP; 6. MT; 7. BOP; 8. PT; 9. None of the three; 10. BOP.

True-False Questions

_____ 1. The risk of a portfolio is measured by the standard deviation of its return.
_____ 2. The risk of an asset is measured by the standard deviation of its return.
_____ 3. Each asset's contribution to the total risk of a portfolio is measured by the asset's contribution to the total return on the portfolio.
_____ 4. A risk-averse investor always prefers the highest possible return for a given level of risk or the lowest risk for a level of expected return.
_____ 5. The means and standard deviations of all optimal portfolios selected from a risk-free asset and a set of risky assets are found on the line that originates at r_0 and is tangent to the efficient portfolio of risky assets.
_____ 6. Relative risk aversion shows the price in currency units of a given amount of risk.
_____ 7. Relative risk aversion varies from asset to asset because some assets are riskier than others.
_____ 8. Portfolio theory assumes that all investors are equally risk averse.

A. 1. true; 2. false; 3. false; 4. true; 5. true; 6. false; 7. false; 8. false.

Multiple Choice Questions

Q1. According to Monetary Theory, how is the spot rate affected by:
(a) An increase in the velocity of domestic money?
(b) An increase in real foreign economic output?
(c) An increase in the foreign money supply?
(d) An increase in real domestic economic output?
(e) An increase in the velocity of foreign money?

A1. The spot rate: (a) increases; (b) increases; (c) decreases; (d) decreases; (e) decreases.

Q2. When applying portfolio theory, we must make a number of assumptions. Which of the following assumptions are correct? Which are not?
(a) The rates of inflation at home and abroad are equal.
(b) There are no information or transactions costs.
(c) There are no taxes.
(d) Investors want to know what the distribution of the wealth will be over time.
(e) Investors care about the future return on their portfolio and the variability of this return.

A2. (b) & (e) are correct; (c) taxes may be non-discriminatory; (d) investors care only about the end-of-period distribution.

Exercises

E1. In Country X, the money supply equals 1 million, real economic output equals 1 million units, and the velocity of money equals 5. In Country Y, the money supply equals 5 million, real economic output equals 10 million units, and the velocity of money equals 3. According to monetary theory, if X is the home country, what is the long-run equilibrium spot exchange rate?

A1. $S = ((5 \times 1\text{m})/1\text{m}) \times ((10\text{m}/(3 \times 5\text{m}) = 3.3333$.

E2. The Country Prince Rupert's Land (PRL) has two companies, Hudson Bay Company (HBC) and Boston Tea Traders (BTT). In equilibrium, the returns of these two companies have the following distributions:

	Expected excess return	Covariances	
		(HBC)	(BTT)
HBC	0.11	0.04	0.01
BTT	0.08	0.01	0.02

(a) Vary the market weight of HBC from 0 to 1 by increments of 0.1, and compute how the market covariance risks of HBC and BTT change as a function of the markets weights x_{HBC} and $x_{BTT} = 1 - x_{\text{HBC}}$.
(b) Find the optimal weights of x_{HBC} and $x_{BTT} = 1 - x_{\text{HBC}}$ and the average risk aversion.
(c) If the total value of the PRL stock market portfolio is 1,000, what is the value of HBC and BTT?

A2. (a) For ease of illustration, we assume that HBC is asset 1, and BTT is asset 2.

x_1	$\text{cov}(\tilde{r}_1,\tilde{r}_p)$	$\text{cov}(\tilde{r}_2,\tilde{r}_p)$	$\frac{\text{E}(\tilde{r}_1 - r_0)}{\text{cov}(\tilde{r}_1,\tilde{r}_p)}$	$\frac{\text{E}(\tilde{r}_2 - r_0)}{\text{cov}(\tilde{r}_2,\tilde{r}_p)}$	$\text{E}(\tilde{r})_p$	$\frac{\text{E}(\tilde{r}_p)}{\text{var}(\tilde{r}_p)}$

0 0	0.010	0.0200	11.000	4.0000	0.0800	4.0000
0.1	0.013	0.0190	8.4615	4.2105	0.0830	4.5109
0.2	0.016	0.0180	6.8750	4.4444	0.0860	4.8864
0.3	0.019	0.0170	5.7895	4.7059	0.0890	5.0568
0.4	**0.022**	**0.0160**	**5.0000**	**5.0000**	**0.0920**	**5.0000**
0.5	0.025	0.0150	4.4000	5.3333	0.0950	4.7500
0.6	0.028	0.0140	3.9286	5.7143	0.0980	4.3750
0.7	0.031	0.0130	3.5484	6.1538	0.1010	3.9453
0.8	0.034	0.0120	3.2353	6.6667	0.1040	3.5135
0.9	0.037	0.0110	2.9730	7.2727	0.1070	3.1105

(b) The optimal weights are 0.4 for HBC and 0.6 for BTT. The average risk aversion is 5.
(c) The value of HBC is 400, and the value of BTT is 600.

E3. Consider the following covariance matrix and expected return vector:

$$V = \begin{vmatrix} 0.0100 & 0.0020 & 0.0010 \\ 0.0020 & 0.0025 & 0.0030 \\ 0.0010 & 0.0030 & 0.0100 \end{vmatrix} \quad E(R_j) = \begin{vmatrix} 0.0330 \\ 0.0195 \\ 0.0250 \end{vmatrix}$$

(a) Compute the expected return on a portfolio with weights for assets $j = 0,...,3$ equal to [0.2, 0.4, 0.2, 0.2], when the T-bill (asset 0) yields a return of 1 percent. Do so directly, and then via the excess returns.
(b) Compute the variance of the same portfolio.
(c) Compute the covariance of the return on each asset with the total portfolio return, and verify that it is a weighted covariance.
(d) Is the above portfolio efficient?
(e) Are the following portfolios efficient?
* weights (0.7, 0.1, 0.1, 0.1) for assets $j = 0,..., 3$.
* weights (0.6, 0.2, 0.1, 0.1) for assets $j = 0,..., 3$.
(f) What is the portfolio held by an investor with risk aversion measure $A = 2.5$?
(g) Assume there are no "outside" bills, that is, all risk-free lending and borrowing is among investors. Therefore, the average investor holds only risky assets. What is the portfolio composition? What is the average investor's risk-aversion measure A?

A3. (a) $0.2 \times 0.01 + 0.4 \times 0.033 + 0.2 \times 0.0195 + 0.2 \times 0.025 = 20.41$ percent, or
$0.01 + [0.4 \times 0.023 + 0.2 \times 0.0095 + 0.2 \times 0.015] = 20.41$ percent.

(b) $0.4 \times [0.4 \times 0.0100 + 0.2 \times 0.0020 + 0.2 \times 0.0010]$
$+ 0.2 \times [0.4 \times 0.0020 + 0.2 \times 0.0025 + 0.2 \times 0.0030]$
$+ 0.2 \times [0.4 \times 0.0010 + 0.2 \times 0.0030 + 0.2 \times 0.0100] = 0.00282.$

(c) $\text{cov}(R_1,R_p) = [0.4 \times 0.0100 + 0.2 \times 0.0020 + 0.2 \times 0.0010] = 0.0046$
$\text{cov}(R_2,R_p) = [0.4 \times 0.0020 + 0.2 \times 0.0025 + 0.2 \times 0.0030] = 0.0019$
$\text{cov}(R_3,R_p) = [0.4 \times 0.0010 + 0.2 \times 0.0030 + 0.2 \times 0.0100] = 0.0030.$

These are, in fact, the respective bracketed terms in the previous problem; so their weighted sum must be 0.00282.
(d) Yes. Because the excess expected returns are proportional to the covariances, the common ratio (expected excess return)/(covariance) is 5 for all risky assets. Apparently, the measure of relative risk aversion A equals 5 for this investor.

(e) The first one is not; from the first-order conditions:

$\text{cov}(R_1,R_p) = [0.1 \times 0.0100 + 0.1 \times 0.0020 + 0.1 \times 0.0010] = 0.0013$
$\text{cov}(R_2,R_p) = [0.1 \times 0.0020 + 0.1 \times 0.0025 + 0.1 \times 0.0030] = 0.00075$
$\text{cov}(R_3,R_p) = [0.1 \times 0.0010 + 0.1 \times 0.0030 + 0.1 \times 0.0100] = 0.0014$

The ratio $E(\tilde{r}_j - r_0)/ \text{cov}(\tilde{r}_j,\tilde{r}_p)$ is not the same across all assets. To further convince yourselves, check this as follows. For the first portfolio, $s^2(\tilde{r}_p) = 0.000345$, or $s(\tilde{r}_p) = 0.01857$, while $E(\tilde{r}_p - r_0) = 0.00475$. This clearly is an inefficient portfolio, because the ratio expected excess return/covariance is different for all risky assets.

The second portfolio is efficient indeed, since the expected returns on the risky assets are all equal to ten times their respective portfolio covariance risks. Check this explicitly. A shortcut is that, since the "risky" weights (0.2, 0.1, 0.1) are half the weights of the original portfolio (0.4, 0.2, 0.2), all portfolio covariance risks are halved too. Thus, there still must be a common ratio $E(\tilde{r}_j - r_0)/\text{cov}(\tilde{r}_j,\tilde{r}_p)$.

It follows that, if you find one efficient portfolio, then *all other portfolios with the same relative weights for the risky assets* are also efficient. For instance, a portfolio of *only* risky assets, with weights (0.5, 0.25, 0.25, 0) must also be efficient. Conversely, any portfolio with risky weights *not* proportional to the original portfolio is *in*efficient. For whatever example you can imagine, check that such a portfolio has an excess return/standard deviation ratio lower than the ratio for efficient portfolios (0.265).

(f) The covariance risks must be twice as high as in the original portfolio in order to achieve $E(\tilde{r}_j - r_0) = 2.5 \times \text{cov}(\tilde{r}_j,\tilde{r}_p)$. This is achieved by doubling the weights of the original portfolio. So the weights must be (-0.6, 0.8, 0.4, 0.4).

This investor leverages his portfolio (that is, he borrows 60 cents for every dollar of his own money, and invests all of it in the risky assets). He must be less risk averse than the first investor, because his risk aversion is lower, that is, A is $2.5 < 5$.

(g) The portfolio must be efficient, with weights for the risky assets summing to unity; so that's (0, 0.5, 0.25, 0.25). These risky assets weights are 1.25 the original portfolio's weights, so the covariances will be 1.25 higher too. This means that A must be lowered by an offsetting factor, from 5 to $5/1.25 = 4$. Therefore, the average relative risk aversion A is 4.

Chapter 14 Risk and Return in Forward Markets

Quiz Questions

True-False Questions

_____ 1. UEH assumes that investor demand a premium for interest rate risk.

_____ 2. When computing the foreign return $r^*_{t,t+1}$, the capital gain earned on the foreign interest (that is, the cross product) is negligible when interest rates are high and exchange rate changes are small.

_____ 3. When the percentage change in the spot rate is regressed on the forward premium, UEH predicts a $\beta = -1$, because a positive forward premuim must make up for the depreciation in the spot rate in the future, while a negative forward premium must make up for the appreciation in the spot rate in the future.

_____ 4. Tests of UEH are ambiguous because we cannot distinguish between a true risk premium and inefficiency (predictability in the forecast error).

_____ 5. By using a trading rule, you can systematically make risk-free money by investing in currencies with high interest rates while financing the investment by borrowing in low interest rate currencies.

_____ 6. Tests using trading rules suggest that interest rate differentials tend to overcompensate for expected depreciations.

_____ 7. High-interest currencies offer the highest returns for the lowest level of risk.

_____ 8. The Fisher Open Relationship explains international differences in interest rates by international differences in inflation.

_____ 9. In a PPP framework, the Fisher Open Relationship explains international differences in interest rates by international differences in inflation.

_____ 10. According to the Fisher Equation, the expected real rate of return is a function of expected inflation and an exogenous nominal interest rate.

_____ 11. Because the forward rate is biased, it is not useful for evaluating projects whose payoffs depend on an uncertain future spot rate.

Ans. 1. false; 2. false; 3. false; 4. true; 5. false: there is risk; 6. true; 7. false: not the lowest risk; 8. true; 9. false; 10. false.

Multiple Choice Questions

Choose the correct answer(s):

Q1. The forward rate is an unbiased predictor of the future spot rate:
- (a) Under uncertainty.
- (b) When the inflation rates in the domestic and foreign countries are low.
- (c) When there is little central bank intervention.
- (d) Under certainty.
- (e) When investors are risk neutral and inflation is known in advance.

A1. (d).

Q2. The Siegel Paradox:
- (a) Assumes that inflation is constant.
- (b) Assumes that investors are risk neutral and all exchange risk is diversifiable.
- (c) Says that when an investor sets the forward rate equal to his expectations for the future spot rate, the resulting forward rate differs according to how the investor

quotes the exchange rate. For example, for the GBP there is no problem because both foreign and UK investors qutoe the rate as foreign currency units per GBP.
(d) Says that when an investor sets the forward rate equal to expectations for the future spot rate, the result depends on what the investor's home currency is.
(e) Says that the forward rate is a biased predictor of the spot rate only when there is great exchange rate uncertainty and the time to maturity of the forward contract is long.
(f) Disappears when inflation is certain.

A2. None of these. UEH assumes that (1) inflation is known in advance (but not necessarily constant) and investors are risk neutral OR (2) exchange risk is diversifiable. The Siegel Paradox arises if the UEH is assumed.

Q3. Empirical tests have shown that:
(a) Over long periods, the average risk premium in the forward rate may be close to zero.
(b) A positive forward premium will be followed by an appreciation in the spot exchange rate in significantly more than 50 percent of all cases.
(c) Markets are inefficient because the risk premium is positive over time.
(d) Investors clearly overestimate the probability of a single major event affecting the value of a currency.

A3. (a).

Q4. Conceivable explanations of violations of UEH include the following:
(a) Investors want to be compensated for risk.
(b) Foreign exchange markets are inefficient.
(c) A currency's value fluctuates erratically whenever there is central bank intervention.
(d) A currency's riskiness changes erratically whenever there is central bank intervention.
(e) Investors incorrectly form expectations about the value of a currency.
(f) Because Latin American currencies like the peso are infrequently but positively affected by important events like a devaluation.

Q4. (a), (b), & (e).

Q5. The domestic and foreign real rates of return on a given asset are the same:
(a) When domestic and foreign investors demand the same risk premiums for each currency.
(b) When PPP holds.
(c) Both (a) and (b).
(d) None of the above. Because PPP never holds, so UEH will never hold.

A5. (b).

Exercises

E1. Suppose that there is no uncertainty. Inflation is 10 percent at home, and 5 percent abroad. Solve the following questions in the exact form, not with linear approximations.
(a) What is the change in the exchange rate if PPP holds?
(b) What are the nominal rates in the two countries if the real rate is 2 percent (on all assets—recall that we have certainty, and PPP holds)?

(c) What is the forward premium?
(d) Is the forward premium equal to the change in the spot rate?

A1. (a) $s_{t,T}$ = (1.1/1.05) - 1 = 4.762 percent.
(b) $r_{t,T}$ = (1.02 × 1.1) - 1 = 12.2 percent.
$r^*_{t,T}$ = (1.02 × 1.05) - 1 = 7.1 percent.
(c) $FP_{t,T}$ = (1.122/1.071) - 1 = 4.762 percent.
(d) yes.

E2. Suppose that there is no uncertainty and PPP holds. The domestic and foreign interest rates are 5 percent and 10 percent, respectively. The real rate is 2 percent. Solve the following questions in the exact form, not with linear approximations.
(a) What is the inflation differential?
(b) Is the inflation differential equal to the change in the spot rate that is implicit in the forward premium?

A2. (a) $I_{t,T}$ = (1.05/1.02) - 1 = 2.94 percent.
$I^*_{t,T}$ = (1.10/1.02) - 1 = 7.84 percent.
relative PPP says $s_{t,T}$ = (1.0294/1.0784) - 1 = -4.5454 percent.
(b) UEH says $s_{t,T}$ = (1.05/1.10) - 1 = -4.5454 percent.

E3. A friend suggests to you that an investment in Turkish lira provides an excellent return because the real rate is very high. Specifically, inflation has been at a reliable 70-80 percent *p.a.*, and interest rates on Lira t-bills are 100 percent. If expected inflation is 75 percent, the expected real return is 100 percent - 75 percent = 25 percent, your friend argues.
(a) We know that the linear approximation, as used by your friend, does not work very well when inflation is high. How would you obtain a correct estimate of the real return if there were no inflation uncertainty?
(b) Is this a perfect (unbiased) estimate of the expected return when future inflation is uncertain? Why (not)?
(c) Assuming that the correctly estimated real interest rate on Lira T-bills is about 14 percent, and the expected real return on your home currency T-bill is 4 percent, is your friend's argument necessarily compelling? Why (not)? (Hint: your answer should be based on whether or not PPP holds and investors are risk-averse.)

A3. (a) (1 + 100%)/(1 + 75%) – 1 = 14.29 percent.
(b) No, for the expected real return, we need $\mathrm{E}\left(\frac{1}{1+inflation}\right)$, not $\frac{1}{1+\mathrm{E}(inflation)}$.
(c) No. First, the 14 percent expected real return on the lira T-bill is the return to a Turkish investor. The expected return to you (on the same asset) will be different unless PPP holds. Second, even if PPP holds, the real return to you from the lira investment is likely to have a different risk than the real return you would earn from your domestic T-bill.

Mind-Expanding Exercise

ME1. Imagine a world with perfect goods markets and perfect foresight. Then PPP and UEH would hold as identities. Show that, in the Fisher Relationship, both countries' real rates would become identical.

A1. For simplicity, drop the time subscripts. In general, the real return depends on the asset and the nationality of the investor. The convention in the text is:

ρ = the expected real return on the domestic T-bill, to the domestic investor.

ρ^* = the expected real return on the foreign T-bill, to the foreign investor.

Thus, in the text, an asterisk (or lack thereof) denotes both the asset and the residence of the holder. A more general notation would be:

$R_{j,k}$ = ex post real return from asset j to an investor from country k.
$r_{j,k}$ = ex post nominal return from asset j measured in currency k.

Thus, if asset 1 is the domestic T-bill and asset 2 the foreign T-bill, and country 1 is the home country while country 2 is the foreign one, we have

$$E(R_{1,1}) \equiv \rho \text{ and } E(R_{2,2}) \equiv \rho^*.$$

The implication of PPP is that $R_{j,1} = R_{j,2}$. Thus, the *ex post* returns depend only on the asset, not on the country of residence of the holder. To show this, consider the real return, to a *domestic* investor (from country 1), on a given asset j—say Apple common stock. This return equals:

$$1 + R_{j,1} = \frac{1 + r_{j,1}}{1 + I_1} = \frac{(1 + r_{j,2})(1 + s)}{1 + I_1} .$$

If relative PPP holds, we have $(1 + s) = \frac{1 + I_1}{1 + I_2}$. Thus, under relative PPP,

$$1 + R_{j,1} = \frac{1 + r_{j,2}}{1 + I_2} \equiv 1 + R_{j,2} .$$

The implication of certainty is that all assets are riskless to a given investor. Thus, the *ex post* real return to an investor of country k is the same on all assets:

$$R_{j,1} = R_{i,1}, \text{ all } i \text{ and } j$$
$$R_{j,2} = R_{i,2}, \text{ all } i \text{ and } j.$$

The conclusion is that under certainty and PPP, the real return is independent of both the choice of the asset and the nationality of holder:

$$R_{i,1} = R_{i,2} = R_{j,2} = R_{i,2}, \text{ all } i \text{ and } j.$$

In particular, if asset 1 is the domestic T-bill and asset 2 the foreign T-bill,

$$R_{1,1} = R_{2,2} \Rightarrow \rho = \rho^*.$$

Chapter 15 Forecasting Exchange Rates

Quiz Questions

True-False Questions

_____ 1. Technical forecasting models analyze micoreconomic variables in an attempt to forecast future changes in the exchange rate.

_____ 2. Fundamental analysis models analyze macroeconomic variables in an attempt to forecast future changes in the exchange rate.

_____ 3. By a "technical correction," one means that investors underreact to bad news so that the exchange rate does not drop low as it should. This means that demand must fall farther, in order to correctly value a foreign currency in terms of the home currency.

_____ 4. If the exchange rate bottoms out (that is, it hits a low point but begins to rise again), but it increases again by *x* percent, we can make substantial (and low-risk) profits by buying foreign currency—even when paying "retail" bid-ask spreads.

_____ 5. Because we cannot make significant profits from predicting the exchange rate based on past information, the exchange markets are weak-form efficient.

_____ 6. Runs tests have confirmed that positive changes in the exchange rate tend to be followed by positive changes and negative changes by negative changes. This is consistent with the conclusions from autocorrelation tests.

_____ 7. The results from runs tests and autocorrelation tests provide unambiguous evidence that the foreign exchange markets are inefficient.

_____ 8. Central bankers are able to forecast the future spot rate because they have inside information.

_____ 9. Central bankers are able to forecast the future spot rate because they have inside information, but not the forward rate because they are unable to correctly forecast the foreign risk-free rates of return.

Ans. 1. false; 2. true; 3. false; 4. false; 5. true; 6. true; 7. false; 8. false; 9. false

Multiple Choice Questions (choose the correct answer(s))

Q1. Technical analysis:
- (a) Has been proven to be utterly useless as a way of predicting the exchange rate.
- (b) Relies on statistical and econometric models rather than trading rules.
- (c) Is solely based on a forecaster's sentiments about the exchange rate markets.
- (d) Can only work when there is weak-form market efficiency.
- (e) Provides evidence of semi-strong form inefficiency (when technical analysis works that is).

A1. None of the above.

Q2. Fundamental analysis:
- (a) Has been proven to be of little value as a way of predicting the exchange rate.
- (b) Relies on macroeconomic variables like inflation, interest rates, and real economic output.
- (c) May rely on a forecaster's sentiments about the exchange rate markets rather than solely on a formal quantitative model.
- (d) Can only work when there is weak-form market efficiency.

(e) Provide evidence of semi-strong inefficiency (when fundamental analysis works, that is).

A2. (a), (b), (c).