"A Report On
Pricing and Technical Analysis of Derivatives"

THE INDIAN INSTITUTE OF PLANNING AND MANAGEMENT

EXECUTIVE SUMMARY

The emergence of Derivatives market especially Futures and Options can be traced back to the willingness of the risk adverse economic agents to guard against themselves against the fluctuations in the price of Underlying asset. Derivatives, whose price is determined by the price of underlying asset, generally do not cause any fluctuations in the price of underlying asset. But impact of any change in the price of underlying asset may cause swift change in the price of Derivatives instrument. This project concerns one of the core issues in Derivatives-Pricing of Derivatives and impact of change in price of underlying to the price of Futures and Option through scenario analysis , valuation of Option and Futures through appropriate mathematical models and comparison of actual market price with theoretical price and exploiting arbitrage opportunities when even there are any deviations in the pricing , past trend of Options and Futures market and daily movements in Nifty Spot , Nifty Futures and Options for the past three months.

Another important issue in Derivatives is the appropriate position to choose from plethora of series of Call options and Put Options on a single day and permutations and combinations of strategies along with various option positions can be daunting task. This project seeks to answer some of the questions regarding appropriate strategy to choose in order to maximize total payoff through technical analysis of the parameters of Option.

TABLE OF CONTENTS

Derivatives:

Derivative is a financial instrument whose value depends upon the underlying instrument.

Forward Contract:

A Forward contract is an agreement between two parties to buy or sell an asset at a certain future time for certain price. In this, one of the parties assumes a *Long Position* and agrees to buy the underlying asset at certain specified future date and the other party assumes *Short Position* and agrees to see the asset on the same date for the same price.

A forward contract is settled at Maturity and the holder of short position delivers the asset to the holder of the long position in return for a cash amount equal to the Delivery Price.

Futures contract:

Like a Forward Contract, a Futures Contract is an agreement between two parties to buy or sell an asset at certain future date price but Futures Contract unlike forward contract are traded on the exchange and are standardized.

Contango: Where the price of a more distant delivery is greater than the price of the near month.

Backwardation: Markets where near by delivery is trading at the premium to the more distinct months are said to be in Backwardation.

Payoffs from the Forward Contract:

Payoff from a Long Position in the Forward Contract: S_t-k

Payoff from a Short Position in the Forward Contract: K- S_t

K: Delivery Price.

S_t : Spot Price.

Table: 1. FUTURE AND SPOT PRICES OF NIFTY				
	S&P CNX NIFTY FUTURE			
DATE	**SPOT**	**1 MONTH**	**2 MONTH**	**3 MONTH**
2-Jan-06	2835.95	**2819.70**	**2813.70**	**2803.70**
3-Jan-06	2883.35	**2868.85**	**2859.50**	**2849.00**
4-Jan-06	2904.40	**2890.10**	**2882.40**	**2873.95**
5-Jan-06	2899.85	**2883.90**	**2873.80**	**2867.25**
6-Jan-06	2914.00	**2895.65**	**2886.85**	**2877.20**
9-Jan-06	2910.10	**2893.45**	**2885.20**	**2878.50**
10-Jan-06	2870.80	**2857.30**	**2849.50**	**2841.50**
12-Jan-06	2850.70	**2831.40**	**2822.95**	**2815.20**
13-Jan-06	2850.55	**2823.65**	**2812.40**	**2807.40**
16-Jan-06	2833.10	**2821.15**	**2809.65**	**2801.65**
17-Jan-06	2829.10	**2801.85**	**2794.55**	**2786.85**
18-Jan-06	2809.20	**2797.00**	**2787.75**	**2783.90**
19-Jan-06	2870.85	**2869.25**	**2858.55**	**2850.10**
20-Jan-06	2900.95	**2897.55**	**2888.35**	**2882.00**
23-Jan-06	2884.05	**2881.65**	**2866.35**	**2858.00**
24-Jan-06	2908.00	**2906.25**	**2898.90**	**2891.75**

25-Jan-06	2940.35	**2941.95**	**2922.25**	**2913.05**
27-Jan-06	2982.75	**2959.75**	**2978.55**	**2969.05**
30-Jan-06	2974.50	**2957.25**	**2972.35**	**2963.80**
31-Jan-06	3001.10	**2984.75**	**3002.25**	**2992.35**
1-Feb-06	2971.55	**2963.05**	**2952.45**	**2950.45**
2-Feb-06	2967.45	**2956.45**	**2947.70**	**2942.90**
3-Feb-06	2940.60	**2921.80**	**2913.15**	**2906.10**
6-Feb-06	3000.45	**2991.55**	**2981.35**	**2976.60**
7-Feb-06	3020.10	**3004.15**	**2994.90**	**2988.90**
8-Feb-06	3008.95	**2992.95**	**2983.10**	**2976.25**
10-Feb-06	3027.55	**3021.10**	**3011.60**	**3001.95**
13-Feb-06	3041.15	**3028.20**	**3018.40**	**3012.60**
14-Feb-06	3017.55	**3009.15**	**3000.15**	**2993.80**
15-Feb-06	3022.20	**3017.15**	**3007.60**	**2999.70**
16-Feb-06	3021.60	**3013.85**	**3003.80**	**2995.65**
17-Feb-06	2981.50	**2978.40**	**2968.55**	**2963.70**
20-Feb-06	3005.85	**3010.10**	**2998.50**	**2990.30**
21-Feb-06	3035.50	**3039.45**	**3033.60**	**3024.30**
22-Feb-06	3050.80	**3056.85**	**3048.55**	**3039.85**

23-Feb-06	3062.10	**3064.40**	**3054.20**	**3046.20**
24-Feb-06	3050.05	**3033.00**	**3044.10**	**3035.10**
27-Feb-06	3067.45	**3039.30**	**3055.15**	**3047.30**
28-Feb-06	3074.70	**3057.55**	**3071.05**	**3064.35**
1-Mar-06	3123.10	**3101.75**	**3094.50**	**3085.15**
2-Mar-06	3150.70	**3134.55**	**3131.25**	**3126.40**
3-Mar-06	3147.35	**3137.60**	**3131.90**	**3124.00**
6-Mar-06	3190.40	**3185.45**	**3179.50**	**3171.25**
7-Mar-06	3182.80	**3167.35**	**3162.25**	**3153.75**
8-Mar-06	3116.70	**3082.65**	**3081.95**	**3071.35**
9-Mar-06	3129.10	**3113.85**	**3107.60**	**3100.35**
10-Mar-06	3183.90	**3166.45**	**3160.90**	**3147.30**
13-Mar-06	3202.65	**3180.85**	**3176.70**	**3168.90**
14-Mar-06	3195.35	**3171.90**	**3167.40**	**3159.00**
16-Mar-06	3226.60	**3205.00**	**3198.30**	**3188.10**
17-Mar-06	3234.05	**3213.95**	**3208.85**	**3202.85**
20-Mar-06	3265.65	**3251.70**	**3243.15**	**3238.05**
21-Mar-06	3262.30	**3241.95**	**3234.45**	**3232.05**
22-Mar-06	3240.15	**3227.25**	**3215.90**	**3212.85**

23-Mar-06	3247.15	**3239.25**	**3231.50**	**3229.90**
24-Mar-06	3279.80	**3279.90**	**3271.35**	**3262.50**
27-Mar-06	3321.65	**3326.45**	**3317.35**	**3310.65**
28-Mar-06	3325.00	**3332.40**	**3324.45**	**3309.70**
29-Mar-06	3354.20	**3364.90**	**3353.05**	**3344.30**
30-Mar-06	3418.95	**3412.75**	**3394.05**	**3386.65**
31-Mar-06	3402.55	**3392.40**	**3403.60**	**3396.85**
3-Apr-06	3473.30	**3474.00**	**3463.15**	**3457.60**
4-Apr-06	3483.15	**3489.70**	**3482.35**	**3475.05**
5-Apr-06	3510.90	**3510.20**	**3503.90**	**3495.85**
7-Apr-06	3454.80	**3458.15**	**3455.30**	**3452.80**
10-Apr-06	3478.45	**3488.55**	**3477.50**	**3472.35**
12-Apr-06	3380.00	**3387.00**	**3384.35**	**3383.95**
13-Apr-06	3345.50	**3348.50**	**3343.30**	**3341.45**
17-Apr-06	3425.15	**3424.65**	**3413.50**	**3411.80**
18-Apr-06	3518.10	**3524.05**	**3518.45**	**3512.05**
19-Apr-06	3535.85	**3546.65**	**3540.80**	**3536.80**
20-Apr-06	3573.50	**3581.80**	**3574.75**	**3568.10**
21-Apr-06	3573.05	**3583.90**	**3576.80**	**3571.75**

24-Apr-06	3548.90	**3556.50**	**3549.75**	**3547.45**
25-Apr-06	3462.65	**3465.50**	**3454.05**	**3451.25**
26-Apr-06	3555.75	**3579.45**	**3562.50**	**3556.85**
27-Apr-06	3508.10	**3508.80**	**3502.05**	**3493.25**
28-Apr-06	3508.35	**3492.60**	**3497.60**	**3491.55**
29-Apr-06	3557.60	**3523.70**	**3545.40**	**3533.75**
2-May-06	3605.45	**3595.00**	**3585.80**	**3580.20**
3-May-06	3634.25	**3612.40**	**3605.10**	**3595.05**
4-May-06	3648.40	**3627.40**	**3620.35**	**3610.00**
5-May-06	3663.95	**3644.10**	**3633.90**	**3624.35**
8-May-06	3693.15	**3685.85**	**3676.80**	**3669.20**
9-May-06	3720.55	**3712.95**	**3702.80**	**3692.10**
10-May-06	3754.25	**3745.40**	**3729.50**	**3723.60**
11-May-06	3701.05	**3692.90**	**3681.80**	**3677.25**
12-May-06	3650.05	**3633.00**	**3620.90**	**3615.35**
15-May-06	3502.95	**3462.05**	**3448.90**	**3440.05**
16-May-06	3523.30	**3520.30**	**3509.15**	**3500.20**
17-May-06	3635.10	**3641.25**	**3628.75**	**3619.85**
18-May-06	3388.90	**3363.85**	**3350.95**	**3349.00**

19-May-06	3246.90	**3224.35**	**3209.40**	**3225.05**
22-May-06	3081.35	**3020.90**	**2994.50**	**2973.25**
23-May-06	3199.35	**3190.50**	**3155.10**	**3143.15**
24-May-06	3115.55	**3087.25**	**3030.50**	**3024.80**
25-May-06	3177.70	**3180.15**	**3112.65**	**3097.20**
26-May-06	3209.60	**3171.95**	**3179.15**	**3164.85**
29-May-06	3214.90	**3154.05**	**3175.00**	**3158.95**
30-May-06	3185.30	**3097.00**	**3125.35**	**3108.60**
31-May-06	3071.05	**3001.85**	**3032.40**	**3011.80**
1-Jun-06	2962.25	**2889.90**	**2869.20**	**2864.90**
2-Jun-06	3091.35	**3061.55**	**3039.60**	**3018.55**
5-Jun-06	3016.65	**2957.30**	**2934.85**	**2914.20**
6-Jun-06	2937.30	**2902.80**	**2868.25**	**2858.30**
7-Jun-06	2860.45	**2838.05**	**2805.70**	**2790.20**
8-Jun-06	2724.35	**2705.60**	**2673.65**	**2658.70**
9-Jun-06	2866.30	**2831.25**	**2811.70**	**2782.20**
12-Jun-06	2776.85	**2716.00**	**2686.45**	**2663.55**
13-Jun-06	2663.30	**2629.15**	**2599.40**	**2585.05**
14-Jun-06	2632.80	**2618.25**	**2594.80**	**2586.75**

15-Jun-06	2798.80	**2786.70**	**2760.40**	**2746.00**
16-Jun-06	2890.35	**2880.75**	**2858.90**	**2840.65**
19-Jun-06	2916.90	**2909.40**	**2886.05**	**2865.40**
20-Jun-06	2861.30	**2839.35**	**2829.50**	**2794.85**
21-Jun-06	2923.45	**2912.10**	**2891.15**	**2869.75**
22-Jun-06	2994.75	**2982.25**	**2963.10**	**2938.40**
23-Jun-06	3042.70	**3042.25**	**3017.25**	**3000.25**
25-Jun-06	3050.30	**3043.90**	**3023.40**	**3006.80**
26-Jun-06	2943.20	**2930.60**	**2902.10**	**2886.50**
27-Jun-06	2982.45	**2981.10**	**2950.30**	**2929.05**
28-Jun-06	2981.10	**2983.50**	**2951.40**	**2928.50**
29-Jun-06	2997.90	**3003.00**	**2981.65**	**2967.40**
30-Jun-06	3128.20	**3058.00**	**3118.10**	**3100.65**
3-Jul-06	3150.95	**3130.30**	**3113.25**	**3097.65**
4-Jul-06	3138.65	**3114.20**	**3095.35**	**3078.60**
5-Jul-06	3197.10	**3170.10**	**3150.45**	**3138.65**
6-Jul-06	3156.40	**3132.45**	**3111.65**	**3100.70**
7-Jul-06	3075.85	**3039.45**	**3019.50**	**3006.50**
10-Jul-06	3142.00	**3124.35**	**3102.90**	**3087.90**

11-Jul-06	3116.15	**3094.55**	**3071.70**	**3055.10**
12-Jul-06	3195.90	**3180.80**	**3158.45**	**3139.05**
13-Jul-06	3169.30	**3142.70**	**3121.95**	**3104.70**
14-Jul-06	3123.35	**3091.40**	**3069.35**	**3056.25**
17-Jul-06	3007.55	**2980.95**	**2955.70**	**2949.60**
18-Jul-06	2993.65	**2973.10**	**2947.60**	**2935.35**
19-Jul-06	2932.75	**2909.95**	**2886.10**	**2875.75**
20-Jul-06	3023.05	**3018.75**	**2993.45**	**2974.70**
21-Jul-06	2945.00	**2937.60**	**2908.05**	**2892.95**
24-Jul-06	2985.85	**2987.40**	**2954.20**	**2936.65**
25-Jul-06	3040.50	**3039.45**	**3011.65**	**2992.90**
26-Jul-06	3110.15	**3111.40**	**3085.45**	**3066.40**
27-Jul-06	3156.15	**3153.50**	**3124.45**	**3103.95**

SPOT AND FORWARD NIFTY MOVEMENT
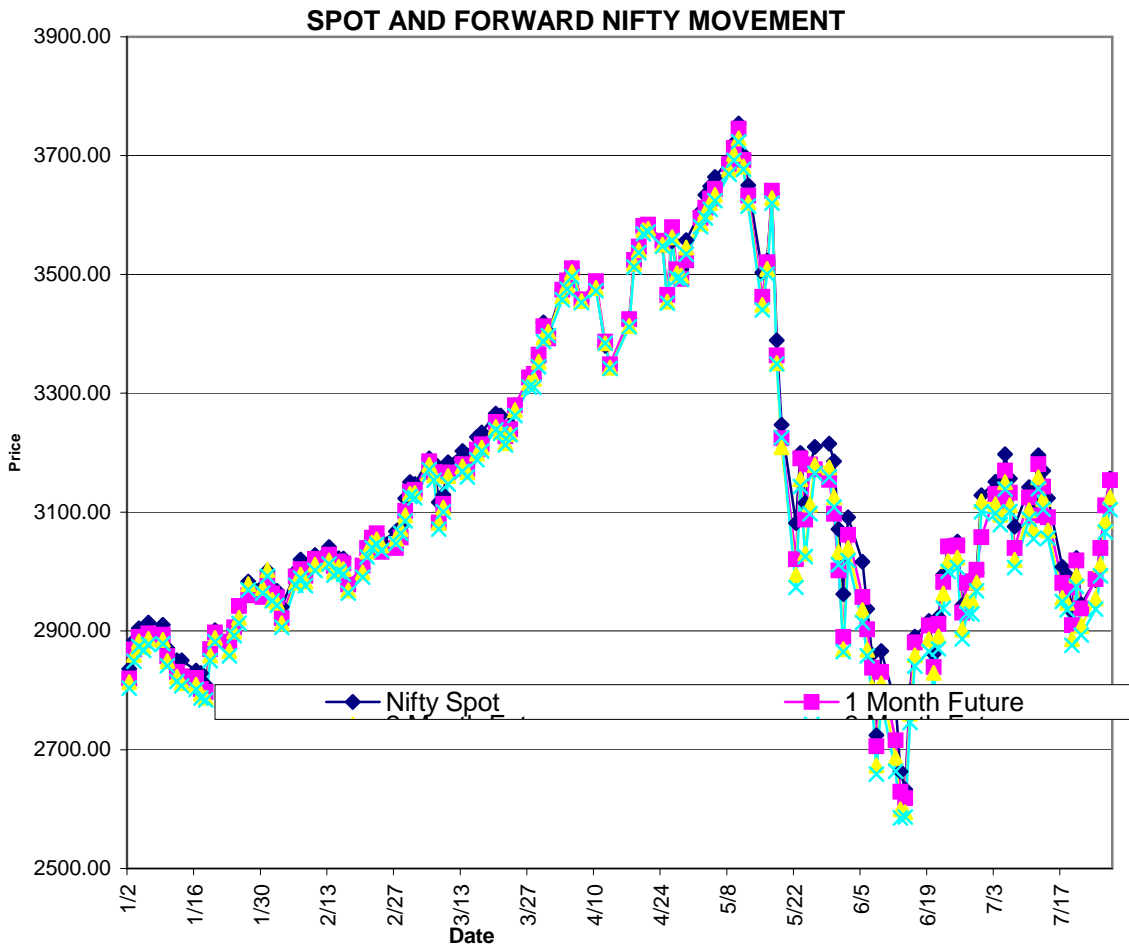
Basis:

Basis is defined as Spot price minus the Futures Price. In the normal market, the basis will be negative, since the futures price normally exceed the spot price. In the inverted market, the basis will be positive. The basis will approach zero as the delivery period nears. At the close of trading on the delivery date Basis must be zero else, there will be arbitrage opportunity. If the Basis is positive on the expiration date then one can take short position in the futures contract and take delivery and sell it in the spot market and earn risk less profits. The process of basis moving towards zero is called as **Convergence.**

Basis= Spot Price-Future price of the contract used.

S_t-F.

Strengthening of Basis: when the spot price increases by more than the futures price.

Weakening of Basis: when Futures price increases more than the pot price.

Basis risk:

An Individual who is having an un hedged position will face the price risk (i.e.) if the current spot price is S_1 and the price that will be in future is S_2 the price risk faced by such an investor will be S_1- S_2. An hedger exchanges Price risk for Basis risk.

Suppose someone has hedged his stock by buying Futures then the risk faced by such an investor will be

$(S_1-S_2) -(F_1-F_2)$

$= (S_1.F_1) - (S_2-F_2)$

$=$ Basis $_1$- Basis $_2$

where Basis 1 is known but Basis 2 is unknown. Thus, an unhedged position will face Price risk but a Hedged position will face Basis risk.

Table : 2. FUTURE& SPOT PRICES OF NIFTY					
S&P CNX NIFTY			**BASIS**		
DATE	**SPOT**	**CHANGES IN SPOT RATE**	**1 MONTH**	**2 MONTH**	**3 MONTH**
2-Jan-06	2835.95		16.25	22.25	32.25
3-Jan-06	2883.35	47.40	14.50	23.85	34.35
4-Jan-06	2904.40	21.05	14.30	22.00	30.45
5-Jan-06	2899.85	-4.55	15.95	26.05	32.60
6-Jan-06	2914.00	14.15	18.35	27.15	36.80
9-Jan-06	2910.10	-3.90	16.65	24.90	31.60
10-Jan-06	2870.80	-39.30	13.50	21.30	29.30
12-Jan-06	2850.70	-20.10	19.30	27.75	35.50
13-Jan-06	2850.55	-0.15	26.90	38.15	43.15
16-Jan-06	2833.10	-17.45	11.95	23.45	31.45
17-Jan-06	2829.10	-4.00	27.25	34.55	42.25
18-Jan-06	2809.20	-19.90	12.20	21.45	25.30
19-Jan-06	2870.85	61.65	1.60	12.30	20.75
20-Jan-06	2900.95	30.10	3.40	12.60	18.95

23-Jan-06	2884.05	-16.90	2.40	17.70	26.05
24-Jan-06	2908.00	23.95	1.75	9.10	16.25
25-Jan-06	2940.35	32.35	-1.60	18.10	27.30
27-Jan-06	2982.75	42.40	23.00	4.20	13.70
30-Jan-06	2974.50	-8.25	17.25	2.15	10.70
31-Jan-06	3001.10	26.60	16.35	-1.15	8.75
1-Feb-06	2971.55	-29.55	8.50	19.10	21.10
2-Feb-06	2967.45	-4.10	11.00	19.75	24.55
3-Feb-06	2940.60	-26.85	18.80	27.45	34.50
6-Feb-06	3000.45	59.85	8.90	19.10	23.85
7-Feb-06	3020.10	19.65	15.95	25.20	31.20
8-Feb-06	3008.95	-11.15	16.00	25.85	32.70
10-Feb-06	3027.55	18.60	6.45	15.95	25.60
13-Feb-06	3041.15	13.60	12.95	22.75	28.55
14-Feb-06	3017.55	-23.60	8.40	17.40	23.75
15-Feb-06	3022.20	4.65	5.05	14.60	22.50
16-Feb-06	3021.60	-0.60	7.75	17.80	25.95
17-Feb-06	2981.50	-40.10	3.10	12.95	17.80
20-Feb-06	3005.85	24.35	-4.25	7.35	15.55

21-Feb-06	3035.50	**29.65**	**-3.95**	**1.90**	**11.20**
22-Feb-06	3050.80	**15.30**	**-6.05**	**2.25**	**10.95**
23-Feb-06	3062.10	**11.30**	**-2.30**	**7.90**	**15.90**
24-Feb-06	3050.05	**-12.05**	**17.05**	**5.95**	**14.95**
27-Feb-06	3067.45	**17.40**	**28.15**	**12.30**	**20.15**
28-Feb-06	3074.70	**7.25**	**17.15**	**3.65**	**10.35**
1-Mar-06	3123.10	**48.40**	**21.35**	**28.60**	**37.95**
2-Mar-06	3150.70	**27.60**	**16.15**	**19.45**	**24.30**
3-Mar-06	3147.35	**-3.35**	**9.75**	**15.45**	**23.35**
6-Mar-06	3190.40	**43.05**	**4.95**	**10.90**	**19.15**
7-Mar-06	3182.80	**-7.60**	**15.45**	**20.55**	**29.05**
8-Mar-06	3116.70	**-66.10**	**34.05**	**34.75**	**45.35**
9-Mar-06	3129.10	**12.40**	**15.25**	**21.50**	**28.75**
10-Mar-06	3183.90	**54.80**	**17.45**	**23.00**	**36.60**
13-Mar-06	3202.65	**18.75**	**21.80**	**25.95**	**33.75**
14-Mar-06	3195.35	**-7.30**	**23.45**	**27.95**	**36.35**
16-Mar-06	3226.60	**31.25**	**21.60**	**28.30**	**38.50**
17-Mar-06	3234.05	**7.45**	**20.10**	**25.20**	**31.20**
20-Mar-06	3265.65	**31.60**	**13.95**	**22.50**	**27.60**

21-Mar-06	3262.30	-3.35	20.35	27.85	30.25
22-Mar-06	3240.15	-22.15	12.90	24.25	27.30
23-Mar-06	3247.15	7.00	7.90	15.65	17.25
24-Mar-06	3279.80	32.65	-0.10	8.45	17.30
27-Mar-06	3321.65	41.85	-4.80	4.30	11.00
28-Mar-06	3325.00	3.35	-7.40	0.55	15.30
29-Mar-06	3354.20	29.20	-10.70	1.15	9.90
30-Mar-06	3418.95	64.75	6.20	24.90	32.30
31-Mar-06	3402.55	-16.40	10.15	-1.05	5.70
3-Apr-06	3473.30	70.75	-0.70	10.15	15.70
4-Apr-06	3483.15	9.85	-6.55	0.80	8.10
5-Apr-06	3510.90	27.75	0.70	7.00	15.05
7-Apr-06	3454.80	-56.10	-3.35	-0.50	2.00
10-Apr-06	3478.45	23.65	-10.10	0.95	6.10
12-Apr-06	3380.00	-98.45	-7.00	-4.35	-3.95
13-Apr-06	3345.50	-34.50	-3.00	2.20	4.05
17-Apr-06	3425.15	79.65	0.50	11.65	13.35
18-Apr-06	3518.10	92.95	-5.95	-0.35	6.05
19-Apr-06	3535.85	17.75	-10.80	-4.95	-0.95

20-Apr-06	3573.50	**37.65**	**-8.30**	**-1.25**	**5.40**
21-Apr-06	3573.05	**-0.45**	**-10.85**	**-3.75**	**1.30**
24-Apr-06	3548.90	**-24.15**	**-7.60**	**-0.85**	**1.45**
25-Apr-06	3462.65	**-86.25**	**-2.85**	**8.60**	**11.40**
26-Apr-06	3555.75	**93.10**	**-23.70**	**-6.75**	**-1.10**
27-Apr-06	3508.10	**-47.65**	**-0.70**	**6.05**	**14.85**
28-Apr-06	3508.35	**0.25**	**15.75**	**10.75**	**16.80**
29-Apr-06	3557.60	**49.25**	**33.90**	**12.20**	**23.85**
2-May-06	3605.45	**47.85**	**10.45**	**19.65**	**25.25**
3-May-06	3634.25	**28.80**	**21.85**	**29.15**	**39.20**
4-May-06	3648.40	**14.15**	**21.00**	**28.05**	**38.40**
5-May-06	3663.95	**15.55**	**19.85**	**30.05**	**39.60**
8-May-06	3693.15	**29.20**	**7.30**	**16.35**	**23.95**
9-May-06	3720.55	**27.40**	**7.60**	**17.75**	**28.45**
10-May-06	3754.25	**33.70**	**8.85**	**24.75**	**30.65**
11-May-06	3701.05	**-53.20**	**8.15**	**19.25**	**23.80**
12-May-06	3650.05	**-51.00**	**17.05**	**29.15**	**34.70**
15-May-06	3502.95	**-147.10**	**40.90**	**54.05**	**62.90**
16-May-06	3523.30	**20.35**	**3.00**	**14.15**	**23.10**

17-May-06	3635.10	**111.80**	**-6.15**	**6.35**	**15.25**
18-May-06	3388.90	**-246.20**	**25.05**	**37.95**	**39.90**
19-May-06	3246.90	**-142.00**	**22.55**	**37.50**	**21.85**
22-May-06	3081.35	**-165.55**	**60.45**	**86.85**	**108.10**
23-May-06	3199.35	**118.00**	**8.85**	**44.25**	**56.20**
24-May-06	3115.55	**-83.80**	**28.30**	**85.05**	**90.75**
25-May-06	3177.70	**62.15**	**-2.45**	**65.05**	**80.50**
26-May-06	3209.60	**31.90**	**37.65**	**30.45**	**44.75**
29-May-06	3214.90	**5.30**	**60.85**	**39.90**	**55.95**
30-May-06	3185.30	**-29.60**	**88.30**	**59.95**	**76.70**
31-May-06	3071.05	**-114.25**	**69.20**	**38.65**	**59.25**
1-Jun-06	2962.25	**-108.80**	**72.35**	**93.05**	**97.35**
2-Jun-06	3091.35	**129.10**	**29.80**	**51.75**	**72.80**
5-Jun-06	3016.65	**-74.70**	**59.35**	**81.80**	**102.45**
6-Jun-06	2937.30	**-79.35**	**34.50**	**69.05**	**79.00**
7-Jun-06	2860.45	**-76.85**	**22.40**	**54.75**	**70.25**
8-Jun-06	2724.35	**-136.10**	**18.75**	**50.70**	**65.65**
9-Jun-06	2866.30	**141.95**	**35.05**	**54.60**	**84.10**
12-Jun-06	2776.85	**-89.45**	**60.85**	**90.40**	**113.30**

13-Jun-06	2663.30	-113.55	34.15	63.90	78.25
14-Jun-06	2632.80	-30.50	14.55	38.00	46.05
15-Jun-06	2798.80	166.00	12.10	38.40	52.80
16-Jun-06	2890.35	91.55	9.60	31.45	49.70
19-Jun-06	2916.90	26.55	7.50	30.85	51.50
20-Jun-06	2861.30	-55.60	21.95	31.80	66.45
21-Jun-06	2923.45	62.15	11.35	32.30	53.70
22-Jun-06	2994.75	71.30	12.50	31.65	56.35
23-Jun-06	3042.70	47.95	0.45	25.45	42.45
25-Jun-06	3050.30	7.60	6.40	26.90	43.50
26-Jun-06	2943.20	-107.10	12.60	41.10	56.70
27-Jun-06	2982.45	39.25	1.35	32.15	53.40
28-Jun-06	2981.10	-1.35	-2.40	29.70	52.60
29-Jun-06	2997.90	16.80	-5.10	16.25	30.50
30-Jun-06	3128.20	130.30	70.20	10.10	27.55
3-Jul-06	3150.95	22.75	20.65	37.70	53.30
4-Jul-06	3138.65	-12.30	24.45	43.30	60.05
5-Jul-06	3197.10	58.45	27.00	46.65	58.45
6-Jul-06	3156.40	-40.70	23.95	44.75	55.70

7-Jul-06	3075.85	-80.55	36.40	56.35	69.35
10-Jul-06	3142.00	66.15	17.65	39.10	54.10
11-Jul-06	3116.15	-25.85	21.60	44.45	61.05
12-Jul-06	3195.90	79.75	15.10	37.45	56.85
13-Jul-06	3169.30	-26.60	26.60	47.35	64.60
14-Jul-06	3123.35	-45.95	31.95	54.00	67.10
17-Jul-06	3007.55	-115.80	26.60	51.85	57.95
18-Jul-06	2993.65	-13.90	20.55	46.05	58.30
19-Jul-06	2932.75	-60.90	22.80	46.65	57.00
20-Jul-06	3023.05	90.30	4.30	29.60	48.35
21-Jul-06	2945.00	-78.05	7.40	36.95	52.05
24-Jul-06	2985.85	40.85	-1.55	31.65	49.20
25-Jul-06	3040.50	54.65	1.05	28.85	47.60
26-Jul-06	3110.15	69.65	-1.25	24.70	43.75
27-Jul-06	3156.15	46.00	2.65	31.70	52.20

Graph 1: Convergence of Spot and Future Price

Convergence of Spot and Future Price
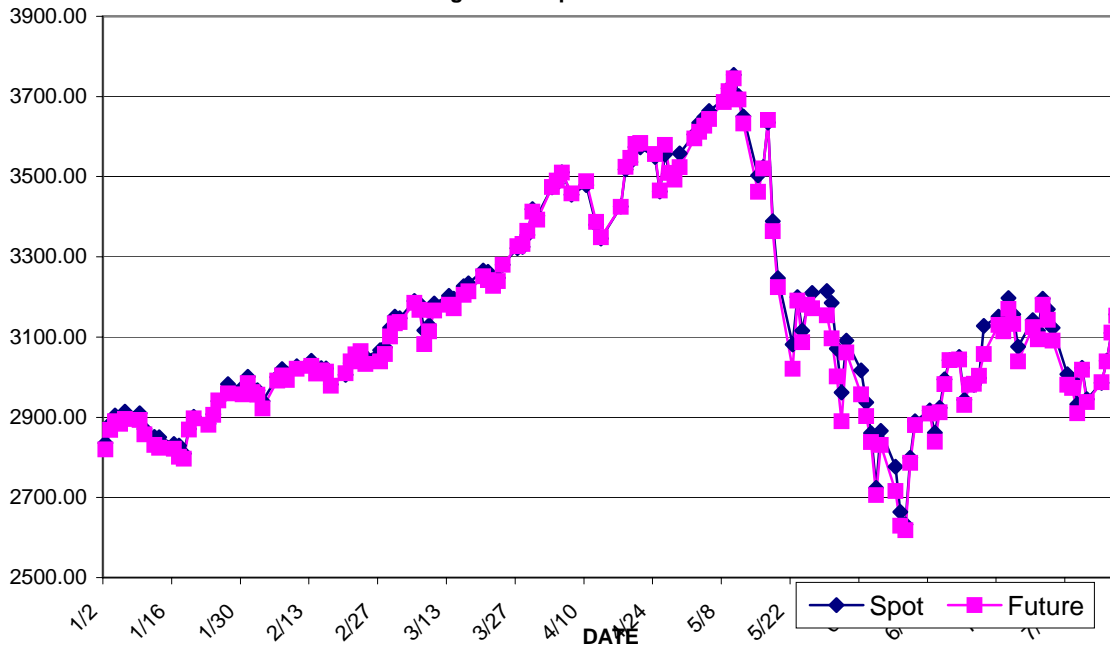
BASIS 1 MONTH
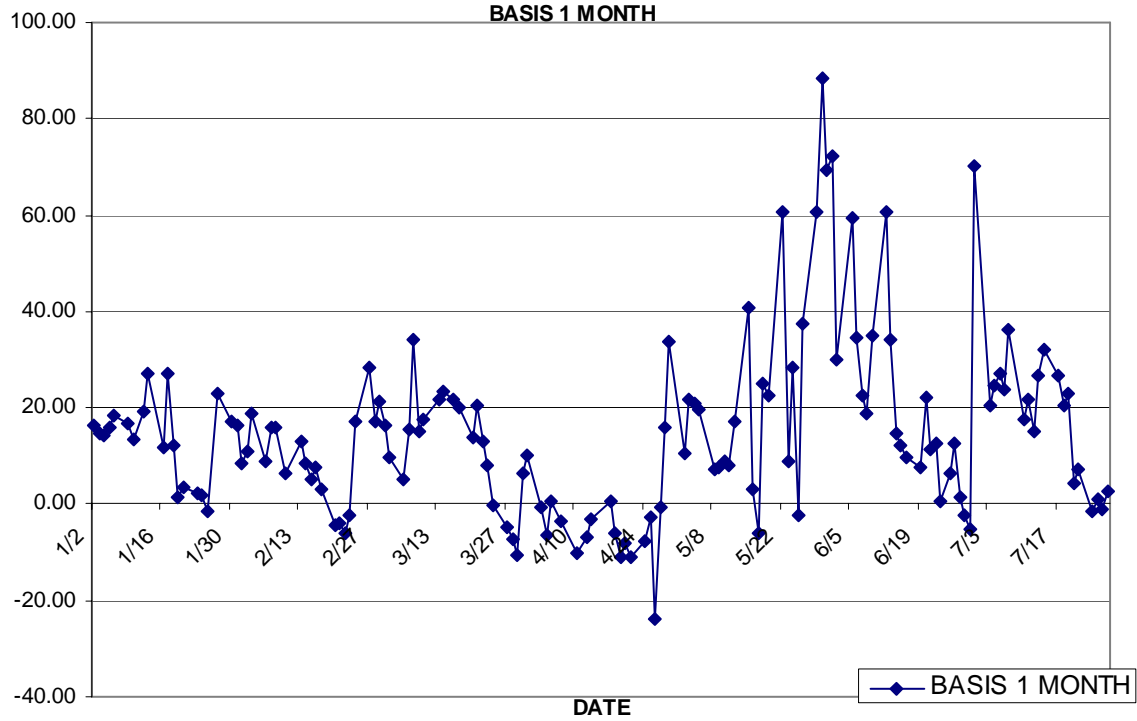
BASIS 2 MONTH

BASIS 3 MONTH

Chart Title
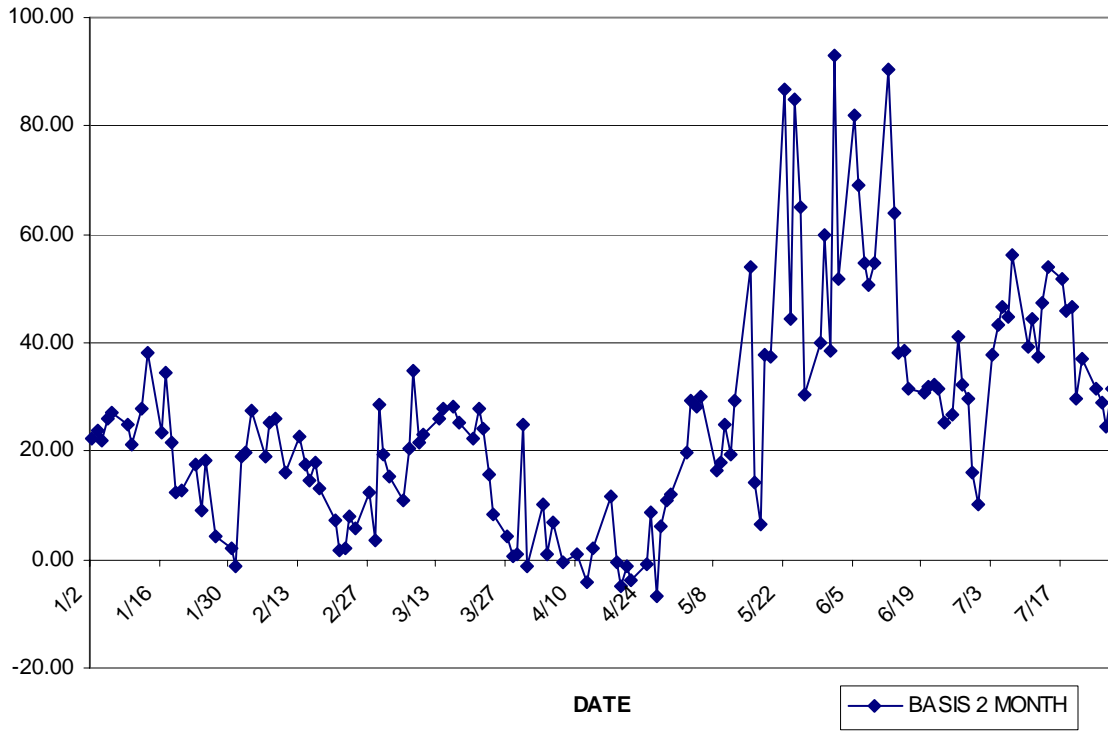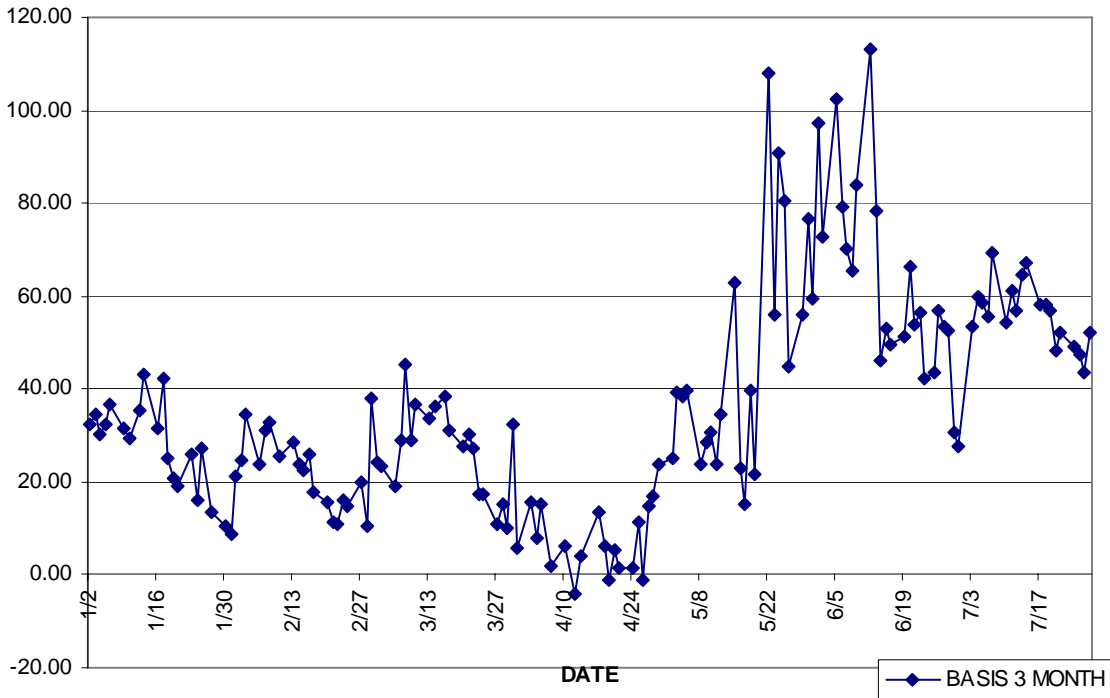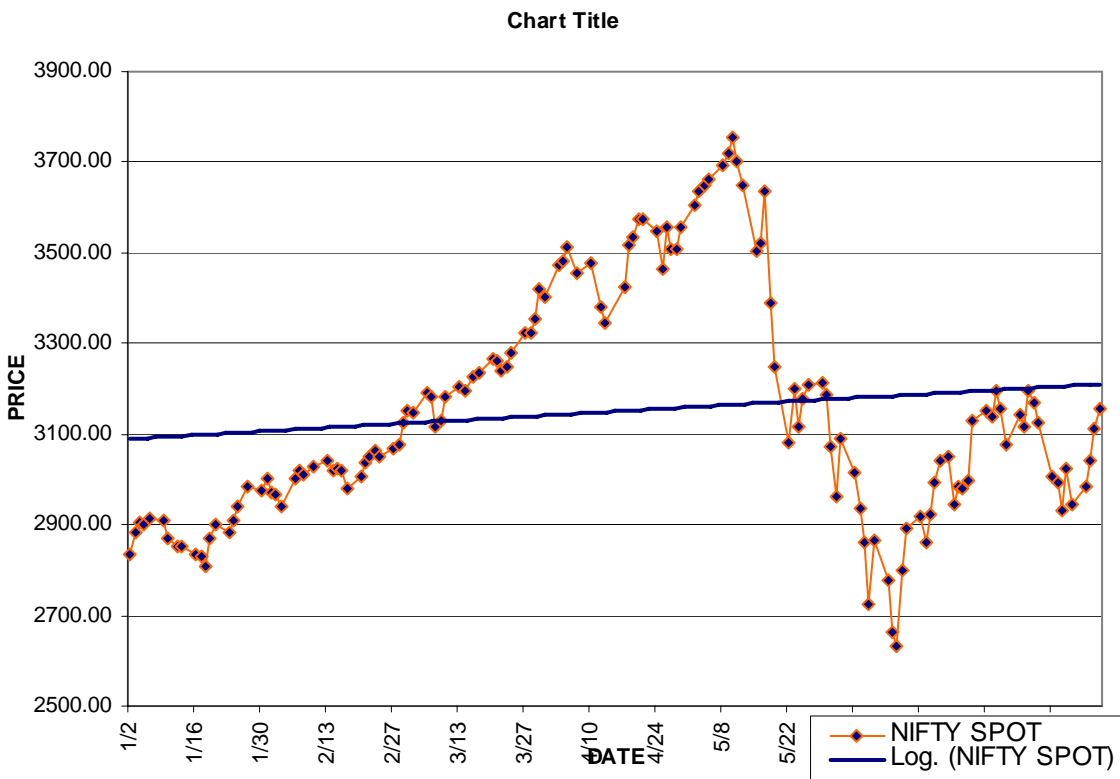
PRICING OF FUTURES:

Relationship between continuous compounding and compounding m times per year.

$R_c = m \ln(1 + R_m/m)$

$R_m = m(e^{R_c/m} - 1)$

Rc = Rate of Interest for Continuous Compounding

Rm = Rate of Interest for Compounding m times a year.

FORWARD CONTRACTS ON A SECURITY THAT PROVIDES NO INCOME.

$F = S\, e^{r(T-t)}$

FORWARD CONTRACT ON A SECURITY THAT PROVIDES A KNOWN CASH INCOME:

$F = (S-I)\, e^{r(T-t)}$

Where I is the present value of all cash incomes discounted at risk free rate of interest r.

FORWARD CONTRACT ON A SECURITY THAT PROVIDES A KNOWN DIVIDEND YIELD:

$F = S\, e^{(r-q)(T-t)}$

FUTURES PRICE CALCULATOR	
INPUTS	
Current date	2-May-06
Spot Price	3605.45
Risk free interest	4.00%
Annualised dividend yield	1.50%
Expiration date	31-May-06
Days to expire	29 days
Time in years	0.079452055
Future Price	$F = S\,.e^{(r-q)t}$
Theototical Future Price	3612.62
INPUTS	
Current date	2-May-06

Spot Price	3605.45
Risk free interest	4%
Future Price	3612.62
Expiration date	31-May-06
Days to expire	29
Time in years	0.079452055
Annualised Dividend Yield	$Q=r-[In(F/S)]/t$
	1.50%

STRATEGY USING FUTURES:

ARBITRAGE OPPORTUNITIES:

When F>S

Investor can borrow funds at risk free rate of interest to buy the asset and take short position in Futures market and then long the asset at time T .

When F<S

Investor can take Long position in the futures market , undertake the delivery of the asset at time T and short the asset in the spot market .

Have funds- Lend them to the market:

This works like repo transaction where the investors buys the security and simultaneously undertakes short position in the futures market. Here the investor can use the securities purchased in the spot market to dispose them at the expiration date of the futures contract. Thus the investor will gain the difference between the futures price and the cash price of the security.

Have securities –Lend them to the market.

Index futures market offers a risk less mechanism for loaning out shares and earning a positive return on them by selling shares at Nifty and invest the proceeds at risk free returns and buying the securities back at the future date by taking long position in the futures market.

HEDGING:

SHORT HEDGE: A company knows that it is due to sell an asset at a particular time in future can hedge by taking Short Futures Position.

If the price of the asset goes up then company gains from sale transaction and if the price of asset goes down the company gains from Futures Transaction.

LONG HEDGE**:**

A company that knows that its due to buy an asset in the future can hedge by taking Long Futures Position.

Similarly, in this case also if the price of asset goes up then the company gains in the Futures Transaction and if the price of asset goes down then the company can gain from Purchase transaction.

Thus, we can see that in both the cases what Hedging as done is that it has made the result of the outcome more predictable. Hedging not necessarily brings greater returns but what it does is that it makes the result of the outcome more predictable and thus it minimizes the risks.

Optimal hedge Ratio:

$H = \rho \ \sigma_s / \sigma_f$

Where

ρ is the co-efficient of correlation between Δs and ΔF.

σ_s is the standard deviation of Δs

σ_f is the standard deviation of ΔF.

HEDGING USING INDEX FUTURES:

Stock index futures can be used to hedge the risk in well-diversified portfolio and removes the risk arising from the market moves and leaves the hedger exposed only to the performance of portfolio relative to the market.

Optimal Number of contracts to short when Hedging :

$$\beta * \ \text{Д/f}$$

Long security/Portfolio - short futures:

Every buy position in the security is a simultaneous Long Position in the Index so if the index gains or loses the security also gains or loses simultaneously. In the sense, a Long Position on any security is also a Long position in the Index. So every time a security is bought a simultaneous short position in the index will hedge the security and offsets the index hidden exposure. The position Long Reliance + short Nifty will be pure play on the value of reliance stock without any extra risk from the fluctuations in the market.

Short security –Long futures:

A person may sell the stock thinking that its overvalued but if the index moves up he will lose because every sell position in the stock is simultaneous sell position in the index. Even thought the stock in this case may be overvalued the stock price will increase because index has increased and the person will regret his decision to sell the stock. In this case he can hedge by taking a long position in the futures contract so that it will offset the hidden exposure from the index.

HEDGING STATERGIES:

Long Portfolio - Short Futures		
If X has Portfolio worth Rs 10,00,000 of Index stocks as on 2nd May 2006 ,when index is at 3605.45 he will have		
No of shares	:	277
In Order to hedge his portfolio against adverse movements in the stock market he can hedge by having Short Position in the Futures		
Number of Futures contract to short for perfect hedge=	:	Beta* Portfolio/ Future Index*lot size)
No of Futures Contract Required	:	3 (2.7735789)
His position as on 25thMay when Spot is 3177.7 will be as below:		
Loss from Spot Transaction	:	-118486.8
Gain from Futures Transaction	:	125190
Net gain/loss	:	6703.25
Thus X has hedged his portfolio against fall in the index. Had he not hedged his portfolio he would have suffered loss of Rs118487 but due to hedging he has now made a profit of Rs 6703.25.		

Short Portfolio- Long Futures

On 2nd May if Mr X is having portfolio of NIFTY worth 277 Shares when they are traded at 3605.45 and Mr X feels that NIFTY is overpriced and he sells his portfolio. The Proceeds from the sale of his portfolio will be		
Cash proceeds from above	:	998709.65
Suppose that he invests this money at risk free interest rate and takes long position in Futures market		
In order to hedge now he takes Long Position in Futures on the same date when the Futures for May Month are being traded at Rs 3595.		
On 25th May when the NIFTY has declined to Rs 3177.7 and he takes again Long position on 277 shares his total portfolio will be as follows		
Loss on Futures	:	-125190
Gain on spot ransaction	:	118486.75
Risk free interest	:	1887.971667
Net Position	:	-4815.278333
Value of Portfolio	:	1003524.928
Thus we can see that though in this particular case he has made loss on Spot transaction it has been compensated from profit in futures transaction. Thus the total Portfolio remains unchanged.		

SPECULATION

Bearish- Short Futures		
On 2nd May the Index is 3605.45 and Futures for month are at Rs 3595 and Mr X feels that the index will go down in the near Future(Bearish) then he can take short position in the futures .		
If he has Rs10,00,000 with him and he takes short position of 3 contracts which expire on 25th May, then his position as on 25th May will be		
Profit form futures		Future price-Spot Price * Number of contracts
		125190
If he has paid an initial margin of 20% (i.e.) Rs 215700 then will gain return of 58.03% on his initial investment.		
Bullish- Long Futures		
On 29th June when the index spot was at 2997.9 and July Futures were trading at 3130.3 and the investor who feels that the index will increase (bullish) then he can take a long position and if index moves in positive direction then he can make profits		
Suppose that Mr.X is bullish as on 29th June and he takes Long position in the futures for 3 contracts and squares off his position on 27th July, then his position as on 27th July will be as follows		
Futures price as on 29th April		3003.00
Sopt price on 26th may		3156.15
Profit from Futures		76575
Suppose the initial margin was 20% then his return on investment will be 42.50%.		

OPTIONS

Call Option **:**

A Call Option gives the right (not obligation) to buyer of call option to buy an underlying asset.

Put Option :

A Put Option gives the right (not obligation) to holder of Put option to sell the underlying asset for exercise price.

American Option :

An American Option is one which can be exercised by the holder anytime prior to maturity date.

European Option :

European Option can be exercised by the holder only on the date of maturity.

Position in Option:

Long Position in Call Option   - Bullish.

Short Position in Call Option   -Bearish.

Long Position in Put Option   -Bearish.

Short Position in Put Option   -Bullish.

Pay off from Option:

Payoff from Long Position in Call Option : Max (St – K , 0)

Payoff from Long Position in Put Option :   Max (K-St , 0)

Adjusting Options to Share Split and Stock dividends:

Share Split:

n for m shape split will cause the sock price to go down by m/n of its previous value and the number of share covered by one contract increases by n/m of its previous value.

Stock dividends:

The treatment is same as that for stock split.20% stock split means 6 for 5 stock split.

Terminology:

Premium :

Premium is the amount paid by the holder of an Option for the right he gets to exercise the Option. Premium of an Option can be separated into two components –Intrinsic Value and Time Value.

Intrinsic Value:

Intrinsic Value of an Option is the amount which would be credited to holder of an Option if he were to exercise the Option and close out the position.

A Call will have intrinsic value if exercise price is less than the current market price of the Underlying. Intrinsic value is equal to *Current Market price – Exercise Price*.

A Put will have intrinsic value if the exercise price is more than the current market price of the underlying.(i.e.) *Exercise Price – Current Market Price*.

Time Value:

Additional amount of premium over and above the Intrinsic value is the time value or extrinsic value of Option. At the Money and Out of Money Options will only have Time Value and no intrinsic value.

In the money:

An Option with intrinsic value is said to be in-the-money. In order to be in the money call should have exercise price less than the current market price and Put should have exercise price more than Current market price.

At the money:

An Option whose exercise price is equal to current market price is said to be at the money.

Out of the money:

A call option is said to be Out of money if the exercise price is more than the current market price of the Underlying.

Put Option is said to be Out of money if exercise price is less than the current market price of underlying.

Factors affecting the Option Prices:

➢ Current Stock Price

➢ Strike Price

Call option:

Payoff from the Call Option will be the amount by which the spot price exceeds the strike price. Hence if the Stock price increase the payoff of call option will increase and hence the call will become more valuable. If the strike price increase the payoff from the call option will decrease and hence the call price will decrease.

Put option:

Payoff from put option is strike price – spot price. Hence if the spot price increases the put will become less valuable and if the strike price increases put will become more valuable.

Time to expiration

Time to expiration will affect only the American Options as European Options can be exercised only on the specific date.

In case of American option , an owner of long life option has all the exercise opportunities that is available to the owner of short life option and more .So the value of long life American option will increase as the time to expiation increases.

Volatility of the stock price

Volatility refers to uncertainty about the movement of share prices both up and down. Owner of a call option benefits from price increase but has limited downside risk similarly put benefits from price decrease but has limited downside risk in case of price increase. Therefore the values of both call and put increase as the Volatility increases.

Risk free rate of interest

In case of Call Option the owner has to pay for security if he decides to exercise the option at a later date so he will have to shell out money sometime in future. If in the mean time interest rate increase he will benefit from investing the money in the risk free returns. So the value of call option increases as the interest rate increase.

In case of put the owner will receive the money if he exercises the put sometime in future , so if the interest rate increase in the meantime present value of the future cash flows that will be received by him will decline so the Put Option will decline in value if the interest rate increase.

Dividends expected during the life of asset

Dividends reduce the stock price on ex-divided date , so the value of call will decline if the dividends increase and the value of put will increase if the dividends increase.

Variable	European Call	European Put	American Call	American Put
Spot price	+	-	+	-
Strike Price	-	+	-	+
Time to expiration	?	?	+	+
Volatility	+	+	+	+
Risk free rate	+	-	+	-
Dividends	-	+	-	+

SCENARIO ANALYSIS

We have done a scenario analysis to show how a change in the strike price on a given particular day will affect the Price of options along with change in the technical parameters (i.e.) how the option price and its technical indicators will respond to any change in spot price.

We have taken 3000 series as on 1st June, 2006 when NIFTY was trading at 2962.25.

Stock Price	2962.25
Exercise Price	3000.00
Current date	1-Jun-06
Expiration date	29-Jun-06
Risk free Interest rate	5.00%
Volatility	14.68%
Dividend yield	2.00%
Time	0.076712329

Scenario Analysis of change in Call Price , Put Price and Other parameters of Option to change in Spot Price and effect of change in Volatility to change in Call Price and Put Price.

Stock Price	Call	Delta	Gamma	Theta	Vega	Rho
2950	29.63	0.3677	0.003138	-325.27	307.49	-80.94
2960	33.47	0.3994	0.003205	-336.34	316.20	-88.13
2970	37.63	0.4317	0.003250	-345.53	322.89	-95.48
2980	42.11	0.4644	0.003274	-352.72	327.45	-102.93
2990	46.91	0.4972	0.003276	-357.81	329.80	-110.44
3000	52.05	0.5298	0.003255	-360.77	329.93	-117.94
3010	57.51	0.5622	0.003213	-361.59	327.85	-125.41
3020	63.29	0.5941	0.003151	-360.32	323.63	-132.77

3030	69.39	0.6252	0.003070	-357.03	317.37	-139.99
3040	75.79	0.6554	0.002971	-351.84	309.21	-147.03
3050	82.49	0.6846	0.002857	-344.91	299.32	-153.84

stock price	Put	Delta	Gamma	Theta	Vega	Rho
2950	72.67	-0.6308	0.003138	-234.76	307.49	-148.32
2960	66.52	-0.5990	0.003205	-245.91	316.20	-141.12
2970	60.69	-0.5667	0.003250	-255.19	322.89	-133.78
2980	55.19	-0.5341	0.003274	-262.48	327.45	-126.32
2990	50.01	-0.5013	0.003276	-267.69	329.80	-118.82
3000	45.16	-0.4686	0.003255	-270.78	329.93	-111.31
3010	40.64	-0.4363	0.003213	-271.75	327.85	-103.85
3020	36.44	-0.4044	0.003151	-270.63	323.63	-96.48
3030	32.55	-0.3733	0.003070	-267.51	317.37	-89.26
3040	28.97	-0.3431	0.002971	-262.50	309.21	-82.23
3050	25.68	-0.3139	0.002857	-255.76	299.32	-75.41

Volatility	Call Price	Put Price
8.00%	13.70	44.51
9.00%	16.68	47.49
10.00%	19.72	50.53
11.00%	22.80	53.61
12.00%	25.92	56.72
13.00%	29.06	59.86
14.00%	32.22	63.02
15.00%	35.39	66.20
16.00%	38.58	69.39
17.00%	41.79	72.59
18.00%	45.00	75.80
19.00%	48.21	79.02
20.00%	51.44	82.24
21.00%	54.67	85.47
22.00%	57.90	88.71
23.00%	61.14	91.95
24.00%	64.38	95.19
25.00%	67.63	98.43
26.00%	70.87	101.68
27.00%	74.12	104.93
28.00%	77.38	108.18
29.00%	80.63	111.44
30.00%	83.89	114.69

Scenario Analysis-Change in Call and Put to Change in Spot.
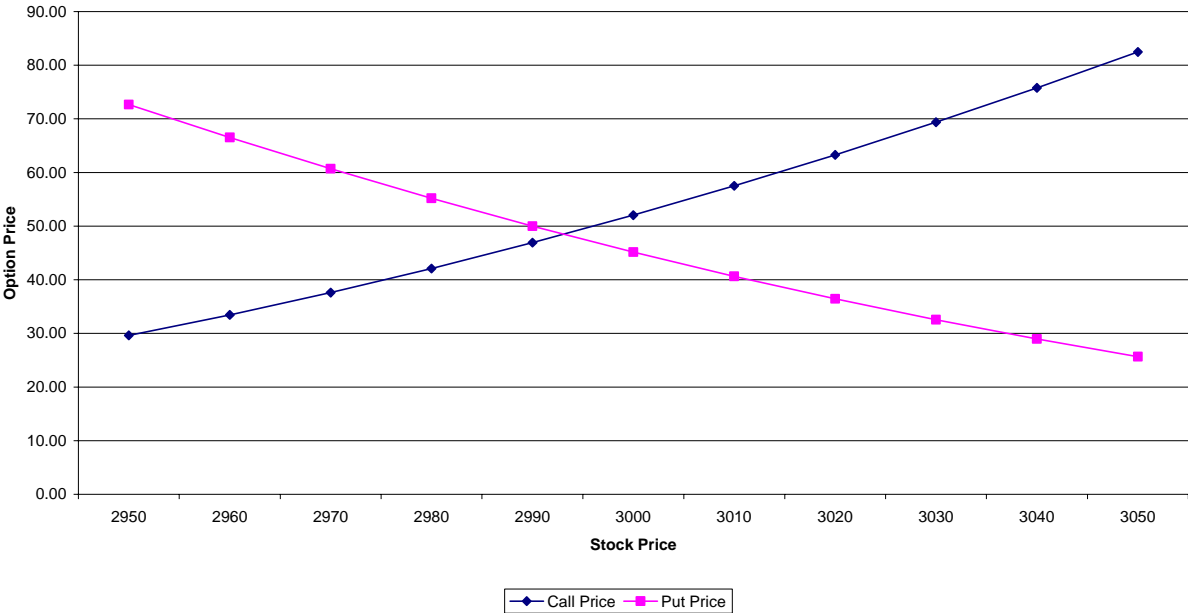
Scenario analysis-Change in Delta to Change in Stock Price

Scenario analysis:

Change in Delta to Change in Stock Price

Delta along with change in option price to Change in strike price also gives indication to probability that the Option will be in-the-money. In the given scenario as the Spot price is increasing, from 2950 onwards, the probability that the Option with exercise price of 3000 will be in-the-money increases as the buyer of call option will exercise the option at any level beyond 3000. As seen from the chart, Delta has increased from 0.3677 when spot price for 3000 exercise price was 2950 to 0.6846 when the NIFTY was changed to 3050. For Put option, any increase in Spot price will decrease the probability that the option will be in-the-money as the option will expire worthless on the expiry date. In the chart above, Delta of put

option is getting closer to 0 with increase in NIFTY spot price as their probability to be exercised decreases and they decline in value because their payoffs will decline with increase in spot price.

Scenario Analysis-Change in Gamma to Change in Spot
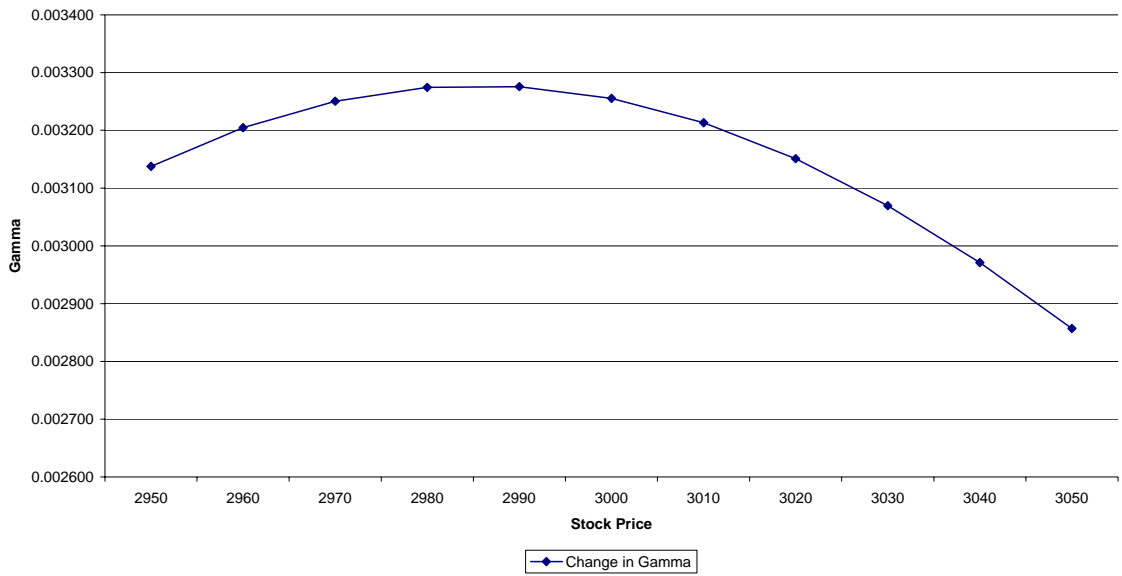
Scenario analysis-

Change in Gamma to Change in Stock Price

Gamma is the rate at which an Option's Delta changes as the price of underlying changes. Gamma is greatest for an option that is at the money and becomes progressively small as the Option moves in the money or out of the money thus forming an inverted U shaped curve. In the above graph, Gamma is greatest when the Option is at the money (ie) when spot price is 2990 and 3000 for series which has exercise price of 3000. As the Call option gets in-the-money and out-of-the money with increase and decrease in spot price, the gamma of the Option progressively declines.

Scenario Analysis-Change in Rho to Change in Underlying Price
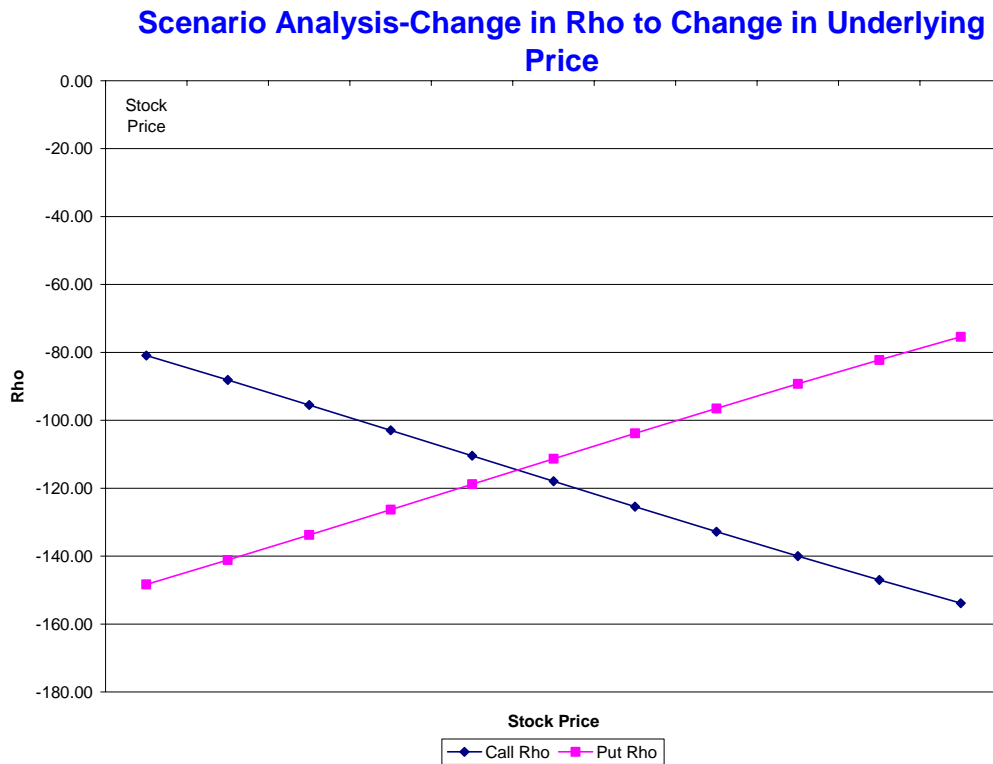
Scenario analysis-

Change in Rho to Change in Stock Price

Rho of an option measures the sensitivity of the option price to changes in the interest rates. As Rho increases, Option price will be highly sensitive to changes in interest rates. In the above scenario analysis, as the Stock price increased from 2950 to 3050 call price has also increased. With increase in Call price, Call Options tend to get more sensitive to changes in interest rates, because higher the call price greater will be the affect of it in interest rates. This

can be verified from increase in Rho from absolute value of 80.94 to 153.84 as the Spot price has been increased from 2950 to 3050.

Similarly when the spot price is increased , the Put Option get more dearer and the effect of interest rates on Put Option decline. This can be seen from decline in the absolute value of Rho from 148.32 to 75.41 when Spot price is increased.

Scenario Analysis-Change in Theta to Change in Underlying
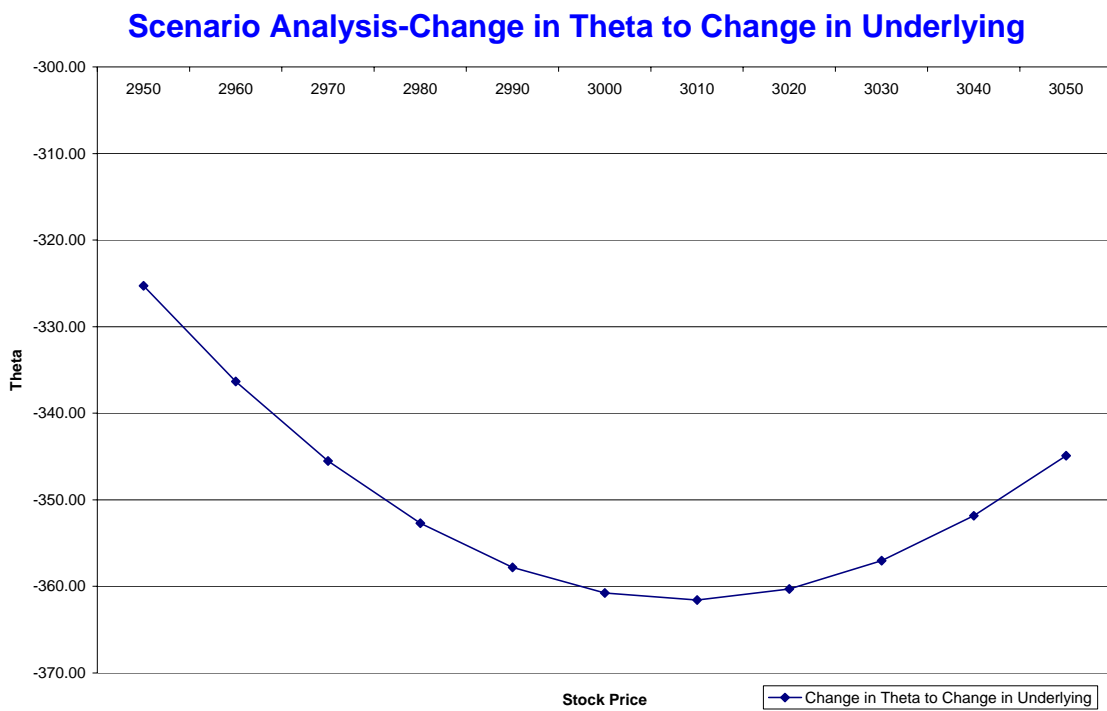
Change In Option price due to Volatility
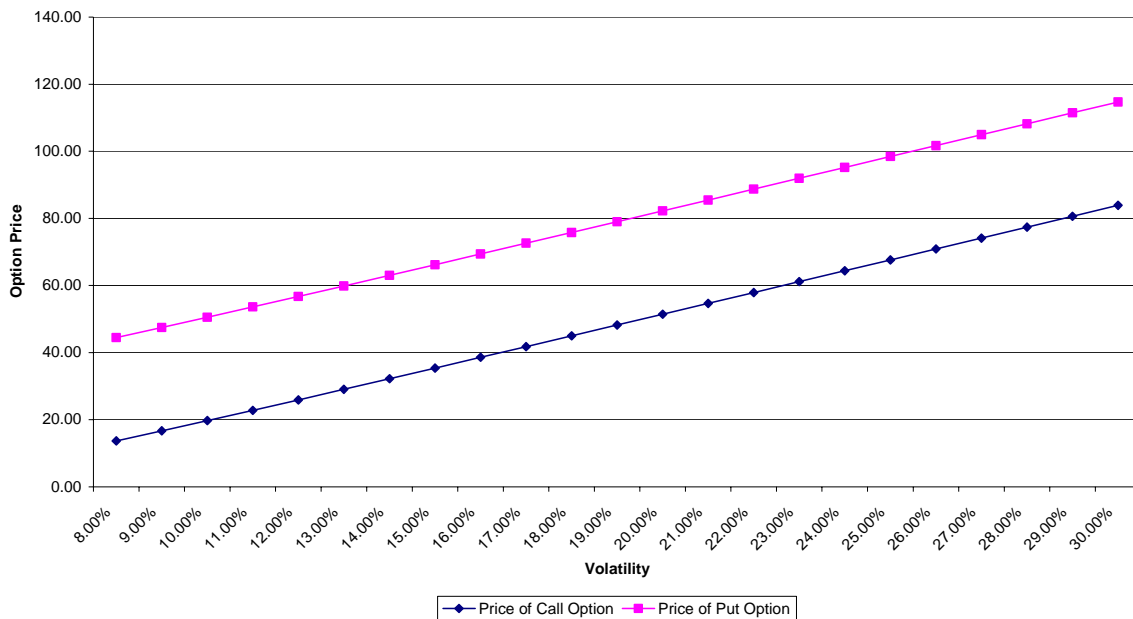
Scenario analysis-

Change in Option price to Change in Volatility

In order to find the effect of Option price due to changes in Volatility, all the rest of parameters of the Option are kept constant and a scenario analysis was built to find out how the change in volatility impact the option price. As can be seen from the given graph as the underlying volatility increases, the price of both call and put options increase as the writer of Option will demand more premium when the market is volatile in order to cover his loss. The graph for both Call and Put option prices show similar patter for changes in volatility. The call price has increased from 13.70 when the volatility was 8% to 83.89 when the volatility was

increased to 30%. Similarly Put price has increased from 44.51 to 114.69 when volatility was changed from 8% to 30%.

Thus other things kept constant, a mere change in underlying volatility of the stock price can cause significant changes to the price of option.

S&P CNX NIFTY

NIFTY Spot and Call

Legend: S&P CNX NIFTY, 3000, 3050, 3100, 3200

NIFTY Spot and Put

Legend: S&P CNX NIFTY, 3000, 3050, 3100, 3200
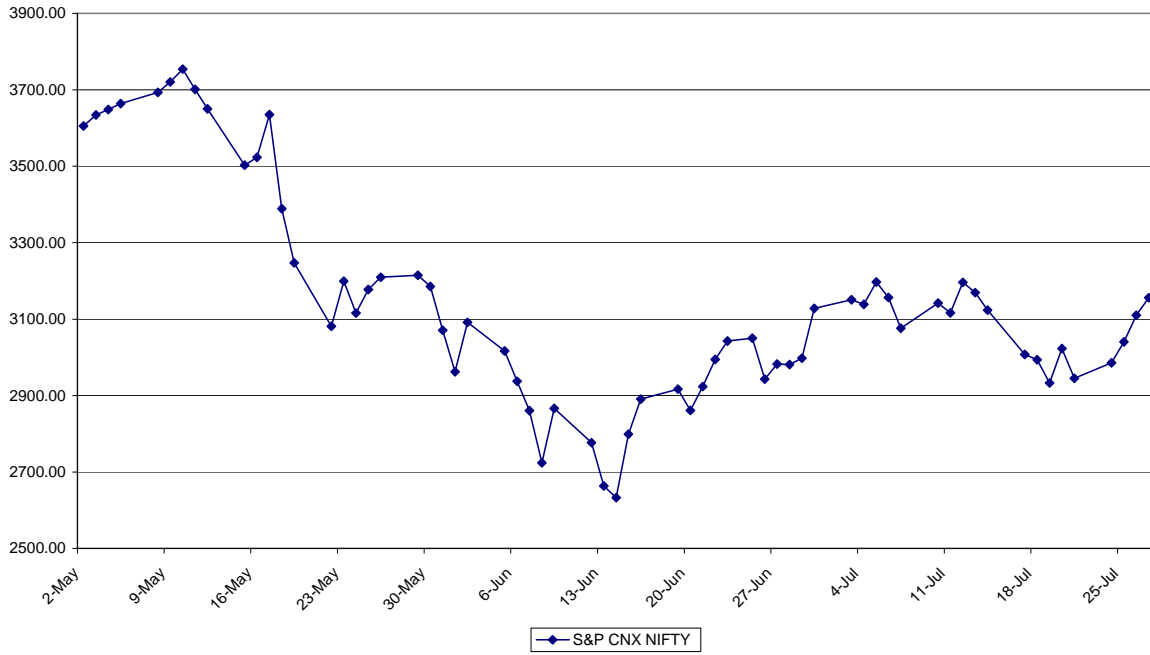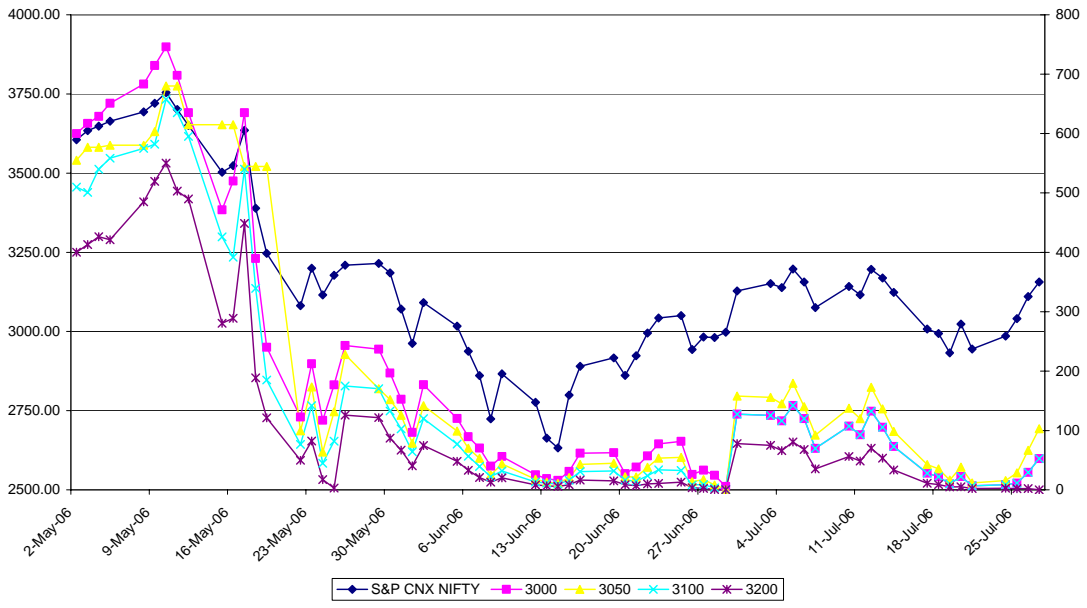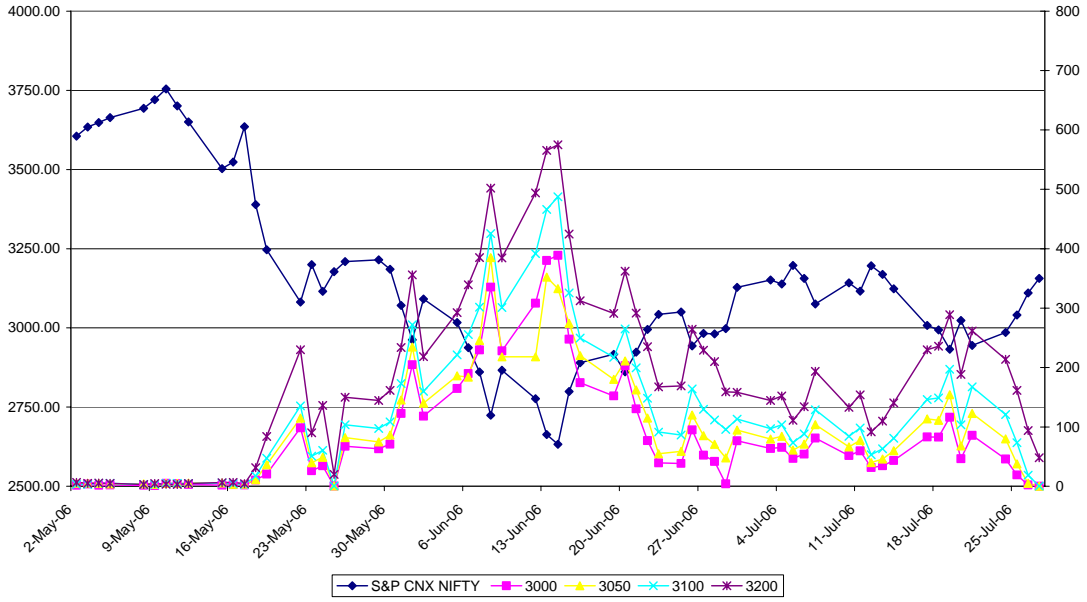
LIMITS ON UPPER AND LOWER BOUND FOR OPTIONS:

<u>Intrinsic Value of an Option:</u>

Call Option :Max (S-X, 0)

Put Option : Max (X-S,0)

<u>Upper Bounds and Lower Bounds for OPTION PRICES:</u>

<u>Upper Bound:</u>

<u>For Call Option</u>:

$c \leq S$

$C \leq S$

<u>For Put Option:</u>

$P \leq X \leq X e^{-r(T-t)}$

$p \leq X$

<u>Lower Bounds:</u>

For European Call Option: $\mathbf{c > S - D\text{-}X\ e^{-r(T-t)}}$

For European Put Option : $\mathbf{p > D + X\ e^{-r(T-t)} - S}$

Its never optimal to Exercise American Call Option on non – dividend paying stock early.

Put Call Parity:

Put Call Parity says that one European Option plus an amount of cash equal to $X e^{-r(T-t)}$ and one share in underlying along with one Long Put must be equal in Value.

Put-Call Parity holds only for European Options.

$$C - P = S - X e^{-r(T-t)}$$

$$S - D - X < C - P < S - X e^{-r(T-t)}$$

Value of an European call with certain exercise price and exercise date can be deducted from value of an European Put with the same exercise price and date.

Both the following portfolio should be equal:

Portfolio A: One European Call Option plus an amount of Cash equal to

$X . e^{-r(T-t)}$.

Portfolio B: One European Put Option plus one share.

If Put – Call parity does not holds true then in would mean that there could be some arbitrage opportunities to exploit.

If Portfolio A is greater than Portfolio B , then investor could take Long position in Call and take short position in both Put and the underlying stock.

If Portfolio B is greater than Portfolio A, then investor could take Short Position in call and have Long Put and Long the Underlying.

Both these cases will bring investor risk less profit.

		PUT CALL PARITY				
Date	SERIES	3000	3050	3100	3200	

	Strike Price	C-P	$<S-X\,e^{-r(T-t)}$	C-P	$<S-X\,e^{-r(T-t)}$	C-P	$<S-X\,e^{-r(T-t)}$	C-P	$<S-X\,e^{-r(T-t)}$
2-May-06	3605.45	598.5	614.89	549.85	565.04	-61.75	515.20	-193.228	415.52
3-May-06	3634.25	613.3	643.28	571.75	593.43	-71	543.58	-194.161	443.88
4-May-06	3648.40	627.15	657.02	572	607.16	-36.2	557.30	-196.095	457.59
5-May-06	3663.95	648.8	672.16	576.2	622.29	-17.7	572.43	-229.244	472.71
8-May-06	3693.15	681.6	700.13	576.2	650.24	-24.7	600.36	-192.228	500.59
9-May-06	3720.55	713.35	727.12	599.7	677.23	-93.1	627.34	-191.011	527.56
10-May-06	3754.25	741	760.41	675.1	710.51	-17.3	660.61	-106.894	560.82
11-May-06	3701.05	693.9	706.80	675.1	656.89	25.55	606.99	-102.377	507.18
12-May-06	3650.05	632	655.39	609.4	605.48	-13.95	555.57	32.87478	455.74
15-May-06	3502.95	469.6	507.06	609.2	457.13	-185.6	407.19	-196.558	307.33
16-May-06	3523.30	517.35	527.00	611.6	477.06	-148.85	427.12	-299.591	327.24
17-May-06	3635.10	632.75	638.39	540.8	588.44	6.7	538.50	107.0267	438.60
18-May-06	3388.90	379.4	391.78	533.3	341.82	-168.85	291.87	-10.6058	191.97
19-May-06	3246.90	219.45	249.36	508.1	199.41	200.65	149.45	88.94683	49.53
22-May-06	3081.35	24.35	82.58	-15.5	32.60	-57.4	-17.38	-100.386	-117.34
23-May-06	3199.35	186.15	200.17	133.8	150.19	126.65	100.20	16.38222	0.23
24-May-06	3115.55	82.85	115.96	14.9	65.97	-86.2	15.97	-110.55	-84.01
25-May-06	3177.70	176.4	177.70	130.95	127.70	82	77.70	3	-22.30
26-May-06	3209.6	175.75	223.54	4.459886	173.77	170.3401	124.00	-47.7724	24.47
29-May-06	3214.9	173.85	227.61	-57.4127	177.82	227.5627	128.04	-56.0246	28.46
30-May-06	3185.3	125.8	197.60	-45.5535	147.81	178.2535	98.01	-60.7585	-1.58
31-May-06	3071.05	29.8	82.94	42.90583	33.14	59.89417	-16.66	34.0076	-116.26
1-Jun-06	2962.25	-107.75	-26.27	104.6152	-76.07	-40.2652	-125.88	116.6738	-225.50
2-Jun-06	3091.35	58.8	102.43	39.1246	52.61	80.6754	2.79	21.99001	-96.84
5-Jun-06	3016.65	-44.45	26.50	72.35318	-23.34	4.646818	-73.17	71.13907	-172.85
6-Jun-06	2937.3	-100.25	-53.26	123.3128	-103.11	-66.6128	-152.95	136.0555	-252.63
7-Jun-06	2860.45	-159.3	-130.52	183.7225	-180.37	-144.523	-230.22	201.3221	-329.92
8-Jun-06	2724.35	-295.4	-267.03	292.2823	-316.89	-270.182	-366.75	329.9386	-466.46
9-Jun-06	2866.3	-171.8	-125.49	169.1421	-175.36	-137.192	-225.22	195.7053	-324.94
12-Jun-06	2776.85	-282.5	-216.17	233.8718	-266.06	-220.722	-315.94	274.5055	-415.71
13-Jun-06	2663.3	-361.1	-330.13	342.9319	-380.02	-331.682	-429.91	386.7224	-529.69
14-Jun-06	2632.8	-372.75	-361.04	371.6919	-410.94	-361.892	-460.84	416.6393	-560.63

15-Jun-06	2798.8	-216.65	-195.45	216.2021	-245.36	-199.952	-295.26	253.9563	-395.07
16-Jun-06	2890.35	-112.5	-104.31	147.4623	-154.22	-116.712	-204.13	170.6733	-303.96
19-Jun-06	2916.9	-89.3	-78.99	123.9432	-128.92	-91.9932	-178.86	143.9248	-278.72
20-Jun-06	2861.3	-175.3	-135.00	157.0536	-184.94	-140.354	-234.88	193.542	-334.76
21-Jun-06	2923.45	-92.05	-73.26	94.81413	-123.21	-79.9641	-173.15	130.2094	-273.05
22-Jun-06	2994.75	-19.55	-2.37	40.42467	-52.33	-16.8247	-102.28	62.42674	-202.18
23-Jun-06	3042.7	38.25	45.16	8.38526	-4.79	25.51474	-54.75	15.54418	-154.67
25-Jun-06	3050.3	43.6	51.94	2.656615	1.97	29.99339	-48.00	10.82922	-147.95
26-Jun-06	2943.2	-69.1	-55.57	69.41738	-105.55	-61.1174	-155.53	109.2468	-255.49
27-Jun-06	2982.45	-19.05	-16.73	34.07819	-66.71	-25.1282	-116.70	69.2645	-216.67
28-Jun-06	2981.1	-17.1	-18.49	26.93907	-68.48	-23.6891	-118.48	69.08222	-218.46
29-Jun-06	2997.9	1.8	-2.10	2.6	-52.10	-2.4	-102.10	52.35	-202.10
30-Jun-06	3128.2	51.1	139.28	18.8246	89.46	108.6754	39.64	-30.5254	-59.99
3-Jul-06	3150.95	61.8	160.80	-4.84682	110.96	130.1968	61.13	-55.2968	-38.55
4-Jul-06	3138.65	50.9	148.09	-3.08718	98.24	119.3372	48.40	-53.2872	-51.28
5-Jul-06	3197.1	95.15	206.13	-26.6275	156.28	168.7275	106.43	-88.2775	6.73
6-Jul-06	3156.4	65.85	165.02	-25.0177	115.16	144.8677	65.30	-77.0677	-34.41
7-Jul-06	3075.85	-11.4	84.06	8.142071	34.19	61.70793	-15.67	-26.2579	-115.39
10-Jul-06	3142	55.6	148.98	-11.7282	99.09	119.0782	49.21	-62.8282	-50.56
11-Jul-06	3116.15	33.05	122.72	-2.81814	72.83	95.61814	22.94	-46.9681	-76.84
12-Jul-06	3195.9	101	202.06	-29.2581	152.16	161.8081	102.26	-91.7581	2.47
13-Jul-06	3169.3	71.05	175.05	-38.5979	125.14	144.0479	75.24	-90.5479	-24.57
14-Jul-06	3123.35	29.65	128.69	-30.4377	78.78	103.4377	28.87	-69.9377	-70.96
17-Jul-06	3007.55	-55.05	11.66	31.19322	-38.27	-3.24322	-88.21	14.44322	-188.07
18-Jul-06	2993.65	-60.35	-2.65	38.00365	-52.59	-15.8036	-102.53	24.75365	-202.41
19-Jul-06	2932.75	-106	-63.96	80.41413	-113.91	-70.1641	-163.85	75.06413	-263.75
20-Jul-06	3023.05	-23.9	25.93	12.52467	-24.03	10.02533	-73.98	-4.77533	-173.88
21-Jul-06	2945	-78.85	-52.54	64.28526	-102.49	-57.5353	-152.45	59.53526	-252.37
24-Jul-06	2985.85	-37	-12.92	28.66738	-62.90	-19.9174	-112.88	22.81738	-212.84
25-Jul-06	3040.5	-7.75	41.32	-12.6218	-8.66	23.97181	-58.65	-22.2218	-158.62
26-Jul-06	3110.15	27.4	110.56	-43.8109	60.57	73.46093	10.57	-71.2609	-89.41
27-Jul-06	3156.15	52.65	156.15	-53.1	106.15	105.8	56.15	-105.7	-43.85

Property distribution of a stock price:

Probability distribution of the stock price St, for time T is given by :

With mean and Standard deviation as follows:

$$\ln S_t \sim \theta \quad \{ \ln S_t + (\mu - \sigma^2) * (T-t), \sigma \sqrt{(T-t)} \}$$

58

Where

St is the Stock Price

μ is the expected return per annum

σ is the Volatility.

T-t is the time period.

Expected value of the Stock price at the end of t Time period is given by

$$E(S_t) = S \, e^{\mu(T-t)}.$$

And the variance of the S_t is given by:

$$Var(S_t) = S^2 \, e^{2\mu(T-t)} \{ e^{\sigma 2(T-t)} - 1 \}.$$

The Distribution of the Rate of Return:

with Mean and Standard deviation of

$$\{ \mu - \sigma^2/2, \, \sigma/\sqrt{T-t} \}$$

PRICING OF OPTIONS

BLACK SCHOLES MODEL:

Value of Call Option:

$$C = SN(d_1) - X e^{-r(T-t)} N(d_2)$$

Or

$$C = e^{-r(T-t)} \{ SN(d_1) e^{r(T-t)} - XN(d_2) \}$$

Where

$$D_1 = In(S/X) + (r + \sigma^2/2)(T-t) / \sigma(\sqrt{T-t})$$

$$D_2 = In(S/X) + (r - \sigma^2/2)(T-t) / \sigma(\sqrt{T-t}) = D_1 - \sigma(\sqrt{T-t}).$$

Interpretation of the above model:

$N(d_1)$ = Change in Option price due to change in the Stock Price.(Delta).

   Probability that the option will be in-the-money.

$N(d_2)$ = Probability that the Option will be exercised.

$XN(d_2)$ = Strike times the Probability.

$SN(d_1) e^{r(T-t)}$ = Expected Value of a Variable that equals S_t, if $S_t > X$ and Zero otherwise in a Risk Neutral World.

Since $C = c$, the Value of American Call Option will be Equal to that of European Call Optio

Value of Put :

$$C= X\,e^{-r\,(T-t)}\,N\,(-d_2) - SN\,(-d_1).$$

By replacing S by $S\,.e^{-q\,(T-t)}$ we can find the price of an Option with known dividend yield q.

If dividends are known then present value of dividends are subtracted from S.

BLACK SCHOLES MODEL

Input Variables:

Stock Price	3605.45
Exercise Price	3000.00
Current date	2-May-06
Expiration date	25-May-06
Risk free Interest rate	5.00%
Volatility	16.52%
Dividend yield	2.00%
Time	0.0630137

Price of Stock Option	Call	Put
Theoretical	610.3463	0.0001

Parameters of Option	Call	Put
Delta	0.9987371	-3.41E-06
Gamma	1.071E-07	1.07E-07
Theta	-77.52858	-0.018618

Vega	0.0144885	0.014488
Rho	-188.4456	-0.000781

		ACTUAL PRICE OF CALL OPTION				THEORETICAL PRICE OF CALL OPTION			
S&P CNX NIFTY		FOR NEAR MONTH				FOR NEAR MONTH			
		EXERCISE PRICE				EXERCISE PRICE			
Date	SPOT	3000	3050	3100	3200	3000	3050	3100	3200
2-May-06	3605.45	600	555	510	400.2	610.35	560.50	510.66	411.05
3-May-06	3634.25	617	576.9	501	413	638.90	589.05	539.20	439.53
4-May-06	3648.40	628.7	576.9	540	426.2	652.82	602.97	553.11	453.41
5-May-06	3663.95	650.8	580.2	558.5	421	668.14	618.28	568.42	468.70
8-May-06	3693.15	683.1	580.2	575	485	696.69	646.81	596.92	497.16
9-May-06	3720.55	714.7	603.2	582	519.5	723.86	673.97	624.08	524.30
10-May-06	3754.25	746	680	657.8	550	757.32	707.43	657.53	557.73
11-May-06	3701.05	698.1	680	634.95	503.1	703.96	654.06	604.15	504.34
12-May-06	3650.05	635.1	615	595.25	490	652.79	602.88	552.97	453.14
15-May-06	3502.95	471.45	615	426	280.5	505.14	455.21	405.27	305.42
16-May-06	3523.30	520	615	391.95	288.85	525.26	475.32	425.38	325.51
17-May-06	3635.10	635	544.5	540	448.85	636.79	586.85	536.90	437.01
18-May-06	3388.90	389.75	544.5	339.25	188.8	390.48	340.52	290.57	190.80
19-May-06	3246.90	240	544.5	185.15	121.55	248.30	198.37	148.70	58.04
22-May-06	3081.35	122.7	99.55	76.4	49.8	82.72	38.66	10.88	0.09
23-May-06	3199.35	212.4	173.35	141.55	82.35	199.82	149.84	99.91	15.54
24-May-06	3115.55	117.15	63.65	44.75	17.15	115.79	65.86	20.42	0.01
25-May-06	3177.70	176.8	131.5	82	3				
26-May-06	3209.6	243.1	228	174.8	126	223.35	179.31	139.02	73.92
29-May-06	3214.9	236.85	170.2	170.15	121.8	226.63	181.77	140.51	73.60
30-May-06	3185.3	196.65	152.05	132.7	87.05	198.77	155.59	116.80	56.80
31-May-06	3071.05	152.45	125.85	102.8	67.15	103.67	71.94	47.03	16.53
1-Jun-06	2962.25	96.95	78.35	64.35	40.6	40.25	23.60	12.82	2.99
2-Jun-06	3091.35	176.9	141.55	119.8	74.6	116.80	82.23	54.46	19.48
5-Jun-06	3016.65	120.15	98.85	77	47.8	62.78	38.64	21.91	5.41
6-Jun-06	2937.3	89.5	70.05	56.7	32.95	25.70	13.32	6.26	1.02
7-Jun-06	2860.45	70.25	53.2	39.2	20.95	7.67	3.21	1.21	0.12
8-Jun-06	2724.35	39.95	25.25	22.1	13.05	0.32	0.09	0.02	0.00
9-Jun-06	2866.3	56.25	43.65	31.95	20.35	7.22	2.89	1.02	0.09
12-Jun-06	2776.85	25.65	17.7	13.15	8.45	0.61	0.16	0.03	0.00

13-Jun-06	2663.3	19.2	12.8	11.25	6.7	0.01	0.00	0.00	0.00
14-Jun-06	2632.8	16	10.65	9.8	5.7	0.00	0.00	0.00	0.00
15-Jun-06	2798.8	31.15	20.75	16.25	8.6	0.59	0.13	0.02	0.00
16-Jun-06	2890.35	61.65	43.15	30.75	16.45	5.58	1.73	0.44	0.02
19-Jun-06	2916.9	62.85	44.95	31.95	15	6.77	1.89	0.41	0.01
20-Jun-06	2861.3	27.4	22.05	16.7	8.6	1.09	0.19	0.02	0.00
21-Jun-06	2923.45	38.35	21.55	14.85	7	5.69	1.32	0.22	0.00
22-Jun-06	2994.75	57.3	38.05	23.6	10.1	25.61	8.69	2.11	0.04
23-Jun-06	3042.7	77.5	53.55	33.9	10.75	53.45	22.93	7.05	0.20
25-Jun-06	3050.3	81.9	54.6	32.65	12.8	55.80	21.69	5.19	0.05
26-Jun-06	2943.2	25.75	13.85	8.3	3.7	2.20	0.14	0.00	0.00
27-Jun-06	2982.45	33.25	17.35	8.95	2.55	7.62	0.50	0.01	0.00
28-Jun-06	2981.1	24.55	8.45	3.25	0.6	3.56	0.03	0.00	0.00
29-Jun-06	2997.9	5.85	0.5	0.2	0.25				
30-Jun-06	3128.2	127.5	158.1	127.5	78.15	146.51	107.70	74.92	30.03
3-Jul-06	3150.95	125.35	155.95	125.35	74.9	163.86	122.15	86.01	34.88
4-Jul-06	3138.65	116.25	145	116.25	66.05	152.26	111.48	76.74	29.27
5-Jul-06	3197.1	142.1	179.5	142.1	80.45	205.10	159.43	117.76	53.09
6-Jul-06	3156.4	119.85	140	119.85	67.8	166.63	123.65	86.20	33.40
7-Jul-06	3075.85	69.85	92.2	69.85	35.45	97.78	64.17	38.63	10.46
10-Jul-06	3142	107.35	137.25	107.35	56.25	150.66	107.80	71.25	23.25
11-Jul-06	3116.15	92.8	119.9	92.8	48.65	126.73	86.41	53.68	14.81
12-Jul-06	3195.9	132.55	172.8	132.55	70.05	200.50	153.10	109.34	42.58
13-Jul-06	3169.3	105.45	136.45	105.45	53.5	174.30	128.10	86.82	28.95
14-Jul-06	3123.35	73	98.25	73	33.5	130.56	88.18	53.43	13.06
17-Jul-06	3007.55	27.95	42.85	27.95	11.2	37.98	16.82	5.99	0.37
18-Jul-06	2993.65	22.2	35.35	22.2	8.95	28.97	11.37	3.47	0.14
19-Jul-06	2932.75	10.25	16.45	10.25	4.9	7.28	1.80	0.32	0.00
20-Jul-06	3023.05	22.55	38.45	22.55	5.25	41.61	16.90	5.06	0.16
21-Jul-06	2945	6.75	11.75	6.75	2	6.92	1.37	0.17	0.00
24-Jul-06	2985.85	8.75	15.75	8.75	2.9	11.97	1.65	0.09	0.00
25-Jul-06	3040.5	11.35	28.7	11.35	1.75	43.47	10.79	0.93	0.00
26-Jul-06	3110.15	29.65	66.75	29.65	2.2	110.39	60.50	16.71	0.00
27-Jul-06	3156.15	52.7	103.05	52.7	0.1				

Technical Analysis of Option Parameters

Delta

Delta is the rate of change of the option Price with respect to underlying asset. Delta hedging keeps the total wealth of an investor as close to unchanged as possible. Suppose the delta of a stock is .60. This means that when stock price changes by some amount the option price changes by 60% of that of underlying. If the call price is Rs 10 and the stock price is Rs 100 and investor has written 20 Call Option's (Lot of 100 each) in order to hedge the investor can buy 1200 shares(2000*.60).In this case gain(loss) in the option position will tend to setoff by loss(gain) in the stock position.

The scheme generally involves selling the stock just after the price has gone down and buying the stock just after the price have gone up(delta will increase so to maintain the portfolio as delta neutral more of the underlying stock must be purchased). It might be termed as- Buy High- sell low scheme. Delta **of the underlying stock is always 1**.

Delta of European Call on Non-dividend paying stock: $\Delta = N. d_1$

Delta of European Put on Non-Dividend paying stock $\Delta = N .d_1 - 1$

Delta of European Call on stock paying a dividend yield q : $\Delta = e^{-q(T-t)} . N. d_1$

Delta of European Put on stock paying a dividend yield q: $\Delta = e^{-q(T-t)} . (N. d_1 -1).$

Since the underlying stock always has delta of 1.00 ,each 100 deltas in an option represents a theoretical position in the underlying stock. (i.e.) if person is having options with delta of 500 this is equivalent to holding 5 underlying stocks.

If we ignore the sign of delta (for Put) then Delta also shows the probability that the Option will be in-the-money.

An Option with delta greater than 50 is in the money , equal to 50 is at the money and delta less than 50 is out of the money.

Thus there are 4 important interpretation of Delta:

Hedge Ratio

Rate of change wrt to Underlying

Probability of Option in the money

Equivalent underlying position

Delta

S&P CNX NIFTY		EXERCISE PRICE			
Date	SPOT	3000	3050	3100	3200
2-May-06	3605.45	1.00	1.00	1.00	1.00
3-May-06	3634.25	1.00	1.00	1.00	1.00
4-May-06	3648.40	1.00	1.00	1.00	1.00
5-May-06	3663.95	1.00	1.00	1.00	1.00
8-May-06	3693.15	1.00	1.00	1.00	1.00
9-May-06	3720.55	1.00	1.00	1.00	1.00
10-May-06	3754.25	1.00	1.00	1.00	1.00
11-May-06	3701.05	1.00	1.00	1.00	1.00
12-May-06	3650.05	1.00	1.00	1.00	1.00
15-May-06	3502.95	1.00	1.00	1.00	1.00
16-May-06	3523.30	1.00	1.00	1.00	1.00
17-May-06	3635.10	1.00	1.00	1.00	1.00
18-May-06	3388.90	1.00	1.00	1.00	0.99
19-May-06	3246.90	1.00	1.00	0.99	0.76
22-May-06	3081.35	0.96	0.76	0.35	0.01
23-May-06	3199.35	1.00	1.00	1.00	0.50
24-May-06	3115.55	1.00	0.99	0.72	0.00
25-May-06	3177.70				
26-May-06	3209.6	0.92	0.86	0.78	0.55
29-May-06	3214.9	0.93	0.88	0.80	0.57
30-May-06	3185.3	0.91	0.84	0.74	0.49
31-May-06	3071.05	0.72	0.59	0.45	0.21
1-Jun-06	2962.25	0.42	0.29	0.18	0.05
2-Jun-06	3091.35	0.77	0.64	0.50	0.24
5-Jun-06	3016.65	0.58	0.42	0.28	0.09
6-Jun-06	2937.3	0.33	0.20	0.11	0.02
7-Jun-06	2860.45	0.13	0.06	0.03	0.00
8-Jun-06	2724.35	0.01	0.00	0.00	0.00
9-Jun-06	2866.3	0.13	0.06	0.02	0.00
12-Jun-06	2776.85	0.02	0.01	0.00	0.00
13-Jun-06	2663.3	0.00	0.00	0.00	0.00
14-Jun-06	2632.8	0.00	0.00	0.00	0.00
15-Jun-06	2798.8	0.02	0.00	0.00	0.00
16-Jun-06	2890.35	0.13	0.05	0.01	0.00

19-Jun-06	2916.9	0.16	0.06	0.01	0.00
20-Jun-06	2861.3	0.04	0.01	0.00	0.00
21-Jun-06	2923.45	0.15	0.05	0.01	0.00
22-Jun-06	2994.75	0.48	0.22	0.07	0.00
23-Jun-06	3042.7	0.76	0.47	0.20	0.01
25-Jun-06	3050.3	0.84	0.51	0.18	0.00
26-Jun-06	2943.2	0.11	0.01	0.00	0.00
27-Jun-06	2982.45	0.32	0.03	0.00	0.00
28-Jun-06	2981.1	0.24	0.00	0.00	0.00
29-Jun-06	2997.9	0.84	0.74	0.61	0.33
30-Jun-06	3128.2				
3-Jul-06	3150.95	0.89	0.80	0.67	0.38
4-Jul-06	3138.65	0.88	0.77	0.64	0.34
5-Jul-06	3197.1	0.95	0.89	0.79	0.52
6-Jul-06	3156.4	0.91	0.82	0.70	0.39
7-Jul-06	3075.85	0.76	0.61	0.44	0.17
10-Jul-06	3142	0.91	0.81	0.67	0.32
11-Jul-06	3116.15	0.87	0.75	0.58	0.24
12-Jul-06	3195.9	0.97	0.93	0.83	0.51
13-Jul-06	3169.3	0.96	0.89	0.77	0.40
14-Jul-06	3123.35	0.91	0.79	0.61	0.23
17-Jul-06	3007.55	0.55	0.32	0.14	0.01
18-Jul-06	2993.65	0.48	0.25	0.10	0.01
19-Jul-06	2932.75	0.19	0.06	0.01	0.00
20-Jul-06	3023.05	0.64	0.36	0.14	0.01
21-Jul-06	2945	0.20	0.05	0.01	0.00
24-Jul-06	2985.85	0.39	0.08	0.01	0.00
25-Jul-06	3040.5	0.87	0.41	0.06	0.00
26-Jul-06	3110.15	1.00	0.99	0.65	0.00
27-Jul-06	3156.15				

delta of put
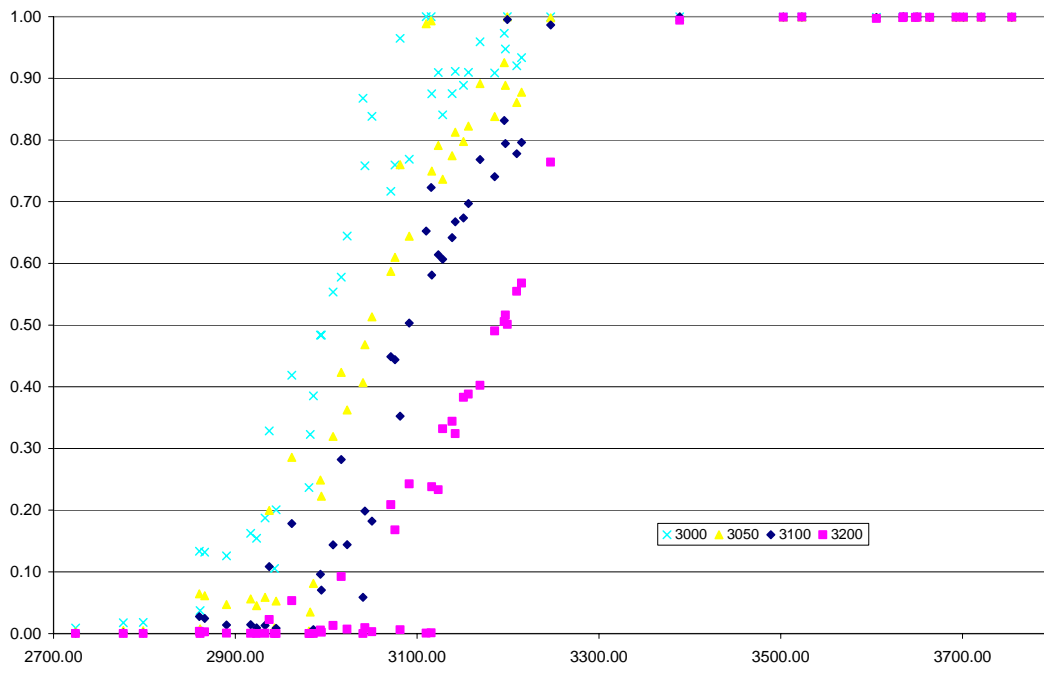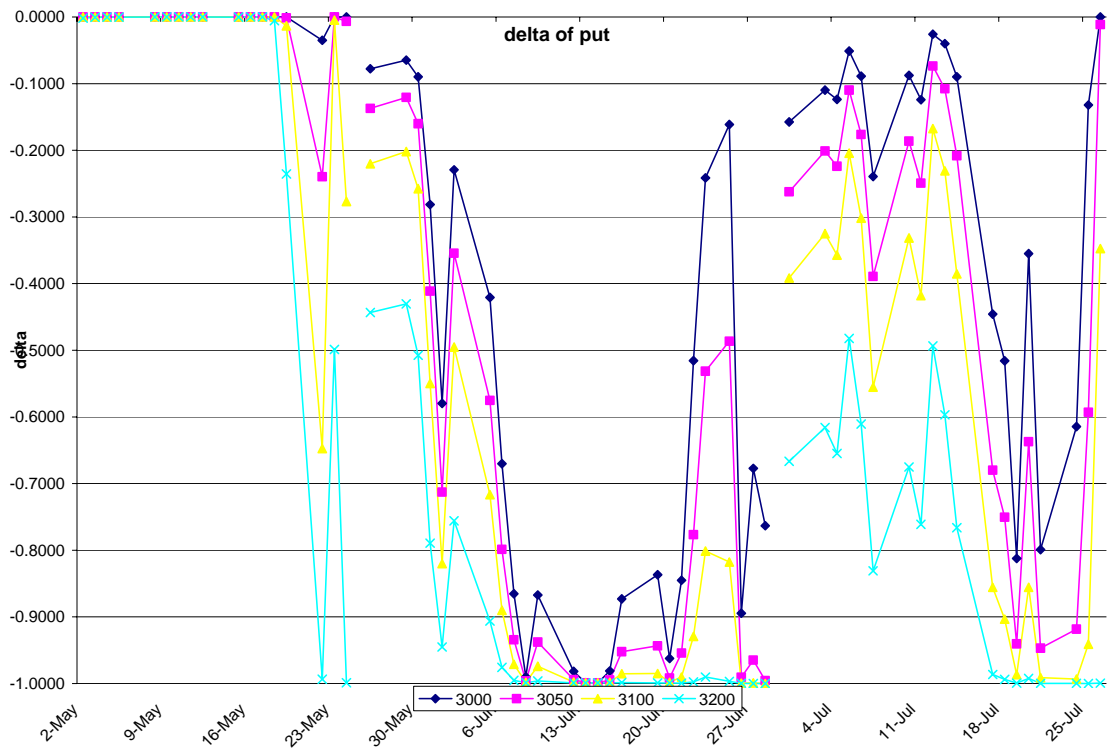
Delta of Call Option
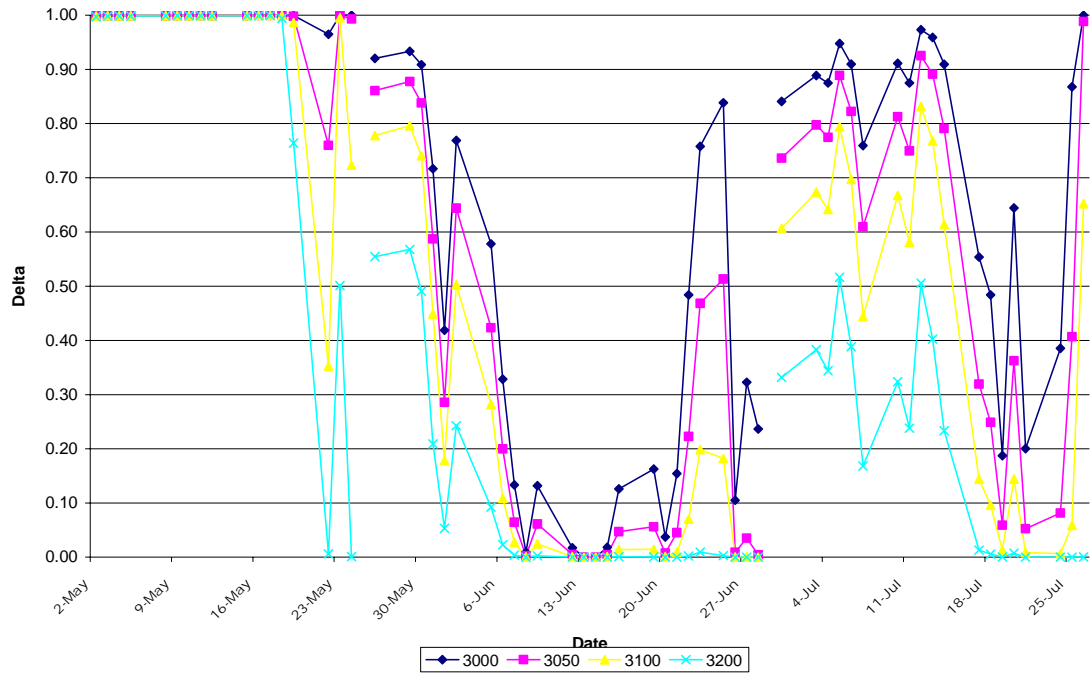
Delta Hedging strategies:

Long Position in Call Option : Short position of N.d_1 shares.

Short position in Call Option : Long Position of N.d_1 shares.

Long position in Put Option : Long position in the underlying stock.

Short position in Put Option : Short position in the underlying stock.

DELTA HEDGING

Portfolio=	$"-C_1+N(d_1)S"$

In order to create delta neutral position a person should take Opposite position to that of Call Option so that the value of the Portfolio remains the same if there is any change in the value of Stock Price.

The amount of shares that have to be purchased in order to make the above portfolio delta neutral is given by N(d1). That is for every Option that is purchased Nd1 shares of the underlying must be bought so that the changes in the value of Stock will not affect the value of Portfolio.

Delta Hedging Strategies

Long Position in Call Option : Short position of N.d_1
shares

Short position in Call Option : Long Position of N.d_1
shares

Long position in Put Option : Long position in the underlying stock

Short position in Put Option : Short position in the underlying stock

If the call Price is Rs 7.97 and the Put Price is Rs 8.91 for a stock which has exercise price of 105 and strike price of 100.

The various parameters of the Option are

Parameters of Option	Call	Put
Delta	0.52430	-0.47570
Gamma	0.01889	0.01889
Theta	-12.06104	-3.98600
Vega	27.95787	27.95787
Rho	-27.92	-27.85

In the above case if the call price is 7.67 with the delta of .5243 then for every option that is purchased .5243 shares of the Underlying stock must be kept.

If a person buys 100 calls for 79.70 then he should have short of roughly 53 shares so that he is delta neutral.

His portfolio will be

Long 100 calls   -767

short 53 shares   5243

Portfolio   4476

Now if the stock price changes to Rs 105 then the value of call option will be Rs 10.82

His portfolio now will be

Long 100 calls	-1082
Short 53 calls	5505.15
Portfolio	4423.15

Thus with help of delta hedging his portfolio has been hedged against the loss in value.

Gamma

Gamma is the rate at which an Option's Delta changes as the price of underlying changes. It is a measure that how fast an Option change sits directional characteristics. If the gamma is extremely large then Delta is highly sensitive to the price of underlying asset. Both the calls and puts have positive gammas. Gamma is greatest for an option that is at the money and becomes progressively small as the Option moves in the money or out of the money. **Gamma of the underlying is always 0** because the delta is 1.

Measurement of Gamma: $N d_1 / S \sigma \sqrt{(T-t)}$.

Making Portfolio Gamma neutral

Since the underlying stock has zero gamma only way by which the portfolio can be made Gamma neutral is taking a position in the traded option. But by taking a position in the traded option will result in changing the delta so again a position must be taken in the underlying stock as a result of change in delta.

The position that must be taken in the traded option to make it Gamma neutral :
$$-\Gamma / \Gamma$$

GAMMA

S&P CNX NIFTY		EXERCISE PRICE			
Date	SPOT	3000	3050	3100	3200
2-May-06	3605.45	0.00000	0.00000	0.00000	0.00004
3-May-06	3634.25	0.00000	0.00000	0.00000	0.00002
4-May-06	3648.40	0.00000	0.00000	0.00000	0.00001
5-May-06	3663.95	0.00000	0.00000	0.00000	0.00001
8-May-06	3693.15	0.00000	0.00000	0.00000	0.00000
9-May-06	3720.55	0.00000	0.00000	0.00000	0.00000
10-May-06	3754.25	0.00000	0.00000	0.00000	0.00000
11-May-06	3701.05	0.00000	0.00000	0.00000	0.00000
12-May-06	3650.05	0.00000	0.00000	0.00000	0.00000
15-May-06	3502.95	0.00000	0.00000	0.00000	0.00001
16-May-06	3523.30	0.00000	0.00000	0.00000	0.00000
17-May-06	3635.10	0.00000	0.00000	0.00000	0.00000
18-May-06	3388.90	0.00000	0.00000	0.00000	0.00019
19-May-06	3246.90	0.00000	0.00007	0.00049	0.00403
22-May-06	3081.35	0.00168	0.00673	0.00804	0.00033
23-May-06	3199.35	0.00000	0.00000	0.00035	0.00905
24-May-06	3115.55	0.00000	0.00070	0.01242	0.00011
25-May-06	3177.70				
26-May-06	3209.6	0.00090	0.00135	0.00183	0.00217
29-May-06	3214.9	0.00082	0.00130	0.00182	0.00226
30-May-06	3185.3	0.00107	0.00161	0.00214	0.00233
31-May-06	3071.05	0.00236	0.00272	0.00276	0.00171
1-Jun-06	2962.25	0.00288	0.00251	0.00192	0.00066
2-Jun-06	3091.35	0.00218	0.00268	0.00287	0.00193
5-Jun-06	3016.65	0.00306	0.00306	0.00264	0.00108
6-Jun-06	2937.3	0.00296	0.00230	0.00153	0.00036
7-Jun-06	2860.45	0.00186	0.00109	0.00055	0.00007
8-Jun-06	2724.35	0.00022	0.00008	0.00002	0.00000
9-Jun-06	2866.3	0.00193	0.00109	0.00052	0.00006
12-Jun-06	2776.85	0.00043	0.00015	0.00004	0.00000
13-Jun-06	2663.3	0.00001	0.00000	0.00000	0.00000
14-Jun-06	2632.8	0.00000	0.00000	0.00000	0.00000
15-Jun-06	2798.8	0.00049	0.00015	0.00004	0.00000
16-Jun-06	2890.35	0.00230	0.00109	0.00040	0.00002

19-Jun-06	2916.9	0.00308	0.00142	0.00046	0.00002
20-Jun-06	2861.3	0.00110	0.00029	0.00005	0.00000
21-Jun-06	2923.45	0.00332	0.00133	0.00035	0.00001
22-Jun-06	2994.75	0.00581	0.00435	0.00197	0.00008
23-Jun-06	3042.7	0.00484	0.00617	0.00432	0.00033
25-Jun-06	3050.3	0.00463	0.00756	0.00501	0.00015
26-Jun-06	2943.2	0.00413	0.00056	0.00002	0.00000
27-Jun-06	2982.45	0.00984	0.00212	0.00008	0.00000
28-Jun-06	2981.1	0.01196	0.00049	0.00000	0.00000
29-Jun-06	2997.9				
30-Jun-06	3128.2	0.00171	0.00232	0.00273	0.00224
3-Jul-06	3150.95	0.00141	0.00210	0.00269	0.00250
4-Jul-06	3138.65	0.00157	0.00230	0.00286	0.00246
5-Jul-06	3197.1	0.00081	0.00145	0.00219	0.00272
6-Jul-06	3156.4	0.00129	0.00207	0.00278	0.00268
7-Jul-06	3075.85	0.00261	0.00322	0.00332	0.00180
10-Jul-06	3142	0.00142	0.00239	0.00324	0.00279
11-Jul-06	3116.15	0.00190	0.00294	0.00362	0.00248
12-Jul-06	3195.9	0.00056	0.00130	0.00234	0.00330
13-Jul-06	3169.3	0.00084	0.00181	0.00297	0.00331
14-Jul-06	3123.35	0.00166	0.00294	0.00392	0.00272
17-Jul-06	3007.55	0.00480	0.00434	0.00275	0.00034
18-Jul-06	2993.65	0.00513	0.00408	0.00219	0.00017
19-Jul-06	2932.75	0.00375	0.00164	0.00046	0.00001
20-Jul-06	3023.05	0.00538	0.00542	0.00328	0.00024
21-Jul-06	2945	0.00449	0.00172	0.00037	0.00000
24-Jul-06	2985.85	0.00855	0.00337	0.00041	0.00000
25-Jul-06	3040.5	0.00575	0.01043	0.00315	0.00000
26-Jul-06	3110.15	0.00000	0.00112	0.01373	0.00006
27-Jul-06	3156.15				

Gamma of Put and Call

78
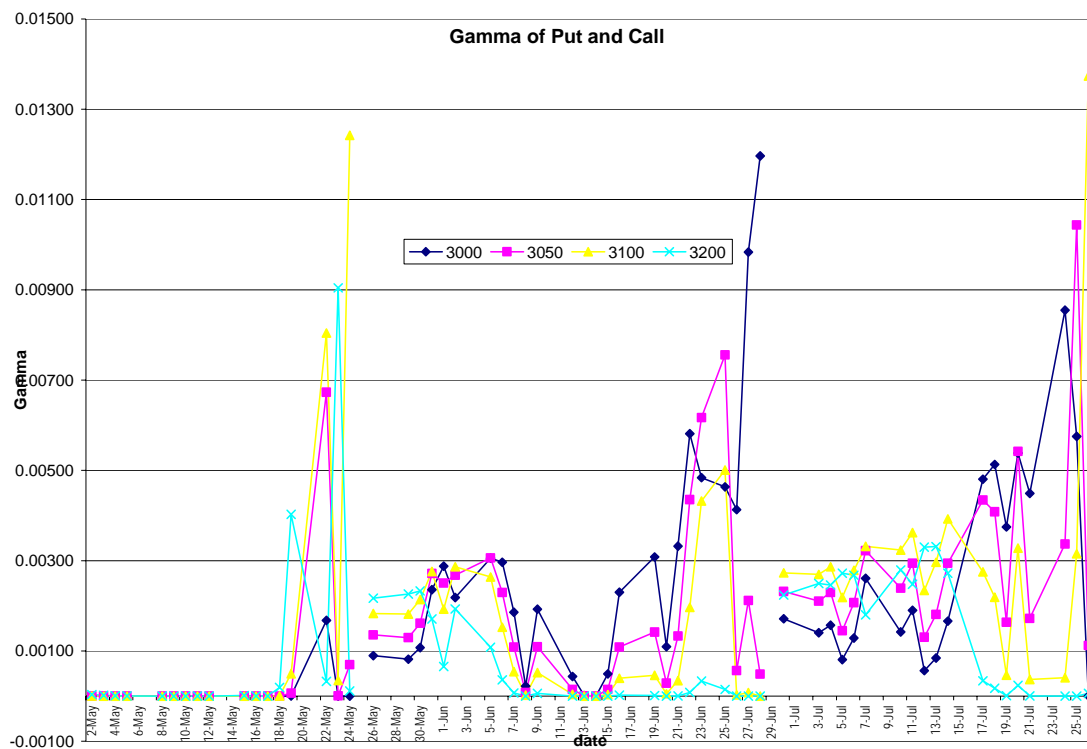
Analysis of Option parameters:

Methodology:

The entire project deals with analysis of Option price and its technical parameters for three month period starting from 2nd May 2006 to 27th July 2006. Actual Nifty closing prices have been taken for the above period along with Call and Put prices for four series 3000, 3050, 3100 and 3200. These actual prices are then compared with theoretical Option price using black scholes model along with Option parameters Delta, Gamma, Vega, Theta and Rho.

NIFTY Movements for the three month period since May has been generally volatile as can be compared from the historical volatility .The historical volatility from 1st Jan to 30th april is 14.30% while historical volatility from 2nd may to 27th july was 43.45%. This volatility is attributable to general market perception regarding the future price
movements as many investors were perceiving Indian market to be too highly priced compared with other markets with price multiple of 25.This along with high oil price, uncertainty regarding US interest rates and meltdown of metal prices lead to downfall of nifty from 3605.45 on 2nd may to 3156.15 on 27th july (High – 3754.25 / Low – 2632.80).

Delta and Gamma:

If we analyze the May series, NIFTY was trading at 3605.45 on 2nd may and all the given option series (i.e.) 3000, 3050, 3100 and 3200 were considerably *deep in-the-money* Call Options as they were expected to be exercised by the holder of call option on the day of expiry.

The Delta for 3200 series was 1.00 till 18th may along with other series of lower exercise price, but sudden collapse of NIFTY from 3635.10 on 17th may to 3081.35 on 22nd may,

changed the entire scenario. The options which were deep in the money till 18th may suddenly

changed to out-of-the money, thereby declining the probability that they will yield positive

returns as reflected by change in Delta from 0.99 to 0.33 and 0.79 to 0.00 for 3100 and 3200

series respectively as can been seen from the chart above in the month of may for the given

series.

Also analyzing the above chart, it can be seen that Options with higher exercise price have

lower delta when compared to Options with lower exercise price, as they are considered more

volatile since they have higher probability that they will be exercised on the date of maturity.

Since these options have higher delta, they are also expected to show significant fluctuations

to change in strike price when compared to options of lower exercise price.

The reverse of the Call option is applicable in case of Put Options. All the series were out-of

the money in the month of May with 0 Delta, as Put options were expected to go unexercised

on the date of expiry but due to downward movement of NIFTY, these options turned out to

be in in-the-money, 3200 series and 3100 series as NIFTY was in the range of 3100-3200

during the last trading days of may. The rest of the series with exercise price of 3000 and

3050 continued to be out-of money. The fall of delta on 22nd may can be explained by fall in

NIFTY to 3081.35 from 3635.10 on 17th may.

Theta :

Theta of a portfolio of derivatives, Θ is the rate of change of the value of the portfolio with

respect to time. Theta is negative for an Option because as the time to maturity decreases the

Option becomes less valuable. Its expressed as points per day.

For European Call Option:

$$\Theta = - SN(d_1)\sigma - r \quad X e^{-r(T-t)} N(d_2) / 2\sqrt{(T-t)}$$

For European Put Option :

$$\Theta = - SN(d_1)\sigma + r \quad X e^{-r(T-t)} N(d_2) / 2\sqrt{(T-t)}$$

Vega (υ) :

Vega is the rate of change of the value of the Portfolio with respect to the volatility of the underlying asset. If Vega is high then the portfolio is highly sensitive to the small changes in the volatility. Since all the options gain value when the volatility increase , the Vegas for both Calls and Puts is positive. At the money option has always greater Vega than in the money or out of the money option .Vega of all the Options decline as the expiration approaches because less time to expiration means any change in volatility will only have minor effect on the options value.

For Non-dividend paying stock:

$$\upsilon = S\sqrt{(T-t)} \ N(d_1)$$

For stock that pays divided with annual yield of q

$$\upsilon = S\sqrt{(T-t)} \ N(d_1) \ e^{-q(T-t)}$$

S&P CNX NIFTY		EXERCISE PRICE			
Date	SPOT	3000	3050	3100	3200
2-May-06	3605.45	0.01	0.08	0.37	4.74
3-May-06	3634.25	0.00	0.02	0.13	2.11
4-May-06	3648.40	0.00	0.01	0.06	1.18
5-May-06	3663.95	0.00	0.00	0.02	0.60

8-May-06	3693.15	0.00	0.00	0.00	0.08
9-May-06	3720.55	0.00	0.00	0.00	0.02
10-May-06	3754.25	0.00	0.00	0.00	0.00
11-May-06	3701.05	0.00	0.00	0.00	0.01
12-May-06	3650.05	0.00	0.00	0.00	0.03
15-May-06	3502.95	0.00	0.00	0.01	0.84
16-May-06	3523.30	0.00	0.00	0.00	0.19
17-May-06	3635.10	0.00	0.00	0.00	0.00
18-May-06	3388.90	0.00	0.00	0.08	7.37
19-May-06	3246.90	0.14	1.91	14.13	128.01
22-May-06	3081.35	21.64	86.78	103.69	4.91
23-May-06	3199.35	142.29	214.79	290.00	386.19
24-May-06	3115.55	118.59	188.01	263.71	367.49
25-May-06	3177.70				
26-May-06	3209.6	147.93	222.28	294.61	363.56
29-May-06	3214.9	291.84	336.32	341.95	248.55
30-May-06	3185.3	320.04	278.57	213.96	88.81
31-May-06	3071.05	254.76	312.52	334.84	262.66
1-Jun-06	2962.25	302.13	302.52	261.08	128.07
2-Jun-06	3091.35	266.27	206.13	137.23	39.81
5-Jun-06	3016.65	151.16	88.51	44.46	7.29
6-Jun-06	2937.3	15.74	5.37	1.57	0.09
7-Jun-06	2860.45	143.24	81.10	38.78	5.51
8-Jun-06	2724.35	25.73	8.68	2.42	0.11
9-Jun-06	2866.3	0.72	0.13	0.02	0.00
12-Jun-06	2776.85	0.13	0.02	0.00	0.00
13-Jun-06	2663.3	24.39	7.35	1.75	0.05
14-Jun-06	2632.8	112.95	53.50	19.50	1.24
15-Jun-06	2798.8	118.65	54.54	17.77	0.72
16-Jun-06	2890.35	36.53	9.57	1.72	0.02
19-Jun-06	2916.9	102.80	41.12	10.69	0.22
20-Jun-06	2861.3	165.22	123.64	55.86	2.76
21-Jun-06	2923.45	121.65	155.06	108.67	9.93
22-Jun-06	2994.75	78.07	127.27	84.40	2.96
23-Jun-06	3042.7	48.58	6.63	0.28	0.00
25-Jun-06	3050.3	79.20	17.05	0.63	0.00
26-Jun-06	2943.2	48.13	1.97	0.00	0.00
27-Jun-06	2982.45	204.87	276.93	326.42	308.50

28-Jun-06	2981.1	151.68	226.85	290.52	307.97
29-Jun-06	2997.9				
30-Jun-06	3128.2	160.93	235.63	293.62	289.67
3-Jul-06	3150.95	82.32	147.44	222.44	312.41
4-Jul-06	3138.65	121.94	195.96	263.71	289.81
5-Jul-06	3197.1	223.35	275.83	284.05	180.71
6-Jul-06	3156.4	108.02	181.75	245.87	243.53
7-Jul-06	3075.85	133.66	206.94	254.57	201.73
10-Jul-06	3142	39.15	90.39	162.35	258.17
11-Jul-06	3116.15	53.64	115.01	188.82	240.00
12-Jul-06	3195.9	95.44	168.95	225.23	180.28
13-Jul-06	3169.3	196.63	177.80	112.73	16.71
14-Jul-06	3123.35	187.26	148.99	80.06	7.67
17-Jul-06	3007.55	116.71	50.97	14.45	0.34
18-Jul-06	2993.65	155.81	156.93	94.96	8.30
19-Jul-06	2932.75	105.82	40.53	8.70	0.08
20-Jul-06	3023.05	103.46	40.78	4.97	0.00
21-Jul-06	2945	48.15	87.31	26.37	0.02
24-Jul-06	2985.85	0.01	4.91	60.13	0.30
25-Jul-06	3040.5	0.00	0.04	3.22	94.45
26-Jul-06	3110.15	0.00	3.06	54.57	0.57
27-Jul-06	3156.15				

Vega of Put
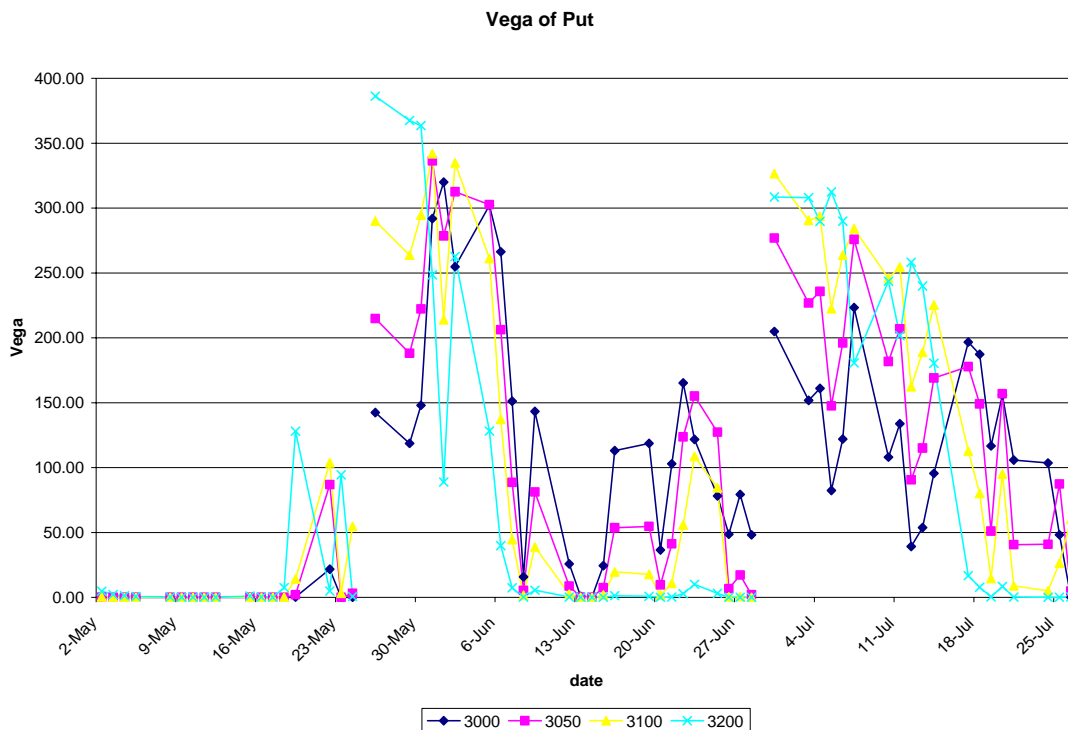
Analysis of Vega of Call and Put Options

A high vega implies that the Option price highly sensitive to the small changes in the volatility. In the above scenario for the may series, vega was quite low during the initial 18 days when the market was range bound, but as the may series reached close to expiry, Vega also fluctuated contrary to the general practice according to which Vega of an Option declines as expiration approaches , due to the fact that less time to expiration means any change in volatility will only have minor effect on the options value. But since the market was highly volatile during the ending period of may, Vega of may series increased to reflect those changes in volatility.

As far as June and July series is concerned, we can see than Vega of all the four series have declined steadily towards the end of expiry.

Within the june and july series also towards the end of expiry, Vega was particulary lower for the series which had higher exercise price when compared to those series which had lower exercise price.

RHO :

Rho of a portfolio is the change in value of portfolio with respect to change in interest rate. It measures the sensitivity of the value of the portfolio with respect to interest rates.

For Call Options:

Rho = X (T-t) $e^{-r(T-t)}$ N (d$_2$)

For Put Options:

Rho = - X (T-t) $e^{-r(T-t)}$ N (-d$_2$)

Elasticity:

Elasticity is the percentage change in the Options value to the percentage change in the underlying. Elasticity of an Option is also referred as Leverage. Greater the Options Elasticity more leveraged the Option is.

Elasticity = (Underlying Price * Delta)/ Theoretical Value.

Comparison of theoretical and actual price of Option:

In the given model, we have assumed interest rate which is risk free interest rate of 5% and dividend yield of 2%. The Volatility used for the calculation purpose is 14.68% which is historical volatility for six month period beginning 1ˢᵗ January 2006.If we look at the above chart, it clearly shows that the Call Options of 3000 to 3200 were generally under priced in the month of may when the market was all the options were over priced in the month of June when the market was bearish. In the month of July when the market was volatile and range bound, all the series were under priced except 3000 which was overpriced.

Comparison of theoretical edge of Put option for the above series show that Put options were over priced for all the four series for entire three months since May 2006.

In the month of May, where call were under priced, Put options were overpriced and in the month of June when Call option were also overpriced, Put options were too overpriced but they were comparatively higher priced than Call options. Similarly the above explanation also holds true for the month of July where Put options were comparatively overpriced than the Call Options. One reason for the above mismatch between Call and Put price can be attributed to the fact that writer of Put option in bearish market might expect more premium from the buyer in order to mitigate himself from further fall in the market.

THEORETICAL EDGE FOR CALL

S&P CNX NIFTY		EXERCISE PRICE			
Date	SPOT	3000	3050	3100	3200
2-May-06	3605.45	10.35	5.50	0.66	10.85
3-May-06	3634.25	21.90	12.15	38.20	26.53
4-May-06	3648.40	24.12	26.07	13.11	27.21
5-May-06	3663.95	17.34	38.08	9.92	47.70
8-May-06	3693.15	13.59	66.61	21.92	12.16
9-May-06	3720.55	9.16	70.77	42.08	4.80
10-May-06	3754.25	11.32	27.43	-0.27	7.73
11-May-06	3701.05	5.86	-25.94	-30.80	1.24
12-May-06	3650.05	17.69	-12.12	-42.28	-36.86
15-May-06	3502.95	33.69	-159.79	-20.73	24.92
16-May-06	3523.30	5.26	-139.68	33.43	36.66
17-May-06	3635.10	1.79	42.35	-3.10	-11.84
18-May-06	3388.90	0.73	-203.98	-48.68	2.00
19-May-06	3246.90	8.30	-346.13	-36.45	-63.51
22-May-06	3081.35	-39.98	-60.89	-65.52	-49.71
23-May-06	3199.35	-12.58	-23.51	-41.64	-66.81
24-May-06	3115.55	-1.36	2.21	-24.33	-17.14
25-May-06	3177.70				
26-May-06	3209.6	-19.75	-48.69	-35.78	-52.08
29-May-06	3214.9	-10.22	11.57	-29.64	-48.20
30-May-06	3185.3	2.12	3.54	-15.90	-30.25
31-May-06	3071.05	-48.78	-53.91	-55.77	-50.62
1-Jun-06	2962.25	-56.70	-54.75	-51.53	-37.61
2-Jun-06	3091.35	-60.10	-59.32	-65.34	-55.12
5-Jun-06	3016.65	-57.37	-60.21	-55.09	-42.39
6-Jun-06	2937.3	-63.80	-56.73	-50.44	-31.93
7-Jun-06	2860.45	-62.58	-49.99	-37.99	-20.83
8-Jun-06	2724.35	-39.63	-25.16	-22.08	-13.05
9-Jun-06	2866.3	-49.03	-40.76	-30.93	-20.26
12-Jun-06	2776.85	-25.04	-17.54	-13.12	-8.45
13-Jun-06	2663.3	-19.19	-12.80	-11.25	-6.70
14-Jun-06	2632.8	-16.00	-10.65	-9.80	-5.70
15-Jun-06	2798.8	-30.56	-20.62	-16.23	-8.60
16-Jun-06	2890.35	-56.07	-41.42	-30.31	-16.43

19-Jun-06	2916.9	-56.08	-43.06	-31.54	-14.99
20-Jun-06	2861.3	-26.31	-21.86	-16.68	-8.60
21-Jun-06	2923.45	-32.66	-20.23	-14.63	-7.00
22-Jun-06	2994.75	-31.69	-29.36	-21.49	-10.06
23-Jun-06	3042.7	-24.05	-30.62	-26.85	-10.55
25-Jun-06	3050.3	-26.10	-32.91	-27.46	-12.75
26-Jun-06	2943.2	-23.55	-13.71	-8.30	-3.70
27-Jun-06	2982.45	-25.63	-16.85	-8.94	-2.55
28-Jun-06	2981.1	-20.99	-8.42	-3.25	-0.60
29-Jun-06	2997.9				
30-Jun-06	3128.2	-5.85	-0.50	-0.20	-0.25
3-Jul-06	3150.95	19.01	-50.40	-52.58	-48.12
4-Jul-06	3138.65	38.51	-33.80	-39.34	-40.02
5-Jul-06	3197.1	36.01	-33.52	-39.51	-36.78
6-Jul-06	3156.4	63.00	-20.07	-24.34	-27.36
7-Jul-06	3075.85	46.78	-16.35	-33.65	-34.40
10-Jul-06	3142	27.93	-28.03	-31.22	-24.99
11-Jul-06	3116.15	43.31	-29.45	-36.10	-33.00
12-Jul-06	3195.9	33.93	-33.49	-39.12	-33.84
13-Jul-06	3169.3	67.95	-19.70	-23.21	-27.47
14-Jul-06	3123.35	68.85	-8.35	-18.63	-24.55
17-Jul-06	3007.55	57.56	-10.07	-19.57	-20.44
18-Jul-06	2993.65	10.03	-26.03	-21.96	-10.83
19-Jul-06	2932.75	6.77	-23.98	-18.73	-8.81
20-Jul-06	3023.05	-2.97	-14.65	-9.93	-4.90
21-Jul-06	2945	19.06	-21.55	-17.49	-5.09
24-Jul-06	2985.85	0.17	-10.38	-6.58	-2.00
25-Jul-06	3040.5	3.22	-14.10	-8.66	-2.90
26-Jul-06	3110.15	32.12	-17.91	-10.42	-1.75
27-July-06	3156.15	80.74	-6.25	-12.94	-2.20

Comparison of Theoretical and Actual Price
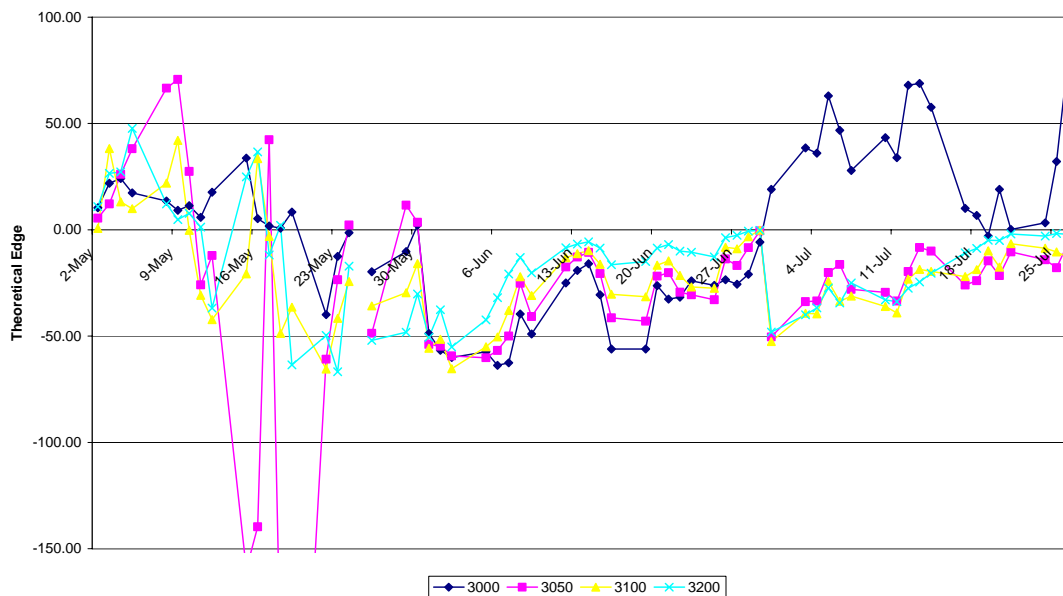
THEORETICAL EDGE FOR CALL

S&P CNX NIFTY		Exercise Price			
Date	SPOT	3000	3050	3100	3200
2-May-06	3605.45	-1.50	-5.15	-3.40	-6.28
3-May-06	3634.25	-3.70	-5.15	-3.00	-5.02
4-May-06	3648.40	-1.55	-4.90	-5.00	-5.44
5-May-06	3663.95	-2.00	-4.00	-5.00	-4.89
8-May-06	3693.15	-1.50	-4.00	-3.00	-3.15
9-May-06	3720.55	-1.35	-3.50	-3.00	-4.65
10-May-06	3754.25	-5.00	-4.90	-4.90	-3.50
11-May-06	3701.05	-4.20	-4.90	-4.90	-3.10
12-May-06	3650.05	-3.10	-5.60	-4.50	-4.70
15-May-06	3502.95	-1.85	-5.80	-5.50	-6.04
16-May-06	3523.30	-2.65	-3.40	-4.15	-6.45
17-May-06	3635.10	-2.25	-3.70	-3.00	-4.35
18-May-06	3388.90	-10.35	-11.20	-17.25	-31.21
19-May-06	3246.90	-20.55	-36.37	-46.88	-74.47
22-May-06	3081.35	-97.70	-108.48	-106.39	-111.97
23-May-06	3199.35	-26.25	-39.55	-50.74	-74.48

24-May-06	3115.55	-34.30	-48.69	-55.78	-51.81
25-May-06	3177.70				
26-May-06	3209.6	-61.57	-70.49	-82.56	-94.58
29-May-06	3214.9	-58.53	-65.25	-79.62	-93.80
30-May-06	3185.3	-64.45	-73.44	-84.33	-97.59
31-May-06	3071.05	-97.05	-101.67	-104.33	-95.93
1-Jun-06	2962.25	-133.65	-130.44	-128.75	-122.92
2-Jun-06	3091.35	-99.16	-105.51	-103.57	-97.41
5-Jun-06	3016.65	-124.35	-119.85	-122.25	-109.93
6-Jun-06	2937.3	-107.09	-63.73	-92.50	-81.95
7-Jun-06	2860.45	-87.92	-58.57	-66.48	-51.71
8-Jun-06	2724.35	-64.87	-64.84	-55.55	-32.31
9-Jun-06	2866.3	-92.20	-36.62	-71.37	-56.33
12-Jun-06	2776.85	-88.78	50.80	-73.44	-75.46
13-Jun-06	2663.3	-47.83	30.06	-33.85	-33.47
14-Jun-06	2632.8	-25.54	80.10	-24.30	-12.21
15-Jun-06	2798.8	-49.61	-26.72	-28.07	-27.63
16-Jun-06	2890.35	-62.20	-61.99	-42.87	-6.17
19-Jun-06	2916.9	-64.79	-47.59	-36.29	-10.67
20-Jun-06	2861.3	-65.19	-24.46	-28.69	-25.98
21-Jun-06	2923.45	-50.16	-36.59	-24.95	-17.47
22-Jun-06	2994.75	-47.71	-52.83	-42.66	-31.63
23-Jun-06	3042.7	-29.97	-26.12	-28.49	-11.57
25-Jun-06	3050.3	-33.78	-38.36	-32.39	-20.34
26-Jun-06	2943.2	-36.59	-13.63	-7.94	-8.23
27-Jun-06	2982.45	-27.62	-17.51	-12.71	-11.85
28-Jun-06	2981.1	-19.44	-2.02	7.04	8.63
29-Jun-06	2997.9				
30-Jun-06	3128.2	-64.54	-71.94	-73.15	-63.66
3-Jul-06	3150.95	-56.34	-64.37	-68.17	-66.78
4-Jul-06	3138.65	-57.23	-67.11	-71.41	-67.70
5-Jul-06	3197.1	-44.13	-53.95	-58.27	-60.74
6-Jul-06	3156.4	-48.76	-58.83	-63.63	-62.72
7-Jul-06	3075.85	-64.16	-70.51	-70.98	-64.47
10-Jul-06	3142	-47.15	-54.67	-59.33	-56.07
11-Jul-06	3116.15	-53.01	-60.99	-64.43	-59.56
12-Jul-06	3195.9	-30.48	-36.38	-43.40	-48.86
13-Jul-06	3169.3	-32.72	-40.51	-49.14	-53.65

14-Jul-06	3123.35	-39.25	-48.23	-54.07	-54.26
17-Jul-06	3007.55	-55.03	-56.56	-50.11	-39.71
18-Jul-06	2993.65	-49.46	-45.56	-41.18	-31.58
19-Jul-06	2932.75	-43.72	-37.36	-31.59	-23.92
20-Jul-06	3023.05	-29.61	-25.96	-23.30	-13.15
21-Jul-06	2945	-25.18	-17.82	-14.05	-8.31
24-Jul-06	2985.85	-20.37	-15.02	-7.44	-0.42
25-Jul-06	3040.5	-16.62	-18.02	-13.63	-2.29
26-Jul-06	3110.15	-2.25	-4.94	-12.45	-4.16
27-July-06	3156.15				

Theoritical Egde Put

Legend: 3000, 3050, 3100, 3200
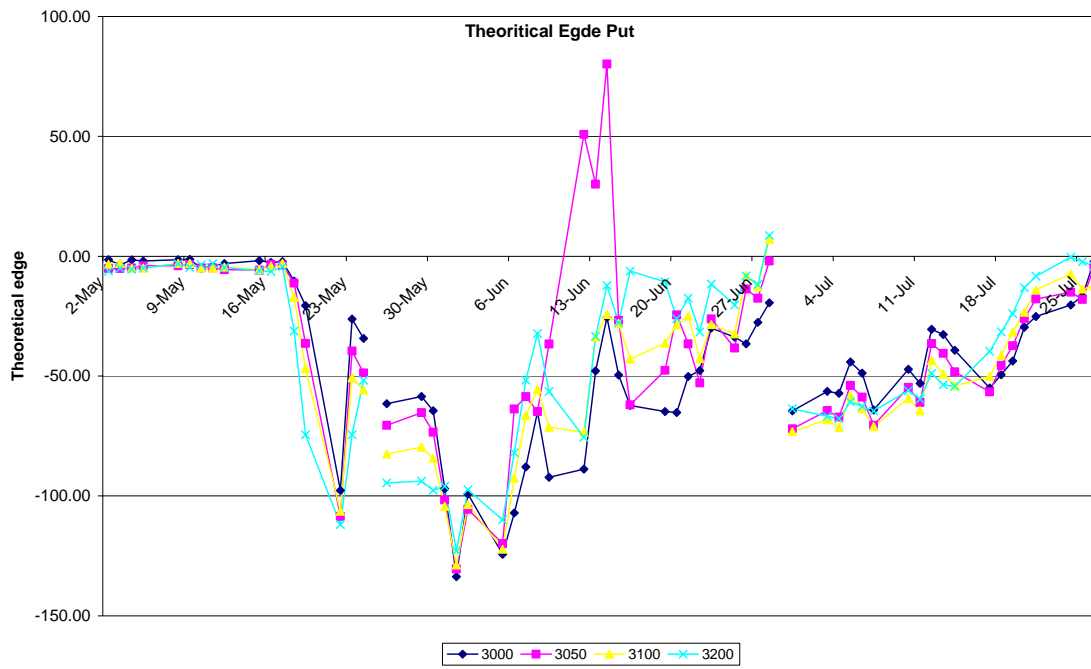
Relative Strength Index (RSI)

Date	Close	Up	Down	AvgGain	AvgLoss	RS	RSI
2-Jan-06	2835.95						
3-Jan-06	2883.35	47.4	47.4				
4-Jan-06	2904.4	21.1	21.1				
5-Jan-06	2899.85	-4.6	4.6				
6-Jan-06	2914	14.2	14.2				
9-Jan-06	2910.1	-3.9	3.9				
10-Jan-06	2870.8	-39.3	39.3				
12-Jan-06	2850.7	-20.1	20.1				
13-Jan-06	2850.55	-0.1	0.1				
16-Jan-06	2833.1	-17.5	17.5				
17-Jan-06	2829.1	-4.0	4.0				
18-Jan-06	2809.2	-19.9	19.9				
19-Jan-06	2870.85	61.7	61.7				
20-Jan-06	2900.95	30.1	30.1				
23-Jan-06	2884.05	-16.9	16.9	12.45	9.02	1.38	58.00
24-Jan-06	2908	23.9	23.9	13.27	8.37	1.59	61.32
25-Jan-06	2940.35	32.3	32.3	14.64	7.78	1.88	65.31
27-Jan-06	2982.75	42.4	42.4	16.62	7.22	2.30	69.71
30-Jan-06	2974.5	-8.3	8.3	15.43	7.29	2.12	67.91
31-Jan-06	3001.1	26.6	26.6	16.23	6.77	2.40	70.56
1-Feb-06	2971.55	-29.5	29.5	15.07	8.40	1.79	64.21
2-Feb-06	2967.45	-4.1	4.1	13.99	8.09	1.73	63.36
3-Feb-06	2940.6	-26.8	26.8	13.00	9.43	1.38	57.94
6-Feb-06	3000.45	59.8	59.8	16.34	8.76	1.87	65.11
7-Feb-06	3020.1	19.7	19.7	16.58	8.13	2.04	67.09
8-Feb-06	3008.95	-11.2	11.2	15.39	8.35	1.84	64.84
10-Feb-06	3027.55	18.6	18.6	15.62	7.75	2.02	66.84
13-Feb-06	3041.15	13.6	13.6	15.48	7.20	2.15	68.26
14-Feb-06	3017.55	-23.6	23.6	14.37	8.37	1.72	63.20
15-Feb-06	3022.2	4.6	4.6	13.68	7.77	1.76	63.77
16-Feb-06	3021.6	-0.6	0.6	12.70	7.26	1.75	63.63
17-Feb-06	2981.5	-40.1	40.1	11.79	9.61	1.23	55.11
20-Feb-06	3005.85	24.3	24.3	12.69	8.92	1.42	58.73
21-Feb-06	3035.5	29.7	29.7	13.90	8.28	1.68	62.67

22-Feb-06	3050.8	15.3	15.3		14.00	7.69	1.82	64.55
23-Feb-06	3062.1	11.3	11.3		13.81	7.14	1.93	65.91
24-Feb-06	3050.05	-12.0		12.0	12.82	7.49	1.71	63.12
27-Feb-06	3067.45	17.4	17.4		13.15	6.96	1.89	65.40
28-Feb-06	3074.7	7.3	7.3		12.73	6.46	1.97	66.33
1-Mar-06	3123.1	48.4	48.4		15.28	6.00	2.55	71.80
2-Mar-06	3150.7	27.6	27.6		16.16	5.57	2.90	74.36
3-Mar-06	3147.35	-3.3		3.3	15.00	5.41	2.77	73.49
6-Mar-06	3190.4	43.1	43.1		17.01	5.02	3.38	77.19
7-Mar-06	3182.8	-7.6		7.6	15.79	5.21	3.03	75.20
8-Mar-06	3116.7	-66.1		66.1	14.66	9.56	1.53	60.54
9-Mar-06	3129.1	12.4	12.4		14.50	8.88	1.63	62.03
10-Mar-06	3183.9	54.8	54.8		17.38	8.24	2.11	67.83
13-Mar-06	3202.65	18.8	18.8		17.48	7.65	2.28	69.55
14-Mar-06	3195.35	-7.3		7.3	16.23	7.63	2.13	68.03
16-Mar-06	3226.6	31.3	31.3		17.30	7.08	2.44	70.95
17-Mar-06	3234.05	7.5	7.5		16.60	6.58	2.52	71.62
20-Mar-06	3265.65	31.6	31.6		17.67	6.11	2.89	74.32
21-Mar-06	3262.3	-3.3		3.3	16.41	5.91	2.78	73.52
22-Mar-06	3240.15	-22.2		22.2	15.24	7.07	2.15	68.30
23-Mar-06	3247.15	7.0	7.0		14.65	6.57	2.23	69.05
24-Mar-06	3279.8	32.7	32.7		15.93	6.10	2.61	72.33
27-Mar-06	3321.65	41.8	41.8		17.78	5.66	3.14	75.86
28-Mar-06	3325	3.3	3.3		16.75	5.26	3.19	76.12
29-Mar-06	3354.2	29.2	29.2		17.64	4.88	3.61	78.33
30-Mar-06	3418.95	64.8	64.8		21.01	4.53	4.64	82.25
31-Mar-06	3402.55	-16.4		16.4	19.51	5.38	3.63	78.38
3-Apr-06	3473.3	70.8	70.8		23.17	5.00	4.64	82.26
4-Apr-06	3483.15	9.8	9.8		22.22	4.64	4.79	82.73
5-Apr-06	3510.9	27.8	27.8		22.61	4.31	5.25	84.00
7-Apr-06	3454.8	-56.1		56.1	21.00	8.01	2.62	72.39
10-Apr-06	3478.45	23.6	23.6		21.19	7.44	2.85	74.02
12-Apr-06	3380	-98.4		98.4	19.67	13.94	1.41	58.53
13-Apr-06	3345.5	-34.5		34.5	18.27	15.40	1.19	54.25
17-Apr-06	3425.15	79.7	79.7		22.65	14.30	1.58	61.29
18-Apr-06	3518.1	92.9	92.9		27.67	13.28	2.08	67.57
19-Apr-06	3535.85	17.8	17.8		26.96	12.33	2.19	68.61

20-Apr-06	3573.5	37.7	37.7		27.73	11.45	2.42	70.77
21-Apr-06	3573.05	-0.4		0.4	25.75	10.67	2.41	70.71
24-Apr-06	3548.9	-24.2		24.2	23.91	11.63	2.06	67.27
25-Apr-06	3462.65	-86.3		86.3	22.20	16.96	1.31	56.69
26-Apr-06	3555.75	93.1	93.1		27.26	15.75	1.73	63.39
27-Apr-06	3508.1	-47.7		47.7	25.32	18.03	1.40	58.41
28-Apr-06	3508.35	0.3	0.3		23.53	16.74	1.41	58.43
29-Apr-06	3557.6	49.3	49.3		25.36	15.54	1.63	62.00
2-May-06	3605.45	47.8	47.8		26.97	14.43	1.87	65.14
3-May-06	3634.25	28.8	28.8		27.10	13.40	2.02	66.91
4-May-06	3648.4	14.2	14.2		26.18	12.45	2.10	67.78
5-May-06	3663.95	15.5	15.5		25.42	11.56	2.20	68.74
8-May-06	3693.15	29.2	29.2		25.69	10.73	2.39	70.53
9-May-06	3720.55	27.4	27.4		25.81	9.96	2.59	72.15
10-May-06	3754.25	33.7	33.7		26.37	9.25	2.85	74.03
11-May-06	3701.05	-53.2		53.2	24.49	12.39	1.98	66.40
12-May-06	3650.05	-51.0		51.0	22.74	15.15	1.50	60.02
15-May-06	3502.95	-147.1		147.1	21.12	24.57	0.86	46.21
16-May-06	3523.3	20.4	20.4		21.06	22.82	0.92	48.00
17-May-06	3635.1	111.8	111.8		27.54	21.19	1.30	56.52
18-May-06	3388.9	-246.2		246.2	25.58	37.26	0.69	40.70
19-May-06	3246.9	-142.0		142.0	23.75	44.74	0.53	34.67
22-May-06	3081.35	-165.6		165.6	22.05	53.37	0.41	29.24
23-May-06	3199.35	118.0	118.0		28.91	49.56	0.58	36.84
24-May-06	3115.55	-83.8		83.8	26.84	52.01	0.52	34.04
25-May-06	3177.7	62.1	62.1		29.36	48.29	0.61	37.81
26-May-06	3209.6	31.9	31.9		29.54	44.84	0.66	39.72
29-May-06	3214.9	5.3	5.3		27.81	41.64	0.67	40.05
30-May-06	3185.3	-29.6		29.6	25.83	40.78	0.63	38.77
31-May-06	3071.05	-114.3		114.3	23.98	46.03	0.52	34.25
1-Jun-06	2962.25	-108.8		108.8	22.27	50.51	0.44	30.60
2-Jun-06	3091.35	129.1	129.1		29.90	46.90	0.64	38.93
5-Jun-06	3016.65	-74.7		74.7	27.76	48.89	0.57	36.22
6-Jun-06	2937.3	-79.3		79.3	25.78	51.06	0.50	33.55
7-Jun-06	2860.45	-76.9		76.9	23.94	52.91	0.45	31.15
8-Jun-06	2724.35	-136.1		136.1	22.23	58.85	0.38	27.42
9-Jun-06	2866.3	142.0	142.0		30.78	54.64	0.56	36.03

12-Jun-06	2776.85	-89.5		89.5	28.58	57.13	0.50	33.35
13-Jun-06	2663.3	-113.6		113.6	26.54	61.16	0.43	30.26
14-Jun-06	2632.8	-30.5		30.5	24.64	58.97	0.42	29.47
15-Jun-06	2798.8	166.0	166.0		34.74	54.76	0.63	38.82
16-Jun-06	2890.35	91.5	91.5		38.80	50.85	0.76	43.28
19-Jun-06	2916.9	26.6	26.6		37.92	47.22	0.80	44.54
20-Jun-06	2861.3	-55.6		55.6	35.22	47.81	0.74	42.41
21-Jun-06	2923.45	62.1	62.1		37.14	44.40	0.84	45.55
22-Jun-06	2994.75	71.3	71.3		39.58	41.23	0.96	48.98
23-Jun-06	3042.7	47.9	47.9		40.18	38.28	1.05	51.21
25-Jun-06	3050.3	7.6	7.6		37.85	35.55	1.06	51.57
26-Jun-06	2943.2	-107.1		107.1	35.15	40.66	0.86	46.36
27-Jun-06	2982.45	39.3	39.3		35.44	37.75	0.94	48.42
28-Jun-06	2981.1	-1.3		1.3	32.91	35.15	0.94	48.35
29-Jun-06	2997.9	16.8	16.8		31.76	32.64	0.97	49.31
30-Jun-06	3128.2	130.3	130.3		38.80	30.31	1.28	56.14
3-Jul-06	3150.95	22.8	22.8		37.65	28.15	1.34	57.22
4-Jul-06	3138.65	-12.3		12.3	34.96	27.01	1.29	56.41
5-Jul-06	3197.1	58.4	58.4		36.64	25.09	1.46	59.36
6-Jul-06	3156.4	-40.7		40.7	34.02	26.20	1.30	56.49
7-Jul-06	3075.85	-80.6		80.6	31.59	30.08	1.05	51.22
10-Jul-06	3142	66.2	66.2		34.06	27.93	1.22	54.94
11-Jul-06	3116.15	-25.8		25.8	31.63	27.78	1.14	53.23
12-Jul-06	3195.9	79.8	79.8		35.06	25.80	1.36	57.61
13-Jul-06	3169.3	-26.6		26.6	32.56	25.86	1.26	55.74
14-Jul-06	3123.35	-46.0		46.0	30.23	27.29	1.11	52.56
17-Jul-06	3007.55	-115.8		115.8	28.07	33.61	0.84	45.51
18-Jul-06	2993.65	-13.9		13.9	26.07	32.21	0.81	44.73
19-Jul-06	2932.75	-60.9		60.9	24.21	34.26	0.71	41.41
20-Jul-06	3023.05	90.3	90.3		28.93	31.81	0.91	47.63
21-Jul-06	2945	-78.1		78.1	26.86	35.11	0.77	43.34
24-Jul-06	2985.85	40.8	40.8		27.86	32.60	0.85	46.08
25-Jul-06	3040.5	54.7	54.7		29.77	30.28	0.98	49.58
26-Jul-06	3110.15	69.7	69.7		32.62	28.11	1.16	53.71
27-Jul-06	3156.15	46.0	46.0		33.58	26.10	1.29	56.26
28-Jul-06	3130.8	-25.3		25.3	31.18	26.05	1.20	54.48
31-Jul-06	3143.2	12.4	12.4		29.84	24.19	1.23	55.23

1-Aug-06	3147.8	4.6	4.6		28.04	22.46	1.25	55.52
2-Aug-06	3182.1	34.3	34.3		28.48	20.86	1.37	57.73
3-Aug-06	3190	7.9	7.9		27.01	19.37	1.39	58.24
4-Aug-06	3176.75	-13.3		13.3	25.08	18.93	1.33	56.99
7-Aug-06	3151.1	-25.7		25.7	23.29	19.41	1.20	54.54
8-Aug-06	3212.4	61.3	61.3		26.01	18.02	1.44	59.06
9-Aug-06	3254.6	42.2	42.2		27.16	16.74	1.62	61.88
10-Aug-06	3260.1	5.5	5.5		25.62	15.54	1.65	62.24
11-Aug-06	3274.35	14.3	14.3		24.80	14.43	1.72	63.22
14-Aug-06	3313.1	38.8	38.8		25.80	13.40	1.93	65.82
16-Aug-06	3356.05	43.0	43.0		27.03	12.44	2.17	68.47
17-Aug-06	3353.9	-2.2		2.2	25.09	11.71	2.14	68.19
18-Aug-06	3356.75	2.8	2.8		23.51	10.87	2.16	68.38
21-Aug-06	3366	9.3	9.3		22.49	10.10	2.23	69.02
22-Aug-06	3364.6	-1.4		1.4	20.88	9.47	2.20	68.79
					19.39	8.80	2.20	68.79

RSI

NIFTY

98
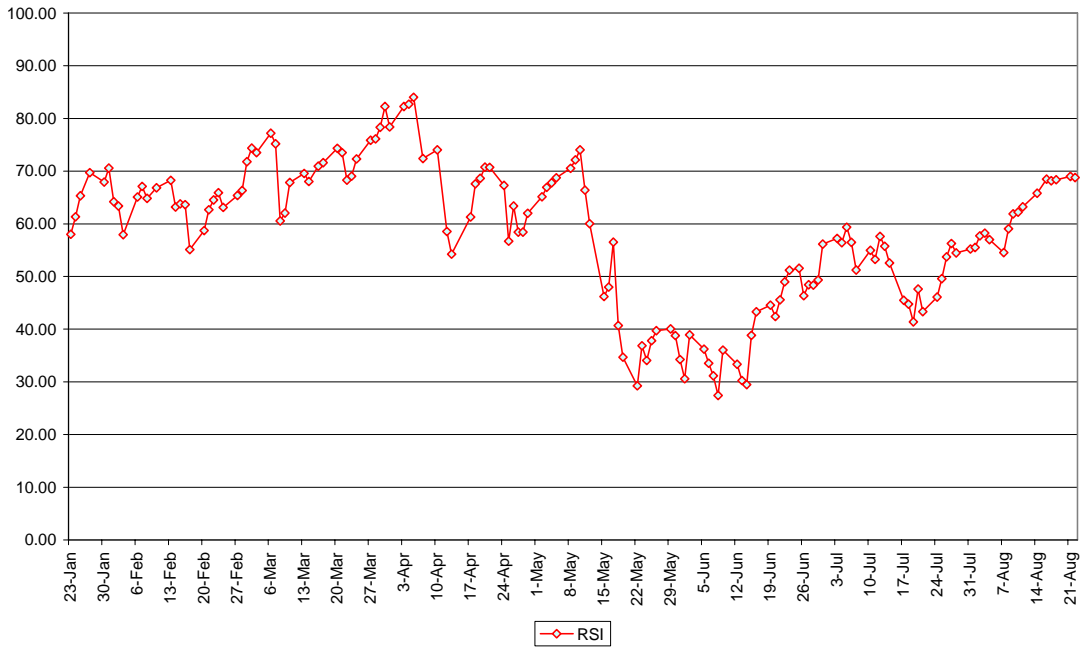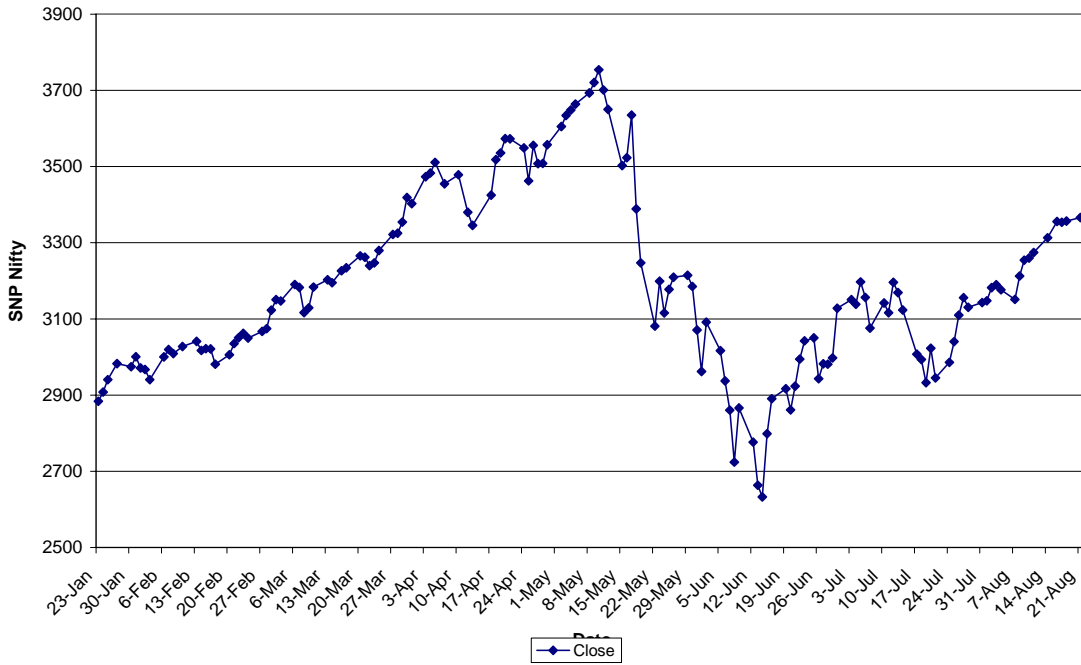
RSI

RSI = 100 - [100/(1 + RS)]

where:

RS = (Avg. of n-day up closes)/(Avg. of n-day down closes)

n= days (9 - 15 day RSI)

The RSI ranges from 0 to 100. At around the 70 level, a stock is considered overbought and one should expect fall in the price of stock. Levels below 30 refer to oversold position and one can expect upward movement in the price of stock from the current level. I

Methodology for RSI calculation

For the calculation of RSI, 14 day moving average period is used.

In the above chart, three month NIFTY data is used starting since 2nd January till 22nd August.

Interpretation

In the above RSI chart, RSI was hovering around the level of 60-70 in the month of January-February, suggesting the early indications that the market may heat up in the days to come. In the month of March and April and 1st 15 days of May ,when NIFTY was at its peak, RSI levels went further to 80 , thus giving a clear indication that market has heaten up and the bull phase is about to get over and one should expect the prices to cool down from the current levels of 3500-3600. In the end of may , after the bull phase as indicated by RSI, market went crashing down and the bear phase continued till mid June , where again RSI level turned to 30 , thus suggesting that market may gain in the near period. The end of bear phase after mid june paved the way for anpther bull phase which continued till end of august.

Implications for Option traders

In January and February, since RSI was at 60 levels and increasing towards 70-80, once could have expected NIFTY to go up and thus a Long Call/ Short put would have been appropriate strategy.

In April and May RSI was at 80 levels, indicating at bearish market, one should have taken short call/ long put.

In mid June as the RSI was at 30 levels, indicating another bull phase, Long Call and Short put should have been appropriate strategy to take.

Trading Strategy using Options:

Using Single Option and the stock:

Long Position in the stock + Short Position in the Call Option.

Short Position in the stock + Long Position in the call Option.

Long Position in the stock +Long Position in the Put option

Short Position in the stock + Short Position in the Put option

Bull Spread:

Buying the call option with a strike price and selling the call option on the same stock with a higher strike price**.** In the Bull Spread if the Stock price does well then the payoff for the investor will be the difference between 2 exercise price. If on the expiration date the stock price lies in between the two exercise price then the payoff will be Strike Price less the Lower exercise price(Long Call). If the stock price is less than both the exercise price then both the calls remain unexercised and investor will lose the initial cost of the spread. In Bull spread the loss as well as the maximum payoff is limited. In return for giving upside potential investor reduces the Spread cost by initial outlay from writing the call option.

3 types of Bull spreads can be distinguished:

Both the calls initially out of the money – Most Aggressive

One call in the money and other call out of money- Less aggressive

Both the calls in the money- Conservative

Bull Spread with Calls:

Long Call   -Lower Strike Price

Short Call   -Higher Strike Price

Bull spreads with Puts:

In Bull spread with Put one put is written with higher strike price and investor buys one put with lower exercise price. Because Put that is written with higher strike price in involves an initial cash inflows.

If on the expiration date , the strike price is higher than both the Exercise price , then both the Put will exercise worthless and investor will gain an amount equal to initial cash inflow.

If on the expiation date , the strike price is lower than both the exercise price then both the Put will be exercised and there will be loss equal to difference between both the exercise price.

If on the expiration date, the strike price is between two exercise price ,then the Put that is written (i.e.) with higher strike price will be exercised and the Put that is bought will expire worthless. The resulting loss in this case will be Higher exercise price less the strike price.

Bull spread with put

Long Put   - Lower Strike Price.

Short Put – Higher Strike Price

BULL SPREAD WITH PUT

On 2nd may when the index was at 1916.75 and if investor is bullish about the market but at the same time he wants to reduce his risk he can use Bull Spread. Suppose an investor buys 2050 Put and at the same time sells 2100 Put then initial inflow will be:

Proceeds from writing a Put	**195.00**
Initial outlay from Long Put	**147.65**
Initial Inflow	**47.35**

His position as on 26th may when the index was at 2074.70 will be

Put that is written for 2100 will be exercised resulting in loss of Rs 25.30 and Put that is bought will expire worthless

Thus investor has earned Rs 22.05(47.35-25.30).

Payoff Structure from Bull Spread with Puts:

Spot Price	Short Put with exercise price of 2100	Long Put with exercise price of 2050	Payoff	Initial Inflow	Total Payoff
2040	-60	10	-50	47.35	-2.65
2045	-55	5	-50	47.35	-2.65
2050	-50	0	-50	47.35	-2.65
2055	-45	0	-45	47.35	2.35
2060	-40	0	-40	47.35	7.35
2065	-35	0	-35	47.35	12.35
2070	-30	0	-30	47.35	17.35
2075	-25	0	-25	47.35	22.35
2080	-20	0	-20	47.35	27.35
2085	-15	0	-15	47.35	32.35
2090	-10	0	-10	47.35	37.35
2095	-5	0	-5	47.35	42.35

2100	0	0	0	47.35	47.35
2105	0	0	0	47.35	47.35
2110	0	0	0	47.35	47.35
2115	0	0	0	47.35	47.35

Pay off Bull -Put
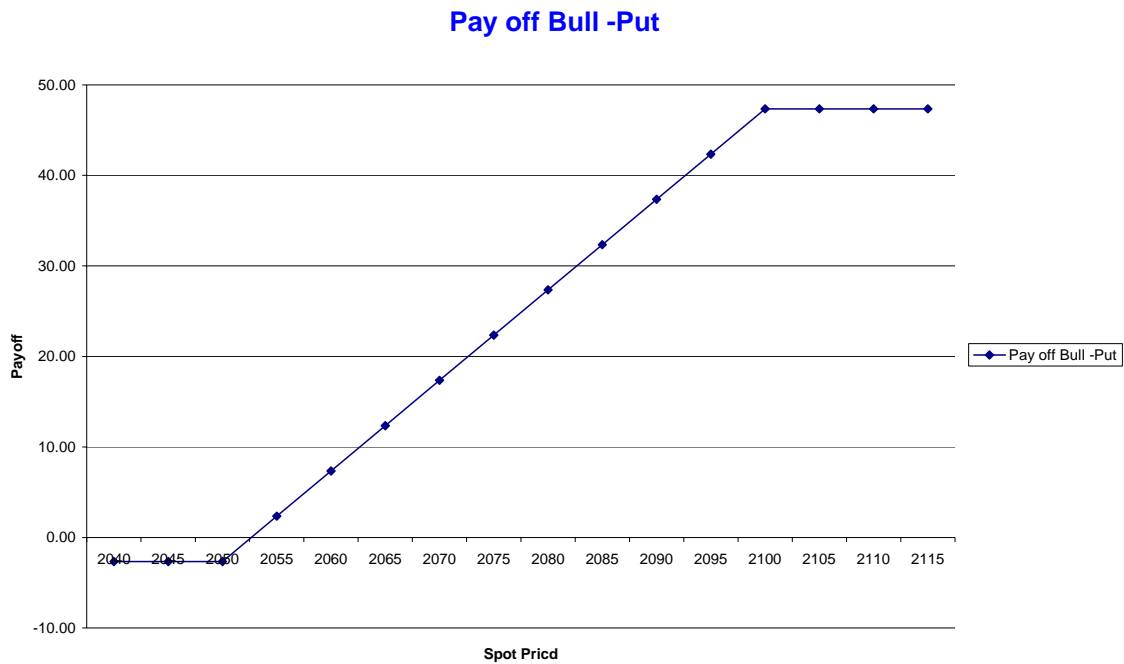
BULL SPREAD WITH CALL

On 2nd may when the index was at 1916.75 and if investor is bullish about the market but at the same time he wants to reduce his risk he can buy Spread.Suppose an investor buys 2050 call and at the same time sells 2100 call then the total investment will be:

Proceeds from writing a call	1.90
Initial outlay from Long Call	3.80
Initial Cost of Spread	**1.90**

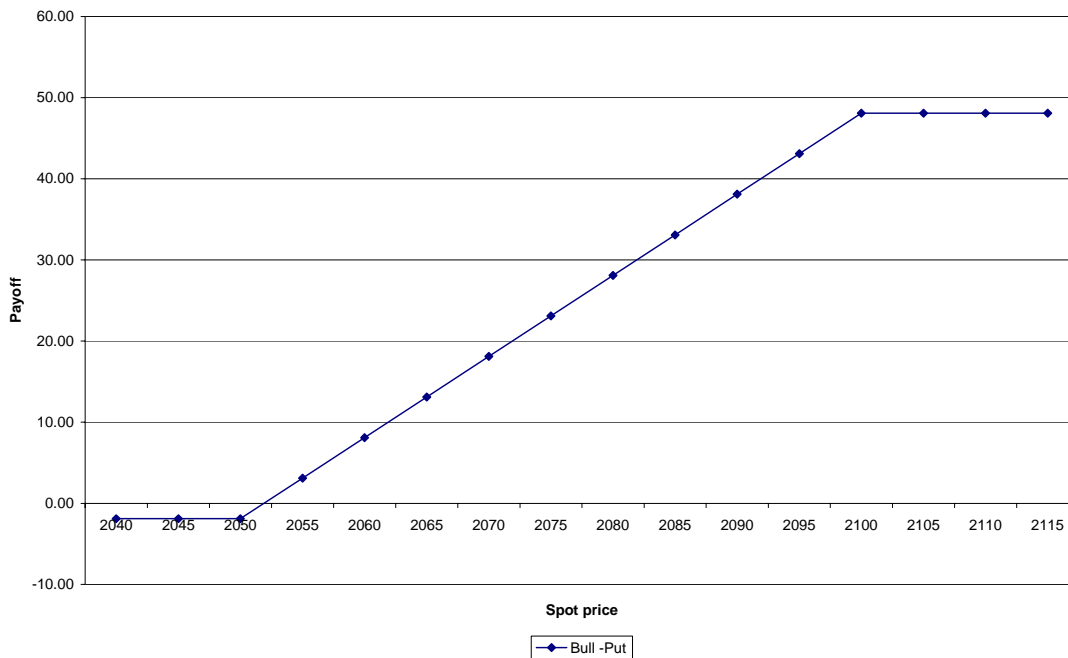His position as on 26th may when the index was at 2074.70 will be

Short Call of 2100 will be unexercised

Long Call of 2050 will be exercised resulting in pay off of 24.70

Thus investor has earned Rs24.70 against initail investment of just Rs 1.90

Payoff Structure from Bull Spread with Calls:

Spot Price	Short Call with exercise price of 2100	Long call with exercise price of 2050	Payoff	Cost	Total Payoff
2040	0	0	0	1.90	-1.90
2045	0	0	0	1.90	-1.90
2050	0	0	0	1.90	-1.90
2055	0	5	5	1.90	3.10
2060	0	10	10	1.90	8.10
2065	0	15	15	1.90	13.10
2070	0	20	20	1.90	18.10
2075	0	25	25	1.90	23.10
2080	0	30	30	1.90	28.10
2085	0	35	35	1.90	33.10
2090	0	40	40	1.90	38.10
2095	0	45	45	1.90	43.10
2100	0	50	50	1.90	48.10
2105	-5	55	50	1.90	48.10
2110	-10	60	50	1.90	48.10
2115	-15	65	50	1.90	48.10

Bear spread :

Bear spread with Call :

Buying a call Option with one strike price and selling a call with another strike price with lower strike price.

Long Call   -Higher Strike Price.

Short Call   -Lower Strike Price.

Bear Spread with Put :

Long Put   - Higher Strike Price.

Short Put   - Lower Strike Price

Volatility Spread:

- ➢ **Backspread**

- ➢ **Ratio Vertical Spread**

- ➢ **Straddle**

> **Strangle**

> **Butterfly**

Back spread:

Back spread is a delta neutral position which consists of more long Options than short Options where all the Options expire at the same time. In order to achieve this Options with smaller deltas must be purchased and Option with larger deltas must be sold. The primary consideration of a Backspread is that some movement will occur. A trader will go for Call Backspread if he expects market to go up and will take Put Backspread if he expects market to go down.

Call Back Spread :

Long Calls - Higher exercise price

Short Calls - Lower exercise price.

Put Back spread :

Long Puts - Lower exercise price

Short Puts - Higher exercise price.

(Long calls should be more than short calls to make it delta neutral).

Ratio Vertical Spread:

In this trader takes opposite position of backspread , and is short more contracts than long with all the options expiring on the same date. Ratio vertical spread realizes its maximum value when stock price finishes right at the exercise price. Its taken by someone who expects the market to be quite stable.

Call ratio vertical Spread :

Long calls - Lower exercise price

Short calls - Higher exercise price.

Put ratio vertical spread :

Long put - Higher exercise price

Short put - Lower exercise price.

(short calls will be more to make it delta neutral).

Backspread will gain if the market moves outside the limits and will lose if the stock price remains with the range of Higher and lower strike price.

Ratio Vertical Spread will gain if the market is within the range of lower and higher exercise price and will lose if the stock price is outside this range.

Butterfly spread:

Long Butterfly :

Buying a call Option with higher and lower strike price and selling two call options with strike price average of the above two strike price. This strategy is suited for an investor who feels that the large price changes are unlikely. Long Butterfly acts like a ratio vertical spread. If the strike price is less than Lowest strike price all the calls will not be exercised and will result in loss to the amount of initial investment. If Strike price is higher than H then all the calls will be exercised and it will result in the loss because gains from buying call will be equalized by loss from writing call option. If on the expiration date if the spot price is between H and L then the strategy will result in a profit with maximum profit when the strike price is in the mid way between the H and L.

Short Butterfly:

Write 2 calls with higher and lower strike price and buy 2 calls with the exercise price in between H and L. This strategy works like backspread and is undertaken by the trader when he expects the market to move sharply in either direction. If the market remains within H and L range then Short butterfly results in loss to the trader.

Straddle :

Investors buys(sells) Call and Put with same expiration date with same strike price.

If both Call and Put Option are purchased then it is Long Straddle (***Bottom Straddle***)and if both Call and Put Option are sold then it is Short Straddle. Trader's buy Straddles and Strangles when they believe that the underlying asset will be volatile but do not have any belief about the direction of the underlying. They will benefit from Put option when the market turns bearish and they will benefit from Call Option when the market turns Bullish..

With a Long straddle , the trader's potential profit is unlimited if market moves in either direction. A loss will be incurred if the market does not move away from the exercise price since in that case both Call and Put will not be exercised. Buying a straddle is an appropriate strategy when large price changes are expected in the stock.

A short Straddle(*Top Straddle*) will realize maximum profit if the market stays close to the call and put exercise price. The writer of straddle benefits from the price stability. They buy a straddle when they believe that the market will remain stable.

Strangle:

Buying a call and Put with same strike price and maturity date but with different strike price. In case of Long Strangle again the investor is not sure about the direction of the stock price but is expecting volatility. In case of Strangle the stock price has to move further away than the Straddle for an investor to make profit but at the same time downward risk in Strangle is less when compared to straddle when the stock ends up at the Central value.

Thus the volatility spreads can be distinguished into 2 categories.

Helped by the fluctuations in the Underlying Asset and those that are hurt by changes in the underlying asset.

Strategies which are **helped by changes in the underlying asset (market is volatile)**

will have Positive Gamma and Positive Vega. So if the **volatility increases then these strategies will bring positive payoff**. The strategies which are helped by changes in the underlying price(direction immaterial) movements are :

- ➢ Backspread

- ➢ Long straddle

- ➢ Long Strangle

➢ Short Butterfly.

Strategies which bring positive payoffs **when the market is quite stable** , have negative Gamma and Negative Vega. If the **volatility decreases then the payoff from these strategies will increase.** The strategies which come under this type are:

➢ Ratio vertical spread

➢ Short straddle

➢ Short Strangle

➢ Long Butterfly

If an option is **under priced** (low implied volatility) then one should look for spreads with positive Vega (i.e.) <u>Backspreads/Long Straddle /Long Strangle/ Short Butterfly</u>.

If an option is **overpriced** (high implied volatility) then one should look for spreads with negative Vega (i.e.) <u>Ratio vertical Spread / Short Straddle / Short Strangle / Long Butterfly</u>.

Calendar spread:

Selling a call option and buying a longer maturity call option with the same strike price.

Diagonal Spread :

Where both the expiration date and strike price differ.

<u>Strap :</u>

Long Position in two calls and one put all with same strike price and expiration date. In this case investor is expecting sharp movement in the price of stock but is expecting strong intuition for upward movement so he buys 2 calls .

Strips:

 Long Position in one call and two puts all with same strike price and expiration date. In the case of strips investor is expecting sharp movement in the stock price with greater expectation for downward movement in the stock price hence he buys 2 puts .

Long Strangle

If the Index on 1st April is at 2067.65 and investor is expecting Volatility and at the same time he wants to minimize the downward risk that occurs from straddle he can buy a strangle.If he buys a 2100 call and 1900 put for april then the total cost for him will be

Long Call	2100	3.00
Long Put	2050	37.95
Total Cost		40.95

Position at expiration (28th April)   1941.3

Call Option	2100	0				
Put Option	2050	108.7				

Net returns	67.75

Individual Pay

off　　　　　　　***Strategy Pay off***

	Call	Put	Call	Put			
Spot Price	*2100*	*2050*	*2100*	*2050*	*Payoff*	*Cost of Straddle*	*Total Payoff*
1875	0	175	-3.00	137.05	175	40.95	134.05
1900	0	150	-3.00	112.05	150	40.95	109.05
1925	0	125	-3.00	87.05	125	40.95	84.05
1950	0	100	-3.00	62.05	100	40.95	59.05
1975	0	75	-3.00	37.05	75	40.95	34.05
2000	0	50	-3.00	12.05	50	40.95	9.05
2025	0	25	-3.00	-12.95	25	40.95	-15.95
2050	0	0	-3.00	-37.95	0	40.95	-40.95
2075	0	0	-3.00	-37.95	0	40.95	-40.95
2100	0	0	-3.00	-37.95	0	40.95	-40.95
2125	25	0	22.00	-37.95	25	40.95	-15.95
2150	50	0	47.00	-37.95	50	40.95	9.05
2175	75	0	72.00	-37.95	75	40.95	34.05

| 2200	100	0	97.00	-37.95	100	40.95	59.05
2225	125	0	122.00	-37.95	125	40.95	84.05
2250	150	0	147.00	-37.95	150	40.95	109.05
2275	175	0	172.00	-37.95	175	40.95	134.05

Long Strangle
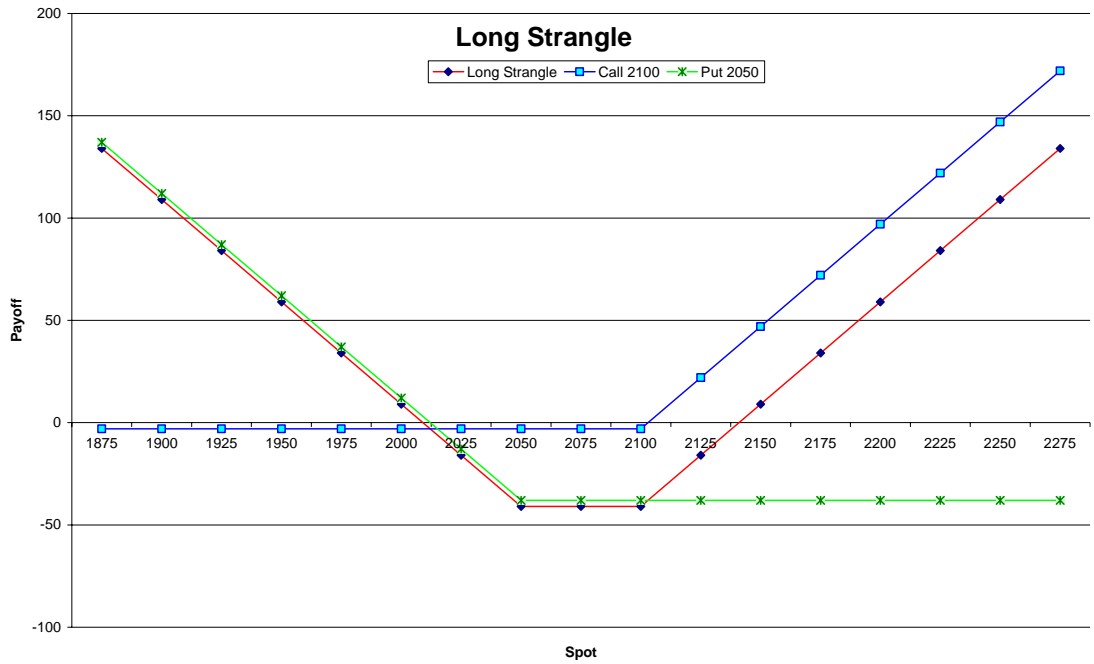
Short Strangle

On 6th May when index was at 1977.50, if an investor shorts 100 2050 Calls and 100 2100 puts for May month with exercise price 2050 having an expiration date on 26th may, then the total credit to the investor will be:

Short Call   2050   8.30

Short Put   2100   139.75

Initail Inflow   148.05

Position on expiration date (may 26th)   2074.7

Spot Price	Call 2050	Put 2100	Short Call 2050	Short Put 2100	Payoff	Initial Credit	Total Payoff
1875	0	-225	8.30	-85.25	-225	145.80	-79.20
1900	0	-200	8.30	-60.25	-200	145.80	-54.20
1925	0	-175	8.30	-35.25	-175	145.80	-29.20
1950	0	-150	8.30	-10.25	-150	145.80	-4.20
1975	0	-125	8.30	14.75	-125	145.80	20.80
2000	0	-100	8.30	39.75	-100	145.80	45.80
2025	0	-75	8.30	64.75	-75	145.80	70.80
2050	0	-50	8.30	89.75	-50	145.80	95.80
2075	-25	-25	-16.70	114.75	-50	145.80	95.80

| 2100 | -50 | 0 | -41.70 | 139.75 | -50 | 145.80 | 95.80 |
2125	-75	0	-66.70	139.75	-75	145.80	70.80
2150	-100	0	-91.70	139.75	-100	145.80	45.80
2175	-125	0	-116.70	139.75	-125	145.80	20.80
2200	-150	0	-141.70	139.75	-150	145.80	-4.20
2225	-175	0	-166.70	139.75	-175	145.80	-29.20
2250	-200	0	-191.70	139.75	-200	145.80	-54.20
2275	-225	0	-216.70	139.75	-225	145.80	-79.20
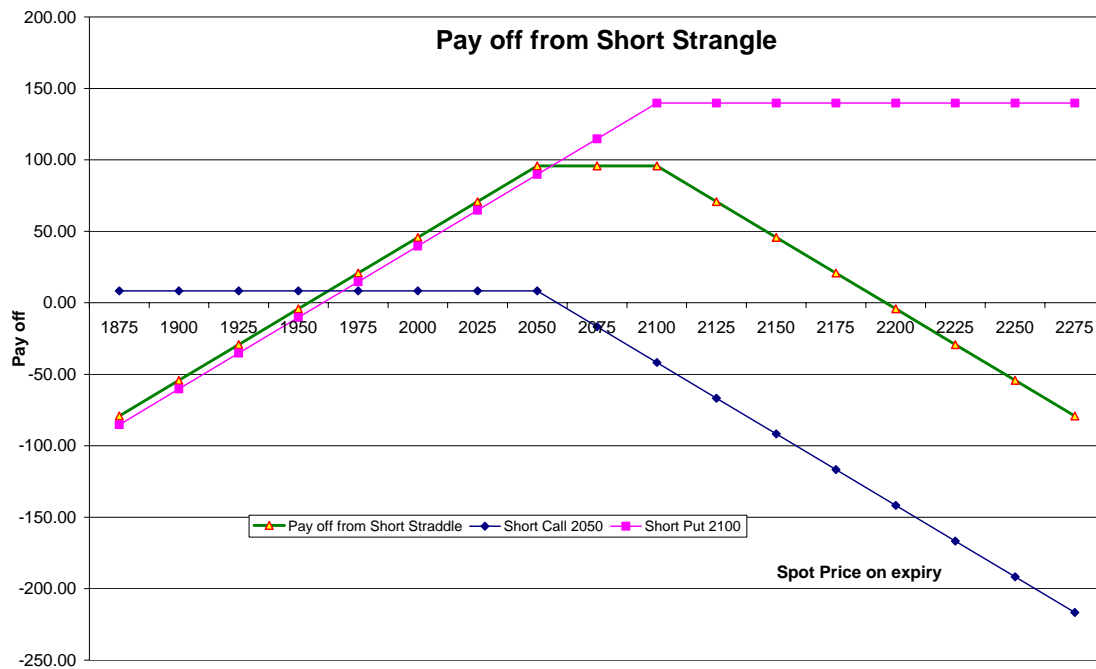
Long Strangle

On 9th march when index was at 2160.80 ,if an investor buys 100 calls and 100 puts

for January month with exercise price 2100 having an expiration date on 31st march, then the total cost to the investor will be:

Long Call	2100	400.20
Long Put	2100	17.80
Total cost		418
Index on expiration date		2030.65
Call Option	2100	0
Put Option	2100	69.35
Net payoff		-348.65

	Payoff from Long		Individual Payoff		Total		
Spot Price	Call 2100	Put 2100	Long Call 2100	Long Put 2100	Payoff	Cost of Straddle	Net Pay off
1925	0	175	-400.20	157.20	175	418	-243
1950	0	150	-400.20	132.20	150	418	-268
1975	0	125	-400.20	107.20	125	418	-293
2000	0	100	-400.20	82.20	100	418	-318
2025	0	75	-400.20	57.20	75	418	-343
2050	0	50	-400.20	32.20	50	418	-368
2075	0	25	-400.20	7.20	25	418	-393
2100	0	0	-400.20	-17.80	0	418	-418

2125	25	0	-375.20	-17.80	25	418	-393
2150	50	0	-350.20	-17.80	50	418	-368
2175	75	0	-325.20	-17.80	75	418	-343
2200	100	0	-300.20	-17.80	100	418	-318
2225	125	0	-275.20	-17.80	125	418	-293
2250	150	0	-250.20	-17.80	150	418	-268
2275	175	0	-225.20	-17.80	175	418	-243

Long Straddle
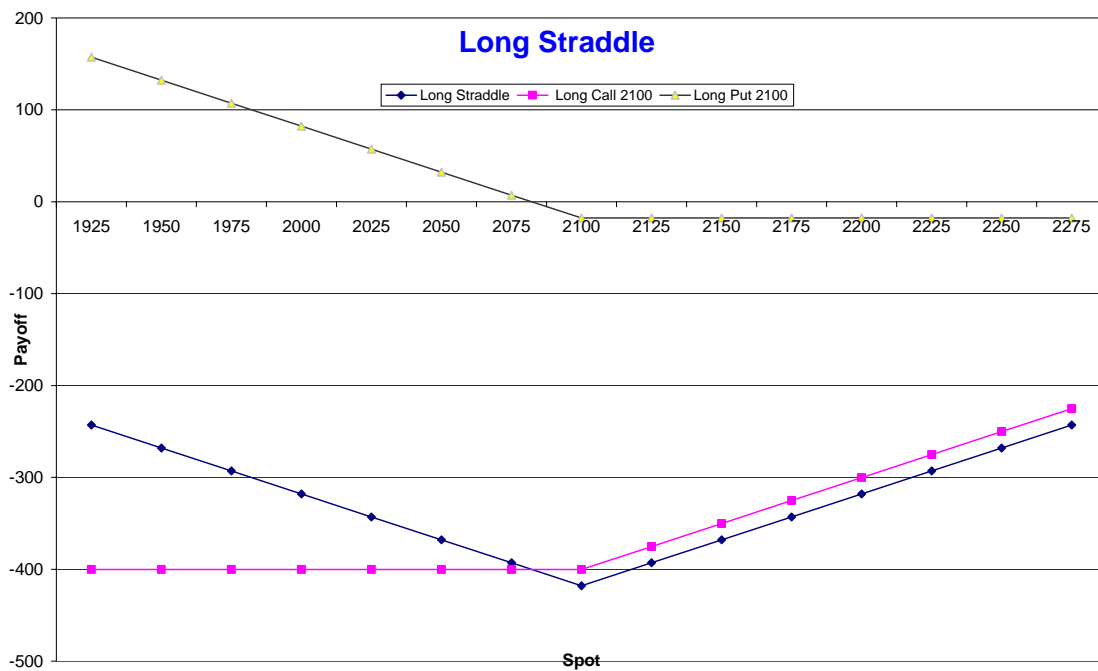
Short Straddle

On 6th May when index was at 1977.50, if an investor shorts 100 calls and 100 puts for

May month with exercise price 2050 having an expiration date on 26th may, then the total

credit to the investor will be:

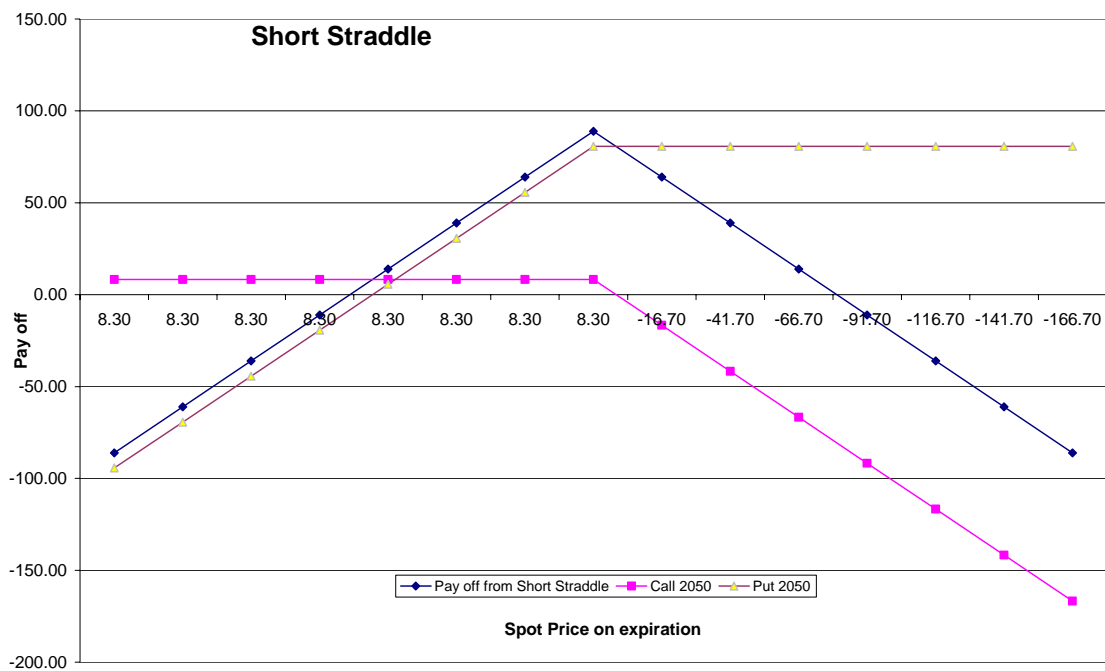|		
Short Call	2050	8.30
Short Put	2050	80.65
Initial Credit		88.95
Position At expiration date.		2074.70
Short Call	2050	-24.70
Short Put	2050	0.00
Net Position		64.25

Example: Short Stradle

On 6th May when index was at 1977.50, if an investor shorts 100 calls and 100 puts for May month with exercise price 2050 having an expiration date on 26th may, then the total credit to the investor will be:

Short Call	2050	8.30
Short Put	2050	80.65
Initial Credit		88.95
Position At expiration date.		2074.70
Short Call	2050	-24.70
Short Put	2050	0.00
Net Position		64.25

Spot Price	loss from short Call 2050	Put 2050	Individual Strategies Call 2050	Put 2050	Total loss	Income from straddle	Net Pay off
1875	0	-175	8.30	-94.35	-175	88.95	-86.05
1900	0	-150	8.30	-69.35	-150	88.95	-61.05
1925	0	-125	8.30	-44.35	-125	88.95	-36.05
1950	0	-100	8.30	-19.35	-100	88.95	-11.05
1975	0	-75	8.30	5.65	-75	88.95	13.95
2000	0	-50	8.30	30.65	-50	88.95	38.95
2025	0	-25	8.30	55.65	-25	88.95	63.95
2050	0	0	8.30	80.65	0	88.95	88.95
2075	-25	0	-16.70	80.65	-25	88.95	63.95
2100	-50	0	-41.70	80.65	-50	88.95	38.95
2125	-75	0	-66.70	80.65	-75	88.95	13.95
2150	-100	0	-91.70	80.65	-100	88.95	-11.05
2175	-125	0	-116.70	80.65	-125	88.95	-36.05
2200	-150	0	-141.70	80.65	-150	88.95	-61.05
2225	-175	0	-166.70	80.65	-175	88.95	-86.05

Short Straddle

Pay off (y-axis) vs Spot Price on expiration (x-axis)

Legend: Pay off from Short Straddle — Call 2050 — Put 2050

Volatility

Date	Spot Nifty	Daily returns	Date	Spot Nifty	Daily returns
2-Jan-06	2835.95		21-Apr-06	3573.05	-0.0001
3-Jan-06	2883.35	0.0166	24-Apr-06	3548.9	-0.0068
4-Jan-06	2904.4	0.0073	25-Apr-06	3462.65	-0.0246
5-Jan-06	2899.85	-0.0016	26-Apr-06	3555.75	0.0265
6-Jan-06	2914	0.0049	27-Apr-06	3508.1	-0.0135
9-Jan-06	2910.1	-0.0013	28-Apr-06	3508.35	0.0001
10-Jan-06	2870.8	-0.0136	29-Apr-06	3557.6	0.0139
12-Jan-06	2850.7	-0.0070	2-May-06	3605.45	0.0134
13-Jan-06	2850.55	-0.0001	3-May-06	3634.25	0.0080

16-Jan-06	2833.1	-0.0061	4-May-06	3648.4	0.0039
17-Jan-06	2829.1	-0.0014	5-May-06	3663.95	0.0043
18-Jan-06	2809.2	-0.0071	8-May-06	3693.15	0.0079
19-Jan-06	2870.85	0.0217	9-May-06	3720.55	0.0074
20-Jan-06	2900.95	0.0104	10-May-06	3754.25	0.0090
23-Jan-06	2884.05	-0.0058	11-May-06	3701.05	-0.0143
24-Jan-06	2908	0.0083	12-May-06	3650.05	-0.0139
25-Jan-06	2940.35	0.0111	15-May-06	3502.95	-0.0411
27-Jan-06	2982.75	0.0143	16-May-06	3523.3	0.0058
30-Jan-06	2974.5	-0.0028	17-May-06	3635.1	0.0312
31-Jan-06	3001.1	0.0089	18-May-06	3388.9	-0.0701
1-Feb-06	2971.55	-0.0099	19-May-06	3246.9	-0.0428
2-Feb-06	2967.45	-0.0014	22-May-06	3081.35	-0.0523
3-Feb-06	2940.6	-0.0091	23-May-06	3199.35	0.0376
6-Feb-06	3000.45	0.0201	24-May-06	3115.55	-0.0265
7-Feb-06	3020.1	0.0065	25-May-06	3177.7	0.0198
8-Feb-06	3008.95	-0.0037	26-May-06	3209.6	0.0100
10-Feb-06	3027.55	0.0062	29-May-06	3214.9	0.0016
13-Feb-06	3041.15	0.0045	30-May-06	3185.3	-0.0092
14-Feb-06	3017.55	-0.0078	31-May-06	3071.05	-0.0365
15-Feb-06	3022.2	0.0015	1-Jun-06	2962.25	-0.0361
16-Feb-06	3021.6	-0.0002	2-Jun-06	3091.35	0.0427
17-Feb-06	2981.5	-0.0134	5-Jun-06	3016.65	-0.0245
20-Feb-06	3005.85	0.0081	6-Jun-06	2937.3	-0.0267

21-Feb-06	3035.5	0.0098	7-Jun-06	2860.45	-0.0265
22-Feb-06	3050.8	0.0050	8-Jun-06	2724.35	-0.0487
23-Feb-06	3062.1	0.0037	9-Jun-06	2866.3	0.0508
24-Feb-06	3050.05	-0.0039	12-Jun-06	2776.85	-0.0317
27-Feb-06	3067.45	0.0057	13-Jun-06	2663.3	-0.0418
28-Feb-06	3074.7	0.0024	14-Jun-06	2632.8	-0.0115
1-Mar-06	3123.1	0.0156	15-Jun-06	2798.8	0.0611
2-Mar-06	3150.7	0.0088	16-Jun-06	2890.35	0.0322
3-Mar-06	3147.35	-0.0011	19-Jun-06	2916.9	0.0091
6-Mar-06	3190.4	0.0136	20-Jun-06	2861.3	-0.0192
7-Mar-06	3182.8	-0.0024	21-Jun-06	2923.45	0.0215
8-Mar-06	3116.7	-0.0210	22-Jun-06	2994.75	0.0241
9-Mar-06	3129.1	0.0040	23-Jun-06	3042.7	0.0159
10-Mar-06	3183.9	0.0174	25-Jun-06	3050.3	0.0025
13-Mar-06	3202.65	0.0059	26-Jun-06	2943.2	-0.0357
14-Mar-06	3195.35	-0.0023	27-Jun-06	2982.45	0.0132
16-Mar-06	3226.6	0.0097	28-Jun-06	2981.1	-0.0005
17-Mar-06	3234.05	0.0023	29-Jun-06	2997.9	0.0056
20-Mar-06	3265.65	0.0097	30-Jun-06	3128.2	0.0425
21-Mar-06	3262.3	-0.0010	3-Jul-06	3150.95	0.0072
22-Mar-06	3240.15	-0.0068	4-Jul-06	3138.65	-0.0039
23-Mar-06	3247.15	0.0022	5-Jul-06	3197.1	0.0185
24-Mar-06	3279.8	0.0100	6-Jul-06	3156.4	-0.0128
27-Mar-06	3321.65	0.0127	7-Jul-06	3075.85	-0.0259

28-Mar-06	3325	0.0010	10-Jul-06	3142	0.0213
29-Mar-06	3354.2	0.0087	11-Jul-06	3116.15	-0.0083
30-Mar-06	3418.95	0.0191	12-Jul-06	3195.9	0.0253
31-Mar-06	3402.55	-0.0048	13-Jul-06	3169.3	-0.0084
3-Apr-06	3473.3	0.0206	14-Jul-06	3123.35	-0.0146
4-Apr-06	3483.15	0.0028	17-Jul-06	3007.55	-0.0378
5-Apr-06	3510.9	0.0079	18-Jul-06	2993.65	-0.0046
7-Apr-06	3454.8	-0.0161	19-Jul-06	2932.75	-0.0206
10-Apr-06	3478.45	0.0068	20-Jul-06	3023.05	0.0303
12-Apr-06	3380	-0.0287	21-Jul-06	2945	-0.0262
13-Apr-06	3345.5	-0.0103	24-Jul-06	2985.85	0.0138
17-Apr-06	3425.15	0.0235	25-Jul-06	3040.5	0.0181
18-Apr-06	3518.1	0.0268	26-Jul-06	3110.15	0.0226
19-Apr-06	3535.85	0.0050	27-Jul-06	3156.15	0.0147
20-Apr-06	3573.5	0.0106			

CALCULATION OF HISTORICAL VOLATILITY:

Historical Volatility =   *Standard deveation of daily return * √ No of days*

No of Days   252 Trading days

Average NIFTY	3119.44
STANDARD DEVEATION	210.85
Average daily returns	0.003256
Annual Returns	82.05%
Standard deveation of daily return	0.010450
Historical Volatility	*16.52%*

Calculation of Implied Volatility

Input Variables:

Stock Price   2724.35

Exercise Price   3000.00

Current date		8-Jun-06
Expiration date		29-Jun-06
Risk free Interest rate		5.00%
Dividend yield		2.00%
Time		0.057534247
		years

Call	Put
39.95	335.35

Theorotical Price of Stock Option

Parameters of Option	Call	Put
Delta	0.2276	-0.7713
Gamma	0.00094	0.00094
Theta	-856.45	-761.30
Vega	197.10	197.10
Rho	-33.37	-138.74
Actual Option Price	39.95	335.35

Implied Volatility of Call	49.03%	
Implied Volatility of Put		61.04%

In order to Calculate Implied Volatility of Call and Put Option when all other inputs of the Black scholes model are given, we can do it by solving using Corrado Miller Approach or Newton Raphson Technique.

The Implied Volatility for Call and Put Option obtained is 47.03% and 53.07% when strike price is 20 for Stock selling at 17.5 having Call Price in Market at 3.5 and Put price as 0.85.

OBJECTIVE BEHIND THE RESEARCH:

Investment Decision Making Factors in STOCK & DERIVATIVE form of Investment:

1) To determine the important macro-economic factors that determines the investment decision.

2) To find out which of the important factors influence investor to choose a particular company and particular sector while making investment decisions.

3) Cluster the respondents according to their according to the factors that determine their investment decisions.

4) To construct a perceptual map to find out the perception of each sector according to various factors.

5) To find out the investment behavior of respondents (speculative, long term, hedger or arbitrager) using discriminant analysis.

6) To determine the most ideal strategy considered by investors and brokers

   - When market is bullish

   - When market is bearish

7) To find out which option strategy can command the maximum premium.

SAMPLE SIZE: 30 respondents.

EXECUTIVE SUMMARY:

The objective of this research is to determine the factors that determine the investing decision for an investor for a particular Company as well as particular firm. It also determines the perception of some of the industrial sectors based on the attributes give by the respondents. In addition to that the investors have been segregated based on the cluster analysis into groups so that investors can be segregated into groups for better understanding the motives for investment. Through Discriminate analysis, the behavior of investors is predicted so that investors could be classified into various groups based on their investing activity by getting score on the factors that they consider while investing in a stock. The research also determines the most optimal strategy while investing in Options through use of Conjoint analysis for both the market conditions (Bullish and Bearish.)

ADVANCE STATISTICAL METHODS:

Research Area   : Stocks and Derivatives.

Research Problem:

➢ *Forecasting the future stock trends based on past movements.*

Parameters reflecting on Index or Stock Movement

1. *Financial performance of Company.*

2. *Daily volumes (Transactions of particular stock).*

3. *Exchange rate movement.*

4. *GDP growth rate.*

5. *Interest rate movements.*

6. *FII inflows and outflows.*

7. *Volatility.*

8. *Inflation.*

9. *Dividends, Bonus shares, right issue, and IPO's.*

➢ *Analyzing the impact of the above macro-economic variables on sector performance.*

➢ *Clustering of Shares based on their annualized returns and determination of cause of inter-relationship between shares within each groups and explanation of inter and intra group effects.*

➢ *Analyzing the impact of spot price on Future's and Option price.*

➢ *Determination of inter-relationship between theoretical Call and Put price (using Black-Scholes pricing model) with actual market price of Call and Put.*

➢ *Call Option and Put Option are influenced by the following 5 factors (Black- Schloes pricing model). Analyzing how much each of the factor is actually reflected in the Option Price.*

1. *Spot price.*

2. *Exercise price.*

3. *Volatility.*

4. *Time to expiry.*

5. *Interest rate.*

EXHIBIT 1:

Age profile of respondents

Age
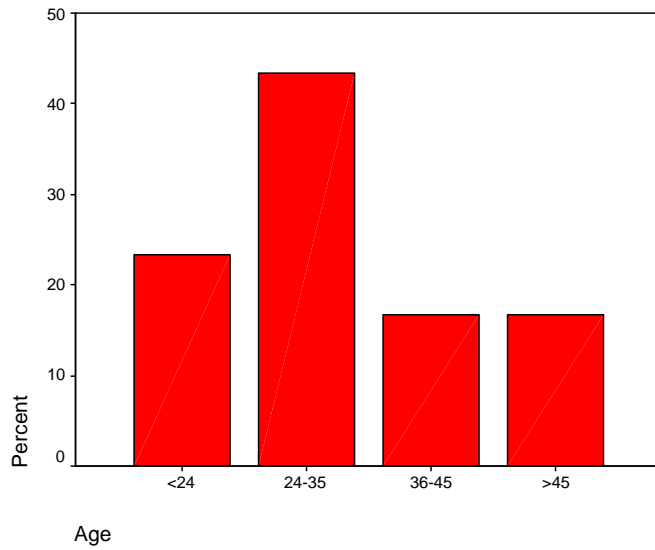
Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<24	7	23.3	23.3	23.3
	24-35	13	43.3	43.3	66.7
	36-45	5	16.7	16.7	83.3
	>45	5	16.7	16.7	100.0
	Total	30	100.0	100.0	

Income Profile:
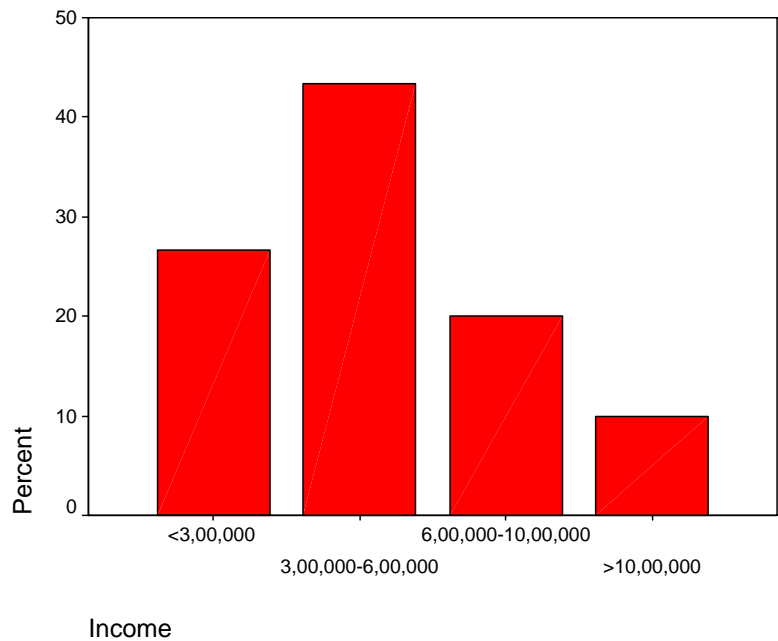
Income

Income

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<3,00,000	8	26.7	26.7	26.7
	3,00,000-6,00,000	13	43.3	43.3	70.0
	6,00,000-10,00,000	6	20.0	20.0	90.0
	>10,00,000	3	10.0	10.0	100.0
	Total	30	100.0	100.0	
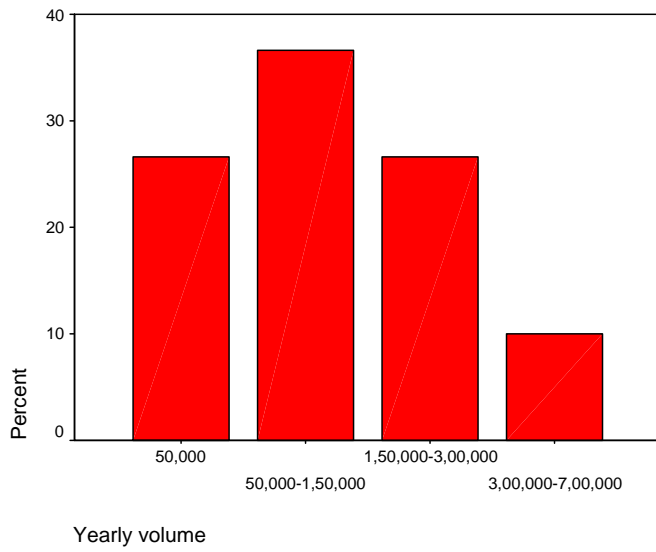
Yearly volume

Yearly volume

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	50,000	8	26.7	26.7	26.7
	50,000-1,50,000	11	36.7	36.7	63.3
	1,50,000-3,00,000	8	26.7	26.7	90.0
	3,00,000-7,00,000	3	10.0	10.0	100.0
	Total	30	100.0	100.0	
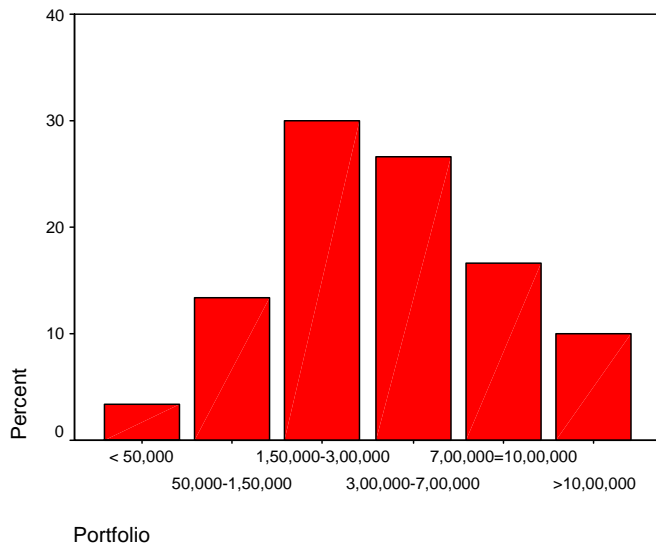
Portfolio

Portfolio

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	< 50,000	1	3.3	3.3	3.3
	50,000-1,50,000	4	13.3	13.3	16.7
	1,50,000-3,00,000	9	30.0	30.0	46.7
	3,00,000-7,00,000	8	26.7	26.7	73.3
	7,00,000=10,00,000	5	16.7	16.7	90.0
	>10,00,000	3	10.0	10.0	100.0
	Total	30	100.0	100.0	
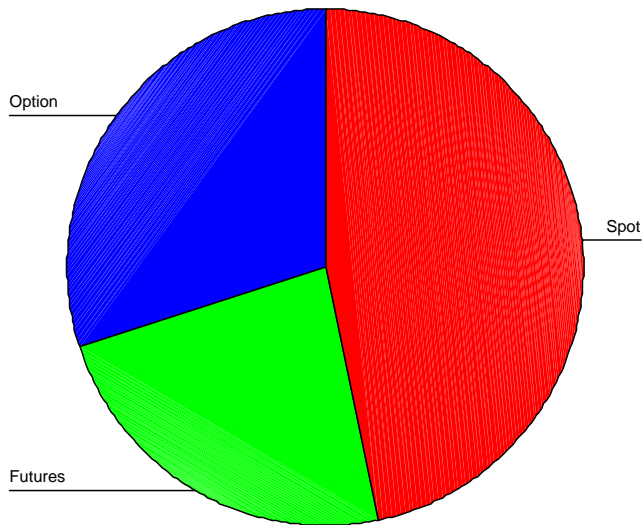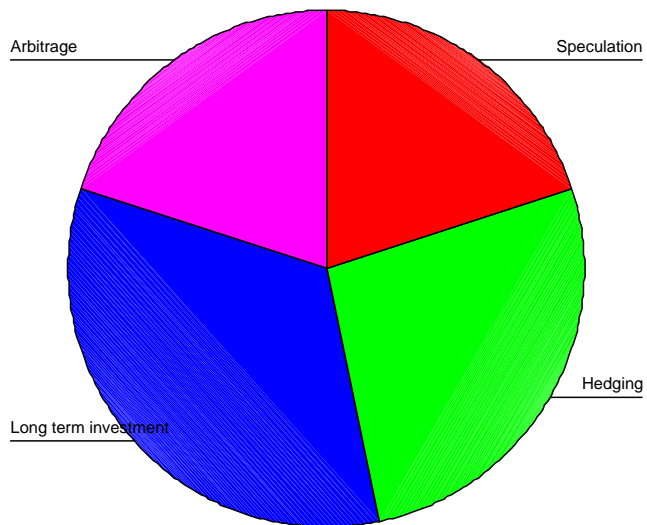
Motive for investment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Speculation	6	20.0	20.0	20.0
	Hedging	8	26.7	26.7	46.7
	Long term investment	10	33.3	33.3	80.0
	Arbitrage	6	20.0	20.0	100.0
	Total	30	100.0	100.0	

Cluster Membership

Case Number	Cluster	Distance
1	3	5.316
2	2	3.929
3	3	4.481
4	2	4.054
5	3	2.314
6	3	2.795
7	3	6.134
8	3	4.823
9	3	3.502
10	3	3.410
11	1	5.734
12	3	3.942
13	3	2.968
14	3	5.334
15	2	4.207
16	2	4.484
17	2	3.401
18	2	3.656
19	2	2.763
20	2	3.826
21	2	4.021
22	2	3.711
23	2	5.601
24	2	5.413
25	2	7.557
26	2	4.806
27	1	3.221
28	1	3.373
29	2	6.616
30	1	4.677

STATISTICS FOR RESTONDENTS:

For the purpose of research , a sample of 30 respondents were selected.

Age Profile of respondents: Out of 30 respondents, 66.67% of them were under the age group of 35 and (20) and 10 respondents were above of the age 36 and above.

Income profile of respondents: Of the 30,respondents were under the upper income category 30% were with income category of Rs6,00,00 and above family income and 26.65 of them were under the income category of Rs3,00,00 and below.

For the purpose of income, annual family income of the respondent was used to segregate them into the groups.

Investment Profile of Respondents:

Most of the sample population studied for the purpose were actively trading in the stock market with 36.7% of sample size were having annual volume of transactions worth more than Rs1,50,000 an year and 36.65 of them had annual volume of transactions worth Rs50,00 to Rs 1,50,000. Only 26.75 of them traded thinly in the stock markets who had annual volume of transactions worth less than Rs50,000 an year.

83.4% of respondents had overall portfolio worth more than Rs3,00,00 invested in shares and futures over a period of time. Thus most of the respondents had invested huge amount of money in the shares market.

Nature of respondents :33.335 of the sample size were long term investors ,20% speculators and arbitragers and 26.75 of them were hedgers. Thus the sample size was evenly distributed according to the nature of activity performed.

Trading instruments used: 46.75 of the sample size were active traders in the cash segment and 30% were actively involved in Options market.23.3% of them were primarily operating in the Futures segment**.**

Market awareness: Out of 30 respondents, 16 of them followed market on daily basis and only 4 of them followed on weekly basis. 10 respondents followed market on hourly basis. All the respondents who followed market on weekly basis were Long term investors and 83.35 of the arbitragers followed market on hourly basis.

Row and Column Points
Symmetrical Normalization
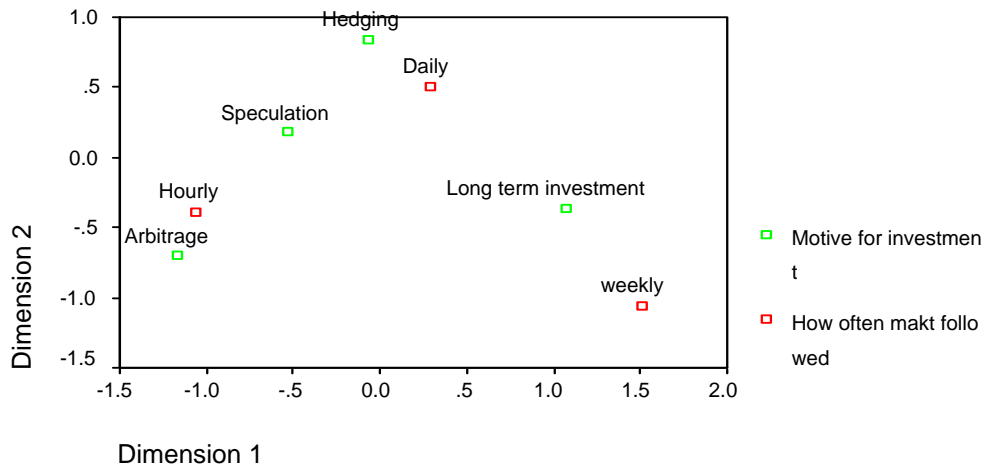
The correspondence analysis conducted to get insight about the nature of investing activities and its relationship with following the market , concludes that Arbitragers follow market on Hourly basis, and long term investors follow market on less continuous basis. Most of the Hedgers and Speculators follow market on daily basis.

Market and Motive for investment :

Row and Column Points

Symmetrical Normalization
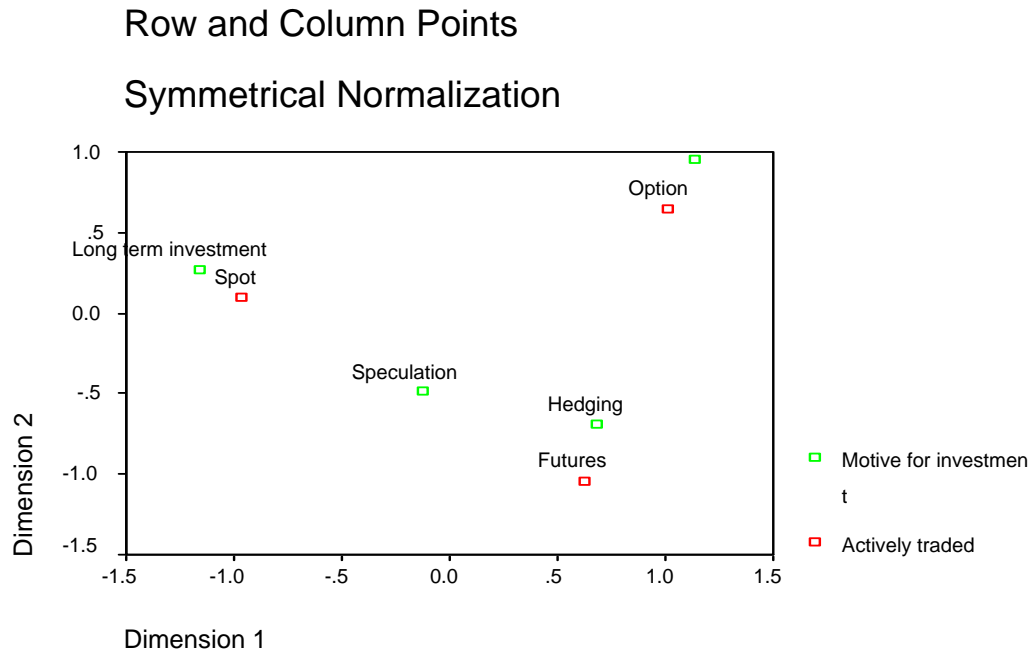
As seen by the above results of the correspondence analysis between nature of investing activity and Market actively traded, we can conclude that Long term investors invest in Spot market ,Hedgers in Futures market and Arbitragers in Option market. Speculators are in someway mid between Spot , Future and Options market concludes the fact that they tend to take a favorable position in any of the market according to the situation. These results can further be validate by the empirical studies and nature of these investors as Futures are the primary tool for taking hedged positions in order to minimize their overall risk of the portfolio. Also Long term investors operate in spot market as in India in Futures and Options market an investor can take a position only for maximum of 90 days which makes them short term investors.

Actively traded * Motive for investment Crosstabulation

Count

		Motive for investment				
		Speculation	Hedging	Long term investment	Arbitrage	Total
Actively traded	Spot	3	1	10		14
	Futures	2	4		1	7
	Option	1	3		5	9
Total		6	8	10	6	30

How often makt followed

Count

		Speculation
How often makt followed	Hourly	3
	Daily	3
	weekly	
Total		6

How often makt followed
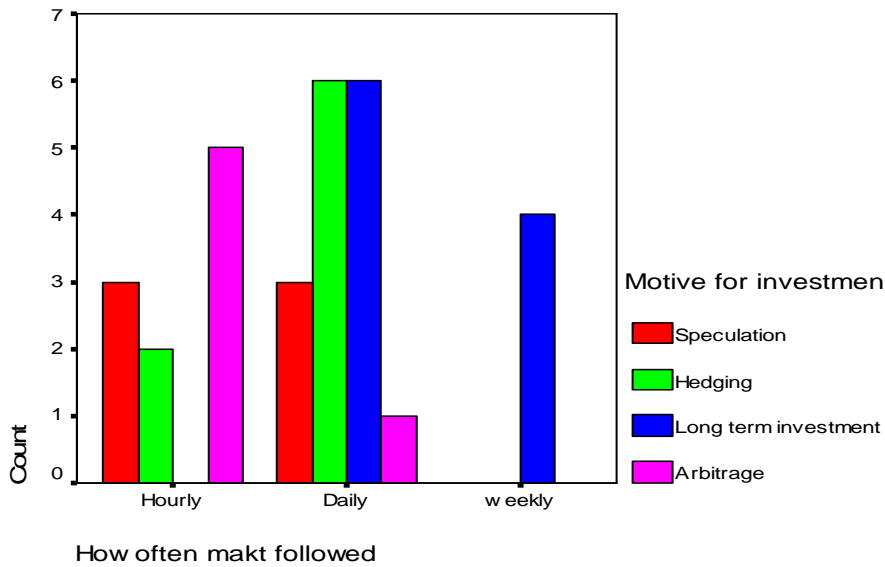
Important Factors Determination While Choosing a Stock

FACTOR ANALYSIS

In order to determine the important factors that investors consider while choosing a particular

company over other provided three most important factors that together explained 77.935 of

the total variance.

141

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.387	53.866	53.866	5.387	53.866	53.866	3.213	32.133	32.133
2	1.388	13.883	67.749	1.388	13.883	67.749	2.526	25.263	57.395
3	1.018	10.181	77.930	1.018	10.181	77.930	2.053	20.534	77.930
4	.688	6.875	84.805						
5	.510	5.098	89.903						
6	.405	4.046	93.949						
7	.220	2.204	96.154						
8	.206	2.064	98.217						
9	.131	1.312	99.530						
10	704E-02	.470	100.000						

Extraction Method: Principal Component Analysis.

Scree Plot
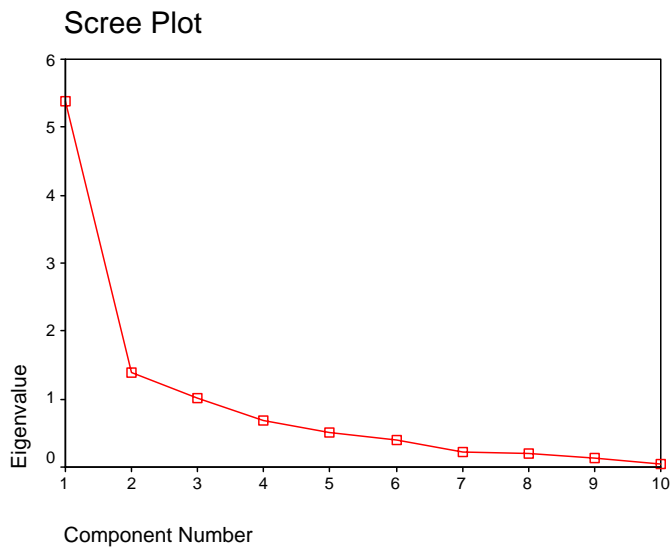
Component Score Coefficient Matrix

	Component		
	1	2	3
Company Brand Name	.068	-.121	.496
Sector of company	.085	-.088	.496
Profits	.103	.269	.150
Dividends	.058	.360	-.008
Mkt scenario	.303	.014	.112
Mkt share	.351	.217	-.046
Promoters	.203	.572	-.214
Management	.069	.240	.159
News	.361	.066	.182
Future price	.368	.201	-.016

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Component Scores.

Three factors are identified based on Eigen Values one, are as follows:

Factor One: Market Scenario, Market Share, News about the company and the price of Company's share in the Futures Market.

Factor two: Profits, Dividends, Promoters goodwill, Management.

Factor three: Company Brand name, Sector of the company,.

Factor 1 is termed as Current Market scenario that explains 32.13% of the variance, Factor 2 as Company's profitability and goodwill that explains 25.62% of the variance and Factor 3 is named as Company's reputation and sector which explains 20.53% of the variance.

Thus the important factors that determine an investors decision to invest in a particular stock are :

- Current Market Scenario.

- Company's Profitability.

- Company's reputation and sector.

Factors Determining Investors Investment Decision

(Macro economic factors that are taken into account before investing)

FACTOR ANALYSIS TO DETERMINE THE MOST IMPORTANT FACTORS THAT DETERMINE THE INVESTMENT DECISION: (Macro level decisions)

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.439
Bartlett's Test of Sphericity	Approx. Chi-Square	172.576
	df	105
	Sig.	.000

Validity of test:

Bartlett's test of Sphericity indicates whether correlation matrix is an identity matrix, which would indicate that our variables are unrelated. Since the sig level is less than .05, it indicates that there are probably significant relationships among variables. Thus, Bartlett's Test of Significance shows that our data is suitable for Factor analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.367	22.449	22.449	3.367	22.449	22.449	3.268	21.784	21.784
2	2.301	15.339	37.788	2.301	15.339	37.788	2.200	14.664	36.449
3	1.993	13.286	51.074	1.993	13.286	51.074	2.013	13.420	49.869
4	1.404	9.358	60.432	1.404	9.358	60.432	1.585	10.563	60.432
5	1.291	8.610	69.042						
6	1.033	6.887	75.929						
7	.890	5.931	81.860						
8	.675	4.500	86.360						
9	.592	3.945	90.305						
10	.497	3.311	93.617						
11	.346	2.303	95.920						
12	.257	1.715	97.635						
13	.182	1.213	98.848						
14	.107	.711	99.560						
15	6.604E-02	.440	100.000						

Extraction Method: Principal Component Analysis.

Scree Plot
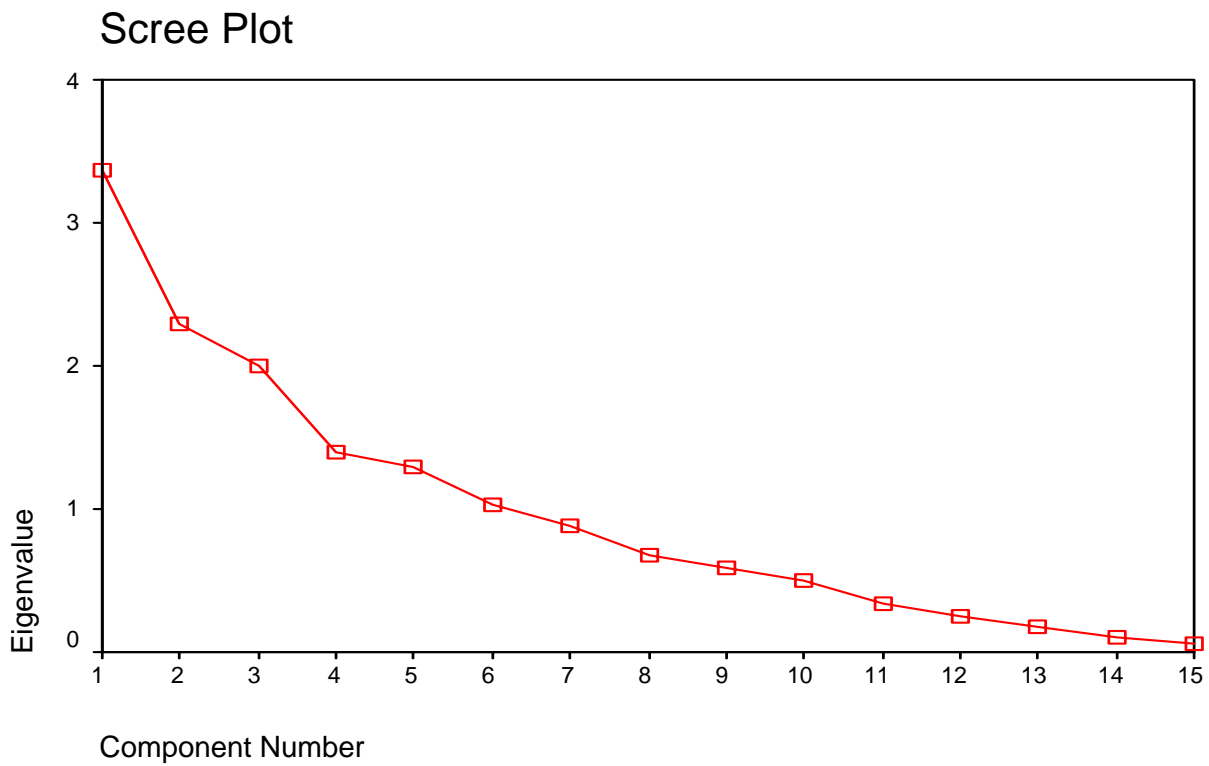
Rotated Component Matrix [a]

	Component			
	1	2	3	4
Bullish teand	-1.73E-02	-3.73E-02	.770	-9.30E-02
Bearish treand	-.156	.632	-8.53E-02	.209
sensex movements	-8.67E-02	.637	.307	-.210
Political factors- Internal	.838	-5.19E-02	-.208	1.214E-02
Poliical factors -External	.815	-5.55E-02	.166	4.991E-02
Monsoon	-4.58E-02	.299	-1.63E-02	.587
Sports	.103	.157	.667	.559
Festival	-.100	-.172	-3.96E-02	.777
Govy policy statments	.891	-2.47E-02	-6.09E-02	-.165
RBI statments	.739	-2.97E-02	.177	-.190
Interest rates	-1.19E-03	.652	-7.48E-02	.207
FII movments	.219	.763	-9.07E-03	-.141
Exchange rate	.329	-.215	-.596	-.170
Inflation rate	-.211	.311	-.565	.206
Bank rate	.553	.306	-.293	.170

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 6 iterations.

The above analysis tells that there are four factors that have been identified to be significant while deciding the investment decision:

- **Factor one**: **Political Factors:** (Political (Internal), Political (External), Government policy, RBI Statements, Bank rate.) which explains 21,74% of the variance,

- **Factor two:** **Market Indicators (**Bearish trend, Sensex movements, FII Movements. Interest rates) which explains 15.34% of the variance.

- **Factor three: Economic Indicators:** Bullish, Exchange rate, Inflation rate, which explains 13,26% of the variance.

- **Factor four**: **External and Uncontrollable Factors**: Monsoon, Sports, festival, which explains 9.36% of the total variance.

- Overall these four factors explain 60.43% of the total variance.

Thus based on the above two tests we can conclude following factors explain the overall investing decision while investing in general and investing in a particular company.

CLUSTER ANALYSIS:

CLUSTER ANALYSIS OF RESPONDENTS BASED ON THE FACTORS THAT THEY CONSIDER IMPORTANT WHILE INVESTING IN SHARE OF A PARTICULAR COMPANY.

Agglomeration Schedule

Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	17	18	3.000	0	0	10
2	5	13	6.000	0	0	6
3	20	27	10.000	0	0	12
4	16	21	11.000	0	0	9
5	3	9	12.000	0	0	15
6	5	6	13.000	2	0	8
7	2	15	14.000	0	0	10
8	5	10	16.667	6	0	13
9	16	19	17.500	4	0	14
10	2	17	17.500	7	1	15
11	22	26	18.000	0	0	14
12	20	28	20.000	3	0	19
13	5	12	23.000	8	0	20
14	16	22	24.333	9	11	17
15	2	3	27.750	10	5	22
16	23	25	28.000	0	0	25
17	4	16	29.400	0	14	21
18	7	8	30.000	0	0	23
19	20	30	38.000	12	0	24
20	1	5	38.000	0	13	26
21	4	29	39.167	17	0	24
22	2	24	41.833	15	0	25
23	7	14	47.000	18	0	26
24	4	20	50.786	21	19	27
25	2	23	52.143	22	16	27
26	1	7	53.333	20	23	29
27	2	4	71.768	25	24	28
28	2	11	103.550	27	0	29
29	1	2	124.947	26	28	0

Since there is sudden jump in the co-efficient , from 71.78 to 103.55, there are three cluster solution.

The three cluster analysis by using K-means Cluster show the following results.

The cluster analysis using K-means cluster for three clusters show that there are significant difference between the distances between the three clusters and number of cases in each cluster is 30.

Final Cluster Centers

	Cluster		
	1	2	3
Company Brand Name	8.30	6.80	6.60
Sector of company	6.60	5.60	6.70
Profits	7.50	3.40	5.80
Dividends	8.00	2.20	5.70
Mkt scenario	5.10	8.80	7.30
Mkt share	5.70	7.70	6.40
Promoters	6.90	3.80	4.80
Management	8.20	3.00	4.90
News	5.20	8.50	7.30
Future price	4.90	8.40	7.40

Distances between Final Cluster Centers

Cluster	1	2	3
1		11.453	6.509
2	11.453		5.500
3	6.509	5.500	

Number of Cases in each Cluster

Cluster	1	4.000
	2	15.000
	3	11.000
Valid		30.000
Missing		.000

Cluster Membership for each case

The cluster analysis using K-means cluster for three clusters show that there are significant difference between the distances between the three clusters and number of cases in each cluster is 30.

THE RESPONDENT'S CHARACTERISTICS FOR THE CLUSTERS:

Cluster one:

The means for cluster one is maximum for these variables which show that for them Brand name, profits, Dividends, Promoters, and Management matter most while investing in shares. Respondent's in cluster one tend to invest in mostly known companies who have reputable image in the public domain.

Cluster two:

The mean for cluster three is maximum for the variables Market scenario, Market share of the company, News and Price of stocks' share in Futures market. This means that these investors take into account the current market situations as the most important variable while investing in shares of a particular company.

Cluster three:

Respondents in cluster three-show average mean of 5-6 in all the variables, these investors are mostly cautious investors who take into account all the relevant factors while investing in shares.

PERCEPUAL MAPPING:

✦ BASED ON FACTOR SCORES:

In order to get the perceptual map of different sectors based on the attributes, the mean score

for each sector on different attributes was identified and factor analysis for these attributes

was generated which resulted in two significant factors.

Factor 1: Consistency, Profitability, Volume, and Growth - Returns

Factor 2: Volatility and risk   - Risk

Sector	Consistency	Profitability	Volume	Growth	Volatility	Risk	fac1_1	fac2_1
Auto	5.77	5.3	4.1	5.9	3.87	4.6	-0.23938	-1.07003
Bank	7.27	7.43	7.57	7.7	5.83	4.03	1.409	-0.40675
Cement	4.33	5.33	5.03	3.73	4.43	4.1	-0.79594	-1.38829
Communication	4.97	6.13	5.8	7.3	6.17	5.7	0.15501	0.79603
Construction	3.97	3.6	3.37	3.9	5.6	4.8	-1.56996	-0.26009
Electronic	6.07	7.37	5.27	6.57	6.07	5.2	0.45415	0.34647
FMCG	6.13	5.9	6.2	5.1	4.3	4.57	0.21144	-1.19855
Hotel	4.67	2.8	2.7	4.67	6.3	6.3	-1.59812	0.96915
Oil	7.7	7.43	7.77	7.23	4.17	5.67	1.54364	-0.5913
Pharma	6.23	7.2	6.03	7.53	6.63	6.93	0.72216	1.56529
Power	4.87	5.53	4.97	5.87	5.73	4.7	-0.34993	-0.0877
Technology	5.3	6.13	4.73	7.43	5.9	6.9	0.05794	1.32577

Rotated Component Matrix [a]

	Component	
	1	2
Consistency	.920	-9.08E-02
Profitability	.945	3.453E-02
Volume	.933	-.181
Growth	.822	.486
Volatility	-8.74E-02	.868
Risk	3.902E-02	.873

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

These factors were plotted in the two dimensional scale to get the perceptual map on the above two dimensions.

153
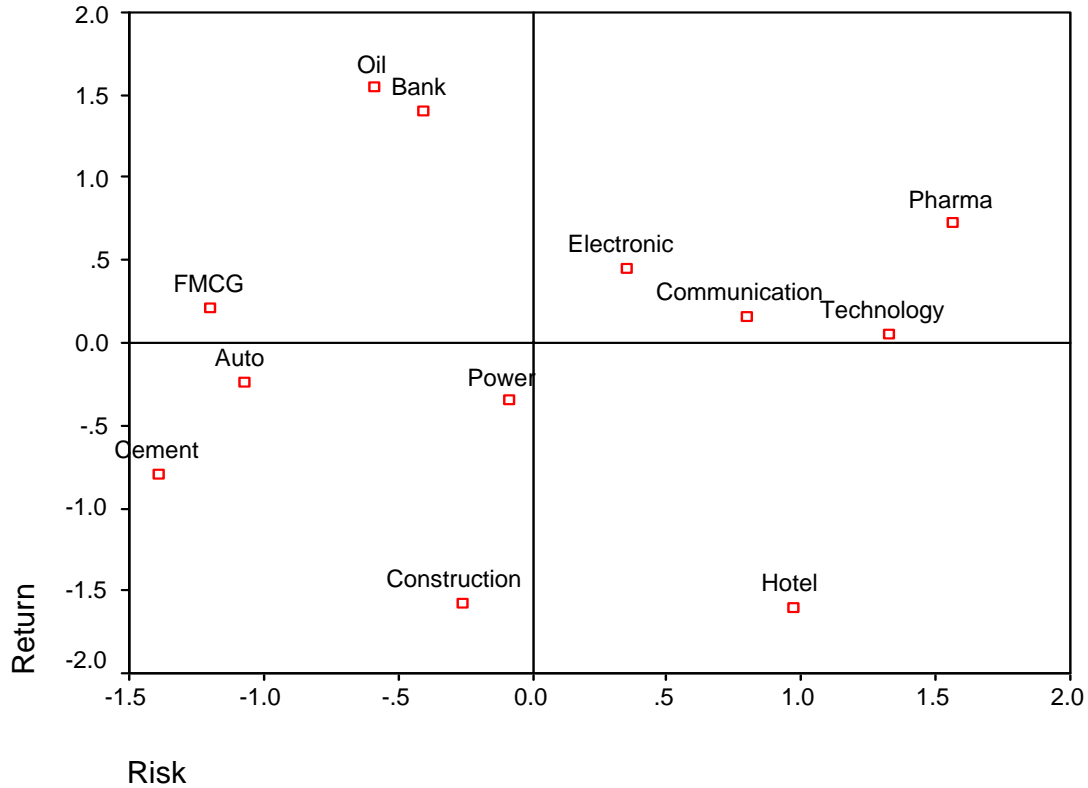
INTERPRETATION OF THE PERCEPTUAL MAP:

- Dimensions for the perceptual map are Risk and Return.

- Following sectors are associated with high risk and high returns- Electronic, Communication, Technology, and Pharma.

- Hotel industry is the only sector that has highest risk and lowest returns.

- Cement, Automobile, Power, and Construction are the sectors that are perceived to have low risk and low returns and are more suitable for investors who have less risk appetite.

- Oil and Banking sector are the industries that are the least risky and provide the highest returns.

- **MULTI-DIMENSIONAL SCALING:**

Multi-dimensional scaling for each of the sectors, based on the Euclidean Distance Method provide similar results as obtained using the factor scores.

Derived Stimulus Configuration

Euclidean distance model
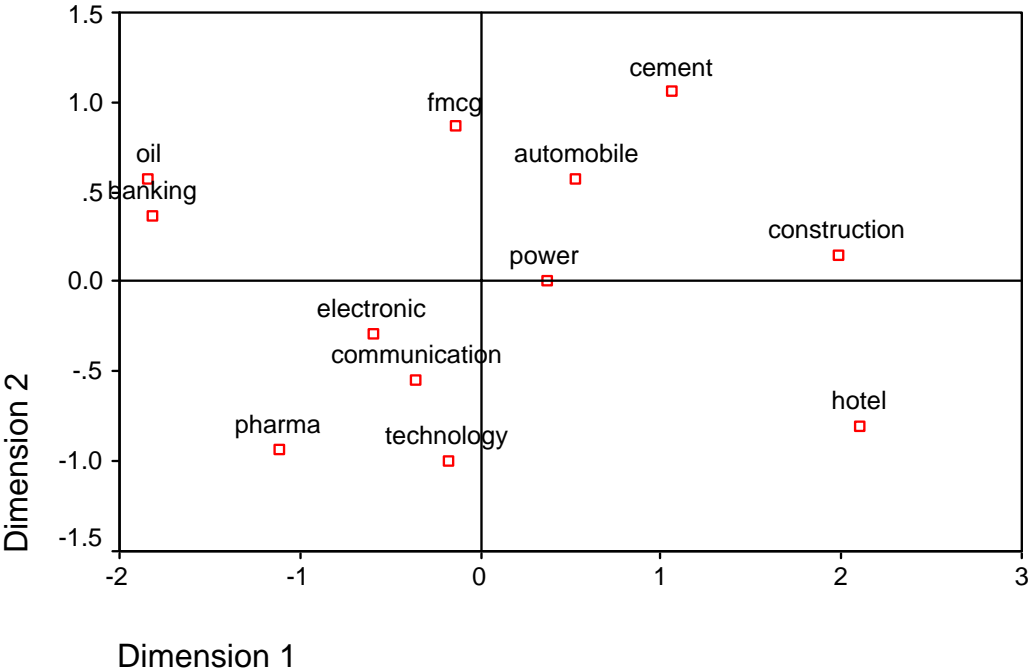
Derived Stimulus Configuration

Euclidean distance model
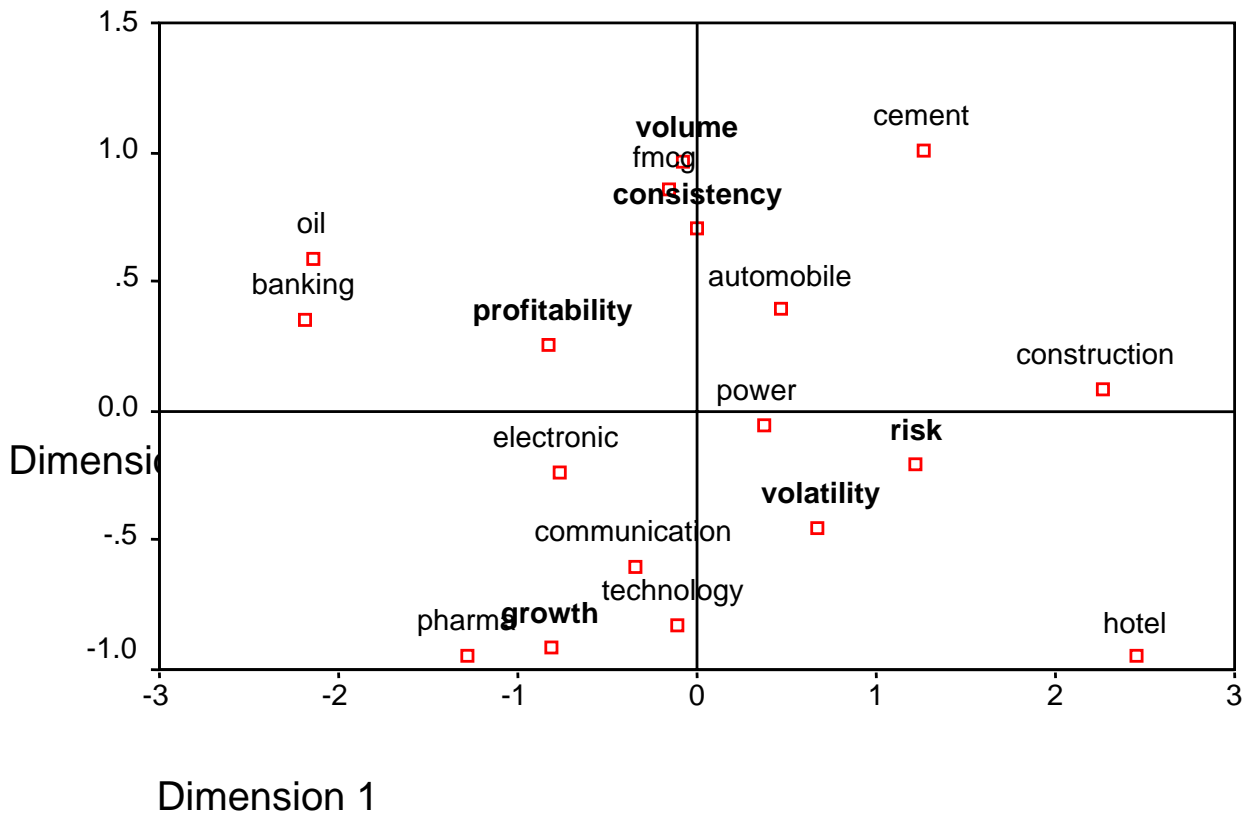
Multidimensional scaling for different industrial sectors based on the six attributes is presented in the above two charts. These show the relative position of various industrial sector based on different attributes. The results of Multi-Dimensional scaling is summarized as follows:

Pharma, technology, Electronic and Communication industries stocks are perceived similar.

Oil and Banking companies stock are perceived as similar in attributes.

Automobile, Power, Construction and Cement are perceived similarly.

Oil and Banking sector are considered to be the most Profitable sector. Pharma, technology, Electronic and Communication industries are considered to be the most growth oriented sector . FMCG stocks are considered to be most consistent in returns and have highest volumes in turnover in the market thereby providing most liquidity. Hotel industries stock are considered to be the least profitable and most dissimilar among the above mentioned sectors and are least favorable for investing.

CONJOINT ANALYSIS:

For determining the most Optimal Strategy while choosing Option when the market is Bullish,

In order to determine the most Optimum Strategy while choosing Options, respondents were given 9 combinations of strategy to choose from.

These combination were developed after conducting fractional factorial Orthogonal design.

The strategies were combination of four factors as follows:

Strategy : Long Call or Short Put (2 levels) (Since under Bullish trend, a rational investor will only opt for Long call or short put and under Bearish scenario , he will opt for Short Call or Long Put)

Premium(3 levels) : In the money Option (In the money Options have Highest Premium), At the Money Option and Out of money Option (These kinds of Options have lowest premium).

Time(3 levels): Near month option, Next month Option and Far month Option.(Currently in India an Investor has only three dated options to choose from- one which expires on current

month, those which expire next month and those which expire tow months later called as Far month)
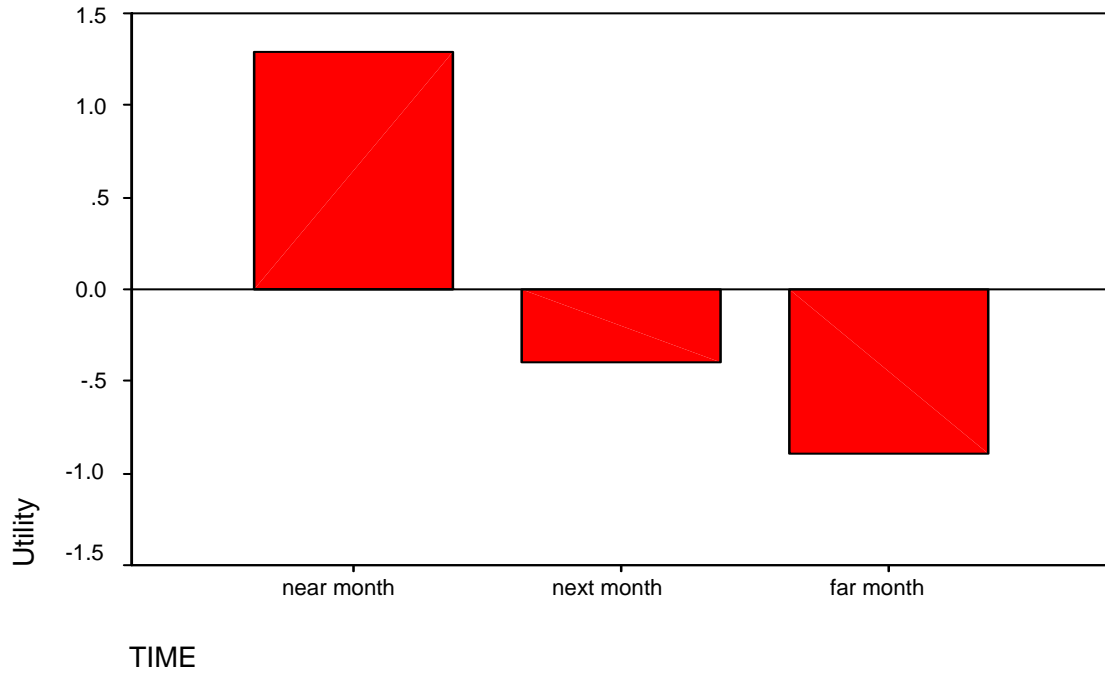
Symbol (2 levels) : Index Option(European Option) and Stock Option.(American Option).
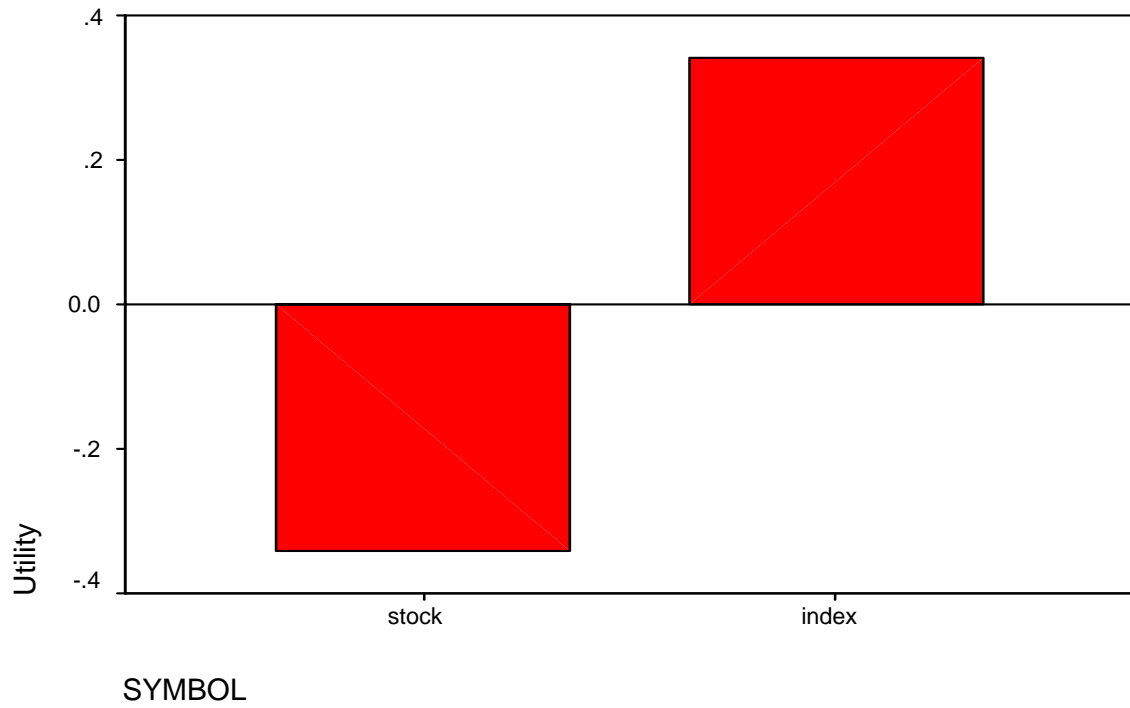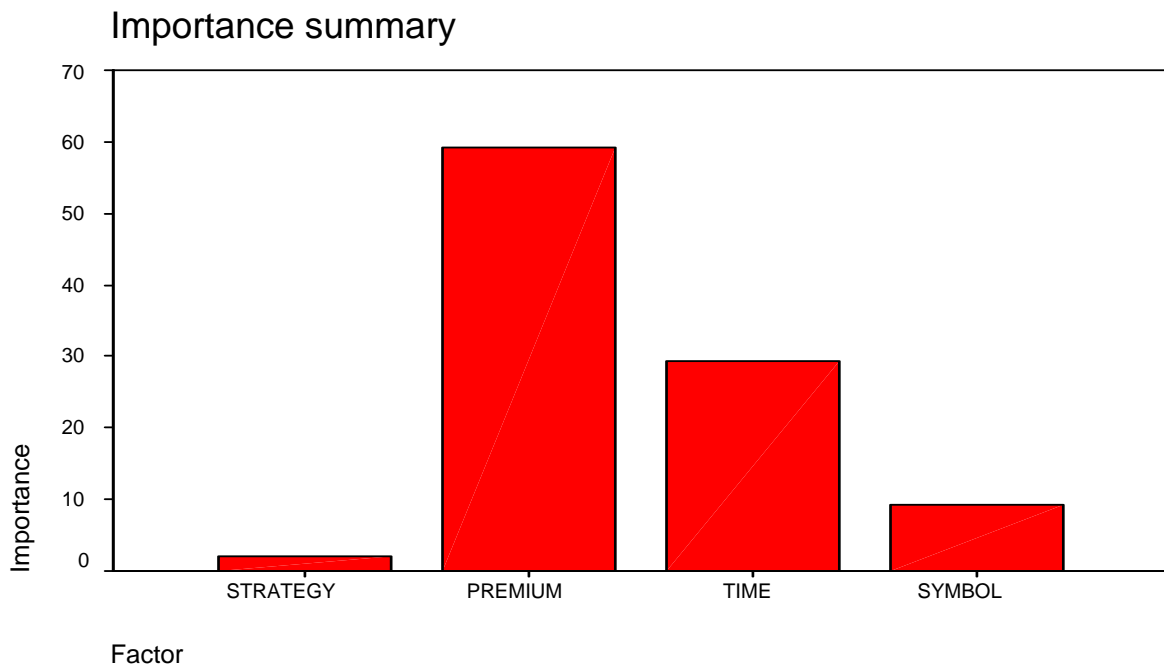
Conjoint Result

Summary Utilities

STRATEGY

Summary Utilities

PREMIUM

Summary Utilities

Utility vs TIME (near month, next month, far month)

Summary Utilities

Utility vs SYMBOL (stock, index)

Importance summary
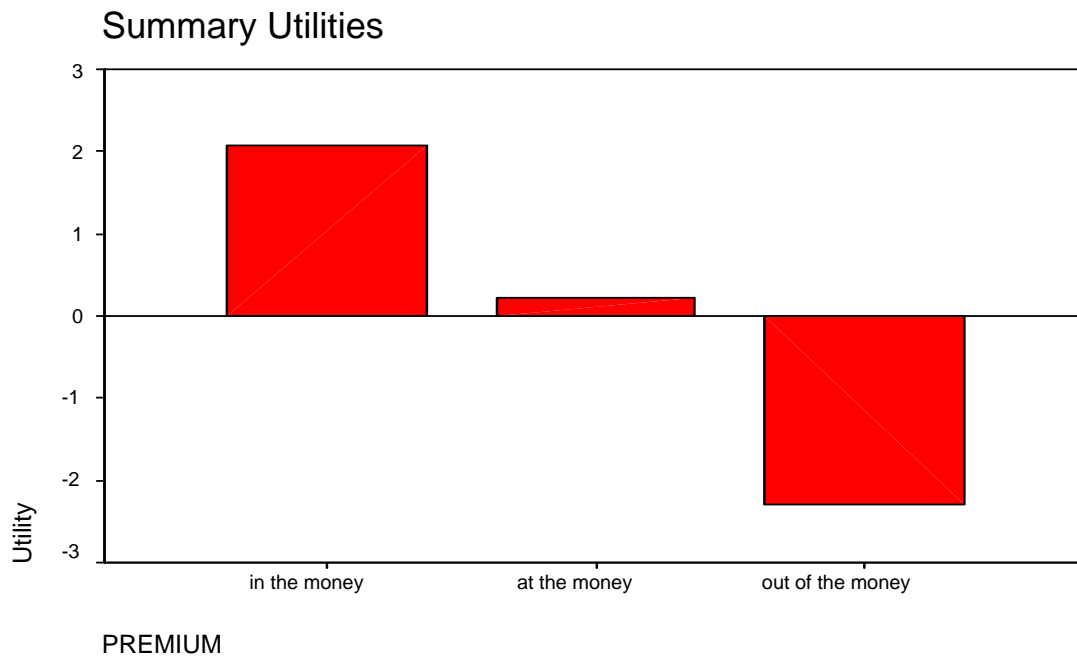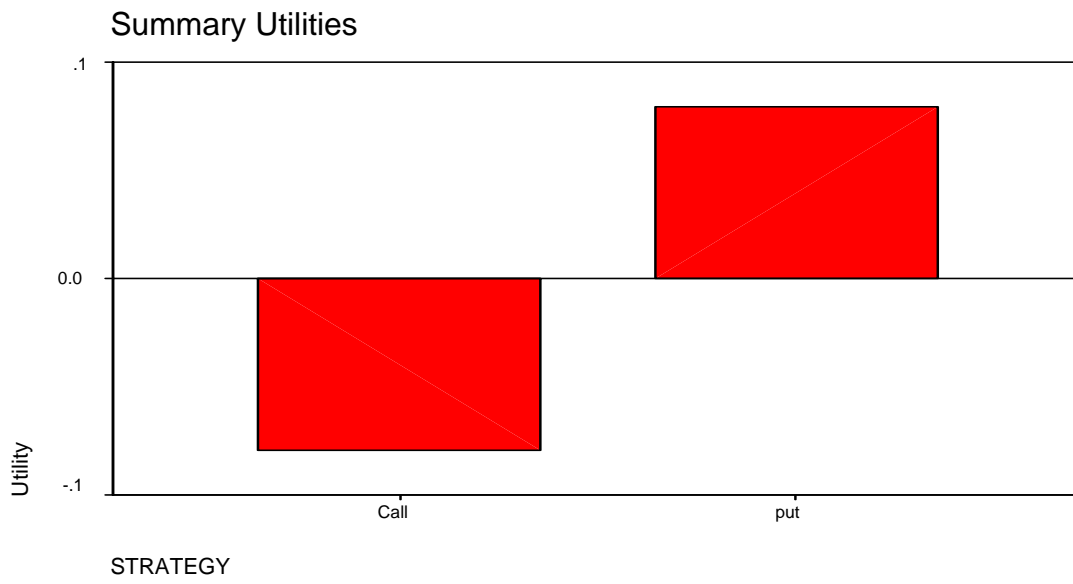
Based on the Utilities score for each variable we can conclude that , under Bullish Trend investors favor the following :

Put option over Call Option.

In the money option , At the money Option and Out of the money option.(In the money options are the least risky)

Near month option over next month and far month. (Due to uncerainity in the future trend investors prefer option that expires in the immediate month as their expectations of market may not hold true for long period of time.)

Index Option as compared to Stock Option. (Index option are better representative of overall market scenario.)

Thus the most optimal strategy based on the utility scores is :

In the money – Index Put Option that expires on near month.

Most important criteria while determining an Option is the Premium which is to be paid for the option. Next most important factor is the time and symbol and the least important variable is the kind of Option that will be purchased (Long call or short put) as both of them provide returns if the market actually turns bullish.

CONJOINT ANALYSIS: When Market is Bearish

In order to determine the most optimal strategy while selecting a Option , respondents were given 9 combinations of strategies that were developed after Orthogonal Design of four factors.

Symbol (2 levels): Index Option and Stock Option
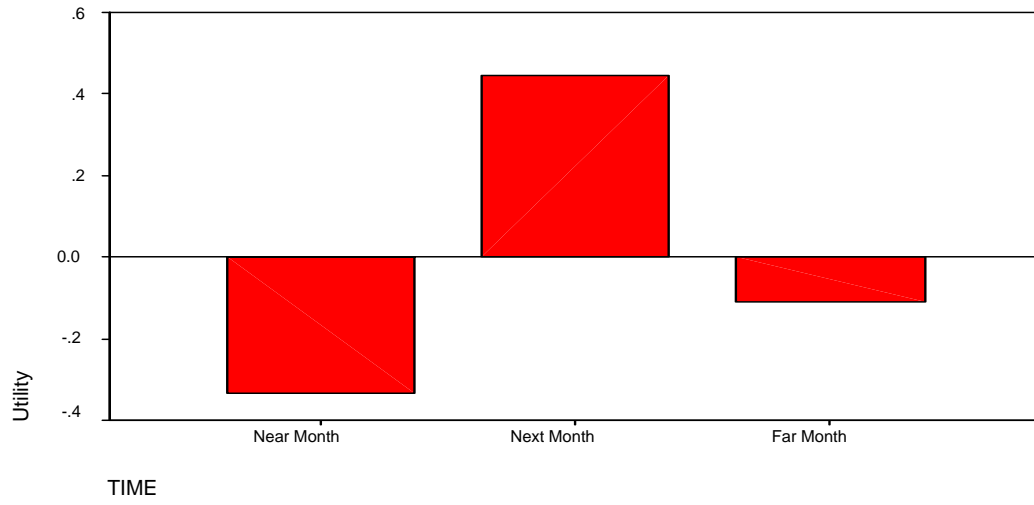
Strategy (2 levels): Long Put and Short Call

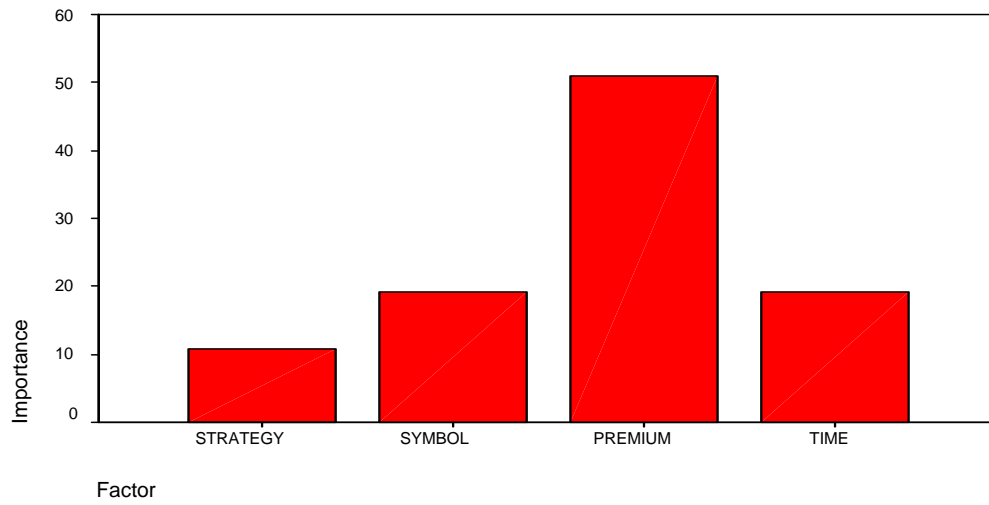**Premium (3 levels) :** In the money Option, At the money option and Out of money Option

Time (3 levels) : Near month, next month and Far month.

Summary Utilities

STRATEGY

Summary Utilities

PREMIUM
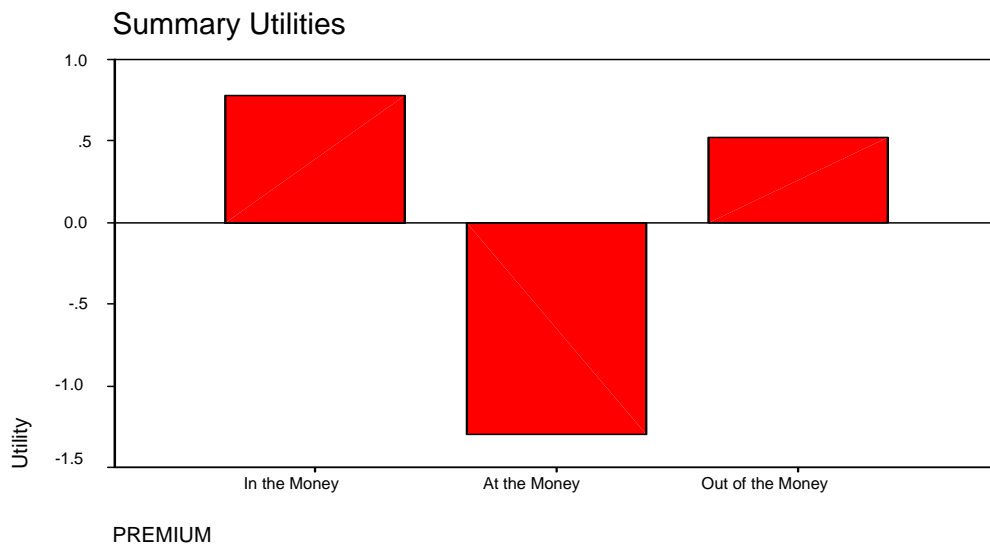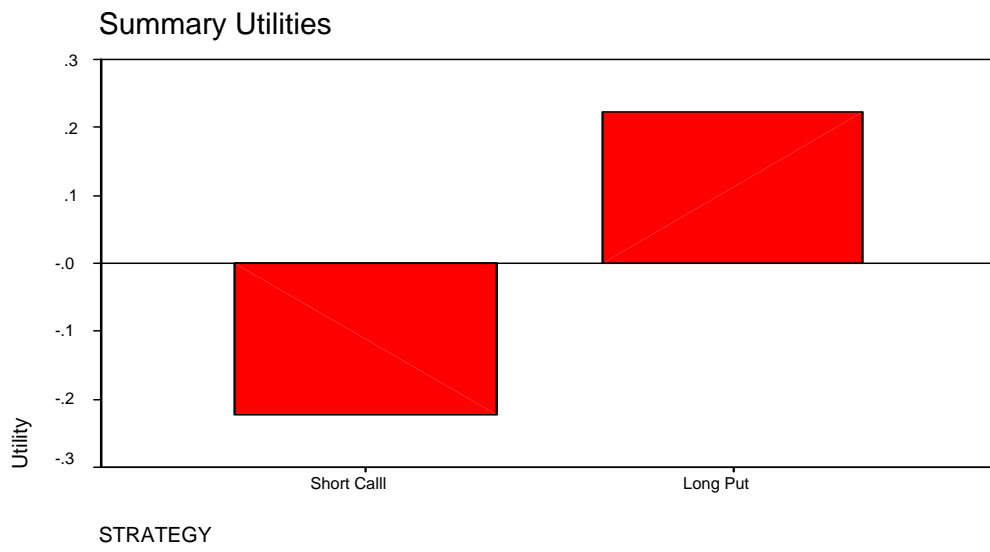
Summary Utilities

Importance summary

Interpretation of the results :

Based on the utility score for each of the above factors the following results emerge out.

Long Put has higher utility when compared to Short Put. In the money option has more utility when compared to out of money and at the money option. Index option is preferred over Stock Option and while deciding the time period of Option, Next month option is more preferred when compared to near month and far month.

Thus on the basis of the above analysis, the most optimal strategy while choosing an Option is Index In the money Put Option which expires on next month.

The most important factor that is used while deciding a particular option strategy is Premium followed by time and symbol and the least most factor is the kind of Option   (Short Call and Long Put).

………………………………………………………………………………………..

Annexure

The annexure which has been prepared for this particular report required high involvement of excel sheets, where in I had to use huge data, then I had to apply complex formulas, where in if I would have given these annexure in my report, the formulas would not have made any sense.

So all the annexure, I am putting it separately on a C.D., if you wish you can have a look at it.

The primary research which was done for this particular report, I am enclosing the questionnaire prepared.

Questionnaire.

1) How often do you follow market**?**

O Hour by hour basis

O Daily basis

O Weekly basis

4) In which of the following are do you actively **traded in**?

O Spot market

O Futures

O Option

6) What is your **primary motive** behind investment**?**

O Speculation

O Hedging

O Long term investment

7) Please **rate** the following **factors** on a scale of **one to seven**, which you consider important

while investing in a stock **for a particular company**?

1) Company brand name   1   2   3   4   5   6   7 8 9 10

2) Industrial Sector of the company

3) Profitability of Company

4) Dividends paid by the company

5) Current market scenario

6) Market share of company

7) Promoter's goodwill

8) Management strength

9) News about the company

10) Price in futures market for company

8) Please **rate** each of the following **factors** on a **scale of one to ten**, which decide/**influence your investment decision**?

1) Bullish trend	1	2	3	4	5	6	7	8	9	10
2) Bearish tread	1	2	3	4	5	6	7	8	9	10
3) BSE /NSE Sensex	1	2	3	4	5	6	7	8	9	10

4) Political factors

- Indian	1	2	3	4	5	6	7	8	9	10
- External	1	2	3	4	5	6	7	8	9	10

5) Non-Political factors

- Monsoon	1	2	3	4	5	6	7	8	9	10
- Sports news	1	2	3	4	5	6	7	8	9	10
- Festivals	1	2	3	4	5	6	7	8	9	10
6) Govt Policy	1	2	3	4	5	6	7	8	9	10
7) RBI statements	1	2	3	4	5	6	7	8	9	10
8) Interest rate scenario	1	2	3	4	5	6	7	8	9	10
9) FII Movements	1	2	3	4	5	6	7	8	9	10
10) Exchange rate	1	2	3	4	5	6	7	8	9	10

Movements

11) Inflation	1	2	3	4	5	6	7	8	9	10

12) Bank rate   1   2   3   4   5   6   7   8   9   10

9) Please, **rate** each of the following sectors on **a scale of one to ten** in order of attractiveness for the following factors.

Sector/Attractiveness	Consistency	Profit ability	Volumes	Growth	Volatility	risk
Auto						
Banking						
Cement						
Communication						
Construction						
Electronic						
FMCG						
Hotel						
Oil						
Pharmaceuticals						
Power						
Technology						

10) Please **rank** the following sectors of stock that you consider as the **most promising for the "next six months"?**

     ⭕ Auto

○ Banking

○ Cements

○ Communication

○ Construction

○ Electronic

○ FMCG

○ Hotel

○ Oil

○ Pharmaceuticals

○ Power

○ Technology/Software

11) While selecting a particular Option strategy please rank the particular strategy from one to nine?

When outlook is -Bullish

Long call , index option, in the money call, next month	

Long call , stock option,	in the money call ,	near month	
Short put, stock option,	in the money put,	far month	
Short put , index option,	at the money put ,	near month	
Long call , stock option,	at the money call ,	next month	
Long call , stock option,	at the money call,	far month	
Long call , stock option,	out of the money call ,	near month	
Short put , index option,	out of the money put ,	next month	
Long call , index option ,	out of the money call ,	far month	

When outlook is –Bearish

Short call , index option, in the money call,	next month	2
Short call , stock option, in the money call ,	**near month**	3
Long Put, stock option, in the money put,	far month	8
Long Put , index option, at the money put ,	near month	1
Short call , stock option, at the money call ,	next month	5
Short call , stock option, at the money call,	far month	6
Short call , stock option, out of the money call ,	near month	7
Long Put , index option, out of the money put ,	next month	4
Short call , index option , out of the money call ,	far month	9

12) What is your **annual family income**?

O <3,00,000

O 3,00,000-6,00,000

O 6,00,000-10,00,000

○ >10,00,000

13) Age

○ less than 24

○ 24-35

○ 36-45

○ >45

2) What is your **yearly volume of transactions?**

○ <1,50,000

○ Rs 1,50,000 – Rs 5,00,000

○ Rs 5,00,000 – Rs 10,00,000

○ >Rs 10,00,000

3) What is your overall portfolio of investments in trading at a particular point of time?

○ <1,50,000

○ Rs 1,50,000 – Rs 5,00,000

○ Rs 5,00,000 – Rs 10,00,000

○ >Rs 10,00,000

Bibliography

- **John.C.Hull**

- **Shelden Nattenberg**

- **NSE Website**