Applications of Financial Derivatives

1.1 Real Assets, Financial Assets and Derivative Assets

Financial markets deal with financial assets and derivative assets.

Derivative assets (positions in forwards, futures, options and swaps) derive values from changes in real assets or financial assets, and sometimes changes of other specific indices, for example temperature index. Derivative assets are assets whose prices and values are derived from some primary assets. Derivatives are claims on primary assets: real or financial underlying assets. Derivative market is much greater than primary assets market.

Real assets tangible or physical (be it land, buildings, machinery, equipment, commodities – gold, oil metals or raw materials) are primary assets.

Financial assets are claims on real assets. For derivatives, financial instruments are also primary assets. Financial asset markets deal with treasury bills, bonds, stocks, loans, deposits and currencies. The owner of a primary asset has a direct claim on the benefits provided by a real asset.

Financial markets are places where borrowers (issuers of securities, sellers) requiring cash (deficit units) can meet with lenders (investors, buyers) able to supply it (surplus units). The financial markets allow firms to realize their investment decisions and financial decisions.

Types of derivatives:

- forward,
- futures contracts
- options
- swaps

Derivatives can be also divided into:

- interest rate derivatives
- currency derivatives
- credit derivatives
- equity derivatives
- commodity derivatives

Spot Markets and Forward/Futures Markets

Spot transactions assume that delivery of an asset is realized instantly or within two or sometimes several days. For example, in currency spot transaction in the interbank market delivery date is usually exactly two working days after transaction.

Forward/futures transactions assume that delivery is at some future date, such as one month or six months into the future.

1.2 Forward and Futures

1.2.1 Forward Contract

A forward contract obliges its purchaser to buy a given amount of a specified asset at some stated time in the future at the forward price. Similarly, the seller of the contract is obliged to deliver the asset at the forward price. Non-delivery forwards (NDF) are settled at maturity and no delivery of primary assets is assumed.

Forward contracts are not traded on exchanges. They are over-the-counter (OTC) contracts. Forwards are privately negotiated between two parties and they are not liquid. Forward contracts are widely used in foreign exchange markets. The profit or loss from a forward contract depends on the difference between the forward price and the spot price of the asset on the day the forward contract matures. Forward contracts are settled only at maturity.

In Poland FX forward contracts are nonstandardized transactions that call for the exchange of some quantity of a foreign currency at a future date. Sometimes it is called outright forward to emphasize that there is no corresponding spot transaction. Non-delivery forward (NDF) assumes only cash settlement at a future date. Maturities range from 1 week to 1 year. Transactions are mostly executed between banks.

1.2.2 Futures Contracts

Futures contracts are created and traded on organized futures exchanges. Contracts are highly standardized in terms of the amount and type of the underlying asset involved and the available dates in which it can be delivered. The exchanges themselves provide assurances that contracts will be honored through clearinghouses. One of the primary roles of the clearinghouse is to be the opposite party to all trades. Buyers and sellers of future contracts do not deal directly with each other but with a clearinghouse.

Types of Futures Contracts

There are five broad types of futures contracts:

- futures on commodities (grains, metals, food),
- futures on currencies,
- futures on interest bearing instruments (Eurodollar deposits, treasury bonds, notes and bills)
- futures on stocks
- futures on stock indexes.

FX Futures

FX futures are standardized exchange traded contracts calling for delivery of a specified quantity of a foreign currency at a fixed date in the future. Investors must post margin, which is marked to market daily. FX futures were introduced in September 1998 on Warsaw Stock Exchange. There were also traded on Warsaw Commodities Exchange and Polish Financial Exchange. All FX futures contracts are settled in cash.

IR futures

Interest rate futures contracts are traded on organized exchanges. In the world interest rate futures (eurodollar, T-bills, T-note, T-bond, municipal bond) contracts represent more than one-half of the entire futures market. In Poland there is still very small interest in interest rate futures. The first IR futures on WIBOR in Poland were introduced by Warsaw Commodities Exchange in February 1999 and after short period these contracts disappeared.

Stock Index Futures

Stock index futures specify an equity index as the underlying asset. Stock index futures can only be settled in cash. Futures on WIG20, MIDWIG, and TechWIG are traded on the Warsaw Stock Exchange.

Stock Futures

Stock futures are futures contracts on individual stocks **(**TPSA, PKNORLEN, ELEKTRIM, Pekao SA, KGHM Polska Miedź, BRE Bank, Agora, Prokom). The first stock futures contracts were introduced in January 2001. Futures on stocks are very popular among small individual investors.

1.3 Options

Options are traded on exchanges and OTC market. An option is a derivative security that gives the buyer (holder) the right, but not the obligation, to buy or sell a specified quantity of a specified asset within a specified time period. An option contract differs from the futures contract in that the option contract gives the buyer the right, but not the obligation, to purchase or sell a security at a later date at a specified price.

One way of creating options is through single contracts that are individually negotiated between parties, usually firms and their banks (OTC options). Organized option exchanges provide the advantages of liquidity, low transaction costs, and safety through the standardization of the assets on which the contracts are based and of the contract sizes and maturity dates.

FX options in Poland are offered by few banks. Quotations are in the form implied volatilities (Garman-Kohlhagen formula is used to calculate option premium). Banks and dealers quote prices for option combinations (strategies): straddle, strangle, sea-gull and risk reversal with maturities from 1 week to 1 year. The FX option market is an OTC (dealer) market.

IR options are instruments which give the right to buy or sell interest rate sensitive instruments at a pre-determined interest rate. The cap and collar are examples of OTC series of interest rate options. The price of an option is a premium.

Securities options give the buyer a right to buy or sell the underlying instrument (stock, debt security) at a pre-agreed price. In Poland warrants (options on stocks) are issued by banks and other financial institutions. Most of these options are traded in the OTC market. Warrants have been listed on the WSE since 1997. Warrants were also traded on CeTO.

1.4 Swaps

Swaps are considered to be interest rate risk management tools because they give an efficient means of adjusting the interest rate exposure of a company's assets and liabilities. It should be noted that other financial instruments, such as exchange-traded interest rate futures and option contracts, are often capable of achieving the similar results. Swaps are long-term OTC instruments. A great flexibility in setting the terms of the swap agreement makes it a very effective instrument in risk management.

Interest Rate Swap (IRS) is an agreement between two parties to exchange cash flows based on a specified amount of principal for a set length of time. IRS is a long term agreement. In Poland maturities reach 20 years (in the world up to 50 years).

FRA (forward rate agreement) is a transaction in which two counterparties agree to a single exchange of cash flows based on fixed and a floating rate. A 3x9 FRA means a contract on a six-month WIBOR (in Poland) reference rate, three months forward. No payment will take place until floating rate six-month WIBOR is revealed after three months. In Poland settlement will take place in advance, eg. after 3 months. The share of the five most active banks in turnover accounts for almost 90 per cent. Most of transactions are speculative.

Cross-Currency Interest Rate Swap (CIRS) is an agreement between two parties to exchange cash flows for a set length of time in different monetary units. Cash flows are based on floating or fixed interest rates in different currencies. Settlements are made every three or six months. The principal is PLN 0,5-1200 million. Maturities range from 1 to 10 years.

FX swap is a transaction in which one (foreign) bank makes a foreign currency deposit in a second (domestic) bank and simultaneously the second (domestic) bank makes a domestic currency deposit in the first (foreign) bank. The typical size of transaction is USD 10 million. Such transaction is a real financial transaction (just two real deposits). This transaction developed enormously from 1999 as it offered short-term zloty financing for foreign traders investing in Polish government bonds and T-bills offering extremely high real interest rates.

Problem 1. Futures. Marking to Market

Specul Inc. receives a $300,000 from a major contract on December 10. This cash is not needed for six days and, rather than investing it in short-term marketable securities Chief Financial Officer (CFO) wants to use these funds to speculate in pork bellies. He purchases 50 contracts. Each pork belly futures contract is for 40,000 pounds and requires a $2,000 initial margin and $1,500 maintenance margin. The current futures price for December delivery is $0,5500. The contracts are purchased at this price.

(a) What is the initial value of Specul Inc. margin account ?

(b) Immediately after the CFO purchases the contracts, the government issues a major report on dietary fat that is expected to reduce the public's bacon consumption. On succeeding days after the purchase of the contracts, pork belly futures trade at $0,5300, $0,5200, $0,5100, $0,5000, $0,4800, and $0,4500. Compute the changes in the margin account on each of these days.

(c) What is the profit/loss on the speculation ? What is the simple rate on the investment ?

(d) Assuming that Specul Inc. will realize the purchase at the end of sixth day (maturity of futures contracts), how much will he pay for pork bellies ?

Solution

(a)

Margin account value = Initial margin per contract * Number of contracts

$2,000 * 50,000 = $100,000

Maintenance margin = $1,500 * 50,000 = $75,000

(b)

Day	Price	Gain or loss	Margin balance	Margin call	Margin account value
0	0,5500			100,000	100,000
1	0,5300	-40,000	60,000	40,000	100,000
2	0,5200	-20,000	80,000	0,000	80,000
3	0,5100	-20,000	60,000	40,000	100,000
4	0,5000	-20,000	80,000	0,000	80,000
5	0,4800	-40,000	40,000	60,000	100,000
6	0,4500	-60,000	40,000	60,000	100,000
	Total			300,000	100,000

(c)

Net loss = -200,000

Loss of cash is equal to -67%.

The simple rate of return is: (-200 : 300) -1 = -67%

(d)

The actual futures price * Number of contracts * Pounds = $900,000.