BUSS386 Problem Set 4

Pricing Forwards and Futures

Prof. Ji-Woong Chung

Problem 1 — Cost-of-carry, non-dividend stock (15 pts)

A 1-year forward contract is written on a non-dividend-paying stock. The current spot price is $S_0 = \$80$ and the risk-free rate is $r = 4\%$ (continuous compounding).

(a) Compute the no-arbitrage 1-year forward price F_0.

(b) Suppose the market quotes the 1-year forward at \$85. Construct an arbitrage strategy and compute the risk-free profit per share.

(c) Now suppose the market quotes the 1-year forward at \$82. Construct an arbitrage strategy and compute the risk-free profit per share. (You may assume short selling is allowed and proceeds can be lent at r.)

Problem 2 — Discrete dividends + live valuation (20 pts)

A 6-month forward is written today on a stock that will pay a \$1 dividend in 2 months and another \$1 dividend in 5 months. The current stock price is \$50 and $r = 6\%$ (continuous compounding).

(a) Compute the 6-month forward price F_0.

(b) *Three months later*, the stock price is \$48 and r is still 6%. The remaining maturity is 3 months and the only remaining dividend is \$1 in 2 months from now. Compute the current 3-month forward price F_t and the value f of the original long position entered at F_0.

(c) In one sentence, explain why the value f in (b) is negative even though the original contract was struck at the no-arbitrage forward price.

Problem 3 — KOSPI 200 index futures (20 pts)

The KOSPI 200 index currently stands at 405. The dividend yield on the index is $q = 1.5\%$ per annum and the KRW risk-free rate is $r = 2.5\%$ per annum (both continuous compounding).

(a) Compute the no-arbitrage 4-month forward price on the index.

(b) Suppose the market quotes the 4-month KOSPI 200 futures at 410. Construct an arbitrage strategy that uses one unit of the index basket and compute the risk-free profit (in index points).

(c) In one sentence, explain why the dividend yield q enters the cost-of-carry formula with a negative sign.

Problem 4 — USD/KRW forward and covered interest parity (25 pts)

On 1 March 2026, the spot USD/KRW exchange rate is $S_0 = 1{,}380$ per USD. The KRW risk-free rate is $r = 2.5\%$ and the USD risk-free rate is $r_f = 4.0\%$ (both continuous compounding).

(a) Compute the no-arbitrage 6-month USD/KRW forward price.

(b) Is USD trading at a forward *premium* or *discount* relative to spot? In one sentence, explain why.

(c) The market quotes the 6-month forward at ₩1,375 per USD. Construct an arbitrage strategy (per 1 USD of forward notional) and compute the KRW profit.

(d) Now suppose the BoK raises the KRW rate to $r = 3.5\%$ while r_f stays at 4.0%. Recompute the no-arbitrage 6-month forward. Did the USD forward premium/discount widen or narrow? Why?

(e) State *covered interest parity* in one sentence.

Problem 5 — Valuing a live forward (20 pts)

On 1 August 2025, an investor enters a 1-year *long* forward on a non-dividend-paying stock. The stock price is \$40 and $r = 5\%$ (continuous compounding) at the time the contract is written.

(a) Compute the original forward price F_0.

(b) Three months later (1 November 2025), the stock price has risen to \$43 and r is still 5%. Compute (i) the new 9-month forward price F_t and (ii) the value f of the investor's original long position, using $f = (F_t - F_0)\, e^{-r(T-t)}$.

(c) Verify your answer to (b)(ii) using the alternative formula $f = S_t - F_0\, e^{-r(T-t)}$.

(d) Suppose instead the stock had *fallen* to \$38 at month 3 (with r unchanged). Recompute f for the long position.

Total: 100 pts.