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Asymmetries in Inflation Volatility: Evidence from India

Swapnil Bhardwaj*

Assistant Professor, Department of Economics, University of Rajasthan, JLN Marg, Jaipur - 302004, Rajasthan, India; swapn25@gmail.com

Abstract

This paper records the volatility and asymmetry present in Indian inflation. The study uses monthly data from January 1991 to December 2016 of Wholesale Price Index (WPI) and Consumer Price Index (CPI) inflation to examine and model the volatility in the backdrop of changes in the monthly Crude Oil and Gold Prices. The methodology uses a generalized autoregressive conditional heteroskedasticity (GARCH) model along with exponential GARCH (EGARCH) and threshold GARCH (TGARCH). The analysis reveals that crude oil and gold price affect WPI and CPI differently. While crude oil price seems to be an insignificant factor contributing to CPI volatility, gold price emerges as a consequential factor influencing WPI inflation volatility.

JEL CLASSIFICATION: C50, E31, O53

Keywords: EGARCH, Inflation Uncertainty, TGARCH

1. Introduction

High inflation volatility is the highest rated risk associated with inflation. Lack of price stability makes the economy more vulnerable by jeopardizing its efficiency and growth. Volatile inflation results in future uncertainty, Literature also treats inflation volatility and uncertainty as synonymous. Inflation uncertainty has high cost in terms of the welfare of the economy as it weakens the price mechanism by making it inefficient in allocating resourcesand lowers output growth (Friedman, 1977).

High unanticipated inflation adversely affects decision making ability of consumers regarding saving, investment and consumption, inflation uncertainty is also responsible for disturbing the informational content of prices and hence the price mechanism and resource allocation. Absence of price stability is damaging to any economy as it gives way to uncertainty and high inflation volatility raises the level of uncertainty. Thus, inflation volatility can cause much more harm even if current inflation is at moderate and acceptable level.

For the emerging economies, high inflation volatility can be even more detrimental compared to their advanced counterparts as the level of inflation is already higher in emerging economies. Given the low level of income in such economies, inflation volatility exerts greater pressure on the population and impedes growth. While most of the research carried out on inflation dynamics is concentrated on inspecting the inflation levels and its persistence, a less work has been done on inflation volatility and understanding the structural reasons behind it. Also, majority of the literature consists of understanding the various aspects of inflation in advanced economies and a few relevant studies exist for developing countries.

India experienced recurring events of high and variable inflation all through 1970's and 80's, while the behavior of inflation from 90's onwards has become relatively calm and stable, nonetheless, there is a need to monitor the volatilities and asymmetries present in inflation. The purpose of this paper is to model the volatility present in the two primary measurements of inflation in India namely Consumer Price Index (CPI) and

*Author for correspondence

Wholesale Price Index (WPI) in the presence of Crude Oil and Gold prices. Import statistics for India indicate that “Petroleum, Crude & Product” and “Gold & Silver” have been consistently among the top categories in terms of their share of total imports. Hence, the Indian economy in particular Inflation is more likely to be endangered by shocks in oil and gold prices. Section 2 discusses India’s experience of inflation; section 3 reviews relevant literature present, data and methodology employed are presented in section 4 and section 5 and 6 canvass the findings and conclusions of the study.

2. India’s Experience of Inflation

High inflation is a cause of concern for a typical developing economy and so it is for India. AlthoughIndia has never faced a threat of hyper-inflation still inflation has mostly been variable and uncertain. Most policymakers and economists share the sentiment that persistent and high inflation gets imbibed into people’s expectations leading to higher price level in future. Thus, price stability is the primary objective of a monetary policy of any standard emerging economy.

India as an emerging economy has experienced inflation as high as 40 per cent (WPI) at the time of famine in 1943-44 and as low as -12.5 per cent (WPI) in 1952-53. It is of general agreement that volatile inflation makes the economy more vulnerable as compared to high inflation and hence exploring the volatility of Indian inflation and using the evidence for future policy making and execution is of utmost importance. The worst inflation that India witnessed was in 1940’s, when famine wrecked its havoc in 1943-44 and in the late 1940’s when world war II came to an end, its adverse implications on the economy became visible. There was a supply shock as supply side was inadequate to meet the ever mounting demand also there was a drop in agricultural production due to its dependency on the monsoon, primitive methods of farming and poor state of power and transport, these and many more reasons contributed to the tremendous increases in prices. Again in 1970’s inflation reached a new high when oil producing Arab nations proclaimed oil embargo which led to an abrupt rise in oil prices. It was in 2009 till 2011 that India once again looked on at inflation mounting and reaching double digits; inflation peaked at 12.5 per cent in 2009-10 declining minimally to 11 per cent in the following year. This time it was because of the US subprime crisis which led to the global slowdown, positive commodity and oil price shocks and poor monsoon tied agricultural productivity. Looking at the inflation data for India, the rates are not so worrisome and have become stable over the years however, the volatility exhibited by both the indices needs attention and there is a need to examine this second order behavior underlying inflation.

The Indian inflation as discussed by most economists is fed by movements in food prices, oil prices and prices of gold and silver. Much research has been done on food inflation in India and the uncertainty of price level due to changing food prices, in the ongoing study the focus is on the volatility in crude oil and gold prices which has its effect on the overall inflation volatility. India being a developing economy is a huge importer of crude oil because of its strategic importance in many industries and transportation. Along with crude oil India is known for its affinity for gold, not only because it’s the safest investment but also because of cultural importance and most of its demand is met through imports.

Since times immemorial, Gold has been a safe haven whenever stock market is going down or dollar weakens, gold emerges as a safe alternative for investment as it has no credit risk attached to it and can be liquidated in any circumstances. In recent years gold prices have experienced pronounced volatility, the US subprime crisis in 2008 led to the stock markets crashing and weakening of currencies all around the world and gold emerged as a reliable avenue for investment. India witnessed swelling gold prices in the backdrop of the euro zone crisis and the US subprime crisis which weakened the US dollar and made stock markets fragile. In the past few years with revival of the US economy and depression in emerging economies gold prices are on the falling trajectory and experience high volatility. Given the importance of gold in the Indian economy as a secure investment, it becomes imperative to investigate how volatility in gold prices affects inflation volatility (both WPI and CPI) in India.

Energy resources are one of the prime drivers of economic growth of a typical developing economy and for a long term and sustainable development, affordable and adequate supply of energy is obligatory. India is one of the largest importers of crude oil in the world after US, Japan and China and around 75-80 per cent of its domestic demand is met through imports. India is a home to abundant resources of hydrocarbons, but it lacks in the exploration potential and hence it depends on the imports to meet its retail needs. As a popular belief industrial and economic growth are significantly correlated to the availability of oil, therefore extreme oil price variations places Indian economy in jeopardy. An increase in oil price adversely affects the functioning of the industries depended on oil by increasing the cost of production leading to higher inflation. Fuel occupies a major share in the CPI basket, and, any positive change in oil prices results in the soaring price levels in general. Changing oil prices have its implications on the major macroeconomic variables including inflation and that being so; it is in dispensible to find the influence of oil price volatility on the CPI and WPI volatility.

The data on inflation (both WPI and CPI) suggests that in the recent years the rates have lowered and stabilized, yet it is required to probe the volatility existing in both the measures of inflation. In 1990-91 India witnessed the dawn of New Economic Policy (NEP) after the dark night of severe economic crisis, it was a break for the Indian economy to put in place the fiscal and structural reforms. The NEP aimed at integrating Indian economy with the world economy and opened its gates to innumerable opportunities. With the globalization and increased openness, the Indian economy saw unprecedented growth but was also subjected to global shocks through various channels. It further resulted in increased volatility and uncertainty in macroeconomic indicators on that account, it is essential to model the existing volatility in the WPI and CPI since the beginning of the new economic regime in India.

3. Literature Review

There is an abundant literature on economic costs of inflation volatility (uncertainty) and the link between inflation and inflation uncertainty. In his Nobel lecture on Inflation and Unemployment in 1977, Friedman discussed that high inflation uncertainty disturbs the informational content of prices thus, affecting the allocation of resources adversely. Azimi (2016) examine the clustering volatility of India's WPI using ARCH (1) and GARCH (1) models. It reveals that GARCH (1) is not appropriate to model WPI and the volatility of previous periods of the WPI is not significant to influence the WPI and ARCH (1) is the best fit model to explain the volatility of WPI under Gaussian model. Rother (2004) unwraps the possible links between fiscal policies and inflation volatility, covering the past 35-year data for 15 OECD countries. The unconditional volatility of monthly CPI and conditional volatility derived from generalized autoregressive conditional heteroscedasticity (GARCH) models suggest that volatility in discretionary fiscal policies contributes to volatility in inflation in the sample analyzed. Chowdhury (2014) analyzes the relationship between inflation and the associated uncertainty by applying GARCH model and examines the direction of causality using the Granger Causality test. The estimates reveal robust presence of direct relationship between the variables and a positive feedback relationship between the two, that is higher levels of inflation results in higher uncertainty or volatility and higher volatility leads to further higher price levels. Emara (2012) uses a panel of thirty-seven countries, both developed and developing economies to examine the impact of inflation volatility on economic growth over the sample period of eighteen years (1989-2006). The results confirm that it is the inflation volatility and not inflation which has a significant and negative repercussion on economic growth especially in developing economies. However, the study does not explore the channels through which inflation volatility dampens growth.

4. Data and Methodology

All variables used in the study are monthly observations spanning from January 1991 to December 2016. The monthly data for CPI and WPI has been taken from Handbook of Statistics on Indian Economy, Reserve Bank of India (RBI), Crude Oil prices have been taken from Ministry of Petroleum and Natural Gas (MoP&NG) and Gold prices from World Gold Council (all prices are in US $). Returns are calculated for CPI and WPI according to the following formula:

$$\text{Return} = \log(\text{Price Index}_t) - \log(\text{Price Index}_{t-1})$$

Time series data are frequently assumed to be non-stationary and accordingly, it is essential to perform a pretest to ensure that all variables are stationary in order to avoid the problem of spurious regression (Granger et. al, 2000). In this regard Augmented Dickey-Fuller (ADF) test is used to check the stationarity of the variables. ADF test allows for an exogenous structural break following which structural breaks have been found in WPI and CPI, to ascertain this fact Chow Breakpoint Test has been used.

GARCH modeling requires determination of adequate mean equation. The most common model selection criteria such as Akaike Information Criterion (AIC) and the Schwarz Information Criteria (SIC) have been used in the study which offers an optimal balance between goodness-of-fit and parsimony.

For modeling the volatility present in the financial time series, the Autoregressive Conditional Heteroskedasticity (ARCH) model was developed by Engle in 1982. The Generalized Autoregressive Conditional Heteroskedasticity (GARCH) models (Bollerslev, 1986) which are the modified extensions to ARCH (p), have been the most universally adopted model for studying and capturing volatility clustering and unconditional return distribution with heavy tails.

Though the GARCH models have been proved to be adequate to explain the dependence structure in conditional variances, there are several important limitations, one of which is that they fail to capture the stylized fact that conditional variance tends to be higher after a decrease in return than after an equal increase (Wu, 2010). To capture the asymmetries present in the Indian inflation the asymmetric models have been employed. The Exponential GARCH (EGARCH) proposed by Nelson (1991) where the conditional variance is specified in the logarithmic form as:

$$ln\ (h_t) = \alpha_0 + \alpha_1\ (€_{t-1}/h_{t-1}{}^{0.5}) + \wedge_1 \mid €_{t-1}/\ h_{t-t}{}^{0.5} \mid + \beta_1\ ln(h_{t-1})$$

and Threshold GARCH (TGARCH) model by Zakoian (1991) which was taken forward in Rabemananjara and Zakoian (1993) and a model studied by Glosten, Jagannathan, and Runkle known as GJR GARCH, similar to the TGARCH model, where the conditional variance is defined as a linear piecewise function as:

$$h_t = \alpha_0 + \alpha_1 €^2_{t-1} + \wedge_1 d_{t-1} €^2_{t-1} + \beta_1 h_{t-1}$$

5. Findings

This section encapsulates the results obtained from the application of various statistical tests and econometric models. The descriptive statistics of CPI and WPI such as sample mean, standard deviation, skewness, and kurtosis are reported here. Standard deviation being a measure of the spread of the series, its value of 1.03 suggests that CPI is quite volatile during the study period. The kurtosis value and the low probability value of Jarque-Bera normality testimply that the series strongly departs from normality. Standard deviation value of 0.68 of WPI shows less volatility in comparison to CPI, the implication from kurtosis value and Jarque-Bera test are the same as in CPI, which is non-normal data series. The ADF test demonstrates that the return series of CPI and WPI are stationary at level while the crude oil and gold price become stationary after first difference. The ADF test for breakpoint unit root test and Chow breakpoint test confirm the presence of a structural break in CPI and WPI in November, 1998 and August 2013 respectively. As a result, dummy variables, D_{98} and D_{13} are generated. Since GARCH modeling requires adequate ARMA model to specify the mean equation, Ordinary Least Squares (OLS) regression is done, the oil and gold price is not taken into account as they are treated as exogenous variables affecting inflation. Statistics of the Ljung–Box Q-test and Breusch-Godfrey test illustrate no serial correlation present; hence no AR and MA terms are included in the model for CPI return series. For WPI, the above-mentioned tests show the presence of serial correlation which is removed when AR (1) is included in the model. Hence AR (1) is the best-fit model (as suggested by AIC and SIC) for WPI for estimating its mean equation. The Engel's (LM) test rejects the null hypothesis of homoscedasticity in the conditional variance, implying the existence of ARCH effect in both CPI and WPI. For CPI returns, GARCH (0, 1) with ARCH in mean model (Table 1) comes out to be the best symmetric model when we assume that the errors follow Student's t distribution with fixed degree of freedom where volatility of gold price affects the volatility of CPI returns negatively and oil price volatility is insignificant to influence it. To seize the asymmetries EGARCH (1, 1) is the most adequate model, the estimated coefficient of ϒ (Table 2) is positive which means that a bad news does not have greater negative impact on conditional variance of CPI returns compared to equal good news and volatility in gold price affects the volatility in CPI inflation negatively whereas volatility in oil price doesn't seem to impact it.

GARCH (0, 1) with ARCH in mean (Table 3), emerge as the best-fit symmetric model for WPI returns where errors are taken as following Generalized Error Distribution (GED) and here crude oil price volatility influence the WPI volatility significantly. TGARCH (1, 1) with ARCH in mean (Table 4), represents the asymmetries and leverage effect present in WPI decently. The results show high and significant leverage effect that is; negative shocks result in a higher increase in inflation uncertainty

Table 1. GARCH (0, 1) model for CPI

Mean Equation	
C D1 (structural break)	1.566523 (0.0001) -0.338025 (0.0018)
Variance Equation	
ω (constant) α (ARCH effect) β (GARCH effect) DGP (volatility in gold price) DOP (volatility in oil price)	0.366548 (0.0320) - 0.492060 (0.0413) -0.002773 (0.0107) -0.017764 (0.1410)

P-values are given in parenthesis

Table 2. EGARCH (1, 1) model for CPI

Mean Equation	
C D1 (structural break)	0.784421 (0.0000) -0.275197 (0.0000)
Variance Equation	
ω (constant) α (ARCH effect) ϒ (asymmetry) β (GARCH effect) DGP (volatility in gold price) DOP (volatility in oil price)	0.040138 (0.0643) -0.104302 (0.0002) 0.310311 (0.0000) 0.873073 (0.0000) -0.004577 (0.0000) 0.009611 (0.1489)

P-values are given in parenthesis

Table 3. GARCH (0, 1) model for WPI

Mean Equation	
C D1(structural break) AR(1)	2.391076 (0.0000) -0.243323 (0.0824) 0.275421 (0.0000)
Variance Equation	
ω (constant) α (ARCH effect) β (GARCH effect) DGP (volatility in gold price) DOP (volatility in oil price)	0.191591 (0.0002) - 0.496007 (0.0001) -0.000370 (0.2542) -0.010888 (0.0004)

P-values are given in parenthesis

than the positive shock of the same magnitude. Volatility in oil price has a negative and significant influence on WPI inflation uncertainty while gold price volatility is not significant enough to hamper the WPI inflation.

6. Conclusion

The volatility and asymmetries present in Indian inflation are quite evident, however, what is of interest is, how

Table 4. TGARCH (1, 1) model for WPI

Mean Equation	
C D1 AR(1)	0.761555 (0.0000) -0.387055 (0.0159) 0.535404 (0.0000)
Variance Equation	
ω (constant) α (ARCH effect) ϒ (asymmetry) β (GARCH effect) DGP (volatility in gold price) DOP (volatility in oil price)	0.200250 (0.0013) 0.301384 (0.0277) -0.420464 (0.0085) 0.422916 (0.0065) -0.000222 (0.7270) -0.011086 (0.0005)

P-values are given in parenthesis

crude oil and gold price affect CPI and WPI differently. India being a large importer of crude oil and gold makes it quite vulnerable to shocks in their prices. Nevertheless, the oil price emerges as an insignificant factor influencing CPI volatility, which may be associated with the state involvement which prevents the oil shocks to pass on to the public. The volatility in gold price substantially affects WPI volatility as gold holds an important place in Indian households not only because of culture and tradition but also as an important asset which explains its significance in affecting WPI inflation volatility.

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Appendix

This section contains the monthly data of all the variables namely; WPI, CPI, Oil price (US$) and Gold price (US$), used in the study.

year:month	WPI	CPI	Oil Price US$	Gold Price US$
1991:01:00	41	44	22.81	383.64
1991:02:00	41	44	18.53	363.83
1991:03:00	41	43	18.21	363.34
1991:04:00	42	44	18.49	358.38
1991:05:00	42	44	18.72	356.95
1991:06:00	43	45	17.78	366.72
1991:07:00	44	46	19.02	367.69
1991:08:00	45	47	19.3	356.31
1991:09:00	45	48	19.95	348.74
1991:10:00	45	48	21.56	358.69
1991:11:00	46	49	20.41	360.17
1991:12:00	46	49	17.63	361.73
1992:01:00	46	49	17.52	354.45
1992:02:00	47	49	17.65	353.91
1992:03:00	47	49	17.35	344.34
1992:04:00	47	50	18.65	338.62
1992:05:00	48	51	19.52	337.24
1992:06:00	48	51	20.88	340.81
1992:07:00	49	52	20.18	352.72
1992:08:00	49	52	19.62	343.06
1992:09:00	50	52	20.19	345.43
1992:10:00	50	53	20.04	344.38
1992:11:00	50	53	18.9	335.02
1992:12:00	50	52	17.93	334.82
1993:01:00	50	52	17.24	329.01
1993:02:00	50	52	18.23	329.31
1993:03:00	50	52	18.5	330.08
1993:04:00	51	53	18.44	342.15
1993:05:00	51	53	18.17	367.18
1993:06:00	52	54	17.37	371.89
1993:07:00	52	55	16.37	392.19
1993:08:00	53	55	16.43	378.84
1993:09:00	54	56	15.8	355.28
1993:10:00	54	57	16.44	364.18
1993:11:00	54	57	15.09	373.83
1993:12:00	54	57	13.36	383.3
1994:01:00	54	57	14.17	386.88
1994:02:00	55	57	13.75	381.91
1994:03:00	56	58	13.69	384.13
1994:04:00	57	58	15.15	377.27
1994:05:00	57	59	16.43	381.43
1994:06:00	58	60	17.23	385.64
1994:07:00	59	61	18.04	385.49
1994:08:00	59	61	16.98	380.36
1994:09:00	59	62	16.13	391.58
1994:10:00	59	62	16.48	389.77
1994:11:00	60	63	17.2	384.39
1994:12:00	60	62	16.13	379.29
1995:01:00	61	62	16.88	378.55
1995:02:00	61	63	17.44	376.64
1995:03:00	61	63	17.35	382.12
1995:04:00	62	64	18.77	391.03
1995:05:00	63	65	18.43	385.22
1995:06:00	63	66	17.33	387.56
1995:07:00	63	68	16.06	386.23
1995:08:00	64	68	16.49	383.67
1995:09:00	64	68	16.77	383.06
1995:10:00	64	69	16.18	383.14
1995:11:00	65	69	16.82	385.31
1995:12:00	64	68	17.93	387.44
1996:01:00	64	68	17.79	399.45
1996:02:00	64	68	17.69	404.76
1996:03:00	65	69	19.46	396.21
1996:04:00	65	70	20.78	392.85
1996:05:00	66	71	19.12	391.93
1996:06:00	66	72	18.56	385.27
1996:07:00	67	73	19.56	383.47
1996:08:00	68	74	20.19	387.35
1996:09:00	68	74	22.14	383.14
1996:10:00	68	75	23.43	381.07
1996:11:00	69	75	22.25	377.85
1996:12:00	69	76	23.51	369

1997:01:00	69	76	23.29	355.11
1997:02:00	69	76	20.54	346.58
1997:03:00	69	76	19.42	351.81
1997:04:00	69	76	17.98	344.47
1997:05:00	69	76	19.47	343.84
1997:06:00	70	77	18.02	340.76
1997:07:00	70	77	18.45	324.1
1997:08:00	70	78	18.79	324.01
1997:09:00	71	78	18.73	322.82
1997:10:00	71	79	20.12	324.87
1997:11:00	71	79	19.16	306.04
1997:12:00	72	80	17.24	288.74
1998:01:00	73	83	15.07	289.1
1998:02:00	73	83	14.18	297.49
1998:03:00	73	82	13.24	295.94
1998:04:00	73	83	13.39	308.29
1998:05:00	74	84	13.97	299.1
1998:06:00	75	86	12.48	292.32
1998:07:00	76	89	12.72	292.87
1998:08:00	76	89	12.49	284.11
1998:09:00	77	91	13.8	288.98
1998:10:00	77	94	13.26	295.93
1998:11:00	77	95	11.88	294.12
1998:12:00	77	93	10.41	291.68
1999:01:00	76	91	11.32	287.08
1999:02:00	77	90	10.75	287.33
1999:03:00	76	89	12.86	285.96
1999:04:00	77	90	15.73	282.62
1999:05:00	77	90	16.12	276.44
1999:06:00	77	91	16.24	261.31
1999:07:00	77	92	18.75	256.08
1999:08:00	78	92	20.21	256.69
1999:09:00	79	93	22.37	264.74
1999:10:00	80	94	22.19	310.72
1999:11:00	79	95	24.22	293.18
1999:12:00	79	93	25.01	283.07
2000:01:00	78	93	25.21	284.32
2000:02:00	78	93	27.15	299.86
2000:03:00	80	94	27.49	286.39
2000:04:00	81	95	23.45	279.69
2000:05:00	81	95	27.23	275.19
2000:06:00	82	95	29.62	285.73
2000:07:00	82	96	28.16	281.59
2000:08:00	82	96	29.41	274.47
2000:09:00	83	96	32.08	273.68
2000:10:00	84	97	31.4	270
2000:11:00	84	97	32.33	266.01
2000:12:00	85	96	25.28	271.45
2001:01:00	85	96	25.95	265.49
2001:02:00	85	96	27.24	261.87
2001:03:00	85	96	25.02	263.03
2001:04:00	85	97	25.66	260.48
2001:05:00	86	97	27.55	272.36
2001:06:00	86	99	26.97	270.23
2001:07:00	86	100	24.8	267.53
2001:08:00	86	101	25.81	272.39
2001:09:00	86	100	25.03	283.42
2001:10:00	87	101	20.73	283.06
2001:11:00	87	102	18.69	276.16
2001:12:00	86	101	18.52	275.85
2002:01:00	86	101	19.15	281.51
2002:02:00	86	101	19.98	295.5
2002:03:00	86	101	23.64	294.06
2002:04:00	87	101	25.43	302.68
2002:05:00	87	102	25.69	314.49
2002:06:00	88	103	24.49	321.18
2002:07:00	88	104	25.75	313.29
2002:08:00	89	105	26.78	310.26
2002:09:00	89	105	28.28	319.14
2002:10:00	89	105	27.53	316.56
2002:11:00	90	106	24.79	319.07
2002:12:00	89	105	27.89	331.92
2003:01:00	90	104	30.77	356.86
2003:02:00	90	105	32.88	358.97
2003:03:00	92	105	30.36	340.55
2003:04:00	92	106	25.49	328.18
2003:05:00	93	107	26.06	355.68
2003:06:00	93	107	27.91	356.35
2003:07:00	93	108	28.59	351.02
2003:08:00	93	108	29.68	359.77
2003:09:00	94	108	26.88	378.95
2003:10:00	94	109	29.01	378.92
2003:11:00	94	109	29.12	389.91
2003:12:00	94	108	29.95	406.95

2004:01:00	95	109	31.4	413.79
2004:02:00	96	109	31.32	404.88
2004:03:00	96	109	33.67	406.67
2004:04:00	97	109	33.71	403.26
2004:05:00	97	110	37.63	383.78
2004:06:00	99	111	35.54	392.37
2004:07:00	100	112	37.93	398.09
2004:08:00	101	113	42.08	400.51
2004:09:00	101	113	41.65	405.28
2004:10:00	101	114	46.87	420.46
2004:11:00	102	113	42.23	439.38
2004:12:00	101	113	39.09	442.08
2005:01:00	101	114	42.89	424.03
2005:02:00	101	113	44.56	423.35
2005:03:00	101	113	50.93	433.85
2005:04:00	103	114	50.64	429.23
2005:05:00	103	114	47.81	421.87
2005:06:00	103	114	53.89	430.66
2005:07:00	104		56.37	424.48
2005:08:00	104	117	61.87	437.93
2005:09:00	105	117	61.65	456.05
2005:10:00	105	118	58.19	469.9
2005:11:00	106	119	54.98	476.67
2005:12:00	105	119	56.47	510.1
2006:01:00	105	119	62.36	549.86
2006:02:00	106	119	59.71	555
2006:03:00	106	119	60.93	557.09
2006:04:00	108	120	68	610.65
2006:05:00	109	121	68.61	675.39
2006:06:00	110	123	68.29	596.15
2006:07:00	111	124	72.51	633.71
2006:08:00	112	124	71.81	632.59
2006:09:00	112	125	61.97	598.19
2006:10:00	113	127	57.95	585.78
2006:11:00	113	127	58.13	627.83
2006:12:00	112	127	61	629.79
2007:01:00	112	127	53.4	631.17
2007:02:00	113	128	57.58	664.75
2007:03:00	113	127	60.6	654.9
2007:04:00	115	128	65.1	679.37
2007:05:00	115	129	65.1	667.31
2007:06:00	115	130	68.19	655.66

2007:07:00	116	132	73.67	665.38
2007:08:00	116	133	70.13	665.41
2007:09:00	116	133	76.91	712.65
2007:10:00	116	134	82.15	754.6
2007:11:00	117	134	91.27	806.25
2007:12:00	117	134	89.43	803.2
2008:01:00	118	134	90.82	889.6
2008:02:00	119	135	93.75	922.3
2008:03:00	122	137	101.84	968.43
2008:04:00	124	138	109.05	909.71
2008:05:00	124	139	122.77	888.66
2008:06:00	127	140	131.52	889.49
2008:07:00	129	143	132.55	939.77
2008:08:00	129	145	114.57	839.03
2008:09:00	129	146	99.29	829.93
2008:10:00	129	148	72.69	806.62
2008:11:00	127	148	54.04	760.86
2008:12:00	125	147	41.53	816.09
2009:01:00	124	148	43.91	858.69
2009:02:00	123	148	41.76	943
2009:03:00	124	148	46.95	924.27
2009:04:00	125	150	50.28	890.2
2009:05:00	126	151	58.1	928.65
2009:06:00	127	153	69.13	945.67
2009:07:00	128	160	64.65	934.23
2009:08:00	130	162	71.63	949.38
2009:09:00	130	163	68.38	996.59
2009:10:00	131	165	74.08	1043.16
2009:11:00	133	168	77.56	1127.04
2009:12:00	133	169	74.88	1134.72
2010:01:00	135	172	77.12	1117.96
2010:02:00	135	170	74.72	1095.41
2010:03:00	136	170	79.3	1113.34
2010:04:00	139	170	84.14	1148.69
2010:05:00	139	172	75.54	1205.43
2010:06:00	140	174	74.73	1232.92
2010:07:00	141	178	74.52	1192.97
2010:08:00	141	178	75.88	1215.81
2010:09:00	142	179	76.11	1270.98
2010:10:00	143	181	81.72	1342.02
2010:11:00	144	182	84.53	1369.89
2010:12:00	146	185	90.07	1390.55

2011:01:00	148	188	92.66	1360.46
2011:02:00	148	185	97.73	1374.68
2011:03:00	150	185	108.65	1423.26
2011:04:00	152	186	116.32	1480.89
2011:05:00	152	187	108.18	1512.58
2011:06:00	153	189	105.85	1529.36
2011:07:00	154	193	107.88	1572.75
2011:08:00	155	194	100.45	1759.01
2011:09:00	156	197	100.83	1772.14
2011:10:00	157	198	99.92	1666.43
2011:11:00	157	199	105.36	1739
2011:12:00	157	197	104.26	1639.97
2012:01:00	159	198	106.89	1654.05
2012:02:00	159	199	112.7	1744.82
2012:03:00	161	201	117.79	1675.95
2012:04:00	164	205	113.75	1649.2
2012:05:00	164	206	104.16	1589.04
2012:06:00	165	208	90.73	1598.76
2012:07:00	166	212	96.75	1594.29
2012:08:00	167	214	105.28	1630.31
2012:09:00	169	215	106.32	1744.81
2012:10:00	169	217	103.39	1746.58
2012:11:00	169	218	101.17	1721.64
2012:12:00	169	219	101.17	1684.76
2013:01:00	170	221	105.04	1671.85
2013:02:00	171	223	107.66	1627.57
2013:03:00	170	242	102.61	1593.09
2013:04:00	171	226	98.85	1487.86
2013:05:00	171	228	99.35	1414.03
2013:06:00	173	231	99.74	1343.35
2013:07:00	176	235	105.21	1285.52
2013:08:00	179	237	108.06	1351.74
2013:09:00	181	238	108.78	1348.6
2013:10:00	181	241	105.46	1316.58
2013:11:00	182	243	102.58	1275.86
2013:12:00	180	239	105.49	1221.51

2014:01:00	179	237	102.25	1244.27
2014:02:00	180	238	104.82	1299.58
2014:03:00	180	239	104.04	1336.08
2014:04:00	181	242	104.94	1298.45
2014:05:00	182	244	105.73	1288.74
2014:06:00	183	246	108.37	1279.1
2014:07:00	185	252	105.22	1310.59
2014:08:00	186	253	100.05	1295.13
2014:09:00	185	253	95.89	1236.55
2014:10:00	184	253	86.13	1222.49
2014:11:00	181	253	76.96	1175.33
2014:12:00	179	253	60.55	1200.62
2015:01:00	177	254	47.45	1250.75
2015:02:00	176	253	54.93	1227.08
2015:03:00	176	254	52.83	1178.63
2015:04:00	176	256	57.42	1198.93
2015:05:00	178	258	62.5	1198.63
2015:06:00	179	261	61.3	1181.5
2015:07:00	178	263	54.43	1128.31
2015:08:00	177	264	45.72	1117.93
2015:09:00	177	266	46.29	1124.77
2015:10:00	177	269	46.96	1159.25
2015:11:00	178	270	43.13	1086.44
2015:12:00	177	269	36.56	1068.25
2016:01:00	175	269	29.92	1097.91
2016:02:00	174	267	31.05	1199.5
2016:03:00	175	268	37.34	1245.14
2016:04:00	178	271	40.75	1242.26
2016:05:00	180	275	45.98	1260.95
2016:06:00	183	277	47.69	1276.4
2016:07:00	184	280	44.22	1336.65
2016:08:00	183	278	44.84	1340.17
2016:09:00	183	277	45.06	1326.61
2016:10:00	184	278	49.29	1266.28
2016:11:00	184	277	45.28	1238.35
2016:12:00	183	275	52.61	1157.36