Sample Topics for MS&E 247S International Investments
July 1, 2002

Topic 1: The Hamburger Standard
Topic 2: Arbitrage
Topic 3: A Macroeconomic Theory of the Open Economy
Topic 4: Building Blocks of The Parity Framework
Topic 5: Monetary Policy, Interest, and Exchange Rates
Topic 6: Swaps & Linkage Across International Capital Markets
Topic 7: CFA Exam Questions

Mankiw / Macroeconomics 5E (good optional background reading)
Chapter 5 Open-Economy Macroeconomics
http://www.bfwpub.com/pdfs/mankiw/0716752379_05.pdf
Chapter 12 Aggregate Demand in the Open Economy

Investors’ Dictionaries (Use them Often!)
http://www.duke.edu/~charvey/Classes/wpg/glossary.htm
http://www.individualinvestor.com/investor_university/inv_glos.asp

Sample Slides for MS&E 247S International Investments
The Hamburger Standard
http://www.economist.com/editorial/justforyou/focus/big_mac_index.html

THE BIG MAC INDEX
http://www.economist.com/markets/Bigmac/Index.cfm

Evidence: The Law of One Price

- One test of the Law of One Price is the Big Mac index, which has been published annually in The Economist since 1986.

- The Big Mac index was devised as a light-hearted guide to whether currencies are at their "correct" level, based on PPP.
  - Our "basket" is a McDonald's Big Mac, which is produced and consumed in various countries around the world.
  - The Big Mac PPP is the exchange rate that would leave hamburgers costing the same in America as abroad.

BIG MAC INDEX

Burgernomics is based on the theory of purchasing-power parity, the notion that a dollar should buy the same amount in all countries. Thus in the long run, the exchange rate between two countries should move towards the rate that equalises the prices of an identical basket of goods and services in each country. In other words, a dollar should buy the same amount everywhere. Our "basket" is a McDonald's Big Mac, which is produced in about 120 countries. The Big Mac PPP is the exchange rate that would mean hamburgers cost the same in America as abroad. Comparing actual exchange rates with PPPs indicates whether a currency is under- or overvalued.

Evidence: The Law of One Price

- Comparing actual exchange rates with PPPs signals whether a currency is under- or overvalued.

- The result of the 2000 survey suggested that the average price of a Big Mac in the U.S. was $2.51, but was as little as $1.19 in Malaysia, and as much as $3.58 in Israel.

- Hence the Israeli shekel is the most overvalued currency (by 43%), while the Malaysian ringgit is the most undervalued (by 53%).
### Evidence: The Law of One Price

**Example 1. Canada**

Purchasing power of C$2.85  
= Purchasing power of $2.51  
= a Big Mac

Hence Big Mac PPP implies 1 C$ = $ (2.51/2.85)

However from the market spot rate, 1 C$ = $ (1/1.47)

(-)/(+) valuation against $, % (based on Big Mac PPP)

\[
\frac{(1/1.47) - (2.51/2.85)}{(2.51/2.85) - (1/1.47)} = \frac{(1/1.47) - 1}{(1.47/2.51) - 1}
\]

\[
= 22.8\%
\]

### Evidence: The Law of One Price

**Example 2. Denmark**

Purchasing power of 24.75 DKr  
= Purchasing power of $2.51  
= a Big Mac

Hence Big Mac PPP implies 1 DKr = $ (2.51/24.75)

However from the market spot rate, 1 DKr = $ (1/8.04)

(-)/(+) valuation against $, % (based on Big Mac PPP)

\[
\frac{(1/8.04) - (2.51/24.75)}{(2.51/24.75) - (1/8.04)} = \frac{(1/8.04)}{(2.51/24.75)} - 1
\]

\[
= 22.6\%
\]

### Evidence: The Law of One Price

- The Big Mac index is not a perfect measure of PPP. Price differences may be distorted by trade barriers on beef, sales taxes, local competition and changes in the cost of non-traded inputs such as rents.
- But despite its flaws, the Big Mac index produces PPP estimates close to those derived by more sophisticated methods.
- A currency can deviate from PPP for long periods, but several studies have found that the Big Mac PPP is a useful predictor of future movements.

Indeed, the Big Mac has had several forecasting successes.

When the euro was launched at the start of 1999, most forecasters predicted that it would rise. But the euro has instead tumbled - exactly as the Big Mac index had signaled. At the start of 1999, euro burgers were much dearer than American ones.
The first column of the table shows local-currency prices of a Big Mac; the second converts them into dollars. The average price of a Big Mac in America is $2.54 (including sales tax). In Japan, Big Mac scoffers have to pay ¥294, or $2.38 at current exchange rates. The third column calculates PPPs. Dividing the yen price by the dollar price gives a Big Mac PPP of ¥116. Comparing that with this week’s rate of ¥124 implies that the yen is 6% undervalued.

\[
\frac{1}{124} - \frac{1}{116} = -0.0645 = -6\% \text{ (yen is 6\% undervalued)}
\]

The greatest triumph of the Big Mac index has been in tracking the euro. When Europe’s new currency was launched in January 1999, virtually everybody predicted that it would rise against the dollar. Everybody, that is, except the Big Mac index, which suggested that the euro started off significantly overvalued. One of the best-known hedge funds, Soros Fund Management, admitted that it chewed over the sell signal given by the Big Mac index when the euro was launched, but then decided to ignore it. The euro tumbled; Soros was cheesed off.

The average price today in the 12 euro countries is \(\text{euro}2.57\), or $2.27 at current exchange rates. The euro’s Big Mac PPP against the dollar is \(\text{euro}1=\$0.99\), which shows that it has now undershot McParity by 11%. That, in turn, implies that sterling is 26% overvalued against the euro.
Overall, the dollar has never looked so overvalued during 15 years of burgernomics. In the mid 1990s the dollar was cheap against most currencies; now it looks dear against all but three. The most undervalued of the rich-world currencies are the Australian and New Zealand dollars, which are both 40-45% below McParity. They need to ketchup. All the emerging-market currencies are undervalued against the dollar on a Big Mac PPP basis. That, in turn, means that a currency such as Argentina’s peso, which is undervalued only a tad against the dollar, is massively overvalued compared with other currencies, such as the Brazilian real and virtually all of the East Asian currencies.

Some of our readers find the Big Mac index hard to swallow. Not only does the theory of purchasing-power parity hold only for the very long run, but hamburgers are a flawed measure of PPP. Local prices may be distorted by trade barriers on beef, sales taxes, or big differences in the cost of property rents. Nevertheless, some academic studies of the Big Mac index have concluded that betting on the most undervalued of the main currencies each year is a profitable strategy.

Please update the Big Mac index (Apr 25th 2002) from the following urls:
http://www.economist.com/markets/Bigmac/Index.cfm
http://www.economist.com/opinion/PrinterFriendly.cfm?Story_ID=1098872

Arbitrage: Transactions intended to take advantage of observed pricing discrepancies, and earn profits with little or no exposure to risk (have arbitrage opportunities diminished due to the issue of the single European currency €?)

- Spatial arbitrage
  For a single currency, spatial arbitrage refers to price differences across market locations or dealers. $/DM (NY) ≠ $/DM (London) or $/DM (Dealer A) ≠ $/DM (Dealer B)

- Triangular arbitrage
  For three currencies, triangular parity implies: SF/MP = SF/$ x $/MP MP: Mexican Peso
  Importance of triangular parity for constructing “cross rates”
  Direct markets in DM/£ were observed, but prices constrained by DM/£ = DM/$ x $/£

Triangular Arbitrage

Suppose we observe these banks posting these exchange rates.

First calculate the implied cross rates to see if an arbitrage exists.

As easy as 1 – 2 – 3:
1. Sell our $ for £,
2. Sell our £ for ¥,
3. Sell those ¥ for $.
Triangular Arbitrage

Sell $100,000 for £ at S(£/$) = 1.50
receive £150,000

Sell our £ 150,000 for ¥ at S(£/¥) = 85
receive ¥12,750,000

Sell ¥ 12,750,000 for $ at S(¥/$) = 120
receive $106,250

profit per round trip = $106,250 - $100,000 = $6,250

The Bid-Ask Spread

• The bid price is the price a dealer is willing to pay you for something.
• The ask price is the amount the dealer wants you to pay for the thing.
• The bid-ask spread is the difference between the bid and ask prices.

Taking Advantage of a Triangular Arbitrage Opportunity

• A cross-rate trader at Bankers Trust notices that:
  – Credit Lyonnais is buying dollars at S(FF/$b) = 5.0515, the same as Bankers Trust’s bid price (bank’s $ buying price)
  – Barclays is offering (selling) dollars at S($/£b) = 1.5573, also the same as Bankers Trust’s selling price
  – Credit Agricole is making a direct market between the franc and the pound, with a current FF bid price of S(FF/£b) = 0.1273 (which implies a reciprocal £ ask price (offering price, bank’s currency selling price) of S(£/FFa) = 7.8555)
• The FF/£ bid price should be no lower than S(FF/£b) = 1.5573 x 5.0515 = 7.8667. Yet Credit Agricole is offering to sell British pounds at a rate of only 7.8555! Opportunity knocks!

Bankers Trust Arbitrage Strategy

$ 5,000,000
× 5.0515 Sell U.S. dollars to Credit Lyonnais
25,257,500 for French francs
÷ 7.8555 Sell French francs to Credit Agricole
3,215,263 for British pounds
£ 1,5573 Sell British pounds to Barclays
× 1.5573 for U.S. dollars
$ 5,007,129
$ 5,000,000
$ 7,129 Arbitrage profit

Taking Advantage of a Triangular Arbitrage Opportunity

1.5573(£/FFb) x 5.0515(FF/$b) = 7.8667(FF/£b)

• Credit Agricole must raise its asking price above FF7.8555/£1.00.
  – The cross exchange rates gave FF/£ bid-ask prices (bank’s FF7.8667-FF7.8717. These prices imply that Credit Agricole can deal inside the spread and sell for less than FF7.8717, but not less than FF7.8667.
  – An ask price of FF7.8700, for example, would eliminate the arbitrage profit. At that price, the FF25,257,500 would be resold for FF25,257,500/7.8700=£3,209,339, which in turn would yield only £3,209,339 x 1.5473 = $4,965,810, or a loss of $34,190.
Cross-Rate Foreign Exchange Transactions

<table>
<thead>
<tr>
<th>Bank Quotations</th>
<th>American Terms ($/FC)</th>
<th>European Terms (FC/$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>British pounds</td>
<td>Bid 1.5573</td>
<td>Ask 1.5578</td>
</tr>
<tr>
<td></td>
<td>Bid .6419</td>
<td>Ask .6421</td>
</tr>
<tr>
<td>French francs</td>
<td>0.1979</td>
<td>0.1980</td>
</tr>
<tr>
<td></td>
<td>5.0515</td>
<td>5.0531</td>
</tr>
</tbody>
</table>

**a.** Bank Customer wants to sell £1,000,000 for French francs. The Bank will sell U.S. dollars (buy British pounds) for $1.5573. The sale yields Bank Customer: £1,000,000 x 1.5573 = $1,557,300.

The Bank will buy dollars (sell French francs) for FF5.0515. The sale of dollars yields Bank Customer: $1,557,300 x FF5.0515 = FF7,866,701

Bank Customer has effectively sold British pounds at a FF/£ bid price of FF7,866,701/£1,000,000 = FF7.8667/£1.00

**b.** Bank Customer wants to sell FF10,000,000 for British pounds. The Bank will sell U.S. dollars (buy French francs) for FF5.0531. The sale yields Bank Customer: FF10,000,000 /5.0531 = $1,978,983.

The Bank will buy dollars (sell British Pounds) for $1.5578. The sale of dollars yields Bank Customer: $1,978,983 / $1.5578 = £1,270,370.

Bank Customer has effectively bought British pounds at a FF/£ ask price of FF10,000,000/£1,270,370 = FF7.8717/£1.00.

From parts (a) and (b), we see the currency against currency bid-ask spread for British pounds is FF7.8667-FF7.8717.

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**A Macroeconomic Theory of the Open Economy**

\[ S = I + NFI \]

S = Domestic investment + Net foreign investment

Net foreign investment is the purchase of foreign assets by domestic residents minus the purchase of domestic assets by foreigners.

**Some Important Identities**

\[ Y = C + G \]

\[ Y = C + I + G \] (for open economies)

Y = C + I + G (for a closed economy)

Y-C-G = I

Y-C-G is called the national saving, or just saving, and is denoted S

S = I (For economy as a whole, saving must be equal to investment.)

S = Y-C-G = Y-T-C + T-G where T is the net tax amount collected by the government, Y-T-C is called private saving, and T-G is called public saving.

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**The Market for Loanable Funds**

Real Interest Rate

Equilibrium real interest rate

Supply of loanable funds (from national saving)

Demand for loanable funds (for domestic investment and net foreign investment)

Equilibrium quantity

Quantity of Loanable Funds

A MACROECONOMIC THEORY OF THE OPEN ECONOMY
The Market for Loanable Funds

The interest rate in an open economy, as in a closed economy, is determined by the supply and demand for loanable funds.

National saving is the source of the supply of loanable funds. Domestic investment and net foreign investment are the sources of the demand for loanable funds.

At the equilibrium interest rate, the amount that people want to save exactly balances the amount that people want to borrow for the purpose of buying domestic capital and foreign assets.

The Market for Foreign Currency Exchange

\[ NFI = NX \]

Net foreign investment = Net exports

Suppose that Boeing sells some planes to a Japanese airline for yen. This sale increases U.S. net exports and U.S. net foreign investment by the same amount. Boeing then exchanges its yen for dollars with a U.S. mutual fund that wants the yen to buy stock in Sony (Japan). NX and NFI rise by an equal amount again!

Real and Nominal Exchange Rates

- International transactions are influenced by international prices.
- The two most important international prices are the nominal exchange rate and the real exchange rate.

Nominal Exchange Rates

- The nominal exchange rate is the rate at which a person can trade the currency of one country for the currency of another.
Nominal Exchange Rates

- Assume the exchange rate between the Japanese yen and U.S. dollar is 80 yen to one dollar.
- One U.S. dollar trades for eighty yen.
- One yen trades for $0.0125$ of a dollar.

Nominal Exchange Rates

- If a dollar buys more foreign currency, there is an appreciation of the dollar.
- If it buys less there is a depreciation of the dollar.

Real Exchange Rates

The real exchange rate is the rate at which a person can trade the goods and services of one country for the goods and services of another.

Real Exchange Rates

- The real exchange rate compares the prices of domestic goods and foreign goods in the domestic economy.
- If a case of German beer is twice as expensive as American beer, the real exchange rate is $1/2$ case of German beer per case of American beer.

Real Exchange Rates

The real exchange rate depends on the nominal exchange rate and the prices of goods in the two countries measured in local currencies.

Real Exchange Rates

- The real exchange rate is a key determinant of how much a country exports and imports.

\[
\text{Real Exchange Rate} = \frac{\text{Nominal exchange rate} \times \text{Domestic price}}{\text{Foreign price}}
\]
### Real Exchange Rates

- A depreciation (fall) in the U.S. real exchange rate means that U.S. goods have become cheaper relative to foreign goods.
- This encourages consumers both at home and abroad to buy more U.S. goods and fewer goods from other countries.

As a result, U.S. exports rise, and U.S. imports fall, and both of these changes raise U.S. net exports.

Conversely, an appreciation in the U.S. real exchange rate means that U.S. goods have become more expensive compared to foreign goods, so U.S. net exports fall.

### Purchasing-Power Parity

- The purchasing-power parity theory is the simplest and most widely accepted theory explaining the variation of currency exchange rates.

According to the purchasing-power parity theory, a unit of any given currency should be able to buy the same quantity of goods in all countries.

### Basic Logic of Purchasing-Power Parity

- The theory of purchasing-power parity is based on a principle called the law of one price.
- According to the law of one price, a good must sell for the same price in all locations.

If the law of one price were not true, unexploited profit opportunities would exist.

The process of taking advantage of differences in prices in different markets is called arbitrage.
Basic Logic of Purchasing-Power Parity

- If arbitrage occurs, eventually prices that differed in two markets would necessarily converge.
- According to the theory of purchasing-power parity, a currency must have the same purchasing power in all countries and exchange rates move to ensure that.

Implications of Purchasing-Power Parity

- If the purchasing power of the dollar is always the same at home and abroad, then the exchange rate cannot change.
- The nominal exchange rate between the currencies of two countries must reflect the different price levels in those countries.

Implications of Purchasing-Power Parity

- When the central bank prints large quantities of money, the money loses value both in terms of the goods and services it can buy and in terms of the amount of other currencies it can buy.

Limitations of Purchasing-Power Parity

- Many goods are not easily traded or shipped from one country to another.
- Tradable goods are not always perfect substitutes when they are produced in different countries.

Money, Prices, and the Nominal Exchange Rate During the German Hyperinflation

The real exchange rate is determined by the supply and demand for foreign-currency exchange.

The supply of dollars comes from net foreign investment (NFI). Because NFI does not depend on the real exchange rate, the supply curve is vertical. The demand for dollars comes from net exports. Because a lower real exchange rate stimulates net exports (and thus increases the quantity of dollars demanded to pay for these net exports), the demand curve is downward sloping.

At the equilibrium real exchange rate, the number of dollars people supply to buy foreign assets exactly balances the number of dollars people demand to buy net exports.
Net Foreign Investment: The Link Between the Two Markets

\[ S = I + NFI \]

\[ NFI = NX \]

How Net Foreign Investment Depends on the Interest Rate

Because a higher domestic real interest rate makes domestic assets more attractive, it reduces net foreign investment.

Note the position of zero on the horizontal axis: Net foreign investment can be either positive or negative.

The Real Equilibrium in an Open Economy

In panel (a), the supply and demand for loanable funds determine the real interest rate. In panel (b), the interest rate determines net foreign investment, which provides the supply of dollars in the market for foreign-currency exchange. In panel (c), the supply and demand for dollars in the market for foreign-currency exchange determine the real exchange rate.
The Effects of a Government Budget Deficit

When the government runs a budget deficit, it reduces the supply of loanable funds from $S_1$ to $S_2$ in panel (a). The interest rate rises from $r_1$ to $r_2$ to balance the supply and demand for loanable funds. In panel (b), the higher interest rate reduces net foreign investment. Reduced net foreign investment, in turn, reduces the supply of dollars in the market for foreign-currency exchange from $S_1$ to $S_2$ in panel (c). This fall in the supply of dollars causes the real exchange rate to appreciate from $E_1$ to $E_2$. The appreciation of the exchange rate pushes the trade balance toward deficit.

The Effects of an Import Quota

When the U.S. government imposes a quota on the import of Japanese cars, nothing happens in the market for loanable funds in panel (a) or to net foreign investment in panel (b). The only effect is a rise in net exports (exports minus imports) for any given real exchange rate. As a result, the demand for dollars in the market for foreign-currency exchange rises, as shown by the shift from $D_1$ to $D_2$ in panel (c). This increase in the demand for dollars causes the value of the dollar to appreciate from $E_1$ to $E_2$. This appreciation of the dollar tends to reduce net exports, offsetting the direct effect of the import quota on the trade balance.

The Effects of Capital Flight

If people in Mexico decide that Mexico is a risky place to keep their savings, they will move their capital to safer havens such as the United States, resulting in an increase in Mexican net foreign investment. Consequently, the demand for loanable funds in Mexico rises from $D_1$ to $D_2$, as shown in panel (a), and this drives up the Mexican real interest rate from $r_1$ to $r_2$. Because net foreign investment is higher for any interest rate, that curve also shifts to the right from $NFI_1$ to $NFI_2$ in panel (b). At the same time, in the market for foreign-currency exchange, the supply of pesos rises from $S_1$ to $S_2$, as shown in panel (c). This increase in the supply of pesos causes the peso to depreciate from $E_1$ to $E_2$, so the peso becomes less valuable compared to other currencies.

Building Blocks of The Parity Framework

<table>
<thead>
<tr>
<th>Key Interest – Exchange Rates Linkages</th>
<th>Forward Rate Unbiased Property + Interest Rate Parity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchasing Power</td>
<td>Four Derived Key Terms: $f_F - f_o, f_r - f_o$</td>
</tr>
<tr>
<td>Parity + uncovered Interest Parity (Fisher International Effect)</td>
<td>Four Definitions: $S, F, r, 1, f, s$</td>
</tr>
</tbody>
</table>
Four Definitions

The spot exchange rate, $S$. The rate of exchange of two currencies tells us the amount of foreign currency that one unit of domestic currency can buy. Spot means that we refer to the exchange rate for immediate delivery.

The forward exchange rate, $F$. The rate of exchange of two currencies set on one date for delivery at a future specified date, the forward rate is quoted today for a delivery taking place at a future date.

The interest rate, $r$. The rate of interest for a given time period is a function of the length of the time period and the denomination of the currency. Interest rates are usually quoted in the market place as an annualized rate.

The inflation rate, $I$. This is equal to the rate of consumer price increase over the period specified. The inflation differential is equal to the difference of inflation rates between two countries.

Four Derived Key Terms

The interest rate differential, $r_F - r_D$. The interest rate differential is equal to the difference in interest rates between two countries.

The inflation differential, $I_F - I_D$. The inflation differential is equal to the difference of inflation rates between two countries.

The forward discount or premium, $f$. This is often calculated as an annualized percentage deviation from the spot rate:

$$f = \left( \frac{F - S_0}{S_0} \right) \times \frac{12}{\text{no. months forward}} \times 100\%$$

The exchange rate movement, $s$. This is equal to the spot exchange rate movement over the period specified.

$$s = \left( \frac{S_1 - S_0}{S_0} \right)$$

Four International Parity Conditions

Purchasing Power Parity linking spot exchange rates and inflation

Absolute PPP: The price of a market basket of U.S. goods equals the price of a market basket of foreign goods when multiplied by the exchange rate.

Relative PPP: The percentage change in the exchange rate equals the percentage change in U.S. goods prices less the percentage change in foreign goods prices.

Uncovered Interest Parity linking interest rates and inflation

Fisher Effect: For a single economy, the nominal interest rate equals the real interest rate plus the expected rate of inflation.

International Fisher Effect: For two economies, the U.S. interest rate minus the foreign interest rate equals the expected difference in inflation rates between the two countries.
International Parity Relations Linear Approximation

where Spot Rate $S$ are in indirect quote (FC/DC or FC/$)

Interest Rate Parity

Forward Rate unbiased

Unbiased Property

Interest Rate Differential

Uncovered Interest Parity or Fisher International Effect

An Example of Interest Rate Parity

Suppose an investor with $1,000,000 to invest for 90 days is trying to decide between investing in U.S. dollars at 8% per annum (2% for 90 days) or in DM at 6% per annum (1.5% for 90 days).

The current spot rate is DM 1.5311/$ and the 90-day forward rate is DM 1.5236/$.

As shown in the next slide, regardless of the investor’s currency choice, his hedged return will be identical.

An Example of Covered Interest Arbitrage

Suppose the interest rate on pounds sterling is 12% in London, and the interest rate on a comparable dollar investment in New York is 7%. The pound spot rate is $1.75 and the one-year forward rate is $1.68. These rates imply a forward discount on sterling of 4% [(1.68 - 1.75) / 1.75] and a covered yield on sterling approximately equal to 8% (12% - 4%). Because there is a covered interest differential in favor of London, funds will flow from New York to London.

To illustrate the profits associated with covered interest arbitrage, we will assume that the borrowing and lending rates are identical and the bid-ask spread in the spot and forward markets is zero.
An Example of Covered Interest Arbitrage

Start:
1. Borrow $1 million at an interest rate of 7%, owing $1,070,000 at year end
2. Convert the $1 million to pounds at $1.75/£ for £571,428.57
3. Invest the £571,428.57 in London at 12%, generating £640,000 by year end
4. Simultaneously, sell the £640,000 in principal plus interest forward at a rate of $1.68/£ for delivery in year, yielding $1,075,200 at year end
5. Collect the £640,000 and deliver it to the bank's foreign exchange department in return for $1,075,200
6. Repay the loan plus interest of $1,070,000
7. Net profit equals $5,200

Monetary Policy, Interest Rates, and Exchange Rates

In an open economy with flexible exchange rates, assume that there is no inflation (so, nominal rates = real rates) and that initially, domestic and foreign interest rates are expected to be constant and equal to each other.

The central bank announces that one-year interest rates will be 2% lower for each of the next five years, after which they will return to normal. Financial markets fully believe this announcement.

What is the effect on the exchange rate today?

The announcement does not affect the interest rates (and hence, exchange rates) beyond the first five years.

Interest parity: For the five years, the domestic currency is expected to appreciate by 2% each year, so that the rates of return on domestic and foreign bonds are equal.

So, a 2% decrease in interest rates expected to last for five years leads to a depreciation of 5x2%=10% today, followed by expected appreciation of 2% a year over the next five years.

Long-Run versus Short-Run

The long run is a misleading guide to current affairs. In the long run we are all dead. Economists set themselves too easy, too useless a task if in tempestuous seasons they can only tell us when the storm is long past, the ocean will be flat.

- John Maynard Keynes

Technical analysis vs. Fundamental Analysis

Technical analysis is the form of charting involves the search of current and predictable patterns in stock prices to enhance returns.

Fundamental analysis uses earnings and dividend prospects of the firm, expectations of future interest rates, and risk evaluation of the firm to determine the stock prices.
International Financial Innovation:

(1) Constructing Outright Forward Contract

(2) Exotic Swap

Spot v.s. Forward

Suppose you need DM in 180 days.

Option 1
buy DM in the spot market
- and earn interest in DM (money market hedging)

Option 2
buy DM in the forward market (hedging with forward)
- will have to pay 1.3022% more than the spot price

Option 3
buy DM in the spot market 180 days later
- but is exposed to foreign exchange rate risk
Foreign Exchange Market Products and Activities

The Relationship between Spot and Forward Contracts

<table>
<thead>
<tr>
<th>time dimension</th>
<th>currency dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 1</td>
<td>US$</td>
</tr>
<tr>
<td></td>
<td>DM</td>
</tr>
<tr>
<td>Jul 1</td>
<td>B</td>
</tr>
</tbody>
</table>

Option 1

- Borrow US$ at \( i_{\text{US}} \)
- Sell DM spot at \( S \)

A manager wishes to own DM on July 1.

Subject: Regarding the "Box" Diagram

(1) An arrow from DM to US$, can be thought of as SELLING DM or BUYING US$.

(2) The reverse arrow from US$ to DM represents the reverse transaction, SELLING US$ or BUYING DM.

(3) An arrow from right to left (from the future to the present), can be thought of as borrowing - taking cash from the future and bringing it to the present.

(4) The reverse arrow from left to right (from the present to the future), can be thought of as investing - taking cash that you have now and putting it away until the future.

Using Figure 3.2:

Constructing Outright Forward Contracts

Forward Purchase of DM on January for Value on July 1
Line segment AD (price \( F \), forward rate \$/DM\)
Can be replicated by:
- Borrowing $, line segment AB (price \( i_{\text{US}} \))
- Buying DM spot, line segment BC (price \( S \))
- Lending DM, line segment CD (price \( i_{\text{DM}} \))

Forward Sale of DM on January 1 for Value on July 1
Line segment DA (price \( F \) Can be replicated by:
- Borrowing DM, line segment DC (price \( i_{\text{DM}} \))
- Selling DM spot, line segment CB (price \( S \))
- Lending $, line segment BA (price \( i_{\text{US}} \))

Note: A forward purchase of DM (equivalent to a forward sale of US$) is shown by the arrow AD. This outright forward contract can be replicated by (1) borrowing US$ (arrow AB), (2) buying DM in the spot market (arrow BC), and (3) lending the DM (arrow CD).

The borrowing and lending are carried out as a single transaction – a foreign exchange swap. The maturity of the forward contracts is identical to the maturity of the borrowing and lending contracts.

A forward sale of DM can be described by reversing the direction of the arrows.

Implication: In the absence of transaction costs, price of forward contract = price of three replicating contracts.

\[
F \left( \frac{\text{US}}{\text{DM}} \right) = S \left( \frac{\text{US}}{\text{DM}} \right) \times \left( 1 + i_\text{US} \right) \times \left( 1 + i_\text{DM} \right)
\]

Further Implications:
Forward contracts are "redundant"; that is, a forward contract can be replicated by a spot contract and a swap (a simultaneous borrowing and lending in the money market).
A corporation that uses an outright forward contract has a contingent, off-balance sheet liability. No cash changes hands so there is no direct effect on the firm's balance sheet. The forward contract uses part of the firm's scarce credit capacity at its bank.

A bank that constructs or hedges a forward position by using a 'spot and a swap' alters the asset and liability exposure of the bank. In other words, the trader's position must be funded.

**Price Quoting Conventions in the Swap Market**

<table>
<thead>
<tr>
<th>Swap Quotes</th>
<th>Bid Quote</th>
<th>Offer Quote</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swap dealer pays fixed rate</td>
<td>Swap dealer receives floating rate</td>
<td>Swap dealer receives fixed rate</td>
</tr>
<tr>
<td>Swap dealer receives floating rate</td>
<td>Swap dealer pays floating rate</td>
<td></td>
</tr>
</tbody>
</table>

Quotes are given from the perspective of the swap dealer. The convention is to quote only the fixed side of the swap. All fixed quotes are against LIBOR unless otherwise stated.

**Applications of Swaps: Magnifying Risk and Return**

Many of the illustrations in this chapter have linked a swap with a bond issue, but these decisions are separable. A firm can issue a bond in one year and then decide to swap later, using the swap as a risk management tool. However, a firm could enter into a swap without a prior bond issue. This transaction is the same as a pure speculation on the direction of exchange rates or interest rates.

**An Unsuccessful Exotic Swap**

Procter and Gamble (P&G) (based in Cincinnati and with $30 billion in annual sales) lost $157 million on an exotic swap whose payments ("in most cases") were defined by the formula:

\[ 17.0415 \times (5\text{-year Treasury rate}) - (\text{price of 6.25 percent Treasury due 8/2023}) - 0.75\% \]

The amount of interest that P&G would pay under this formula is shown in Table 13.7.
International Risk Management

How Leeson Broke Barings

The activities of Nick Leeson on the Japanese and Singapore futures exchanges, which led to the downfall of his employer, Barings, are well-documented. Barings collapsed because it could not meet the enormous trading obligations, which Leeson established in the name of the bank. When it went into receivership on February 27, 1995, Barings, via Leeson, had outstanding notional futures positions on Japanese equities and interest rates of US$27 billion: US$7 billion on the Nikkei 225 equity contract and US$20 billion on Japanese government bond (JGB) and Euroyen contracts. Leeson also sold 70,892 Nikkei put and call options with a nominal value of $6.68 billion. The nominal size of these positions is breathtaking; their enormity is all the more astounding when compared with the banks reported capital of about $615 million.

The size of the positions can also be underlined by the fact that in January and February 1995, Barings Tokyo and London transferred US$835 million to its Singapore office to enable the latter to meet its margin obligations on the Singapore International Monetary Exchange (SIMEX).

The Building Blocks of Contingent Decisions

(a) Purchase of Right to Buy at a Fixed Price
(b) Purchase of Right to Sell at a Fixed Price
(c) Sell Right to Buy at a Fixed Price
(d) Sell Right to Sell at a Fixed Price

Real Options: Amram & Kulatilaka Figure 4.1
The Building Blocks of Noncontingent Decisions

- **Forward Purchase**: (long position) \[ (e) = (a) + (d) \]
- **Forward Sale**: (short position) \[ (f) = (b) + (c) \]

Payoff

Value of Underlying Asset at Decision Date

A forward contract is the right to buy or sell an asset at a specified date in the future at a specified price. The payoffs to a forward are not contingent on a future decision (hence there is no kink) but do depend on the realized value of an uncertain asset (the line is sloped).

About the CFA Program

- The Chartered Financial Analyst (CFA) Program is a globally recognized standard for measuring the competence and integrity of financial analysts.
- Its curriculum develops and reinforces a fundamental knowledge of investment principles.
- Three levels of examination measure a candidate’s ability to apply these principles at a professional level.
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- [http://www.aaimr.org/cfaprogram/](http://www.aaimr.org/cfaprogram/)

CFA (level III, 1997)

a. Explain the following three concepts of purchasing power parity (PPP):

   i. The law of one price.
   ii. Absolute PPP.
   iii. Relative PPP.

b. Evaluate the usefulness of relative PPP in predicting movements in foreign exchange rates on a:

   i. Short-term basis (e.g., three months).
   ii. Long-term basis (e.g., six years).
iii. Relative PPP holds that exchange rate movements reflect differences in price changes (inflation rates) between countries. A country with a relatively high inflation rate will experience a proportionate depreciation of its currency’s value vis-à-vis a country with a lower rate of inflation. Movements in currencies provide a means for maintaining equivalent purchasing power levels among currencies in the presence of differing inflation rates. Relative PPP assumes prices adjust quickly and price indexes properly measure inflation rates. Because relative PPP focuses on changes and not absolute levels, relative PPP is more likely to be satisfied than the law of one price or absolute PPP.

CFA (level III, 1997)

i. Short-term basis (e.g., three months). Relative PPP is not consistently useful in the short run because: (1) Relationships between month-to-month movements in market exchange rates and PPP are not consistently strong, according to empirical research. Deviations between the rates can persist for extended periods; (2) exchange rates fluctuate minute by minute because they are set in the financial markets. Price levels, in contrast, are sticky and adjust slowly; and, (3) many other factors can influence exchange rate movements rather than just inflation.

ii. Long-term basis (e.g., six years). Research suggests that over the long term a tendency exists for market and PPP rates to move together, with market rates eventually moving toward levels implied by PPP.

CFA-3

CFA-4

iii. Even though the investment community generally believes that country M’s recent budget deficit reduction is “credible, sustainable, and large,” analysts disagree about how it will affect country M’s foreign exchange rate. Juan DaSilva, CFA, states “the reduced budget deficit will lower interest rates, which will immediately weaken country M’s foreign exchange rate.”

a. Discuss the direct (short-term) effects of a reduction in country M’s budget deficit on:
   i. Demand for loanable funds.
   ii. Nominal interest rates.
   iii. Exchange rates.

CFA-5

CFA-6

i. Demand for loanable funds. The immediate effect of reducing the budget deficit is to reduce the demand for loanable funds because the government needs to borrow less to bridge the gap between spending and taxes.

ii. Nominal interest rates. The reduced public sector demand for loanable funds has the direct effect of lowering nominal interest rates because lower demand leads to lower cost of borrowing.

iii. Exchange rates. The direct effect of the budget deficit reduction is a depreciation of the domestic currency and the exchange rate. As investors sell lower yielding country M securities to buy the securities of other countries, country M’s currency will come under pressure and country M’s currency will depreciate.

CFA-7

CFA-8

i. Expected inflation rates. In the case of a credible, sustainable, and large reduction in the budget deficit, reduced inflationary expectations are likely because the central bank is less likely to monetize the debt by printing money. Purchasing power parity and international Fisher relationships suggest that a currency should strengthen against other currencies when expected inflation declines.

ii. Expected rates on return on domestic securities. A reduction in government spending would tend to shift resources into private sector investments, where productivity is higher. The effect would be to increase the expected return on domestic securities.
CFA (level III, 1996)
The HFS Trustees have decided to invest in international equity markets and have hired Jacob Hind, a specialist manager, to implement this decision. He has recommended that an unhedged equities position be taken in Japan, providing the following comment and data to support his views:
“Appreciation of a foreign currency increases the returns to a U.S. dollar investor. Since appreciation of the yen from 100¥/$ to 98 ¥/$ is expected, the Japanese stock position should not be hedged.”

CFA (level III, 1996)
Market Rates and Hind’s Expectations

<table>
<thead>
<tr>
<th></th>
<th>U.S.</th>
<th>Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spot rate (direct quote)</td>
<td>n/a</td>
<td>100</td>
</tr>
<tr>
<td>Hind’s 12-month currency forecast</td>
<td>n/a</td>
<td>98</td>
</tr>
<tr>
<td>1-year Eurocurrency rate (% per annum)</td>
<td>6.00</td>
<td>0.80</td>
</tr>
<tr>
<td>Hind’s 1-year inflation forecast (% per annum)</td>
<td>3.00</td>
<td>0.50</td>
</tr>
</tbody>
</table>

Assume that the investment horizon is one year and that there are no costs associated with currency hedging. State and justify whether Hind’s recommendation should be followed. Show any calculations.

CFA (level III, 1996)
Appreciation of a foreign currency will, indeed, increase the dollar returns that accrue to a U.S. investor. However, the amount of the expected appreciation must be compared with the forward premium or discount on that currency in order to determine whether hedging should be undertaken or not.

In the present example to yen is forecast to appreciate from 100 to 98 (2 percent). However, the forward premium on the yen as given by the differential in one-year eurocurrency rates, suggests an appreciation of over 5 percent:

Forward premium = [(1.06)/(1.008)] - 1 = 5.16%

CFA (level III, 1996)
Thus, the manager’s strategy to leave the yen unhedged is not appropriate. The manager should hedge because by doing so, a higher rate of yen appreciation can be locked in. Given the on-year eurocurrency rate differentials, the yen position should be left unhedged only if the yen is forecast to appreciate to over 95 yen per US dollar.

Good Sources of Information on International Investments

- Datasream is an extremely rich source of international financial data (currencies, stocks, bonds, macro statistics, etc.).
- International Financial Statistics, published monthly by The International Monetary Fund, contains much financial and macroeconomic data for IMF member countries.
- The Economist’s Intelligence Unit publishes quarterly Country Reports and annual Country Profiles. These are good, for example, for details on countries’ foreign exchange regimes.
- Commercial and investment banks: most produce valuable research on current developments (e.g., Bank of America’s monthly Currency Review).
- Euromoney is a periodical that focuses on issues relevant to this class; occasionally, a particular topic will be treated in depth in a Euromoney Supplement.
- The National Bureau of Economic Research (NBER) produces a working paper series that contains current academic articles on international topics (check http://www.nber.org).
- See my web page for links to useful sites in international finance http://www.stanford.edu/~fftuy/weblinks.htm