Sample Topics for MS&E 247S International Investments

Wednesday June 25, 2008

Topic 1: The Hamburger Standard, Carry-Trade

Topic 2: Arbitrage

Topic 3: A Macroeconomic Theory of the Open Economy

Topic 4: Building Blocks of The Parity Framework, Carry-Trade

Topic 5: Monetary Policy, Interest, and Exchange Rates

Topic 6: Swaps & Linkage Across International Capital Markets


Case—Swedish Lottery Bonds.
Case—Bank Leu’s Prima Cat Bond Fund.
Case—Catastrophe Bonds at Swiss Re.
Case—Mortgage Backs at Ticonderoga.
Case—KAMCO and the Cross-Border Securitization of Korean Non-Performing Loans.
Case—Nexgen: Structuring Collateralized Debt Obligations (CDOs).
Case—The Enron Odyssey (A): The Special Purpose of SPEs.

Topic 9: International Finance Cases

Exchange Rates and Firms.
Case—Foreign Exchange Hedging Strategies at General Motors: Transactional and Translational Exposures.
Case—Foreign Exchange Hedging Strategies at General Motors: Competitive Exposures.
Financing Decisions within the Firm.
Case—The Refinancing of Shanghai General Motors.
Valuing Cross-Border Investments.
Case—Valuing a Cross-Border LBO: Bidding on the Yell Group.

Mankiw / Macroeconomics 5E (good optional reading)

Chapter 5 Open-Economy Macroeconomics
http://www.bfwpub.com/pdfs/mankiw/0716752379_05.pdf

Chapter 9 Introduction to Economic Fluctuations

Chapter 12 Aggregate Demand in the Open Economy

Investors’ Dictionaries (Use them Often!)

http://www.duke.edu/~charvey/Classes/wpg/glossary.htm
(Campbell R. Harvey’s Hypertextual Finance Glossary)

http://www.quote123.com/usmkt/edu/glossary/glossary.asp
(Mandarin edition of the above)

(Fixed Income Glossary, excellent!)
Excel Gallery of Finance Models

http://www.thomasho.com/mainpages/analysoln.asp
(The Oxford Guide to Financial Modeling)
All formulas are typed in Microsoft Word, handy for your literature review.

Central Banks, Monetary Policy, and Financial Stability
http://highered.mcgraw-hill.com/sites/0073523097/student_view0/chapter15/powerpoints.html

Modern Monetary Economics

Currency Forecasting with BigMac Index

http://www.economist.com/markets/bigmac/

Standard & Poor’s Market Insight and Web-based Problems

Corporate Data Cascade Models

Money and Capital Markets 9e by Rose and Marquis
Questions are available at:
http://highered.mcgraw-hill.com/sites/0072957395/student_view0/chapter10/standard__poor_s_questions.html

A Study of the Fed Funds Market

Federal Data Cascade Models

Money and Capital Markets 9e by Rose and Marquis

Sample Slides for MS&E 247S International Investments
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.

### The 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 equalizes 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%).

<table>
<thead>
<tr>
<th>Big Mac PPP</th>
<th>foreign-currency price</th>
<th>USD($) price</th>
<th>under/overvaluation against the dollar, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>2.51</td>
<td>2.51</td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>1.06</td>
<td>1.90</td>
<td>90% overvalued</td>
</tr>
<tr>
<td>Brazil</td>
<td>1.05</td>
<td>1.10</td>
<td>90% overvalued</td>
</tr>
<tr>
<td>Britain</td>
<td>1.90</td>
<td>1.37</td>
<td>37% overvalued</td>
</tr>
<tr>
<td>Canada</td>
<td>1.85</td>
<td>1.94</td>
<td>94% overvalued</td>
</tr>
<tr>
<td>Chile</td>
<td>2.45</td>
<td>2.45</td>
<td>0% overvalued</td>
</tr>
<tr>
<td>China</td>
<td>3.44</td>
<td>3.44</td>
<td>0% overvalued</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>2.37</td>
<td>2.37</td>
<td>0% overvalued</td>
</tr>
<tr>
<td>Denmark</td>
<td>2.75</td>
<td>2.75</td>
<td>0% overvalued</td>
</tr>
<tr>
<td>Estonia</td>
<td>0.06</td>
<td>0.06</td>
<td>0% overvalued</td>
</tr>
<tr>
<td>France</td>
<td>2.05</td>
<td>2.05</td>
<td>0% overvalued</td>
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<td>Germany</td>
<td>2.91</td>
<td>2.91</td>
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</tr>
<tr>
<td>Italy</td>
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<td>2.16</td>
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<tr>
<td>Japan</td>
<td>2.78</td>
<td>2.78</td>
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<td>Malaysia</td>
<td>1.19</td>
<td>1.19</td>
<td>0% overvalued</td>
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<td>Mexico</td>
<td>4.29</td>
<td>4.29</td>
<td>0% overvalued</td>
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<td>Netherlands</td>
<td>2.75</td>
<td>2.75</td>
<td>0% overvalued</td>
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<td>New Zealand</td>
<td>1.28</td>
<td>1.28</td>
<td>0% overvalued</td>
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<td>Norway</td>
<td>2.07</td>
<td>2.07</td>
<td>0% overvalued</td>
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<td>Portugal</td>
<td>3.45</td>
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<td>0% overvalued</td>
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<td>Spain</td>
<td>3.17</td>
<td>3.17</td>
<td>0% overvalued</td>
</tr>
</tbody>
</table>
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 the dollar, % (based on Big Mac PPP)

\[
\frac{1/1.47 - 2.51/2.85}{2.51/2.85} \times 100 = -22.8\%
\]

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 the dollar, % (based on Big Mac PPP)

\[
\frac{1/8.04 - 2.51/24.75}{2.51/24.75} \times 100 = +22.6\%
\]

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.

Evidence: The Law of One Price

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.

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

The cheapest Big Macs are found in China, Malaysia, the Philippines and South Africa, and all cost less than $1.20. In other words, these countries have the most undervalued currencies, by more than 50%. The most expensive Big Macs are found in Britain, Denmark and Switzerland, which by implication have the most overvalued currencies. Sterling, for example is 12% overvalued against the dollar - less than two years ago, it was overvalued by 26%.

The price of a burger depends heavily on local inputs such as rent and wages, which are not easily arbitraged across borders and tend to be lower in poorer countries. For this reason PPP is a better guide to currency misalignments between countries at a similar stage of development.
The average price today in the 12 euro countries is euro2.57, or $2.27 at current exchange rates. The euro’s Big Mac PPP against the dollar is euro1=$0.99, which shows that it has now undershot McParity by 11%. That, in turn, implies that sterling is 26% overvalued against the euro.

euro2.57 = One BigMac = $2.27  
euro1=$0.99 by Big Mac PPP  
0.88 – 0.99 / 0.99 = -11% Euro is 11% undervalued against US$  
And if sterling pound is 15% overvalued against US$, it is then 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 (May 27th 2004) from the following urls:  
http://www.economist.com/markets/Bigmac/index.cfm  
http://www.economist.com/markets/bigmac/PrinterFriendly.cfm?Story_ID=2708584

Please update the Big Mac index (Jun 9th 2005) from the following urls:  
http://www.economist.com/markets/bigmac/  
http://www.economist.com/markets/Bigmac/Index.cfm  
http://economist.com/PrinterFriendly.cfm?Story_ID=4065603

http://www.economist.com/PrinterFriendly.cfm?Story_ID=1730909

Economics focus

McCurrencies

Apr 24th 2003

From The Economist print edition

Hamburgers should be an essential part of every economist’s diet

<table>
<thead>
<tr>
<th>Country</th>
<th>Local currency price per Big Mac</th>
<th>PPP price of Big Mac in dollars</th>
<th>Actual dollar exchange rate per Big Mac</th>
<th>Under (__) above (+) Parity Value against the dollar, %</th>
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<tbody>
<tr>
<td>United States</td>
<td>$2.71</td>
<td>2.71</td>
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<td></td>
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<tr>
<td>Brazil</td>
<td>Real 4.55</td>
<td>1.48</td>
<td>1.04</td>
<td>-45</td>
</tr>
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<td>Canada</td>
<td>C$3.30</td>
<td>2.71</td>
<td>1.18</td>
<td>-18</td>
</tr>
<tr>
<td>China</td>
<td>Yuan 160.00</td>
<td>1.05</td>
<td>517</td>
<td>-28</td>
</tr>
<tr>
<td>Czech Rep.</td>
<td>Koruna 55.57</td>
<td>1.96</td>
<td>20.9</td>
<td>-28</td>
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<td>Denmark</td>
<td>DKK27.75</td>
<td>4.30</td>
<td>10.2</td>
<td>+51</td>
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<tr>
<td>Egypt</td>
<td>Pound 8.00</td>
<td>1.35</td>
<td>3.95</td>
<td>-57</td>
</tr>
<tr>
<td>Euro area</td>
<td>€2.71</td>
<td>2.72</td>
<td>1.05</td>
<td>+16</td>
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<td>Hong Kong</td>
<td>HK$315.00</td>
<td>1.47</td>
<td>24.1</td>
<td>7.40</td>
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<tr>
<td>Hungary</td>
<td>Forint 600</td>
<td>2.18</td>
<td>181</td>
<td>224</td>
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The hamburger standard

Apr 24th 2003
<table>
<thead>
<tr>
<th>Country</th>
<th>Currency</th>
<th>Purchasing Power Parity (PPP) 2003</th>
<th>Nominal Exchange Rate 2003</th>
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</thead>
<tbody>
<tr>
<td>Indonesia</td>
<td>Rupiah</td>
<td>1,84</td>
<td>5,947</td>
</tr>
<tr>
<td>Japan</td>
<td>Yen</td>
<td>2.19</td>
<td>96.7</td>
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<tr>
<td>Malaysia</td>
<td>Ringgit</td>
<td>1.83</td>
<td>4.86</td>
</tr>
<tr>
<td>Mexico</td>
<td>Peso</td>
<td>3.95</td>
<td>8.40</td>
</tr>
<tr>
<td>New Zealand</td>
<td>Dollar</td>
<td>3.81</td>
<td>1.48</td>
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<tr>
<td>Peru</td>
<td>Sol</td>
<td>2.29</td>
<td>0.92</td>
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<tr>
<td>Philippines</td>
<td>Peso</td>
<td>1.41</td>
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<tr>
<td>Poland</td>
<td>Zloty</td>
<td>0.97</td>
<td>2.32</td>
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<tr>
<td>Portugal</td>
<td>Euro</td>
<td>1.32</td>
<td>1.51</td>
</tr>
<tr>
<td>Singapore</td>
<td>Dollar</td>
<td>1.86</td>
<td>1.28</td>
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<tr>
<td>South Africa</td>
<td>Rand</td>
<td>1.85</td>
<td>1.75</td>
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<tr>
<td>South Korea</td>
<td>Won</td>
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<td>2.28</td>
</tr>
<tr>
<td>Sweden</td>
<td>Krona</td>
<td>3.00</td>
<td>11.2</td>
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<td>Switzerland</td>
<td>Fr Anc</td>
<td>4.59</td>
<td>2.32</td>
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<td>Tunisia</td>
<td>Dinar</td>
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<td>Thailand</td>
<td>Baht</td>
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<td>2.18</td>
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<td>Turkey</td>
<td>Lira</td>
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<td>1.38</td>
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<tr>
<td>Venezuela</td>
<td>Bolivar</td>
<td>2.32</td>
<td>1.36</td>
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</tbody>
</table>

*The ranking may vary by currency and the price index used. The price index in United States was used. *Average of New York, Chicago, San Francisco and Atlanta

Sources: The Economist, BIS, The EIU

### Additional Standard

**Economist:** May 2004

<table>
<thead>
<tr>
<th>Country</th>
<th>Exchange Rate 2003</th>
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</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>2.67</td>
</tr>
<tr>
<td>Brazil</td>
<td>3.30</td>
</tr>
<tr>
<td>Chile</td>
<td>1.70</td>
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<tr>
<td>China</td>
<td>8.05</td>
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<td>Colombia</td>
<td>2.40</td>
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<td>Denmark</td>
<td>1.20</td>
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<td>Egypt</td>
<td>4.05</td>
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<td>France</td>
<td>1.56</td>
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<tr>
<td>Germany</td>
<td>1.44</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>2.70</td>
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<td>India</td>
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<td>Indonesia</td>
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<td>Japan</td>
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<td>Mexico</td>
<td>2.27</td>
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<td>Middle East</td>
<td>1.70</td>
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<td>New Zealand</td>
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<td>Norway</td>
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<td>Pakistan</td>
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<td>South Africa</td>
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<td>Spain</td>
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<td>Sweden</td>
<td>0.40</td>
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<td>Switzerland</td>
<td>0.35</td>
</tr>
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</table>

**Economist:** May 25th, 2006
The price of a burger depends heavily on local inputs such as rent and wages, which are not easily arbitraged across borders and tend to be lower in poorer countries. For this reason PPP is a better guide to currency misalignments between countries at a similar stage of development.

The most overvalued currencies are found on the rich fringes of the European Union: in Iceland, Norway and Switzerland. Indeed, nearly all rich-world currencies are expensive compared with the dollar. The exception is the yen, undervalued by 33%. This anomaly seems to justify fears that speculative carry trades, where funds from low-interest countries such as Japan are used to buy high-yield currencies, have pushed the yen too low. But broader measures of PPP suggest the yen is close to fair value.

Carry Trade: borrow money at a cheaper rate than you can earn on an investment elsewhere

The biggest risk is generally that the exchange rate moves against you – the higher-interest rate currency rapidly devalues, reducing the value of your assets relative to your borrowing. That's why these trades are often described as “picking up nickels in front of a steamroller”

Japan's low Interest Rate

The savings rates of Japanese households have been among the highest in the world, and high savings rates push down the interest rate.

In addition, Japanese investment was low in 2002 because of the weak economy at that time. Low investment also reduced real interest rates.

http://www.centralbankrates.com/

http://www.worthpublishers.com/ballpreview/casestudy1.PDF
Since 1993, KPMG firms have published annual analysis of corporate tax rates around the world. In the initial survey, the rates from 23 countries were examined. Now in 2006, the list stands at 86 countries.

Summary and Comment

The survey has recorded a consistent and dramatic reduction in corporate tax rates over that 14-year period. This reduction began in the mid-1980s in the United Kingdom when the government of Margaret Thatcher lowered the corporate tax rate from 52 percent to 35 percent between 1982 and 1986, forcing other countries to follow suit.

KPMG's Corporate Tax Rate Survey 1993-2006


<table>
<thead>
<tr>
<th>Country</th>
<th>1 Jan 93 (%)</th>
<th>1 Jan 94 (%)</th>
<th>1 Jan 95 (%)</th>
<th>1 Jan 96 (%)</th>
<th>1 Jan 97 (%)</th>
<th>1 Jan 98 (%)</th>
<th>1 Jan 99 (%)</th>
<th>1 Jan 00 (%)</th>
<th>1 Jan 01 (%)</th>
<th>1 Jan 02 (%)</th>
<th>1 Jan 03 (%)</th>
<th>1 Jan 04 (%)</th>
<th>1 Jan 05 (%)</th>
<th>1 Jan 06 (%)</th>
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<tbody>
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*Note: All corporate tax rates are subject to change. The table above does not include any new or updated rates for the year 2006.*
14 Cayman Islands (2006 rate = 0%)
There are no notes for 2006.

32 Hong Kong (2006 rate = 17.5%)
Hong Kong SAR is a Special Administrative Region of the People’s Republic of China. The 17.5 percent rate (with effect from financial year 2003/04) applies to Hong Kong sourced profits that are derived from a business carried on in Hong Kong. Offshore profits, capital gains, dividends and most bank deposit interest income are also exempt from tax. Profits derived from certain securities or types of business (e.g. qualifying debt instruments or profits derived from the business of reinsurance of offshore risks by a professional re-insurer) are either exempt from tax or subject to a concessionary rate of 8.75 percent (half the 17.5 percent standard rate).

40 Japan (2006 rate = 40.69%)
Japanese corporate income taxes consist of corporation tax (national tax), business tax (local tax) and prefectural and municipal inhabitant taxes (local tax). The corporation tax rate is 30 percent (22 percent on the first 8 million yen for companies with paid-in capital of JPY 100 million or less). Local tax rates vary depending on the locality, the amount of paid-in capital of the company, etc. The tax rate shown is the illustrative effective tax rate for a company in Tokyo with paid-in capital of more than JPY 100 million after taking into account a deduction for business tax (the business tax itself is tax deductible). Size-based business tax is also levied on a company with paid-in capital of more than JPY 100 million, in addition to the income-based business tax. So the overall tax rate for such companies can be higher than 40.69 percent. The size-based business tax rates in Tokyo are 0.504 percent on the “added value component” tax base (total of labor costs, net interest payments, net rent payments and income/loss of the current year) and 0.21 percent on the “capital component” tax base (total paid-in capital and capital surplus). For small and medium-sized companies with paid-in capital of JPY 100 million or less, the effective tax rate in Tokyo is 42.05 percent and no size-based business tax is imposed.

67 Singapore (2006 rate = 20% on income derived in 2005)
From the Year of Assessment (YA) 2002 onwards, a partial tax exemption is granted on the first S$100,000 of income as follows: 75 percent up to the first S$10,000 of income and 50 percent on the next S$90,000 are exempt from corporate income tax. For new companies whose first three assessment years fall within YA 2005 to 2009, full tax exemption of regular income (excluding Singapore franked dividends) up to S$100,000 can be claimed provided certain conditions are met. Entities engaged in certain prescribed activities are subject to a concessionary tax rate of 10 percent or lower, or are granted tax incentives. Such activities or incentives include the financial sector incentive scheme, offshore leasing, offshore insurance and reinsurance, offshore global trading, international art and antique dealers, cyber trading, finance and treasury centers, international headquarters and shipping enterprises. For certain activities, approval needs to be sought before tax exemption or the concessionary tax rate can apply.

75 Taiwan (2006 rate = 25%)
The corporate income tax rate of 25 percent is the maximum rate in a progressive rate structure. The rate is applicable on income in excess of TW$100,000.

82 United States (2006 rate = 40%) The highest marginal federal corporate income tax rate is 35 percent. State and local governments may also impose income taxes at rates ranging from less than one percent to 12 percent. A corporation may deduct its state and local income tax expense when computing its federal taxable income, generally resulting in a net effective rate of approximately 40 percent. The effective rate may vary significantly, depending on the locality in which a corporation conducts business.
**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.
  \[ \frac{\$}{\€} \text{ (NY)} \neq \frac{\$}{\€} \text{ (London)} \text{ or} \ \frac{\$}{\€} \text{ (Dealer A)} \neq \frac{\$}{\€} \text{ (Dealer B)} \]

- **Triangular arbitrage**
  For three currencies, triangular parity implies:
  \[ \frac{\text{SF}}{\text{MP}} = \frac{\text{SF}}{\$} \times \frac{\$}{\text{MP}} \]
  MP: Mexican Peso
  Importance of triangular parity for constructing "cross rates"
  Direct markets in €/£ were observed, but prices constrained by
  \[ \frac{\$}{\€} \times \frac{\€}{\£} = \frac{\$}{\£} \]

### Triangular Arbitrage

**Suppose we observe these banks posting these exchange rates.**

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

<table>
<thead>
<tr>
<th>Bank</th>
<th>$/¥</th>
<th>¥/£</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit Lyonnais</td>
<td>1.50</td>
<td></td>
</tr>
<tr>
<td>Credit Agricole</td>
<td>85</td>
<td></td>
</tr>
<tr>
<td>Barclays</td>
<td>120</td>
<td>80</td>
</tr>
</tbody>
</table>

The implied $/¥ cross rate is $/¥ = 80

Credit Agricole has posted a quote of $/¥ = 85 so there is an arbitrage opportunity.

**So, how can we make money?**

1. **Sell $100,000 for £ at S(£/$) = 1.50**
   - receive £150,000
2. **Sell our £ 150,000 for ¥ at S(¥/£) = 85**
   - receive ¥12,750,000
3. **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 \( S(\text{FF$/}$\text{b})=5.0515 \), the same as Bankers Trust’s bid price (bank’s$ buying price)
- Barclays is offering (selling) dollars at \( S(\text{S$/£b})=1.5573 \), 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 \( S(\text{£/FFb})=0.1273 \) (which implies a reciprocal £ ask price (offering price, bank’s currency selling price) of \( S(\text{FF/£a})=7.8555 \))

- The FF/£ bid price should be no lower than \( S(\text{FF/£b}) = 1.5573 \times 5.0515 = 7.8667 \). Yet Credit Agricole is offering to sell British pounds at a rate of only 7.8667! Opportunity knocks!

**Bankers Trust Arbitrage Strategy**

1. Sell $3. Regain $  
2. FF is just a vehicle
3. Regain £
   - Sell S
   - Credit Lyonnais \( S(\text{FF$/£b})=5.0515 \)
   - 1. Sell S
   - Barclays \( S(\text{S$/£b})=1.5573 \)
   - 1. Sell S
   - Credit Agricole \( S(\text{£/FFa})=7.8555 \)

**Cross-Rate Foreign Exchange Transactions**

<table>
<thead>
<tr>
<th>Bank Quotations</th>
<th>American Terms (S/FC)</th>
<th>European Terms (FC/$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>British pounds</td>
<td>1.5573</td>
<td>0.1979</td>
</tr>
<tr>
<td>French francs</td>
<td>0.1979</td>
<td>6419</td>
</tr>
</tbody>
</table>

\( 0.1979 \times 5.0515 = 1.000 \) and \( 0.1979 \times 5.0531 = 1.000 \)

b. 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 = FF7,866.71

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

\[ S = I + NFI \]

\[ \text{Saving} = \text{Domestic investment} + \text{Net foreign investment} \]

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

\[ \text{http://www.bfwpub.com/pdfs/mankiw/0716752379_05.pdf} \]
\[ \text{http://www.bfwpub.com/pdfs/mankiw/0716752379_12.pdf} \]

Some Important Identities

\[ Y = C + I + G + NX \]

(for open economies)

\[ Y = C + I \]

(for a closed economy)

\[ Y - C - G = I \]

\[ S = I \]

For economy as a whole, saving must be equal to investment.

\[ S = Y - C - G = (Y - T - C) + (T - G) \]

\[ \text{where} \ T \text{is the net tax amount collected by the government,} \ Y - T - C \text{is called private saving, and} \ T - G \text{is called public saving.} \]

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 are still of the same amount!
The Market for Foreign-Currency Exchange...

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.

Real and 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.

Real and Nominal Exchange Rates

- The nominal exchange rate is expressed in two ways:
  - In units of foreign currency per one U.S. dollar.
  - And in units of U.S. dollars per one unit of the foreign currency.

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 1/80 (=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.

- 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.

- That is, when the real exchange rate of beer is less than 1, US beer is competitive (affordable) and will be exported to Germany!

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

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.
Real Exchange Rates

- 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.

Purchasing-Power Parity

- 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.

Basic Logic of Purchasing-Power Parity

- 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 Market for Foreign Currency Exchange

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 is negative.

Net foreign investment is positive.

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.

Despite strict capital controls, China is being flooded by the biggest wave of speculative capital ever to hit an emerging economy. Why? It’s because China has high economic growth rate and significantly undervalued currency.

**Economist, June 26, 2008**

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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

Key Interest – Exchange Rates Linkages

Forward Rate Unbiased Property + Interest Rate Parity

Purchasing Power Parity + Uncovered Interest Parity (Fisher International Effect)

Four Definitions: S, F, r, I

Four Derived Key Terms: \( r_F - r_D \), \( I_F - I_D \), \( f \), \( s \)

The Parity Framework

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 marketplace 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:

\[ f = \frac{(F-S_0)}{S_0} \times 100\% \]

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

\[ s = \frac{(S^t-S_0)}{S_0} \]

Four International Parity Conditions

Purchasing Power Parity

\[ \text{linking spot exchange rates and inflation} \]

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

\[ \text{linking interest rates and inflation} \]

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.

Key Interest Rate-Exchange Rate Linkages:

The Parity Framework

Please note that parity conditions are long-term equilibrium conditions. It might not happen in the near future (e.g., in three months) but it more likely to happen in the long-run (e.g., in six years).

- Parity conditions are useful when parity holds
- Parity conditions are useful when parity does not hold
Interest Rate Parity linking forward exchange rates and expected spot exchange rate

The forward exchange rate premium equals (approximately) the U.S. interest rate minus the foreign interest rate.

Forward Rate Unbiased Property linking forward exchange rates and expected spot exchange rates

Foreign Exchange Expectations: Today’s forward premium (for delivery in \( n \) days) equals the expected percentage change in the spot rate (over the next \( n \) days).

**Interest Rate Parity**

**Forward Rate Unbiased Property**

---

**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 € at 6% per annum (1.5% for 90 days).

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

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

1. Convert $1,000,000 to € at € 1.5311/$ for € 1,531,100
2. Invest € 1,531,100 at 1.5% for 90 days, yielding € 1,554,066.50 in 90 days
3. Simultaneously with the € investment, sell the € 1,554,066.50 forward at a rate of € 1.5236/$ for delivery in 90 days. A receive $1,020,000 in 90 days

Korean Won: Depreciation versus Interest Rate Differential

From 1991 to 1996, the won had a much higher interest rate than the dollar (an annual differential around 10%), but the exchange rate with the dollar remained stable. In 1997, the Asian crisis hit many currencies in the region and the won was devalued by some 50%.

Averaging over the 1991-97 period, we find that the interest rate differential roughly matches the currency depreciation. So any investor applying the strategy to invest in this high-interest-rate currency would have made a profit for several years and lost all of it in 1997.

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.

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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?
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.

Box 7.2: Positions, Profits & Losses Day-by-Day Using a Technical Trading Model

<table>
<thead>
<tr>
<th>Time</th>
<th>Day</th>
<th>$DM</th>
<th>$DM</th>
<th>Value of DM</th>
<th>Value of $DM</th>
<th>$DM</th>
<th>$DM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.02</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>2</td>
<td>0.02</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>3</td>
<td>0.02</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>4</td>
<td>0.02</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>5</td>
<td>0.02</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>6</td>
<td>0.02</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>7</td>
<td>0.02</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>8</td>
<td>0.02</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>9</td>
<td>0.02</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>10</td>
<td>0.02</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
</tr>
</tbody>
</table>

*Bold entry indicates where a position is closed and profit (loss) is realized.
International Financial Innovation:

(1) Constructing Outright Forward Contract
(2) Exotic Swap

Spot v.s. Forward

Suppose you need € in 180 days.

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

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

Option 3
buy € in the spot market 180 days later
- but is exposed to foreign exchange rate risk

Spot rate: $S_0 = S$ current time
Forward rate: $F_{0,1} = F$ contract signing time, time to maturity

Forward exchange rate premium $f = (F - S_0)/S_0$
Exchange rate movement over the period specified
$s = (S_1 - S_0)/S_0$
### Foreign Exchange Market Products and Activities

The Relationship between Spot and Forward Contracts

#### Jan 1
- **US$**
  - lend US$ at $i_s$
  - sell € spot at $S$

#### Jul 1
- **€**
  - borrow € at $i_e$

A manager wishes to own US$ on July 1. ($€ A/R due$)

### Spot v.s. Forward

<table>
<thead>
<tr>
<th>Time Dimension</th>
<th>Currency Dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 1</td>
<td>US$</td>
</tr>
<tr>
<td></td>
<td>borrow US$ at $i_s$</td>
</tr>
<tr>
<td></td>
<td>lend US$ at $i_s$</td>
</tr>
<tr>
<td>Jul 1</td>
<td>€</td>
</tr>
<tr>
<td></td>
<td>sell € spot at $S$</td>
</tr>
<tr>
<td></td>
<td>buy € forward at $F$</td>
</tr>
<tr>
<td></td>
<td>sell € forward at $F$</td>
</tr>
</tbody>
</table>

Levich Figure 3.2 Pg. 78

### Subject: Regarding the "Box" Diagram

1. An arrow from € to US$, can be thought of as SELLING € or BUYING US$.
2. The reverse arrow from US$ to € represents the reverse transaction, SELLING US$ or BUYING €.
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 € on January for Value on July 1**

- Line segment AD (price $F$, forward rate $\$/€)
- Can be replicated by:
  - Borrowing $\$, line segment AB (price $i_s$
  - Buying € spot, line segment BC (price $S$
  - Lending €, line segment CD (price $i_e$

**Forward Sale of € on January 1 for Value on July 1**

- Line segment DA (price $F$
- Can be replicated by:
  - Borrowing €, line segment DC (price $i_e$
  - Selling € spot, line segment CB (price $S$
  - Lending $\$, line segment BA (price $i_s$

### Implication:

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

\[
F (\$/€) = S (\$/€) \times (1 + i_s) \times (1 + i_e)
\]

### Note:

A forward purchase of € (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 € in the spot market (arrow BC), and (3) lending the € (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 € can be described by reversing the direction of the arrows.

### 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 hand 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. (Reference: Accounting for Derivatives in Intermediate Accounting, Eleventh Edition by Donald E. Kieso)

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.

Medical Swap vs. Financial Swap

Swaps & Linkages Across International Capital Markets

Price Quoting Conventions in the Swap Market

Swap Quotes

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

<table>
<thead>
<tr>
<th>Swap Dealer</th>
<th>Counter Party A</th>
<th>Counter Party B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swap dealer receives fixed rate</td>
<td>Swap dealer receives 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:

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

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

<table>
<thead>
<tr>
<th>5-year Int</th>
<th>6%</th>
<th>7%</th>
<th>8%</th>
</tr>
</thead>
<tbody>
<tr>
<td>5%</td>
<td>-0.75%</td>
<td>-0.75%</td>
<td>4.20%</td>
</tr>
<tr>
<td>6%</td>
<td>-0.75%</td>
<td>10.80%</td>
<td>21.20%</td>
</tr>
<tr>
<td>7%</td>
<td>15.10%</td>
<td>24.90%</td>
<td>38.20%</td>
</tr>
</tbody>
</table>

Table 13.7 Interest Cost (Premium over the CP Rate) in the Procter & Gamble/Bankers Trust Interest Rate Swap

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) Long a bond (invest in a bond)
(b) Short a bond (issue a bond)

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

Option Payoff
Value of Underlying Asset at Decision Date

The Building Blocks of Noncontingent Decisions

(g) Forward Purchase (long position)
(h) Forward Sale (short position)

Profit or Loss in $
$/£

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).
Use of a Butterfly Spread

From the Trader’s Desk

A stock is currently selling for $61. The prices of call options expiring in 6 months are quoted as follows:

- Strike price = $55, call price = $10
- Strike price = $60, call price = $7
- Strike price = $65, call price = $5

An investor feels it is unlikely that the stock price will move significantly in the next 6 months.

The Strategy

The investor sets up a butterfly spread:
1. Buy one call with a $55 strike.
2. Buy one call with a $65 strike.
3. Sell two calls with a $60 strike.

The cost is $10 + $5 - (2 x $7) = $1. The strategy leads to a net loss (maximum $1) if the stock price moves outside the $56-to-$64 range but leads to a profit if it stays within this range. The maximum profit of $4 is realized if the stock price is $60 on the expiration date.

Butterfly Spread Using Call Options

![Butterfly Spread Diagram]

Disappearing Act

The Fed is proposing new caps on subprime lending, but the market is dwindling.

Key points of Fed proposal:
- Require lenders to assess subprime borrowers’ ability to repay loans from sources other than rising home values.
- Bar lenders from making high-cost loans that rely on unverifiable income or assets.
- Bar lenders from paying mortgage brokers bounties beyond what consumers have agreed in advance the brokers would receive.

Topics in Financial Innovation and Challenges

- US housing and household sector
- Stock prices
- Mortgage market features
- Consumer credit

US business cycles

- Personal consumption
- Employment
- Residential investment

*In real terms.  The peak is assumed to be Q4 2005.  Average of cycles with peaks in this period.

Source: National data.
The innovation of credit derivative instruments does not stop at single name credit default swaps, which shift credit exposure to a credit protection seller, and operate like standby letters of credit or insurance. Collateralized Debt Obligations (CDOs) alone, where a pool of credits such as bonds or loans are created and pieces of the pool are sold to different investors based on their risk/return appetite, is another trillion-dollar market.

"Credit Default Swap": Banks may sell credit default swap in exchange for face amount of lending/loans in case of default. Investors who invest in "credit default swap" receive premium (just like selling insurance) but lose their investment when there are defaults. Therefore, "credit default swap" sells for excellent price when economy is good; and "credit default swap" loses most of its value when economy turns sour.
In the past week of June 28, 2008, the ABX index of swaps, which tracks the performance of subprime-mortgage bonds, dropped to new lows as the cost of default insurance on these assets soared. The index that tracks triple-A subprimemortgage-backed securities fell to 45.9 cents on the dollar, down 17% from a month ago and 38% in the year to date, according to data from Markit.

The ABX has been criticized as an inaccurate indicator of subprime mortgage losses -- even the Bank for International Settlements said in a recent report that loss estimates implied by the triple-A slice of the index may be overstated. Financial institutions continue to use the index to hedge their holdings of mortgage assets, and their buying of protection has the effect of pushing the index lower still. Credit-default swaps tied to GM imply it has a 31% chance of defaulting in the next year, even though GM has billions in cash to tide it over the near term.

The CDO market started with cash CDOs where the underlying pool contains actual bonds or loans. The life insurer is the largest investor's group of the cash CDO securities. CDO's future cash flow comprises interests receivable and principal receivable.

Then synthetic CDOs, which have a collateral pool consisting of a portfolio of single name default swaps, quickly followed suit. This innovation overcame the constraint that only limited actual assets could be taken as collateral in the cash CDO markets. Be alert!!!
Topics in Financial Innovation and Challenges

The modelling of default events using survival time distribution is very similar to the modelling of the death of a human life. A credit curve, which describes the term structures of default probabilities for an obligor, is very much like a mortality table. Pricing a default swap is not much different from pricing a life insurance contract. David Li on Synthetic CDO

WSJ 0912 2005 Slices of Risk: How a Formula Ignited Market That Burned Some Big Investors

Fixed Income Securities: Analytics and Derivatives
Fabozzi: Bond Markets, Analysis, and Strategies

Individual Bond Strategies:

Barbells Strategy
Ladders Strategy
Bullets Strategy

Ladders are popular among investors who want bonds as part of a long-term investment objective, such as saving for college tuition, or seeking additional predictable income for retirement planning.

Ladders have several potential advantages:
1. The periodic return of principal provides the investor with additional income beyond the set interest payments.
2. The income derived from principal and interest payments can either be directed back into the ladder if interest rates are relatively high or invested elsewhere if they are relatively low.
3. Interest rate volatility is reduced because the investor now determines the best investment option every few years, as each bond matures.
4. Investors should be aware that laddering can require commitment of assets over time, and return of principal at time of redemption is not guaranteed.

Barbells are a strategy for buying short-term and long-term bonds, but not intermediate-term bonds. The long-term end of the barbell allows you to lock into attractive long-term interest rates, while the short-term end insures that you will have the opportunity to invest elsewhere if the bond market takes a downturn.

Example: Barbells strategy
You see appealing long-term interest rates, so you buy two long-term bonds. You also buy two short-term bonds. When the short-term bond matures, you receive the principal and have the opportunity to reinvest it elsewhere.
Bullets Strategies

Bullets

Bullets are a strategy for having several bonds mature at the same time and minimizing the interest rate risk by staggering when you buy the bonds. This is useful when you know that you will need the proceeds from the bonds at a specific time, such as when a child begins college.

Example: Bullet strategy

You want all bonds to mature in 10 years, but want to stagger the investment to reduce the interest rate risk. You buy the bonds over four years.

Topics in Financial Contract Design

Read the following episode carefully.

Italian Asset Swap Volumes Soar on Buyback Plans

Volumes in the basis-swap spread market doubled last week as traders entered swaps in response to the Italian treasury’s announcement that it “does not rule out buybacks.” Traders said the increase in volume was exceptional given that so many investors are on holiday at this time of year. Traders and investors were entering trades designed to profit if the treasury initiates a buyback program and the bonds increase in value as they become scarcer and outperform the swaps curve. A trader, said in a typical trade the investor owns the 30-year Italian government bond and enters a swap in which it pays the 6% coupon and receives 10.5 basis points over six-month Euribor. “Since traders started entering the position last Monday the spread has narrowed to 8bps over Euribor,” he added. The trader thinks the spread could narrow to 6.5bps over Euribor within the next six months. The typical notional size of the trades is EUR50 million (USD43.65 million) and the maturity is 30 years. (IFR Issue 1217)

(a) Suppose there is an Italian swap curve along with a yield curve obtained from Italian government bonds (sovereign curve). Suppose this latter is upward sloping. Discuss how the two curves might shift relative to each other if the Italian government buys back some bonds.

(b) Is it important which bonds are bought back? Discuss.

(c) Show the cash flows of a 5-year Italian government coupon bond (paying 6%) and the cash flows of a fixed-payer interest-rate swap.

(d) What is the reason behind the existence of the 10.15 bp spread?

(e) What happens to this spread when government buys back bonds? Show your conclusions using cash flow diagrams.

Questions for consideration:

Foreigners buying Australian dollar instruments issued in Australia have to pay withholding taxes on interest earnings. This withholding tax can be exploited in tax-arbitrage portfolios using swaps and bonds. First let us consider an episode from this issue.

Under Australia’s withholding tax regime, resident issuers have been relegated to second cousin status compared with non resident issuers in both the domestic and international markets. Something has to change. In the domestic market, bond offerings from resident issuers, commonly known as Kangaroo bonds, do not incur withholding tax because the income is sourced from overseas. This raises the specter of international issuers crowding out local issuers from their own markets. In the international arena, punitive tax rules restricting coupon washing have reduced foreign investor interest in Commonwealth government securities and some government bonds. This has facilitated the growth of global Australian dollar offerings by Triple A rated issuers such as Fannie Mae, which offer foreign investors an attractive tax-free alternative.

The impact of the tax regime is aptly demonstrated in the secondary market. Exchangeable issues in the international markets from both Queensland Treasury Corporation and Treasury Corporation of ‘NSW are presently trading through comparable domestic issues. These exchangeable issues are exempt from withholding tax.

If Australia wishes to develop into an international financial centre, domestic borrowers must have unfettered access to the international capital markets—which means compliance costs and uncertainty over tax treatment must be minimized. Moreover, for the Australian domestic debt markets to continue to develop, the inequitable tax treatment between domestic and foreign issuers must be corrected. (IFR, Issue 1217)

We now consider a series of questions dealing with this problem. First, take a 4-year straight coupon bond issued by a local government that pays interest annually. We let the coupon rate be denoted by c%. Next, consider an Aussie dollar Eurobond issued at the same time by a Spanish company. The Eurobond has a coupon rate d%. The Spanish company will use the funds domestically in Spain. Finally, you know that interest rate swaps or FRAs in Austies are not subject to any tax.

(a) Would a foreign investor have to pay the withholding tax on the Eurobond? Why or why not?

(b) Suppose the Aussie$ IRSs are trading at a swap rate of d + 10bp. Design a 4-year interest rate swap that will benefit from tax arbitrage. Display the relevant cash flows.

(c) If the swap notional is denoted by N, how much would the tax arbitrage yield?

(d) Can you benefit from the same tax-arbitrage using a strip of FRAs in Austies?

(e) Which arbitrage portfolio would you prefer, swaps or FRAs? For what reasons?

(f) Where do you think it is more profitable for the Spanish company to issue bonds under these conditions, in Australian domestic markets or in Euromarkets? Explain.

Handout #2A Page 34 of 41
**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.
- The CFA exam is administered annually in more than 70 nations worldwide.
- [http://www.aimr.org/cfaprogram/](http://www.aimr.org/cfaprogram/)

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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).**

---

**CFA (level III, 1997)**

i. **The law of one price** is that, assuming competitive markets and no transportation costs or tariffs, the same goods should have the same real prices in all countries after converting prices to a common currency.

ii. **Absolute PPP**, focusing on baskets of goods and services, states that the same basket of goods should have the same price in all countries after conversion to a common currency. Under absolute PPP, the equilibrium exchange rate between two currencies would be the rate that equalizes the prices of a basket of goods between the two countries. This rate would correspond to the ratio of average price levels in the countries. Absolute PPP assumes no impediments to trade and identical price indexes that do not create measurement problems.

---

**CFA (level III, 1997)**

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, 1998)**

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.
b. Helga Wu, CFA, states, “Country M’s foreign exchange rate will strengthen over time as a result of changes in expectations in the private sector in country M.” Support Wu’s position that country M’s foreign exchange rate will strengthen because of the changes a budget deficit reduction will cause in:

i. Expected inflation rates.

ii. Expected rates on return on domestic securities.

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.

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.

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.

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.

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.

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.

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 = $$\frac{[(1.06)/(1.008)]-1}{5.16\%}$$
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.
Description: In 2001, Bank Leu, a Swiss private bank, is considering creating the world’s first public fund for catastrophe bonds. Cat bonds are securities whose payments depend on the probability of a catastrophe occurring, such as an earthquake or hurricane. Cat bonds are traditionally issued by large insurance or reinsurance companies. This case outlines the traditional reinsurance market and securitization efforts that have taken place in the past and focuses on Bank Leu’s decision as a buy-side participant in the cat bond market.

Learning Objective: To explore how insurance risks can be transferred to the capital markets and how risks in general can be brokered, securitized, and traded.


Setting: Zurich, Switzerland; Banking industry; 116 million CHF revenues; 600 employees; 2001

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Description: In 2002, Swiss Re, the world’s second-largest insurance company, is considering securitizing parts of its risk portfolio in the capital markets. This would be a first for the company that, until then, had never transferred risk off its balance sheet. Peter Giessmann, head of the Retrocession Group, is considering catastrophe bonds as a way of transferring risk. “Cat bonds” are securities whose payments depend on the probability of a catastrophe occurring, such as an earthquake or hurricane. This case outlines the traditional reinsurance market and securitization efforts that have taken place in the past and then focuses on Swiss Re’s decision as a sell-side participant in the cat bond market.

Learning Objective: To explore how insurance risks can be transferred to the capital markets and how risks in general can be brokered, securitized, and traded.


Setting: Zurich, Switzerland; Insurance industry; 31 million Swiss francs revenues; 2002

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Description: Ticonderoga is a small hedge fund that trades in mortgage-backed securities—securities created from pooled mortgage loans. They often appear as straightforward so-called “pass-throughs,” but can also be pooled again to create collateral for a mortgage security known as a collateralized mortgage obligation (CMO). CMOs allow cash flows from the underlying pass-throughs to be directed, allowing the creation of different classes of securities—tranches—with different maturities, coupons, and risk profiles. In April 2005, the general managers of Ticonderoga are looking at the market data, trying to construct a trade given their view on the prepayment speed of mortgages vs. the implied prepayment speed they derive from CMOs in the market.

Learning Objective: To learn about the institutional details behind the mortgage-backed securities (MBS) market, covering both the actors as well as the mechanics (with special emphasis on the important prepayment feature). Also, to go through the mathematics and calculations behind MBS—in essence, students are asked to behave as if they worked at a mortgage-back trading desk.

Subjects Covered: Derivatives, Finance, Hedging, Over the counter trading, Securities, Trade.

Setting: London, Financial industry; 10 employees; 2005
Setting:
Koreas; South Korea; $160 million; 1,500 employees; 2000

Subjects Covered:
Capital markets, Debt management, Financial instruments, Financing.

Learning Objective:
To understand financial securitization—both structuring and valuation principles.

Description:
Covers the first international nonperforming loan securitization done in Korea. The CEO of KAMCO is trying to dispose of a portfolio of nonperforming commercial loans that the organization acquired from a number of banks. A group of investment bankers have proposed securitizing the loans and selling them to institutional investors. Securitization of loans (or any other type of assets) is not common in Korea, so the CEO must think through several factors as he decides whether to accept this proposal, the most important of which is the recovery price.
To understand the core elements of financing a multinational subsidiary overseas, from its initial formation to subsequent refinancing discussions. Capturing this "life-cycle" of subsidiary finance is accomplished in a rewritten version of an earlier case.

Description:
To analyze foreign exchange hedging decisions, the appropriate design of risk management policies, and multinational financial management.

Learning Objectives:
- To analyze competitive exposures and appropriate hedging policies.
- To analyze competitive exposures and appropriate hedging policies.

Subjects Covered:

Setting:
- New York, NY; Automotive industry; $177.3 billion revenues; 365,000 employees; 2001

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Description:
A team of private equity investors must value the leveraged buyout of a Yellow Pages business that operated in both the United States and the United Kingdom. In the process, they must wrestle with issues of how to conduct cross-border valuations and how to value a stable cash cow business along with a growth business. The case analyzes the economics and incentives of carried interest and compares two valuation methods—Capital Cash Flow and Free Cash Flow. To obtain executable spreadsheets (courseware), please contact our customer service department at custserv@hbsp.harvard.edu.

Learning Objective:
To understand the core elements of cross-border valuation in the setting of a leveraged buyout. In the process, students must employ exchange rates, decide among betas, and translate values from two mature, developed economies to arrive at a bid. Students must conduct this valuation in a private equity setting with the idiosyncrasies of a leveraged buyout, including the economics of carried interest.

Subjects Covered:

Setting:
United Kingdom; $100 million revenues; 500 employees; 2001

Good Sources of Information on International Investments

- Datastream 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/~ffuy/weblinks.htm