

# FINM3405 Derivatives and risk management

## Tutorial Sheet 2: Futures and forwards examples and basic concepts

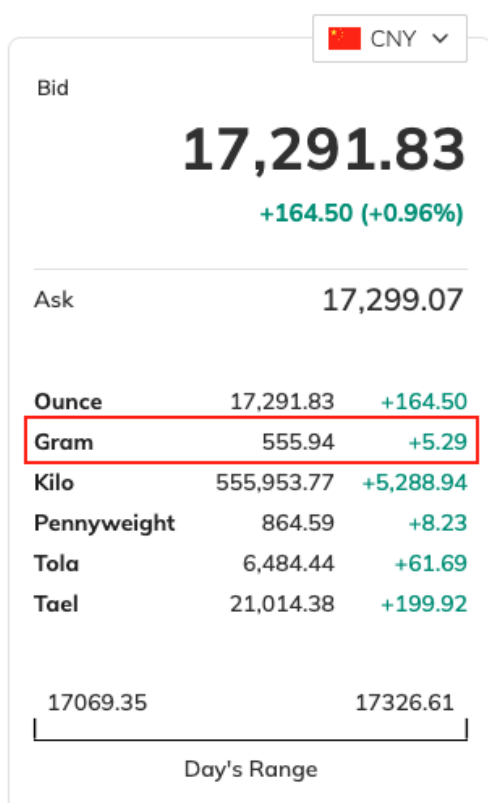
July 28, 2024

### Commodities

**Question 1.** Here is the current gold price in CNY (the Chinese Yuan) and contract specifications for gold futures on the [Shanghai Futures Exchange](#):

#### Live Gold Price

Jul 26, 2024 - 21:08 NY Time





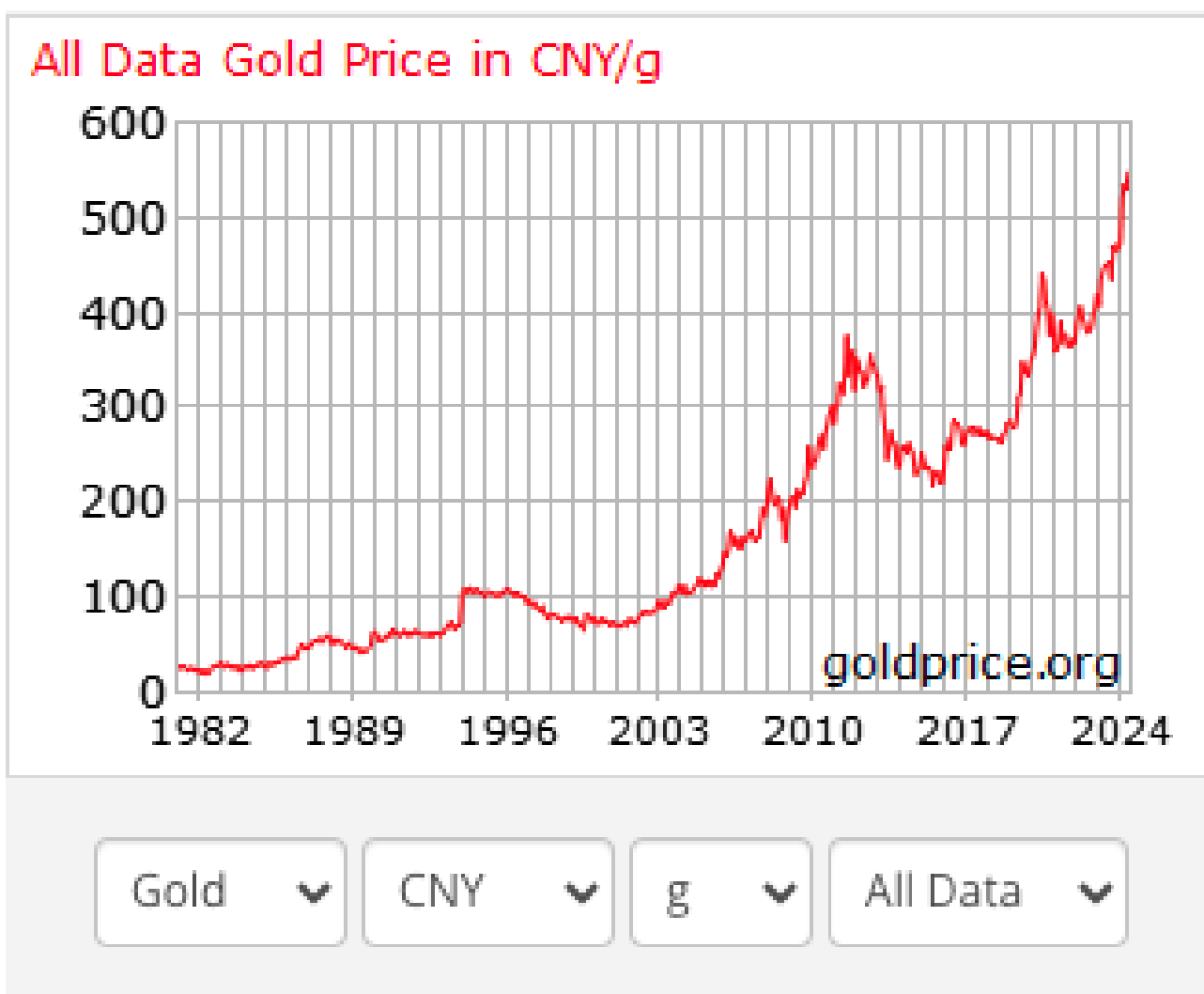
#### SHFE Gold Contract Specification

Updated on Aug 31, 2020

|                                  |  |
|----------------------------------|--|
| Product                          | Gold   |
| Contract Size                    | 1,000 grams/lot  |
| Price Quotation                  | Yuan (RMB)/gram  |
| Minimum Price Fluctuation        | 0.02 yuan/gram   |
| Range of Price Limit             | Within 3% of the settlement price of the preceding trading day   |
| Listed Contracts                 | Monthly contract for the most recent 3 months and bimonthly contract for the most recent 13 months   |
| Trading Hours                    | 9:00 a.m. to 11:30 a.m., 1:30 p.m. to 3:00 p.m., and other hours specified by the Exchange (Beijing Time)  |
| Last Trading Day                 | 15th day of the contract month (postponed accordingly if it is a legal holiday in China and subject to separate adjustment and announcement by the Exchange if it falls in the Spring Festival month or another month specially designated by the Exchange.)         |
| Delivery Period                  | The first business day after the last trading day  |
| Grade and Quality Specifications | Domestic gold ingots with gold content not less than 99.95% and standard gold ingots produced by a supplier or refiner certified by the London Bullion Market Association (LBMA) and recognized by the Exchange (refer to the Annex for detailed quality standards). |
| Delivery Venue                   | SHFE-designated gold delivery warehouses   |
| Minimum Trade Margin             | 4% of contract value   |
| Settlement Type                  | Physical delivery  |
| Delivery Unit                    | 3,000 grams  |
| Contract Symbol                  | AU   |
| Listing Exchange                 | Shanghai Futures Exchange  |

Here is some gold futures quotes and a chart of the CNY gold price:

| Contract | Last   | Chg  | Open Interest | Volume | Turnover    | Bid-Ask       | Pre-clear | Open   | Low    | High   | Chart   |
|----------|--------|------|---------------|--------|-------------|---------------|-----------|--------|--------|--------|---|
| au2408   | 558.76 | 5.66 | 16872         | 6591   | 3676234640  | 558.32/558.76 | 553.10    | 557.10 | 556.00 | 559.40 |  |
| au2409   | 558.72 | 4.62 | 211           | 57     | 31846460    | 559.66/559.94 | 554.10    | 557.72 | 557.22 | 560.02 |  |
| au2410   | 560.64 | 5.76 | 178248        | 132176 | 73980674220 | 560.60/560.62 | 554.88    | 559.58 | 557.84 | 561.26 |  |
| au2412   | 562.78 | 5.62 | 132121        | 27051  | 15197078600 | 562.74/562.78 | 557.16    | 560.92 | 559.82 | 563.36 |  |
| au2502   | 564.70 | 6.26 | 21013         | 3818   | 2151948920  | 563.52/565.00 | 558.44    | 563.48 | 561.78 | 565.26 |  |
| au2504   | 566.82 | 6.10 | 15754         | 1260   | 713010380   | 566.70/567.18 | 560.72    | 565.38 | 564.12 | 567.46 |  |
| au2506   | 569.14 | 6.36 | 9138          | 586    | 332974020   | 567.00/569.48 | 562.78    | 567.86 | 566.50 | 569.56 |  |
| au2508   | 570.46 | 6.20 | 862           | 100    | 56980700    | 570.18/572.80 | 564.26    | 569.08 | 568.32 | 570.98 |  |



In the following questions you can use the last traded futures prices.

1. You run a gold mining company currently producing approximately 1 ton of gold per month, which you sell to Chinese businesses and government. What risk are you exposed to in your business and how would you use SHFE futures contracts over the next 3 months of August, September and October to manage this risk?
2. Following on from 1., alternatively, what risk is your Chinese buyers exposed to and how would they use futures contracts to manage this risk over the next few months?
3. Following on from 1., suppose the gold price was 575 CNY at the August contract maturity, 600 CNY at the September contract maturity, and 625 CNY at the October contract maturity. Are you happy with your hedging decision? How would you justify this to your board of directors? Are your Chinese buyers happy with their decision to hedge?
4. Now suppose you're a gold futures trader and you think that the gold price will keep going up at least until the end of the year. How would you use futures contracts to speculate on this view? Plot a payoff diagram of your speculative position in 100 December contracts. Alternatively, how would you speculate on the gold price falling? Plot a payoff diagram of your position speculating on a fall in price using 100 December futures.

## Equities

**Question 2.** The **Tencent** share price on the **Hong Kong Exchange** (HKEX):



## Contract specifications for HKEX share futures, and Tencent's multiplier:

| CONTRACT SUMMARY                |  |
|---------------------------------|--|
| Item                            | Contract Terms   |
| Underlying Stocks & HKATS Codes | Please refer to <a href="#">list of stock futures</a>  |
| Contract Multiplier             | Board lot size of the underlying shares *  |
| Contracted Value                | Contracted price multiplied by Contract Multiplier   |
| Minimum Fluctuation             | HK\$0.01   |
| Contract Months                 | Spot Month, the next two calendar months, & next two calendar quarter months   |
| Trading Hours                   | 9:30 am - 12:00 noon & 1:00 pm - 4:00 pm   |
| Last Trading Day                | The second last Trading Day of the Contract Month  |
| Final Settlement Day            | The first Trading Day after the Last Trading Day   |
| Final Settlement Price **       | The official closing price of the underlying stock as quoted by SEHK on the Last Trading Day.                          |
| Settlement Method               | Cash settled contract of difference  |
| Transaction Costs***            | Exchange Fee Tier 1: HK\$3.0 Tier 2: HK\$1.0 Tier 3: HK\$0.5<br>Commission Levy HK\$0.10<br>Commission Rate Negotiable |

\*Relevant information regarding contract multiplier of individual stock futures can be found in the list of stock futures

\*\*Starting from 3 July 2018, the Final Settlement Price (FSP) shall be revised to the official closing price of the underlying stock as quoted by SEHK on the Last Trading Day.

\*\*\*Starting from 3 July 2018, a new 3-Tier trading fee structure will be introduced. Please refer to the circular [MKD/EQD/16/18](#) for the tier level.

| No. | SEHK Code | Underlying Stocks        | HKATS Code | Contract Multiplier (shares) | Tier No. | Position Limit **<br>(Effective from 1 April 2024) | Market Makers | Approved by FSC Taiwan |
|-----|-----------|--------------------------|------------|------------------------------|----------|--|---------------|------------------------|
| 18  | 700       | Tencent Holdings Limited | TCH        | 100                          | 1        | 25,000   | Y             | ✓                      |

## Tencent share futures quotes:

| FUTURES  |             |            |                           |                  |        |                  |        |                        | <a href="#">Export to Excel</a> > |
|----------|-------------|------------|---------------------------|------------------|--------|------------------|--------|------------------------|-----------------------------------|
| Contract | Last Traded | Net Change | Prev.Day Settlement Price | Bid Ask          | Open   | High Low         | Volume | Prev.Day Open Interest |                                   |
| Total    |             |            |                           |                  |        |                  | 749    | 2,203                  |                                   |
| Jul-24   | 354.80      | +3.00      | 354.85                    | 354.51<br>355.19 | 353.80 | 358.36<br>352.66 | 476    | 982                    |                                   |
| Aug-24   | 356.30      | +3.12      | 356.37                    | 356.00<br>356.73 | 355.15 | 359.66<br>355.00 | 243    | 1,129                  |                                   |
| Sep-24   | 357.50      | +3.02      | 357.77                    | -<br>380.00      | 357.06 | 360.60<br>357.06 | 25     | 91                     |                                   |
| Dec-24   | -           | -          | 354.03                    | -<br>-           | -      | -<br>-           | -      | -                      |                                   |
| Mar-25   | 367.30      | +14.20     | 360.00                    | 360.00<br>-      | 360.00 | 368.00<br>360.00 | 5      | 1                      |                                   |

1. You own 10,000 Tencent shares and are worried that the share price is heading back down again over the next 2 months. How would you use HKEX Tencent futures to insure your holding against this risk? Plot a payoff diagram of your position at maturity of your chosen contract.
2. Now suppose you're a futures trader in Hong Kong and believe that Tencent will reach all-time highs over the next 9 or so months. How do you trade 10 March 2025 futures contracts to speculate on Tencent going up? Plot a payoff diagram of your trade. What would be your payoff if Tencent actually revisited its recent low of say 200 HKD?
3. Following on from 2., suppose Tencent hits 500 HKD after 2 months so you closed out your trade and took your profits. How much did you make?
4. Following on from 2., suppose Tencent range traded between 200 HKD and 400 HKD over the life of your trade. The HKEX margin requirements on Tencent are below. How much capital in HKD would you need in order to maintain your position?

|                       |     |                | Initial margin | Maintenance margin |
|-----------------------|-----|----------------|----------------|--------------------|
| Tencent Holdings Ltd. | TCH | Full Rate /lot | 2,846          | 2,276              |
|                       |     |                |                |                    |

## Currencies

Bitcoin's a currency, right?

**Question 3.** Consider the CME Group **Micro Bitcoin Futures** contract:

### MICRO BITCOIN FUTURES - QUOTES

VENUE: GLOBEX

AUTO-REFRESH IS OFF Last Updated 26 Jul 2024 10:30:41 PM CT. Market data is delayed by at least 10 minutes.

| MONTH          | OPTIONS | CHART | LAST  | CHANGE         | PRIOR SETTLE | OPEN  | HIGH  | LOW   | VOLUME | UPDATED                    |
|----------------|---------|-------|-------|----------------|--------------|-------|-------|-------|--------|----------------------------|
| AUG 2024 MBTQ4 | OPT     |       | 68185 | +2795 (+4.27%) | -            | 66195 | 68985 | 66195 | 36,843 | 16:38:35 CT<br>26 Jul 2024 |
| SEP 2024 MBTU4 | OPT     |       | 68910 | +3810 (+4.57%) | -            | 67255 | 69460 | 66945 | 631    | 16:38:05 CT<br>26 Jul 2024 |
| OCT 2024 MBTV4 | OPT     |       | 69355 | +2980 (+4.49%) | -            | 68020 | 69435 | 68020 | 21     | 16:38:20 CT<br>26 Jul 2024 |
| NOV 2024 MBTX4 | OPT     |       | -     | -              | -            | -     | -     | -     | 0      | 16:38:39 CT<br>26 Jul 2024 |
| DEC 2024 MBTZ4 | OPT     |       | 69600 | +2220 (+3.29%) | -            | 70000 | 70000 | 69600 | 13     | 16:37:56 CT<br>26 Jul 2024 |

## Review contract highlights

### CONTRACT UNIT ⓘ

0.10 bitcoin, as defined by the CME CF Bitcoin Reference Rate (BRR)

### PRICE QUOTATION ⓘ

U.S. dollars and cents

### PRODUCT CODE ⓘ

CME Globex: MBT  
CME ClearPort: MBT  
Clearing: MBT

TAS: TBM  
BTIC: "MYB","MIB","AMB"

### SETTLEMENT METHOD

Financially Settled

[→ View full contract specs](#)

*Last Updated 26 Jul 2024 10:25:43 PM CT.*

## Bitcoin

### REFERENCE RATE

**\$67,414.79** BRR

26 Jul 2024 10:00:00 am CT

### REAL-TIME INDEX

**\$67,819.97** BRTI

26 Jul 2024 22:26:20 pm CT

### REFERENCE RATE (NY)

**\$67,816.23** BRRNY

26 Jul 2024 15:00:00 pm CT

### REFERENCE RATE (APAC)

**\$67,022.08** BRRAP

26 Jul 2024 03:00:00 am CT

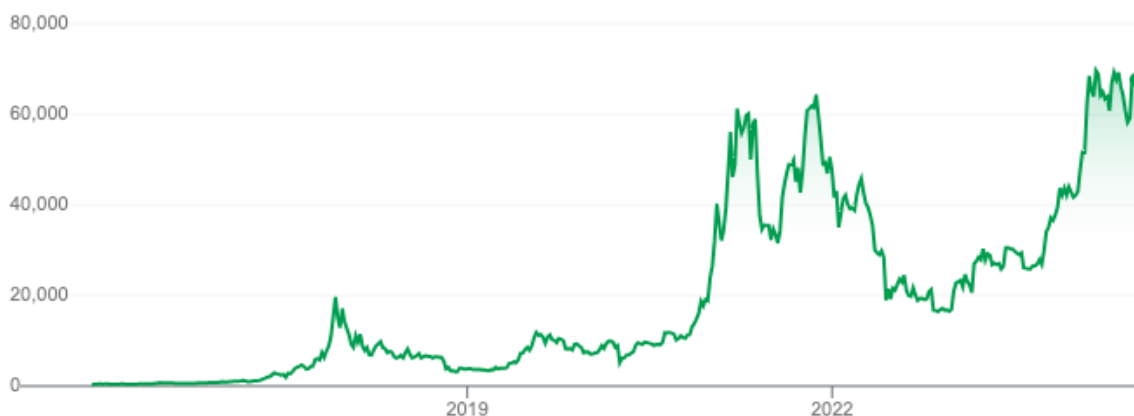
Note that the Bitcoin price defined in the contract is the CME CF Bitcoin Reference rate, as described [here](#). But just think of it as the USD Bitcoin price.

67,820.60 USD

+67,493.60 (20,640.24%) ↑ all time

27 July, 3:34 am UTC · [Disclaimer](#)

1D | 5D | 1M | 6M | YTD | 1Y | 5Y | Max



1

BTC ▾

67820.60

USD ▾

1. You hold 10 Bitcoin and don't think it will break through its all-time highs, and will most likely fall over the next month or two. How might you use CME Bitcoin futures to insure your holding against this risk?
2. How do you use futures to speculate on Bitcoin breaking through its all-time highs by December, by getting an exposure to 10 Bitcoin? Plot a payoff diagram of your trade.
3. You think Elon Musk will come out and say something negative about cryptocurrencies in the next month, or maybe just post some cryptic meme on X, causing the Bitcoin price to crash. How do you use September Bitcoin contracts to speculate on this, via an exposure to 10 Bitcoin? Plot a payoff diagram of your position.

**Question 4.** You're from the USA starting your PhD in finance at the UQ Business School (good choice!), and your parents sold a property in the USA and have bought you a \$1,000,000 AUD apartment to live in during your studies (lucky you!). Both contracts finalise in 3 months, at which time your parents will then exchange USD for AUD to settle the purchase. What risk is your parents exposed to? How would you advise your parents use CME Group **AUD futures** to manage this risk? What is their futures payoff if the USD depreciates 10% against the AUD in 3 months - are you in the good or bad books with your parents? Plot a payoff diagram of their futures position.

# Interest rates

## FRA

Question 5. Consider the following **EURIBOR** yield curve:



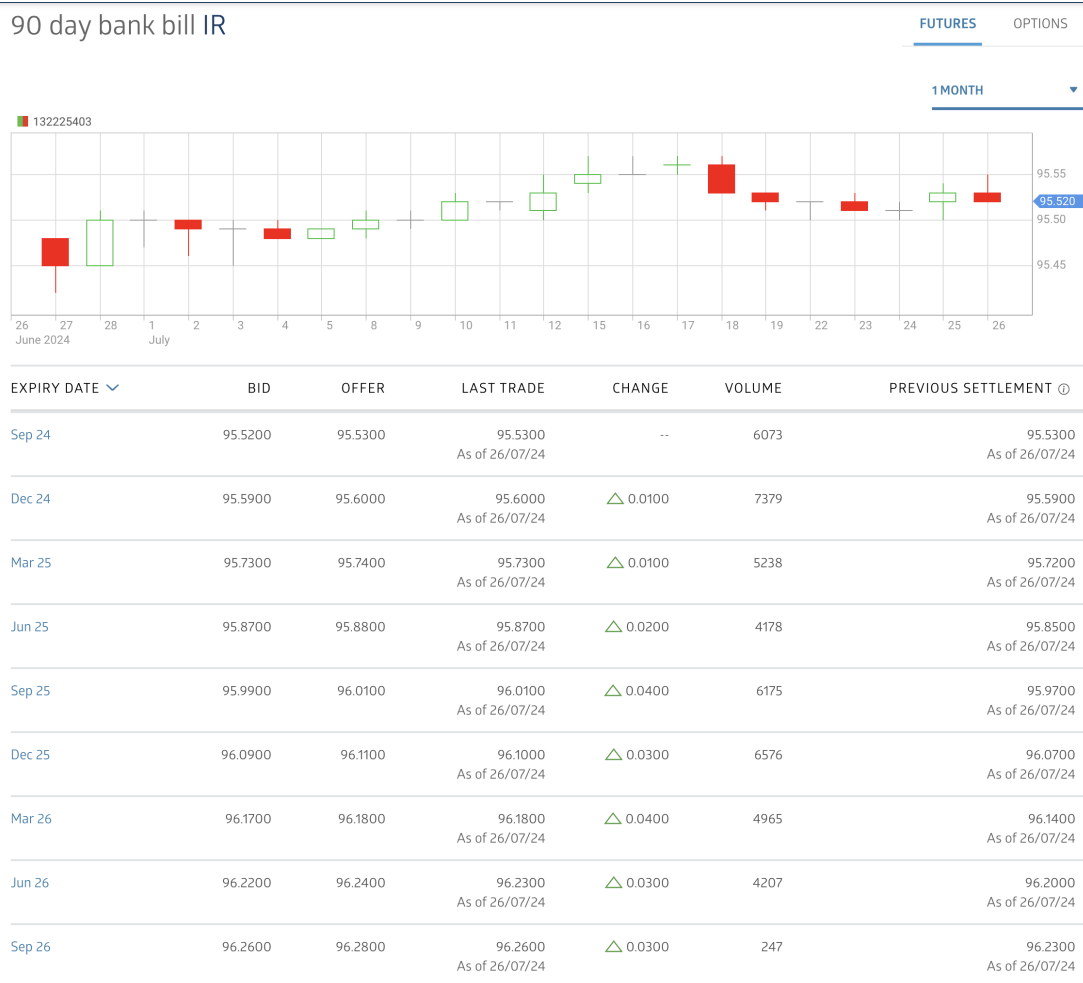
Note that we show in the week 3 lecture that the correct fixed rate  $k$  in a FRA is the implied forward rate embedded in the yield curve.

1. You need to borrow €1,000,000 in 3 months time for a period of 3 months, paying back the loan in one payment. What risk are you exposed to? How do you use a FRA to manage this risk?
2. Following on from 1., suppose that the spot 3 month EURIBOR rate in 3 months time unexpectedly increases to  $r = 5\%$ . Show the mechanics of how you locked in your borrowing rate at  $k$ .
3. Following on from 1., plot a payoff diagram of your FRA position over a range of different spot 3 month EURIBOR rates in 3 months time.
4. Suppose you wanted to speculate on 3 month EURIBOR rates being lower than market expectations in 3 months time. How do you do this via a FRA? Plot a payoff diagram of your position again on a notional or face value of €1,000,000.



## BAB Futures

**Question 6.** Use the last traded price of the following **BAB futures quotes**:



1. You work in the liquidity management function within the treasury department of a large company and forecast that you will have approximately \$5,000,000 AUD in surplus funds to invest in December for 90 days. What risk are you exposed to? How do you use BAB futures to manage this risk?
2. Following on from 1., show the mechanics of your trading and investing activities at maturity of the December contract if the RBA reduced interest rates and the 90 day BBSW rate dropped to 4% by December.
3. How do you use BAB futures to speculate on 90 day BAB yields being lower than market expectations in June next year, with a notional or face value of \$10,000,000? Plot a payoff diagram of your position for a range of 90 day BBSW rates at maturity.
4. Suppose the RBA decreases interest rates more than expected, and the BAB futures fixed rate falls to 3.5% in March, so you close out your position. What was your payoff?