Definition 1.1
A derivative (derivative security, contingent claim) is a financial instrument whose value depends on (derives from, is contingent on) the values of other, more basic, underlying variables (the underlying).

Example 1.2
- Forwards
- Futures
- Swaps
- Options

Remark 1.3
Market forms for derivatives are
- Exchange-traded markets, e.g., NYSE 1792, CBOT 1848, CME 1919, NASDAQ 1971, CBOE 1973
  - open outcry system
  - electronic
- Over-the-counter markets
Definition 1.4
There are three types of traders:
• Hedgers attempt to reduce exposure to risk a company already faces
• Speculators invest available funds opportunistically in the hope of making a profit
• Arbitrageurs try to lock in riskless profit

no-arbitrage principle: arbitrage opportunities are absent

Definition 1.5
• A forward contract is an agreement to sell or buy an asset at a fixed date in the future (delivery time) for a price specified in advance (forward price, delivery price).
• The party selling the asset assumes what is termed a short (forward) position, while the party buying the asset enters into a long (forward) position.

Definition 1.5 (continued)
• It costs nothing to enter a forward contract. A forward contract can be contrasted to a spot contract, which is an agreement to buy or sell an asset today.

Example 1.6 (a)
Suppose that
• The spot price of ¼ oz gold is $300
• The 1-year forward price of ¼ oz gold is $340
• The 1-year interest rate is 5% p.a.

Example 1.6 (b)
Suppose that
• The spot price of ¼ oz gold is $300
• The 1-year forward price of ¼ oz gold is $310
• The 1-year interest rate is 5% p.a.

Example 1.7
Foreign exchange quote for GBP in USD on August 14, 2022

<table>
<thead>
<tr>
<th>Currency</th>
<th>Buy</th>
<th>Sell</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spot</td>
<td>1.21152</td>
<td>1.21172</td>
</tr>
<tr>
<td>1-month forward</td>
<td>1.21219</td>
<td>1.21240</td>
</tr>
<tr>
<td>3-month forward</td>
<td>1.21393</td>
<td>1.21432</td>
</tr>
<tr>
<td>6-month forward</td>
<td>1.21739</td>
<td>1.21746</td>
</tr>
</tbody>
</table>
Example 1.7 (continued)

(a) Say it is August 14, 2022, and Import Co, a company based in the US, knows that it will have to pay GBP 10 million on November 14, 2022, for goods purchased from a British supplier.
(b) Export Co exports goods to UK and knows it will receive GBP 10 million in three months.

Definition 1.8

• A European call option is a contract giving the holder the right (but no obligation) to buy an asset (the underlying) for a price fixed in advance (exercise price, strike price) at a specified future time (exercise time, expiry time, maturity).
• A European put option is a contract giving the right to sell an asset for a certain strike price at a certain exercise time.

Definition 1.8 (continued)

• An American put or call option can be exercised any time up to and including the expiry time.
• Since payoffs are nonnegative, a premium (the market price of the option) must be paid when acquiring an option.

Example 1.9

Suppose an investor owns 1000 Microsoft shares on August 12, 2022, $292 per share is the current price. Suppose the investor is concerned about a possible share price decline in the next 2 months and wants protection. The investor could buy 10 put option contracts with strike price $290 and expiration time October 21, 2022. Assume each option price is $14. Ignore the time value of money.

Example 1.10

On August 21, 2022, European calls on Twitter stock with K=40 USD and T=October 21, 2022 were traded at 6.50 USD at NASDAQ. Ignoring the time value of money, when will the investment bring profit?