

S&P 500 options (Jan-Feb2014)
First 10 observations

Monday, November 2, 2020 02:44:26 PM 1

Obs	date	tau	K	call_option_price	S	r	put_option_price	date2
1	2014-01-02	16	1735	98.6	1831.98	0.0018	2.175	02JAN2014
2	2014-01-02	16	1740	93.9	1831.98	0.0018	2.175	02JAN2014
3	2014-01-02	16	1745	88.85	1831.98	0.0018	2.525	02JAN2014
4	2014-01-02	16	1750	84.05	1831.98	0.0018	2.6	02JAN2014
5	2014-01-02	16	1755	79.4	1831.98	0.0018	2.825	02JAN2014
6	2014-01-02	16	1760	74.75	1831.98	0.0018	3.25	02JAN2014
7	2014-01-02	16	1765	69.95	1831.98	0.0018	3.55	02JAN2014
8	2014-01-02	16	1770	65.35	1831.98	0.0018	3.95	02JAN2014
9	2014-01-02	16	1775	60.6	1831.98	0.0018	4.35	02JAN2014
10	2014-01-02	16	1780	56.3	1831.98	0.0018	4.8	02JAN2014

date	T	T1	T2	F1	F2	K01	K02	Contrib_sum1	Contrib_sum2	sigma_sq1	sigma_sq2	vix
02/01/2014	16	0.0438356	0.0986301	1831.7501	.	1830	.	0.0003007	.	0.0136979	.	.
02/01/2014	36	0.0438356	0.0986301	.	1830.6001	.	1830	.	0.0007122	.	0.0144402	11.97
03/01/2014	15	0.0410959	0.0958904	1831.1001	.	1830	.	0.0002456	.	0.011943	.	.
03/01/2014	35	0.0410959	0.0958904	.	1830.1	.	1830	.	0.0006687	.	0.0139464	11.70
06/01/2014	12	0.0328767	0.0876712	1827.2001	.	1825	.	0.0001797	.	0.0108865	.	.
06/01/2014	32	0.0328767	0.0876712	.	1825.9502	.	1825	.	0.0005943	.	0.0135553	11.60
07/01/2014	11	0.030137	0.0849315	1837.1501	.	1835	.	0.0001468	.	0.0096952	.	.
07/01/2014	31	0.030137	0.0849315	.	1835.9002	.	1835	.	0.0005285	.	0.0124427	11.13
09/01/2014	15	0.0410959	0.0986301	1837.8498	.	1835	.	0.0002244	.	0.0108624	.	.
09/01/2014	36	0.0410959	0.0986301	.	1835.5501	.	1835	.	0.0005891	.	0.0119452	10.86
10/01/2014	14	0.0383562	0.0958904	1841.1501	.	1840	.	0.0001659	.	0.0086389	.	.
10/01/2014	35	0.0383562	0.0958904	.	1838.8998	.	1835	.	0.0005364	.	0.0111409	10.42
13/01/2014	11	0.030137	0.0876712	1817.7999	.	1815	.	0.0002213	.	0.0146051	.	.
13/01/2014	32	0.030137	0.0876712	.	1815.4001	.	1815	.	0.0006144	.	0.0140146	11.85
14/01/2014	17	0.0465753	0.0849315	1838.0498	.	1835	.	0.0002732	.	0.0116727	.	.
14/01/2014	31	0.0465753	0.0849315	.	1836.0001	.	1835	.	0.0005025	.	0.0118295	10.87
15/01/2014	16	0.0438356	0.1041096	1847.2002	.	1845	.	0.0002511	.	0.0114252	.	.
15/01/2014	38	0.0438356	0.1041096	.	1844.3499	.	1840	.	0.0005914	.	0.0113073	10.64
16/01/2014	15	0.0410959	0.1013699	1844.95	.	1840	.	0.0002369	.	0.0113526	.	.
16/01/2014	37	0.0410959	0.1013699	.	1841.4502	.	1840	.	0.0005708	.	0.011256	10.62
17/01/2014	14	0.0383562	0.0986301	1837.2001	.	1835	.	0.0002223	.	0.0115547	.	.
17/01/2014	36	0.0383562	0.0986301	.	1833.6998	.	1830	.	0.0005427	.	0.0109636	10.51
21/01/2014	17	0.0465753	0.0876712	1840.9001	.	1840	.	0.0002681	.	0.011509	.	.
21/01/2014	32	0.0465753	0.0876712	.	1839.1999	.	1835	.	0.0004794	.	0.0108771	10.45
22/01/2014	16	0.0438356	0.0849315	1844.2499	.	1840	.	0.0002674	.	0.0120803	.	.
22/01/2014	31	0.0438356	0.0849315	.	1842.2003	.	1840	.	0.0004634	.	0.0108959	10.46
23/01/2014	15	0.0410959	0.0986301	1826.4501	.	1825	.	0.0003229	.	0.0156989	.	.
23/01/2014	36	0.0410959	0.0986301	.	1823.5498	.	1820	.	0.000654	.	0.0132223	11.65
24/01/2014	14	0.0383562	0.0958904	1791.0501	.	1790	.	0.0005082	.	0.0264882	.	.
24/01/2014	35	0.0383562	0.0958904	.	1788.4998	.	1785	.	0.0009187	.	0.0191208	14.12
27/01/2014	11	0.030137	0.0876712	1782.1501	.	1780	.	0.0004023	.	0.0266514	.	.
27/01/2014	32	0.030137	0.0876712	.	1779.5999	.	1775	.	0.0008724	.	0.0198257	14.16
28/01/2014	17	0.0465753	0.0849315	1789.85	.	1785	.	0.0004984	.	0.0212429	.	.
28/01/2014	31	0.0465753	0.0849315	.	1788.2497	.	1785	.	0.0007607	.	0.0178749	13.42
29/01/2014	16	0.0438356	0.1013699	1771.9502	.	1770	.	0.0005789	.	0.026384	.	.
29/01/2014	37	0.0438356	0.1013699	.	1769.5999	.	1765	.	0.0010262	.	0.0201797	14.59
30/01/2014	15	0.0410959	0.0986301	1791.5501	.	1790	.	0.0004564	.	0.0221915	.	.
30/01/2014	36	0.0410959	0.0986301	.	1789.4999	.	1785	.	0.0009261	.	0.0187139	13.86

date	T	T1	T2	F1	F2	K01	K02	Contrib_sum1	Contrib_sum2	sigma_sq1	sigma_sq2	vix
31/01/2014	14	0.0383562	0.0958904	1778.3999	.	1775	.	0.0005528	.	0.0287296	.	.
31/01/2014	35	0.0383562	0.0958904	.	1775.9502	.	1775	.	0.0010642	.	0.0221927	15.14
03/02/2014	11	0.030137	0.0876712	1738.4999	.	1735	.	0.0006542	.	0.0432795	.	.
03/02/2014	32	0.030137	0.0876712	.	1736.3502	.	1735	.	0.0012475	.	0.0284527	17.02
04/02/2014	18	0.0493151	0.0849315	1751.4501	.	1750	.	0.0005944	.	0.0240928	.	.
04/02/2014	31	0.0493151	0.0849315	.	1749.7	.	1745	.	0.0009965	.	0.023381	15.30
05/02/2014	17	0.0465753	0.1013699	1748.4499	.	1745	.	0.0006322	.	0.027063	.	.
05/02/2014	37	0.0465753	0.1013699	.	1746.4003	.	1745	.	0.0012057	.	0.023781	15.63
06/02/2014	16	0.0438356	0.0986301	1771.4001	.	1770	.	0.000474	.	0.0216105	.	.
06/02/2014	36	0.0438356	0.0986301	.	1769.2499	.	1765	.	0.0009931	.	0.0200786	14.26
07/02/2014	15	0.0410959	0.0958904	1794.0999	.	1790	.	0.0002998	.	0.0144619	.	.
07/02/2014	35	0.0410959	0.0958904	.	1792.1004	.	1790	.	0.0007822	.	0.0163003	12.68
10/02/2014	12	0.0328767	0.0876712	1796.7001	.	1795	.	0.0002254	.	0.0136856	.	.
10/02/2014	32	0.0328767	0.0876712	.	1794.9	.	1790	.	0.0007229	.	0.0164059	12.77
11/02/2014	11	0.030137	0.0849315	1816.7501	.	1815	.	0.0001589	.	0.0105126	.	.
11/02/2014	31	0.030137	0.0849315	.	1814.3999	.	1810	.	0.0006182	.	0.0144885	12.01
12/02/2014	16	0.0438356	0.1041096	1816.5001	.	1815	.	0.0002922	.	0.0133151	.	.
12/02/2014	38	0.0438356	0.1041096	.	1814.5999	.	1810	.	0.0007476	.	0.0142998	11.88
13/02/2014	15	0.0410959	0.1013699	1827.3001	.	1825	.	0.0002412	.	0.0116999	.	.
13/02/2014	37	0.0410959	0.1013699	.	1825.5501	.	1825	.	0.0006952	.	0.0137157	11.57
14/02/2014	14	0.0383562	0.0986301	1837.0001	.	1835	.	0.0002048	.	0.0106466	.	.
14/02/2014	36	0.0383562	0.0986301	.	1834.9	.	1830	.	0.0006494	.	0.0130949	11.31
18/02/2014	17	0.0465753	0.0876712	1838.0499	.	1835	.	0.0003006	.	0.0128467	.	.
18/02/2014	32	0.0465753	0.0876712	.	1837.4503	.	1835	.	0.0006007	.	0.0136841	11.67
19/02/2014	16	0.0438356	0.0849315	1825.75	.	1825	.	0.0003609	.	0.0164607	.	.
19/02/2014	31	0.0438356	0.0849315	.	1825.1	.	1825	.	0.0006815	.	0.016048	12.67
20/02/2014	15	0.0410959	0.0986301	1839.0499	.	1835	.	0.0003034	.	0.0146492	.	.
20/02/2014	36	0.0410959	0.0986301	.	1837.6996	.	1835	.	0.000711	.	0.0143954	12.01
21/02/2014	14	0.0383562	0.0958904	1834.15	.	1830	.	0.0002783	.	0.0143749	.	.
21/02/2014	35	0.0383562	0.0958904	.	1832.6996	.	1830	.	0.0006767	.	0.0140917	11.88
24/02/2014	11	0.030137	0.0876712	1848.3999	.	1845	.	0.0002204	.	0.0145132	.	.
24/02/2014	32	0.030137	0.0876712	.	1847.1003	.	1845	.	0.0006086	.	0.0138694	11.79
25/02/2014	17	0.0465753	0.0849315	1842.2501	.	1840	.	0.0003201	.	0.0137144	.	.
25/02/2014	31	0.0465753	0.0849315	.	1841.8002	.	1840	.	0.0006158	.	0.01449	12.02
26/02/2014	16	0.0438356	0.090411	1843.6499	.	1840	.	0.0003017	.	0.0136756	.	.
26/02/2014	33	0.0438356	0.090411	.	1842.6496	.	1840	.	0.0006339	.	0.0140001	11.82
27/02/2014	15	0.0410959	0.0876712	1851.6501	.	1850	.	0.0002513	.	0.0122108	.	.
27/02/2014	32	0.0410959	0.0876712	.	1850.6001	.	1850	.	0.0005801	.	0.0132332	11.48

date	T	T1	T2	F1	F2	K01	K02	Contrib_sum1	Contrib_sum2	sigma_sq1	sigma_sq2	vix
28/02/2014	14	0.0383562	0.0849315	1857.6499	.	1855	.	0.0002667	.	0.0138532	.	.
28/02/2014	31	0.0383562	0.0849315	.	1857.1003	.	1855	.	0.0005664	.	0.0133231	11.55

atm_date	atm_vol tau	r	K	S	c	atm_sigma
02/01/2014	16	0.0018	1830	1831.98	17.8	0.1093095
02/01/2014	36	0.0022	1830	1831.98	27.85	0.1161662
03/01/2014	15	0.0018	1830	1831.37	15.6	0.1002058
03/01/2014	35	0.0022	1830	1831.37	26.75	0.1143741
06/01/2014	12	0.0016	1825	1826.77	14.3	0.1010529
06/01/2014	32	0.0022	1825	1826.77	25.4	0.1127951
07/01/2014	11	0.0015	1840	1837.88	10.35	0.0890376
07/01/2014	31	0.0021	1840	1837.88	21.1	0.1028385
09/01/2014	15	0.0018	1840	1838.13	13.35	0.095479
09/01/2014	36	0.0017	1840	1838.13	22.45	0.1007975
10/01/2014	14	0.0017	1840	1842.37	13.5	0.0849131
10/01/2014	35	0.0017	1840	1842.37	22.8	0.0942653
13/01/2014	11	0.0016	1820	1819.2	13.4	0.1091401
13/01/2014	32	0.0016	1820	1819.2	22.75	0.1071185
14/01/2014	17	0.0018	1840	1838.88	15.2	0.0990028
14/01/2014	31	0.0016	1840	1838.88	20.5	0.0978875
15/01/2014	16	0.0018	1850	1848.38	14	0.0953416
15/01/2014	38	0.0017	1850	1848.38	21.3	0.0921847
16/01/2014	15	0.0018	1845	1845.89	14.85	0.0960255
16/01/2014	37	0.0017	1845	1845.89	22.25	0.0923333
17/01/2014	14	0.0017	1840	1838.7	12.65	0.092075
17/01/2014	36	0.0017	1840	1838.7	20.3	0.0902335
21/01/2014	17	0.0018	1845	1843.8	14.15	0.0923668
21/01/2014	32	0.0016	1845	1843.8	18.75	0.0882131
22/01/2014	16	0.0018	1845	1844.86	15.45	0.1002471
22/01/2014	31	0.0016	1845	1844.86	20.15	0.093691
23/01/2014	15	0.0018	1830	1828.46	15.45	0.1091241
23/01/2014	36	0.0016	1830	1828.46	22.7	0.1017661
24/01/2014	14	0.0017	1790	1790.29	23	0.1629959
24/01/2014	35	0.0017	1790	1790.29	30.7	0.1375224
27/01/2014	11	0.0016	1780	1781.56	20.65	0.1606848
27/01/2014	32	0.0017	1780	1781.56	30.05	0.1384932
28/01/2014	17	0.0018	1790	1792.5	21.75	0.1322718
28/01/2014	31	0.0017	1790	1792.5	27.2	0.1238879
29/01/2014	16	0.0018	1775	1774.2	21.95	0.1503126
29/01/2014	37	0.0018	1775	1774.2	30.5	0.1363883
30/01/2014	15	0.0018	1795	1794.19	19.05	0.1335851

atm_date	atm_vol tau	r	K	S	c	atm_sigma
30/01/2014	36	0.0018	1795	1794.19	28.45	0.1276417
31/01/2014	14	0.0017	1785	1782.59	19.45	0.147648
31/01/2014	35	0.0018	1785	1782.59	29.35	0.1379272
03/02/2014	11	0.0013	1740	1741.89	24.1	0.191664
03/02/2014	32	0.0018	1740	1741.89	35.4	0.1668536
04/02/2014	18	0.0014	1755	1755.2	21.9	0.1398206
04/02/2014	31	0.0018	1755	1755.2	29.55	0.1436853
05/02/2014	17	0.0014	1750	1751.64	23.75	0.151678
05/02/2014	37	0.0019	1750	1751.64	34.8	0.1520283
06/02/2014	16	0.0014	1775	1773.43	19.3	0.1351159
06/02/2014	36	0.0019	1775	1773.43	29.25	0.134372
07/02/2014	15	0.0014	1795	1797.02	16.5	0.1061327
07/02/2014	35	0.0019	1795	1797.02	26.9	0.1158909
10/02/2014	12	0.0013	1800	1799.84	13.45	0.1036259
10/02/2014	32	0.002	1800	1799.84	24.4	0.1144112
11/02/2014	11	0.0013	1820	1819.75	11.3	0.0903653
11/02/2014	31	0.002	1820	1819.75	22.15	0.1045589
12/02/2014	16	0.0014	1820	1819.26	15.25	0.1023963
12/02/2014	38	0.0017	1820	1819.26	25.05	0.1078519
13/02/2014	15	0.0014	1830	1829.83	14.1	0.0954977
13/02/2014	37	0.0017	1830	1829.83	24.75	0.1061842
14/02/2014	14	0.0013	1840	1838.63	12.55	0.0917115
14/02/2014	36	0.0017	1840	1838.63	23.4	0.103842
18/02/2014	17	0.0014	1840	1840.76	16.45	0.1010216
18/02/2014	32	0.0016	1840	1840.76	23.5	0.1057527
19/02/2014	16	0.0014	1830	1828.75	16.5	0.1116728
19/02/2014	31	0.0016	1830	1828.75	23.8	0.1142515
20/02/2014	15	0.0014	1840	1839.78	16.3	0.109932
20/02/2014	36	0.0017	1840	1839.78	26.5	0.1147818
21/02/2014	14	0.0013	1835	1836.25	15.4	0.1026361
21/02/2014	35	0.0017	1835	1836.25	25.55	0.1092348
24/02/2014	11	0.0013	1850	1847.61	13.5	0.1142604
24/02/2014	32	0.0017	1850	1847.61	23.9	0.1142274
25/02/2014	17	0.0014	1845	1845.12	16.1	0.1005979
25/02/2014	31	0.0016	1845	1845.12	23.55	0.108929
26/02/2014	16	0.0014	1845	1845.16	16.25	0.1045587
26/02/2014	33	0.0017	1845	1845.16	24.55	0.10993

atm_date	atm_vol tau	r	K	S	c	atm_sigma
27/02/2014	15	0.0013	1855	1854.29	14.1	0.0960314
27/02/2014	32	0.0017	1855	1854.29	22.35	0.1030164
28/02/2014	14	0.0013	1860	1859.45	14.7	0.1027376
28/02/2014	31	0.0017	1860	1859.45	22.7	0.1056477

Difference between VIX and Implied volatility (ATM Vol.)

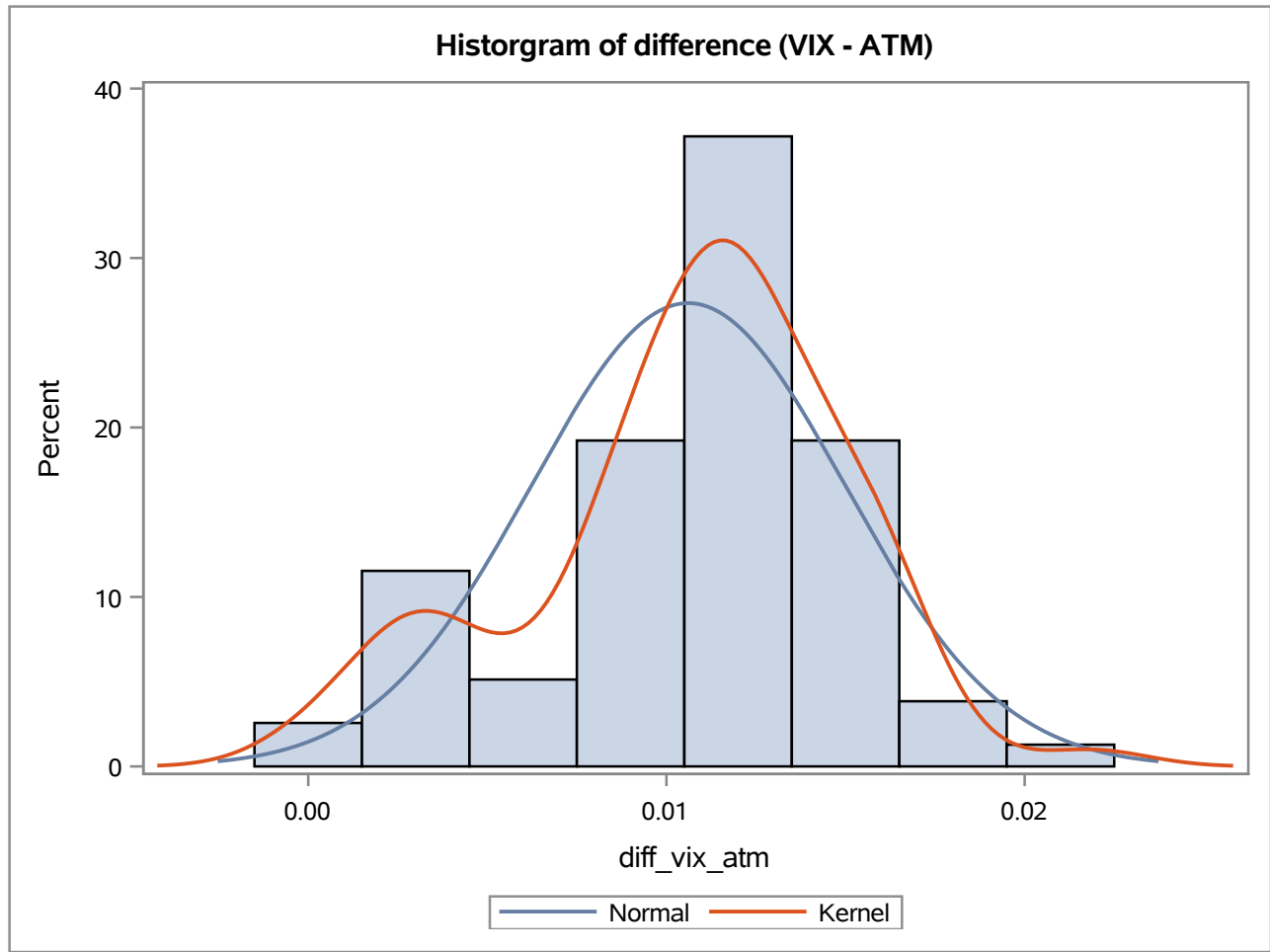
date	tau	VIX sigma	ATM implied vol	difference
02/01/2014	16	0.1170381	0.1093095	0.0077286
02/01/2014	36	0.1201672	0.1161662	0.004001
03/01/2014	15	0.1092842	0.1002058	0.0090784
03/01/2014	35	0.1180947	0.1143741	0.0037206
06/01/2014	12	0.1043383	0.1010529	0.0032854
06/01/2014	32	0.1164273	0.1127951	0.0036322
07/01/2014	11	0.0984643	0.0890376	0.0094267
07/01/2014	31	0.111547	0.1028385	0.0087085
09/01/2014	15	0.104223	0.095479	0.0087439
09/01/2014	36	0.1092941	0.1007975	0.0084967
10/01/2014	14	0.0929455	0.0849131	0.0080324
10/01/2014	35	0.1055504	0.0942653	0.011285
13/01/2014	11	0.1208517	0.1091401	0.0117115
13/01/2014	32	0.1183832	0.1071185	0.0112646
14/01/2014	17	0.1080404	0.0990028	0.0090376
14/01/2014	31	0.1087634	0.0978875	0.0108759
15/01/2014	16	0.1068886	0.0953416	0.011547
15/01/2014	38	0.1063358	0.0921847	0.0141511
16/01/2014	15	0.1065485	0.0960255	0.0105231
16/01/2014	37	0.1060944	0.0923333	0.0137612
17/01/2014	14	0.1074926	0.092075	0.0154176
17/01/2014	36	0.1047073	0.0902335	0.0144737
21/01/2014	17	0.1072802	0.0923668	0.0149135
21/01/2014	32	0.1042935	0.0882131	0.0160804
22/01/2014	16	0.1099104	0.1002471	0.0096633
22/01/2014	31	0.1043836	0.093691	0.0106926
23/01/2014	15	0.1252954	0.1091241	0.0161713
23/01/2014	36	0.1149881	0.1017661	0.013222
24/01/2014	14	0.1627518	0.1629959	-0.000244
24/01/2014	35	0.1382781	0.1375224	0.0007557
27/01/2014	11	0.1632527	0.1606848	0.0025678
27/01/2014	32	0.1408039	0.1384932	0.0023107
28/01/2014	17	0.1457494	0.1322718	0.0134776
28/01/2014	31	0.1336971	0.1238879	0.0098092
29/01/2014	16	0.1624316	0.1503126	0.012119
29/01/2014	37	0.1420554	0.1363883	0.0056671

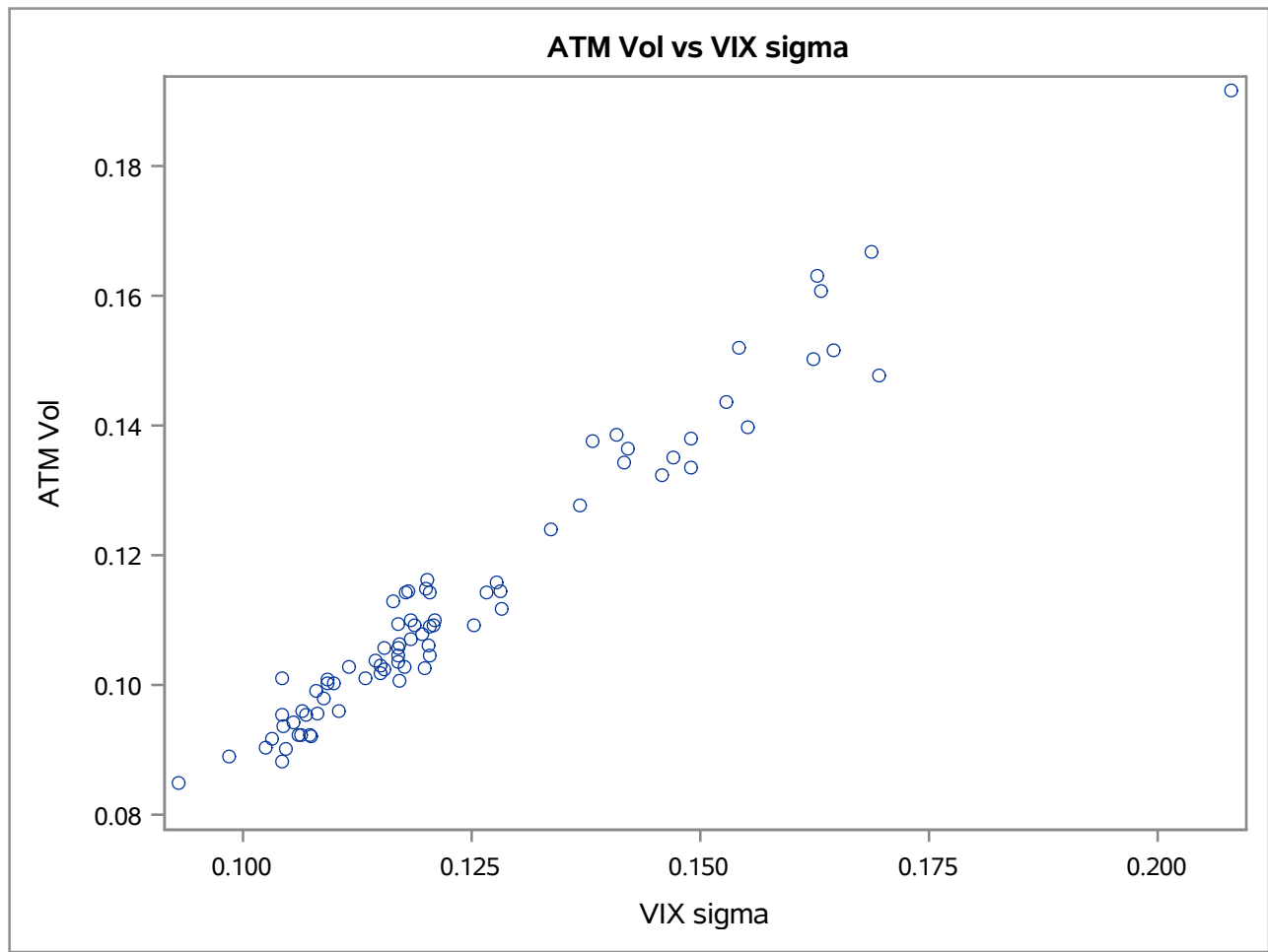
Difference between VIX and Implied volatility (ATM Vol.)

date	tau	VIX sigma	ATM implied vol	difference
30/01/2014	15	0.148968	0.1335851	0.0153828
30/01/2014	36	0.1367989	0.1276417	0.0091571
31/01/2014	14	0.1694981	0.147648	0.0218501
31/01/2014	35	0.148972	0.1379272	0.0110448
03/02/2014	11	0.2080373	0.191664	0.0163734
03/02/2014	32	0.1686793	0.1668536	0.0018257
04/02/2014	18	0.1552187	0.1398206	0.0153981
04/02/2014	31	0.1529083	0.1436853	0.009223
05/02/2014	17	0.1645084	0.151678	0.0128303
05/02/2014	37	0.154211	0.1520283	0.0021827
06/02/2014	16	0.147005	0.1351159	0.0118891
06/02/2014	36	0.1416988	0.134372	0.0073268
07/02/2014	15	0.1202574	0.1061327	0.0141247
07/02/2014	35	0.1276725	0.1158909	0.0117817
10/02/2014	12	0.1169855	0.1036259	0.0133596
10/02/2014	32	0.1280854	0.1144112	0.0136742
11/02/2014	11	0.1025309	0.0903653	0.0121656
11/02/2014	31	0.1203682	0.1045589	0.0158092
12/02/2014	16	0.1153911	0.1023963	0.0129948
12/02/2014	38	0.1195816	0.1078519	0.0117297
13/02/2014	15	0.108166	0.0954977	0.0126683
13/02/2014	37	0.117114	0.1061842	0.0109298
14/02/2014	14	0.1031824	0.0917115	0.0114708
14/02/2014	36	0.1144331	0.103842	0.0105911
18/02/2014	17	0.1133432	0.1010216	0.0123216
18/02/2014	32	0.1169791	0.1057527	0.0112265
19/02/2014	16	0.1282995	0.1116728	0.0166266
19/02/2014	31	0.1266805	0.1142515	0.012429
20/02/2014	15	0.1210338	0.109932	0.0111017
20/02/2014	36	0.1199807	0.1147818	0.005199
21/02/2014	14	0.1198954	0.1026361	0.0172592
21/02/2014	35	0.1187085	0.1092348	0.0094737
24/02/2014	11	0.1204709	0.1142604	0.0062105
24/02/2014	32	0.1177683	0.1142274	0.0035409
25/02/2014	17	0.1171083	0.1005979	0.0165104
25/02/2014	31	0.1203744	0.108929	0.0114455

Difference between VIX and Implied volatility (ATM Vol.)

date	tau	VIX sigma	ATM implied vol	difference
26/02/2014	16	0.1169427	0.1045587	0.012384
26/02/2014	33	0.1183219	0.10993	0.0083919
27/02/2014	15	0.1105026	0.0960314	0.0144712
27/02/2014	32	0.1150355	0.1030164	0.012019
28/02/2014	14	0.1176995	0.1027376	0.0149619
28/02/2014	31	0.1154259	0.1056477	0.0097782





corr	
1	0.9792483
0.9792483	1

LMS: The 40th ordered squared residual will be minimized.

Median and Mean		
	Median	Mean
VAR1	0.1066513421	0.1135160317
Intercep	1	1
Response	0.1179315	0.1241217126

Dispersion and Standard Deviation		
	Dispersion	StdDev
VAR1	0.0133459362	0.0215358518
Intercep	0	0
Response	0.0145714687	0.0207554125

There are 3003 subsets of 2 cases out of 78 cases.

The algorithm will draw 1000 random subsets of 2 cases.

Random Subsampling for LMS

25 % of calculations have been executed.

75 % of calculations have been executed.

Minimum Criterion= 0.1463100594

Least Median of Squares (LMS) Method

Minimizing 40th Ordered Squared Residual.

Highest Possible Breakdown Value = 50.00 %

Random Selection of 1000 Subsets

All 1000 Subsets were Nonsingular

Observations of Best Subset	
11	40

Estimated Coefficients	
VAR1	Intercep
1.0568228445	0.0053393053

LMS Objective Function = 0.0021319525

Preliminary LMS Scale = 0.0032651267

Robust R Squared = 0.9090047932

Final LMS Scale = 0.0036455741**The run has been executed successfully.**

LMS Information and Estimates	
Quantile	40
Number of Subsets	1000
Number of Singular Subsets	0
Number of Nonzero Weights	72
Objective Function	0.002132
Preliminary Scale Estimate	0.0032651
Final Scale Estimate	0.0036456
Robust R Squared	0.9090048
Asymptotic Consistency Factor	1.4392593