ACT370
Financial Principles for Actuarial Science II

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Contents

1 Introduction to Pricing, Financial Instruments, and Derivatives

1.1 Derivatives

There are several ways to define a derivative:

- **Textbook**: An agreement between two parties which has a value determined by the price of something else
- **US GAAP**: A financial instrument or other contract with the following characteristics
  1. Has (1) one or more underlyings and (2) one or more notional amounts of payment provisions or both
  2. Requires no initial net investment or an initial net investment that is smaller than would be required for other types of contracts that would be expected to have a similar response to changes in market factors
  3. Terms require or permit net settlement, it can be readily settled net by a means outside the contract, or it provides for delivery of an asset that puts the recipient in a position not substantially different from net settlement
- **IFRS IAS39**: A financial instrument with the following characteristics
  1. Value changes in response to a change in price of, or index on, a specified underlying financial or non-financial item or other variable
  2. Requires no, or comparatively little initial investment
  3. To be settled at a future date

Derivatives can also be classified as several different types:

- **Freestanding**: Options, futures, forwards, swaps, swaptions, etc.
- **Exchange Traded**: Options, futures
- **Over-the-Counter**: Options, forwards
- **Embedded**: Bond with a coupon defined by a ratio of FX rates

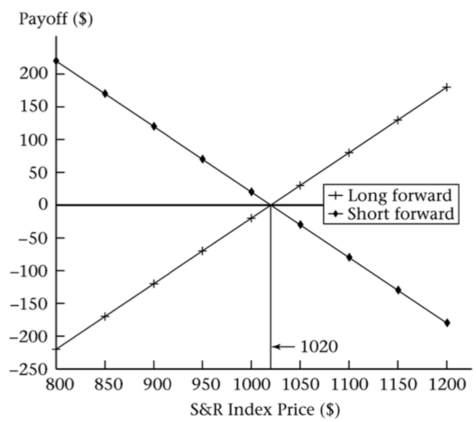
1.2 Forward Contracts

Forward contracts are an obligation to buy/sell an underlying asset in the future, at a price set today. This specifies the following:

- Features and quantity of the asset being delivered
- Delivery logistics, such as time, date, and place
- Price the buyer will pay at the time of delivery

The **Payoff** of a contract is its value at expiration. This could be either a long forward or short forward:

- ***Long Forward*** $=$ *Spot Price at Expiration* $-$ *Forward Price*
- ***Short Forward*** $=$ *Forward Price* $-$ *Spot Price at Expiration*



Some additional considerations when looking at forward contracts include the following:

1.3 Options

2 Binomial Asset Pricing Model

3 Lognormal Stock Price Model

4 Black-Scholes Formula

5 Exotic Options

6 Interest Rate Derivatives