AcF305:

International Financial and Risk Management

Week 4

Dr. Mykola Babiak

Lancaster University Management School

Outline of Lecture 4

- Essential reading: Chapter 5 of Sercu (2009).
- Topics:
  - **Forward quotes with bid/ask spreads**: How are forwards quoted in the presence of bid/ask spreads? Is there a relation between spreads and maturity? Why?
  - **Covered interest parity with bid/ask spreads**: How does covered interest parity work in the presence of bid/ask spreads? What are possible and what are impossible quotes?
  - **Using forward contracts in Risk Management**: What does hedging mean? How does hedging work in theory? How is hedging done in practice? What is a speculator? What are simple and more complicated speculation strategies?

Forward Quotes with Bid/Ask Spreads I

- In the real-world with bid/ask spreads, forwards can still be quoted 'outright' or as a swap rate.
  - **Outright**: The rate at which agents can buy currency in the future.
  - **Swap**: Difference between forward rate and spot rate.

- To obtain outright quotes from swap rates, add (or subtract) first quote from spot bid rate and add (or subtract) second from spot ask rate.

Example 1: spot rates: USD/EUR 1.1774−78;

swap rates USD/EUR 0.0001920 and 0.00028.

- Outright forward bid = 1.1774 + 0.0001920 = USD/EUR 1.1775920
- Outright forward ask = 1.1778 + 0.0001928 = USD/EUR 1.1779928

Example 2: spot rates: SEK/EUR 9.5160−64;

swap rates SEK/EUR − 0.0005210 and − 0.0004780

- Outright forward bid = 9.5160 − 0.0005210 = SEK/EUR 9.515479
- Outright forward ask = 9.5164 − 0.0004780 = SEK/EUR 9.515922

Forward Quotes with Bid/Ask Spreads II

- Second law of imperfect exchange markets
  - The forward spread is **always larger** than the spot spread
  - Spreads **always increase** with maturity

- Some newspaper suppress the sign of the swap rate (+/−). What shall be done then?

  → if you added spot rates and swap rates and the spread declined, you should have subtracted

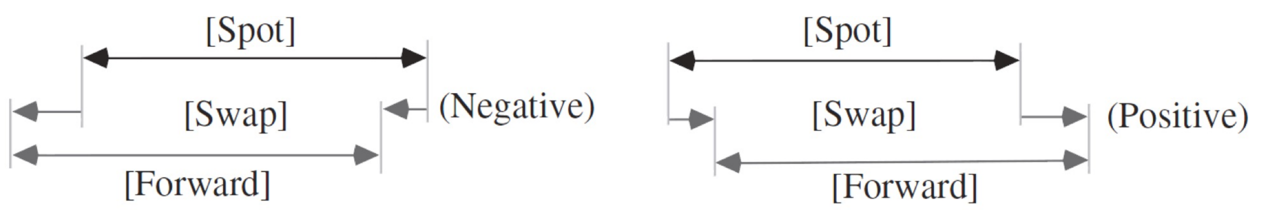


Figure 5.2. The bid-ask spread in a forward is wider than in a spot. For negative swap rates the bid is the bigger one, in absolute terms, while for positive swap rates the ask is the bigger one. This is equivalent to observing a larger total bid-ask spread in the forward market.

Provisions for Default I

- Why do spreads increase with maturity (“Law of imperfect markets”)?

  1. The longer the maturity, the lower the transaction volume.

  − spreads tend to be high in thin markets

  2. Higher uncertainty about customer creditworthiness.

  − this increases the default risk.

  3. Spot rates can change much more over longer horizons

  − this implies more risk to the bank (the bank’s payoff has more time to become very unfavourable)

Provisions for Default I

- Then again, conditional on maturity, how do banks deal with default risk?

  – **Right of offset**: If one party defaults, the other party does not need to honour its obligations.

    Example: Banks sells FC 1 forward to A for a price of HC $F_{t0,T}$. A defaults. Bank can sell FC 1 in spot market. Maximum loss: $(F_{t0,T} - S_T)$.

  – **Interbank, credit agreements**: Banks only deal with other banks that are well-known; there are also credit limits.

Provisions for Default II

- **Answer (continued)**:
  - **Firms, credit agreements or securities**: Banks also only deal with well-known customers; others need to post a margin.
    - *Example:* A wants to sell forward GBP 1m for USD 1.5m. Bank asks for a 25% margin: A must deposit 1m*1.5*0.25 = USD 375,000.
  - **Restricted use**: Banks only allow customers to use forward contracts for hedging purposes; speculation is frowned upon.
  - **Short lives**: Banks do not offer long maturity contracts to risky customers; instead, these have to roll over short-term contracts.
    - *Example:* A wants to buy USD 1m for INR $F_{t,T}$ at T = 3 years. The bank can offer either (a) a 3-year contract or (b) 3 consecutive 1-year contracts.

      Suppose: $F_{0,3} = 40$, $F_{0,1} = 40.3$, $F_{1,2} = 37.2$ and $F_{2,3} = 35.9$.
      $S_1 = 38$, $S_2 = 36$ and $S_3 = 34$. A defaults in year 3.

      Maximum loss of option (a) 6m [34−40] vs. option (b) 1.9m [34−35.9].

Arbitrage in Forward Markets with Bid/Ask Spreads

- Spot market: bid-ask quotes are the least favourable rate for the bank's costumer. The same applies for the synthetic forwards.
- Check through *synthetically* selling one unit of FC:

$$FC_T \rightarrow FC_t \rightarrow HC_t \rightarrow HC_T$$

Use the diagram: 1 unit of $FC = S_t^{bid} \dfrac{1+r_{t,T}^{bid}}{1+r_{t,T}^{*ask}}$ units of HC.

- Check through *synthetically* buying FC with one unit of HC:

$$HC_T \rightarrow HC_t \rightarrow FC_t \rightarrow FC_T$$

Use the diagram: 1 unit of $HC = \left(1/S_t^{ask}\right) \dfrac{1+r_{t,T}^{*bid}}{1+r_{t,T}^{ask}}$ units of FC.

- Synthetic: $[F_{t,T}^{bid}, F_{t,T}^{ask}] = \left[S_t^{bid} \dfrac{1+r_{t,T}^{bid}}{1+r_{t,T}^{*ask}}, S_t^{ask} \dfrac{1+r_{t,T}^{ask}}{1+r_{t,T}^{*bid}} \right]$ (both in HC/FC).

Spot/Forward/Money Market Diagram: Spreads

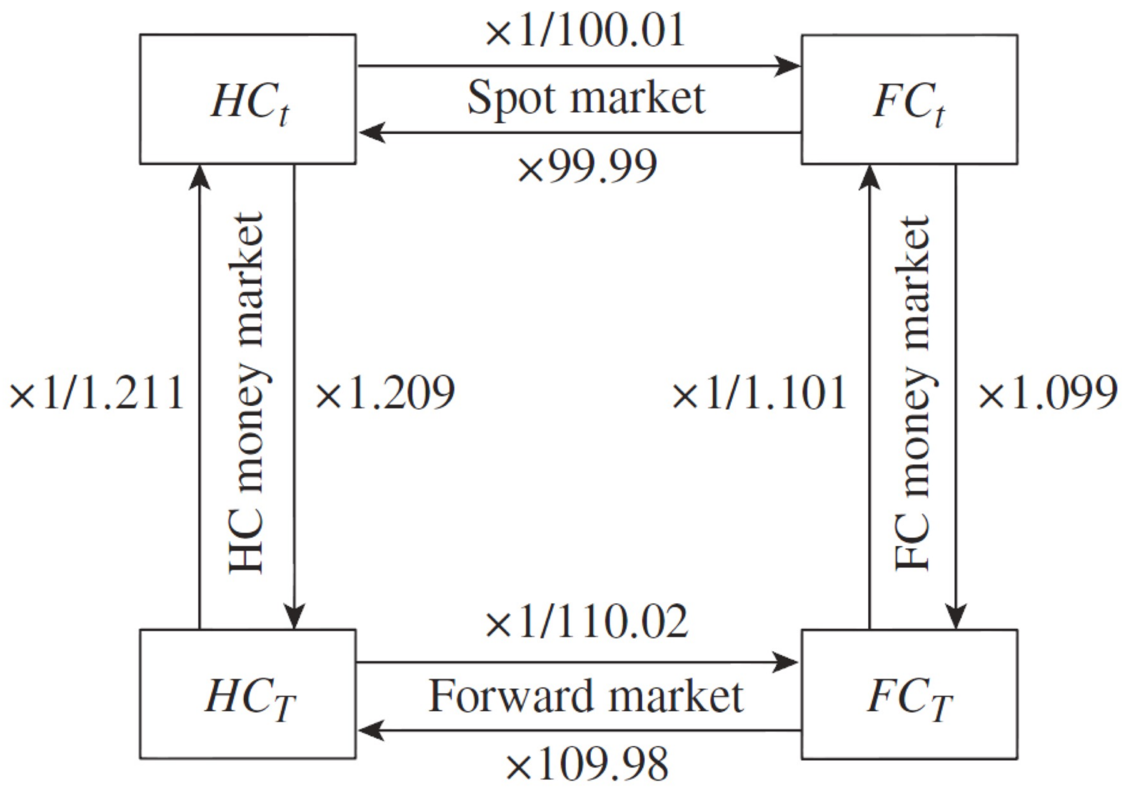


Figure 5.3. Spot/forward/money market diagram with bid-ask spreads.

(Permanently) Possible and Impossible Quotes

- Some conceivable quotes:

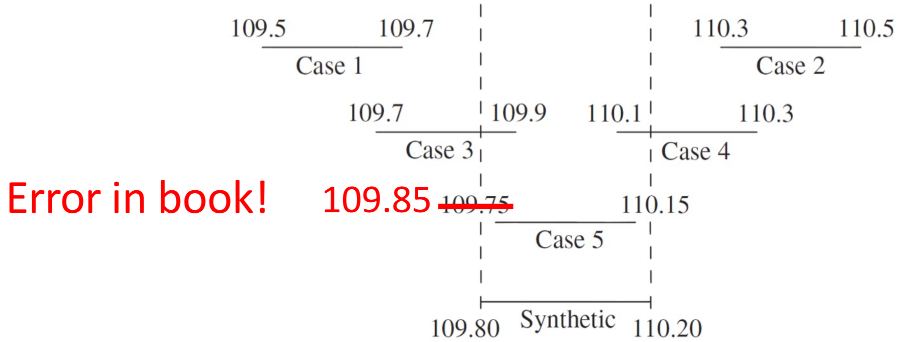


Figure 5.4. Synthetic and actual forward rates: some conceivable combinations.

- **Remember**: Traders always buy low and sell high → bid < ask.

- Relative to the synthetic quotes, discuss with course-mates:

  1. Which case(s) lead(s) to arbitrage opportunities? Why?

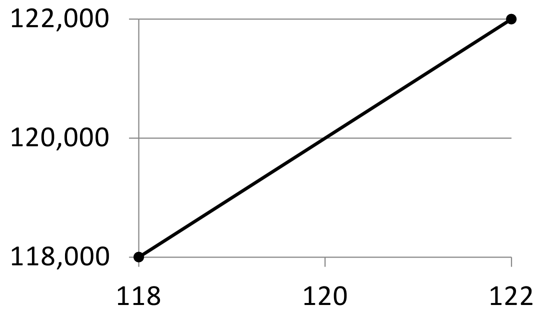
  2. Which case(s) do(es) not permit arbitrage, yet can nevertheless not be a stable equilibrium? Why?

  3. Which case(s) is (are) a stable equilibrium? Why?

Using Forwards to Hedge Contractual Exposure

- Some definitions:
  - **Hedging**: Eliminating (or, at least, reducing) the variability of the HC value of future cash inflows or outflows denominated in FC.
  - **Contractual exposure**: Arises from a signed contract which ensures a known cash inflow or outflow in FC at some specified future time. Measures by what multiple the HC value of a cash flow denominated in FC changes with a Δ change in the exchange rate:

$$B^{*}_{t,T} = \frac{\Delta \tilde{V}_T}{\Delta \tilde{S}_T}$$



- *Example:*
  1. When S_T is 118 JPY/USD, then V_T is equal to 118,000 JPY.
  2. When S_T is 122 JPY/USD, then V_T is equal to 122,000 JPY.
  3. $B^{*}_{t,T}$ = (122,000 − 118,000) / (122 − 118) = USD 1,000
- As $V_T = C^{*} * S_T$, $B^{*}_{t,T}$ (the derivative of V_T w.r.t. S_T) is simply C^{*}, the contractual payment denominated in FC.

Some Hedging Technicalities I

- **Net exposure**: Firms only hedge *net* exposures, i.e. the difference between inflows and outflows on each future date:

Item	30 days In	30 days Out	60 days In	60 days Out
(a) A/R	100,000	—	2,200,000	—
(b) Commodity sales contracts	0	—	0	—
(c) *Expiring deposits*	3,000,000	—	0	—
(d) *Forward purchases*	0	—	0	—
(e) *Inflows from forward loans in FC*	0	—	0	—
(f) A/P	—	2,300,000	—	1,000,000
(g) Commodity purchase contracts:	—	0	—	0
(h) *Loan due*	—	0	—	2,300,000
(i) *Forward sales*	—	0	—	0
(j) *Outflows for forward deposits in FC*	—	0	—	0
Net flow	+800,000		−1,100,000	

- Perfect hedge: Sell FC 800k forward in 30 days and buy FC −1,100k forward in 60 days (alternatives discussed later).
- **Default risk**: If other party fails to deliver, hedge becomes open position.
  - *Example:* If FC 800k will not be delivered in 30 days, hedging firm nonetheless has to deliver FC 800k to the bank.
  - Solution: Buy FC 800k forward and *reverse* (i.e. eliminate) the hedge; potentially costly: $F_{t_0,T} - F_{t,T}$ could be negative.
- If default risk is substantial, then firm can buy insurance from banks (bank guarantees), private or government agencies.

Some Hedging Technicalities II

- **Hedging bins**: It can be beneficial to pool net exposures which are *close* to one another (in time) into bins.
  - Advantage: Saves transaction costs (i.e. make use of netting over time or of economies of scale).
  - Disadvantage: Creates interest rate risk, which can be hedged, too.

- *Example:* Assume company X expects SEK 100m at beginning of year t=5 and SEK 50m at the end of year t=5: hedge with one forward with maturity July 1 (middle of year).
  1. Deposit the SEK 100m for ½.
  2. Borrow against the SEK 50m for ½ year.
  3. Sell forward the proceeds of the deposit and the loan on July 1.
- Danger! Interest rate risk (how do you do the discounting/compounding?)

Alternatives to Hedging with Forwards

- **Extreme bin**: Hedge PV of all exposures with one instrument (forward or equivalent) with same PV.
  - No company follows this extreme approach → too risky.

- **Match future cash inflows and cash outflows**.
  - Difficult, as cash inflows and outflows are seldom certain. Also, certain firms (e.g. exporters) typically have much larger FC inflows than outflows.

- **Only invoice in HC**.
  - Feasibility of this strategy limited by counterparty’s preferences, market power and company strategy.

Using Forwards for Speculation

- *Several different definitions:*
  1. Speculators take on positions for financial reasons, not because they need the asset or want to hedge (… *but most investors fulfill these conditions*).
  2. Speculators take on risk (… *but even the market portfolio is risky*).
  3. Speculators give up diversification to bet on the future direction of an assets' market value.
- Conditions for successful speculation:
  1. Speculator can spot mispricing which market has (foolishly) not yet noticed.
  2. Market will soon notice its error and will take on speculator's view.
  3. Gains from this price adjustment outweigh costs from under-diversification.
- *Example:* speculation with forwards

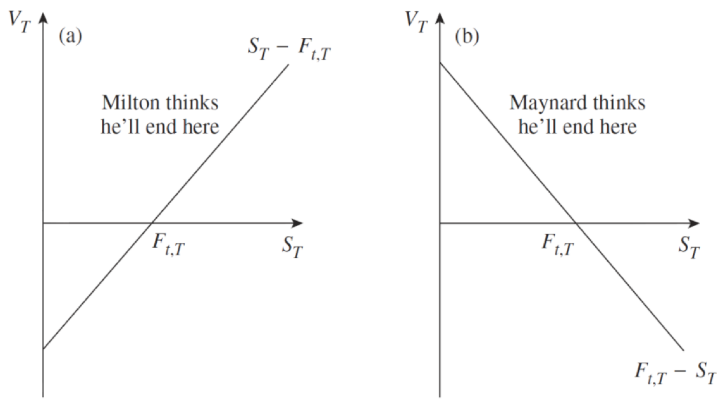


Figure 5.5. Speculating in the spot market: (a) buy forward; (b) sell forward.

Speculation – More Complex Strategies I

- *Assume:* An agent wants to speculate on $\tilde{F}_{T_1,T_2}$, i.e. he believes the forward rate for delivery at T_2 will have gone up by T_1.
  - Buy forward now (at time t) and sell forward in future (at time T_1), both for delivery at $T = 2$.
  - Payoff at time T_2: $\tilde{F}_{T_1,T_2} - F_{t,T_2}$
- Speculate on drop in $\tilde{F}_{T_1,T_2}$: reverse strategy.
- Note that the forward rate = spot rate + swap rate. As a result, the above strategy is a bet on both spot rate and swap rate.
  - Payoff at time T_2: $\tilde{S}_{T_1} + \tilde{w}_{T_1,T_2} - S_t - w_{t,T_2} = \left(\tilde{S}_{T_1} - S_t\right) + \left(\tilde{w}_{T_1,T_2} - w_{t,T_2}\right)$

- *Exercise:* Think that an agent wants to speculate on swap rate $\tilde{w}_{T_1,T_2}$ alone, i.e. he believes that the swap rate will have gone up by T_1 – relative to the swap rate at time t with delivery at time T_2. The example in the book is rather difficult and misleading, ignore it.

Summary, Homework and Additional Reading

- **In this lecture**, we dealt with:
  - Forward quotes with bid/ask spreads.
  - Covered interest parity with bid/ask spreads.
  - Using forward contracts: Hedging, speculation and other uses.

- **At home**, you will need to cover:
  - More background knowledge on using forward markets for information reasons and for legal reasons.

- **Additional reading**:
  - The Economist (2009), “Corporate hedging gets harder: The perils of prudence”, *The Economist*, 18 June 2009.