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MATHEMATICAL ANALYSIS OF MARGINAL INVESTMENT SYSTEMS

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Investment systems are the set of historical trades and can be studied as the cumulative probability distributions on all possible gains and losses of the trades. Marginal investment systems are investment systems that allow one to invest more than the capital he has. But the margin costs also play an important role in encouraging or deterring the investor if he should trade on margin. In this thesis, the efficiency index for investment system with margin will be discussed together with the method of how to simulate the trade from the real world data. Furthermore, the interest rate has been taken into account too.

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CHAPTER I

INTRODUCTION

An investment system is a set of rule of buying and selling investment properties such as stocks, bounds, real estate, commodities. The investment size also plays an important role in deciding what profile we should invest in. If the margin trading is allowed, then one can increase his gain by investing more than the capital he has. But he also has to pay the price of the margin cost. If the margin rate is favorable, then the investor should use this leverage to increase his gain. On the other hand, one should avoid trading on margin if the cost is too high. Furthermore, we have included the interest factor into account. If the money is not use in trading, we should have received the interest from depositing it. Trading cost or commission, typically calculated at 0.25% to 0.15%, it is another factor which plays but its value is dominated by other factor because of its relatively small size.

To compare the performance of investment systems, we need to focus on the percentage gain or loss, investment size, interest rate and margin costs into account to represent the real world trading systems.

1.1 Motivation

A mathematical analysis of investment system has been studied by Zhu[1]. In the work of Zhu [1], the author has formulated the notion of the efficiency index but didn't take into account the effect of neither the margin costs nor the interest. One important thing is how to implement this result in the real world situation. So we try to introduce some method for simulating the trade data from the real world data.

CHAPTER II

MARGINAL INVESTMENT SYSTEMS

2.1 Marginal investment systems

An Investment system arises from the historical data of trades. Let $\{g_n : n = 1, \dots, N\}$ be the set of percentage gain(or loss) with $g_1 < g_2 < g_3 < g_4 \dots < g_N$. If $g_n < 0$, it means loss. The set of frequency or probability is p_n where p_n is correspondent to each g_n . Let us use s to denote the size of each trade as the percentage of available capital and M to denote the total number of trades in the test. Clearly Mp_n is the number of trades that have gain g_n . Let β_m be the marginal cost calculated as the percentage of capital exceeding the available capital per trade. Let β_i be the interest rate calculated in percent per trade. Use $G(s)$ to denote the average exponential growth rate. Thus

$$G(s)^M = \begin{cases} \prod_{n=1}^N (1 + sg_n + (1 - s)\beta_i)^{Mp_n} & ; s \in [0, 1] \\ \prod_{n=1}^N (1 + sg_n - (s - 1)\beta_m)^{Mp_n} & ; s \geq 1 \end{cases}$$

then

$$G(s) = \begin{cases} \prod_{n=1}^N (1 + sg_n + (1 - s)\beta_i)^{p_n} & ; s \in [0, 1] \\ \prod_{n=1}^N (1 + sg_n - (s - 1)\beta_m)^{p_n} & ; s \geq 1 \end{cases}$$

Here, we use the natural log because of ease of analysis and we call this f the log return function. The important thing in analysis is the statistical outcome of the trade, not how to generate the trades. So, it suffices to consider the set of

the trades. Furthermore, we can view this as a sampling. Let us summarize the above consideration.

Definition 2.1.1. (Investment system). A trade is the process of acquiring an investment property with the investment capital and subsequently liquidating the property and returning the proceed to the investment capital. An investment system \mathcal{I} is a set of (historical and/or future) trades. For each trade $T \in \mathcal{I}$ the outcome is measured by its percentage gain and is denoted by $g(T)$. The set $\mathcal{S}_{\mathcal{I}} = \{g(T) : T \in \mathcal{I}\}$ is called the gain space of the investment system \mathcal{I} . The profile P of an investment system \mathcal{I} is the cumulative probability distribution on its gain space defined by

$$P(x) = \text{prob} \{T \in \mathcal{I} : g(T) \leq x\}.$$

Definition 2.1.2. (Log return function and efficiency index). Let \mathcal{I} be an investment system with a profile P and let $a = \inf S_{\mathcal{I}}$ and $b = \sup S_{\mathcal{I}}$. The log return function of \mathcal{I} is defined by

$$f_{\mathcal{I}}(s) = \begin{cases} \int_a^b \ln(1 + sx + (1 - s)\beta_i)dP(x) & ; s \in [0, 1] \\ \int_a^b \ln(1 + sx - (s - 1)\beta_m)dP(x) & ; s \geq 1 \end{cases},$$

where β_i and β_m are the interest rate and the margin costs, respectively. The efficiency index of \mathcal{I} is defined by

$$\gamma_{\mathcal{I}} = \sup_{s \in [0, \infty)} f(s).$$

The integration appeared in this definition is Riemann–Stieltjes integral. The subscript \mathcal{I} will be omitted in the sequel unless doing so will cause confusion.

If $a \geq 0$, it means that the outcome of the trades are all gains which is unlikely to occur, under the favorable margin costs, one should long on margins as much

as one can reach the unlimited gains. In the same way if $b \leq 0$ that one always loss. The interesting case is when $a < 0 < b$. Therefore, we assume $g_1 < 0$ and $g_n > 0$.

Proposition 2.1.3. (*Investment system with a finite gain space*). The log return function and the efficiency index of an investment system with a finite gain space $\{g_n : n = 1, \dots, N\}$ with $(g_1 < g_2 < \dots < g_N)$ and margin costs β_m and interest rate β_i are

$$f(s) = \begin{cases} \sum_{n=1}^N p_n \ln(1 + sg_n + (1-s)\beta_i) & ; s \in [0, 1] \\ \sum_{n=1}^N p_n \ln(1 + sg_n - (s-1)\beta_m) & ; s \geq 1 \end{cases}$$

and

$$\gamma_{\mathcal{I}} = \max_{s \in [0, \infty)} f(s).$$

Here p_n is the probability for a trade to have a gain g_n .

Proof. Observing that $P(x) = \sum_{k=1}^n p_k$ if $x \in [g_n, g_{n+1})$ for $n = 1, \dots, N-1$ we

$$\text{have } f(s) = \begin{cases} \sum_{n=1}^N p_n (1 + sg_n + (1-s)\beta_i) & ; s \in [0, 1] \\ \sum_{n=1}^N p_n (1 + sg_n - (s-1)\beta_m) & ; s \geq 1 \end{cases} \quad \square$$

To facilitate the analysis of the log return function with profile P , we consider

$$f_1(s) = \int_a^b \ln(1 + sx + (1-s)\beta_i) dP(x) \quad ; s \in \left(-\frac{1+\beta_i}{g_N-\beta_i}, -\frac{1+\beta_i}{g_1-\beta_i}\right)$$

$$f_2(s) = \int_a^b \ln(1 + sx - (s-1)\beta_m) dP(x) \quad ; s \in \left(-\frac{1+\beta_m}{g_N-\beta_m}, -\frac{1+\beta_m}{g_1-\beta_m}\right)$$

The domains of f_1 and f_2 are the largest possible that f_1 and f_2 are still continuous. Zhu have already discussed the case when the trades with no margin costs and interest in Zhu [1]. Therefore, we will focus only the case where there are some margin costs.

Remark 2.1.4. The exponential of the log return function $G_1(s) := \exp(f_1(s))$ and $G_2(s) := \exp(f_2(s))$ are the expected average rate of exponential growth per trade as a function of the investment size s . These function are also strictly concave since

$$\begin{aligned} G_1''(s) &= \exp(f_1(s))[(f_1'(s))^2 + f_1''(s)] \\ &= \exp(f_1(s)) \cdot \\ &\quad \left[\left(\int_a^b \frac{x - \beta_i}{1 + \beta_i + s(x - \beta_i)} dP(x) \right)^2 - \int_a^b \left(\frac{x - \beta_i}{1 + \beta_i + s(x - \beta_i)} \right)^2 dP(x) \right] < 0. \end{aligned}$$

by the Jensen inequality(see Royden [2, Section 5.5]). Similarly for f_2 .

Theorem 2.1.5. *(Compute the efficiency index for the investment systems with a finite gain space). Consider an investment systems with a finite gain space $\{g_n : n = 1, \dots, N\}$ with $(g_1 < g_2 < \dots < g_N)$. Suppose that that, for each n , p_n is the probability for a trade to have a gain g_n . Let β_i and β_m be the interest rate and margin costs, respectively.*

Let \bar{s}_1 and \bar{s}_2 be the unique solution of the $(N-1)$ th order polynomial equation

$$0 = \prod_{n=1}^N (1 + sg_n + (1 - s)\beta_i) \left(\sum_{n=1}^N \frac{p_n(g_n + \beta_i)}{1 + sg_n + (1 - s)\beta_i} \right)$$

on the interval $(-\frac{1+\beta_i}{g_N-\beta_i}, -\frac{1+\beta_i}{g_1-\beta_i})$ and

$$0 = \prod_{n=1}^N (1 + sg_n - (s - 1)\beta_m) \left(\sum_{n=1}^N \frac{p_n(g_n - \beta_m)}{1 + sg_n - (s - 1)\beta_m} \right)$$

on the interval $(-\frac{1+\beta_m}{g_N-\beta_m}, -\frac{1+\beta_m}{g_1-\beta_m})$, respectively.

Then the efficiency index for this investment system can be evaluated by

$$\gamma = f(\bar{s}),$$

where

$$\bar{s} = \begin{cases} \bar{s}_1 & ; \text{ if } \bar{s}_1 \in [0, 1] \\ \bar{s}_2 & ; \text{ if } \bar{s}_2 \geq 1 \\ 1 & ; \text{ if } \bar{s}_1 > 1 \text{ and } \bar{s}_2 < 1 \end{cases}.$$

Therefore, \bar{s} is called the best investment size which maximizes $f(s)$.

Proof. Since both f_1 and f_2 are both strictly concave functions on $(-\frac{1+\beta_i}{g_N-\beta_i}, -\frac{1+\beta_i}{g_1-\beta_i})$ and $(-\frac{1+\beta_m}{g_N-\beta_m}, -\frac{1+\beta_m}{g_1-\beta_m})$, respectively. Their derivatives are strictly decreasing. Moreover, it is easy to see that $\lim_{s \rightarrow (-\frac{1+\beta_i}{g_N-\beta_i})^+} f_1'(s) = \infty$ and $\lim_{s \rightarrow (-\frac{1+\beta_i}{g_1-\beta_i})^-} f_1'(s) = -\infty$. So are $\lim_{s \rightarrow (-\frac{1+\beta_m}{g_N-\beta_m})^+} f_2'(s) = \infty$ and $\lim_{s \rightarrow (-\frac{1+\beta_m}{g_1-\beta_m})^-} f_2'(s) = -\infty$. Thus there is a unique solution \bar{s}_1 to the equation

$$0 = f_1'(s) = \sum_{n=1}^N \frac{p_n(g_n - \beta_i)}{1 + sg_n + (1-s)\beta_i} \text{ on } (-\frac{1+\beta_i}{g_N-\beta_i}, -\frac{1+\beta_i}{g_1-\beta_i})$$

and \bar{s}_2 to the equation

$$0 = f_2'(s) = \sum_{n=1}^N \frac{p_n(g_n - \beta_m)}{1 + sg_n - (s-1)\beta_m} \text{ on } (-\frac{1+\beta_m}{g_N-\beta_m}, -\frac{1+\beta_m}{g_1-\beta_m}).$$

Since the polynomials $\prod_{n=1}^N (1 + sg_n + (1-s)\beta_i)$ and $\prod_{n=1}^N (1 + sg_n - (s-1)\beta_m)$ have no solution in $(-\frac{1+\beta_i}{g_N-\beta_i}, -\frac{1+\beta_i}{g_1-\beta_i})$ and $(-\frac{1+\beta_m}{g_N-\beta_m}, -\frac{1+\beta_m}{g_1-\beta_m})$, respectively, we can conclude that \bar{s}_1 and \bar{s}_2 must be the unique solution of the (N-1)th polynomial equation

$$0 = \prod_{n=1}^N (1 + sg_n + (1-s)\beta_i) \left(\sum_{n=1}^N \frac{p_n g_n - \beta_i}{1 + sg_n + (1-s)\beta_i} \right)$$

on the interval $(-\frac{1+\beta_i}{g_N-\beta_i}, -\frac{1+\beta_i}{g_1-\beta_i})$ and

$$0 = \prod_{n=1}^N (1 + sg_n - (s-1)\beta_m) \left(\sum_{n=1}^N \frac{p_n(g_n - \beta_m)}{1 + sg_n - (s-1)\beta_m} \right)$$

on the interval $(-\frac{1+\beta_m}{g_N-\beta_m}, -\frac{1+\beta_m}{g_1-\beta_m})$, respectively.

Observe that if $s \in [0, 1]$, then one use his own capital and the margin costs do not have any effect at all. It is when $s > 1$ that the margin cost will kick in and we have to use f_2 also to analysis the best investment size. Therefore, when $\bar{s}_1 > 1$ and $\bar{s}_2 < 1$, it means that neither \bar{s}_1 nor \bar{s}_2 is the best investment size. Hence the best investment size should be 1, i.e.

$$\bar{s} = \begin{cases} \bar{s}_1 & ; \text{ if } \bar{s}_1 \in [0, 1] \\ \bar{s}_2 & ; \text{ if } \bar{s}_2 \geq 1 \\ 1 & ; \text{ if } \bar{s}_1 > 1 \text{ and } \bar{s}_2 < 1 \end{cases} \quad \square$$

The next section we will focus on the trade that have only two distinct gain and some examples.

2.2 Investment system with 2 distinct gains and example

The special cases of investment systems with two distinct gains are particularly important. They are related to the time tested strategy of cutting losses and taking profits at fixed thresholds. The detail will be explain in next chapter.

Theorem 2.2.1. (*Investment systems with two distinct gains*). *Let \mathcal{I} be an investment system with two distinct gains c and t with $c < t$. Suppose that the probabilities of a trade in \mathcal{I} to have gains c and t are p_c and p_t , respectively. Let β_m and β_i be percentage margin costs and interest rate, respectively. Then the best investment size and the efficiency index for \mathcal{I} are*

$$\bar{s} = \begin{cases} -\frac{(1+\beta_i)(p_c c + p_t t - \beta_i)}{(c-\beta_i)(t-\beta_i)} & ; \text{ if } -\frac{(1+\beta_i)(p_c c + p_t t - \beta_i)}{(c-\beta_i)(t-\beta_i)} \in [0, 1] \\ -\frac{(1+\beta_m)(p_c c + p_t t - \beta_m)}{(c-\beta_m)(t-\beta_m)} & ; \text{ if } -\frac{(1+\beta_m)(p_c c + p_t t - \beta_m)}{(c-\beta_m)(t-\beta_m)} \geq 1 \\ 1 & ; \text{ if } -\frac{(1+\beta_i)(p_c c + p_t t - \beta_i)}{(c-\beta_i)(t-\beta_i)} > 1 \\ & \text{ and } -\frac{(1+\beta_m)(p_c c + p_t t - \beta_m)}{(c-\beta_m)(t-\beta_m)} < 1 \end{cases}$$

and

$$\gamma = \begin{cases} p_c \ln \frac{p_c(t-c)(1+\beta_i)}{t-\beta_i} + p_t \ln \frac{p_t(c-t)(1+\beta_i)}{c-\beta_i} & ; \text{ if } \bar{s} \in [0, 1] \\ p_c \ln \frac{p_c(t-c)(1+\beta_m)}{t-\beta_m} + p_t \ln \frac{p_t(c-t)(1+\beta_m)}{c-\beta_m} & ; \text{ if } \bar{s} > 1 \\ p_c \ln(1+c) + p_t \ln(1+t) & ; \text{ if } \bar{s} = 1 \end{cases}$$

Proof. The log return function for this investment system is

$$f(s) = \begin{cases} p_c \ln(1+sc+(1-s)\beta_i) + p_t \ln(1+st+(1-s)\beta_i) & ; s \in [0, 1] \\ p_c \ln(1+sc-(s-1)\beta_m) + p_t \ln(1+st-(s-1)\beta_m) & ; s \geq 1 \end{cases}$$

By Theorem 2.1.5, \bar{s}_1 and \bar{s}_2 are the solutions of equations

$$0 = (1+sc+(1-s)\beta_i)(1+st+(1-s)\beta_i) \left(\frac{p_c(c-\beta_i)}{1+sc+(1-s)\beta_i} \right) \left(\frac{p_t(t-\beta_i)}{1+st+(1-s)\beta_i} \right)$$

and

$$0 = (1+sc-(s-1)\beta_m)(1+st-(s-1)\beta_m) \left(\frac{p_c(c-\beta_m)}{1+sc-(s-1)\beta_m} \right) \left(\frac{p_t(t-\beta_m)}{1+st-(s-1)\beta_m} \right).$$

Solving these equations produces \bar{s} above. Then we can derive the efficiency index by setting $\gamma = f(\bar{s})$. \square

Corollary 2.2.2. *(The suitable margin costs) Let \mathcal{I} be an investment system with two distinct gains c and t with $c < t$. Suppose that the probabilities of a trade in \mathcal{I} to have gains c and t are p_c and p_t , respectively. Then the suitable margin costs should not greater than*

$$\frac{p_c c + p_t t + ct}{1 + p_c t + p_t c}$$

Proof. From the previous Theorem, solving the equation $\bar{s}_2 = 1$ produces the maximum of β_m □

2.3 Concluding remarks

Investment systems are analyzed under a framework that emphasizes their statistical profile. The log return function is used to characterize investment systems. If one want to compare the annual return of the investment, one should compute $\exp(\gamma M) - 1 \times 100\%$ where M is the number of trade per year. The efficiency index, the maximum of the log return function, is proposed as a measure for the potential profitability of investment systems. We take into account the impact of margin costs and the interest. And we can calculate that how much should the margin costs be set up. The new efficiency index and the best investment size were formulated accordingly. For the future work, Corrolary 2.2.2 suggested how the broker house should set their margin costs if the range of the gain/loss percentage is known.

CHAPTER III

METHOD FOR SIMULATING THE TRADE FROM THE REAL WORLD DATA

In this chapter, we will use the theorem in previous chapter to evaluate the potential of the system. We will simulate the system from the historical data from some stock in the Stock Exchange of Thailand(SET).

3.1 System with two distinct gains

We have introduced the system with two distinct gains in previous chapter. The system with two distinct gains is related to the time test strategy of cutting losses and taking profits at fixed thresholds that are often adopted by professional stock traders. The investment system works as follows

1. Generate the two following signals
 - (a) The signal $c < 0$ represent the signal for cutting losses computed in terms of percentage.
 - (b) The signal $t > 0$ represent the signal for taking profits computed in terms of percentage.
2. Purchase a stock (using a predetermined position size) whenever a signal is generated.
3. Hold on to the stock until its price percentage change reaches either c or t .
4. Liquidate that stock (assuming that is always possible).
5. Wait for the next signal and repeat process.

Usually $|c|$ is much smaller than t and the idea is to cut losses quickly to preserve the capital and to let the winning trades cover the losses and make money. Obviously the outcome of a trade in such an investment system is either c or t and the system is characterized by the probability p_c and p_t of trades result in c and t , respectively.

3.2 EXAMPLES

In this section we will demonstrate how to generate the trade from the historical data. We select 3 stocks from SET namely BBL, PTT and ADVANC. We generate the system by setting

$$t = 10\%, c = 6\% \text{ and}$$

rebuy when the price movement exceeds 4% from the last price we sold.

About finding both β , notice that both β are placed in the same position the equations. The method of deriving them are as follow

$$\beta = \frac{D\iota}{365M},$$

where D = number of days which the stock/money is held.

ι = the interest rate/the margin cost computed annually.

M = number of trade.

Assume that we join the market at 3rd january 2007. The margin rate is 10% and the interest rate is 2% Together with the Theorem 2.2.1, we have the summarize data,

Table 3.1: BBL's Historical Data

DATE	ACTION	PRICE	AIM1	AIM2	DAY FROM PREVIOUS ACTION
1/3/2007	buy	105	116	99	
1/5/2007	sell	99	95	103	2
1/9/2007	buy	95	105	89	4
1/12/2007	sell	105	101	109	3
1/19/2007	buy	109	120	102	7
6/1/2007	sell	120	115	125	133
6/5/2007	buy	115	127	108	4
7/3/2007	sell	127	122	132	28
7/10/2007	buy	132	145	124	7
8/1/2007	sell	124	119	129	22
8/6/2007	buy	119	131	112	5
8/16/2007	sell	112	108	116	10
8/17/2007	buy	116	128	109	1
10/11/2007	sell	128	123	133	55
10/16/2007	buy	123	135	116	5
10/22/2007	sell	116	111	121	6
10/25/2007	buy	121	133	114	3
11/21/2007	sell	114	109	119	27
12/7/2007	buy	119	131	112	16
12/17/2007	sell	112	108	116	10
12/25/2007	buy	116	128	109	8
1/16/2008	sell	109	105	113	22
1/18/2008	buy	113	124	106	2
1/22/2008	sell	106	102	110	4
1/23/2008	buy	110	121	103	1
2/1/2008	sell	121	116	126	9
2/14/2008	buy	127	140	119	13
4/2/2008	sell	140	134	146	48

Continued on next page

Table 3.1 continued from previous page

DATE	ACTION	PRICE	AIM1	AIM2	DAY FROM PREVIOUS ACTION
4/25/2008	buy	134	147	126	23
6/3/2008	sell	126	121	131	39

Table 3.2: PTT's Historical Data

DATE	ACTION	PRICE	AIM1	AIM2	DAY FROM PREVIOUS ACTION
1/3/2007	buy	200	220	188	
4/30/2007	sell	220	212	228	117
5/3/2007	buy	228	250	214	3
5/22/2007	sell	250	240	260	19
5/24/2007	buy	240	264	226	2
6/4/2007	sell	264	254	274	10
6/13/2007	buy	254	280	238	9
7/3/2007	sell	280	268	292	20
7/4/2007	buy	292	322	274	1
7/24/2007	sell	322	310	334	20
7/26/2007	buy	334	368	314	2
7/31/2007	sell	314	302	326	5
8/1/2007	buy	302	332	284	1
8/10/2007	sell	284	272	296	9
8/15/2007	buy	272	300	256	5
8/31/2007	sell	300	288	312	16
9/3/2007	buy	312	344	294	3
10/9/2007	sell	344	330	358	36
10/15/2007	buy	358	394	336	6
10/25/2007	sell	394	378	410	10
10/26/2007	buy	410	452	386	1

Continued on next page

Table 3.2 continued from previous page

DATE	ACTION	PRICE	AIM1	AIM2	DAY FROM PREVIOUS ACTION
11/5/2007	sell	386	370	402	10
11/6/2007	buy	402	442	378	1
11/13/2007	sell	378	362	394	7
11/19/2007	buy	362	398	340	6
12/19/2007	sell	340	326	354	30
12/25/2007	buy	354	390	332	6
1/7/2008	sell	332	318	346	13
1/9/2008	buy	346	380	326	2
1/11/2008	sell	326	312	340	2
1/15/2008	buy	312	344	294	4
1/22/2008	sell	294	282	306	7
1/23/2008	buy	306	336	288	1
1/24/2008	sell	288	276	300	1
1/25/2008	buy	300	330	282	1
1/31/2008	sell	330	316	344	6
2/4/2008	buy	344	378	324	4
2/5/2008	sell	324	312	336	1
2/6/2008	buy	312	344	294	1
2/29/2008	sell	344	330	358	23
3/4/2008	buy	330	364	310	4
3/21/2008	sell	310	298	322	17
3/25/2008	buy	322	354	302	4
5/8/2008	sell	354	340	368	44
5/13/2008	buy	340	374	320	5
5/20/2008	sell	374	360	388	7
5/26/2008	buy	360	396	338	6
5/29/2008	sell	338	324	352	3

Table 3.3: ADVANC's Historical Data

DATE	ACTION	PRICE	AIM1	AIM2	DAY FROM PREVIOUS ACTION
1/3/2007	buy	75.5	83	71	
1/10/2007	sell	71	68	74	7
1/10/2007	buy	74	81.5	69.5	0
2/9/2007	sell	81.5	78	85	30
2/12/2007	buy	85	93.5	80	3
2/16/2007	sell	80	77	83	4
2/19/2007	buy	77	84.5	72.5	3
2/28/2007	sell	72.5	69.5	75.5	9
3/28/2007	buy	69.5	76.5	65.5	28
4/30/2007	sell	76.5	73.5	79.5	33
5/3/2007	buy	79.5	87.5	74.5	3
5/8/2007	sell	87.5	84	91	5
5/9/2007	buy	84	92.5	79	1
5/15/2007	sell	92.5	89	96	6
5/18/2007	buy	89	98	83.5	3
6/13/2007	sell	83.5	80	87	26
6/18/2007	buy	87	95.5	82	5
7/12/2007	sell	95.5	91.5	99.5	24
7/20/2007	buy	99.5	109.5	93.5	8
8/1/2007	sell	93.5	90	97	12
8/2/2007	buy	97.5	107.5	91.5	1
8/16/2007	sell	90	86.5	93.5	14
8/17/2007	buy	86.5	95	81.5	1
8/23/2007	sell	95	91	99	6
8/24/2007	buy	91.5	100.5	86	1
9/19/2007	sell	86	82.5	89.5	26
9/24/2007	buy	89.5	98.5	84	5
10/10/2007	sell	98.5	94.5	102.5	16

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Table 3.3 continued from previous page

DATE	ACTION	PRICE	AIM1	AIM2	DAY FROM PREVIOUS ACTION
10/12/2007	buy	94.5	104	89	2
10/22/2007	sell	89	85.5	92.5	10
10/26/2007	buy	92.5	102	87	4
11/2/2007	sell	87	83.5	90.5	7
11/29/2007	buy	90.5	99.5	85	27
1/4/2008	sell	99.5	95.5	103.5	36
1/7/2008	buy	95.5	105	90	3
1/22/2008	sell	90	86.5	93.5	15
1/25/2008	buy	93.5	103	88	3
2/4/2008	sell	104	100	108	10
2/12/2008	buy	100	110	94	8
4/16/2008	sell	94	90	98	64
5/15/2008	buy	98	108	92	29
6/9/2008	sell	91.5	88	95	25

parameter	BBL	PTT	ADVANC
M	15	24	21
p_t	$\frac{6}{15}$	$\frac{12}{24}$	$\frac{9}{21}$
p_c	$\frac{9}{15}$	$\frac{12}{24}$	$\frac{12}{21}$
Stock hold(day)	418	434	385
β_m	0.004581	0.002973	0.003014
Cash hold(day)	105	89	138
β_i	0.000384	0.000203	0.000315
\bar{s}_1	0.6014	3.2957	1.3808
\bar{s}_2	-	2.4492	0.5778
\bar{s}	0.6014	2.4492	1
γ	0.001463	0.022948	0.005490
%return	2.22%	73.46%	12.22%

Table 3.4: Summary of Trade compared

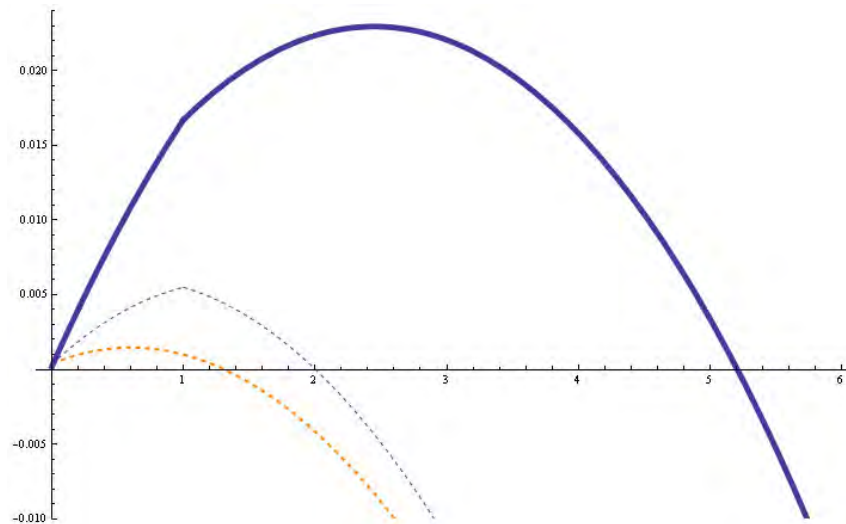


Figure 3.1: Log return function

We can conclude that within about one year and a half, starting from 3rd january 2007 to 9th June 2008, the PTT has the higher efficiency index with this set of rules. We can say that this set of rules is favorable to PTT than others.

3.3 Summary

According to our scheme, it is better to invest in PTT than the other two stocks, during the given period. However, we still can modify our scheme to maximize the profit by adjusting the rebuy signal. There are lots of technical indicator such as MACD(Moving Average Convergence/Divergence), Stochastic oscillator etc. Also, tuning the parameter c and t might help. The theorem in this thesis has the merit of setting up the test framework to find out the suitable c , t or how should one to invest in some systems. But please be aware that in the real world system, there are more factors to taking into account than this. For example, drawdown.

REFERENCES

- [1] Q.J. Zhu.(2007).Mathematical analysis of investment systems.*Journal of Mathematical Analysis and Applications*,326,708-720.
- [2] H.L. Royden.(1998). *Real Analysis* (third ed.). New York:Macmillan.

APPENDIX

Table A-1: BBL's Historical Data

DATE	OPEN	HIGH	LOW	CLOSE	CHANGE	%CHANGE	VOLUMN	VALUE
6/9/2008	122	122	120	121	-4	-3.2	33191	401.97
6/6/2008	126	127	124	125	1	0.8	44827	560.93
6/5/2008	123	124	121	124	0	0	39095	479.87
6/4/2008	125	127	122	124	0	0	63860	797.32
6/3/2008	127	128	124	124	-4	-3.12	68872	863.58
6/2/2008	132	133	128	128	-5	-3.75	51315	664.75
5/30/2008	131	134	131	133	3	2.3	22816	302.99
5/29/2008	132	132	129	130	-1	-0.76	52643	686.7
5/28/2008	136	137	131	131	-6	-4.37	56917	755.34
5/27/2008	136	137	135	137	1	0.73	21271	290.26
5/26/2008	136	137	135	136	-1	-0.72	34699	470.28
5/23/2008	138	139	136	137	1	0.73	49359	680.72
5/22/2008	137	137	135	136	-3	-2.15	53583	731.1
5/21/2008	133	139	133	139	5	3.73	57106	781.94
5/20/2008	138	138	134	134	-3	-2.18	37862	511.28
5/16/2008	136	139	136	137	1	0.73	35632	490.35
5/15/2008	135	137	135	136	1	0.74	20026	272.43
5/14/2008	134	135	132	135	1	0.74	28534	380.27
5/13/2008	131	135	131	134	4	3.07	37659	501.82
5/12/2008	129	131	128	130	1	0.77	31638	411.03
5/9/2008	133	133	129	129	-4	-3	63428	825.25
5/8/2008	135	136	133	133	-2	-1.48	37517	504.25
5/7/2008	136	137	134	135	0	0	34240	463.15
5/6/2008	138	138	135	135	-1	-0.73	29540	400.95
5/2/2008	138	140	136	136	-2	-1.44	34310	473.04
4/30/2008	138	139	137	138	0	0	13298	183.55
4/29/2008	136	138	135	138	2	1.47	11658	159.88
4/28/2008	135	137	133	136	2	1.49	26060	351.12
4/25/2008	135	136	133	134	-3	-2.18	25660	344.7
4/24/2008	136	137	135	137	1	0.73	20147	274.53
4/23/2008	138	138	135	136	-2	-1.44	31661	429.28
4/22/2008	138	138	135	138	-1	-0.71	38476	525.84
4/21/2008	142	142	137	139	-2	-1.41	50043	695.38
4/18/2008	142	142	140	141	-1	-0.7	65113	918.43
4/17/2008	144	145	142	142	0	0	57106	819.86
4/16/2008	142	144	141	142	0	0	74363	1061.34
4/11/2008	140	142	139	142	2	1.42	31349	440.67
4/10/2008	141	141	140	140	-1	-0.7	28378	399.01
4/9/2008	142	143	141	141	0	0	32966	466.69
4/8/2008	141	143	139	141	0	0	50683	714.31
4/4/2008	141	141	140	141	1	0.71	43885	617.7
4/3/2008	138	140	138	140	2	1.44	45089	626.07
4/2/2008	138	140	137	138	2	1.47	73098	1015.96
4/1/2008	136	137	135	136	1	0.74	37664	512.26
3/31/2008	137	137	134	135	-1	-0.73	38773	524.49
3/28/2008	139	139	135	136	-2	-1.44	47216	644.2
3/27/2008	134	139	134	138	3	2.22	65347	895.69
3/26/2008	136	136	132	135	-1	-0.73	56144	752.06
3/25/2008	133	137	133	136	3	2.25	98967	1336.28
3/24/2008	131	133	130	133	3	2.3	46308	610.98
3/21/2008	129	131	129	130	3	2.36	51492	668.16
3/20/2008	128	128	127	127	-3	-2.3	50026	638.06
3/19/2008	130	130	128	130	2	1.56	51993	671.57
3/18/2008	124	128	124	128	3	2.4	44596	560.2

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Table A-1 continued from previous page

DATE	OPEN	HIGH	LOW	CLOSE	CHANGE	%CHANGE	VOLUMN	VALUE
3/17/2008	125	126	124	125	-3	-2.34	35344	440.71
3/14/2008	126	129	126	128	3	2.4	22709	290.45
3/13/2008	128	128	125	125	-3	-2.34	22225	281.62
3/12/2008	129	130	128	128	0	0	41920	542.36
3/11/2008	125	128	124	128	3	2.4	31292	394.37
3/10/2008	126	127	125	125	-3	-2.34	40837	513.15
3/7/2008	127	128	126	128	-1	-0.77	29313	372.05
3/6/2008	128	129	128	129	2	1.57	22628	291.62
3/5/2008	128	129	126	127	-1	-0.78	14060	179.21
3/4/2008	130	131	127	128	-3	-2.29	33113	426.23
3/3/2008	128	132	127	131	1	0.76	85252	1101.91
2/29/2008	128	131	127	130	2	1.56	98919	1281.39
2/28/2008	126	128	125	128	3	2.4	35515	449.27
2/27/2008	126	127	125	125	-1	-0.79	10795	136.03
2/26/2008	128	128	124	126	0	0	39813	499.19
2/25/2008	127	128	126	126	1	0.8	33103	420.07
2/22/2008	125	126	124	125	0	0	38740	484.06
2/20/2008	126	127	124	125	-1	-0.79	37461	470.01
2/19/2008	127	128	126	126	1	0.8	55979	713.49
2/18/2008	126	126	124	125	0	0	31503	395.38
2/15/2008	125	126	124	125	0	0	69536	869.35
2/14/2008	127	127	125	125	0	0	70825	893.13
2/13/2008	124	125	123	125	1	0.8	81568	1013.39
2/12/2008	124	125	122	124	2	1.63	96690	1196.71
2/11/2008	121	123	121	122	1	0.82	56942	696.26
2/8/2008	120	122	120	121	1	0.83	16474	199.19
2/7/2008	120	120	119	120	0	0	4916	58.7
2/6/2008	119	121	118	120	-1	-0.82	49527	590.66
2/5/2008	120	122	120	121	-1	-0.81	42624	517.55
2/4/2008	122	122	120	122	3	2.52	93763	1138.26
2/1/2008	120	121	118	119	1	0.84	99397	1194.43
1/31/2008	115	119	113	118	4	3.5	145809	1711.66
1/30/2008	113	115	112	114	2	1.78	38194	432.29
1/29/2008	110	113	109	112	4	3.7	33597	374.59
1/28/2008	110	110	108	108	-4	-3.57	24805	269.94
1/25/2008	108	113	108	112	5	4.67	83925	928.28
1/24/2008	106	109	106	107	1	0.94	31677	339.79
1/23/2008	109	110	106	106	-1	-0.93	51896	557.97
1/22/2008	107	109	104	107	-3	-2.72	73332	780.19
1/21/2008	114	118	109	110	-2	-1.78	117395	1332.47
1/18/2008	111	113	110	112	0	0	25502	284.45
1/17/2008	110	112	109	112	2	1.81	39254	435.45
1/16/2008	110	110	108	110	-2	-1.78	56134	614.78
1/15/2008	113	114	112	112	-1	-0.88	17837	200.37
1/14/2008	113	113	111	113	0	0	17887	200.38
1/11/2008	113	113	111	113	1	0.89	35876	403.61
1/10/2008	113	113	111	112	-1	-0.88	33863	379.73
1/9/2008	112	114	112	113	1	0.89	27364	309.16
1/8/2008	113	114	112	112	0	0	27164	305.48
1/7/2008	113	113	112	112	-2	-1.75	35366	399.3
1/4/2008	115	116	113	114	-1	-0.86	42045	478.88
1/3/2008	115	116	114	115	-1	-0.86	52488	600.21
1/2/2008	119	119	116	116	-2	-1.69	13302	155.66
12/28/2007	117	119	117	118	0	0	19651	231.92
12/27/2007	118	118	116	118	1	0.85	10711	125.94
12/26/2007	118	119	117	117	-1	-0.84	31250	367.36
12/25/2007	115	118	114	118	3	2.6	32768	381.59

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Table A-1 continued from previous page

DATE	OPEN	HIGH	LOW	CLOSE	CHANGE	%CHANGE	VOLUMN	VALUE
12/21/2007	113	115	113	115	2	1.76	17861	203.81
12/20/2007	113	114	112	113	-1	-0.87	30735	347.3
12/19/2007	114	114	113	114	1	0.88	9131	104.04
12/18/2007	113	115	113	113	0	0	22684	257.62
12/17/2007	115	115	112	113	-2	-1.73	33849	383.49
12/14/2007	115	117	114	115	0	0	25860	298.39
12/13/2007	116	117	115	115	-2	-1.7	54474	629.36
12/12/2007	117	118	116	117	-2	-1.68	21469	251.18
12/11/2007	120	120	117	119	0	0	21859	258.3
12/7/2007	119	120	117	119	2	1.7	40247	477.93
12/6/2007	117	118	116	117	1	0.86	31713	371.12
12/4/2007	115	117	115	116	0	0	27878	320.95
12/3/2007	116	118	115	116	1	0.86	15685	182.23
11/30/2007	117	117	115	115	-2	-1.7	23654	274.6
11/29/2007	115	117	115	117	4	3.53	59382	688.33
11/28/2007	115	115	113	113	-2	-1.73	45281	516.71
11/27/2007	115	116	114	115	-1	-0.86	8910	102.46
11/26/2007	115	116	115	116	2	1.75	22619	262.14
11/23/2007	114	115	113	114	-1	-0.86	30106	343.67
11/22/2007	113	115	112	115	2	1.76	58410	664.51
11/21/2007	116	118	113	113	-5	-4.23	64061	735.59
11/20/2007	117	119	116	118	-1	-0.84	49686	582.59
11/19/2007	120	120	118	119	-1	-0.83	18583	221.04
11/16/2007	120	120	118	120	-1	-0.82	14732	175.61
11/15/2007	120	122	120	121	0	0	29544	355.39
11/14/2007	121	121	119	121	2	1.68	43169	519.6
11/13/2007	119	121	118	119	0	0	19157	228.44
11/12/2007	118	119	118	119	-1	-0.83	23030	272.28
11/9/2007	120	121	119	120	0	0	27883	334.58
11/8/2007	119	120	118	120	-1	-0.82	43657	519.79
11/7/2007	123	124	121	121	-2	-1.62	24118	293.67
11/6/2007	119	123	119	123	4	3.36	31142	377.36
11/5/2007	122	122	117	119	-3	-2.45	92431	1099.48
11/2/2007	122	123	120	122	-1	-0.81	66795	810.72
11/1/2007	127	127	122	123	-2	-1.6	74893	939.19
10/31/2007	122	127	122	125	2	1.62	101056	1263.16
10/30/2007	122	124	121	123	0	0	68537	843.98
10/29/2007	123	123	121	123	2	1.65	27840	340.36
10/26/2007	122	124	120	121	0	0	117341	1436.41
10/25/2007	118	121	117	121	3	2.54	73855	881.68
10/24/2007	118	119	118	118	1	0.85	76399	903.96
10/22/2007	116	118	116	117	-2	-1.68	51219	598.85
10/19/2007	120	120	118	119	0	0	64175	764.83
10/18/2007	122	122	119	119	-2	-1.65	41468	499.63
10/17/2007	120	122	119	121	-1	-0.81	65383	787.34
10/16/2007	125	126	122	122	-3	-2.4	67715	835.24
10/15/2007	126	126	124	125	0	0	54726	684.36
10/12/2007	127	128	124	125	-2	-1.57	72982	915.2
10/11/2007	124	128	123	127	4	3.25	147094	1851.54
10/10/2007	122	123	121	123	3	2.5	116038	1421.02
10/9/2007	120	121	118	120	1	0.84	113518	1357.34
10/8/2007	118	120	118	119	1	0.84	56730	675.09
10/5/2007	117	119	116	118	1	0.85	66119	777.49
10/4/2007	116	117	115	117	0	0	36222	420.51
10/3/2007	116	118	116	117	1	0.86	58345	682.44
10/2/2007	117	118	116	116	0	0	74436	869.46
10/1/2007	115	116	114	116	0	0	90595	1043.28

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Table A-1 continued from previous page

DATE	OPEN	HIGH	LOW	CLOSE	CHANGE	%CHANGE	VOLUMN	VALUE
9/28/2007	117	118	115	116	-1	-0.85	108228	1259.02
9/27/2007	119	120	117	117	-2	-1.68	85381	1011.74
9/26/2007	118	119	116	119	1	0.84	76570	902.87
9/25/2007	119	119	117	118	-1	-0.84	26478	311.8
9/24/2007	118	119	117	119	2	1.7	49138	581.87
9/21/2007	115	118	114	117	2	1.73	58761	683.62
9/20/2007	115	115	114	115	0	0	16750	192.42
9/19/2007	115	116	114	115	2	1.76	54948	629.81
9/18/2007	113	115	113	113	-1	-0.87	22273	253.1
9/17/2007	115	115	113	114	0	0	17489	199.4
9/14/2007	115	116	114	114	0	0	29322	336.97
9/13/2007	114	115	113	114	0	0	43473	495.95
9/12/2007	115	115	113	114	0	0	37767	430.74
9/11/2007	115	115	113	114	0	0	51908	591.65
9/10/2007	114	115	113	114	-1	-0.86	17472	199.82
9/7/2007	117	117	114	115	-2	-1.7	39080	450.38
9/6/2007	116	117	115	117	0	0	8455	98.16
9/5/2007	118	118	117	117	0	0	11687	136.99
9/4/2007	119	119	117	117	-3	-2.5	27059	319.51
9/3/2007	118	120	117	120	1	0.84	21497	255.31
8/31/2007	116	119	116	119	4	3.47	36297	426.75
8/30/2007	117	117	115	115	-1	-0.86	24884	288.93
8/29/2007	113	116	113	116	0	0	28117	321.52
8/28/2007	117	117	115	116	-2	-1.69	23887	276.06
8/27/2007	118	118	117	118	2	1.72	15512	182.42
8/24/2007	116	117	115	116	-1	-0.85	12900	149.67
8/23/2007	119	119	116	117	1	0.86	27473	323.22
8/22/2007	114	117	113	116	3	2.65	36611	421.2
8/21/2007	119	119	113	113	-6	-5.04	49510	573.88
8/20/2007	118	119	117	119	4	3.47	41116	485.47
8/17/2007	113	116	110	115	2	1.76	58431	655.79
8/16/2007	110	113	109	113	-1	-0.87	70650	784.92
8/15/2007	116	117	114	114	-4	-3.38	35530	408.82
8/14/2007	117	118	116	118	1	0.85	25659	300.09
8/10/2007	115	117	115	117	-2	-1.68	75330	873.64
8/9/2007	124	125	119	119	-4	-3.25	57487	696.82
8/8/2007	123	124	122	123	2	1.65	23171	284.51
8/7/2007	120	122	119	121	2	1.68	47041	564.49
8/6/2007	120	120	118	119	-5	-4.03	100084	1190.35
8/3/2007	123	125	122	124	2	1.63	39519	487.51
8/2/2007	125	125	120	122	-1	-0.81	84869	1034.42
8/1/2007	127	127	123	123	-5	-3.9	65200	809.92
7/31/2007	128	130	126	128	0	0	59064	755.1
7/27/2007	127	129	126	128	-3	-2.29	113376	1445.23
7/26/2007	134	135	130	131	-2	-1.5	63959	843.9
7/25/2007	134	136	133	133	-2	-1.48	54232	727.81
7/24/2007	134	137	134	135	2	1.5	87594	1187.91
7/23/2007	129	134	129	133	2	1.52	61712	810.8
7/20/2007	129	132	128	131	5	3.96	94856	1231.62
7/19/2007	128	128	125	126	-3	-2.32	53024	669.36
7/18/2007	130	131	128	129	-2	-1.52	48046	625.95
7/17/2007	131	132	128	131	0	0	32556	424.91
7/16/2007	133	133	129	131	-1	-0.75	21673	284.27
7/13/2007	132	133	130	132	3	2.32	41595	548.1
7/12/2007	131	132	128	129	-2	-1.52	69127	894.1
7/11/2007	131	133	130	131	-2	-1.5	52187	685.72
7/10/2007	130	134	128	133	3	2.3	69566	917.16

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Table A-1 continued from previous page

DATE	OPEN	HIGH	LOW	CLOSE	CHANGE	%CHANGE	VOLUMN	VALUE
7/9/2007	130	131	129	130	2	1.56	62282	808.32
7/6/2007	126	128	124	128	1	0.78	56675	715.26
7/5/2007	130	130	125	127	-1	-0.78	53927	686.37
7/4/2007	127	129	125	128	2	1.58	90537	1146.14
7/3/2007	122	127	121	126	6	5	154549	1927.53
7/2/2007	118	121	118	120	3	2.56	65965	790.17
6/29/2007	118	119	117	117	-2	-1.68	41774	492.98
6/28/2007	117	119	116	119	3	2.58	43758	512.51
6/27/2007	117	118	116	116	0	0	38901	454.35
6/26/2007	116	117	116	116	0	0	7802	91.02
6/25/2007	118	119	116	116	-2	-1.69	29648	347.85
6/22/2007	120	120	118	118	-1	-0.84	16174	192.26
6/21/2007	119	120	118	119	-1	-0.83	45124	537.2
6/20/2007	117	120	117	120	3	2.56	49678	589.88
6/19/2007	117	118	116	117	0	0	30545	357.42
6/18/2007	116	118	116	117	3	2.63	55144	645.42
6/15/2007	113	115	113	114	1	0.88	52015	592.1
6/14/2007	113	114	113	113	1	0.89	35606	402.39
6/13/2007	113	114	112	112	-1	-0.88	66435	746.77
6/12/2007	115	115	113	113	-2	-1.73	23326	265.64
6/11/2007	114	115	113	115	0	0	38606	441.37
6/8/2007	115	116	114	115	-1	-0.86	34438	396.16
6/7/2007	116	117	115	116	-1	-0.85	30628	355.15
6/6/2007	116	118	116	117	1	0.86	59427	691.91
6/5/2007	119	119	115	116	-3	-2.52	149481	1740.15
6/4/2007	120	121	118	119	-1	-0.83	86979	1041.13
6/1/2007	115	120	114	120	6	5.26	163812	1917.4
5/30/2007	113	115	113	114	2	1.78	68709	779.56
5/29/2007	113	114	112	112	-1	-0.88	47982	539.56
5/28/2007	112	113	112	113	1	0.89	19724	222.85
5/25/2007	113	114	112	112	-2	-1.75	30410	343.44
5/24/2007	114	115	113	114	0	0	70753	803.47
5/23/2007	117	117	114	114	-2	-1.72	51961	598.18
5/22/2007	114	117	114	116	3	2.65	99951	1152.45
5/21/2007	113	114	113	113	0	0	19846	224.61
5/18/2007	113	114	112	113	1	0.89	41299	466.57
5/17/2007	111	113	111	112	1	0.9	76355	856.76
5/16/2007	110	111	110	111	1	0.9	62490	688.61
5/15/2007	111	111	110	110	-1	-0.9	32762	360.91
5/14/2007	110	112	110	111	1	0.9	36469	404.72
5/11/2007	109	110	108	110	1	0.91	79419	866.64
5/10/2007	109	110	108	109	0	0	34729	378.51
5/9/2007	111	111	108	109	-2	-1.8	93407	1023.76
5/8/2007	113	113	111	111	-1	-0.89	29758	332.85
5/4/2007	112	113	111	112	0	0	30384	341.05
5/3/2007	113	113	112	112	0	0	22865	256.29
5/2/2007	110	113	110	112	2	1.81	37031	412.52
4/30/2007	110	110	108	110	0	0	74579	815.09
4/27/2007	111	111	110	110	0	0	27556	303.15
4/26/2007	110	112	110	110	0	0	41019	454.74
4/25/2007	111	111	110	110	0	0	31043	342.4
4/24/2007	110	111	110	110	-2	-1.78	21843	240.45
4/23/2007	113	113	112	112	-1	-0.88	47451	532.22
4/20/2007	112	113	112	113	1	0.89	6191	69.68
4/19/2007	113	113	112	112	-2	-1.75	15087	169.76
4/18/2007	114	114	112	114	0	0	16988	192.28
4/17/2007	113	114	113	114	2	1.78	47889	541.76

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Table A-1 continued from previous page

DATE	OPEN	HIGH	LOW	CLOSE	CHANGE	%CHANGE	VOLUMN	VALUE
4/12/2007	113	113	112	112	-1	-0.88	8320	93.59
4/11/2007	112	113	111	113	1	0.89	76833	860.75
4/10/2007	113	113	112	112	0	0	52116	583.83
4/9/2007	113	114	112	112	-1	-0.88	16291	183.88
4/5/2007	113	113	112	113	0	0	11290	127.06
4/4/2007	111	114	111	113	3	2.72	96544	1085.66
4/3/2007	109	110	109	110	1	0.91	72011	791.48
4/2/2007	108	110	108	109	1	0.92	94520	1029.22
3/30/2007	108	109	108	108	0	0	47728	517.12
3/29/2007	107	108	107	108	1	0.93	7543	81.22
3/28/2007	109	109	107	107	-2	-1.83	40904	441.26
3/27/2007	108	109	107	109	1	0.92	44719	484.03
3/26/2007	109	109	108	108	0	0	35754	389.45
3/23/2007	108	109	107	108	0	0	42159	455.43
3/22/2007	107	108	107	108	2	1.88	13536	144.99
3/21/2007	107	107	106	106	-1	-0.93	31320	333.41
3/20/2007	107	107	106	107	1	0.94	19780	211.45
3/19/2007	108	108	106	106	-1	-0.93	48503	518.85
3/16/2007	108	109	107	107	-2	-1.83	33514	361.77
3/15/2007	108	109	108	109	2	1.86	18216	197.15
3/14/2007	108	109	106	107	-1	-0.92	54084	580.67
3/13/2007	108	109	108	108	-1	-0.91	38370	415.67
3/12/2007	109	109	107	109	0	0	26585	287.57
3/9/2007	108	109	107	109	1	0.92	32083	346.88
3/8/2007	107	108	107	108	1	0.93	31817	342.7
3/7/2007	110	110	107	107	-2	-1.83	30827	334.33
3/6/2007	108	109	107	109	1	0.92	70964	765.67
3/2/2007	108	109	107	108	-1	-0.91	43050	465.39
3/1/2007	110	110	108	109	0	0	36663	400.37
2/28/2007	108	109	106	109	-2	-1.8	148928	1603.45
2/27/2007	111	113	110	111	0	0	56753	630.53
2/26/2007	111	112	110	111	0	0	27673	307.11
2/23/2007	111	112	110	111	0	0	43211	479.51
2/22/2007	112	113	111	111	0	0	35746	400.37
2/21/2007	110	112	110	111	0	0	29867	330.94
2/20/2007	110	111	109	111	1	0.9	48742	537
2/19/2007	111	111	109	110	-1	-0.9	11782	129.72
2/16/2007	112	112	110	111	-1	-0.89	43570	483.79
2/15/2007	113	114	112	112	-1	-0.88	51024	577.94
2/14/2007	112	113	112	113	2	1.8	37265	417.56
2/13/2007	113	113	110	111	-1	-0.89	113667	1269.59
2/12/2007	113	113	112	112	0	0	44060	495.18
2/9/2007	111	113	111	112	1	0.9	122439	1370.93
2/8/2007	109	112	109	111	2	1.83	130688	1445.21
2/7/2007	109	110	108	109	0	0	26246	286.43
2/6/2007	111	111	109	109	-1	-0.9	20917	229.24
2/5/2007	110	111	109	110	1	0.91	79364	873.82
2/2/2007	108	110	107	109	2	1.86	82036	890.85
2/1/2007	107	107	106	107	1	0.94	33566	358.38
1/31/2007	108	108	106	106	-3	-2.75	26449	282.81
1/30/2007	107	109	106	109	2	1.86	28068	301.49
1/29/2007	108	108	107	107	-1	-0.92	41221	441.8
1/26/2007	108	108	106	108	-1	-0.91	45423	486.46
1/25/2007	108	110	107	109	1	0.92	30459	331.26
1/24/2007	107	108	105	108	3	2.85	39956	426.41
1/23/2007	108	108	105	105	-5	-4.54	70714	749.8
1/22/2007	109	112	109	110	1	0.91	59217	652.88

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Table A-1 continued from previous page

DATE	OPEN	HIGH	LOW	CLOSE	CHANGE	%CHANGE	VOLUMN	VALUE
1/19/2007	108	109	107	109	2	1.86	48604	525.65
1/18/2007	106	107	105	107	2	1.9	36190	384.09
1/17/2007	105	107	104	105	0	0	72478	764.12
1/16/2007	105	106	104	105	0	0	69396	728.86
1/15/2007	105	106	104	105	1	0.96	53594	564.52
1/12/2007	104	105	103	104	3	2.97	160185	1669.42
1/11/2007	97	102	97	101	5.5	5.75	180646	1801.34
1/10/2007	94.5	97	93.5	95.5	0	0	161739	1543.01
1/9/2007	99.5	99.5	95	95.5	-3.5	-3.53	94114	915.83
1/8/2007	99.5	101	98	99	-0.5	-0.5	62290	620.1
1/5/2007	100	101	98	99.5	-1.5	-1.48	157093	1562.12
1/4/2007	105	105	101	101	-5	-4.71	105578	1084.86
1/3/2007	105	107	104	106	-4	-3.63	92185	973.41

Table A-2: PTT's Historical Data

DATE	OPEN	HIGH	LOW	CLOSE	CHANGE	%CHANGE	VOLUMN	VALUE
6/9/2008	334	334	328	330	-2	-0.6	29989	992.29
6/6/2008	328	334	326	332	8	2.46	58424	1930.26
6/5/2008	320	324	318	324	2	0.62	38980	1251.21
6/4/2008	318	326	318	322	0	0	46244	1489.06
6/3/2008	322	326	320	322	0	0	74349	2399.73
6/2/2008	330	334	320	322	-14	-4.16	80997	2648.25
5/30/2008	342	346	334	336	-4	-1.17	63724	2169.69
5/29/2008	342	344	330	340	0	0	88243	2974.91
5/28/2008	352	352	340	340	-14	-3.95	60344	2080.44
5/27/2008	360	360	352	354	-6	-1.66	47169	1678.56
5/26/2008	366	368	358	360	-12	-3.22	89109	3225.67
5/23/2008	372	378	372	372	0	0	50100	1872.22
5/22/2008	380	382	370	372	-8	-2.1	112805	4235.2
5/21/2008	374	380	372	380	4	1.06	83261	3132.12
5/20/2008	374	376	370	376	10	2.73	101070	3778.27
5/16/2008	356	366	354	366	14	3.97	111866	4042.22
5/15/2008	350	352	348	352	6	1.73	30747	1076.14
5/14/2008	342	348	342	346	6	1.76	35160	1212.92
5/13/2008	346	350	340	340	-6	-1.73	42913	1478.41
5/12/2008	352	352	346	346	-6	-1.7	46112	1607.15
5/9/2008	352	356	346	352	0	0	46921	1644.67
5/8/2008	348	360	344	352	4	1.14	104734	3687.34
5/7/2008	344	350	344	348	4	1.16	41908	1452.66
5/6/2008	344	346	340	344	4	1.17	37829	1299.47
5/2/2008	336	340	334	340	6	1.79	23299	787.51
4/30/2008	334	336	334	334	-4	-1.18	10907	365.24
4/29/2008	340	342	334	338	-2	-0.58	29792	1008.15
4/28/2008	334	342	334	340	8	2.4	27728	936.93
4/25/2008	336	338	332	332	-2	-0.59	28031	936.07
4/24/2008	340	344	334	334	-4	-1.18	34554	1172.27
4/23/2008	346	348	338	338	-8	-2.31	90259	3099.78
4/22/2008	336	346	336	346	12	3.59	77843	2649.97
4/21/2008	338	342	334	334	0	0	47946	1620.08
4/18/2008	334	336	332	334	2	0.6	43700	1460.92
4/17/2008	326	334	326	332	10	3.1	90072	2974.57
4/16/2008	318	324	318	322	4	1.25	66189	2125.86
4/11/2008	316	320	316	318	2	0.63	14680	466.41

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DATE	OPEN	HIGH	LOW	CLOSE	CHANGE	%CHANGE	VOLUMN	VALUE
4/10/2008	318	318	316	316	-2	-0.62	31909	1013.26
4/9/2008	322	324	318	318	-2	-0.62	22158	708.07
4/8/2008	318	322	318	320	2	0.62	27057	865.41
4/4/2008	320	322	316	318	-2	-0.62	18260	581.79
4/3/2008	320	322	318	320	0	0	17714	566.94
4/2/2008	324	326	318	320	0	0	30878	995.43
4/1/2008	318	320	316	320	4	1.26	13194	418.67
3/31/2008	322	322	316	316	-6	-1.86	20073	639.77
3/28/2008	322	324	318	322	2	0.62	34508	1108.18
3/27/2008	316	322	314	320	4	1.26	34825	1115.19
3/26/2008	322	322	314	316	-6	-1.86	35868	1139.84
3/25/2008	312	326	312	322	10	3.2	35971	1149.97
3/24/2008	314	314	310	312	0	0	17963	560.33
3/21/2008	314	316	310	312	-2	-0.63	25330	791.87
3/20/2008	314	316	312	314	-6	-1.87	35120	1102.9
3/19/2008	326	328	320	320	-4	-1.23	41344	1334.62
3/18/2008	320	324	320	324	-4	-1.21	47613	1530.42
3/17/2008	330	332	328	328	-6	-1.79	34319	1131.83
3/14/2008	336	338	332	334	2	0.6	25202	845.62
3/13/2008	338	340	332	332	-6	-1.77	67916	2277.44
3/12/2008	336	338	334	338	8	2.42	77546	2607.74
3/11/2008	320	330	320	330	10	3.12	68584	2229.25
3/10/2008	318	322	318	320	-4	-1.23	45912	1466.66
3/7/2008	322	324	318	324	0	0	52188	1678.92
3/6/2008	326	330	324	324	2	0.62	42769	1394.31
3/5/2008	328	330	322	322	-8	-2.42	57668	1867.56
3/4/2008	338	342	328	330	-6	-1.78	81584	2721.79
3/3/2008	340	344	336	336	-6	-1.75	90523	3077.83
2/29/2008	338	346	336	342	2	0.58	90206	3082.5
2/28/2008	334	340	332	340	6	1.79	58835	1986.79
2/27/2008	336	338	332	334	0	0	35343	1182.45
2/26/2008	340	340	330	334	-2	-0.59	73993	2474.13
2/25/2008	332	338	332	336	8	2.43	40942	1370.52
2/22/2008	328	332	328	328	-4	-1.2	29029	955.97
2/20/2008	340	340	328	332	0	0	59916	2002.8
2/19/2008	328	334	328	332	6	1.84	47343	1573
2/18/2008	328	332	324	326	-2	-0.6	37184	1218.21
2/15/2008	328	332	324	328	-4	-1.2	67443	2210.45
2/14/2008	336	340	330	332	2	0.6	90749	3047.49
2/13/2008	326	332	324	330	6	1.85	67902	2230.54
2/12/2008	320	326	316	324	8	2.53	72055	2316.54
2/11/2008	322	326	314	316	-2	-0.62	62459	1999.26
2/8/2008	312	320	312	318	8	2.58	24364	771.84
2/7/2008	314	316	308	310	-6	-1.89	38564	1202.22
2/6/2008	318	320	312	316	-10	-3.06	71838	2271.66
2/5/2008	324	334	324	326	-2	-0.6	78022	2563.46
2/4/2008	344	346	328	328	-10	-2.95	125890	4210.38
2/1/2008	330	342	328	338	12	3.68	121924	4080.74
1/31/2008	312	330	308	326	14	4.48	141274	4535.41
1/30/2008	312	316	306	312	2	0.64	65244	2030.89
1/29/2008	310	312	306	310	6	1.97	48236	1492.65
1/28/2008	308	310	300	304	-10	-3.18	67228	2061.11
1/25/2008	298	316	296	314	26	9.02	124610	3812.93
1/24/2008	296	302	288	288	-6	-2.04	65955	1947
1/23/2008	304	306	292	294	2	0.68	113483	3395.14
1/22/2008	286	294	282	292	-4	-1.35	104604	3003.21
1/21/2008	320	324	296	296	-24	-7.5	158025	4914.92

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Table A-2 continued from previous page

DATE	OPEN	HIGH	LOW	CLOSE	CHANGE	%CHANGE	VOLUMN	VALUE
1/18/2008	310	326	308	320	0	0	118761	3764.72
1/17/2008	300	326	300	320	16	5.26	117856	3702.68
1/16/2008	292	304	290	304	-4	-1.29	127323	3773.48
1/15/2008	324	326	302	308	-12	-3.75	87802	2742.27
1/14/2008	322	324	320	320	-6	-1.84	38243	1230.88
1/11/2008	334	336	326	326	-6	-1.8	63867	2115.99
1/10/2008	342	344	332	332	-16	-4.59	70603	2374.25
1/9/2008	332	348	328	348	12	3.57	78117	2642.48
1/8/2008	336	340	330	336	2	0.59	54499	1828.39
1/7/2008	340	340	332	334	-12	-3.46	77200	2591.48
1/4/2008	358	360	346	346	-14	-3.88	137081	4845.73
1/3/2008	362	364	356	360	-8	-2.17	67357	2422.56
1/2/2008	376	378	368	368	-8	-2.12	33214	1234.52
12/28/2007	370	378	368	376	4	1.07	57796	2164.32
12/27/2007	372	374	364	372	4	1.08	43481	1607.28
12/26/2007	372	376	364	368	0	0	71624	2654.1
12/25/2007	350	368	350	368	22	6.35	63448	2285.57
12/21/2007	332	346	332	346	16	4.84	50647	1721.08
12/20/2007	342	344	328	330	-10	-2.94	83929	2809.75
12/19/2007	358	360	340	340	-18	-5.02	90469	3153.61
12/18/2007	360	366	354	358	-10	-2.71	101601	3652.71
12/17/2007	0	0	0	0	0	0	0	0
12/14/2007	0	0	0	0	0	0	0	0
12/13/2007	358	370	354	368	8	2.22	82143	2953.58
12/12/2007	358	362	356	360	-4	-1.09	47490	1703.51
12/11/2007	356	366	352	364	8	2.24	55270	1984.15
12/7/2007	372	374	354	356	-10	-2.73	69016	2507.92
12/6/2007	358	370	358	366	10	2.8	65032	2373.46
12/4/2007	356	360	350	356	-2	-0.55	75425	2669.85
12/3/2007	376	380	358	358	-22	-5.78	102447	3767.73
11/30/2007	376	384	372	380	6	1.6	64786	2449.23
11/29/2007	368	374	368	374	10	2.74	63039	2338.58
11/28/2007	364	370	362	364	0	0	50769	1853.37
11/27/2007	364	368	362	364	-6	-1.62	33466	1221.81
11/26/2007	366	374	366	370	10	2.77	64285	2376.88
11/23/2007	360	364	350	360	4	1.12	83723	2985.71
11/22/2007	354	360	346	356	6	1.71	76241	2690.72
11/21/2007	360	370	350	350	-16	-4.37	83213	2996.99
11/20/2007	354	370	350	366	4	1.1	122279	4394.12
11/19/2007	374	378	362	362	-10	-2.68	60057	2207.01
11/16/2007	374	376	370	372	-6	-1.58	38669	1442.93
11/15/2007	380	382	376	378	0	0	28788	1088.91
11/14/2007	384	386	378	378	-2	-0.52	37803	1445.27
11/13/2007	384	386	374	380	-6	-1.55	99765	3796.84
11/12/2007	390	392	382	386	-14	-3.5	98584	3813.29
11/9/2007	396	404	394	400	4	1.01	84881	3396.73
11/8/2007	392	396	390	396	-4	-1	58397	2293.18
11/7/2007	412	412	400	400	-4	-0.99	91640	3721.64
11/6/2007	386	404	386	404	18	4.66	53875	2120.39
11/5/2007	400	404	386	386	-18	-4.45	104256	4076.01
11/2/2007	408	408	398	404	-12	-2.88	126806	5113.12
11/1/2007	436	436	416	416	0	0	83454	3551.03
10/31/2007	412	424	408	416	-12	-2.8	88405	3667.55
10/30/2007	432	440	424	428	-12	-2.72	86297	3727.23
10/29/2007	424	440	420	440	32	7.84	82352	3539.13
10/26/2007	400	420	398	408	14	3.55	135706	5547.76
10/25/2007	372	394	368	394	24	6.48	84526	3225.49

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Table A-2 continued from previous page

DATE	OPEN	HIGH	LOW	CLOSE	CHANGE	%CHANGE	VOLUMN	VALUE
10/24/2007	368	374	368	370	6	1.64	47397	1753.76
10/22/2007	362	366	362	364	-8	-2.15	44987	1637.23
10/19/2007	372	376	366	372	4	1.08	44564	1654.97
10/18/2007	378	380	368	368	-10	-2.64	55167	2063.39
10/17/2007	380	384	374	378	-8	-2.07	87719	3327.91
10/16/2007	380	386	378	386	20	5.46	96300	3668.69
10/15/2007	356	370	354	366	14	3.97	88899	3221.93
10/12/2007	350	356	346	352	4	1.14	75788	2657.03
10/11/2007	340	352	340	348	10	2.95	88008	3044.47
10/10/2007	342	346	338	338	-2	-0.58	72249	2471.79
10/9/2007	334	344	332	340	6	1.79	60375	2046.97
10/8/2007	330	336	330	334	6	1.82	50069	1670.11
10/5/2007	328	332	326	328	4	1.23	45619	1500.56
10/4/2007	326	328	322	324	-6	-1.81	52195	1697.16
10/3/2007	332	334	330	330	-2	-0.6	30488	1012.36
10/2/2007	338	340	332	332	-6	-1.77	73222	2459.08
10/1/2007	336	342	334	338	2	0.59	34342	1165.57
9/28/2007	336	338	332	336	2	0.59	39694	1331.85
9/27/2007	334	336	330	334	0	0	53959	1798.92
9/26/2007	332	336	326	334	4	1.21	53229	1766.18
9/25/2007	330	330	324	330	-2	-0.6	42560	1394.97
9/24/2007	334	336	330	332	0	0	51522	1714.56
9/21/2007	322	332	322	332	12	3.75	71453	2343.09
9/20/2007	318	322	318	320	2	0.62	47064	1509.57
9/19/2007	320	322	316	318	6	1.92	53515	1709.34
9/18/2007	314	316	312	312	-2	-0.63	35425	1111.75
9/17/2007	320	320	312	314	-10	-3.08	43107	1360.53
9/14/2007	322	328	322	324	4	1.25	65016	2114.03
9/13/2007	314	320	314	320	6	1.91	29485	935.3
9/12/2007	316	318	312	314	0	0	25882	815.76
9/11/2007	312	316	310	314	2	0.64	32518	1017.56
9/10/2007	308	312	306	312	0	0	34760	1074.5
9/7/2007	316	316	306	312	-2	-0.63	75202	2337.39
9/6/2007	312	316	312	314	0	0	27354	858.59
9/5/2007	312	316	310	314	6	1.94	34800	1091.49
9/4/2007	310	312	306	308	-4	-1.28	46908	1453.73
9/3/2007	306	312	302	312	6	1.96	39571	1220.13
8/31/2007	292	306	292	306	14	4.79	64911	1951.87
8/30/2007	294	296	290	292	2	0.68	40473	1187.66
8/29/2007	282	290	280	290	4	1.39	42520	1208.3
8/28/2007	290	290	284	286	-2	-0.69	23187	665.1
8/27/2007	292	294	288	288	-2	-0.68	41395	1203.82
8/24/2007	284	290	284	290	2	0.69	23810	683.49
8/23/2007	292	292	286	288	0	0	57244	1656.18
8/22/2007	280	288	276	288	12	4.34	56750	1605.18
8/21/2007	292	292	276	276	-12	-4.16	75309	2132.34
8/20/2007	284	288	280	288	16	5.88	73658	2089.5
8/17/2007	274	274	262	272	2	0.74	108493	2898.24
8/16/2007	266	274	262	270	-4	-1.45	88688	2367.55
8/15/2007	272	276	270	274	-4	-1.43	74896	2038.87
8/14/2007	288	288	276	278	-12	-4.13	102003	2858.34
8/10/2007	284	290	284	290	-4	-1.36	88429	2539.17
8/9/2007	306	312	294	294	-10	-3.28	47088	1430.08
8/8/2007	296	304	294	304	12	4.1	37355	1120.34
8/7/2007	294	294	286	292	0	0	38297	1113.84
8/6/2007	294	296	290	292	-10	-3.31	59757	1751.16
8/3/2007	306	308	302	302	0	0	50445	1536.77

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Table A-2 continued from previous page

DATE	OPEN	HIGH	LOW	CLOSE	CHANGE	%CHANGE	VOLUMN	VALUE
8/2/2007	308	310	296	302	-4	-1.3	75293	2270.73
8/1/2007	312	314	302	306	-8	-2.54	82884	2552.87
7/31/2007	324	326	314	314	-8	-2.48	52546	1673.06
7/27/2007	324	328	318	322	-10	-3.01	89502	2888.89
7/26/2007	336	336	326	332	4	1.21	58127	1928.61
7/25/2007	324	332	324	328	0	0	58950	1934.77
7/24/2007	316	330	314	328	18	5.8	67828	2193.92
7/23/2007	304	310	300	310	4	1.3	30559	934.73
7/20/2007	308	310	304	306	-2	-0.64	29492	906.33
7/19/2007	308	308	304	308	-2	-0.64	31142	954.52
7/18/2007	308	314	306	310	2	0.64	38508	1197.61
7/17/2007	308	312	304	308	0	0	39013	1202.38
7/16/2007	308	314	304	308	2	0.65	46905	1449.86
7/13/2007	304	308	304	306	8	2.68	43737	1335.98
7/12/2007	304	304	296	298	-4	-1.32	56410	1695.23
7/11/2007	304	308	302	302	-6	-1.94	61365	1870.29
7/10/2007	296	308	294	308	12	4.05	75197	2266.66
7/9/2007	298	302	294	296	2	0.68	53178	1584.77
7/6/2007	284	294	284	294	10	3.52	47301	1374.19
7/5/2007	292	292	284	284	-6	-2.06	43433	1247.57
7/4/2007	288	292	284	290	6	2.11	78215	2259.04
7/3/2007	280	290	280	284	6	2.15	83373	2373.72
7/2/2007	272	278	270	278	8	2.96	57241	1571.03
6/29/2007	270	272	268	270	0	0	26562	717.45
6/28/2007	270	272	268	270	0	0	30745	829.82
6/27/2007	268	270	266	270	2	0.74	20496	549.92
6/26/2007	268	268	264	268	2	0.75	27583	734.3
6/25/2007	266	270	266	266	0	0	28383	760.59
6/22/2007	268	270	266	266	-2	-0.74	37158	993.18
6/21/2007	270	272	266	268	-4	-1.47	33534	899.22
6/20/2007	268	272	266	272	6	2.25	44012	1186.44
6/19/2007	270	270	264	266	-4	-1.48	43973	1175.87
6/18/2007	266	270	266	270	10	3.84	76869	2062.39
6/15/2007	254	260	254	260	8	3.17	70398	1814.91
6/14/2007	254	254	250	252	4	1.61	42928	1084
6/13/2007	256	258	248	248	-10	-3.87	72812	1832.46
6/12/2007	262	262	258	258	-4	-1.52	50050	1301.96
6/11/2007	264	264	258	262	-2	-0.75	59479	1551.5
6/8/2007	266	268	264	264	-6	-2.22	46216	1225.22
6/7/2007	268	270	266	270	2	0.74	28543	766.46
6/6/2007	264	272	264	268	2	0.75	94508	2536.39
6/5/2007	270	272	262	266	-4	-1.48	114304	3045.25
6/4/2007	260	274	260	270	12	4.65	117874	3149.05
6/1/2007	258	260	256	258	4	1.57	106267	2748.91
5/30/2007	250	254	248	254	4	1.6	62166	1557.64
5/29/2007	248	254	248	250	2	0.8	87299	2187.75
5/28/2007	244	248	242	248	6	2.47	34210	843.64
5/25/2007	240	246	240	242	-2	-0.81	56795	1375.38
5/24/2007	246	248	240	244	-2	-0.81	56070	1374.66
5/23/2007	246	250	244	246	0	0	64375	1590.57
5/22/2007	246	250	244	246	0	0	60127	1486.85
5/21/2007	244	246	242	246	6	2.5	50920	1246.03
5/18/2007	240	242	240	240	2	0.84	60047	1449.29
5/17/2007	236	240	234	238	2	0.84	66832	1588.12
5/16/2007	234	238	234	236	4	1.72	59090	1391.84
5/15/2007	234	234	230	232	0	0	10623	246.58
5/14/2007	230	234	230	232	4	1.75	26957	624.7

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Table A-2 continued from previous page

DATE	OPEN	HIGH	LOW	CLOSE	CHANGE	%CHANGE	VOLUMN	VALUE
5/11/2007	228	230	226	228	0	0	38006	866.59
5/10/2007	228	230	226	228	0	0	18943	433.63
5/9/2007	230	230	224	228	0	0	52081	1187.35
5/8/2007	234	234	226	228	-8	-3.38	51484	1183.39
5/4/2007	232	236	228	236	6	2.6	74733	1735.67
5/3/2007	226	232	226	230	6	2.67	81511	1873.9
5/2/2007	220	226	220	224	4	1.81	43399	970.37
4/30/2007	216	222	216	220	4	1.85	55833	1222.97
4/27/2007	214	216	214	216	2	0.93	43335	931.32
4/26/2007	212	216	212	214	4	1.9	44709	955.56
4/25/2007	208	212	208	210	2	0.96	33676	705.71
4/24/2007	212	212	208	208	-2	-0.95	29530	619.72
4/23/2007	212	214	210	210	-2	-0.94	12406	262.57
4/20/2007	212	214	210	212	0	0	13017	276.25
4/19/2007	214	214	212	212	-2	-0.93	21213	452.51
4/18/2007	216	218	214	214	-2	-0.92	19518	420.33
4/17/2007	216	218	216	216	0	0	27967	604.15
4/12/2007	216	216	214	216	0	0	34641	747.77
4/11/2007	210	216	210	216	8	3.84	71404	1519.78
4/10/2007	208	210	208	208	0	0	21432	445.78
4/9/2007	210	210	206	208	0	0	8497	176.77
4/5/2007	208	210	206	208	0	0	14242	296.65
4/4/2007	210	210	208	208	0	0	40221	841.63
4/3/2007	206	208	206	208	-2	-0.95	45535	943.79
4/2/2007	208	212	208	210	2	0.96	59303	1248.42
3/30/2007	208	210	206	208	0	0	35291	734.05
3/29/2007	206	208	204	208	2	0.97	18214	375.53
3/28/2007	210	210	204	206	-2	-0.96	25057	516.04
3/27/2007	210	210	208	208	0	0	18855	393.48
3/26/2007	206	210	206	208	2	0.97	21271	442.15
3/23/2007	206	206	204	206	0	0	20388	419.9
3/22/2007	206	206	204	206	2	0.98	27365	560.56
3/21/2007	202	204	202	204	0	0	5630	114.01
3/20/2007	204	204	200	204	2	0.99	15500	314.01
3/19/2007	202	204	202	202	0	0	11272	227.71
3/16/2007	202	204	202	202	0	0	13556	273.91
3/15/2007	202	204	202	202	0	0	18687	378.21
3/14/2007	202	204	200	202	-2	-0.98	25244	510
3/13/2007	202	206	202	204	2	0.99	13482	274.67
3/12/2007	204	206	202	202	-2	-0.98	10735	218.48
3/9/2007	204	206	202	204	0	0	17364	353.64
3/8/2007	204	206	204	204	2	0.99	27697	565.04
3/7/2007	208	210	202	202	-4	-1.94	51449	1055.16
3/6/2007	208	208	206	206	-4	-1.9	44512	918.57
3/2/2007	210	212	208	210	0	0	13015	273.26
3/1/2007	210	212	208	210	2	0.96	38009	798.19
2/28/2007	206	210	206	208	-4	-1.88	76075	1580.82
2/27/2007	214	214	212	212	0	0	18448	394.24
2/26/2007	214	214	212	212	-2	-0.93	12966	276.57
2/23/2007	212	214	210	214	2	0.94	16457	349.47
2/22/2007	214	216	212	212	0	0	30535	652.8
2/21/2007	208	212	208	212	4	1.92	21565	455.18
2/20/2007	208	210	208	208	0	0	19618	408.47
2/19/2007	208	210	206	208	0	0	16586	344.99
2/16/2007	210	210	208	208	-2	-0.95	26832	562.57
2/15/2007	212	214	210	210	-2	-0.94	31961	677.13
2/14/2007	214	214	212	212	0	0	12679	270.42

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Table A-2 continued from previous page

DATE	OPEN	HIGH	LOW	CLOSE	CHANGE	%CHANGE	VOLUMN	VALUE
2/13/2007	216	216	210	212	-4	-1.85	27571	586.52
2/12/2007	214	216	212	216	2	0.93	41379	886.47
2/9/2007	210	214	210	214	4	1.9	68077	1445.71
2/8/2007	202	210	202	210	8	3.96	95503	1976.65
2/7/2007	202	204	202	202	2	1	22818	461.79
2/6/2007	202	202	199	200	0	0	14278	285.86
2/5/2007	202	204	200	200	0	0	41259	832.62
2/2/2007	198	200	198	200	2	1.01	47150	940.27
2/1/2007	200	202	198	198	-1	-0.5	35839	714.18
1/31/2007	199	200	198	199	1	0.5	26603	529.3
1/30/2007	200	202	196	198	-4	-1.98	88359	1751.8
1/29/2007	202	204	202	202	0	0	29687	600.13
1/26/2007	206	206	202	202	-4	-1.94	44733	910.27
1/25/2007	208	208	206	206	0	0	29451	611.23
1/24/2007	206	208	204	206	4	1.98	52182	1075.14
1/23/2007	202	204	202	202	-2	-0.98	24288	491.91
1/22/2007	206	208	204	204	0	0	21657	444.27
1/19/2007	206	208	202	204	-2	-0.97	39466	809.78
1/18/2007	208	208	204	206	0	0	17196	354.79
1/17/2007	208	210	204	206	-2	-0.96	49482	1024.7
1/16/2007	210	210	208	208	0	0	47025	982.78
1/15/2007	204	208	204	208	6	2.97	26928	556.68
1/12/2007	204	204	199	202	2	1	30295	609.67
1/11/2007	197	202	197	200	4	2.04	52457	1046
1/10/2007	190	196	189	196	4	2.08	48858	940.62
1/9/2007	197	199	190	192	-6	-3.03	67883	1319.43
1/8/2007	191	199	190	198	6	3.12	44911	878.73
1/5/2007	197	198	192	192	-8	-4	53296	1034.64
1/4/2007	202	204	200	200	-4	-1.96	39435	795.92
1/3/2007	200	206	200	204	-6	-2.85	37274	759.39

Table A-3: ADVANC's Historical Data

DATE	OPEN	HIGH	LOW	CLOSE	CHANGE	%CHANGE	VOLUMN	VALUE
6/9/2008	91.5	91.5	90.5	91	-2	-2.15	42818	389.74
6/6/2008	93.5	93.5	92.5	93	-1	-1.06	47779	443.39
6/5/2008	94	94.5	93	94	-1	-1.05	27891	261.01
6/4/2008	95	95.5	94	95	0	0	22729	215.64
6/3/2008	96	96	93	95	-1	-1.04	47020	443.99
6/2/2008	97	97	95.5	96	-1.5	-1.53	20787	199.58
5/30/2008	97	98.5	96.5	97.5	1	1.03	87717	854.52
5/29/2008	94	96.5	93.5	96.5	3.5	3.76	69401	656.93
5/28/2008	96	96	93	93	-3	-3.12	44059	417.65
5/27/2008	95.5	96.5	94.5	96	0.5	0.52	31674	303.03
5/26/2008	97.5	97.5	95	95.5	-2	-2.05	40944	394.11
5/23/2008	99.5	101	97.5	97.5	-0.5	-0.51	82559	819.28
5/22/2008	100	100	98	98	-3	-2.97	61556	609.2
5/21/2008	97.5	102	97.5	101	3	3.06	79972	800.02
5/20/2008	100	100	97.5	98	-2	-2	43538	428.81
5/16/2008	98.5	100	97.5	100	2	2.04	76623	759.33
5/15/2008	98	98.5	96	98	1.5	1.55	130908	1279.08
5/14/2008	93.5	97	92.5	96.5	3.5	3.76	121479	1157.02
5/13/2008	92.5	93.5	92.5	93	0	0	39645	369.15
5/12/2008	93.5	93.5	92.5	93	-1	-1.06	28134	261.39

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Table A-3 continued from previous page

DATE	OPEN	HIGH	LOW	CLOSE	CHANGE	%CHANGE	VOLUMN	VALUE
5/9/2008	94	94	92.5	94	0.5	0.53	110147	1026.74
5/8/2008	92	94	91.5	93.5	1.5	1.63	123696	1144.36
5/7/2008	91.5	92	91	92	0.5	0.54	92975	851.92
5/6/2008	92	92.5	91	91.5	-1.5	-1.61	39493	362.47
5/2/2008	93.5	94.5	92.5	93	0	0	48630	453.61
4/30/2008	93	93	92	93	0.5	0.54	41387	383.04
4/29/2008	92	93	91.5	92.5	1	1.09	26010	240
4/28/2008	93	93.5	91	91.5	-1.5	-1.61	45150	415.62
4/25/2008	92.5	93.5	92	93	0.5	0.54	54393	505.79
4/24/2008	92.5	92.5	91.5	92.5	1	1.09	77613	714.78
4/23/2008	93	93	91	91.5	-1	-1.08	37805	346.92
4/22/2008	93	93	90.5	92.5	-1	-1.06	103190	946.21
4/21/2008	95	95	93	93.5	-0.5	-0.53	50910	477
4/18/2008	95	95	93	94	-1	-1.05	54981	516.2
4/17/2008	95	95.5	94.5	95	0	0	66363	630.21
4/16/2008	95	95.5	94	95	-3	-3.06	62906	594.67
4/11/2008	99	99.5	97	98	-1	-1.01	89947	883.56
4/10/2008	99	99.5	98.5	99	0	0	25944	256.73
4/9/2008	99.5	99.5	98	99	0	0	41090	404.26
4/8/2008	99	99.5	98.5	99	0.5	0.5	42988	425.65
4/4/2008	98.5	98.5	96.5	98.5	0	0	49514	482.66
4/3/2008	99	99	97.5	98.5	-0.5	-0.5	45676	448.07
4/2/2008	100	101	99	99	-0.5	-0.5	45333	455.52
4/1/2008	100	100	98.5	99.5	-0.5	-0.5	20160	199.86
3/31/2008	102	102	98.5	100	-3	-2.91	41559	414.51
3/28/2008	100	103	100	103	3	3	20013	203.93
3/27/2008	100	101	99.5	100	0	0	43236	432.7
3/26/2008	99.5	100	98.5	100	1	1.01	26983	268.45
3/25/2008	100	100	99	99	-0.5	-0.5	52009	518.83
3/24/2008	98	99.5	97.5	99.5	2	2.05	16978	167.4
3/21/2008	97	98	97	97.5	1.5	1.56	14965	145.4
3/20/2008	97.5	98	96	96	-2.5	-2.53	38630	373.32
3/19/2008	100	100	98.5	98.5	0	0	31210	309.03
3/18/2008	98	99	98	98.5	-1.5	-1.5	47399	466
3/17/2008	97	100	96	100	2.5	2.56	15581	154.31
3/14/2008	98	99.5	97.5	97.5	0.5	0.51	22930	226.42
3/13/2008	99.5	99.5	97	97	-3	-3	26825	261.99
3/12/2008	101	102	99.5	100	1	1.01	61692	618.55
3/11/2008	97	100	97	99	1.5	1.53	44607	441.63
3/10/2008	98.5	99.5	96.5	97.5	-2	-2.01	40646	397.31
3/7/2008	100	100	99	99.5	-1.5	-1.48	31797	315.96
3/6/2008	101	102	100	101	1.5	1.5	44373	447.45
3/5/2008	102	102	99	99.5	-1.5	-1.48	35813	357.77
3/4/2008	104	105	101	101	-3	-2.88	50031	513.38
3/3/2008	103	104	101	104	-1	-0.95	78310	805.27
2/29/2008	104	106	103	105	0	0	34804	364.21
2/28/2008	105	106	104	105	1	0.96	33970	357.32
2/27/2008	107	107	104	104	-3	-2.8	11277	118.92
2/26/2008	107	107	103	107	1	0.94	29914	315.1
2/25/2008	104	108	104	106	3	2.91	32129	341.85
2/22/2008	102	105	100	103	1	0.98	26656	274.8
2/20/2008	104	105	100	102	-2	-1.92	40039	407.25
2/19/2008	104	108	103	104	1	0.97	48636	516.98
2/18/2008	102	105	101	103	2	1.98	27262	281.18
2/15/2008	101	103	99	101	-4	-3.8	40691	410.95
2/14/2008	107	109	103	105	-2	-1.86	51501	544.28
2/13/2008	99	108	98.5	107	8.5	8.62	105881	1096.35

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DATE	OPEN	HIGH	LOW	CLOSE	CHANGE	%CHANGE	VOLUMN	VALUE
2/12/2008	99	100	97.5	98.5	1	1.02	100907	1002.77
2/11/2008	97	99.5	96.5	97.5	0.5	0.51	30626	299.94
2/8/2008	95	97.5	95	97	2.5	2.64	20039	193.27
2/7/2008	94	94.5	93.5	94.5	0	0	9637	90.68
2/6/2008	94.5	95	92	94.5	-2.5	-2.57	65440	612.93
2/5/2008	99	99	95.5	97	-3	-3	48293	469.32
2/4/2008	104	104	99.5	100	2	2.04	124587	1259.62
2/1/2008	96	98.5	95.5	98	4.5	4.81	108246	1051.65
1/31/2008	92.5	94.5	91	93.5	-0.5	-0.53	55805	519.61
1/30/2008	96	96	93	94	-1.5	-1.57	18588	174.95
1/29/2008	94.5	95.5	94	95.5	1.5	1.59	26871	255.21
1/28/2008	95	95	93	94	-0.5	-0.52	13820	129.42
1/25/2008	91	95	91	94.5	4	4.41	51202	475.34
1/24/2008	89.5	92	89.5	90.5	1.5	1.68	20923	190.05
1/23/2008	92	92	88.5	89	-1	-1.11	54696	490.34
1/22/2008	90.5	91	88.5	90	-3.5	-3.74	55211	495.36
1/21/2008	96	96.5	93.5	93.5	-2.5	-2.6	42550	404.27
1/18/2008	94	96	94	96	0.5	0.52	36263	344.39
1/17/2008	93	95.5	93	95.5	2.5	2.68	48661	459.26
1/16/2008	94	95	91.5	93	-4.5	-4.61	47308	440.7
1/15/2008	98.5	98.5	94	97.5	-1	-1.01	46237	445.13
1/14/2008	96	98.5	96	98.5	2.5	2.6	8568	83.12
1/11/2008	97.5	98.5	96	96	-0.5	-0.51	17170	167.09
1/10/2008	97.5	97.5	96	96.5	-1	-1.02	28397	274.1
1/9/2008	97	97.5	95.5	97.5	-0.5	-0.51	34634	334.88
1/8/2008	97	98	96	98	2.5	2.61	16056	155.56
1/7/2008	96	96.5	95.5	95.5	-1.5	-1.54	24504	235.26
1/4/2008	96	101	95.5	97	1.5	1.57	78832	773.25
1/3/2008	95.5	96	95	95.5	-1	-1.03	12758	121.93
1/2/2008	97.5	97.5	95.5	96.5	-0.5	-0.51	25100	242.16
12/28/2007	97	97	95	97	-1	-1.02	44459	428.52
12/27/2007	96	98	95	98	2	2.08	28663	278.38
12/26/2007	97	97	95	96	-2	-2.04	11353	108.76
12/25/2007	92	98	92	98	7	7.69	40606	387.5
12/21/2007	90	91	89	91	1	1.11	25561	230
12/20/2007	91	91.5	88.5	90	-2	-2.17	26788	239.15
12/19/2007	90.5	92	90	92	2	2.22	18478	167.89
12/18/2007	93	93	90	90	-4	-4.25	48157	436.6
12/17/2007	96	96	93	94	-2	-2.08	13456	126.34
12/14/2007	96	96.5	95	96	0	0	21555	206.12
12/13/2007	96	97	95.5	96	0	0	41010	394.39
12/12/2007	95	96	94.5	96	0	0	53807	512.53
12/11/2007	94.5	96	93.5	96	2.5	2.67	42873	405.75
12/7/2007	96	97	93.5	93.5	-1.5	-1.57	59715	567.6
12/6/2007	93	95.5	93	95	3	3.26	59606	562.34
12/4/2007	91.5	92	91	92	1	1.09	15306	140.36
12/3/2007	92	92.5	90.5	91	-1.5	-1.62	26918	245.43
11/30/2007	91.5	92.5	90.5	92.5	1.5	1.64	27120	248.14
11/29/2007	89.5	91	89	91	2.5	2.82	55135	496.89
11/28/2007	89	89	88	88.5	0.5	0.56	28171	249.32
11/27/2007	87.5	88.5	87	88	-0.5	-0.56	23795	209.29
11/26/2007	90	90	88	88.5	-1.5	-1.66	11069	98.37
11/23/2007	86	90	86	90	4.5	5.26	45554	404.49
11/22/2007	84.5	85.5	84	85.5	1	1.18	24095	204.17
11/21/2007	85	86	84	84.5	-2	-2.31	44307	376.13
11/20/2007	84	87	84	86.5	0.5	0.58	69946	595.09
11/19/2007	87.5	87.5	85.5	86	-2	-2.27	25122	216.57

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DATE	OPEN	HIGH	LOW	CLOSE	CHANGE	%CHANGE	VOLUMN	VALUE
11/16/2007	87.5	88	87	88	-0.5	-0.56	20097	175.93
11/15/2007	89.5	89.5	87.5	88.5	-1.5	-1.66	42791	378.9
11/14/2007	89	90	89	90	2.5	2.85	73558	657.39
11/13/2007	86	87.5	86	87.5	1.5	1.74	18684	162.06
11/12/2007	86.5	86.5	84.5	86	-1.5	-1.71	60734	519.16
11/9/2007	87.5	88	87	87.5	-0.5	-0.56	22260	194.77
11/8/2007	87	88	87	88	0	0	21934	191.78
11/7/2007	88.5	89	88	88	0	0	16573	146.37
11/6/2007	87.5	88.5	87	88	0	0	29303	256.91
11/5/2007	89	89.5	87	88	-1.5	-1.67	23609	208.41
11/2/2007	87	89.5	87	89.5	1.5	1.7	49811	441.75
11/1/2007	90	90.5	87.5	88	-1	-1.12	76199	678.82
10/31/2007	89.5	90.5	89	89	-1	-1.11	79686	713.05
10/30/2007	91	92.5	89	90	-1	-1.09	56763	515.48
10/29/2007	92.5	93.5	90.5	91	-1	-1.08	41109	376.21
10/26/2007	92.5	94	91	92	0	0	53908	499.72
10/25/2007	91	92	89	92	1.5	1.65	32301	292.37
10/24/2007	92	92	89	90.5	-0.5	-0.54	45201	410.62
10/22/2007	89.5	91	89	91	-0.5	-0.54	17607	158.91
10/19/2007	93	93	91	91.5	-2	-2.13	15338	140.74
10/18/2007	93	94	92	93.5	1.5	1.63	21007	195.69
10/17/2007	90.5	93	90.5	92	1	1.09	31525	289.04
10/16/2007	92.5	93.5	90.5	91	-2	-2.15	62931	576.69
10/15/2007	94	94.5	92	93	-2	-2.1	49028	456.9
10/12/2007	96	96.5	94.5	95	-1	-1.04	24234	231.18
10/11/2007	98.5	98.5	95	96	-2	-2.04	73765	708.48
10/10/2007	98.5	99.5	98	98	0	0	36487	359.4
10/9/2007	95.5	98	95.5	98	2.5	2.61	44376	429.69
10/8/2007	95	96	94.5	95.5	2	2.13	44540	425.34
10/5/2007	92	94.5	92	93.5	1.5	1.63	61855	579.15
10/4/2007	90	92	89.5	92	2	2.22	31387	287.25
10/3/2007	90	92	90	90	0.5	0.55	43531	395.63
10/2/2007	90.5	91	89.5	89.5	0	0	39642	358.34
10/1/2007	88.5	90	88.5	89.5	0.5	0.56	31305	280.24
9/28/2007	90	90	87.5	89	-1	-1.11	67478	596.4
9/27/2007	91.5	91.5	89.5	90	-0.5	-0.55	26684	241.41
9/26/2007	90	91	89	90.5	0.5	0.55	28322	255.37
9/25/2007	89.5	90	89	90	0.5	0.55	25043	224.17
9/24/2007	87.5	89.5	86.5	89.5	2.5	2.87	35812	316.97
9/21/2007	86.5	87	86	87	1.5	1.75	44175	382.52
9/20/2007	86.5	87.5	85.5	85.5	0	0	53374	460.92
9/19/2007	89	89	85	85.5	-2	-2.28	72171	625.4
9/18/2007	88	88	87	87.5	-1.5	-1.68	35615	311.59
9/17/2007	90.5	90.5	89	89	-1.5	-1.65	15731	140.47
9/14/2007	89	91	88.5	90.5	1.5	1.68	16463	148.26
9/13/2007	89	89.5	88.5	89	0	0	9737	86.66
9/12/2007	89	89	88.5	89	1	1.13	23996	213.14
9/11/2007	88	88.5	86.5	88	1	1.14	35448	309.41
9/10/2007	87.5	88	86.5	87	-2	-2.24	24988	217.75
9/7/2007	92	92	88.5	89	-3.5	-3.78	31676	283.48
9/6/2007	90.5	92.5	90.5	92.5	1	1.09	16712	152.36
9/5/2007	92.5	92.5	91.5	91.5	-0.5	-0.54	10878	100.26
9/4/2007	92.5	92.5	91.5	92	-1	-1.07	8225	75.55
9/3/2007	92	93.5	92	93	0	0	11097	103.06
8/31/2007	89	93	89	93	3.5	3.91	27567	252.92
8/30/2007	90	90.5	89.5	89.5	0.5	0.56	9699	87.18
8/29/2007	88.5	89.5	86.5	89	-0.5	-0.55	21596	190.41

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DATE	OPEN	HIGH	LOW	CLOSE	CHANGE	%CHANGE	VOLUMN	VALUE
8/28/2007	89.5	90	88	89.5	0	0	13285	117.78
8/27/2007	92	92	89	89.5	-2	-2.18	11020	99.98
8/24/2007	91.5	91.5	91	91.5	-3	-3.17	10161	92.73
8/23/2007	94	95	93.5	94.5	0.5	0.53	51075	481.3
8/22/2007	93	94	91.5	94	2	2.17	16016	149.28
8/21/2007	93	93.5	91.5	92	0.5	0.54	54054	499.18
8/20/2007	91.5	92.5	90.5	91.5	2.5	2.8	48823	448.24
8/17/2007	87	89	83.5	89	2.5	2.89	60929	521.79
8/16/2007	89.5	90	84.5	86.5	-6.5	-6.98	104993	907.07
8/15/2007	94.5	95.5	93	93	-4	-4.12	49453	464.65
8/14/2007	97	97	96.5	97	-0.5	-0.51	22790	220.35
8/10/2007	94.5	97.5	94.5	97.5	0.5	0.51	40701	389.46
8/9/2007	100	102	97	97	-3	-3	43065	429.17
8/8/2007	98.5	100	98	100	1.5	1.52	21407	212.31
8/7/2007	99	101	97.5	98.5	0	0	28977	286.06
8/6/2007	96.5	99	96	98.5	-0.5	-0.5	35747	348.87
8/3/2007	97.5	99.5	97	99	2	2.06	25198	248.15
8/2/2007	97.5	98	94.5	97	2	2.1	31615	302.16
8/1/2007	97.5	97.5	93.5	95	-3.5	-3.55	45984	440.1
7/31/2007	99.5	100	98	98.5	0	0	45295	447.78
7/27/2007	98.5	99.5	97	98.5	-3.5	-3.43	84283	827.27
7/26/2007	104	104	99.5	102	-1	-0.97	35676	363.32
7/25/2007	102	105	101	103	0	0	61745	637.19
7/24/2007	100	104	100	103	4.5	4.56	87996	901.93
7/23/2007	98	98.5	96.5	98.5	-0.5	-0.5	48014	468.17
7/20/2007	97.5	99.5	96.5	99	2	2.06	48847	480.55
7/19/2007	96	97	96	97	0.5	0.51	19861	191.29
7/18/2007	95	96.5	95	96.5	1.5	1.57	55998	536.69
7/17/2007	95	96	94.5	95	0	0	21215	202.24
7/16/2007	95.5	97	94.5	95	-0.5	-0.52	41187	393.64
7/13/2007	96	96.5	94.5	95.5	1.5	1.59	72741	695.7
7/12/2007	94.5	95.5	92.5	94	1	1.07	84313	794.73
7/11/2007	91.5	95	91.5	93	-0.5	-0.53	95095	890.82
7/10/2007	91	93.5	91	93.5	2.5	2.74	94350	872.22
7/9/2007	90.5	92	90	91	1.5	1.67	87616	798.69
7/6/2007	89.5	90	88	89.5	-0.5	-0.55	28569	255.03
7/5/2007	92	92.5	89	90	-0.5	-0.55	92971	845.82
7/4/2007	90	91	89.5	90.5	1.5	1.68	83430	754.2
7/3/2007	88.5	90	88	89	1.5	1.71	98136	871.97
7/2/2007	86	88	86	87.5	2.5	2.94	30127	262.71
6/29/2007	87	87	85	85	-1.5	-1.73	50082	426.78
6/28/2007	84.5	86.5	84.5	86.5	2	2.36	41958	357.6
6/27/2007	85	86	83	84.5	-0.5	-0.58	22884	193.03
6/26/2007	86	86	84	85	0	0	14850	126.15
6/25/2007	86.5	87	85	85	-1.5	-1.73	16904	145
6/22/2007	89	89	86	86.5	-1.5	-1.7	15137	131.99
6/21/2007	88	89	87.5	88	-1.5	-1.67	9881	87.17
6/20/2007	88	89.5	87.5	89.5	2	2.28	9928	87.93
6/19/2007	88	88	87	87.5	-0.5	-0.56	10192	89.19
6/18/2007	84.5	88	84.5	88	5	6.02	32222	278.11
6/15/2007	84	84	82.5	83	0.5	0.6	38257	317.6
6/14/2007	84.5	84.5	82	82.5	0.5	0.6	35953	296.91
6/13/2007	86	86	82	82	-4	-4.65	23922	199.71
6/12/2007	87	87.5	86	86	-3.5	-3.91	24187	208.86
6/11/2007	85	89.5	85	89.5	2.5	2.87	25362	222.11
6/8/2007	86.5	89.5	86	87	-3	-3.33	41382	361.71
6/7/2007	91	91	89.5	90	-0.5	-0.55	14513	130.47

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DATE	OPEN	HIGH	LOW	CLOSE	CHANGE	%CHANGE	VOLUMN	VALUE
6/6/2007	90	93	90	90.5	0.5	0.55	38341	349.19
6/5/2007	91	91.5	89	90	-0.5	-0.55	16895	151.94
6/4/2007	90.5	92.5	90.5	90.5	0	0	21205	193.69
6/1/2007	89.5	91	89	90.5	0.5	0.55	24105	217.45
5/30/2007	87.5	90	87.5	90	2.5	2.85	16326	145.75
5/29/2007	87.5	88	86	87.5	0.5	0.57	17625	153.86
5/28/2007	87	87.5	86	87	0.5	0.57	5214	45.38
5/25/2007	87.5	88	86	86.5	-1	-1.14	7668	66.72
5/24/2007	89	89.5	86.5	87.5	-2.5	-2.77	26661	233.81
5/23/2007	86	90	86	90	4	4.65	21190	186.17
5/22/2007	86	88	84.5	86	0	0	29562	254.98
5/21/2007	89	89	84	86	-3	-3.37	31663	271.17
5/18/2007	90.5	91	89	89	-1	-1.11	21391	192.58
5/17/2007	93.5	93.5	90	90	-3	-3.22	12381	112.48
5/16/2007	91	93.5	91	93	2	2.19	30551	282.84
5/15/2007	90.5	92.5	89.5	91	1.5	1.67	48129	435.91
5/14/2007	86	89.5	86	89.5	4	4.67	24804	219.45
5/11/2007	85.5	86	84.5	85.5	0	0	29199	248.69
5/10/2007	85.5	86	85	85.5	0	0	13501	115.5
5/9/2007	88	89.5	82.5	85.5	-2	-2.28	62102	533.38
5/8/2007	87	90.5	87	87.5	1.5	1.74	51947	463.63
5/4/2007	82	86	82	86	4	4.87	59876	507.79
5/3/2007	78	82.5	78	82	4	5.12	68569	552.58
5/2/2007	76	78	76	78	2.5	3.31	16416	126.85
4/30/2007	75.5	76.5	75.5	75.5	0	0	8447	64.04
4/27/2007	75	76	75	75.5	1	1.34	7815	58.95
4/26/2007	75	75.5	74.5	74.5	0	0	56455	423.51
4/25/2007	73	74.5	73	74.5	1.5	2.05	7558	56.16
4/24/2007	73.5	73.5	72.5	73	0	0	11188	81.66
4/23/2007	74.5	74.5	73	73	-1	-1.35	3673	26.92
4/20/2007	74	74.5	74	74	0	0	11513	85.21
4/19/2007	74.5	74.5	73	74	-0.5	-0.67	11505	85.1
4/18/2007	74.5	75.5	74	74.5	0.5	0.67	15852	118.35
4/17/2007	72.5	74.5	72.5	74	2	2.77	31730	234.3
4/12/2007	72	72	71	72	0	0	4643	33.18
4/11/2007	71.5	72	71.5	72	1	1.4	17246	123.5
4/10/2007	71	71.5	70.5	71	-0.5	-0.69	14505	102.6
4/9/2007	73.5	73.5	71.5	71.5	-2	-2.72	4827	34.81
4/5/2007	75	75	73	73.5	-1.5	-2	7620	56.22
4/4/2007	74	75.5	73.5	75	2.5	3.44	27605	206.39
4/3/2007	69	73	69	72.5	4.5	6.61	42835	306.53
4/2/2007	67.5	69.5	67.5	68	1	1.49	19888	136.39
3/30/2007	67	67.5	66	67	-3.5	-4.96	16787	112.26
3/29/2007	69	70.5	69	70.5	1	1.43	23571	164.71
3/28/2007	71	71	68.5	69.5	-1.5	-2.11	16332	113.81
3/27/2007	72.5	73	70	71	-1.5	-2.06	16383	117.07
3/26/2007	72.5	73	72.5	72.5	0	0	17977	130.33
3/23/2007	72.5	73	72	72.5	0	0	4141	29.97
3/22/2007	73	73.5	72.5	72.5	-0.5	-0.68	6359	46.4
3/21/2007	72.5	73	72	73	1	1.38	3751	27.16
3/20/2007	72	72.5	71.5	72	0	0	5875	42.27
3/19/2007	72.5	72.5	71.5	72	-0.5	-0.68	10977	79.05
3/16/2007	72.5	73	72	72.5	0	0	9000	65.23
3/15/2007	72	72.5	72	72.5	0.5	0.69	6131	44.16
3/14/2007	72	73	71.5	72	-0.5	-0.68	19295	138.63
3/13/2007	72.5	73.5	72	72.5	0	0	21540	156.4
3/12/2007	73	73	72	72.5	-0.5	-0.68	5099	36.98

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Table A-3 continued from previous page

DATE	OPEN	HIGH	LOW	CLOSE	CHANGE	%CHANGE	VOLUMN	VALUE
3/9/2007	73.5	73.5	72.5	73	-0.5	-0.68	2362	17.24
3/8/2007	73	73.5	73	73.5	0.5	0.68	3811	27.97
3/7/2007	74.5	74.5	73	73	-1.5	-2.01	4718	34.56
3/6/2007	73.5	74.5	73	74.5	0	0	17655	129.26
3/2/2007	74.5	75	74.5	74.5	0.5	0.67	7472	55.98
3/1/2007	73	75	73	74	1	1.36	10784	80.2
2/28/2007	71	73	71	73	-1	-1.35	39450	284.78
2/27/2007	75.5	76	74	74	-1.5	-1.98	5758	43.11
2/26/2007	76	76	74.5	75.5	0	0	6065	45.58
2/23/2007	76	76.5	75	75.5	0	0	14309	108.37
2/22/2007	77	77.5	75.5	75.5	-1.5	-1.94	11842	90.14
2/21/2007	77.5	78	77	77	-0.5	-0.64	8975	69.55
2/20/2007	77.5	78	77	77.5	0	0	1604	12.43
2/19/2007	76	78	75.5	77.5	1	1.3	7234	55.56
2/16/2007	82	82	76.5	76.5	-5.5	-6.7	26141	203.6
2/15/2007	82.5	83.5	81.5	82	-0.5	-0.6	14135	116.65
2/14/2007	83	83	81.5	82.5	-0.5	-0.6	12821	105.43
2/13/2007	84.5	84.5	83	83	-1.5	-1.77	17497	146.48
2/12/2007	82	86	82	84.5	2.5	3.04	56185	474.8
2/9/2007	80.5	83	80.5	82	2	2.5	22358	183.38
2/8/2007	77.5	80.5	77.5	80	3	3.89	37302	296.55
2/7/2007	77	77.5	77	77	1	1.31	25386	195.59
2/6/2007	76.5	77	74.5	76	0	0	19649	148.76
2/5/2007	75	76	75	76	1.5	2.01	14873	112.07
2/2/2007	73.5	75.5	73.5	74.5	1.5	2.05	15631	116.83
2/1/2007	74.5	75	73	73	-1	-1.35	8496	63.4
1/31/2007	73	74.5	72	74	1	1.36	16524	121.86
1/30/2007	71.5	73	71.5	73	1	1.38	3084	22.36
1/29/2007	72	73	71.5	72	0	0	8716	63.08
1/26/2007	72	72.5	72	72	-0.5	-0.68	11725	84.43
1/25/2007	74	74	72.5	72.5	-1.5	-2.02	10902	79.26
1/24/2007	74	74	73	74	0	0	14824	108.71
1/23/2007	73	74	72	74	0.5	0.68	24899	181.14
1/22/2007	73	74	72.5	73.5	1	1.37	27162	198.93
1/19/2007	71.5	73.5	71.5	72.5	1	1.39	31760	229.93
1/18/2007	72	72	70.5	71.5	-0.5	-0.69	27479	196.3
1/17/2007	73.5	73.5	71.5	72	-0.5	-0.68	20191	146.6
1/16/2007	75	75	72.5	72.5	-2.5	-3.33	16140	118.3
1/15/2007	74	75	74	75	0	0	8586	64.1
1/12/2007	75.5	76	74	75	-0.5	-0.66	27532	205.87
1/11/2007	77	77	75	75.5	0.5	0.66	46639	353.21
1/10/2007	72	75	70.5	75	0	0	39905	291.99
1/9/2007	75.5	78.5	74.5	75	-2	-2.59	17946	136.5
1/8/2007	72.5	77	72.5	77	4	5.47	17807	133.43
1/5/2007	75	75	71.5	73	-2	-2.66	55290	403.41
1/4/2007	75.5	76	74.5	75	-1	-1.31	6809	51.15
1/3/2007	75.5	76.5	75	76	-1.5	-1.93	12572	95.25

VITA

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