CHAPTER 4

SUGGESTED ANSWERS TO CHAPTER 4 QUESTIONS

1. a. What is purchasing power parity?

**Answer.** In its absolute version, purchasing power parity states that price levels should be equal worldwide when expressed in a common currency. In other words, a unit of home currency (HC) should have the same purchasing power around the world. The relative version of purchasing power parity, which is used more commonly now, states that the exchange rate between the home currency and any foreign currency will adjust to reflect changes in the price levels of the two countries. For example, if inflation is 5% in the United States and 1% in Japan, then the dollar value of the Japanese yen must rise by about 4% to equalize the dollar price of goods in the two countries.

b. What are some reasons for deviations from purchasing power parity?

**Answer.** PPP might not hold because:

- The price indices used to measure PPP may use different weights or different goods and services.
- Arbitrage may be too costly, because of tariffs and other trade barriers and high transportation costs, or too risky, because prices could change during the time that an item is in transit between countries.
- Since some goods and services used in the indices are not traded, there could be price discrepancies between countries.
- Relative price changes could lead to exchange rate changes even in the absence of an inflation differential.
- Government intervention could lead to a disequilibrium exchange rate.

c. Under what circumstances can purchasing power parity be applied?

**Answer.** The relative version of purchasing power parity holds up best in two circumstances: (a) over long periods of time among countries with a moderate inflation differential since the general trend in the price level ratio will tend to dominate the effects of relative price changes, and (b) in the short run during periods of hyperinflation since with high inflation changes in the general level of prices quickly swamp the effects of relative price changes.

2. One proposal to stabilize the international monetary system involves setting exchange rates at their purchasing power parity rates. Once exchange rates are correctly aligned (according to PPP), each nation would adjust its monetary policy so as to maintain them. What problems might arise from using the PPP rate as a guide to the equilibrium exchange rate?

**Answer.** The proposal to adjust monetary policy so as to maintain purchasing power parity assumes that the PPP rate is the equilibrium rate. This assumption ignores the many shortcomings of PPP as a theory of exchange rate determination. Deviations from PPP have prevailed throughout the history of floating rate regimes. Thus there is good reason to believe that PPP provides a poor proxy for the equilibrium exchange rate at any point in time. If the PPP benchmark is used as a proxy for the equilibrium exchange rate when there are disequilibrium departures from PPP, this guideline will interfere with long-run equilibration in the foreign exchange market. Here is the basic problem: Domestic and foreign goods are not perfect substitutes, and hence issues of spatial arbitrage and the law of one price are irrelevant. Imagine that at the PPP exchange rate U.S. firms can't find buyers for their goods, while Japanese firms work overtime to meet the demand for their goods. Something will have to give, probably the real exchange rate. When a country opens new markets, introduces new products, or experiences a favorable or unfavorable price shock for its traditional exports, the real exchange rate will change. Monetary policy that stabilizes a disequilibrium exchange rate is clearly inappropriate.
3. Suppose the dollar/rupee rate is fixed but Indonesian prices are rising faster than U.S. prices. Is the Indonesian rupee appreciating or depreciating in real terms?

**Answer.** The rupee's real value is rising since it is not depreciating to compensate for higher Indonesian inflation.

4. Comment on the following statement. "It makes sense to borrow during times of high inflation because you can repay the loan in cheaper dollars."

**Answer.** According to the Fisher effect, interest rates adjust to take into account the effects of inflation on the real cost of repaying a loan. Thus, borrowing during times of inflation is profitable only if inflation turns out to be higher than expected at the time the loan was made. By definition, however, it is impossible to expect to profit from the unexpected. Hence, this statement is inconsistent with elementary notions of market efficiency.

5. Which is likely to be higher, a 150% ruble return in Russia or a 15% dollar return in the United States?

**Answer.** Since both are stated in nominal terms in different currencies, they cannot be compared directly. The cruzeiro return must be adjusted for Russian inflation and the dollar return for U.S. inflation to get the real returns. Alternatively, the nominal Russian return should be converted into dollars to get the nominal dollar return in Russia.

6. The interest rate in England is 12%, while in Switzerland it is 5%. What are possible reasons for this interest rate differential? What is the most likely reason?

**Answer.** Although there are several possible explanations for higher interest rates, the most likely explanation is that inflation is expected to be higher in England than in Switzerland.

7. From 1982 to 1988, Peru and Chile stand out as countries whose interest rates are not consistent with their inflation experience. Specifically, Peru's inflation and interest rates averaged about 125% and 8%, respectively, over this period, whereas Chile's inflation and interest rates averaged about 22% and 38%, respectively.

a. How would you characterize the real interest rates of Peru and Chile (e.g., close to zero, highly positive, highly negative)?

**Answer.** Highly negative for Peru and highly positive for Chile.

b. What might account for Peru's low interest rate relative to its high inflation rate? What are the likely consequences of this low interest rate?

**Answer.** Peru's nominal interest rate averaged around 8% during this period, even as its inflation rate approached 130% annually. This highly negative real interest rate was due to government controls on the interest rate that could be paid on savings. As a result, Peruvian savings plummeted, a black market for capital arose, and those Peruvians who could convert their money into dollars or other hard currencies likely to maintain their value.

c. What might account for Chile's high interest rate relative to its inflation rate? What are the likely consequences of this high interest rate?

**Answer.** Chile had undergone a period of rapid inflation prior to period shown in the exhibit. As a result, investors were projecting a high rate of future inflation and this was reflected in the interest rate (remember, the Fisher effect says nominal rates are based on expected future inflation). In addition, investors probably added an inflation risk premium to the interest rate to compensate for inflation risk.

d. During the same period, Peru had a small interest differential and yet a large average exchange rate change. How would you reconcile this experience with the international Fisher effect and with your answer to part b?

**Answer.** The narrow interest differential owes to the government interest rate controls mentioned in part b. The international Fisher effect refers to interest rates set in a free market. It says nothing about controlled interest rates.
8. From 1982 to 1988 a number of countries (e.g., Pakistan, Hungary, and Venezuela) had a small or negative interest rate differential and a large average annual depreciation against the dollar. How would you explain these data? Can you reconcile these data with the international Fisher effect?

**ANSWER.** As these countries have had fairly high inflation combined with controls that held their interest rates below those that would prevail in a free market. The large average annual depreciation can be explained by their rapid inflation, whereas the absence of the international Fisher effect is due to the interest rate controls. As noted in the answer to question 7, part d, the IFE refers to interest rates set in a free market. It has nothing to say about controlled interest rates.

9. What factors might lead to persistent covered interest arbitrage opportunities among countries?

**ANSWER.** The principal factor would be the existence of political risk, particularly the fear that at some point the government would impose exchange controls, not allowing capital to be removed. Another possible factor is differential tax laws which could lead to similar after-tax returns, even if before-tax returns differ.

10. In early 1989, Japanese interest rates were about 4 percentage points below U.S. rates. The wide difference between Japanese and U.S. interest rates prompted some U.S. real estate developers to borrow in yen to finance their projects. Comment on this strategy.

**ANSWER.** The U.S. developers were gambling that the 400 basis point differential did not reflect market expectations of dollar depreciation, which is what the international Fisher effect would argue for. In other words, the developers were committing the economist's unpardonable sin of comparing apples (dollar interest rates) with oranges (yen rates). This policy also makes no sense from a currency risk standpoint since the developers had dollar cash inflows (from the real estate rentals on their developments) and yen cash outflows on the mortgages, exposing them to considerable exchange risk. A rise in the value of the yen could conceivably cost them more than the savings on the lower yen interest rates. Moreover, this rise was quite likely since the international Fisher effect says that international differences in interest rates can be traced to expected changes in exchange rates, with low interest rate currencies expected to appreciate against high interest rate currencies. This is indeed what happened in the case of the yen.

11. In early 1990, Japanese and German interest rates rose while U.S. rates fell. At the same time, the yen and DM fell against the U.S. dollar. What might explain the divergent trends in interest rates?

**ANSWER.** According to the Fisher effect, the most likely cause for the rise in German and Japanese interest rates was higher expected inflation in those countries. At the same time, the fall in U.S. interest rates could be attributable to a decline in expected U.S. inflation. If so, then PPP would predict that the future value of the dollar should rise relative to what was previously expected. Since these expectations would be immediately impounded in currency values, we would expect the dollar to rise relative to the yen and DM. This scenario is consistent with what actually happened.

12. In late December 1990, one-year German Treasury bills yielded 9.1%, whereas one-year U.S. Treasury bills yielded 6.9%. At the same time, the inflation rate during 1990 was 6.3% in the United States, double the German rate of 3.1%.

   a. Are these inflation and interest rates consistent with the Fisher effect?

**ANSWER.** Not if one assumes that future inflation will equal past inflation. In that case, the real interest rate in Germany will be approximately 6% (9.1% - 3.1%) and in the United States 0.6% (6.9% - 6.3%). More likely, what was happening was that the markets were anticipating a fall in U.S. inflation (because of tight money in the U.S. combined with the U.S. recession) and a rise in German inflation (given the costs of German unification). If so, then these rates are consistent with the Fisher effect, which says that nominal interest rates are based on expected, not past inflation.

   b. What might explain this difference in interest rates between the United States and Germany?
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**ANSWER.** One possible answer was suggested in part a, namely that 1990 inflation was not considered a reasonable predictor of 1991 inflation. An alternative answer is that real interest rates in Germany were rising to attract the added capital needed to finance the enormous investment in eastern Germany.

13. The spot rate on the euro is $1.39, and the 180-day forward rate is $1.41. What are possible reasons for the difference between the two rates?

**ANSWER.** The relative values of the spot and forward rates suggest that the market believes the euro will appreciate against the dollar by about $0.02 over the next 180 days. The difference also indicates that the interest rate on dollars exceeds the interest rate on euro. These explanations are consistent with each other since a higher U.S. dollar interest rate indicates higher expected U.S. inflation and an expected depreciation of the dollar.

14. German government bonds, or Bunds, currently are paying higher interest rates than comparable U.S. Treasury bonds. Suppose the Bundesbank eases the money supply to drive down interest rates. How is an American investor in Bunds likely to fare?

**ANSWER.** The answer is impossible to determine in advance. The fall in DM interest rates will increase the price of Bunds (bond prices move inversely with interest rates), giving U.S. investors a capital gain in DM. At the same time, however, the decline in DM interest rates and the easing of German monetary policy could lead to a weaker DM. The net effect on U.S. investors' dollar returns of the higher DM price of Bunds and the lower dollar value of the DM is uncertain. It depends on which of the two factors dominates.

15. In 1993 and early 1994, Turkish banks borrowed abroad at relatively low interest rates to fund their lending at home. The banks earned high profits because rampant inflation in Turkey forced up domestic interest rates. At the same time, Turkey's central bank was intervening in the foreign exchange market to maintain the value of the Turkish lira. Comment on the Turkish banks' funding strategy.

**ANSWER.** This strategy, while profitable in the short run, exposes the Turkish banks to significant and predictable exchange risk. It will work only so long as the Turkish central bank is able to maintain a fixed nominal exchange rate in the face of high domestic inflation. In the process of doing so, the Turkish lira's real value will rise, putting pressure on exporters (who will see their goods priced out of world markets) and companies competing against imports. According to purchasing power parity, higher Turkish inflation will eventually lead to lira devaluation. If and when this happens, Turkish banks will find themselves facing a much higher lira cost of servicing their foreign debts. In fact, the Turkish lira did devalue, by 28% (in April, 1994), forcing a number of Turkish banks to the point of bankruptcy. The squeeze on Turkish banks was exacerbated when depositors, jittery over the banks' problems, began to withdraw cash. The Turkish central bank was forced to step in to help guarantee banks' liquidity and calm depositors' nerves.

**ADDITIONAL CHAPTER 4 QUESTIONS AND ANSWERS**

1. If the dollar is appreciating against the Polish zloty in nominal terms but depreciating against the zloty in real terms, what do we know about Polish and U.S. inflation rates?

**ANSWER.** The Polish inflation rate must be exceeding the U.S. inflation rate in order for the zloty to rise in real terms even as it is depreciating in nominal terms. This can be seen by studying Equation 8.6.

2. Suppose the nominal peso/dollar exchange rate is fixed. If the inflation rates in the Mexico and the United States are constant (but not necessarily equal in both countries), will the real value of the peso/dollar exchange rate also be constant over time?

**ANSWER.** No. In order for the real exchange rate to remain constant, the price levels in both countries must remain constant. To see this, suppose that at time 0 the nominal exchange rate is 1, as is the real exchange rate. If U.S. inflation is 2% and Mexican inflation is 15%, then according to Equation 8.6, the peso's real exchange rate in one year will equal 1.13 (1 x 1.15/1.02). This figure represents a 13% rise in the real value of the peso.
3. If the average rate of inflation in the world rises from 5% to 7%, what will be the likely effect on the U.S. dollar's forward premium or discount relative to foreign currencies?

**ANSWER.** If inflation rises uniformly around the world, there will be no change in relative inflation rates and, hence, there should be no change in currency values and in the forward discount or premium on the dollar.

4. Comment on the following statement. "It makes sense to borrow during times of high inflation because you can repay the loan in cheaper dollars."

**ANSWER.** According to the Fisher effect, interest rates adjust to take into account the effects of inflation on the real cost of repaying a loan. Thus, borrowing during times of inflation is profitable only if inflation turns out to be higher than expected at the time the loan was made. By definition, however, it is impossible to expect to profit from the unexpected. Hence, this statement is inconsistent with elementary notions of market efficiency.

5. The empirical evidence shows that there is no consistent relationship between the spot exchange rate and the nominal interest rate differential. Why might this be?

**ANSWER.** When the nominal interest rate differential rises (falls) because U.S. inflation is expected to increase (decrease), the value of the dollar can be expected to fall (rise). Alternatively, if the increase (decrease) in the nominal interest differential is due to a change in the real interest rate, then the dollar can be expected to increase (decrease) in value.

6. During 1988, the U.S. prime rate—the rate of interest banks charge on loans to their best customers—stood at 9.5%. Japan's prime rate, meanwhile, was about 3.5%. Pointing to that discrepancy, a number of commentators argued that the cost of capital must come down for U.S. business to remain competitive with Japanese companies. What additional information would you need to properly assess this claim? Why might interest rates be lower in Japan than in the U.S.?

**ANSWER.** To begin, 3.5% in yen is not the same as 9.5% in dollars. Absent government controls or subsidized financing, the expected cost of the two loans should be about the same when measured in the same currency. This is the international Fisher effect. Further, the generalized version of the Fisher effect says that the real cost of borrowing in different currencies should be about the same. The interest rates referred to in the question are nominal, not real. Absent government constraints on capital flows, the reason nominal interest rates differ is that lenders expect different rates of inflation measured in different currencies. Thus, to properly assess this claim, you would need to subtract off expected inflation from the interest rates and compare real interest rates. Given U.S. inflation of about 5% in 1988 and Japanese inflation of about -1%, it can be seen that real interest rates were about the same in both countries. The bottom line is that these nominal rate differences don't place U.S. companies at a competitive disadvantage.

7. In the late 1960s, Firestone Tire decided that Swiss francs at 2% were cheaper than U.S. dollars at 8% and borrowed about SFr 500 million. Comment on this choice.

**ANSWER.** Firestone Tire was gambling that the 6% lower interest rate on the Swiss franc would not be offset by appreciation of the Swiss franc against the dollar. It lost its bet that the international Fisher effect would not hold. When it went to repay the loan several years later, the Swiss franc had more than doubled in value against the dollar.

8. Comment on the following quote from a story in the *Wall Street Journal* (August 27, 1984, p. 6) that discusses the improving outlook for Britain's economy: "Recovery here will probably last longer than in the U.S. because there isn't a huge budget deficit to pressure interest rates higher."

**ANSWER.** In a world characterized by a relatively free flow of capital, a higher real return in the United States will attract capital from England, thereby driving up rates there as well. Thus if real interest rates rise in the U.S., real rates in the U.K. will also rise.
9. Comment on the following headline that appeared in the *Wall Street Journal* (December 19, 1990, p. C10): "Dollar Falls Across the Board as Fed Cuts Discount Rate to 6.5% From 7%." The discount rate is the interest rate the Fed charges member banks for loans.

**Answer.** In cutting the discount rate, the Fed is easing monetary policy. This easing will likely bring with it higher future inflation which, via PPP, will cause future dollar depreciation. At the same time, the cut in the nominal U.S. interest rate was also a real cut (because expected future inflation is now higher). Both explanations predict that dollar investments will be less attractive. In response, traders and investors will dump dollars today, causing the dollar to fall immediately.

10. In late 1990, the U.S. government announced that it might try to reduce the budget deficit by imposing a 0.5% transfer tax on all sales and purchases of securities in the United States, with the exception of Treasury securities. It projected the tax would raise $10 billion in federal revenues—an amount arrived at by multiplying 0.5% by the value of the $2 trillion trading on the New York Stock Exchange each year.

a. What are the likely consequences of this tax? Consider its effects on trading volume in the United States and stock and bond prices.

**Answer.** This classic example of static revenue analysis assumes that making trading in the U.S. more expensive and less profitable will not reduce the number of trades executed there. In fact, investors are likely to respond in one of two ways: (a) they will shift their trading activity overseas to avoid the transfer tax and/or (b) they will reduce the number of trades they engage in. It is easy for traders to shift their activities to any market via a phone line and a fax machine. So the U.S. government will collect less revenue, possibly far less, than it expected. Not surprisingly, the transfer tax has strong support from the British financial services sector, which anticipates a jump in trading activity for the City of London. In effect, a meaningful transfer tax will lead to the same type of regulatory arbitrage we have seen in other times and places. For example, the Kennedy Administration adopted the Interest Equalization Tax, which taxed foreign borrowings in the U.S. in order to restrict capital outflows. The IET drove a wedge between the returns from lending dollars in the U.S. and the returns from lending dollars held on deposit in Europe (Eurodollars). The net result of the IET was to jump start the Eurodollar market, because lending Eurodollars did not incur the IET. Markets will also be more volatile since investors will not trade on information that would justify small increases or decreases in the prices of stocks. But as information continues to flow, a point will be reached where the benefits of doing the trade will exceed the cost of the tax. The tax, in other words, will cause stock prices to move in bigger jumps, both up and down, than they now do. The result: a less liquid and more volatile market.

b. Why does the U.S. government plan to exclude its securities from this tax?

**Answer.** To the extent the transfer tax is effective, it will raise the cost of capital for American companies, since investors will demand to be compensated for the added costs of buying and selling securities. All investors care about is their net return after all taxes have been paid. Clearly, the government understands the harm its proposal can do since its proposal exempts federal debt from the tax. In effect, the proposal would raise capital costs for the private sector while subsidizing federal debt creation. Sauce for the goose is evidently not sauce for the gander.

c. Critically assess the government's estimates of the revenue it will raise from this tax.

**Answer.** One of the axioms of tax economics is that you should try to tax behavior that won't change much in response to the imposition of the tax. Here, the government is considering a tax on one of the world's most quickly moving targets. Currently, 12% of all trading orders in New York are from foreign clients—but most of these orders could just as well be executed in London, Toronto, Tokyo, or Frankfurt. Moreover, U.S. institutions would surely shift some of their domestic business overseas to cut costs. As the case of the IET shows, when countries impose transactions fees, they lose business to competing markets. The Swedish transfer tax was recently abolished after resourceful Swedes successfully transferred much trading to London from Stockholm. And since Britain announced that it would abolish transfer taxes in 1991, both the Netherlands and Germany have decided to eliminate theirs too. Pressure is building on France and Switzerland to abolish their transfer taxes, while Japan and Italy are cutting transfer taxes as well. The net result is that the U.S. is unlikely to collect much revenue from the tax.
11. It has been argued that the U.S. government's economic policies, particularly as they affect the U.S. budget deficit, are severely constrained by the world's financial markets. Do you agree or disagree? Discuss.

**Answer.** True. In order to finance its huge budget deficits (which have recently turned into surpluses), the U.S. government has needed continual access to the world's capital markets. Given deficits, if investors begin to believe that the United States would pursue economic policies that are inflationary, they would immediately change the terms on which they are prepared to lend the U.S. government money. Inflationary policies, therefore, would lead to higher interest rates, thereby worsening the budget deficit, hobbling economic growth, and even throwing the nation into a recession. At the same time, the value of the dollar would fall. The adverse political consequences of these two effects--higher interest rates and a falling dollar--actually constrained government policymakers to pursue economic policies that were regarded by the financial markets as being noninflationary. Of course, the U.S. government could always have promised to maintain the value of the dollar, but such a pledge would be far more credible if backed by serious deficit reduction, such as how now happened. The actual deficit reduction is owed to rapid economic growth and the resulting jump in federal revenues. Rapid growth, in turn, has strengthened the U.S. dollar, as predicted.

President Clinton got a taste of bond investors' power in 1993 when, during the last month of his campaign, bondholders pushed up long-term interest rates by about 40 basis points in anticipation of his victory. Why? Because investors feared that he would honor his promise to reinvigorate the economy and put the unemployed back to work through traditional Democratic big government spending programs and regulations. Fearing that his policies and programs would accelerate inflation, investors sold bonds, causing bond prices to fall and interest rates to rise. It was the bond market's way of warning Mr. Clinton that he would long be on probation, with his every move scrutinized by nervous investors. Conversely, bondholders tended to ignore the large budget deficits during the Reagan and Bush administrations because they felt secure with fiscally conservative Republicans in the White House.

12. In 1991, the U.S. government imposed a stiff import tariff on the active-matrix LCD screens that now appear in next-generation laptop computers.

a. Assess the likely consequences of the import duty for U.S. laptop computer manufacturers.

**Answer.** U.S. laptop manufacturers will find their costs rising significantly, particularly since the active-matrix LCD screen is already the most expensive component in a color laptop. Unfortunately, they will be unable to raise their prices by much since they are facing competition from foreign laptop manufacturers, who pay no duty on assembled machines containing active-matrix screens. Moreover, U.S. companies don't have the luxury of shifting to a U.S. active-matrix supplier since none exists. The result for U.S. manufacturers will be a steep decline in profits on laptops made in the United States.

b. How are these manufacturers likely to react to this import duty?

**Answer.** The key to answering this question is to recognize that the duty is imposed on the active-matrix screens, not on the computers. U.S. manufacturers will, and did, react by shifting manufacture of color laptops overseas and then exporting the assembled machines duty-free to the United States. In June, 1993, the U.S. revoked its self-destructive LCD duties. Almost immediately, Apple Computer, Compaq, and Toshiba announced that they would shift laptop production back to the U.S.

13. "High real interest rates can be a cause for celebration, not alarm." Discuss.

**Answer.** The most likely reason for a rise in real interest rates is a pickup in economic activity. Historically, an increase in real interest rates has usually signaled good economic times, while a real interest rate decrease has typically signaled economic decline. Specifically, real interest rates tend to be at their low point during a recession because of the low demand for capital. As the world economy comes out of recession, real rates typically rise. Hence, a high real interest rate likely signifies that economic growth is picking up. Of course, if real interest rates rise because the supply of capital is contracting, then high real rates would be a bad sign. But normally it is the demand for capital, not its supply, that is the determining factor for real rates.
14. In an integrated world capital market, will higher interest rates in, say Japan, mean higher interest rates in, say, the United States?

**Answer.** The answer depends critically on whether we are talking about real rates or nominal rates. If nominal interest rates rise in Japan because of higher expected Japanese inflation, this will have no effect on nominal U.S. rates unless the U.S. is following similar inflationary policies. However, a rise in real interest rates in Japan will tend to push up real rates in the United States through the process of international arbitrage, brought about by capital flows from the United States to Japan to take advantage of the higher real rates expected there.

15. In France in 1994, short-term interest rates and bond yields remained higher than in Germany, despite a better outlook for inflation in France. Does this situation indicate a violation of the Fisher effect? Explain.

**Answer.** No. The Fisher effect is based on expected future inflation. Investors were saying that they believed that Germany would likely have a lower rate of inflation in the future, despite its higher current rate of inflation. Hence, investors accorded lower interest rates to Germany than to France. Investors believed that Germany would have a lower future rate of inflation than France because of the macroeconomic situation in these countries at the time. Both countries had high unemployment rates in 1994 and people were calling for the monetary authorities in the two countries to ease up on the money supply in order to boost economic growth, even if this led also to higher inflation. Given France's much shorter history of monetary rectitude than Germany's and, hence, lesser degree of monetary credibility, investors were clearly saying that they believed that French monetary authorities were less likely to resist the pressures to reflate than the Bundesbank. This expectation was based on the historical willingness of French authorities to tolerate higher inflation in order to stimulate economic growth.

16. On February 15, 1993, President Clinton previewed his State of the Union message to Congress in a toughly-worded talk on television about how the growing federal budget deficit made tax increases necessary. Financial markets reacted by pushing bond prices up and pummeling stock prices. President Clinton said that the rise in Treasury bond prices was a "very positive" response to his televised speech the night before. How would you interpret the reaction of the financial markets to President Clinton's speech?

**Answer.** News stories at the time reveal that the markets' reaction was driven by investor expectations that a tax increase would reduce economic growth, thereby lowering both nominal and real interest rates. These stories are consistent with the differing reactions of the stock and bond markets. Lower interest rates will boost bond prices, but if those lower rates are driven by expectations of slower economic growth, then stock prices will fall (since expected future corporate earnings will be lower).

17. At the same time that it was talking down the dollar, the Clinton Administration was talking about the need for low interest rates to stimulate economic growth. Comment.

**Answer.** These objectives were inconsistent with each other. If foreign investors expect the dollar to fall in the future, then they will demand a higher U.S. interest rate to compensate themselves for their capital loss. Similarly, American investors will demand a higher dollar interest rate since their alternative is to invest in foreign bonds, which will provide them with a capital gain if and when the dollar falls. Moreover, dollar depreciation will also likely fuel inflation, which will push up interest rates.

18. One idea to curb potentially destabilizing international movements of capital has been devised by James Tobin, a Nobel Prize-winning economist. He proposes putting a small tax on foreign exchange transactions. He claims that his "Tobin tax" would make short-term speculation more costly while having little effect on long-term investment.

a. Why would the Tobin tax have a disproportionate impact on short-term investments?

**Answer.** A given cost of buying and selling foreign exchange would be a larger percentage of annualized returns over a short period of time. For example, a cost of 0.1% would have an annualized cost of 5.2% over a one-week period (0.1% x 52) but only a 0.02% annualized cost over a five-year period (0.1%/5). The larger the annualized cost the greater the impact on a potential transaction.
b. Is the Tobin tax likely to accomplish its objective? Explain.

**Answer.** No. A Tobin tax would be easy to avoid by moving currency trades to a country that does not tax them. It could also be avoided in other ways. For example, rather than trade DM for dollars, say, traders might agree to swap German bunds for U.S. Treasury bonds. It should also be noted that speculators who attack a currency expect returns far greater than the cost of a Tobin tax. Moreover, it would not necessarily solve problems such as those in East Asia, where the biggest sellers of local currency were not speculators but local firms trying desperately to hedge or repay debts denominated in dollars.

**SUGGESTED SOLUTIONS TO CHAPTER 4 PROBLEMS**

1. From base price levels of 100 in 2000, Japanese and U.S. price levels in 2003 stood at 102 and 106, respectively.
   a. If the 2000 $:¥ exchange rate was $0.007692, what should the exchange rate be in 2003?

   **Answer.** If $e_{2003}$ is the dollar value of the yen in 2003, then according to purchasing power parity
   
   \[ \frac{e_{2003}}{0.007692} = \frac{106}{102} \]
   
   or $e_{2003} = 0.007994$.

   b. In fact, the exchange rate in 2003 was ¥ 1 = $0.008696. What might account for the discrepancy? (Price levels were measured using the consumer price index.)

   **Answer.** The discrepancy between the predicted rate of $0.007994 and the actual rate of $0.008696 could be due to mismeasurement of the relevant price indices. Estimates based on narrower price indices reflecting only traded goods prices would probably be closer to the mark. Alternatively, it could be due to a switch in investors' preferences from dollar to non-dollar assets.

2. Two countries, the United States and England, produce only one good, wheat. Suppose the price of wheat is $3.25 in the United States and is £1.35 in England.
   a. According to the law of one price, what should the $:£ spot exchange rate be?

   **Answer.** Since the price of wheat must be the same in both nations, the exchange rate, e, is 3.25/1.35 or $e = 2.4074$.

   b. Suppose the price of wheat over the next year is expected to rise to $3.50 in the United States and to £1.60 in England. What should the one-year $:£ forward rate be?

   **Answer.** In the absence of uncertainty, the forward rate, f, should be 3.50/1.60 or $f = 2.1875$.

   c. If the U.S. government imposes a tariff of $0.50 per bushel on wheat imported from England, what is the maximum possible change in the spot exchange rate that could occur?

   **Answer.** If $e$ is the exchange rate, then wheat selling in England at £1.35 will sell in the United States for 1.35e + 0.5, where 0.5 is the U.S. tariff on English wheat. In order to eliminate the possibility of arbitrage, 1.35e + 0.5 must be greater than or equal to $3.25, the price of wheat in the U.S. or $e > 2.0370$. Thus the maximum exchange rate change that could occur is $(2.4074 - 2.0370)/2.4074 = 15.38\%$. This solution assumes that the pound and dollar prices of wheat remain the same as before the tariff.

3. If expected inflation is 100 percent and the real required return is 5 percent, what will the nominal interest rate be according to the Fisher effect?
According to the Fisher effect, the relationship between the nominal interest rate, \( r \), the real interest rate \( a \), and the expected inflation rate, \( i \), is \( 1 + r = (1 + a)(1 + i) \). Substituting in the numbers in the problem yields \( 1 + r = 1.05 \times 2 = 2.1 \), or \( r = 110\% \).

4. In early 1996, the short-term interest rate in France was 3.7%, and forecast French inflation was 1.8%. At the same time, the short-term German interest rate was 2.6% and forecast German inflation was 1.6%.

a. Based on these figures, what were the real interest rates in France and Germany?

**Answer.** The French real interest rate was \( \frac{1.037}{1.018} - 1 = 1.87\% \). The corresponding real rate in Germany was \( \frac{1.026}{1.016} - 1 = 0.98\% \).

b. To what would you attribute any discrepancy in real rates between France and Germany?

**Answer.** The most likely reason for the discrepancy is the inclusion of a higher inflation risk component in the French real interest rate than in the German real rate. Other possibilities are the effects of currency risk or transactions costs precluding this seeming arbitrage opportunity.

5. In July, the one-year interest rate is 12% on British pounds and 9% on U.S. dollars.

a. If the current exchange rate is $1.63:£1, what is the expected future exchange rate in one year?

**Answer.** According to the international Fisher effect, the spot exchange rate expected in one year equals \( 1.63 \times \frac{1.09}{1.12} = $1.5863 \).

b. Suppose a change in expectations regarding future U.S. inflation causes the expected future spot rate to decline to $1.52:£1. What should happen to the U.S. interest rate?

**Answer.** If \( r_m \) is the unknown U.S. interest rate, and assuming that the British interest rate stayed at 12% (because there has been no change in expectations of British inflation), then according to the IFE, \( \frac{1.52}{1.63} = \frac{1 + r_m}{1.12} \) or \( r_m = 4.44\% \).

6. Suppose that in Japan the interest rate is 8% and inflation is expected to be 3%. Meanwhile, the expected inflation rate in France is 12%, and the English interest rate is 14%. To the nearest whole number, what is the best estimate of the one-year forward exchange premium (discount) at which the pound will be selling relative to the French franc?

**Answer.** Based on the numbers, Japan's real interest rate is about 5% (8% - 3%). From that, we can calculate France's nominal interest rate as about 17% (12% + 5%), assuming that arbitrage will equate real interest rates across countries and currencies. Since England's nominal interest rate is 14%, for interest rate parity to hold, the pound should sell at around a 3% forward premium relative to the French franc.

7. Chase Econometrics has just published projected inflation rates for the United States and Germany for the next five years. U.S. inflation is expected to be 10 percent per year, and German inflation is expected to be 4 percent per year.
a. If the current exchange rate is $0.95/€, what should the exchange rates for the next five years be?

**Answer.** According to PPP, the exchange rate for the euro at the end of year $t$ should equal $0.95(1.10/1.04)^t$. Hence, projected exchange rates for the next 5 years are $1.0048$, $1.0628$, $1.1241$, $1.1889$, $1.2575$.

b. Suppose that U.S. inflation over the next five years turns out to average 3.2%, German inflation averages 1.5%, and the exchange rate in five years is $0.99/€$. What has happened to the real value of the euro over this five-year period?

**Answer.** According to Equation 4.7, the real value of the euro at the end of five years is

$$e_t = e_0 \left( \frac{1 + i_f}{1 + i_h} \right)^t = 0.99 \times \left( \frac{1.015}{1.032} \right)^5 = 0.9111$$

Hence, even though the euro has appreciated in nominal terms over this five-year period, it has fallen in real terms by 4.09% \([(0.9111 - 0.95)/0.95]\).

8. During 1995, the Mexican peso exchange rate rose from Mex$5.33/U.S.$ to Mex$7.64/U.S.$ At the same time, U.S. inflation was approximately 3% in contrast to Mexican inflation of about 48.7%.

a. By how much did the nominal value of the peso change during 1995?

**Answer.** During 1995, the peso fell from $0.1876 (1/5.33) to $0.1309 (1/7.64), which is equivalent to a devaluation of 30.24% \([(0.1309 - 0.1876)/0.1876]\).

b. By how much did the real value of the peso change over this period?

**Answer.** Using Equation 4.7, the real value of the peso by the end of 1995 was $0.1890:

$$e_t = e_0 \left( \frac{1 + i_f}{1 + i_h} \right)^t = 0.1309 \times \frac{1.487}{1.03} = 0.1890$$

Based on this real exchange rate, the peso has appreciated during 1995 by 0.72% \([(0.1890 - 0.1876)/0.1876]\). In other words, the real exchange rate stayed virtually constant, implying the purchasing power parity held during the year.

9. Suppose three-year deposit rates on Eurodollars and Eurofrancs (Swiss) are 12 percent and 7 percent, respectively. If the current spot rate for the Swiss franc is $0.3985, what is the spot rate implied by these interest rates for the franc three years from now?

**Answer.** If $r_{us}$ and $r_{sw}$ are the associated Eurodollar and Eurofranc nominal interest rates, then the international Fisher effect says that

$$e_t/e_0 = (1 + r_{us})/(1 + r_{sw})^t$$

where $e_t$ is the period $t$ expected spot rate and $e_0$ is the current spot rate ($\text{SFr}1 = \text{Se}$). Substituting in the numbers given in the problem yields $e_t = 0.3985 \times (1.12/1.07)^3 = 0.4570$.

10. Assume the interest rate is 16 percent on pounds sterling and 7 percent on euros. At the same time, inflation is running at an annual rate of 3 percent in Germany and 9 percent in England.
a. If the euro is selling at a one-year forward premium of 10 percent against the pound, is there an arbitrage opportunity? Explain.

**Answer.** According to interest rate parity, with a euro rate of 7% and a 10% forward premium on the euro against the pound, the equilibrium pound interest rate should be

\[ 1.07 \times 1.10 - 1 = 17.7\% \]

Since the pound interest rate is only 16%, there is an arbitrage opportunity. It involves borrowing pounds at 16%, converting them into euros, investing them at 7%, and then selling the proceeds forward, locking in a pound return of 17.7%.

b. What is the real interest rate in Germany? in England?

**Answer.**

The real interest rate in Germany is \( \frac{1.07}{1.03} - 1 = 3.88\% \). The real interest rate in England is \( \frac{1.16}{1.09} - 1 = 6.42\% \).

c. Suppose that during the year the exchange rate changes from €1.8/£1 to €1.77/£1. What are the real costs to a German company of borrowing pounds? Contrast this cost to its real cost of borrowing euros.

**Answer.** At the end of one year, the German company must repay £1.16 for every pound borrowed. However, since the pound has devalued against the euro by 1.67% (1.77/1.80 - 1 = -1.67%), the effective cost in euros is \( 1.16 \times (1 - 0.0167) - 1 = 14.07\% \). In real terms, given the 3% rate of German inflation, the cost of the pound loan is found as \( 1.1385/1.03 - 1 = 10.74\% \).

As shown above, the real cost of borrowing euros equals 3.88%, which is significantly lower than the real cost of borrowing pounds. What happened is that the pound loan factored in an expected devaluation of about 9% (16% - 7%), whereas the pound only devalued by about 2%. The difference between the expected and actual pound devaluation accounts for the approximately 7% higher real cost of borrowing pounds.

d. What are the real costs to a British firm of borrowing euros? Contrast this cost to its real cost of borrowing pounds.

**Answer.** During the year, the euro appreciated by 1.69% (1.80/1.77 - 1) against the pound. Hence, a euro loan at 7% will cost 8.81% in pounds (1.07 x 1.0169 - 1). In real pound terms, given a 9% rate of inflation in England, this loan will cost the British firm -0.2% (1.0881/1.09 - 1) or essentially zero. As shown above, the real interest on borrowing pounds is 6.42%.

11. Suppose the Eurosterling rate is 15 percent, and the Eurodollar rate is 11.5 percent. What is the forward premium on the dollar? Explain.

**Answer.** According to interest rate parity, if \( P \) is the forward premium on the dollar, then

\[ (1.115)(1 + P) = 1.15, \text{ or } P = 3.14\% \]

12. Suppose the spot rates for the euro, pound sterling, and Swiss franc are $1.52, $2.01, and $0.98, respectively. The associated 90-day interest rates (annualized) are 8 percent, 16 percent, and 4 percent; the U.S. 90- day rate (annualized) is 12 percent. What is the 90-day forward rate on an ACU ( ACU 1 = €1 + £1 + SFr 1 ) if interest parity holds?

**Answer.** The key to working this problem is to recognize that the forward rate for a sum of currencies is just the sum of the forward rates for each individual currency. Also note that the forward rates are for 90 days. Hence, the interest rates must be divided by 4 to convert them into quarterly values. Assuming interest parity, the forward rate for the pound is $2.01 x 1.03/1.04 = $1.9907, the forward rate for the euro is $1.52 x 1.03/1.02 = $1.5349, and the forward rate on the Swiss franc is $0.98 x 1.03/1.01 = $0.9994. If interest parity holds, the 90-day forward rate on an ACU must, therefore, equal \$1.9907 + $1.5349 + $0.9994 = $4.5250.

13. Suppose that three-month interest rates (annualized) in Japan and the United States are 7 percent and 9 percent, respectively. If the spot rate is ¥142:$1 and the 90-day forward rate is ¥139:$1:
a. Where would you invest?

**ANSWER.** The dollar return from a three-month investment in Japan can be found by converting dollars to yen at the spot rate, investing the yen at 1.75% (7%/4), and then selling the proceeds forward for dollars. This yields a dollar return equal to 142 x 1.0175/139 = 1.0395 or 3.95%. This return significantly exceeds the 2.25% (9%/4) return available from investing in the United States.

b. Where would you borrow?

**ANSWER.** The flip side of a lower return in the United States is a lower borrowing cost. Borrow in the United States.

c. What arbitrage opportunity do these figures present?

**ANSWER.** Absent transaction costs that would wipe out the yield differential, it makes sense to borrow dollars in New York at 2.25% and invest them in Tokyo at 3.95%.

d. Assuming no transaction costs, what would be your arbitrage profit per dollar or dollar-equivalent borrowed?

**ANSWER.** The profit would be a 1.7% (3.95% - 2.25%) return per dollar borrowed.

14. Here are some prices in the international money markets:

<table>
<thead>
<tr>
<th>Spot rate</th>
<th>Forward rate (one year)</th>
<th>Interest rate (€)</th>
<th>Interest rate ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.46/€</td>
<td>$1.49/€</td>
<td>7% per year</td>
<td>9% per year</td>
</tr>
</tbody>
</table>

a. Assuming no transaction costs or taxes exist, do covered arbitrage profits exist in the above situation? Describe the flows.

**ANSWER.** The annual dollar return on dollars invested in Germany is (1.07 x 1.49)/1.46 - 1 = 9.20%. This return exceeds the 9% return on dollars invested in the United States by 0.25% per annum. Hence arbitrage profits can be earned by borrowing dollars or selling dollar assets, buying euros in the spot market, investing the euros at 7%, and simultaneously selling the euro interest and principal forward for one year for dollars.

b. Suppose now that transaction costs in the foreign exchange market equal 0.25% per transaction. Do unexploited covered arbitrage profit opportunities still exist?

**ANSWER.** In this case, the return on arbitraging dollars falls to 1.07 x 1.49/1.46 x 0.9975^2 - 1.09 = -0.35%

Thus, arbitraging from dollars to euros has now become unprofitable and no capital flows will occur.

c. Suppose no transaction costs exist. Let the capital gains tax on currency profits equal 25%, and the ordinary income tax on interest income equal 50%. In this situation, do covered arbitrage profits exist? How large are they? Describe the transactions required to exploit these profits.

**ANSWER.** In this case, the after-tax interest differential in favor of the U.S. is (0.09 x 0.50 - 0.07 x 0.50)/(1 + 0.07 x 0.50) = (0.045 - 0.035)/1.035 = 0.97%, while the after-tax forward premium on the euro is 0.75x(1.49 – 1.46)/1.46 = 1.54%. Since the after-tax forward premium exceeds the after-tax interest differential, dollars will continue to flow to Germany as before.

15. Suppose today's exchange rate is $1.55/€. The six-month interest rates on dollars and euros are 6 percent and 3 percent, respectively. The six-month forward rate is $1.5478. A foreign exchange advisory service has predicted that the euro will appreciate to $1.5790 within six months.
a. How would you use forward contracts to profit in the above situation?

**ANSWER.** By buying euros forward for six months and selling them in the spot market, you can lock in an expected profit of $0.0312, (1.5790 - 1.5478) per euro bought forward. This is a semiannual return of 2.02% (0.0312/1.5478). Whether this profit materializes depends on the accuracy of the advisory service's forecast.

b. How would you use money market instruments (borrowing and lending) to profit?

**ANSWER.** By borrowing dollars at 6% (3% semiannually), converting them to euros in the spot market, investing the euros at 3% (1.5% semiannually), selling the euro proceeds at an expected price of $1.5790/€, and repaying the dollar loan, you will earn an expected semiannual return of 1.30%:

\[
\text{Return per dollar borrowed} = \left(\frac{1}{1.55}\right) \times 1.015 \times 1.5790 - 1.03 = 0.40\%
\]

c. Which alternatives (forward contracts or money market instruments) would you prefer? Why?

**ANSWER.** The return per dollar in the forward market is substantially higher than the return using the money market speculation. Other things being equal, therefore, the forward market speculation would be preferred.

**ADDITIONAL CHAPTER 4 PROBLEMS AND SOLUTIONS**

1. In February 1985, Bolivian inflation reached a monthly peak of 182%. What was the annualized rate of inflation in Bolivia for that month?

**ANSWER.** The annualized rate of inflation is found as the solution to \((1 + i)^{12} - 1\), where \(i\) is the monthly inflation rate. Hence, the annualized Bolivian inflation rate, in percentage terms, was \((2.82)^{12} - 1 = 25,292,257\%\).

2. The inflation rate in Great Britain is expected to be 4% per year, and the inflation rate in France is expected to be 6% per year. If the current spot rate is £1 = FF 12.50, what is the expected spot rate in two years?

**ANSWER.** Based on PPP, the expected value of the pound in two years is 12.5 \(\times (1.06/1.04)^2 = FF12.99\).

3. If the $:¥ spot rate is $1 = ¥218 and interest rates in Tokyo and New York are 6% and 12%, respectively, what is the expected $:¥ exchange rate one year hence?

**ANSWER.** According to the international Fisher effect, the dollar spot rate in one year should equal 218\((1.06/1.12) = ¥206.32\).

4. Suppose that on January 1, the cost of borrowing French francs for the year is 18%. During the year, U.S. inflation is 5%, and French inflation is 9%. At the same time, the exchange rate changes from FF 1 = $0.15 on January 1 to FF 1 = $0.10 on December 31. What was the real U.S. dollar cost of borrowing francs for the year?

**ANSWER.** During the year, the franc devalued by \((.15 - .10)/.15 = 33.33\%\). The nominal dollar cost of borrowing French francs, therefore, was \(18(1 - .3333) = 11.22\%\) (see Chapter 12). For each dollar's worth of francs borrowed on January 1, it cost only $0.7867 to repay the principal plus interest. With U.S. inflation of 5% during the year, the real dollar cost of repaying the principal and interest is $0.7867/1.05 = $0.7492. Subtracting the original $1 borrowed, we see that the real dollar cost of repaying the franc loan is -$0.2508 or a real dollar interest rate of -25.08%.
5. In late 1990, following Britain's entry into the exchange-rate mechanism of the European Monetary System, 10-year British Treasury bonds yielded 11.5%, and the German equivalent offered a yield of just 9%. Under terms of its entry, Britain established a central rate against the DM of DM 2.95 and pledged to maintain this rate within a band of plus and minus 6%.

   a. By how much would sterling have to fall against the DM over a 10-year period for the German bond to offer a higher overall return than the British one? Assume the Treasuries are zero-coupon bonds with no interest paid until maturity.

   **Answer.** An investment of DM 1 in the zero-coupon British Treasury bond will return \( \left( \frac{1}{e_0} \right) \left( 1.115 \right)^{10} e_{10} \) DM in 10 years where \( e_0 \) is the current DM spot price of a pound and \( e_{10} \) is the spot rate in 10 years. To find the amount of sterling depreciation at which returns are equalized, we set this return equal to the DM return on investing in the German zero:

   \[
   \left( \frac{1}{e_0} \right) \left( 1.115 \right)^{10} e_{10} = 1.09^{10}
   \]

   Solving for the relation between the current and future spot values of sterling that will equalize the two returns we get \( \frac{e_{10}}{e_0} = 0.7971 \). In other words, the pound would have to depreciate by 20.29% over the next 10 years before the higher return on sterling would be offset by the exchange loss.

   b. How does the exchange rate established in Part a compare to the lower limit that the British government is pledged to maintain for sterling against the DM?

   **Answer.** The lower limit on sterling under the ERM is £1 = DM 2.7730 (.94 x 2.95). Given an initial rate of £1 = DM 2.95, a 20.29% devaluation yields a rate of £1 = DM 2.3514, far below the lower limit.

   c. What accounts for the difference between the two rates? Does this difference violate the international Fisher effect?

   **Answer.** Clearly, the market is somewhat skeptical that Britain will uphold its end of the agreement. In other words, the market is betting that Britain will allow the pound to depreciate by more than 6% against the central rate. The difference in rates doesn't violate the international Fisher effect, which deals with the market's expectations, not with government promises that may not be fulfilled.

6. Assume the interest rate is 11% on pounds sterling and 8% on euros. If the euro is selling at a one-year forward premium of 4% against the pound, is there an arbitrage opportunity? Explain.

   **Answer.** In order for there to be no arbitrage opportunity, the return on investing in sterling, 11%, must equal the sterling return on investing in euros, \( 0.08 + 0.04 + 0.08 \times 0.04 = 12.32\% \) (or 1.08 x 1.04 -1). According to these numbers, there is an arbitrage incentive of 1.32% for investing in euros.

7. If the Swiss franc is $0.68 on the spot market and the 180-day forward rate is $0.70, what is the annualized interest rate in the United States over the next six months? The annualized interest rate in Switzerland is 2%.

   **Answer.** According to the interest rate parity,

   \[
   \frac{1 + r_{us}}{1 + r_{sw}} = \frac{f_0}{e_0}
   \]

   where \( f_0 \) and \( e_0 \) are the SFr forward and spot rates. Substituting in the numbers and recalling that everything must be converted to a semi-annual basis, we have \( (1 + .5r_{us})/1.01 = 0.70/0.68 \), or \( 1 + .5r_{us} = 1.0397 \). The solution is \( r_{us} = 7.94\% \).

8. The interest rate in the United States is 8%; in Japan the comparable rate is 2%. The spot rate for the yen is $0.007692. If interest rate parity holds, what is the 90-day forward rate on the Japanese yen?

   **Answer.** According to the IRPT, the 90-day forward rate on the yen should equal

   \[
   $0.007692[(1 + .08/4)/(1 + .02/4)] = $0.0078
   \]