IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

Future and option

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Abstract : The study focuses on Financial Derivatives, particularly futures and options.
A financial derivative is a contract between two parties whose value is derived from the performance of an underlying asset, index, or entity.
Underlying assets can include a wide range of financial instruments or entities, such as stocks, bonds, commodities (like gold or oil), market indices (like the S&P 500), currencies, interest rates, or even other derivatives.

INTRODUCTION

Futures and options were developed as financial instruments to help manage risk and enhance trading flexibility in the financial markets. They offer tools for individuals and institutions to hedge against price fluctuations and speculate on future price movements. These instruments were introduced in 1972 with the establishment of the International Monetary Market by the Chicago Mercantile Exchange, followed by the introduction of the world's first interest-rate futures contract at the Chicago Board of Trade in 1975. While they can be used to mitigate risks associated with stock market volatility, their development wasn't directly prompted by stock market failures. Instead, they evolved to meet the growing complexity of financial markets and the needs of market participantsFutures: A futures contract is an agreement between two parties to buy or sell an asset (such as a commodity, currency, or financial instrument) at a specified price on a predetermined future date. Futures contracts are standardised and traded on organised exchanges. They obligate both parties to fulfil the terms of the contract at the agreed-upon price and date.

Options: An option is a contract that gives the buyer the right, but not the obligation, to buy (call option) or sell (put option) an underlying asset at a specified price (strike price) within a predetermined period (until expiration). Options provide flexibility to investors, as they can choose whether to exercise the option based on market conditions.

Both futures and options are used for various purposes, including hedging against price fluctuations, speculation on future price movements, and enhancing trading strategies. They play essential roles in financial markets and are integral components of many investment portfolios.

The main difference between future and options are
Futures: Obligation to buy/sell at a specific price on a future date.
Options: Right, but not obligation, to buy/sell at a specific price within a timeframe.

PERSPECTIVES FROM LITERARY DISCOURSE

John C. Hull: "Understanding the principles of futures and options is essential for effective risk management and investment strategies in modern financial markets."
Franklin R. Edwards: "Futures and options play a crucial role in pricing, trading, and risk management, serving as indispensable tools for investors and institutions alike."
Peter Ritchken: "Quantitative modelling and analysis are key to unlocking the complexities of futures and options, allowing for a deeper understanding of their pricing dynamics and risk implications."
Robert E. Whaley: "Understanding the principles of futures and options is essential for navigating the complexities of modern financial markets."
Sheldon Natenberg: "The success of futures and options trading hinges on sound risk management practices and disciplined decision-making."

Prospectors of future options

1.Individual Investors: Retail traders who speculate on price movements or use derivatives for investment purposes.

2.Institutional Investors: Hedge funds, pension funds, and other large financial institutions often use futures and options for hedging and portfolio management.

3.Commodity Producers and Consumers: Companies involved in industries like agriculture, energy, and manufacturing use derivatives to hedge against price fluctuations in the underlying commodities.

4.Speculators: Traders who seek to profit from short-term price movements in futures and options contracts.

5.Market Makers: Financial firms that provide liquidity by buying and selling contracts, helping to ensure smooth market functioning.

governance of futures and options

Regulation of the futures and options markets varies by country, but it is typically overseen by regulatory agencies or government bodies responsible for financial markets. In the United States, for example, the Commodity Futures Trading Commission (CFTC) regulates futures and options trading to ensure market integrity, transparency, and investor protection. In other countries, similar regulatory authorities may exist to oversee derivatives markets and enforce rules and regulations.

In India, the regulation of futures and options markets falls under the purview of the Securities and Exchange Board of India (SEBI)

Hedging with the help of financial derivatives

Financial derivatives serve as a tool to hedge against losses due to fluctuations in the variables affecting the underlying asset such as price levels , interest rates , exchange rates etc . These future losses can be hedged or prevented by coming under the contract of the financial derivatives where different derivatives serve different methods and ways of hedging against these losses .

Hedging with the future options

Total number of stocks	1000
Volatility (standard deviation)	0.2 (20%)
Strike price	40
Risk free rate of return	0.05 (5%)

Here the table shows the number of shares or stocks which are there in the option contract . The volatility of the option contract refers to the fluctuations in the price of a stock in a given period of time , where more volatile the stock is the more will be the fluctuations in the price levels of that stock in the given period of time and the volatility of a stock is measured through the standard deviation of that underlying asset .

WEEK	TIME	Stock price	D1	ND1	Stocks to hold	Stocks Bought/Sold	Cost Of Stocks	CUMULATIVE COST	C.O.I(APPROX)
15	0.288	30	-2.49019	0.01	0	0	0	0	0
14	0.269	35	-1.10513	0.13	100	100	3500	3500	3
13	0.250	42	0.662902	0.75	700	600	25200	28700	28
12	0.231	41	0.425143	0.66	700	0	0	28700	28
11	0.212	38	-0.39664	0.35	300	-400	-15200	13500	13
10	0.192	40	0.153485	0.56	600	300	12000	25500	25
9	0.173	43	1.014795	0.84	800	200	8600	34100	33
8	0.154	48	2.461434	0.99	1000	200	9600	43700	42
7	0.135	45	1.733527	0.96	1000	0	0	43700	42
6	0.115	43	1.18342	0.88	900	-100	-4300	39400	38
5	0.096	44	1.645361	0.95	1000	100	4400	43800	42
4	0.077	45	2.220436	0.99	1000	0	0	43800	42
3	0.058	42	1.099716	0.86	900	-100	-4200	39600	38
2	0.038	43	1.912463	0.97	1000	100	4300	43900	42
1	0.019	43	2.656095	1.00	1000	0	0	43900	42
0	0.000	_	_	_	_	_	_	_	_

Here hedging is done in regular intervals (weekly) where the aim is to hold the number of stocks each week to reduce the loss to zero each week , where 15 weeks of time period is taken for the maturity of the option contract and each week is converted into a yearly basis . Black and scholes model is used to calculate D1 with the given data for each week and by calculating the cumulative area of the normal standard distribution through D1 we will get the ND1 which gives us the probability whether the call would be in the money option thus multiplying the number of stocks we would get required number of stocks to hold (i.e .. 1000 multiply by ND1 of each week) where we can calculate the number of stocks to buy and sell weekly to get the required number of stocks each week and as the stock price would be more than the strike price and time interval reduces the ND1 becomes closer to 1 and number of stocks eventually becomes equal to 1000 then we can calculate the amount of shares and cumulative cost of each week through which we could calculate the cost of interest (C.O.I) which is the opportunity cost of amount invested each week through risk free rate of return and dividing by 52 to convert to yearly basis .

$$C(S,t) = N(d_1)S - N(d_2)Ke^{-rT}$$

$$d_1 = \frac{ln\left(\frac{S}{K}\right) + \left(r + \frac{\sigma^2}{2}\right)T}{\sigma\sqrt{T}}$$

$$d_2 = d_1 - \sigma\sqrt{T}$$

$C(S,t)$	(call option price)
$N(\,)$	(cumulative distribution function)
$T = (T_1 - t)$	(time left til maturity (in years))
S	(stock price)
K	(strike price)
r	(risk free rate)
σ	(volatility)

Where D1 can be calculated through the above formula where stock price and time factor and standard deviation would have a positive impact in the D1 and strike price would have a negative effect on D1 as more the volatility of a stock and time factor would increase the value of the option contract .

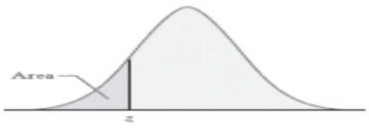

Table IV

Standard Normal Distribution

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
−3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
−3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
−3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
−3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
−3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
−2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
−2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
−2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
−2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
−2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
−2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
−2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
−2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
−2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
−2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
−1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
−1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
−1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
−1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
−1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
−1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
−1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
−1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
−1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
−1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
−0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
−0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
−0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
−0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
−0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
−0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
−0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
−0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
−0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
−0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641

Where ND1 is calculated through the table using D1 . Where ND1 represents the probability of the money in the call option and represents the weighted probability as it is the cumulative area under this normal standard distribution .

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