DETERMINANTS OF EXCHANGE RATE IN INDIA

By

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Abstract

Appreciation or depreciation of the domestic currency depends on the supply of foreign exchange reserves, liquidity conditions in the economy as determined by money supply, central bank's policy intentions and differences in the interest yield on dated securities of the concerned economies. The present research tests validity of this hypothesis in association with the exchange rate between the Indian rupee and the US dollar. In particular, an attempt is made to investigate the impact of bank rate policy of the Reserve Bank of India (RBI) and interest yield differentials between the India and the US securities. Impact of broad money supply and foreign exchange reserves is also analyzed. A monthly time series from April 1996 to June 2007 is used for the purpose. It is observed that the monetary policy intentions depicted by the bank rate of the RBI, the short-term and long-term domestic interest differentials and interest yield differentials, and the rate of change of foreign exchange reserves have a significant impact on the monthly average of the exchange rate between Indian rupee and the US dollar and quite in line with the economic theory.

JEL Classification: E51, E52, F31

Key Words: Foreign exchange rate, interest yield differentials

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1. INTRODUCTION

Foreign exchange rate is the price of a unit of foreign currency in terms of the domestic currency. In a floating exchange rate mechanism, foreign exchange rate is determined much in the same way as the price of any commodity in a free market economy. Appreciation or depreciation of the domestic currency thus depends on the supply of foreign exchange reserves, liquidity conditions in the economy as determined by money supply, central bank's policy intentions and differences in the interest yield on dated securities of the concerned economies.

Literature on similar studies for various economies, especially developed economies, is an inspiration for the present work. (See Bhanumurthy, 2006; Drine & Rault, 2003; Ibarra, 2005; and MacDonald & Nagayasu, 1999; among others.) At the same time, there is a need to understand the determinants of foreign exchange rate under the shifting exchange rate policy in case of Indian economy. The present article discusses validity of the hypothesis that interest rate structure can prove to be significant determinant of exchange rate along with the impact of changes in liquidity, i.e., changes in broad money supply and foreign exchange reserves. A monthly time series from April 1996 to June 2007 is used for the purpose.

For an emerging economy like India, reduction in exchange rate volatility is not the single most important objective of the monetary authority. Over the years, the RBI has adopted twin objectives of high, sustainable economic growth and stability in the price level. However, with increasing integration of the Indian economy with the world economy on one hand, and an attempt towards fuller capital account convertibility gradually on the other hand; reduction in the exchange rate volatility gains significance as an objective of monetary policy of the RBI. These three objectives are not in tandem with one another, and all cannot be attained simultaneously. An appropriate balance among the three is needed to render stable and sustainable growth and development to the economy and also reflect healthy state of the economy to the rest of the world.

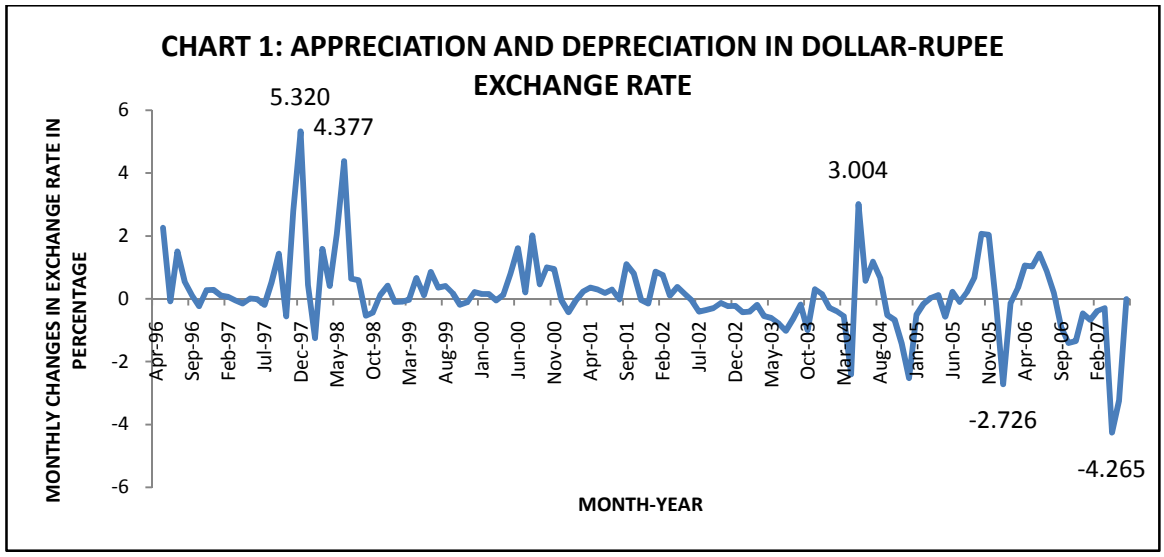

Chart 1 shows the high range of volatility in rupee-dollar exchange rates over the last eleven years. While the rate of depreciation peaked at 5.320 per cent in December 1997, appreciation registered a high of 4.265 per cent in April 2007. Other major fluctuations in the exchange rate are also shown in the chart. This clearly implies that there has been a significant variation of almost nine-and-a half per cent in the exchange rate.

What are the major determinants of exchange rate between the US dollar and Indian rupee? This question is of utmost importance especially since the US is the single largest trading partner of India. Not only that, the US dollar is the major international currency, in spite of emergence of euro as a strong competitor. And, considering the economic strength of the US economy, it is bound to continue as a major currency during the coming few years. Section 2 establishes theoretical framework for the determinants of exchange rate, with special consideration to Indian economy. This is essential to test the hypothesis that interest rates in various capacities are major determinants of exchange rate between the US dollar and Indian rupee. Empirical results are presented in section 3; while observations about the significance of various determinants and the stance of the RBI are discussed in section 4. Lastly, section 5 concludes.

2. EXCHANGE RATE DETERMINATION MECHANISM

2.1. THE BANK RATE:

Changes in the bank rate indicate the monetary policy intentions of the RBI. If such a change is unanticipated, economic agents alter their expectations regarding the future monetary policy. Thus, an increase in the bank rate indicates a tight monetary policy, and is counter-reacted with an expectation that the bank rate will decline in future. This results in a depreciation of the domestic currency. On the contrary, the increase in bank rate may also result in further tightening of the monetary policy by the RBI, which is necessary for lowering the inflation in the domestic economy as against the foreign economy.

A future appreciation of domestic currency is anticipated here, causing an appreciation of the current exchange rate. To incorporate this effect, data on bank rate are included. Simultaneously, the impact of the differences between the cost of long-term and short-term liquidity are also included by introducing the difference between inter-bank call money rate and the bank rate. Five-period lag values point out any lag effect of the same on the exchange rate.

2.2. INTEREST YIELD DIFFERENTIALS:

The relation between short-term and long-term interest yield differentials and exchange rate is complex. An increase in the interest differential between domestic securities and foreign securities indicates a rise in the gain from capital inflows into the economy. This is expected to result in a depreciation of the domestic currency.

The nominal interest differential reflects both the real interest differential and the inflation differential. The inverse relation between the exchange rate and nominal interest differential is due to the inflation differential. Thus, if inflation in India exceeds the inflation in the US, the nominal interest differential is positive, making a positive gain on capital in India possible. This hypothesis is investigated by incorporating two types of interest yields in the model: one, the long-term differential is between the interest yield on 10-year dated securities of India and the US; and two; the short-term differential is between the interest yield on 90-day securities of India and the US.

2.3. LIQUIDITY:

The growth rates of broad money and foreign exchange reserves indicate increased liquidity in the economy. Such an increase in the liquidity is expected to cause depreciation in the exchange rate. An anticipation of inflation due to increased liquidity and increase in the aggregate demand are two major causes behind such depreciation. However, an increase in the foreign exchange reserves also implies an increase in the supply of foreign currency, which often results in appreciation of the domestic currency.

This is investigated by introducing the growth rate of broad money and the growth rate of foreign exchange reserves as explanatory variables in the model. The bank rate also has an impact on these indicators of liquidity, and has an indirect impact on the exchange rate.

2.4. EXTERNAL SHOCKS:

Two dummy variables, D1 and D2, are introduced to capture the impact of external shocks to the exchange rate mechanism. The first such shock relates to the month of December 1997. In spite of strong economic fundamentals, market sentiment weakened sharply during September 1997 to January 1998. Profit taking by FIIs on the stock exchanges added to the pressure on the rupee in November. The market was driven by downside expectations created largely in the backwash of the currency turmoil in South-East Asia and political developments within the country. Excess demand conditions reflected in the intensified spot merchant transactions too. The volatility in the exchange market and the swing in the market sentiments were reflected in the significant spurt in

inter-bank and merchant turnover by November and December 1997 in relation to April-June 1997 levels. Over the quarter October-December 1997, there was a nominal depreciation of the spot exchange rate by about 7.6 per cent, and the value of rupee eroded by more than 5.3 per cent in the month of December alone.

Another major shock was felt in April 2007, when the rupee appreciated by almost 4.3 per cent. This was mainly due to strong domestic economic growth vis-à-vis moderating of the US economy during the previous two years, robust growth in the euro area and narrowing interest differentials. Large capital inflows due to increasing investor interest, dampening crude oil prices in the world market and depreciation in dollar against other currencies further added to appreciation of the rupee.

3. THE EMPIRICAL RESULTS

The above hypotheses are tested using the linear model for a period of 135 months. Five-month lag effects of the exchange rate and the call rate-bank rate differential are also introduced in the model. Simple econometric analysis through ordinary least squares (OLS) method is presented below in table 1. Thus percentage variation in dollar-rupee exchange rate is defined as a function of five months lag values of exchange rate, difference between call rate and bank rate, including its lag effect for five months, interest yield differentials between 90 days T-bills of India and the US as well as 10-year government securities of India and the US, money supply in India, foreign exchange reserves and two dummy variables.

The model: Y = b(1)X(1) +.....+ b(19)X(19) + U,
Where Y = %DIF1[ExRt], i.e., rate of change in the rupee exchange rate per US dollar
X variables: X(1), …, X(5) = LAG1[%DIF1[ExRt]], …, LAG5[%DIF1[ExRt]]
X(6) = DIF1[Call-BR]
X(7), …, X(11) = LAG1[DIF1[Call-BR]], …, LAG5[DIF1[Call-BR]]
X(12) = DIF1[BR]
X(13) = DIF1[Yield10Ind-Yield10US]
X(14) = DIF1[Yield90Ind-Yield90US]
X(15) = %DIF1[M3]
X(16) = %DIF1[ForExRes]
X(17) = D1, i.e., dummy variable for the month 1997.12
X(18) = D2, i.e., dummy variable for the month 2007.04
X(19) = 1
U is the error term, satisfying E[U|X(1),...,X(18)] = 0.

Table I: Estimation Results

Variables	**OLS estimate**	**t-value**	**[p-value]**	
LAG1[%DIF1[ExRt]]	0.657495	4.342	[0.00001]	*
LAG2[%DIF1[ExRt]]	- 0.181683	- 1.176	[0.23954]	
LAG3[%DIF1[ExRt]]	0.004804	0.040	[0.96795]	
LAG4[%DIF1[ExRt]]	0.141856	- 1.072	[0.28382]	
LAG5[%DIF1[ExRt]]	0.130586	1.585	[0.11297]	
DIF1[Call-BR]	- 0.089085	- 2.528	[0.01148]	*
LAG1[DIF1[Call-BR]]	- 0.148915	- 4.219	[0.00002]	*
LAG2[DIF1[Call-BR]]	- 0.011386	- 0.320	[0.74911]	
LAG3[DIF1[Call-BR]]	- 0.007130	- 0.199	[0.84225]	
LAG4[DIF1[Call-BR]]	- 0.045797	- 1.864	[0.06228]	**
LAG5[DIF1[Call-BR]]	0.059711	2.374	[0.01757]	*
DIF1[BR]	- 0.470849	- 1.730	[0.08361]	**
DIF1[Yield10Ind-Yield10US]	0.094114	0.577	[0.56419]	
DIF1[Yield90Ind-Yield90US]	0.066681	0.832	[0.40516]	
%DIF1[M3]	0.055706	0.887	[0.37489]	
%DIF1[ForExRes]	- 0.106812	- 4.113	[0.00004]	*
D1	4.100964	8.245	[0.00000]	*
D2	- 3.776212	- 6.398	[0.00000]	*
Intercept	0.170514	1.697	[0.08962]	**
R-square =	0.5893			

* Significant at 5 per cent level. ** Significant at maximum 10 per cent level.

4. OBSEREVATIONS

The table shows that almost 59 per cent variations in the dollar-rupee exchange rates are due to the variables included in the model. Thus, the changes in domestic interest rates are a significant source of appreciation or depreciation of rupee. However, the interest rate differences between India and the US are not so significant determinants.

The first period lag effect of exchange rate is positive, indicating contribution of the past changes in building up the anticipation of the economic agents as far as the exchange rate changes are concerned. While the call rate-bank rate differential depicts a negative, but significant first period lag effect. This indicates that an increase in the difference between the call rate and bank rate leads to an appreciation of rupee.

The call rate-bank rate differential has a negative impact, indicating appreciation of the domestic currency with an increase in the previous period's call rate-bank rate differential. This shows that RBI policy, as reflected by this differential, leads economic agents to anticipate a continuation of the policy in future. That is, a tighter monetary policy regime leads to anticipation for a further tightening of monetary policy regime in future, which results in appreciation of rupee against dollar. However, correction mechanism sets in after a quarter, indicating that positive impact of tighter monetary regime have settled in, and the exchange rate will depreciate as a consequence of a rise in the bank rate and subsequently easing out of the access liquidity.

The variables of specific interest here are the bank rate, long-term yield and short-term yield differentials, growth of money supply and growth rate of foreign exchange reserves. All variables, except the bank rate and the growth rate of foreign exchange reserves are insignificant.

The bank rate is an indicator of long-term monetary policy intentions of the RBI. The negative value of the coefficient of changes in the bank rate indicates that an increase in the bank rate leads to an appreciation of the domestic currency. This is because the economic agents form confirmatory anticipation regarding the future bank rate policy to control high rates of inflation and contain the growth of money supply in the economy. Not only the anticipation effect, but also the immediate cost of the domestic investment to increase since the rise in bank rate is followed by a rise in all interest rates across the board. As the investment funds flow tightens in the economy, the value of the domestic currency appreciates against the foreign currency.

However, both long-term interest yield differential {DIF1[Yield10Ind-Yield10US]} and the short-term interest yield differential {DIF1[Yield90Ind-Yield90US]} have a positive (but insignificant) impact on the exchange rate. An increase in the interest yield differentials implies that comparative return on investment in India is higher than in the US. Again this may be due to scarcity of capital resources in the domestic economy as against the foreign economy and / or inflationary pressure in the domestic economy. This results in greater investment inflow in the Indian economy, leading to depreciation of rupee against the US dollar. Interestingly, the short-term

interest yield differential appears to be more significant than the long-term interest yield differential with relatively low p-value.

Growth of money supply in India, in isolation, is not a significant determinant of exchange rate between the rupee and the dollar. This may be due to the fact that the impact of growth of money supply on the national income is not taken into consideration. Similarly, a comparison between the rate of change on money supply in India and that in the US may have greater explanatory power in exchange rate determination. However, rate of change in the foreign exchange reserves is a highly significant determinant of exchange rate. This reflects a direct, but negative, supply side impact on the price of the foreign currency in terms of the domestic currency. An increase in the foreign exchange reserves causes increase in the supply of foreign currency, and builds up liquidity pressure in the economy. Such pressure causes the exchange rate to appreciate.

Interestingly, the RBI recognizes the significance of interest rate in providing stability to exchange rate in India as the monetary authority prepares for full convertibility on capital account. The Report of the Committee on Fuller Capital Account Convertibility categorically accepts that volatility in exchange rate is caused due to flexible exchange rate policy, inflationary pressure and capital inflow. Further, it accepts that interest rate management can be a more efficient tool to control volatility in exchange rate. For this, it will be necessary to align the domestic interest rates with the international interest rates, and also to reduce the misalignment between short-term and long-term interest rates within the Indian money market.

5. SUMMARY AND CONCLUSIONS

The objective of this article is to show the impact of various supply-side variables considered to be significant in exchange rate determination. These include the unanticipated changes in the monetary policy, as well as the conventional determinants like money supply and foreign exchange reserves. It is observed that the monetary policy intentions depicted by the bank rate of the RBI, the short-term and long-term domestic interest differentials, and the rate of change of foreign exchange reserves have a significant impact on the monthly average of the exchange rate between Indian rupee and the US dollar. The interest yield differentials do not show a very significant impact, however. Further, the impact of these explanatory variables is quite in line with the economic theory. Though the exchange rate determination may depend on several other variables, these variables may be targeted by the monetary authority efficiently to regulate exchange rate movements in case of unwarranted volatility. ☙

REFERENCES

1. Bhanumurthy, N. R. (2006) "Macroeconomic Fundamentals and Exchange Rate Dynamics in India: Some Survey Results", *Draft Paper*, www.igidr.ac.in/~money/mfc_06/bhanuigidr.pdf
2. Drine, Imed and Christophe Rault. (2003) "On the Long-Run Determinants of Real Exchange Rates for Developing Countries: Evidence from Africa, Latin America and Asia", *William Davidson Working Paper Number 571,* May
3. Ibarra, Carlos A. (2005) "The Behaviour of Interest Rate Differentials under Shifting Exchange Rate Regimes: The Experience of Chile, Colombia and Israel", *Cuadernos de Economia Vol. 42 (Mayo),* pp. 103-131
4. MacDonald, Ronald and Jun Nagayasu. (1999) "The Long-Run Relationship Between Real Exchange Rates and Real Interest Differentials: A Panel Study", *IMF Working Paper WP/99/37,* March
5. Reserve Bank of India. (1998-2007) *Annual Report*, various issues
6. Reserve Bank of India. (2007) *Handbook of Statistics on Indian Economy*
7. Tarapore, S. S. (2006) *Report of the Committee on Fuller Capital Account Convertibility,* Reserve Bank of India, July

ANNEXURE 1: MONTHLY DATA ON EXCHANGE RATE DETERMINANTS

Month	Exchange Rate (Rupee-US Dollar)	Call Rate	Bank Rate	Yield 10 Years Government Securities India	Yield 90 Days Treasury Bills India	Yield 10 Years Government Securities US	Yield 90 Days Treasury Bills US	Broad Money M3 (Rs. Crore)	Foreign Exchange Reserves (Rs. Crore)
Apr-96	34.2391	11.38	12	13.9551	13.7002	6.51	5.09	609258	21620
May-96	35.0105	10.88	12	13.9551	11.7592	6.74	5.15	611251	21620
Jun-96	34.9803	10.87	12	13.9551	11.8561	6.91	5.23	619531	22091
Jul-96	35.505	3.59	12	13.9551	8.6692	6.87	5.3	622165	22441
Aug-96	35.6955	6.07	12	13.8973	8.821	6.64	5.19	625777	22441
Sep-96	35.7284	8.36	12	13.8973	10.0016	6.83	5.24	638358	22900
Oct-96	35.6404	9.58	12	13.671	9.1712	6.53	5.12	641243	23635
Nov-96	35.7353	6.26	12	13.6601	7.8191	6.2	5.17	648652	23752
Dec-96	35.8352	8.07	12	13.7528	7.6383	6.3	5.04	653548	24110
Jan-97	35.8699	4.84	12	13.66	7.8424	6.58	5.17	669411	23973
Feb-97	35.8892	5.08	12	13.4275	7.5194	6.42	5.14	676367	23674
Mar-97	35.8697	4.35	12	13.4328	7.4239	6.69	5.28	696012	26423
Apr-97	35.8139	1.22	11	12.8648	3.6892	6.89	5.3	708509	26667
May-97	35.8145	5.9	11	12.8741	7.0824	6.71	5.2	716052	28096
Jun-97	35.8095	5.16	10	12.5858	5.2348	6.49	5.07	724347	29331

Jul-97	35.7372	3.77	10	11.6555	6.3909	6.22	5.19	726205	29789
Aug-97	35.92	5.86	10	11.5798	5.3347	6.3	5.28	728929	30228
Sep-97	36.4318	6.71	10	11.8622	6.7813	6.21	5.08	744252	29435
Oct-97	36.226	6.25	9	10.8648	6.5818	6.03	5.11	752822	30022
Nov-97	37.2358	6.13	9	10.9653	6.2327	5.88	5.28	763584	27893
Dec-97	39.2168	8.21	9	11.1751	7.7715	5.81	5.3	768304	27355
Jan-98	39.3843	28.7	11	13.3477	13.7015	5.54	5.18	778587	27838
Feb-98	38.8871	9.7	11	12.6259	11.0945	5.57	5.23	791408	27461
Mar-98	39.5007	8.75	10.5	12.1175	9.4993	5.65	5.16	821332	29367
Apr-98	39.6572	6.73	10	11.9194	7.5294	5.64	5.08	836895	29452
May-98	40.4708	6.75	9	12.1312	9.3244	5.65	5.14	845958	28671
Jun-98	42.2423	6.42	9	12.1086	7.6037	5.5	5.12	854466	27034
Jul-98	42.5102	6.02	9	12.1923	6.932	5.46	5.09	863461	27088
Aug-98	42.7563	7.59	9	12.2001	10.0539	5.34	5.04	883276	27765
Sep-98	42.5217	8.41	9	12.272	9.165	4.81	4.74	901150	29182
Oct-98	42.3338	8.42	9	12.2947	9.695	4.53	4.07	915011	29757
Nov-98	42.381	8	9	12.2221	9.478	4.83	4.53	919220	29667
Dec-98	42.553	8.33	9	12.2326	9.3558	4.65	4.5	923698	30056
Jan-99	42.5061	10.04	9	12.2489	8.8562	4.72	4.45	940234	30445
Feb-99	42.4656	8.86	9	12.3306	9.3993	5	4.56	951197	30758
Mar-99	42.4487	8.49	8	12.0324	8.7013	5.23	4.57	980960	32490

Apr-99	42.725	8.02	8	11.8903	8.6063	5.18	4.41	994160	32538
May-99	42.7712	8.76	8	11.7293	8.5911	5.54	4.63	1004358	33475
Jun-99	43.1355	8.1	8	11.862	8.726	5.9	4.72	1010682	33265
Jul-99	43.285	8.21	8	11.7061	8.7464	5.79	4.69	1023354	33422
Aug-99	43.4594	9.38	8	11.6356	9.1679	5.94	4.87	1031774	33269
Sep-99	43.5349	9.67	8	11.5811	9.1254	5.92	4.82	1050431	33203
Oct-99	43.4493	10.95	8	11.5924	9.7032	6.11	5.02	1062314	33805
Nov-99	43.3968	8.07	8	11.4341	8.5906	6.03	5.23	1070116	34359
Dec-99	43.485	7.74	8	11.2471	8.2332	6.28	5.36	1095461	34935
Jan-00	43.55	7.87	8	10.9434	8.6254	6.66	5.5	1094368	34896
Feb-00	43.6136	10.31	8	10.4416	8.7364	6.52	5.73	1111108	35903
Mar-00	43.5862	9.39	8	10.8663	10.0878	6.26	5.86	1124174	38036
Apr-00	43.6388	6.79	7	10.3663	8.0696	5.99	5.82	1154093	37896
May-00	43.9829	7.48	7	10.8186	8.6201	6.44	5.99	1161394	37245
Jun-00	44.6893	11.08	7	11.1004	9.7122	6.1	5.86	1177524	36730
Jul-00	44.7788	7.77	8	11.3	8.5493	6.05	6.14	1178053	36231
Aug-00	45.68	13.06	8	11.3715	11.0161	5.83	6.28	1185598	35619
Sep-00	45.8883	10.32	8	11.8051	10.0974	5.8	6.18	1203254	35438
Oct-00	46.3445	9.07	8	11.6078	9.4619	5.74	6.29	1223187	34899
Nov-00	46.7789	9.28	8	11.4009	9.3421	5.72	6.36	1253290	39040
Dec-00	46.7496	8.76	8	10.9359	9.2538	5.24	5.94	1272412	40077

Jan-01	46.5439	9.89	8	10.4842	9.0769	5.16	5.29	1276376	41120
Feb-01	46.5167	8.51	7.5	10.0447	8.279	5.1	5.01	1290702	41608
Mar-01	46.6205	7.78	7	10.2737	8.493	4.89	4.54	1313220	42281
Apr-01	46.7835	7.49	7	10.0779	7.6029	5.14	3.97	1350614	42526
May-01	46.9202	8.03	7	9.7149	7.414	5.39	3.7	1369482	42991
Jun-01	47.0038	7.24	7	9.4551	7.0545	5.28	3.57	1384395	43454
Jul-01	47.1393	7.19	7	9.2609	7.0345	5.24	3.59	1387649	43730
Aug-01	47.1265	6.94	7	9.1394	6.982	4.97	3.44	1398511	45358
Sep-01	47.642	7.3	7	9.1468	6.9294	4.73	2.69	1407906	44877
Oct-01	48.0198	7.4	6.5	8.7893	6.671	4.57	2.2	1420842	45256
Nov-01	47.9947	6.97	6.5	7.9239	6.4669	4.65	1.91	1439227	46891
Dec-01	47.9176	7.08	6.5	8.2666	6.9184	5.09	1.72	1450506	48112
Jan-02	48.3287	6.63	6.5	7.6474	6.4843	5.04	1.68	1458425	49479
Feb-02	48.6893	6.73	6.5	7.4725	6.2329	4.91	1.76	1474385	50776
Mar-02	48.7371	6.97	6.5	7.3437	5.9177	5.28	1.83	1498355	54106
Apr-02	48.9183	6.58	6.5	7.3952	6.0097	5.21	1.75	1542227	55870
May-02	48.9968	6.9	6.5	7.6529	6.4259	5.16	1.76	1605225	56779
Jun-02	48.9665	6.04	6.5	7.5701	6.1419	4.93	1.73	1609476	58693
Jul-02	48.7635	5.75	6.5	7.3733	5.828	4.65	1.71	1614181	60607
Aug-02	48.5852	5.72	6.5	7.156	5.753	4.26	1.65	1630709	62140
Sep-02	48.44	5.75	6.5	7.1976	5.7139	3.87	1.66	1640398	63620

Oct-02	48.3714	5.73	6.25	6.9791	5.516	3.94	1.61	1658925	65159
Nov-02	48.2545	5.45	6.25	6.4573	5.1018	4.05	1.25	1673538	67578
Dec-02	48.1405	5.58	6.25	6.0818	5.4337	4.03	1.21	1682014	71110
Jan-03	47.9328	5.66	6.25	6.339	5.5742	4.05	1.19	1693749	74256
Feb-03	47.7347	5.71	6.25	6.2321	5.529	3.9	1.19	1707306	73547
Mar-03	47.6395	5.86	6.25	6.1936	5.6552	3.81	1.15	1717960	76100
Apr-03	47.3758	4.87	6	5.9053	4.5977	3.96	1.15	1770558	78325
May-03	47.0816	4.87	6	5.8479	4.6704	3.57	1.09	1784717	82308
Jun-03	46.7098	4.91	6	5.7329	4.9326	3.33	0.94	1802324	83221
Jul-03	46.23	4.9	6	5.6206	4.6897	3.98	0.92	1806665	85551
Aug-03	45.933	4.83	6	5.262	4.6448	4.45	0.97	1819454	87306
Sep-03	45.8471	4.5	6	5.2589	4.5441	4.27	0.96	1831608	92339
Oct-03	45.3873	4.64	6	5.1052	4.7328	4.29	0.94	1864886	93803
Nov-03	45.5221	4.38	6	5.1433	4.2324	4.3	0.95	1874932	97400
Dec-03	45.588	4.4	6	5.1368	4.2052	4.27	0.91	1896318	103151
Jan-04	45.4557	4.43	6	5.1911	4.3092	4.15	0.9	1922696	106384
Feb-04	45.2703	4.33	6	5.2703	4.332	4.08	0.94	1959412	109572
Mar-04	45.0179	4.37	6	5.1542	4.3277	3.83	0.95	2005676	112959
Apr-04	43.9311	4.29	6	5.1461	4.3609	4.35	0.96	2060153	118490
May-04	45.2508	4.3	6	5.3016	4.3831	4.72	1.04	2060166	119379
Jun-04	45.5068	4.35	6	5.8677	4.3738	4.73	1.29	2075507	119511

Jul-04	46.0416	4.31	6	6.1935	4.4679	4.5	1.36	2083368	118385
Aug-04	46.341	4.41	6	6.1545	4.5086	4.28	1.5	2104000	118154
Sep-04	46.095	4.45	6	6.2446	4.7893	4.13	1.68	2092506	119579
Oct-04	45.7826	4.63	6	6.8652	4.9898	4.1	1.79	2133922	121337
Nov-04	45.1251	5.62	6	7.2053	5.1903	4.19	2.11	2134846	128226
Dec-04	43.9796	5.28	6	6.591	5.3304	4.23	2.22	2145964	131178
Jan-05	43.7545	4.72	6	6.7091	5.141	4.22	2.37	2193202	129463
Feb-05	43.6798	4.76	6	6.4867	5.0448	4.17	2.58	2218219	135900
Mar-05	43.6905	4.72	6	6.6853	5.1531	4.5	2.8	2251449	141514
Apr-05	43.7412	4.77	6	7.1866	5.1551	4.34	2.84	2336249	141841
May-05	43.4889	4.99	6	7.0602	5.1573	4.14	2.9	2347098	138857
Jun-05	43.5836	5.1	6	6.8835	5.3604	4	3.04	2360115	138370
Jul-05	43.5361	5.02	6	6.9451	5.3117	4.18	3.29	2375747	140542
Aug-05	43.6245	5.02	6	7.1918	5.129	4.26	3.52	2402095	144079
Sep-05	43.915	5.05	6	7.2081	5.148	4.2	3.49	2482572	143059
Oct-05	44.818	5.12	6	7.0784	5.4832	4.46	3.79	2489063	143573
Nov-05	45.7265	5.79	6	7.1108	5.6576	4.54	3.97	2504892	142821
Dec-05	45.6411	6	6	7.1191	6.055	4.47	3.97	2527676	137206
Jan-06	44.397	6.83	6	7.309	6.5959	4.42	4.34	2536207	140374
Feb-06	44.3289	6.95	6	7.3441	6.6533	4.57	4.54	2579947	142400
Mar-06	44.481	6.58	6	7.5291	6.1	4.72	4.63	2729545	151622

Apr-06	44.9491	5.62	6	7.3941	5.5176	4.99	4.72	2772379	160677
May-06	45.4073	5.54	6	7.6809	5.5442	5.11	4.84	2779279	163868
Jun-06	46.0561	5.73	6	8.1318	6.2844	5.11	4.92	2784956	162912
Jul-06	46.4562	5.86	6	8.2809	6.3575	5.09	5.08	2836479	164577
Aug-06	46.537	6.06	6	7.9304	6.2027	4.88	5.09	2879043	166244
Sep-06	46.1181	6.33	6	7.6776	6.59	4.72	4.93	2953356	165305
Oct-06	45.4676	6.75	6	7.6417	6.5197	4.73	5.05	2946329	167392
Nov-06	44.8507	6.69	6	7.4061	6.2467	4.6	5.07	2993258	174641
Dec-06	44.6351	8.63	6	7.6071	7.2496	4.56	4.97	3016308	177251
Jan-07	44.3325	8.18	6	7.7739	7.2936	4.76	5.11	3073887	180161
Feb-07	44.1583	7.16	6	7.9454	7.101	4.72	5.16	3144572	194563
Mar-07	44.026	14.07	6	7.936	7.5567	4.56	5.08	3310278	199179
Apr-07	42.1482	8.33	6	8.1316	7.3701	4.69	5.01	3321799	204409
May-07	40.7814	6.96	6	8.1225	6.4405	4.75	4.87	3325860	208068
Jun-07	40.7736	2.42	6	8.1559	6.9877	5.1	4.74	3388916	213362