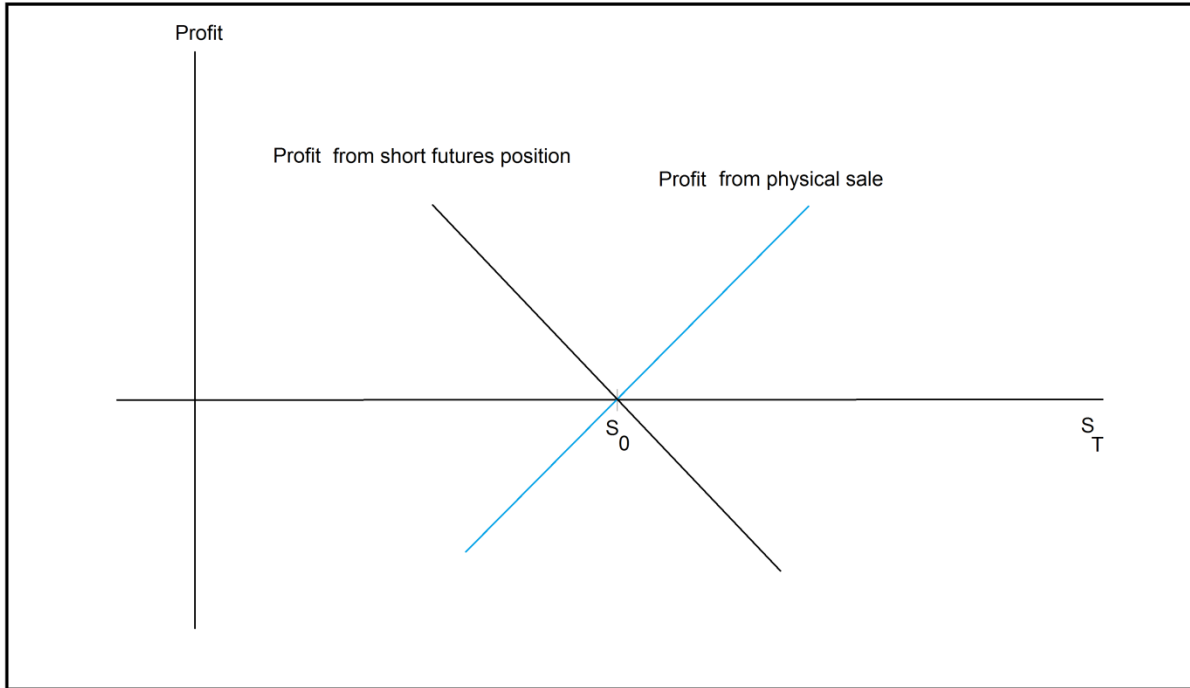


CHAPTER 7

Solutions

Exercise 1

(Parts (a)-(c) answered together): A gold miner risks losing money if the price of gold declines, between the time say, when she is mining the gold ($t=0$) and when she would actually sell it ($t=T$). So, she sells futures. If the market prices fall, she has still locked in a rate, say F_0 (at the present time, based on the present day value of gold) high enough for her to make some profit on. This is how she can hedge against a steady decline in gold prices over the years. Let's assume $F_0 = S_0$ for simplicity so the current futures price for delivery at time T is the same as the current spot price. The diagram below illustrates the profit on the physical sale at time $t=T$ and the profit/loss on the futures position. Unless she sets a futures price that is lower than the present day value of gold, she cannot have a loss. And this will typically not happen since this would also lead to arbitrage opportunities. But the hedge could lead to a 'loss' in the sense that if the market price appreciates then she would not make as much profit as she could have.



Exercise 2

In the main text we assumed storage costs of \$3.85 per ton and insurance costs of 0.25% of hull value. We can call this scenario 1. Now we are asked to consider an alternative scenario. Scenario 2 assumes that storage costs are towards the upper range provided in the Bloomberg article, that is \$4.5 instead of \$3.85 per ton and that insurance costs are 1.5% and not 0.25% of hull value for two months. This leads to a total expected profit of \$768,275 instead of \$2,832,838 which is significantly lower. Given uncertainty about all cost and revenue assumptions the assumed profit in scenario 2 may not be enough to incentivize the firm to carry out the transaction.

JPMorgan heating oil example	Scenario 1	Scenario 2
Storage capacity	273000	
cost of storage per ton	3.85	4.5
Price august spot	553	
Price futures	580	

Insurance costs of	0.25%	1.5%
Borrowing costs for 2 months	1.00%	
Cost of buying oil spot in dollars	150,969,000	150969000
Cost of borrowing at	1,509,690	1,509,690.00
Insurance costs of	377,423	2,264,535
cost from singapore to europe:	1,600,000	1,600,000
cost of storage	1,051,050	1228500
<hr/>		
Total costs=	155,507,163	157571725
Revenue from sale=	158,340,000	158340000
Profit=	2,832,838	768,275

Exercise 3

The example requires the calculation of floating and fixed payments and the discounting of the resulting net payment. One possible solution is given below:

<i>Settlements</i>	<i>Floating Payment (\$)</i>	<i>Fixed Payment (\$)</i>	<i>Net Payment (\$)</i>	<i>Discount Factor</i>	<i>NPV net payment (\$)</i>
31/01/2013	8,864,870	9,500,000	635,130	0.99973	634,959
28/02/2013	8,918,842	9,500,000	581,158	0.99947	580,850
31/03/2013	8,967,619	9,500,000	532,381	0.99915	531,928
30/04/2013	9,006,667	9,500,000	493,333	0.99886	492,771
31/05/2013	9,035,000	9,500,000	465,000	0.99859	464,344
28/06/2013	9,052,263	9,500,000	447,737	0.99834	446,994
31/07/2013	9,059,727	9,500,000	440,273	0.99804	439,410
30/08/2013	9,063,000	9,500,000	437,000	0.99776	436,021
30/09/2013	9,062,500	9,500,000	437,500	0.99747	436,393

31/10/2013	9,061,522	9,500,000	438,478	0.99717	437,237
27/11/2013	9,056,286	9,500,000	443,714	0.99691	442,343
31/12/2013	9,045,500	9,500,000	454,500	0.99656	452,937
<i>Swap mark-to-market</i>					5,796,187
<i>Fair fixed price</i>					90.13

Exercise 4

The answer below is based on a report submitted by students in the Financial Engineering Class at the ISMA Centre. The text quoted from these answers is in italics.

General Background

Hong Kong is a special administrative region of China (HKSAR). It is, arguably, the world's fourth-largest center for international finance after New York, London and Tokyo. Hong Kong is the world's ninth-largest international banking center and the second largest in Asia, in term of the value of external transactions. Hong Kong has the world's tenth-largest securities market and the second largest in Asia after Tokyo.

Hong Kong's gross domestic product (GDP) grew by 3% in 1999-compared with a decline of 5.1% in 1998(the crisis year)- and grew by a further 14.3% in the first quarter of 2000. There is no central bank in Hong Kong, instead, the monetary system is one of **Currency Board**. It is called the Hong Kong Monetary Authority (HKMA). Traders refer to it as "the M-A". HKMA was created in 1993 through a merger of the office of the Exchange Fund and the office of the Commissioner of Banking. The primary monetary policy of Hong Kong Monetary

Authority (HKMA) is to maintain exchange rate stability within the framework of Linked Exchange Rate System through sound management of the exchange fund, monetary operations and other means deemed necessary.

The Financial Sector In Hong Kong

The financial sector is a key element in the future growth of Hong Kong and a key element in Hong Kong's financial sector is the **exchange regime** adopted by the Hong Kong government. Hong Kong currency is pegged to the US dollar. This is simply referred to as "The peg". See Chart 1 for a plot of the HKD/USD.

HKMA doesn't issue bank notes, bank notes are issued by the three note issuing commercial banks (NIBs). When the three NIBs issue bank notes, they are required to submit US dollar (at HK\$ 7.8 =US\$ 1) to the HKMA for the account of the exchange fund in return for non-interest bearing certificates for indebtedness (which are required by law as backing for the bank notes issued). The Hong Kong dollar banknotes are therefore fully backed by US dollar held by the Exchange Fund.

This requirement that notes and coins be fully backed by foreign exchange reserves means that the exchange rate system operates as an example of currency board.

Currency board: is a legal framework that enables local currency to be issued only under strictly limited circumstances. The goal is to ensure that local currency is at all time fully or almost fully backed by reserves of strong currency such as the U.S dollar, so that the two become nearly perfect substitutes. It involves a legislative commitment to exchange the two currencies at

a fixed rate, combined with restrictions on the issuing authority such that new local currency is issued only in the presence of sufficient reserves of external currency, so that the exchange commitment is always credible.

In Hong Kong the system differs from pure currency board arrangement, for two reasons:

- (1) The HKMA has a limited scope for affecting monetary conditions.
- (2) Only transaction related with note-issuing purposes between the Exchange Fund and the Note-Issuing Banks (NIBs) are carried out at a linked exchange rate, whereas all other transactions are conducted freely negotiated rates.

The principal features of a currency board are as follows:

- Discretionary policy in setting the exchange rate is removed.
- Discretionary policy in determining the money supply is limited since increases in the supply of notes in circulation are tied to increases in bank holdings of US dollars.
- Interest rate policy is used for the purpose of augmenting the demand for local currency. For example, a fall in the demand for Hong Kong dollars can be partly offset by increases in the interest rates in order to encourage the holding of Hong Kong bank deposits rather than repatriating the currency for deposits in overseas banks.

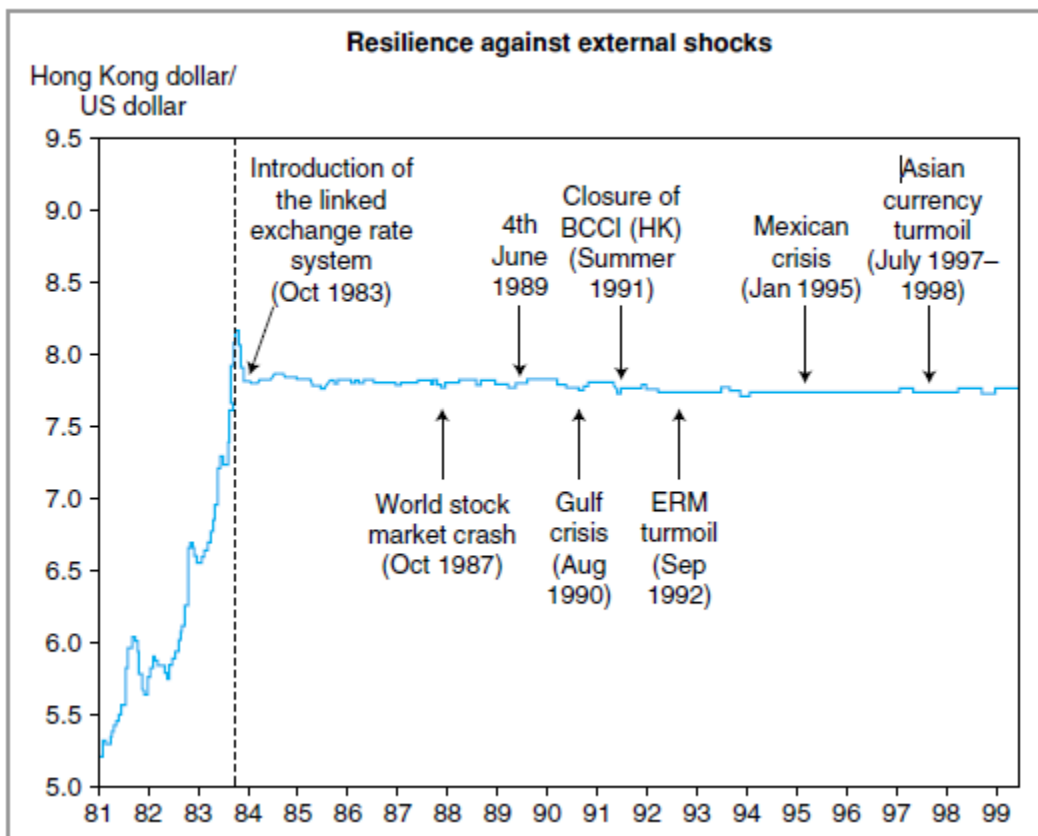
Thus, although the currency board system provided stability to the Hong Kong dollar exchange rate, and also to the domestic money supply, it limits the use of monetary policy for other purposes.

In addition, the choice of the “link currency” will also have an impact on the domestic economy. Movements in the rate of exchange of that currency with other currencies will affect the exchange rate between the Hong Kong dollar and those other currencies.

Hedge Fund have been playing a no-lose game

In the simplest strategy a hedge fund borrows Hong Kong dollars (HKD) and then sells them in the market against USD, i.e., they short the HKD. Note that this will cause the money supply to shrink. A decrease in money supply leads to an interest rates increase. Increases in interest rates have several effects on the stock market. First borrowing HKD to buy stocks becomes more expensive. Hence fewer investors would use margin. Second, an increase in deposit interest rates will draw funds from stocks to deposits. Third, interest rate increases are negative for businesses and their value will go down. Again stocks decline.

Chart 1: HKD/USD



On the other hand, higher interest rates lure more investors to park their money in Hong Kong, boosting the currency. But they also slam the stock market because rising rates hurt companies' ability to borrow and expand.

However, many of these Hedge Funds involved in the speculation did not operate in the cash market. Instead they shorted the HKD in the futures markets. This does not require borrowing HKD. It is the counterparty who has to hedge the long HKD position who needs to "borrow HKD" from the banking system.

In the particular case discussed here Hedge Fund managers believed that they were taking little risk:

- The hedge funds bet on the collapse of the peg. If the peg breaks, the HKD is expected to fall. Given the psychology of those days, the casual view was that the HKD was overvalued. The only risk to Hedge Funds is that the peg holds.

Under these conditions their loss will be the difference between the initial cost of entering the trade to sell HKD in futures markets and the pegged rate. The reading suggests that this cost is low.

Example: Hedge Fund enters contract to sell HK\$ in six month's. At expiration, the Hedge Fund needs to buy spot HKD and deliver these against the short future's position.

If the peg holds the cost of replacing the HKD it has sold is essentially the 6 month differential between USD and HKD interest rates. On Thursday August, 20th the difference in inter-bank interest rates was about 6.3%, (Hong Kong rates being higher due to heavy demand for HKD

loans, which are needed to short the currency.) So a hedge fund manager making a USD 1 million bet Thursday against the HKD would have paid USD63,000.

If the fund manager believed that the peg would break and thus the HKD depreciate, say, about 30%, then the potential profit would be USD300,000. Compared to the cost of making the trade, USD63,000 this is a good profit.

MA Intervenes: HKMA intervened to defend the peg. Using its own FX reserves, MA sold USD. Normally, when a country with a pegged currency spends reserves to defend the currency's value, the intervention will have to be "sterilized". In other words, the central bank would buy local currency bonds from the banking system. The purchase will be roughly in similar quantities so that the overall monetary base remains constant. However, doing this in Hong Kong at that time would result in further increases in interest rates. This would be considered as severely harmful by real estate companies in Hong Kong.

1 PARTA

1.1 What is the rationale of the double-play strategy?

The hedge funds deploy a double-play strategy in order to engineer steep increases in interest rates and steep declines in stock prices so as to gain from their short positions in the stock market and in the FX futures market. But first, some comments about the economic conditions prevailing at that time. In early August of 1998, external and domestic conditions deteriorated.

The Dow Jones index declined sharply by 300 points on August 5th and the Yen was at an eight year low, at 147 on August 11th. Rumors were abundant concerning abandonment of the peg. There was strong selling pressure on HKD early August.

1. Speculators shorted the HKD by swapping HKD for USD.

2. On the equity markets, the stocks index futures market open positions grew sharply:

The HSI FUTURES rose from 70,000 contracts in June to 92,000 contracts in August.

The strategy of the Hedge Funds was to undermine the stability of the exchange value of **the HK\$ so as to produce sharply higher interest rates.**

The sharp increases would then lower stock prices, it was hoped. Hedge Funds sell HKD. This increases HKD interest rates(r). Such high interest rates cannot be tolerated by property developers. Real Estate companies suffer serious losses and their stocks decline sharply. The HSI goes down, as the HIBOR goes up.

At this point, another strategy is to short sell borrowed shares. Yet, the existence of futures markets makes this redundant. A speculator can short the HSI index instead.

1.2 How are the HIBOR, HSI and HSI futures related?

The HIBOR and HSI are inversely related. Consequently futures on HIBOR and HSI are also inversely related. See Chart 2 (effective exchange rate and HKD/USD) and Chart 3.

Chart 2 (effective exchange rate and HKD/USD):

HK dollar exchange rate (July – September 1998)

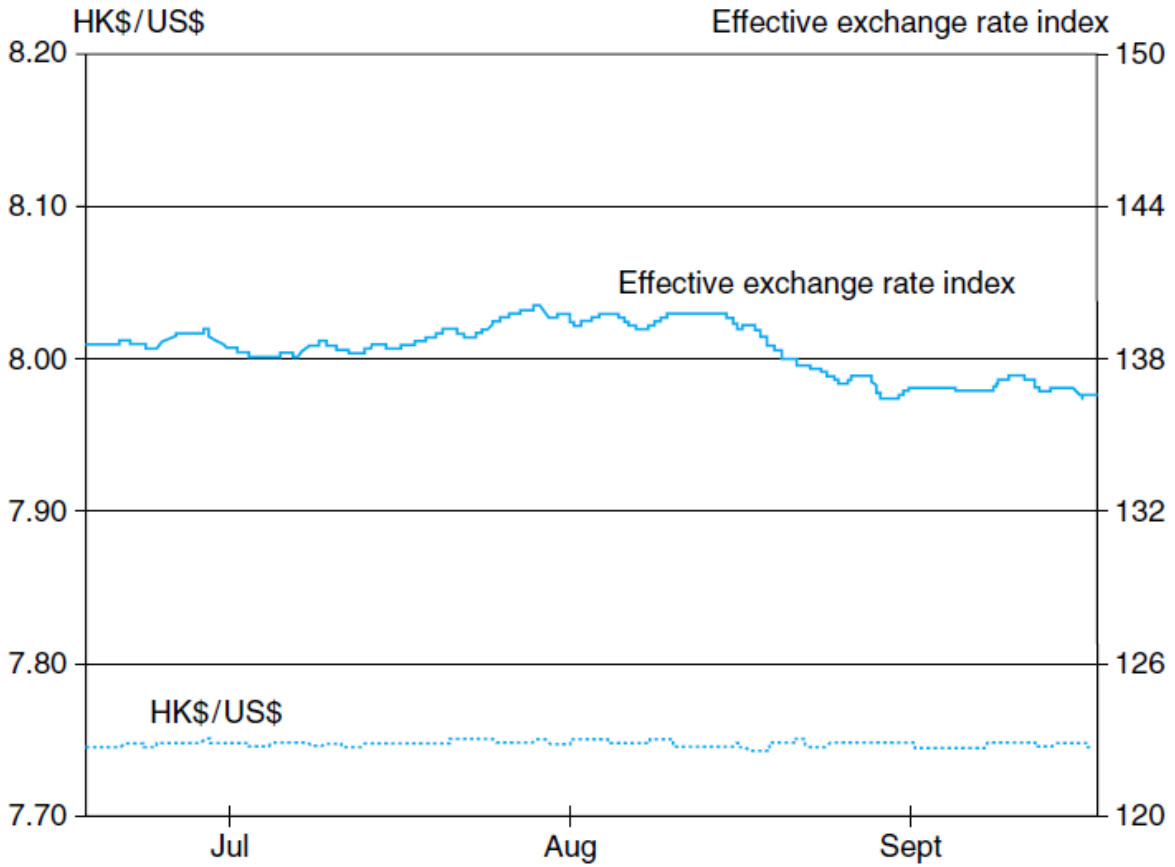
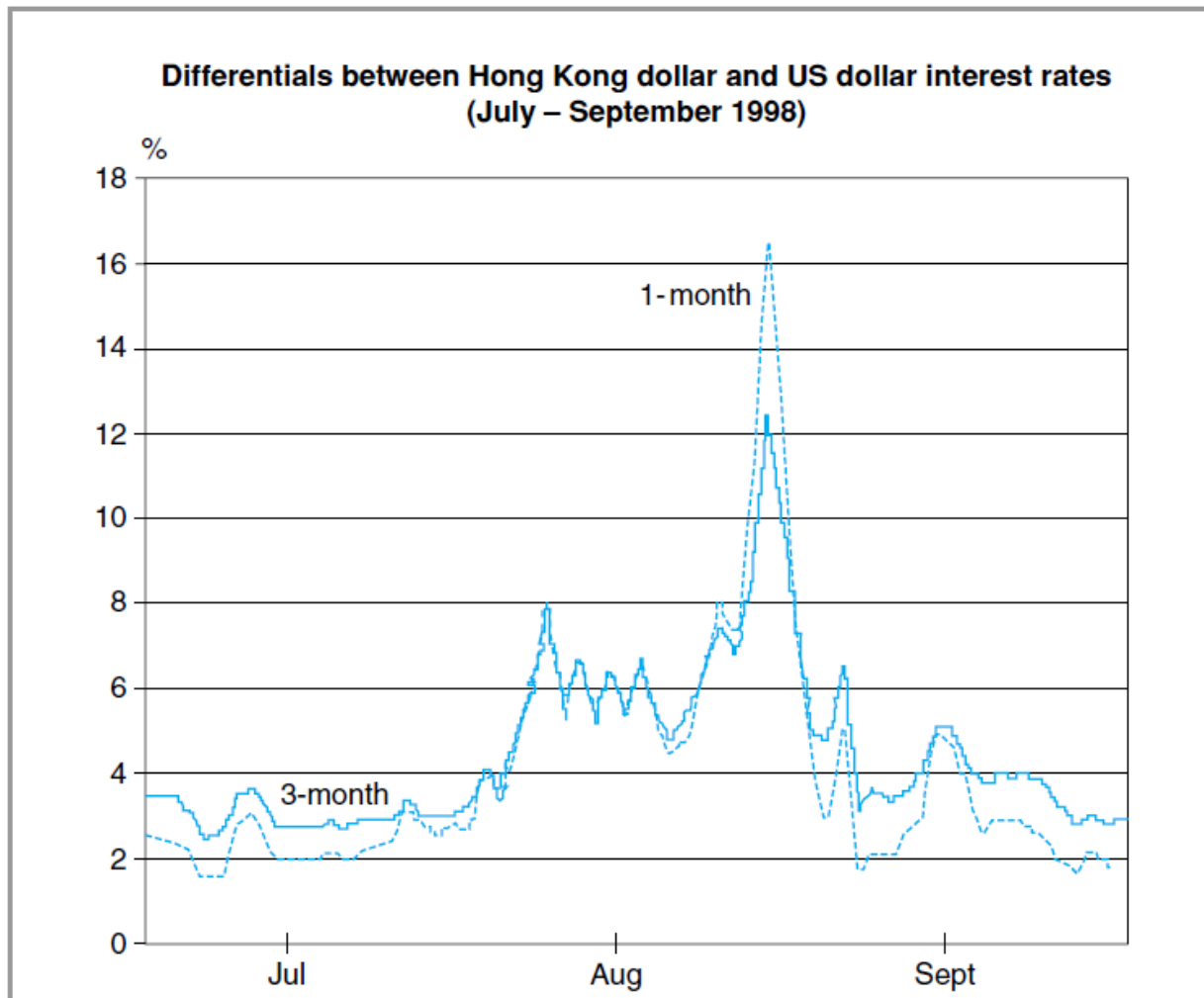


Chart 3 (HKD and USD interest rates):



1.3 Display the position explicitly

Example: I borrow 7,800,000 HKD at time $t = t_0$ at an interest rate r_{t_0} . After one year I pay back 7,800,000(1 + r_{t_0}).

At t_0 I exchange these HKD into USD1,000,000. These I deposit at the “risk free” rate R_{t_0} .

I expect that The HKD to depreciate 30% during the same time period. My expected gain is:

$$R_{t_0}1,000,000 - r_{t_0}78,000/[e_{t_0}(1 + .30)] + 300,000$$

where the e_{t_0} is the pegged exchange rate, 7.8.

1.4 How is the position rolled over?

As Hong Kong government intervened Hedge Funds decide to just rolling their short position over during the month of August. These open positions are rolled by converting August contracts into September contracts.

The Table below gives further data for this case study.

	12 August	19 August	26 August	2 September	9 September
Short term interest rates	11.63	12.05	12.33	14.39	8.8
US Federal Funds Rate	5.50	5.59	5.48	5.61	5.47
% change from previous week in the Hang Seng	-8	11.1	2.8	-6.1	7.5