

國立交通大學

管理學院(工業工程與管理學程)碩士班

碩士論文

個別股票的隨機指標(KD)參數制定
與買賣策略的選擇

Select Operation Alternatives of the KD Method to
Security Market Stock

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指導教授：劉復華 博士
 陳安斌 博士

中華民國九十四年六月

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摘要

在股票市場上，投資人常以淨報酬率來做為評量投資績效的依據，而技術指標通常是作為買賣進出的輔助工具，以期獲得最大報酬率。但是股票投資是一種高報酬高風險的投資行為，所以顯然的單一以報酬率的高低做為買賣操作方法選擇是無法規避高度風險的。

在本文中，我們採用 KD 指標來模擬運算做為買賣進出的依據指標，其 KD 周期則採用不同天數(5 天、6 天、及 9 天)、週數(4 週、6 週、及 9 週)來製作，共有 6 種。另外在執行買賣的策略上，我們也提出 α 、 β 與 γ ，3 種買賣策略，經交叉運用共產生十八種買賣操作方法。

為判別各買賣操作方法之優劣良窳，我們在台北股市中挑選 5 檔各產業的龍頭股，分別是台積電、聯電、台塑、中鋼、及國泰金控，以各組買賣操作方法套入歷史資料(2001/1/2~2004/12/31) 來模擬計算並各取得 3 項績效指標，分別是交易成本、報酬率之變異數、及淨報酬率。至於應如何決定 3 項績效指標之權重來產生最佳之買賣操作方法呢？在本研究中採用資料包絡分析法(Data Envelopment Analysis)做為評比各組買賣操作方法績效的理論與工具，資料包絡分析法可以求得各組買賣操作方法在十八組中之相對績效，亦即決定各組最佳績效指標之權重。再以各組最佳績效值來評比各組之績效，排列出十八組買賣操作方法之優劣名次。

關鍵詞：隨機指標、KD 指標、資料包絡分析法

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Abstract

It is popular for people to invest in stocks even though it may have high return and high risk respect to bonds and deposit. Individuals often lose money in stock investment since they tend to focus on high return, but ignore the high risk and cost behind the investment. In the stock market, individuals and portfolio managers employ variety analysis techniques to decide buying/selling for short-term investment. The Stochastic Oscillator (KD) is one of the popular analysis techniques. We use the past 991 days² (or 206 weeks²) opening, closing, the highest, and the lowest prices of five major stocks in Taiwan to generate six types KD curves that are based upon different moving average time intervals. In this research, we consider three selling/buying strategies. We assess the performance of the eighteen operation methods (OMs), the compositions of six KD curves and three strategies, by Data Envelopment Analysis (DEA). Three indices are used: transaction cost, return rate variance, and total return rate. We observed one of the proposed strategies outperforms the others. Depends on the market characteristics of a stock, a particular OM may outperform the others. One would observe the interaction effects between time intervals for generating the KD curves and the selling/buying strategies.

Keywords: Stochastic Oscillators, KD, Data Envelopment Analysis, DEA

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陳志剛 謹誌於

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1. Introduction

Security market is one of the most popular investment places for people and plays an important role in the economy. Stock investment yields high return, high risk, and high uncertainty. Focus is placed on high return, with little attention to high risk and investment cost, resulting in frequent investment loss. Individuals and portfolio managers use a variety of analysis techniques as tools for buying-selling for short-term investment. One popular technique is the Stochastic Oscillator (KD) [1] [2]. The Stochastic Oscillator (KD) is the leading price-technique indicator based on direct stock prices. It is popular for buying-selling for short term investment because of its relative sensitivity.

The Stochastic Oscillator compares a closing stock price to its price range over a given time period. It operates on the theory that, prices will close near their high in an upward trend market and near their low in a downward trend market. The Stochastic Oscillator (KD) compares the relative internal strength and divergence of momentum of the Relative Strength Index (RSI) [3] with the Moving Average (MA) [4] advantage. It also indicates the relative location to the high/low range and may provide stock trends over a short time.

Portfolio managers and individuals currently use nine periods of stock data to compute KD values to determine whether to buy/sell or hold the stock for the next period. The operation strategy α in this research slows down to catch the real-time buying-selling point. Stock trading prices may vary rapidly during a trading period and the K and D Stochastic Oscillators may crossover each other one or more than once. We considered buying/selling the stock once the K and D crossover occurred or before the end of the period, rather than waiting until the next trading period. Extending strategy α , we propose two new buying-selling strategies β and γ in this paper.

The n -period KD Stochastic Oscillator curve is updated periodically according to previous n periods' data. The period unit could be a day, week, month, or a year, etc. A KD curve shows stock trend and variation at the same time. If in comparing two KD curves, n equals both a 6-day and 4-week curve, the 6-day KD curve emphasizes recent variations, while the 4-week KD curve emphasizes short-term variations. One of the objectives of this research is to determine the proper value of n that depends on stock behavior. We considered six different n values that are commonly used, 5-day, 6-day, 9-day, 4-week, 6-week, and 9-week. We also observed that stock performance is greatly influenced by buying-selling strategy. We named the composition of a given n value and a given buying-selling strategy as an operation method (OM). In this research we considered eighteen OMs produced by the fore mentioned six n values and the three buying-selling strategies, α , β and γ . The purpose of this research is to identify the most efficient OM among the eighteen OMs, the proper n value, and buying-selling strategy for a specified stock.

We analyzed five stocks of leading companies in Taiwan in electronics, plastics, steels, and financial industries. We simulated each of the five stocks' historic data from the periods of January 2nd 2001 to December 31st 2004, 991 days or 206 weeks. The buying-selling transactions in the period are recorded in three indices: trading fee, return rate variance, and total return rate are computed for every OM.

We employed Data Envelopment Analysis (DEA) (Charnes, Cooper, and Rhodes, 1978) [5] [6] [7] to assess the relative efficiency of each OM against eighteen OMs. Based upon the three performance indices, we identified the efficient OMs. We also further ranked the efficient OMs according to their super-efficiencies.

2. Stock buying/selling strategies

A stock's historical data are used to generate the six types of KD curves based upon six n values. We introduce three buying/selling strategies that are applied to the six KD curves. For a trading period t , denoted as $Period_t$, the opening price O_t , the closing price C_t , the lowest price l_t , and the highest price h_t of a stock are given. Strategy α is currently the one most popularly implemented, while Strategies β and γ are newly proposed in this paper. The three strategies are depicted in Table 1 and Figures 1~8.

2.1 Strategy α

Based upon recent n trading periods' data, we use the following notations to compute K_t and D_t values of $Period_t$ after the market is closed.

L_t : The lowest price between $Period_t$ and $Period_{t-n+1}$, $L_t = \text{Min}(l_t, l_{t-1}, \dots, l_{t-n+1})$

H_t : The highest price between $Period_t$ and $Period_{t-n+1}$, $H_t = \text{Max}(h_t, h_{t-1}, \dots, h_{t-n+1})$

Raw Stochastic Value (RSV) at $Period_t$ is computed in the following equation:

$$RSV_t = \frac{(C_t - L_t)}{(H_t - L_t)} \times 100 \quad (1)$$

Based on the exponential smoothing moving average of past π periods, the Fast Oscillator K_t and the Slow Oscillator D_t of $Period_t$ are computed as follows:

$$K_t = RSV_t \times \frac{1}{\pi} + K_{t-1} \times \left(1 - \frac{1}{\pi}\right) \quad (2)$$

$$D_t = K_t \times \frac{1}{\pi} + D_{t-1} \times \left(1 - \frac{1}{\pi}\right) \quad (3)$$

If K_0 and D_0 at $Period_0$ are not available, we set them equal to 50 and discard the first 50 periods' data in simulation, with π set to 3 in this research.

In $Period_{t+1}$, one of the situations: α_1 , α_2 , and α_3 should occur. α_1 : buying the stock with the opening price O_{t+1} as golden-cross appeared, $K_{t-1} < D_{t-1}$, and $K_t > D_t$, as shown in Figure 1. α_2 : selling the stock with the opening price O_{t+1} as the deadly-cross appeared, $K_{t-1} > D_{t-1}$, and $K_t < D_t$, as shown in Figure 2. α_3 : do not buy and sell the stock.

2.2 Strategy β

Stock market real time data can almost be realized through internet today. One is able to update KD values at any instant as stock bidding is in progress. We propose a more aggressive strategy, β , to substitute strategy α that one has to wait until the next trading period for bidding. We employ the Stochastic Oscillator method to forecast the crossing point of K_t and D_t before the opening of the trading period, $Period_t$. Based upon the data of past n periods, $period_{t-1}$ to $period_{t-n}$, we compute the value where the K and D curves meet. Let K_t^f and D_t^f represent the forecasted value of K_t and D_t at trading $Period_t$, respectively. Let F_t denote the forecasted stock price of $K_t^f = D_t^f$. One could compute F_t based on the exponential smoothing moving average of past π periods. We use L_{t-1} and H_{t-1} as the lowest and highest price of the current period, $Period_t$, L_t^f and H_t^f , respectively.

L_t^f : The lowest price between $Period_{t-1}$ and $Period_{t-n}$, $L_t^f = \text{Min}(l_{t-1}, l_{t-2}, \dots, l_{t-n})$

H_t^f : The highest price between $Period_{t-1}$ and $Period_{t-n}$, $H_t^f = \text{Max}(h_{t-1}, h_{t-2}, \dots, h_{t-n})$

$$RSV_t^f = \frac{(F_t - L_t^f)}{(H_t^f - L_t^f)} \times 100 \quad (4)$$

$$K_t^f = RSV_t^f \times \frac{1}{\pi} + K_{t-1} \times (1 - \frac{1}{\pi}) \quad (5)$$

$$D_t^f = K_t^f \times \frac{1}{\pi} + D_{t-1} \times (1 - \frac{1}{\pi}) \quad (6)$$

From equations (4), (5), (6), if $K_t^f = D_t^f$, one may obtain F_t recursively.

$$F_t = L_t^f + \frac{(\pi \times D_{t-1} - (\pi - 1) \times K_{t-1}) \times (H_t^f - L_t^f)}{100} \quad (7)$$

The following relationship holds that:

$$L_t^f \leq F_t \leq H_t^f \quad (8)$$

Strategy β mainly operates under the condition that h_t and l_t fall between the values of L_t^f and H_t^f . On the other hand, if h_t and l_t fall outside the region of L_t^f and H_t^f , as shown in the following inequality, Strategy β still performs consistently in a reasonable way. It supports using L_{t-1} and H_{t-1} respectively, for L_t^f and H_t^f is adequate. It shows that F_t would be in error if the relationship of inequality (9) occurred. In this case, it would not harm performance of strategy β .

$$l_t < L_t^f \leq F_t \leq H_t^f < h_t \quad (9)$$

Let S_t^τ denote the stock trading price at any time point τ in trading *Period*_{*t*}. Given (K_{t-1}, D_{t-1}) , (K_t, D_t) , F_t , and S_t^τ , one of the five situations $\beta_1, \beta_2, \beta_3, \beta_4$, and β_5 should occur.

In this research we simulate historical data to comprehend the performance of Strategy β hence the real time data S_t^τ is not possible available. Therefore, given $K_{t-1} < D_{t-1}$ and F_t , situations β_1 and β_2 are detected as $h_t > F_t$ and buy the stock with price $(F_t + \Delta_1)$ ¹. There are two possible situations at the end of the period. In situation β_1 , if $C_t > F_t$, keep the stock. In situation β_2 , if $C_t < F_t$, sell the stock at price C_t at the period closing time. On the other hand, given $K_{t-1} > D_{t-1}$ and F_t , situations β_3 and β_4 are detected as $l_t < F_t$ and sell the stock with price $(F_t - \Delta_2)$ ². There are two possible situations at the end of the period. In situation β_3 , if $C_t < F_t$, no action is required for the stock. In situation β_4 , if $C_t > F_t$, buy the stock back at the price C_t at the period closing time.

¹ Δ_1 is an adjustable value to let $(F_t + \Delta_1)$ meet the rule of tick size.

² Δ_2 is an adjustable value to let $(F_t - \Delta_2)$ meet the rule of tick size.

As one employ Strategy β in real time, at any time point τ in trading $Period_t$ the stock price S_t^τ is compared to F_t . If given $K_{t-1} < D_{t-1}$ and F_t , situations β_1 and β_2 , as shown in Figures 3 and 4, $S_t^\tau > F_t$ and buy the stock with price $(F_t + \Delta_1)$. There are two possible situations at the end of the period. In situation β_1 , if $C_t > F_t$, keep the stock, as shown in Figure 3. In situation β_2 , if $C_t < F_t$, sell the stock at price C_t at the period closing time, as shown in Figure 4. On the other hand, given $K_{t-1} > D_{t-1}$ and F_t , situations β_3 and β_4 are detected as $S_t^\tau < F_t$ and sell the stock with price $(F_t - \Delta_2)$. There are two possible situations at the end of the period. In situation β_3 , if $C_t < F_t$, no action is required for the stock, as shown in Figure 5. In situation β_4 , if $C_t > F_t$, buy the stock back at the price C_t at the period closing time, as shown in Figure 6.

Other conditions are all categorized to situation β_5 , do not buy or sell the stock.



2.3 Strategy γ

In this research we simulate historical data to comprehend the performance of Strategy γ hence the real time data S_t^τ is not possible available. For the case given $K_{t-1} < D_{t-1}$ and F_t , situation γ_1 is detected as $h_t > F_t$ and buy the stock at the closing time with price C_t . On the other hand, given $K_{t-1} > D_{t-1}$ and F_t , situation γ_2 is detected as $l_t < F_t$ and sell the at closing price C_t if $C_t < F_t$ at the period closing time to avoid traps like β_4 .

As one employ Strategy γ in real time, at any time point τ in trading $Period_t$ the stock price S_t^τ is compared to F_t . If given $K_{t-1} < D_{t-1}$ and F_t , situation γ_1 is similar to β_1 as shown in Figure 7, $S_t^\tau > F_t$ and buy the stock at closing price C_t if $C_t > F_t$ at the period closing time to avoid traps like β_2 . On the other hand, given $K_{t-1} > D_{t-1}$ and F_t , situation γ_2 is similar to β_3 as

shown in Figure 8, $S_t^r < F_t$ and sell the stock at closing price C_t if $C_t < F_t$ at the period closing time to avoid traps like β_4 .

Other conditions will be included in γ_3 , do not buy or sell the stock.

Table 1 Three possible stock operation strategies used at $Period_t$

Strategy	Signal	Situation Illustration	Action
α	$K_{t-1} < D_{t-1}$ $K_t > D_t$	α_1 Fig.1	Buy opening trading price at $Period_{t+1}$
	$K_{t-1} > D_{t-1}$ $K_t < D_t$	α_2 Fig.2	Sell opening trading price at $Period_{t+1}$
	<i>Others</i>	α_3	Do not buy or sell
β	$K_{t-1} < D_{t-1}$ $h_t > F_t$ $C_t > F_t$	β_1 Fig. 3	Buying price ($F_t + \Delta_1$) is offered as the signal appeared.
	$K_{t-1} < D_{t-1}$ $h_t > F_t$ $C_t < F_t$	β_2 Fig. 4	Buying price ($F_t + \Delta_1$) is offered as the signal appeared. Sell the stock bought at $Period_t$ with price C_t when $C_t < F_t$.
	$K_{t-1} > D_{t-1}$ $l_t < F_t$ $C_t < F_t$	β_3 Fig. 5	Selling price ($F_t - \Delta_2$) is offered as the signal appeared.
	$K_{t-1} > D_{t-1}$ $l_t < F_t$ $C_t > F_t$	β_4 Fig. 6	Selling price ($F_t - \Delta_2$) is offered as the signal appeared. Buy the stock sold at $Period_t$ with price C_t when $C_t > F_t$.
	<i>Others</i>	β_5	Do not buy or sell
γ	$K_t < D_t$ $C_t > F_t$	γ_1 Fig. 7	Buy the stock with price C_t at the end of $Period_t$
	$K_t > D_t$ $C_t < F_t$	γ_2 Fig. 8	Sell the stock with price C_t at the end of $Period_t$
	<i>Others</i>	γ_3	Do not buy or sell

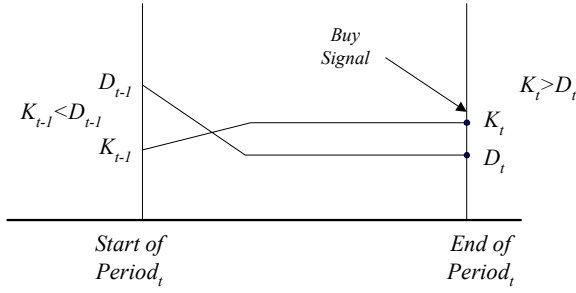


Fig.1. Strategy α , Situation α_1 , $K_{t-1} < D_{t-1}$ and $K_t > D_t$

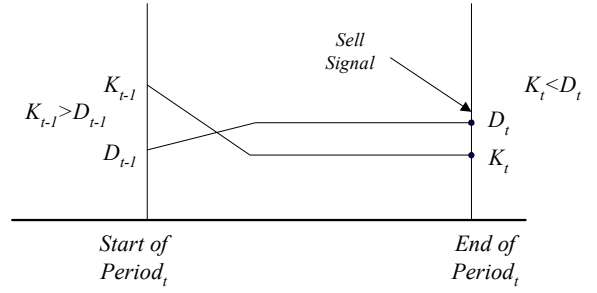


Fig.2. Strategy α , Situation α_2 , $K_{t-1} > D_{t-1}$ and $K_t < D_t$

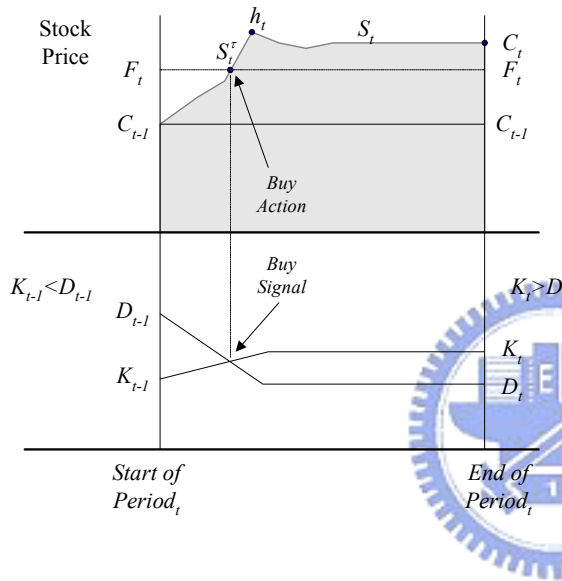


Fig.3. Strategy β , Situation β_1 , $K_{t-1} < D_{t-1}$, $h_t > F_t$, $C_t > F_t$

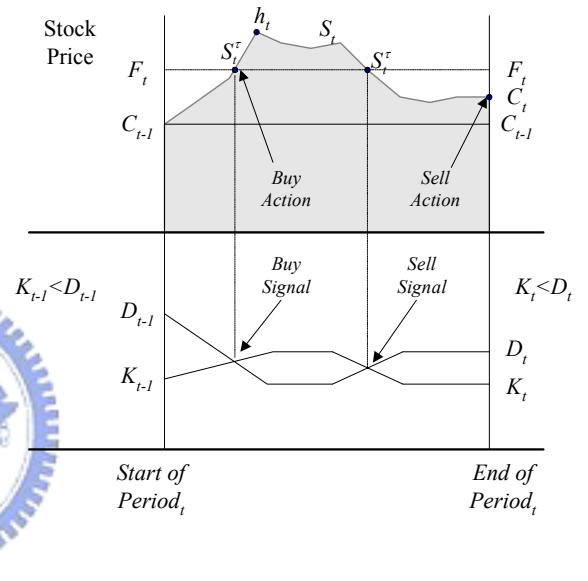


Fig.4. Strategy β , Situation β_2 , $K_{t-1} < D_{t-1}$, $h_t > F_t$, $C_t < F_t$

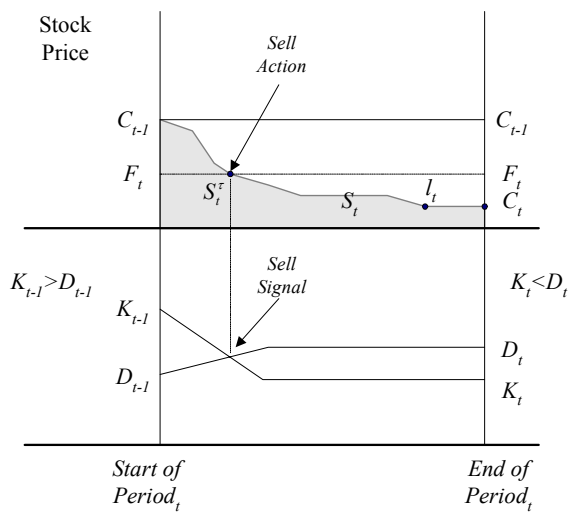


Fig.5. Strategy β , Situation β_3 , $K_{t-1} > D_{t-1}$, $l_t < F_t$, $C_t < F_t$

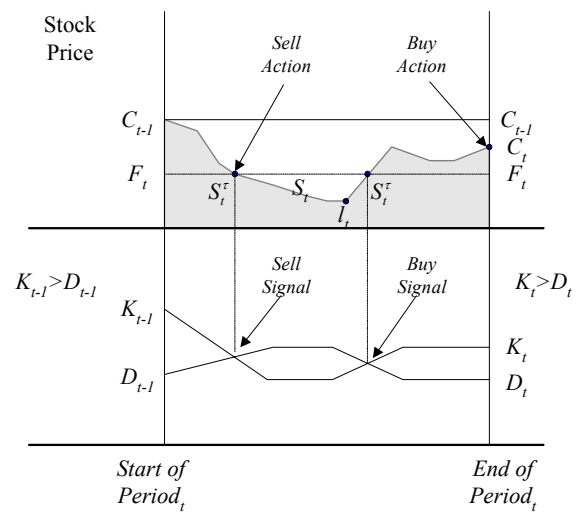


Fig.6. Strategy β , Situation β_4 , $K_{t-1} > D_{t-1}$, $l_t < F_t$, $C_t > F_t$

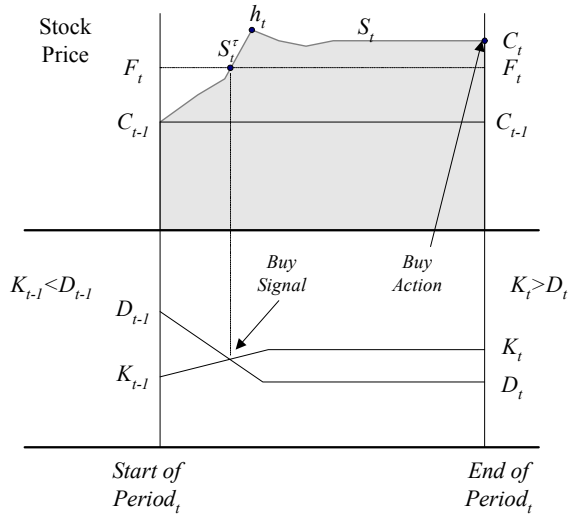


Fig.7. Strategy γ , Situation γ_1 , $K_{t-1} < D_{t-1}$ and $C_t > F_t$

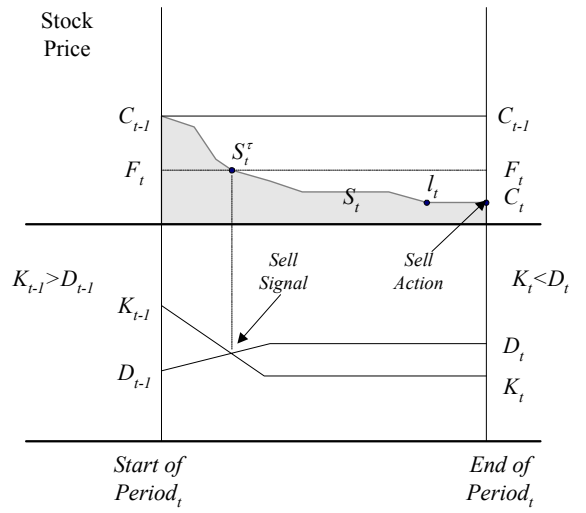


Fig.8. Strategy γ , Situation γ_2 , $K_{t-1} > D_{t-1}$ and $C_t < F_t$



3. Eighteen stock operation methods under selection

The Raw Stochastic Value (RSV) in equation (1) is obtained by past n periods' data. We consider six ways to compute RSV. Therefore, stock may operate upon six different types of period numbers.

D5: $n=5$, approximately a week.

D6: $n=6$, generally used by broker/dealer firms.

D9: $n=9$, generally used by stock market.

W4: $n=4$, approximately a month.

W6: $n=6$, generally used by portfolio firms.

W9: $n=9$, generally used by stock market.

A period could be a day such as D5, D6, and D9, or could be a week such as W4, W6, and W9. There are eighteen possible stock operation methods (OMs), which are the composite of the six ways to determine KD curves and the three strategies, depicted in Table 2, and denoted in a sequence as OM_1 , OM_2 , ..., and OM_{18} .

Table 2 Combinations of KD curves and strategies

KD Curves	Strategies		
	Strategy α	Strategy β	Strategy γ
D5	D5 α (OM_1)	D5 β (OM_2)	D5 γ (OM_3)
D6	D6 α (OM_4)	D6 β (OM_5)	D6 γ (OM_6)
D9	D9 α (OM_7)	D9 β (OM_8)	D9 γ (OM_9)
W4	W4 α (OM_{10})	W4 β (OM_{11})	W4 γ (OM_{12})
W6	W6 α (OM_{13})	W6 β (OM_{14})	W6 γ (OM_{15})
W9	W9 α (OM_{16})	W9 β (OM_{17})	W9 γ (OM_{18})

4. Performance assessment of the eighteen OMs

We selected five major stocks in Taiwan for simulation, as shown in Table 4. These are leading companies in electronics, plastics, steels, and financial industries. The historic data in the periods between January 2nd 2001 to December 31st 2004, 991 days or 206 weeks are collected. The profiles of the five stocks studied in this research are listed in Table 3.

Table 3 Profiles of five major stocks in 2003

Stock Code	Company	Capital (Billion, USD)	Revenue (Billion, USD)	Stock Turnover rate (Day)
2303.tw	United Micro Electronics Corp	4.981	2.620	0.62%
1301.tw	Formosa Plastics Corp.	1.483	2.607	0.26%
2002.tw	China Steel Corp.	2.918	4.003	0.75%
2330.tw	Taiwan Semiconductor Mfg. Co., Ltd.	6.255	6.231	0.22%
2882.tw	Cathay Financial Holding Co., Ltd.	2.564	16.227	0.25%

Exchange rate is USD: NTD= 1: 32.4

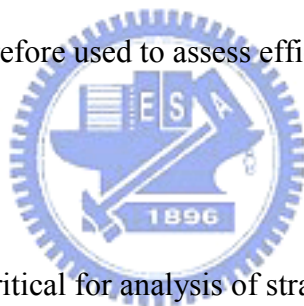
There are several given conditions for the eighteen stock operation methods. The methods are only applied on the Buy-first, Sell-later situation. Margin, short, and day-trade are permitted, and the margin fee and short fee are not considered. The service charge fee for the broker is 0.1425% and the stock trading tax is 0.3%. Trading unit is defined as per share. Buying or selling is activated, without considering limit up, limit down, and trading volume.

Data Envelopment Analysis (DEA) [5] [6] [7] was first introduced by Charnes, Cooper, and Rhodes (1978). The efficiency frontier is obtained by adopting non-predetermined production function rather than often used “predetermined production function.” Based on the efficient frontier, technical efficiency and price efficiency of units are assessed. DEA borrows

the envelopment concept, setting production frontier in order to distinguish efficient and inefficient Decision Making Units (DMUs). In order to commemorate their contribution, this model is named after the three with the short name of CCR model. This model is based on the linear programming technique with the frontier formed by the “best possibilities” of all possibilities.

The DEA model projects the assessment unit input and output items into geometric space, establishing the frontier. The DEA model regards those which fall into the frontier as the most efficient combinations of input and output and therefore assigns them the efficiency index of 1. For those units that fail to fall into the frontier, a relative efficiency index is assigned based on a specific point, which ranges between 0 and 1.

As a result, the DEA is capable of resolving controversies caused by assigned weights. A more objective approach is therefore used to assess efficiencies among DMUs.



4.1 Performance indices

Performance indices are critical for analysis of strategy efficiency for stock trading. A set of effective performance indices can truly reflect stock trading features. Table 4 shows the clear definition and description for each index and the feasibility of efficiency analysis.

Table 4 The Indices

Index	Notation	Unit	Definition
Transaction Cost	X_1	NT\$/Share	The cost is the price of stock investment including buying/selling fee and tax.
Return Rate Variance	X_2	None	The variance is often used by investors to measure the risk of a stock or a stock portfolio. The basic idea is that the variance is a measure of volatility: the more a stock's returns vary from the stock's average return, the more volatile the stock.
Total Return Rate	Y_1	%	The return is directly an investment performance regardless of risk and cost.

In order to truly simulate the real stock operation, 0.1425% of fee was charged as part of the initial cost. When the stock was sold at the end, 0.1425% of fee and 0.3% of tax were charged.

If OM_j operates to the set of historic data, m_j buying-selling transactions occur. For the i -th transaction, the buying and selling price is denoted as P_{ij}^{buy} and P_{ij}^{sell} , respectively. Data for OM_j on the three indices X_1 , X_2 , and Y_1 , are x_{1j} , x_{2j} and y_{1j} , respectively, and can be obtained as follows:

The trading cost of the i -th transaction A_{ij} is computed as following

$$A_{ij} = P_{ij}^{buy} \times 0.1425\% + P_{ij}^{sell} \times (0.1425\% + 0.3\%) \quad (10)$$

$$x_{1j} = \sum_{i=1}^{m_j} A_{ij} \quad (11)$$

The return of OM_j at the i -th buying-selling transaction is:

$$R_{ij} = \frac{P_{ij}^{sell} - P_{ij}^{buy} - A_{ij}}{P_{ij}^{buy} \times (1 + 0.1425\%)} \times 100\% \quad (12)$$

The average return of each buying-selling transaction is:

$$\mu_j = \frac{R_{1j} + R_{2j} + \dots + R_{m_jj}}{m_j} \quad (13)$$

The return rate variance of each buying-selling transaction is:

$$x_{2j} = Var(R_{ij}) = \frac{\sum_{i=1}^{m_j} (R_{ij} - \mu_j)^2}{m_j} \quad (14)$$

The return of OM_j at each buying-selling transaction is:

$$y_{1j} = \sum_{i=1}^{m_j} R_{ij} \quad (15)$$

4.2 Assessing efficiency of OM_k

We define the OM_k efficiency score in equation (16). h_k is equal to the weighted to-be-maximized indices, $X_1 \sim X_2$, divided by the weighted value of to-be-minimized indices Y_1 .

$$h_k = \frac{y_{1k}u_1 - u_0}{x_{1k}v_1 + x_{2k}v_2} \quad (16)$$

The indices in the denominator, A_{ij} and $Var(R_{ij})$ are called to-be-minimized indices since the efficiency score will be greater as they become smaller in the above equation. On the contrary, when the index of the numerator, R_{ij} get greater, the efficiency score will be greater. This is the so-called to-be-maximized index. However, the above-said weights (v_1, v_2, u_1) will determine efficiency score so controversies arise as to the values accorded to the weights.

The following fractional programming model (FP_k) is employed to measure the relative efficiency of OM_k among the eighteen OMs. The eighteen OMs take turns being the object, represented by OM_k .

($BCC_I_FP_k$)



(17)

$$\begin{aligned} \text{Max } h_k &= \frac{y_{1k}u_1 - u_0}{x_{1k}v_1 + x_{2k}v_2} \\ \text{st } \frac{y_{1j}u_1 - u_0}{x_{1j}v_1 + x_{2j}v_2} &\leq 1 \quad j = 1, 2, \dots, 18 \\ u_1 &\geq \varepsilon > 0 \\ v_1, v_2 &\geq \varepsilon > 0, \\ \varepsilon &\text{ is an non-Archimedean small number} \end{aligned}$$

The objective function is to determine the optimal decision variables v_1, v_2, u_1 so that the efficiency score h_k is maximized. Each of the eighteen constraints used to limit the efficiency score of OM_j is no more than 1. Since a solution cannot be obtained under the FP_k

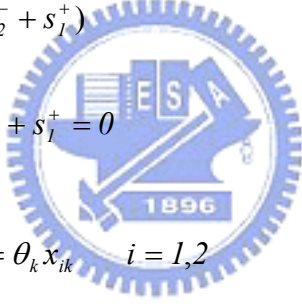
model, mathematics conversion is borrowed to obtain standard linear programming. The conversion is below:

$$(BCC_I_LP_k) \tag{18}$$

$$\begin{aligned} \min \quad & h_k = y_{1k}u_1 - u_0 \\ \text{st} \quad & x_{1k}v_1 + x_{2k}v_2 = 1 \\ & -x_{1j}v_1 - x_{2j}v_2 + y_{1j}u_1 - u_0 \leq 0 \quad j = 1, 2, \dots, 18 \\ & u_1, v_1, v_2 \geq \varepsilon > 0, \quad \varepsilon : \text{non - Archimedean small number} \end{aligned}$$

Further convert LP_k into dual type, as follows:

$$(BCC_I_DLP_k) \tag{19}$$

$$\begin{aligned} \max \quad & \theta_k + \varepsilon(s_1^- + s_2^- + s_1^+) \\ \text{st} \quad & y_{1k} - \sum_{j=1}^{18} y_{1j}\lambda_j + s_1^+ = 0 \\ & \sum_{j=1}^{18} x_{ij}\lambda_j + s_i^- = \theta_k x_{ik} \quad i = 1, 2 \\ & \sum_{j=1}^{18} \lambda_j = 1 \\ & \lambda_j \geq 0, \quad j = 1, 2, \dots, 18 \\ & \theta_k \text{ free in sign}, \quad s_1^-, s_2^-, s_1^+ \geq 0 \end{aligned}$$


Since ε is very small, it is difficult to assign a value to it. Given that inappropriate assignment will lead to errors, a two-stage calculation is required to obtain the solution.

First Stage to obtain solution for θ_k^*

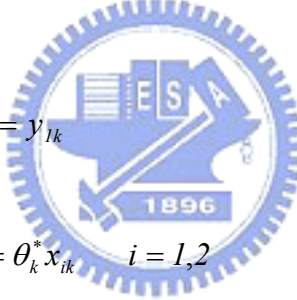
$$(BCC_I_DLP_k - I) \tag{20}$$

$$\theta_k^* = \max \quad \theta_k$$

$$\begin{aligned}
st \quad & y_{1k} - \sum_{j=1}^{18} y_{1j} \lambda_j \leq 0 \\
& \sum_{j=1}^{18} x_{ij} \lambda_j \leq \theta_k x_{ik} \quad i = 1, 2 \\
& \sum_{j=1}^{18} \lambda_j = 1 \\
& \lambda_j \geq 0, \quad j = 1, 2, \dots, 18 \\
& \theta_k \text{ free in sign}
\end{aligned}$$

Second Stage to obtain solution for $s_1^{-*}, s_2^{-*}, s_1^{+*}$

(BCC_I_DLP_k-II) (21)

$$\begin{aligned}
\max \quad & s_1^+ + s_1^- + s_2^- \\
st \quad & \sum_{j=1}^{18} y_{1j} \lambda_j - s_1^+ = y_{1k} \\
& \sum_{j=1}^{18} x_{ij} \lambda_j + s_i^- = \theta_k^* x_{ik} \quad i = 1, 2 \\
& \sum_{j=1}^{18} \lambda_j = 1 \\
& \lambda_j \geq 0, \quad j = 1, 2, \dots, 18 \\
& s_1^-, s_2^-, s_1^+ \geq 0
\end{aligned}$$


The best weight when $\theta_k^*, s_1^{-*}, s_2^{-*}, s_1^{+*}$ are obtained by the best solution of DLP_k , the best solutions for $h_k^*, v_1^*, v_2^*, u_1^*$ are obtained. The efficiency of OM_k is as follows:

$$h_k^* = \frac{y_{1k} u_1^* - u_0^*}{x_{1k} v_1^* + x_{2k} v_2^*} \quad (22)$$

When denominator is 1, then $h_k^* = y_{1k} u_1^* - u_0^*$

4.3 Computation of super-efficiency

The super-efficiency introduced by Andersen & Petersen (1993) [8] is used to compute the efficiencies of DMUs. If the object DMU, DMU_k , is an efficient unit, its super-efficiency can be measured.

$$(AP-BCC_I_DLP_k -I) \tag{23}$$

$$\begin{aligned} \theta_k^* &= \max \quad \theta_k \\ st \quad & y_{1k} - \sum_{j=1, j \neq k}^{18} y_{1j} \lambda_j \leq 0 \\ & \sum_{j=1, j \neq k}^{18} x_{ij} \lambda_j \leq \theta_k x_{ik} \quad i = 1, 2 \\ & \sum_{j=1, j \neq k}^{18} \lambda_j = 1 \\ & \lambda_j \geq 0, \quad j = 1, 2, \dots, 18, j \neq k \\ & \theta_k \quad \text{free in sign} \end{aligned}$$



The second phase is as follows:

$$(AP-BCC_I_DLP_k -II) \tag{24}$$


$$\begin{aligned} \max \quad & s_1^+ + s_1^- + s_2^- \\ st \quad & \sum_{j=1, j \neq k}^{18} y_{1j} \lambda_j - s_1^+ = y_{1k} \\ & \sum_{j=1, j \neq k}^{18} x_{ij} \lambda_j + s_i^- = \theta_k^* x_{ik} \quad i = 1, 2 \\ & \sum_{j=1, j \neq k}^{18} \lambda_j = 1 \\ & \lambda_j \geq 0, \quad j = 1, 2, \dots, 18, j \neq k \end{aligned}$$

$$s_1^-, s_2^-, s_i^+ \geq 0$$

Certain efficient DMU_s may result in an infeasible solution. We further employed Yao Chen method [9][10] to obtain appropriate super-efficiency.

If the DMU_k is infeasible in models (23), we compute the projection point of each inefficient DMU on the efficient frontier. The projection point is denoted as \hat{y}_{rk} . $\hat{y}_{rk} = \theta_k^* y_{rk}$.

The following model computes the efficient DMU projection point on the frontier.

$$\begin{aligned} \tilde{\theta}_k^* &= \min \tilde{\theta}_k & (25) \\ \text{s.t. } \sum_{\substack{j=1 \\ j \neq k}}^n \lambda_j x_{ij} &\leq \tilde{\theta}_k x_{ik}, \quad i = 1, 2, \dots, m, \\ \sum_{\substack{j=1 \\ j \neq k}}^n \lambda_j \hat{y}_{rj} &\geq \hat{y}_{rk} = y_{rk}, \quad r = 1, 2, \dots, s, \\ \sum_{\substack{j=1 \\ j \neq k}}^n \lambda_j &= 1, \\ \lambda_j &\geq 0, \quad j \neq k. \end{aligned}$$


The super-efficiency of DMU_k, ϕ_k is obtained according to the following situations.

$$\phi_k = \begin{cases} \theta_k^* & \text{if model (23) is feasible} \\ \tilde{\theta}_k^* & \text{if model (23) is infeasible and model (25) is feasible} \\ 1, & \text{if model (25) is infeasible} \end{cases}$$

5. Computation and results

5.1 The computation of UMC

UMC (2303.tw) is a popular high-tech stock with heavy trading volume and also favored by individual investors and broker/dealer firms. The three indices data of the eighteen OMs are depicted in Table 5.

Table 5 Performance data of the eighteen OMs of UMC (2303.tw)

OM_j	Name	Buying-Selling Transaction m_j	Average Return μ_j	Transaction Cost x_{1j}	Return Rate Variance x_{2j}	Total Return Rate y_{1j}
1	D5 α	107	-1.212%	20.542	0.412%	-129.676%
2	D5 β	248	0.589%	39.280	0.240%	145.999%
3	D5 γ	98	-0.449%	19.022	0.390%	-43.993%
4	D6 α	97	-0.944%	18.753	0.390%	-91.551%
5	D6 β	219	0.733%	25.965	0.241%	160.441%
6	D6 γ	93	-0.150%	18.137	0.391%	-13.956%
7	D9 α	80	-0.672%	15.034	0.503%	-53.788%
8	D9 β	196	0.537%	32.084	0.276%	105.190%
9	D9 γ	80	0.230%	15.108	0.513%	18.431%
10	W4 α	27	-2.945%	5.192	2.192%	-79.523%
11	W4 β	55	1.820%	10.406	1.876%	100.078%
12	W4 γ	23	-1.817%	4.536	2.143%	-41.785%
13	W6 α	22	-1.956%	4.256	2.530%	-43.022%
14	W6 β	49	1.573%	8.805	1.229%	77.065%
15	W6 γ	20	-2.390%	3.979	2.486%	-47.792%
16	W9 α	18	-2.318%	3.360	3.004%	-41.733%
17	W9 β	43	-0.268%	7.687	1.007%	-11.523%
18	W9 γ	17	-1.182%	3.224	2.630%	-20.102%

The eighteen OM data consisting of trading fee, return rate variance, and total return rate listed in table 5, was analyzed with DEA analysis. The results are ϕ_k , ν_1^* , ν_2^* , u_0^* , and u_1^* .

Table 6 results show a weak relationship between indices. One substitutes A_{ij} into equation (12) would find R_{ij} is a function of P^{buy} and P^{sell} . We could not directly tell the correlation between A_{ij} and R_{ij} . From equations (13) and (14), we can tell the negative correlation between A_{ij} and $Var(R_{ij})$. This strongly suggests that index selection is proper and reasonable.

Table 6 Correlation between indices

	Transaction Cost	Return Rate Variance	Total Return Rate
Transaction cost	1.000	-0.830	0.525
Return Rate Variance	-0.830	1.000	-0.287
Total Return Rate	0.525	-0.287	1.000

Negative data is evident in column y_{ij} in Table 5. We transform the data to positive by adding 130% to each value. The resulting data is depicted in Table 7.

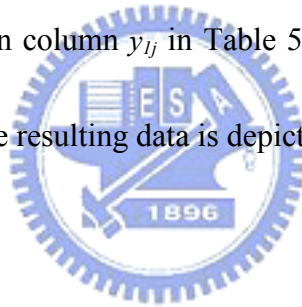


Table 7 Transformed data of UMC

OM_j	Name	Buying-Selling Transaction m_j	Average Return μ_j	Transaction Cost x_{1j}	Variance of the Rate of the Returns x_{2j}	Total Rate of the Returns y_{1j}
1	D5 α	107	-1.212%	20.542	0.412%	0.324%
2	D5 β	248	0.589%	39.280	0.240%	275.999%
3	D5 γ	98	-0.449%	19.022	0.390%	86.007%
4	D6 α	97	-0.944%	18.753	0.390%	38.449%
5	D6 β	219	0.733%	25.965	0.241%	290.441%
6	D6 γ	93	-0.150%	18.137	0.391%	116.044%
7	D9 α	80	-0.672%	15.034	0.503%	76.212%
8	D9 β	196	0.537%	32.084	0.276%	235.190%
9	D9 γ	80	0.230%	15.108	0.513%	148.431%
10	W4 α	27	-2.945%	5.192	2.192%	50.477%
11	W4 β	55	1.820%	10.406	1.876%	230.078%
12	W4 γ	23	-1.817%	4.536	2.143%	88.215%
13	W6 α	22	-1.956%	4.256	2.530%	86.978%
14	W6 β	49	1.573%	8.805	1.229%	207.065%
15	W6 γ	20	-2.390%	3.979	2.486%	82.208%
16	W9 α	18	-2.318%	3.360	3.004%	88.267%
17	W9 β	43	-0.268%	7.687	1.007%	118.477%
18	W9 γ	17	-1.182%	3.224	2.630%	109.898%

By implementing models (23) or (25), the following efficiencies are obtained, as in Table 8.

Table 8 Efficiency of eighteen OMs of UMC

OM_k	Name	ϕ_k	Ranking
1	D5 α	0.917	17
2	D5 β	1.006	9
3	D5 γ	0.978	12
4	D6 α	0.985	11
5	D6 β	1.236	3
6	D6 γ	1.019	7
7	D9 α	1.012	8
8	D9 β	0.871	18
9	D9 γ	1.066	6
10	W4 α	0.930	16
11	W4 β	1.301	1
12	W4 γ	1.003	10
13	W6 α	0.931	15
14	W6 β	1.245	2
15	W6 γ	0.966	13
16	W9 α	0.960	14
17	W9 β	1.185	4
18	W9 γ	1.091	5

Efficiencies sorted to ranking order.

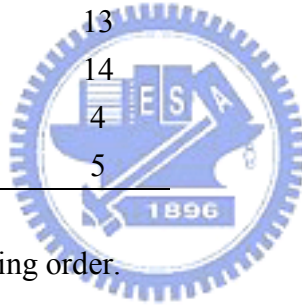


Table 9 Efficiency ranking of eighteen OMs of UMC

Ranking	OM_k	Name	ϕ_k
1	11	W4 β	1.301
2	14	W6 β	1.245
3	5	D6 β	1.236
4	17	W9 β	1.185
5	18	W9 γ	1.091
6	9	D9 γ	1.066
7	6	D6 γ	1.019
8	7	D9 α	1.012
9	2	D5 β	1.006
10	12	W4 γ	1.003
11	4	D6 α	0.985
12	3	D5 γ	0.978
13	15	W6 γ	0.966
14	16	W9 α	0.960
15	13	W6 α	0.931
16	10	W4 α	0.930
17	1	D5 α	0.917
18	8	D9 β	0.871

From the above result, we know W4 β is ranked to 1. Its efficiency is superior to other OMs. It exhibited excellent control in input or outstanding performance in output.

5.2 Original data for the other four stocks

We also collected data for the other four major stocks in Taiwan. Appendix Tables T1~T18 depict some of the original data for the five stocks operated by Strategies α , β , and γ . Following the same process as used for UMC stock, values of performance indices for the four stocks are obtained, as depicted in Tables 10 and 11. There are negative values in the columns of y_{lj} . We transform those to positive. The resulting data is depicted in Tables 12 and 13.

Table 10 Formosa Plastic and China Steel Stock Data

OM_j	Name	Formosa Plastic (1301.tw)					China Steel (2002.tw)				
		m_j	μ_j	x_{1j}	x_{2j}	y_{1j}	m_j	μ_j	x_{1j}	x_{2j}	y_{1j}
1	D5 α	95	-0.233%	24.621	0.287%	-22.17%	106	-0.440%	14.011	0.196%	-46.69%
2	D5 β	235	0.018%	62.630	0.139%	4.33%	250	-0.067%	33.431	0.091%	-16.71%
3	D5 γ	98	0.109%	25.799	0.264%	10.73%	101	-0.178%	13.353	0.227%	-17.98%
4	D6 α	97	-0.362%	25.309	0.286%	-35.07%	100	-0.383%	13.249	0.186%	-38.30%
5	D6 β	214	0.148%	56.773	0.158%	31.74%	226	-0.088%	29.972	0.092%	-19.81%
6	D6 γ	99	0.060%	26.116	0.266%	5.97%	98	-0.342%	12.818	0.213%	-33.53%
7	D9 α	86	-0.057%	22.614	0.332%	-4.93%	85	-0.283%	10.969	0.216%	-24.06%
8	D9 β	198	0.051%	52.434	0.180%	10.15%	201	0.046%	26.302	0.114%	9.18%
9	D9 γ	79	0.468%	20.821	0.344%	36.94%	86	-0.152%	11.070	0.203%	-13.04%
10	W4 α	23	0.226%	6.040	0.983%	5.21%	21	2.230%	2.686	0.768%	46.82%
11	W4 β	50	1.602%	13.338	0.713%	80.12%	42	3.384%	5.391	0.851%	142.11%
12	W4 γ	22	0.049%	5.768	0.854%	1.08%	23	1.741%	2.820	0.950%	40.03%
13	W6 α	20	-0.801%	5.180	1.017%	-16.02%	20	1.468%	2.553	0.952%	29.36%
14	W6 β	47	0.745%	12.027	0.499%	35.00%	39	2.342%	4.843	0.690%	91.33%
15	W6 γ	21	-1.913%	5.439	1.082%	-40.17%	20	1.303%	2.564	0.988%	26.05%
16	W9 α	17	0.557%	4.580	2.451%	9.48%	20	0.750%	2.547	0.775%	15.00%
17	W9 β	42	0.309%	11.323	0.480%	12.96%	53	0.635%	6.840	0.371%	33.67%
18	W9 γ	17	-0.110%	4.578	2.389%	-1.87%	20	1.117%	2.502	0.849%	22.33%

Table 11 Taiwan Semiconductor Manufacturing Company (TSMC) and Cathay Financial Holding Company (CFHC) Stock Data

OM_j	Name	TSMC (2330.tw)					CFHC (2882.tw)				
		m_j	μ_j	x_{1j}	x_{2j}	y_{1j}	m_j	μ_j	x_{1j}	x_{2j}	y_{1j}
1	D5 α	100	-0.717%	36.712	0.426%	-71.71%	109	-0.563%	31.533	0.252%	-61.41%
2	D5 β	185	0.869%	67.954	0.257%	160.71%	237	-0.033%	68.997	0.164%	-7.73%
3	D5 γ	98	0.273%	36.349	0.393%	26.75%	100	-0.177%	29.090	0.325%	-17.72%
4	D6 α	94	-0.711%	34.509	0.467%	-66.84%	103	-0.507%	29.872	0.254%	-52.23%
5	D6 β	177	0.809%	65.406	0.287%	143.11%	224	-0.137%	64.634	0.159%	-30.59%
6	D6 γ	90	0.321%	33.175	0.437%	28.91%	98	-0.241%	28.520	0.301%	-23.61%
7	D9 α	84	-0.765%	30.717	0.506%	-64.28%	91	-0.127%	26.373	0.259%	-11.55%
8	D9 β	174	0.421%	64.861	0.313%	73.26%	214	-0.119%	61.772	0.152%	-25.42%
9	D9 γ	82	0.266%	30.220	0.544%	21.77%	86	0.099%	25.001	0.313%	8.51%
10	W4 α	29	-1.432%	11.442	1.269%	-41.53%	24	-0.846%	6.839	0.798%	-20.30%
11	W4 β	57	0.870%	22.274	0.607%	49.62%	43	1.438%	12.591	0.483%	61.85%
12	W4 γ	26	-1.484%	10.216	1.535%	-38.59%	23	-0.020%	6.599	0.790%	-0.46%
13	W6 α	21	0.191%	7.994	2.228%	4.01%	21	-2.061%	5.927	0.920%	-43.28%
14	W6 β	47	1.280%	17.624	0.985%	60.17%	41	0.762%	11.700	0.659%	31.23%
15	W6 γ	20	-1.607%	7.685	2.396%	-32.14%	21	-0.775%	6.006	0.959%	-16.28%
16	W9 α	20	-3.806%	7.298	2.747%	-76.13%	18	0.811%	5.136	1.299%	14.59%
17	W9 β	41	0.252%	15.275	1.318%	10.33%	40	0.546%	10.662	0.439%	21.85%
18	W9 γ	20	-1.932%	7.307	2.510%	-38.64%	18	0.484%	5.141	1.061%	8.72%

Table 12 Formosa Plastic and China Steel Transformed Stock Data

OM_j	Name	Formosa Plastic (1301.tw)					China Steel (2002.tw)				
		m_j	μ_j	x_{1j}	x_{2j}	y_{1j}	m_j	μ_j	x_{1j}	x_{2j}	y_{1j}
1	D5 α	95	-0.233%	24.621	0.287%	18.83%	106	-0.440%	14.011	0.196%	0.31%
2	D5 β	235	0.018%	62.630	0.139%	45.33%	250	-0.067%	33.431	0.091%	30.29%
3	D5 γ	98	0.109%	25.799	0.264%	51.73%	101	-0.178%	13.353	0.227%	29.02%
4	D6 α	97	-0.362%	25.309	0.286%	5.93%	100	-0.383%	13.249	0.186%	8.70%
5	D6 β	214	0.148%	56.773	0.158%	72.74%	226	-0.088%	29.972	0.092%	27.19%
6	D6 γ	99	0.060%	26.116	0.266%	46.97%	98	-0.342%	12.818	0.213%	13.47%
7	D9 α	86	-0.057%	22.614	0.332%	36.07%	85	-0.283%	10.969	0.216%	22.94%
8	D9 β	198	0.051%	52.434	0.180%	51.15%	201	0.046%	26.302	0.114%	56.18%
9	D9 γ	79	0.468%	20.821	0.344%	77.94%	86	-0.152%	11.070	0.203%	33.96%
10	W4 α	23	0.226%	6.040	0.983%	46.21%	21	2.230%	2.686	0.768%	93.82%
11	W4 β	50	1.602%	13.338	0.713%	121.12%	42	3.384%	5.391	0.851%	189.11%
12	W4 γ	22	0.049%	5.768	0.854%	42.08%	23	1.741%	2.820	0.950%	87.03%
13	W6 α	20	-0.801%	5.180	1.017%	24.98%	20	1.468%	2.553	0.952%	76.36%
14	W6 β	47	0.745%	12.027	0.499%	76.00%	39	2.342%	4.843	0.690%	138.33%
15	W6 γ	21	-1.913%	5.439	1.082%	0.83%	20	1.303%	2.564	0.988%	73.05%
16	W9 α	17	0.557%	4.580	2.451%	50.48%	20	0.750%	2.547	0.775%	62.00%
17	W9 β	42	0.309%	11.323	0.480%	53.96%	53	0.635%	6.840	0.371%	80.67%
18	W9 γ	17	-0.110%	4.578	2.389%	39.13%	20	1.117%	2.502	0.849%	69.33%

Table 13 Taiwan Semiconductor Manufacturing Company (TSMC) and Cathay Financial Holding Company (CFHC) Transformed Stock Data

OM_j	Name	TSMC (2330.tw)					CFHC (2882.tw)				
		m_j	μ_j	x_{1j}	x_{2j}	y_{1j}	m_j	μ_j	x_{1j}	x_{2j}	y_{1j}
1	D5 α	100	-0.717%	36.712	0.426%	5.29%	109	-0.563%	31.533	0.252%	0.59%
2	D5 β	185	0.869%	67.954	0.257%	237.71%	237	-0.033%	68.997	0.164%	54.27%
3	D5 γ	98	0.273%	36.349	0.393%	103.75%	100	-0.177%	29.090	0.325%	44.28%
4	D6 α	94	-0.711%	34.509	0.467%	10.16%	103	-0.507%	29.872	0.254%	9.77%
5	D6 β	177	0.809%	65.406	0.287%	220.11%	224	-0.137%	64.634	0.159%	31.41%
6	D6 γ	90	0.321%	33.175	0.437%	105.91%	98	-0.241%	28.520	0.301%	38.39%
7	D9 α	84	-0.765%	30.717	0.506%	12.72%	91	-0.127%	26.373	0.259%	50.45%
8	D9 β	174	0.421%	64.861	0.313%	150.26%	214	-0.119%	61.772	0.152%	36.58%
9	D9 γ	82	0.266%	30.220	0.544%	98.77%	86	0.099%	25.001	0.313%	70.51%
10	W4 α	29	-1.432%	11.442	1.269%	35.47%	24	-0.846%	6.839	0.798%	41.70%
11	W4 β	57	0.870%	22.274	0.607%	126.62%	43	1.438%	12.591	0.483%	123.85%
12	W4 γ	26	-1.484%	10.216	1.535%	38.41%	23	-0.020%	6.599	0.790%	61.54%
13	W6 α	21	0.191%	7.994	2.228%	81.01%	21	-2.061%	5.927	0.920%	18.72%
14	W6 β	47	1.280%	17.624	0.985%	137.17%	41	0.762%	11.700	0.659%	93.23%
15	W6 γ	20	-1.607%	7.685	2.396%	44.86%	21	-0.775%	6.006	0.959%	45.72%
16	W9 α	20	-3.806%	7.298	2.747%	0.87%	18	0.811%	5.136	1.299%	76.59%
17	W9 β	41	0.252%	15.275	1.318%	87.33%	40	0.546%	10.662	0.439%	83.85%
18	W9 γ	20	-1.932%	7.307	2.510%	38.36%	18	0.484%	5.141	1.061%	70.72%

5.3 Eighteen OMs Performance for the five stocks

Performance rankings of the eighteen OMs for the five stocks are summarized in Table 14.

Table 14 Performance rankings of the eighteen OMs for the five stocks

Ranking	2303.tw	1301.tw	2002.tw	2330.tw	2882.tw
1	W4 β (1.301)	W4 β (1.561)	D9 β (1.891)	W6 α (1.257)	W4 β (1.366)
2	W6 β (1.245)	W9 α (1.264)	W9 β (1.174)	W6 β (1.223)	D5 β (1.200)
3	D6 β (1.236)	D5 β (1.137)	W4 α (1.123)	W4 β (1.146)	W9 α (1.159)
4	W9 β (1.185)	D6 β (1.134)	D6 β (1.054)	D5 β (1.118)	W9 β (1.144)
5	W9 γ (1.091)	W4 γ (1.102)	D9 γ (1.038)	W4 α (1.080)	W9 γ (1.067)
6	D9 γ (1.066)	W6 β (1.070)	W6 β (1.037)	D5 γ (1.046)	D9 α (1.056)
7	D6 γ (1.019)	W6 α (1.053)	D5 β (1.035)	W9 γ (1.031)	D9 β (1.049)
8	D9 α (1.012)	W9 β (1.053)	W9 α (1.029)	W4 γ (1.017)	W4 γ (1.024)
9	D5 β (1.006)	D9 γ (1.038)	W9 γ (1.019)	D6 γ (1.005)	D9 γ (1.001)
10	W4 γ (1.003)	D5 γ (1.009)	D6 α (1.014)	W9 α (1.001)	W6 α (0.997)
11	D6 α (0.985)	W9 γ (1.005)	W6 α (1.000)	W6 γ (0.993)	D6 α (0.983)
12	D5 γ (0.978)	W4 α (0.994)	W6 γ (0.987)	D6 β (0.971)	W4 α (0.979)
13	W6 γ (0.966)	D6 γ (0.993)	D9 α (0.985)	D9 α (0.969)	D5 α (0.974)
14	W9 α (0.960)	D5 α (0.992)	D5 α (0.948)	D5 α (0.959)	W6 γ (0.972)
15	W6 α (0.931)	D9 β (0.982)	W4 γ (0.934)	D6 α (0.949)	D6 β (0.955)
16	W4 α (0.930)	D6 α (0.979)	D6 γ (0.923)	D9 γ (0.939)	D6 γ (0.894)
17	D5 α (0.917)	D9 α (0.970)	W4 β (0.898)	D9 β (0.927)	W6 β (0.867)
18	D9 β (0.871)	W6 γ (0.951)	D5 γ (0.874)	W9 β (0.921)	D5 γ (0.853)

The eighteen OMs are ordered according to their weighted sum. Rank 1 to Rank 18 are weighted by 18 to 1, respectively. As shown in Table 15, we further divide the eighteen OMs into three parts. The first six OMs, ranking 1~6, are W4 β , D5 β , W6 β , W9 β , W9 α , and W9 γ . We summarize that the combinations of strategy β and n-week KD are outperformed than others. Oppositely, the last six OMs, ranking 13~18, D9 β , D6 γ , D6 α , D5 γ , W6 γ , and D5 α , the combinations of strategy α and n-day KD, performed poorly.

Table 15 Overall ranking of the OMs in the five stocks

OM \ Ranking	Ranking																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
W4 β	3		1														1	
D5 β		1	1	1			1		1									
W6 β		2				2											1	
W9 β		1		2				1										1
W9 α		1	1					1			1			1				
W9 γ					2		1		1		1							
D6 β			1	2								1			1			
W6 α	1						1			1	1				1			
D9 γ					1	1			2							1		
W4 γ				1				2		1					1			
W4 α			1		1							2				1		
D9 α						1		1					2				1	
D9 β	1						1								1		1	1
D6 γ							1		1				1			2		
D6 α									1	2					1	1		
D5 γ						1				1		1						2
W6 γ										1	1		1	1				1
D5 α													1	3			1	

5.4 Tick size impact analysis

Tick size Δ varies corresponding to the stock prices, p . [11]

$\Delta = \text{NT\$}0.01$ if $p < \text{NT\$}5$;

$\Delta = \text{NT\$}0.05$ if $\text{NT\$}5 \leq p < \text{NT\$}15$;

$\Delta = \text{NT\$}0.1$ if $\text{NT\$}15 \leq p < \text{NT\$}50$;

$\Delta = \text{NT\$}0.5$ if $\text{NT\$}50 \leq p < \text{NT\$}150$;

$\Delta = \text{NT\$}1.0$ if $\text{NT\$}150 \leq p < \text{NT\$}1000$;

$\Delta = \text{NT\$}5.0$ if $\text{NT\$}1000 \leq p$.

Given a tick size, let p_L and p_U be the lower bound and the upper bound of stock prices.

The average impact of the tick size is computed by the following equation.

$$I = [2 * \Delta / (p_L + p_U)] * 100\%$$

The following table depicts the average tick size impact on various stock prices. In our simulation of stock 2330.tw under operation methods W6 α , W6 β , and W4 β , trading frequencies are also listed.

Table 16 Tick size impact of 2330.tw

Price range		Tick size ()	Counts of trading frequencies of 2330.tw					Tick size impact (I)
p _L	p _U		W6 α	W6 β		W4 β		
			Count	Count	Difference with W6 α	Count	Difference with W6 α	
40	45	0.1	3	6	-0.71%	6	-0.71%	0.24%
45	50	0.1	2	10	-1.68%	7	-1.05%	0.21%
50	55	0.5	2	1	0.95%	5	-2.86%	0.95%
55	60	0.5	3	7	-3.48%	5	-1.74%	0.87%
60	65	0.5	3	3	0.00%	6	-2.40%	0.80%
65	70	0.5	1	7	-4.44%	8	-5.19%	0.74%
70	75	0.5	0	0	0.00%	2	-1.38%	0.69%
75	80	0.5	1	0	0.65%	0	0.65%	0.65%
80	85	0.5	1	2	-0.61%	4	-1.82%	0.61%
85	90	0.5	4	5	-0.57%	6	-1.14%	0.57%
90	95	0.5	1	5	-2.16%	6	-2.70%	0.54%
95	100	0.5		0	0.00%	2	-1.03%	0.51%
100	110	0.5		1	-0.48%			0.48%
Total			21	47	-12.53%	57	-21.36%	

We also obtain tick size impact, -12.53% and -21.36%, from the difference between W6 β and W6 α , and between W4 β and W6 α . That means the overall performance of 2330.tw is heavily impacted by tick size. This is one of the reasons that strategy α outperforms β as shown in Table 14.

6. Conclusions

We proposed two new strategies in this research, aside from the conventional stock buying-selling strategy and KD curves. We also considered the performance of the three strategies under six different period lengths. Combining of period lengths with buying-selling strategies, created eighteen stock operation methods to select. We simulated five major stocks in Taiwan and accessed the performance of the eighteen operation methods.

The indices selection is a key point. Other factors that may influence the stock market include politics, economics, and natural or man-made calamities (ex. earthquake, SARS, war, etc.). Transaction cost, risk of investment, and net return from trading are used as performance indices in this research. The performance index should not be limited. Depending on the interest, employment performance indices will lead to different results.

Obviously, each stock has its own market characteristics. One stock may be active and have a wider variation range than others. The eighteen OMs perform differently in various stocks. Reaching a firm conclusion for ranking the eighteen OMs to all the stocks may be difficult. We recommend that portfolio managers or individual investors buy/sell a stock using the OM with the highest performance based on its historical data.

Using Strategy β with KD curves will overreact on buying/selling, and the increased transaction cost will harm performance. On the other hand, using Strategy γ with KD curves may miss good timing for buying/selling.

Conventional KD indicators are less reliable. To use a particular analysis method for a specific stock, the investor could search for optimal parameter settings for the method, such as reviewing period length and operation strategy.

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Appendix

T1: The abstract of calculation process for 2303 strategy D5 α

No	Date	Open	High	Low	Close	5DHigh	5DLow	RSV	K	D	KD cross	B/S	Buy price	Sell price	Return rate	Tax for buying	Tax for selling	
1	2001/01/02	46.8	50	45.8	49.6	50.0	43.6	93.75	77.19	61.27	45.48	B	46.80			0.06669		
2	2001/01/03	48	49	47.5	48.3	50.0	45.0	66.00	73.46	65.33	47.45							
3	2001/01/04	50.5	51.5	49.6	50.5	51.5	45.8	82.46	76.46	69.04	48.89							
4	2001/01/05	50.5	53	50	52	53.0	45.8	86.11	79.68	72.59	50.01							
5	2001/01/08	51	52.5	50.5	50.5	53.0	45.8	65.28	74.88	73.35	50.86							
6	2001/01/09	50.5	53	50.5	53	53.0	47.5	100.00	83.25	76.65	50.99							
7	2001/01/10	53	53.5	51.5	52	53.5	49.6	61.54	76.01	76.44	52.61	S						
8	2001/01/11	52.5	53.5	51	51.5	53.5	50.0	42.86	64.96	72.61	53.08			52.5	11.52		0.2323125	
9	2001/01/12	52	53	51.5	52	53.5	50.5	50.00	59.97	68.40	53.06							
10	2001/01/15	52	53	51.5	53	53.5	50.5	83.33	67.76	68.19	52.57							
11	2001/01/16	53.5	56.5	53.5	56.5	56.5	51.0	100.00	78.51	71.63	54.18	B						
12	2001/01/17	57.5	59	57	59	59.0	51.0	100.00	85.67	76.31	55.61		57.50			0.0819375		
13	2001/01/18	59.5	59.5	57.5	58.5	59.5	51.5	87.50	86.28	79.63	56.81							
14	2001/01/29	58.5	58.5	54.5	54.5	59.5	51.5	37.50	70.02	76.43	58.64	S						
15	2001/01/30	54.5	56.5	54	56.5	59.5	53.5	50.00	63.35	72.07	58.87			54.5	-5.77		0.2411625	
.....																		
978	2004/12/14	19.9	20.1	19.8	20	20.4	19.7	42.86	30.20	33.11	19.97							
979	2004/12/15	20.1	20.4	20	20.3	20.4	19.7	85.71	48.70	38.31	19.82	B						
980	2004/12/16	20.3	20.4	20.1	20.2	20.4	19.7	71.43	56.28	44.30	19.84		20.30			0.028927499		
981	2004/12/17	20.2	20.3	20.1	20.1	20.4	19.7	57.14	56.57	48.39	19.92							
982	2004/12/20	19.9	20	19.7	19.8	20.4	19.7	14.29	42.47	46.42	20.08	S						
983	2004/12/21	19.9	20	19.8	19.8	20.4	19.7	14.29	33.08	41.97	20.12			19.9	-2.54		0.0880575	
984	2004/12/22	19.9	20.1	19.9	19.9	20.4	19.7	28.57	31.58	38.50	20.07							
985	2004/12/23	19.9	20	19.8	19.9	20.3	19.7	33.33	32.16	36.39	19.97							
986	2004/12/24	19.9	20	19.8	20	20.1	19.7	75.00	46.44	39.74	19.81	B						
987	2004/12/27	20	20	19.8	19.9	20.1	19.8	33.33	42.07	40.52	19.91		20.00			0.0285		
988	2004/12/28	19.8	20	19.8	19.8	20.1	19.8	0.00	28.05	36.36	19.96	S						
989	2004/12/29	19.9	20.3	19.9	20.2	20.3	19.8	80.00	45.37	39.36	19.94	B		19.9	-1.08		0.0880575	
990	2004/12/30	20.3	20.3	20.1	20.2	20.3	19.8	80.00	56.91	45.21	19.91		20.30			0.028927499		
991	2004/12/31	20.3	20.5	20.1	20.5	20.5	19.8	100.00	71.27	53.90	19.93	S		20.5	0.40		0.0907125	
									Return cost	-129.68%			107	107	-129.68	5.03	15.51	
									Var	20.54	0.412%							

T2: The abstract of calculation process for 2303 strategy D5β

No	Date	Open	High	Low	Close	5DHigh	5DLow	RSV	K	D	KD cross	B/S	Buy price	Sell price	Return rate	Tax for buying	Tax for selling	
1	2001/01/02	46.8	50	45.8	49.6	50.0	43.6	93.75	77.19	61.27	45.48	B	46.80			0.06669		
2	2001/01/03	48	49	47.5	48.3	50.0	45.0	66.00	73.46	65.33	47.45							
3	2001/01/04	50.5	51.5	49.6	50.5	51.5	45.8	82.46	76.46	69.04	48.89							
4	2001/01/05	50.5	53	50	52	53.0	45.8	86.11	79.68	72.59	50.01							
5	2001/01/08	51	52.5	50.5	50.5	53.0	45.8	65.28	74.88	73.35	50.86							
6	2001/01/09	50.5	53	50.5	53	53.0	47.5	100.00	83.25	76.65	50.99	SB	53.00	50.50	7.28	0.075525	0.2234625	
7	2001/01/10	53	53.5	51.5	52	53.5	49.6	61.54	76.01	76.44	52.61							
8	2001/01/11	52.5	53.5	51	51.5	53.5	50.0	42.86	64.96	72.61	53.08	S		52.5	-1.52		0.2323125	
9	2001/01/12	52	53	51.5	52	53.5	50.5	50.00	59.97	68.40	53.06							
10	2001/01/15	52	53	51.5	53	53.5	50.5	83.33	67.76	68.19	52.57							
11	2001/01/16	53.5	56.5	53.5	56.5	56.5	51.0	100.00	78.51	71.63	54.18	B	53.00			0.075525		
12	2001/01/17	57.5	59	57	59	59.0	51.0	100.00	85.67	76.31	55.61							
13	2001/01/18	59.5	59.5	57.5	58.5	59.5	51.5	87.50	86.28	79.63	56.81							
14	2001/01/29	58.5	58.5	54.5	54.5	59.5	51.5	37.50	70.02	76.43	58.64	S		56.5	5.98		0.2500125	
15	2001/01/30	54.5	56.5	54	56.5	59.5	53.5	50.00	63.35	72.07	58.87							
.....																		
978	2004/12/14	19.9	20.1	19.8	20	20.4	19.7	42.86	30.20	33.11	19.97							
979	2004/12/15	20.1	20.4	20	20.3	20.4	19.7	85.71	48.70	38.31	19.82	B	20.00			0.0285		
980	2004/12/16	20.3	20.4	20.1	20.2	20.4	19.7	71.43	56.28	44.30	19.84							
981	2004/12/17	20.2	20.3	20.1	20.1	20.4	19.7	57.14	56.57	48.39	19.92							
982	2004/12/20	19.9	20	19.7	19.8	20.4	19.7	14.29	42.47	46.42	20.08	S		19.9	-1.08		0.0880575	
983	2004/12/21	19.9	20	19.8	19.8	20.4	19.7	14.29	33.08	41.97	20.12							
984	2004/12/22	19.9	20.1	19.9	19.9	20.4	19.7	28.57	31.58	38.50	20.07							
985	2004/12/23	19.9	20	19.8	19.9	20.3	19.7	33.33	32.16	36.39	19.97							
986	2004/12/24	19.9	20	19.8	20	20.1	19.7	75.00	46.44	39.74	19.81	B	20.00			0.0285		
987	2004/12/27	20	20	19.8	19.9	20.1	19.8	33.33	42.07	40.52	19.91	SB	19.90	19.80	-1.58	0.028357499	0.087615	
988	2004/12/28	19.8	20	19.8	19.8	20.1	19.8	0.00	28.05	36.36	19.96	S		19.9	-0.58		0.0880575	
989	2004/12/29	19.9	20.3	19.9	20.2	20.3	19.8	80.00	45.37	39.36	19.94	B	20.00			0.0285		
990	2004/12/30	20.3	20.3	20.1	20.2	20.3	19.8	80.00	56.91	45.21	19.91							
991	2004/12/31	20.3	20.5	20.1	20.5	20.5	19.8	100.00	71.27	53.90	19.93	S		20.5	1.90		0.0907125	
										Return	146.00%			248	248	146.00	9.48	29.80
										cost	39.28							
										Var	0.240%							

T3: The abstract of calculation process for 2303 strategy D5y

No	Date	Open	High	Low	Close	5DHigh	5DLow	RSV	K	D	KD cross	B/S	Buy price	Sell price	Return rate	Tax for buying	Tax for selling	
1	2001/01/02	46.8	50	45.8	49.6	50.0	43.6	93.75	77.19	61.27	45.48	B	46.8			0.06669		
2	2001/01/03	48	49	47.5	48.3	50.0	45.0	66.00	73.46	65.33	47.45							
3	2001/01/04	50.5	51.5	49.6	50.5	51.5	45.8	82.46	76.46	69.04	48.89							
4	2001/01/05	50.5	53	50	52	53.0	45.8	86.11	79.68	72.59	50.01							
5	2001/01/08	51	52.5	50.5	50.5	53.0	45.8	65.28	74.88	73.35	50.86							
6	2001/01/09	50.5	53	50.5	53	53.0	47.5	100.00	83.25	76.65	50.99							
7	2001/01/10	53	53.5	51.5	52	53.5	49.6	61.54	76.01	76.44	52.61							
8	2001/01/11	52.5	53.5	51	51.5	53.5	50.0	42.86	64.96	72.61	53.08	S		51.5	9.40		0.2278875	
9	2001/01/12	52	53	51.5	52	53.5	50.5	50.00	59.97	68.40	53.06							
10	2001/01/15	52	53	51.5	53	53.5	50.5	83.33	67.76	68.19	52.57							
11	2001/01/16	53.5	56.5	53.5	56.5	56.5	51.0	100.00	78.51	71.63	54.18	B	56.5			0.0805125		
12	2001/01/17	57.5	59	57	59	59.0	51.0	100.00	85.67	76.31	55.61							
13	2001/01/18	59.5	59.5	57.5	58.5	59.5	51.5	87.50	86.28	79.63	56.81							
14	2001/01/29	58.5	58.5	54.5	54.5	59.5	51.5	37.50	70.02	76.43	58.64	S		54.5	-4.10		0.2411625	
15	2001/01/30	54.5	56.5	54	56.5	59.5	53.5	50.00	63.35	72.07	58.87							
.....																		
978	2004/12/14	19.9	20.1	19.8	20	20.4	19.7	42.86	30.20	33.11	19.97							
979	2004/12/15	20.1	20.4	20	20.3	20.4	19.7	85.71	48.70	38.31	19.82	B	20.3			0.028927499		
980	2004/12/16	20.3	20.4	20.1	20.2	20.4	19.7	71.43	56.28	44.30	19.84							
981	2004/12/17	20.2	20.3	20.1	20.1	20.4	19.7	57.14	56.57	48.39	19.92							
982	2004/12/20	19.9	20	19.7	19.8	20.4	19.7	14.29	42.47	46.42	20.08	S		19.8	-3.03		0.087614997	
983	2004/12/21	19.9	20	19.8	19.8	20.4	19.7	14.29	33.08	41.97	20.12							
984	2004/12/22	19.9	20.1	19.9	19.9	20.4	19.7	28.57	31.58	38.50	20.07							
985	2004/12/23	19.9	20	19.8	19.9	20.3	19.7	33.33	32.16	36.39	19.97							
986	2004/12/24	19.9	20	19.8	20	20.1	19.7	75.00	46.44	39.74	19.81	B	20			0.0285		
987	2004/12/27	20	20	19.8	19.9	20.1	19.8	33.33	42.07	40.52	19.91							
988	2004/12/28	19.8	20	19.8	19.8	20.1	19.8	0.00	28.05	36.36	19.96	S		19.8	-1.58		0.087614997	
989	2004/12/29	19.9	20.3	19.9	20.2	20.3	19.8	80.00	45.37	39.36	19.94	B	20.2			0.028785001		
990	2004/12/30	20.3	20.3	20.1	20.2	20.3	19.8	80.00	56.91	45.21	19.91							
991	2004/12/31	20.3	20.5	20.1	20.5	20.5	19.8	100.00	71.27	53.90	19.93	S		20.5	0.89		0.0907125	
										Return	-43.99%			98	98	-43.99	4.63	14.39
										cost	19.02							
										Var	0.390%							

T4: The abstract of calculation process for 2303 strategy D6 α

No	Date	Open	High	Low	Close	6DHigh	6DLow	RSV	K	D	KD cross	B/S	Buy price	Sell price	Return rate	Tax for buying	Tax for selling	
1	2001/01/02	46.8	50	45.8	49.6	50.0	43.6	93.75	77.93	60.77	45.29	B	46.80			0.06669		
2	2001/01/03	48	49	47.5	48.3	50.0	43.6	73.44	76.44	65.99	46.49							
3	2001/01/04	50.5	51.5	49.6	50.5	51.5	45.0	84.62	79.16	70.38	48.43							
4	2001/01/05	50.5	53	50	52	53.0	45.8	86.11	81.48	74.08	50.07							
5	2001/01/08	51	52.5	50.5	50.5	53.0	45.8	65.28	76.08	74.75	50.99							
6	2001/01/09	50.5	53	50.5	53	53.0	45.8	100.00	84.05	77.85	50.51							
7	2001/01/10	53	53.5	51.5	52	53.5	47.5	75.00	81.03	78.91	51.98							
8	2001/01/11	52.5	53.5	51	51.5	53.5	49.6	48.72	70.26	76.03	53.01	S						
9	2001/01/12	52	53	51.5	52	53.5	50.0	57.14	65.89	72.65	53.02		52	10.46			0.2301	
10	2001/01/15	52	53	51.5	53	53.5	50.5	83.33	71.70	72.33	52.71							
11	2001/01/16	53.5	56.5	53.5	56.5	56.5	50.5	100.00	81.14	75.27	54.31	B						
12	2001/01/17	57.5	59	57	59	59.0	51.0	100.00	87.42	79.32	56.05		57.50			0.0819375		
13	2001/01/18	59.5	59.5	57.5	58.5	59.5	51.0	88.24	87.69	82.11	57.03							
14	2001/01/29	58.5	58.5	54.5	54.5	59.5	51.5	37.50	70.96	78.40	58.96	S						
15	2001/01/30	54.5	56.5	54	56.5	59.5	51.5	62.50	68.14	74.98	58.59			54.5	-5.77		0.2411625	
.....																		
978	2004/12/14	19.9	20.1	19.8	20	20.5	19.7	37.50	29.82	34.71	20.06							
979	2004/12/15	20.1	20.4	20	20.3	20.4	19.7	85.71	48.45	39.29	19.85	B						
980	2004/12/16	20.3	20.4	20.1	20.2	20.4	19.7	71.43	56.11	44.89	19.86		20.30			0.028927499		
981	2004/12/17	20.2	20.3	20.1	20.1	20.4	19.7	57.14	56.45	48.75	19.93							
982	2004/12/20	19.9	20	19.7	19.8	20.4	19.7	14.29	42.40	46.63	20.09	S						
983	2004/12/21	19.9	20	19.8	19.8	20.4	19.7	14.29	33.03	42.10	20.12		19.9	-2.54			0.0880575	
984	2004/12/22	19.9	20.1	19.9	19.9	20.4	19.7	28.57	31.54	38.58	20.07							
985	2004/12/23	19.9	20	19.8	19.9	20.4	19.7	28.57	30.55	35.90	20.03							
986	2004/12/24	19.9	20	19.8	20	20.3	19.7	50.00	37.03	36.28	19.91	B						
987	2004/12/27	20	20	19.8	19.9	20.1	19.7	50.00	41.36	37.97	19.82		20.00			0.0285		
988	2004/12/28	19.8	20	19.8	19.8	20.1	19.8	0.00	27.57	34.50	19.95	S						
989	2004/12/29	19.9	20.3	19.9	20.2	20.3	19.8	80.00	45.05	38.02	19.92	B		19.9	-1.08		0.0880575	
990	2004/12/30	20.3	20.3	20.1	20.2	20.3	19.8	80.00	56.70	44.25	19.90		20.30			0.028927499		
991	2004/12/31	20.3	20.5	20.1	20.5	20.5	19.8	100.00	71.13	53.21	19.92	S		20.5	0.40		0.0907125	
										Return	-91.55%			97	97	-91.55	4.58	14.17
										cost	18.75							
										Var	0.390%							

T5: The abstract of calculation process for 2303 strategy D6β

No	Date	Open	High	Low	Close	6DHigh	6DLow	RSV	K	D	KD cross	B/S	Buy price	Sell price	Return rate	Tax for buying	Tax for selling		
1	2001/01/02	46.8	50	45.8	49.6	50.0	43.6	93.75	77.93	60.77	45.29	B	46.80			0.06669			
2	2001/01/03	48	49	47.5	48.3	50.0	43.6	73.44	76.44	65.99	46.49								
3	2001/01/04	50.5	51.5	49.6	50.5	51.5	45.0	84.62	79.16	70.38	48.43								
4	2001/01/05	50.5	53	50	52	53.0	45.8	86.11	81.48	74.08	50.07								
5	2001/01/08	51	52.5	50.5	50.5	53.0	45.8	65.28	76.08	74.75	50.99								
6	2001/01/09	50.5	53	50.5	53	53.0	45.8	100.00	84.05	77.85	50.51	SB	53.00	50.50	7.28	0.075525	0.2234625		
7	2001/01/10	53	53.5	51.5	52	53.5	47.5	75.00	81.03	78.91	51.98								
8	2001/01/11	52.5	53.5	51	51.5	53.5	49.6	48.72	70.26	76.03	53.01	S		51.5	-3.40		0.2278875		
9	2001/01/12	52	53	51.5	52	53.5	50.0	57.14	65.89	72.65	53.02								
10	2001/01/15	52	53	51.5	53	53.5	50.5	83.33	71.70	72.33	52.71								
11	2001/01/16	53.5	56.5	53.5	56.5	56.5	50.5	100.00	81.14	75.27	54.31	B	53.00			0.075525			
12	2001/01/17	57.5	59	57	59	59.0	51.0	100.00	87.42	79.32	56.05								
13	2001/01/18	59.5	59.5	57.5	58.5	59.5	51.0	88.24	87.69	82.11	57.03								
14	2001/01/29	58.5	58.5	54.5	54.5	59.5	51.5	37.50	70.96	78.40	58.96	S		57	6.92		0.252225		
15	2001/01/30	54.5	56.5	54	56.5	59.5	51.5	62.50	68.14	74.98	58.59								
.....																			
978	2004/12/14	19.9	20.1	19.8	20	20.5	19.7	37.50	29.82	34.71	20.06								
979	2004/12/15	20.1	20.4	20	20.3	20.4	19.7	85.71	48.45	39.29	19.85	B	20.10			0.0286425			
980	2004/12/16	20.3	20.4	20.1	20.2	20.4	19.7	71.43	56.11	44.89	19.86								
981	2004/12/17	20.2	20.3	20.1	20.1	20.4	19.7	57.14	56.45	48.75	19.93								
982	2004/12/20	19.9	20	19.7	19.8	20.4	19.7	14.29	42.40	46.63	20.09	S		19.9	-1.57		0.0880575		
983	2004/12/21	19.9	20	19.8	19.8	20.4	19.7	14.29	33.03	42.10	20.12								
984	2004/12/22	19.9	20.1	19.9	19.9	20.4	19.7	28.57	31.54	38.58	20.07								
985	2004/12/23	19.9	20	19.8	19.9	20.4	19.7	28.57	30.55	35.90	20.03								
986	2004/12/24	19.9	20	19.8	20	20.3	19.7	50.00	37.03	36.28	19.91								
987	2004/12/27	20	20	19.8	19.9	20.1	19.7	50.00	41.36	37.97	19.82	BS	20.00	19.90	-1.08				
988	2004/12/28	19.8	20	19.8	19.8	20.1	19.8	0.00	27.57	34.50	19.95	BS	19.90	19.80	-1.08				
989	2004/12/29	19.9	20.3	19.9	20.2	20.3	19.8	80.00	45.05	38.02	19.92	B	20.00			0.0285			
990	2004/12/30	20.3	20.3	20.1	20.2	20.3	19.8	80.00	56.70	44.25	19.90								
991	2004/12/31	20.3	20.5	20.1	20.5	20.5	19.8	100.00	71.13	53.21	19.92	S		20.5	1.90				
										Return	160.44%			184	184	160.44	6.23	19.73	
										cost	25.97								
										Var	0.241%								

T6: The abstract of calculation process for 2303 strategy D6y

No	Date	Open	High	Low	Close	6DHigh	6DLow	RSV	K	D	KD cross	B/S	Buy price	Sell price	Return rate	Tax for buying	Tax for selling	
1	2001/01/02	46.8	50	45.8	49.6	50.0	43.6	93.75	77.93	60.77	45.29	B	46.8			0.06669		
2	2001/01/03	48	49	47.5	48.3	50.0	43.6	73.44	76.44	65.99	46.49							
3	2001/01/04	50.5	51.5	49.6	50.5	51.5	45.0	84.62	79.16	70.38	48.43							
4	2001/01/05	50.5	53	50	52	53.0	45.8	86.11	81.48	74.08	50.07							
5	2001/01/08	51	52.5	50.5	50.5	53.0	45.8	65.28	76.08	74.75	50.99							
6	2001/01/09	50.5	53	50.5	53	53.0	45.8	100.00	84.05	77.85	50.51							
7	2001/01/10	53	53.5	51.5	52	53.5	47.5	75.00	81.03	78.91	51.98							
8	2001/01/11	52.5	53.5	51	51.5	53.5	49.6	48.72	70.26	76.03	53.01	S		51.5	9.40		0.2278875	
9	2001/01/12	52	53	51.5	52	53.5	50.0	57.14	65.89	72.65	53.02							
10	2001/01/15	52	53	51.5	53	53.5	50.5	83.33	71.70	72.33	52.71							
11	2001/01/16	53.5	56.5	53.5	56.5	56.5	50.5	100.00	81.14	75.27	54.31	B	56.5			0.0805125		
12	2001/01/17	57.5	59	57	59	59.0	51.0	100.00	87.42	79.32	56.05							
13	2001/01/18	59.5	59.5	57.5	58.5	59.5	51.0	88.24	87.69	82.11	57.03							
14	2001/01/29	58.5	58.5	54.5	54.5	59.5	51.5	37.50	70.96	78.40	58.96	S		54.5	-4.10		0.2411625	
15	2001/01/30	54.5	56.5	54	56.5	59.5	51.5	62.50	68.14	74.98	58.59							
.....																		
978	2004/12/14	19.9	20.1	19.8	20	20.5	19.7	37.50	29.82	34.71	20.06							
979	2004/12/15	20.1	20.4	20	20.3	20.4	19.7	85.71	48.45	39.29	19.85	B	20.3			0.0289275		
980	2004/12/16	20.3	20.4	20.1	20.2	20.4	19.7	71.43	56.11	44.89	19.86							
981	2004/12/17	20.2	20.3	20.1	20.1	20.4	19.7	57.14	56.45	48.75	19.93							
982	2004/12/20	19.9	20	19.7	19.8	20.4	19.7	14.29	42.40	46.63	20.09	S		19.8	-3.03		0.087615	
983	2004/12/21	19.9	20	19.8	19.8	20.4	19.7	14.29	33.03	42.10	20.12							
984	2004/12/22	19.9	20.1	19.9	19.9	20.4	19.7	28.57	31.54	38.58	20.07							
985	2004/12/23	19.9	20	19.8	19.9	20.4	19.7	28.57	30.55	35.90	20.03							
986	2004/12/24	19.9	20	19.8	20	20.3	19.7	50.00	37.03	36.28	19.91							
987	2004/12/27	20	20	19.8	19.9	20.1	19.7	50.00	41.36	37.97	19.82							
988	2004/12/28	19.8	20	19.8	19.8	20.1	19.8	0.00	27.57	34.50	19.95							
989	2004/12/29	19.9	20.3	19.9	20.2	20.3	19.8	80.00	45.05	38.02	19.92	B	20.2			0.028785		
990	2004/12/30	20.3	20.3	20.1	20.2	20.3	19.8	80.00	56.70	44.25	19.90							
991	2004/12/31	20.3	20.5	20.1	20.5	20.5	19.8	100.00	71.13	53.21	19.92	S		20.5	0.89		0.0907125	
										Return	-13.96%			93	93	-13.96	4.41	13.73
										cost	18.14							
										Var	0.391%							

T7: The abstract of calculation process for 2303 strategy D9 α

No	Date	Open	High	Low	Close	9DHigh	9DLow	RSV	K	D	KD cross	B/S	Buy price	Sell price	Return rate	Tax for buying	Tax for selling	
1	2001/01/02	46.8	50	45.8	49.6	50.0	42.3	94.81	69.96	50.41	43.17	B	46.80			0.06669		
2	2001/01/03	48	49	47.5	48.3	50.0	42.3	77.92	72.62	57.81	44.47							
3	2001/01/04	50.5	51.5	49.6	50.5	51.5	42.3	89.13	78.12	64.58	45.75							
4	2001/01/05	50.5	53	50	52	53.0	43.6	89.36	81.87	70.34	48.05							
5	2001/01/08	51	52.5	50.5	50.5	53.0	43.6	73.40	79.05	73.25	49.39							
6	2001/01/09	50.5	53	50.5	53	53.0	45.0	100.00	86.03	77.51	49.84							
7	2001/01/10	53	53.5	51.5	52	53.5	45.8	80.52	84.19	79.74	51.25							
8	2001/01/11	52.5	53.5	51	51.5	53.5	45.8	74.03	80.80	80.09	51.86							
9	2001/01/12	52	53	51.5	52	53.5	45.8	80.52	80.71	80.30	51.92							
10	2001/01/15	52	53	51.5	53	53.5	47.5	91.67	84.36	81.65	52.07							
11	2001/01/16	53.5	56.5	53.5	56.5	56.5	49.6	100.00	89.57	84.29	54.69							
12	2001/01/17	57.5	59	57	59	59.0	50.0	100.00	93.05	87.21	56.80							
13	2001/01/18	59.5	59.5	57.5	58.5	59.5	50.5	88.89	91.66	88.70	57.95							
14	2001/01/29	58.5	58.5	54.5	54.5	59.5	50.5	44.44	75.92	84.44	59.63	S						
15	2001/01/30	54.5	56.5	54	56.5	59.5	51.0	64.71	72.18	80.35	59.22		54.5	15.77			0.2411625	
.....																		
978	2004/12/14	19.9	20.1	19.8	20	20.6	19.7	33.33	25.91	29.21	20.02							
979	2004/12/15	20.1	20.4	20	20.3	20.6	19.7	66.67	39.50	32.64	19.87	B						
980	2004/12/16	20.3	20.4	20.1	20.2	20.5	19.7	62.50	47.16	37.48	19.84		20.30			0.028927499		
981	2004/12/17	20.2	20.3	20.1	20.1	20.5	19.7	50.00	48.11	41.02	19.91							
982	2004/12/20	19.9	20	19.7	19.8	20.4	19.7	14.29	36.83	39.63	20.02	S						
983	2004/12/21	19.9	20	19.8	19.8	20.4	19.7	14.29	29.32	36.19	20.05		19.9	-2.54			0.0880575	
984	2004/12/22	19.9	20.1	19.9	19.9	20.4	19.7	28.57	29.07	33.82	20.00							
985	2004/12/23	19.9	20	19.8	19.9	20.4	19.7	28.57	28.90	32.18	19.97							
986	2004/12/24	19.9	20	19.8	20	20.4	19.7	42.86	33.55	32.64	19.92	B						
987	2004/12/27	20	20	19.8	19.9	20.4	19.7	28.57	31.89	32.39	19.93	S	20.00			0.0285		
988	2004/12/28	19.8	20	19.8	19.8	20.4	19.7	14.29	26.02	30.27	19.97		19.8	-1.58			0.087615	
989	2004/12/29	19.9	20.3	19.9	20.2	20.3	19.7	83.33	45.13	35.22	19.79	B						
990	2004/12/30	20.3	20.3	20.1	20.2	20.3	19.7	83.33	57.86	42.77	19.78		20.30			0.028927499		
991	2004/12/31	20.3	20.5	20.1	20.5	20.5	19.8	100.00	71.91	52.48	19.90	S		20.5	0.40			0.0907125
										Return	-53.79%			80	80	-53.79	3.67	11.32
										cost	14.99							
										Var	0.503%							

T8: The abstract of calculation process for 2303 strategy D9β

No	Date	Open	High	Low	Close	9DHigh	9DLow	RSV	K	D	KD cross	B/S	Buy price	Sell price	Return rate	Tax for buying	Tax for selling	
1	2001/01/02	46.8	50	45.8	49.6	50.0	42.3	94.81	69.96	50.41	43.17	B	46.80			0.06669		
2	2001/01/03	48	49	47.5	48.3	50.0	42.3	77.92	72.62	57.81	44.47							
3	2001/01/04	50.5	51.5	49.6	50.5	51.5	42.3	89.13	78.12	64.58	45.75							
4	2001/01/05	50.5	53	50	52	53.0	43.6	89.36	81.87	70.34	48.05							
5	2001/01/08	51	52.5	50.5	50.5	53.0	43.6	73.40	79.05	73.25	49.39							
6	2001/01/09	50.5	53	50.5	53	53.0	45.0	100.00	86.03	77.51	49.84							
7	2001/01/10	53	53.5	51.5	52	53.5	45.8	80.52	84.19	79.74	51.25							
8	2001/01/11	52.5	53.5	51	51.5	53.5	45.8	74.03	80.80	80.09	51.86	SB	51.50	51.00	8.34	0.0733875	0.225675	
9	2001/01/12	52	53	51.5	52	53.5	45.8	80.52	80.71	80.30	51.92	SB	52.00	51.50	-0.58	0.0741	0.2278875	
10	2001/01/15	52	53	51.5	53	53.5	47.5	91.67	84.36	81.65	52.07	SB	53.00	51.50	-1.54	0.075525	0.2278875	
11	2001/01/16	53.5	56.5	53.5	56.5	56.5	49.6	100.00	89.57	84.29	54.69							
12	2001/01/17	57.5	59	57	59	59.0	50.0	100.00	93.05	87.21	56.80							
13	2001/01/18	59.5	59.5	57.5	58.5	59.5	50.5	88.89	91.66	88.70	57.95							
14	2001/01/29	58.5	58.5	54.5	54.5	59.5	50.5	44.44	75.92	84.44	59.63	S		57.5	7.86		0.2544375	
15	2001/01/30	54.5	56.5	54	56.5	59.5	51.0	64.71	72.18	80.35	59.22							
.....																		
978	2004/12/14	19.9	20.1	19.8	20	20.6	19.7	33.33	25.91	29.21	20.02							
979	2004/12/15	20.1	20.4	20	20.3	20.6	19.7	66.67	39.50	32.64	19.87	B	20.10			0.0286425		
980	2004/12/16	20.3	20.4	20.1	20.2	20.5	19.7	62.50	47.16	37.48	19.84							
981	2004/12/17	20.2	20.3	20.1	20.1	20.5	19.7	50.00	48.11	41.02	19.91							
982	2004/12/20	19.9	20	19.7	19.8	20.4	19.7	14.29	36.83	39.63	20.02	S		19.9	-1.57		0.0880575	
983	2004/12/21	19.9	20	19.8	19.8	20.4	19.7	14.29	29.32	36.19	20.05							
984	2004/12/22	19.9	20.1	19.9	19.9	20.4	19.7	28.57	29.07	33.82	20.00	BS	20.10	19.90	-1.57	0.0286425	0.088057498	
985	2004/12/23	19.9	20	19.8	19.9	20.4	19.7	28.57	28.90	32.18	19.97							
986	2004/12/24	19.9	20	19.8	20	20.4	19.7	42.86	33.55	32.64	19.92	B	20.00			0.0285		
987	2004/12/27	20	20	19.8	19.9	20.4	19.7	28.57	31.89	32.39	19.93	S		19.9	-1.08		0.0880575	
988	2004/12/28	19.8	20	19.8	19.8	20.4	19.7	14.29	26.02	30.27	19.97	BS	20.00	19.80	-1.58	0.0285	0.087614997	
989	2004/12/29	19.9	20.3	19.9	20.2	20.3	19.7	83.33	45.13	35.22	19.79	B	20.00			0.0285		
990	2004/12/30	20.3	20.3	20.1	20.2	20.3	19.7	83.33	57.86	42.77	19.78							
991	2004/12/31	20.3	20.5	20.1	20.5	20.5	19.8	100.00	71.91	52.48	19.90	S		20.5	1.90		0.0907125	
										Return	105.19%			196	196	105.19	7.75	24.34
										cost	32.08							
										Var	0.276%							

T9: The abstract of calculation process for 2303 strategy D9y

No	Date	Open	High	Low	Close	9DHigh	9DLow	RSV	K	D	KD cross	B/S	Buy price	Sell price	Return rate	Tax for buying	Tax for selling	
1	2001/01/02	46.8	50	45.8	49.6	50.0	42.3	94.81	69.96	50.41	43.17	B	46.8			0.06669		
2	2001/01/03	48	49	47.5	48.3	50.0	42.3	77.92	72.62	57.81	44.47							
3	2001/01/04	50.5	51.5	49.6	50.5	51.5	42.3	89.13	78.12	64.58	45.75							
4	2001/01/05	50.5	53	50	52	53.0	43.6	89.36	81.87	70.34	48.05							
5	2001/01/08	51	52.5	50.5	50.5	53.0	43.6	73.40	79.05	73.25	49.39							
6	2001/01/09	50.5	53	50.5	53	53.0	45.0	100.00	86.03	77.51	49.84							
7	2001/01/10	53	53.5	51.5	52	53.5	45.8	80.52	84.19	79.74	51.25							
8	2001/01/11	52.5	53.5	51	51.5	53.5	45.8	74.03	80.80	80.09	51.86							
9	2001/01/12	52	53	51.5	52	53.5	45.8	80.52	80.71	80.30	51.92							
10	2001/01/15	52	53	51.5	53	53.5	47.5	91.67	84.36	81.65	52.07							
11	2001/01/16	53.5	56.5	53.5	56.5	56.5	49.6	100.00	89.57	84.29	54.69							
12	2001/01/17	57.5	59	57	59	59.0	50.0	100.00	93.05	87.21	56.80							
13	2001/01/18	59.5	59.5	57.5	58.5	59.5	50.5	88.89	91.66	88.70	57.95							
14	2001/01/29	58.5	58.5	54.5	54.5	59.5	50.5	44.44	75.92	84.44	59.63	S		54.5	15.77		0.2411625	
15	2001/01/30	54.5	56.5	54	56.5	59.5	51.0	64.71	72.18	80.35	59.22							
.....																		
978	2004/12/14	19.9	20.1	19.8	20	20.6	19.7	33.33	25.91	29.21	20.02							
979	2004/12/15	20.1	20.4	20	20.3	20.6	19.7	66.67	39.50	32.64	19.87	B	20.3			0.0289275		
980	2004/12/16	20.3	20.4	20.1	20.2	20.5	19.7	62.50	47.16	37.48	19.84							
981	2004/12/17	20.2	20.3	20.1	20.1	20.5	19.7	50.00	48.11	41.02	19.91							
982	2004/12/20	19.9	20	19.7	19.8	20.4	19.7	14.29	36.83	39.63	20.02	S		19.8	-3.03		0.087615	
983	2004/12/21	19.9	20	19.8	19.8	20.4	19.7	14.29	29.32	36.19	20.05							
984	2004/12/22	19.9	20.1	19.9	19.9	20.4	19.7	28.57	29.07	33.82	20.00							
985	2004/12/23	19.9	20	19.8	19.9	20.4	19.7	28.57	28.90	32.18	19.97							
986	2004/12/24	19.9	20	19.8	20	20.4	19.7	42.86	33.55	32.64	19.92	B	20			0.0285		
987	2004/12/27	20	20	19.8	19.9	20.4	19.7	28.57	31.89	32.39	19.93	S		19.9	-1.08		0.088057498	
988	2004/12/28	19.8	20	19.8	19.8	20.4	19.7	14.29	26.02	30.27	19.97							
989	2004/12/29	19.9	20.3	19.9	20.2	20.3	19.7	83.33	45.13	35.22	19.79	B	20.2			0.028785		
990	2004/12/30	20.3	20.3	20.1	20.2	20.3	19.7	83.33	57.86	42.77	19.78							
991	2004/12/31	20.3	20.5	20.1	20.5	20.5	19.8	100.00	71.91	52.48	19.90	S		20.5	0.89		0.0907125	
										Return	18.43%			80	80	18.43	3.66	11.45
										cost	15.11							
										Var	0.513%							

T10: The abstract of calculation process for 2303 strategy W4 α

No	Date	Open	High	Low	Close	4WHigh	4WLow	RSV	K	D	KD cross	B/S	Buy price	Sell price	Return rate	Tax for buying	Tax for selling	
1	2001/01/05	46.8	53	45.8	52	53.5	42.3	86.61	46.69	32.88	42.89		46.80			0.066689999		
2	2001/01/12	51	53.5	50.5	52	53.5	42.3	86.61	60.00	41.92	42.95							
3	2001/01/18	52	59.5	51.5	58.5	59.5	43.6	93.71	71.24	51.69	45.60							
4	2001/02/02	58.5	60	54	58.5	60.0	45.8	89.44	77.30	60.23	49.50							
5	2001/02/09	57.5	58	52	54.5	60.0	50.5	42.11	65.57	62.01	55.71							
6	2001/02/16	54	61.5	54	59.5	61.5	51.5	80.00	70.38	64.80	56.86							
7	2001/02/23	58	61	54	54.5	61.5	52.0	26.32	55.69	61.76	59.02	S						
8	2001/03/02	54	54.5	50	51	61.5	50.0	8.70	40.03	54.52	59.60			54	14.71		0.23895	
9	2001/03/09	51	56	50.5	53.5	61.5	50.0	30.43	36.83	48.62	58.30							
10	2001/03/16	52	55.5	51	54	61.0	50.0	36.36	36.67	44.64	56.66							
11	2001/03/23	53.5	55.5	51.5	54.5	56.0	50.0	75.00	49.45	46.24	52.39	B						
12	2001/03/30	55.5	56.5	52.5	53	56.5	50.5	41.67	46.86	46.45	53.24		55.50			0.0790875		
13	2001/04/06	53	53	48.5	49.5	56.5	48.5	12.50	35.40	42.77	53.10	S						
14	2001/04/13	49	51.5	47.3	50	56.5	47.3	29.35	33.38	39.64	52.10			49	-12.23		0.216825	
.....																		
193	2004/10/01	20.7	20.9	20.3	20.9	22.4	20.3	28.57	21.19	27.14	21.12							
194	2004/10/08	21.3	21.6	20.6	20.7	22.4	20.3	19.05	20.47	24.92	21.01							
195	2004/10/15	20.5	20.7	20	20	21.6	20.0	0.00	13.65	21.16	20.58							
196	2004/10/22	20.1	20.6	19.8	20.3	21.6	19.8	27.78	18.36	20.23	20.23							
197	2004/10/29	20	20.2	19.3	20.2	21.6	19.3	39.13	25.28	21.91	19.65	B						
198	2004/11/05	20.2	21.4	19.5	21.2	21.4	19.3	90.48	47.01	30.28	19.23		20.20			0.028785001		
199	2004/11/12	21.2	21.2	20.1	20.5	21.4	19.3	57.14	50.39	36.98	19.51							
200	2004/11/19	20.6	21.9	20.4	21.5	21.9	19.3	84.62	61.80	45.25	19.62							
201	2004/11/26	21.2	21.3	20	20	21.9	19.5	20.83	48.14	46.22	20.52							
202	2004/12/03	20	20.6	19.8	20.4	21.9	19.8	28.57	41.62	44.69	20.87	S						
203	2004/12/10	20.4	20.5	19.8	19.9	21.9	19.8	4.76	29.33	39.57	21.06			20.4	0.40		0.090269998	
204	2004/12/17	20	20.4	19.7	20.1	21.3	19.7	25.00	27.89	35.67	20.52							
205	2004/12/24	19.9	20.1	19.7	20	20.6	19.7	33.33	29.70	33.68	20.07							
206	2004/12/31	20	20.5	19.8	20.5	20.5	19.7	100.00	53.14	40.17	19.81							
											Return	-79.52%	27	27	-79.52	1.30	3.89	
											cost	5.19						
											Var	2.192%						

T11: The abstract of calculation process for 2303 strategy W4β

No	Date	Open	High	Low	Close	4WHigh	4WLow	RSV	K	D	KD cross	B/S	Buy price	Sell price	Return rate	Tax for buying	Tax for selling	
1	2001/01/05	46.8	53	45.8	52	53.5	42.3	86.61	46.69	32.88	42.89	B	45.10			0.0642675		
2	2001/01/12	51	53.5	50.5	52	53.5	42.3	86.61	60.00	41.92	42.95							
3	2001/01/18	52	59.5	51.5	58.5	59.5	43.6	93.71	71.24	51.69	45.60							
4	2001/02/02	58.5	60	54	58.5	60.0	45.8	89.44	77.30	60.23	49.50							
5	2001/02/09	57.5	58	52	54.5	60.0	50.5	42.11	65.57	62.01	55.71							
6	2001/02/16	54	61.5	54	59.5	61.5	51.5	80.00	70.38	64.80	56.86	SB	59.50	55.50	22.34	0.0847875	0.2455875	
7	2001/02/23	58	61	54	54.5	61.5	52.0	26.32	55.69	61.76	59.02	S		56.5	-5.60		0.2500125	
8	2001/03/02	54	54.5	50	51	61.5	50.0	8.70	40.03	54.52	59.60							
9	2001/03/09	51	56	50.5	53.5	61.5	50.0	30.43	36.83	48.62	58.30							
10	2001/03/16	52	55.5	51	54	61.0	50.0	36.36	36.67	44.64	56.66							
11	2001/03/23	53.5	55.5	51.5	54.5	56.0	50.0	75.00	49.45	46.24	52.39							
12	2001/03/30	55.5	56.5	52.5	53	56.5	50.5	41.67	46.86	46.45	53.24	B	52.50			0.0748125		
13	2001/04/06	53	53	48.5	49.5	56.5	48.5	12.50	35.40	42.77	53.10	S		53	0.36		0.234525	
14	2001/04/13	49	51.5	47.3	50	56.5	47.3	29.35	33.38	39.64	52.10							
.....																		
193	2004/10/01	20.7	20.9	20.3	20.9	22.4	20.3	28.57	21.19	27.14	21.12							
194	2004/10/08	21.3	21.6	20.6	20.7	22.4	20.3	19.05	20.47	24.92	21.01	BS	21.20	20.70	-2.93	0.03021	0.091597503	
195	2004/10/15	20.5	20.7	20	20	21.6	20.0	0.00	13.65	21.16	20.58							
196	2004/10/22	20.1	20.6	19.8	20.3	21.6	19.8	27.78	18.36	20.23	20.23	BS	20.60	20.30	-2.03	0.029355	0.089827497	
197	2004/10/29	20	20.2	19.3	20.2	21.6	19.3	39.13	25.28	21.91	19.65							
198	2004/11/05	20.2	21.4	19.5	21.2	21.4	19.3	90.48	47.01	30.28	19.23	B	19.70			0.0280725		
199	2004/11/12	21.2	21.2	20.1	20.5	21.4	19.3	57.14	50.39	36.98	19.51							
200	2004/11/19	20.6	21.9	20.4	21.5	21.9	19.3	84.62	61.80	45.25	19.62							
201	2004/11/26	21.2	21.3	20	20	21.9	19.5	20.83	48.14	46.22	20.52							
202	2004/12/03	20	20.6	19.8	20.4	21.9	19.8	28.57	41.62	44.69	20.87	S		20.5	3.45		0.0907125	
203	2004/12/10	20.4	20.5	19.8	19.9	21.9	19.8	4.76	29.33	39.57	21.06							
204	2004/12/17	20	20.4	19.7	20.1	21.3	19.7	25.00	27.89	35.67	20.52							
205	2004/12/24	19.9	20.1	19.7	20	20.6	19.7	33.33	29.70	33.68	20.07							
206	2004/12/31	20	20.5	19.8	20.5	20.5	19.7	100.00	53.14	40.17	19.81							
										Return	100.08%			55	55	100.08	2.50	7.91
										cost	10.41							
										Var	1.876%							

T12: The abstract of calculation process for 2303 strategy W4γ

No	Date	Open	High	Low	Close	4WHigh	4WLow	RSV	K	D	KD cross	B/S	Buy price	Sell price	Return rate	Tax for buying	Tax for selling	
1	2001/01/05	46.8	53	45.8	52	53.5	42.3	86.61	46.69	32.88	42.89	B	52			0.0741		
2	2001/01/12	51	53.5	50.5	52	53.5	42.3	86.61	60.00	41.92	42.95							
3	2001/01/18	52	59.5	51.5	58.5	59.5	43.6	93.71	71.24	51.69	45.60							
4	2001/02/02	58.5	60	54	58.5	60.0	45.8	89.44	77.30	60.23	49.50							
5	2001/02/09	57.5	58	52	54.5	60.0	50.5	42.11	65.57	62.01	55.71							
6	2001/02/16	54	61.5	54	59.5	61.5	51.5	80.00	70.38	64.80	56.86							
7	2001/02/23	58	61	54	54.5	61.5	52.0	26.32	55.69	61.76	59.02	S		54.5	4.20		0.2411625	
8	2001/03/02	54	54.5	50	51	61.5	50.0	8.70	40.03	54.52	59.60							
9	2001/03/09	51	56	50.5	53.5	61.5	50.0	30.43	36.83	48.62	58.30							
10	2001/03/16	52	55.5	51	54	61.0	50.0	36.36	36.67	44.64	56.66							
11	2001/03/23	53.5	55.5	51.5	54.5	56.0	50.0	75.00	49.45	46.24	52.39							
12	2001/03/30	55.5	56.5	52.5	53	56.5	50.5	41.67	46.86	46.45	53.24	B	53			0.075525		
13	2001/04/06	53	53	48.5	49.5	56.5	48.5	12.50	35.40	42.77	53.10	S		49.5	-7.15		0.2190375	
14	2001/04/13	49	51.5	47.3	50	56.5	47.3	29.35	33.38	39.64	52.10							
.....																		
193	2004/10/01	20.7	20.9	20.3	20.9	22.4	20.3	28.57	21.19	27.14	21.12							
194	2004/10/08	21.3	21.6	20.6	20.7	22.4	20.3	19.05	20.47	24.92	21.01							
195	2004/10/15	20.5	20.7	20	20	21.6	20.0	0.00	13.65	21.16	20.58							
196	2004/10/22	20.1	20.6	19.8	20.3	21.6	19.8	27.78	18.36	20.23	20.23							
197	2004/10/29	20	20.2	19.3	20.2	21.6	19.3	39.13	25.28	21.91	19.65							
198	2004/11/05	20.2	21.4	19.5	21.2	21.4	19.3	90.48	47.01	30.28	19.23	B	21.2			0.03021		
199	2004/11/12	21.2	21.2	20.1	20.5	21.4	19.3	57.14	50.39	36.98	19.51							
200	2004/11/19	20.6	21.9	20.4	21.5	21.9	19.3	84.62	61.80	45.25	19.62							
201	2004/11/26	21.2	21.3	20	20	21.9	19.5	20.83	48.14	46.22	20.52							
202	2004/12/03	20	20.6	19.8	20.4	21.9	19.8	28.57	41.62	44.69	20.87	S		20.4	-4.34		0.090269998	
203	2004/12/10	20.4	20.5	19.8	19.9	21.9	19.8	4.76	29.33	39.57	21.06							
204	2004/12/17	20	20.4	19.7	20.1	21.3	19.7	25.00	27.89	35.67	20.52							
205	2004/12/24	19.9	20.1	19.7	20	20.6	19.7	33.33	29.70	33.68	20.07							
206	2004/12/31	20	20.5	19.8	20.5	20.5	19.7	100.00	53.14	40.17	19.81							
										Return	-41.78%			23	23	-41.78	1.13	3.41
										cost	4.54							
										Var	2.143%							

T13: The abstract of calculation process for 2303 strategy W6α

No	Date	Open	High	Low	Close	6WHigh	6WLow	RSV	K	D	KD cross	B/S	Buy price	Sell price	Return rate	Tax for buying	Tax for selling	
1	2001/01/05	46.8	53	45.8	52	57.5	42.3	63.82	35.02	26.62	43.79	B						
2	2001/01/12	51	53.5	50.5	52	53.5	42.3	86.61	52.21	35.15	42.42		51.00			0.072675		
3	2001/01/18	52	59.5	51.5	58.5	59.5	42.3	94.19	66.20	45.50	43.01							
4	2001/02/02	58.5	60	54	58.5	60.0	42.3	91.53	74.65	55.22	45.20							
5	2001/02/09	57.5	58	52	54.5	60.0	43.6	66.46	71.92	60.78	49.92							
6	2001/02/16	54	61.5	54	59.5	61.5	45.8	87.26	77.03	66.20	52.79							
7	2001/02/23	58	61	54	54.5	61.5	50.5	36.36	63.48	65.29	58.08	S						
8	2001/03/02	54	54.5	50	51	61.5	50.0	8.70	45.22	58.60	59.82			54	5.26		0.23895	
9	2001/03/09	51	56	50.5	53.5	61.5	50.0	30.43	40.29	52.50	58.84							
10	2001/03/16	52	55.5	51	54	61.5	50.0	34.78	38.45	47.82	57.65							
11	2001/03/23	53.5	55.5	51.5	54.5	61.5	50.0	39.13	38.68	44.77	56.55							
12	2001/03/30	55.5	56.5	52.5	53	61.0	50.0	27.27	34.88	41.47	56.01							
13	2001/04/06	53	53	48.5	49.5	56.5	48.5	12.50	27.42	36.79	52.94							
14	2001/04/13	49	51.5	47.3	50	56.5	47.3	29.35	28.06	33.88	51.49							
.....																		
193	2004/10/01	20.7	20.9	20.3	20.9	24.1	20.3	15.79	16.78	24.10	21.77							
194	2004/10/08	21.3	21.6	20.6	20.7	23.9	20.3	11.11	14.89	21.03	21.50							
195	2004/10/15	20.5	20.7	20	20	22.4	20.0	0.00	9.93	17.33	20.77							
196	2004/10/22	20.1	20.6	19.8	20.3	22.4	19.8	19.23	13.03	15.90	20.36							
197	2004/10/29	20	20.2	19.3	20.2	21.6	19.3	39.13	21.73	17.84	19.53	B						
198	2004/11/05	20.2	21.4	19.5	21.2	21.6	19.3	82.61	42.02	25.90	19.15		20.20			0.028785001		
199	2004/11/12	21.2	21.2	20.1	20.5	21.6	19.3	52.17	45.41	32.40	19.45							
200	2004/11/19	20.6	21.9	20.4	21.5	21.9	19.3	84.62	58.48	41.09	19.46							
201	2004/11/26	21.2	21.3	20	20	21.9	19.3	26.92	47.96	43.38	20.19							
202	2004/12/03	20	20.6	19.8	20.4	21.9	19.3	42.31	46.07	44.28	20.36							
203	2004/12/10	20.4	20.5	19.8	19.9	21.9	19.5	16.67	36.27	41.61	20.75	S						
204	2004/12/17	20	20.4	19.7	20.1	21.9	19.7	18.18	30.24	37.82	20.87			20	-1.57		0.0885	
205	2004/12/24	19.9	20.1	19.7	20	21.9	19.7	13.64	24.71	33.45	20.82							
206	2004/12/31	20	20.5	19.8	20.5	21.3	19.7	50.00	33.14	33.35	20.24							
										Return	-43.02%			22	22	-43.02	1.06	3.19
										cost	4.26							
										Var	2.530%							

T14: The abstract of calculation process for 2303 strategy W6β

No	Date	Open	High	Low	Close	6WHigh	6WLow	RSV	K	D	KD cross	B/S	Buy price	Sell price	Return rate	Tax for buying	Tax for selling	
1	2001/01/05	46.8	53	45.8	52	57.5	42.3	63.82	35.02	26.62	43.79	B	46.30			0.0659775		
2	2001/01/12	51	53.5	50.5	52	53.5	42.3	86.61	52.21	35.15	42.42							
3	2001/01/18	52	59.5	51.5	58.5	59.5	42.3	94.19	66.20	45.50	43.01							
4	2001/02/02	58.5	60	54	58.5	60.0	42.3	91.53	74.65	55.22	45.20							
5	2001/02/09	57.5	58	52	54.5	60.0	43.6	66.46	71.92	60.78	49.92							
6	2001/02/16	54	61.5	54	59.5	61.5	45.8	87.26	77.03	66.20	52.79							
7	2001/02/23	58	61	54	54.5	61.5	50.5	36.36	63.48	65.29	58.08							
8	2001/03/02	54	54.5	50	51	61.5	50.0	8.70	45.22	58.60	59.82	S		58	24.54		0.25665	
9	2001/03/09	51	56	50.5	53.5	61.5	50.0	30.43	40.29	52.50	58.84							
10	2001/03/16	52	55.5	51	54	61.5	50.0	34.78	38.45	47.82	57.65							
11	2001/03/23	53.5	55.5	51.5	54.5	61.5	50.0	39.13	38.68	44.77	56.55							
12	2001/03/30	55.5	56.5	52.5	53	61.0	50.0	27.27	34.88	41.47	56.01							
13	2001/04/06	53	53	48.5	49.5	56.5	48.5	12.50	27.42	36.79	52.94							
14	2001/04/13	49	51.5	47.3	50	56.5	47.3	29.35	28.06	33.88	51.49							
.....																		
193	2004/10/01	20.7	20.9	20.3	20.9	24.1	20.3	15.79	16.78	24.10	21.77							
194	2004/10/08	21.3	21.6	20.6	20.7	23.9	20.3	11.11	14.89	21.03	21.50							
195	2004/10/15	20.5	20.7	20	20	22.4	20.0	0.00	9.93	17.33	20.77							
196	2004/10/22	20.1	20.6	19.8	20.3	22.4	19.8	19.23	13.03	15.90	20.36							
197	2004/10/29	20	20.2	19.3	20.2	21.6	19.3	39.13	21.73	17.84	19.53							
198	2004/11/05	20.2	21.4	19.5	21.2	21.6	19.3	82.61	42.02	25.90	19.15	B	19.60			0.02793		
199	2004/11/12	21.2	21.2	20.1	20.5	21.6	19.3	52.17	45.41	32.40	19.45							
200	2004/11/19	20.6	21.9	20.4	21.5	21.9	19.3	84.62	58.48	41.09	19.46							
201	2004/11/26	21.2	21.3	20	20	21.9	19.3	26.92	47.96	43.38	20.19							
202	2004/12/03	20	20.6	19.8	20.4	21.9	19.3	42.31	46.07	44.28	20.36	SB	20.40	20.10	1.95	0.029069999	0.0889425	
203	2004/12/10	20.4	20.5	19.8	19.9	21.9	19.5	16.67	36.27	41.61	20.75	S		20.3	-1.07		0.0898275	
204	2004/12/17	20	20.4	19.7	20.1	21.9	19.7	18.18	30.24	37.82	20.87							
205	2004/12/24	19.9	20.1	19.7	20	21.9	19.7	13.64	24.71	33.45	20.82							
206	2004/12/31	20	20.5	19.8	20.5	21.3	19.7	50.00	33.14	33.35	20.24							
										Return cost Var	77.06% 8.81 1.229%	49	49	77.06	2.11	6.70		

T15: The abstract of calculation process for 2303 strategy W6γ

No	Date	Open	High	Low	Close	6WHigh	6WLow	RSV	K	D	KD cross	B/S	Buy price	Sell price	Return rate	Tax for buying	Tax for selling	
1	2001/01/05	46.8	53	45.8	52	57.5	42.3	63.82	35.02	26.62	43.79	B	52			0.0741		
2	2001/01/12	51	53.5	50.5	52	53.5	42.3	86.61	52.21	35.15	42.42							
3	2001/01/18	52	59.5	51.5	58.5	59.5	42.3	94.19	66.20	45.50	43.01							
4	2001/02/02	58.5	60	54	58.5	60.0	42.3	91.53	74.65	55.22	45.20							
5	2001/02/09	57.5	58	52	54.5	60.0	43.6	66.46	71.92	60.78	49.92							
6	2001/02/16	54	61.5	54	59.5	61.5	45.8	87.26	77.03	66.20	52.79							
7	2001/02/23	58	61	54	54.5	61.5	50.5	36.36	63.48	65.29	58.08							
8	2001/03/02	54	54.5	50	51	61.5	50.0	8.70	45.22	58.60	59.82	S		51	-2.50		0.225675	
9	2001/03/09	51	56	50.5	53.5	61.5	50.0	30.43	40.29	52.50	58.84							
10	2001/03/16	52	55.5	51	54	61.5	50.0	34.78	38.45	47.82	57.65							
11	2001/03/23	53.5	55.5	51.5	54.5	61.5	50.0	39.13	38.68	44.77	56.55							
12	2001/03/30	55.5	56.5	52.5	53	61.0	50.0	27.27	34.88	41.47	56.01							
13	2001/04/06	53	53	48.5	49.5	56.5	48.5	12.50	27.42	36.79	52.94							
14	2001/04/13	49	51.5	47.3	50	56.5	47.3	29.35	28.06	33.88	51.49							
.....																		
193	2004/10/01	20.7	20.9	20.3	20.9	24.1	20.3	15.79	16.78	24.10	21.77							
194	2004/10/08	21.3	21.6	20.6	20.7	23.9	20.3	11.11	14.89	21.03	21.50							
195	2004/10/15	20.5	20.7	20	20	22.4	20.0	0.00	9.93	17.33	20.77							
196	2004/10/22	20.1	20.6	19.8	20.3	22.4	19.8	19.23	13.03	15.90	20.36							
197	2004/10/29	20	20.2	19.3	20.2	21.6	19.3	39.13	21.73	17.84	19.53							
198	2004/11/05	20.2	21.4	19.5	21.2	21.6	19.3	82.61	42.02	25.90	19.15	B	21.2			0.03021		
199	2004/11/12	21.2	21.2	20.1	20.5	21.6	19.3	52.17	45.41	32.40	19.45							
200	2004/11/19	20.6	21.9	20.4	21.5	21.9	19.3	84.62	58.48	41.09	19.46							
201	2004/11/26	21.2	21.3	20	20	21.9	19.3	26.92	47.96	43.38	20.19							
202	2004/12/03	20	20.6	19.8	20.4	21.9	19.3	42.31	46.07	44.28	20.36							
203	2004/12/10	20.4	20.5	19.8	19.9	21.9	19.5	16.67	36.27	41.61	20.75	S		19.9	-6.68		0.0880575	
204	2004/12/17	20	20.4	19.7	20.1	21.9	19.7	18.18	30.24	37.82	20.87							
205	2004/12/24	19.9	20.1	19.7	20	21.9	19.7	13.64	24.71	33.45	20.82							
206	2004/12/31	20	20.5	19.8	20.5	21.3	19.7	50.00	33.14	33.35	20.24							
										Return	-47.79%	20	20	-47.79	0.99	2.99		
										cost	3.98							
										Var	2.486%							

T16: The abstract of calculation process for 2303 strategy W9α

No	Date	Open	High	Low	Close	9WHigh	9WLow	RSV	K	D	KD cross	B/S	Buy price	Sell price	Return rate	Tax for buying	Tax for selling
1	2001/01/05	46.8	53	45.8	52	70.0	42.3	35.02	21.30	18.82	46.14	B					
2	2001/01/12	51	53.5	50.5	52	64.5	42.3	43.69	28.76	22.13	44.27		51.00			0.072675	
3	2001/01/18	52	59.5	51.5	58.5	59.5	42.3	94.19	50.57	31.61	41.22						
4	2001/02/02	58.5	60	54	58.5	60.0	42.3	91.53	64.22	42.48	42.12						
5	2001/02/09	57.5	58	52	54.5	60.0	42.3	68.93	65.79	50.25	45.69						
6	2001/02/16	54	61.5	54	59.5	61.5	42.3	89.58	73.72	58.07	47.44						
7	2001/02/23	58	61	54	54.5	61.5	42.3	63.54	70.33	62.16	51.10						
8	2001/03/02	54	54.5	50	51	61.5	43.6	41.34	60.67	61.66	54.99	S					
9	2001/03/09	51	56	50.5	53.5	61.5	45.8	49.04	56.79	60.04	56.25			51	-0.58		0.225675
10	2001/03/16	52	55.5	51	54	61.5	50.0	34.78	49.46	56.51	58.12						
11	2001/03/23	53.5	55.5	51.5	54.5	61.5	50.0	39.13	46.01	53.01	57.71						
12	2001/03/30	55.5	56.5	52.5	53	61.5	50.0	26.09	39.37	48.46	57.66						
13	2001/04/06	53	53	48.5	49.5	61.5	48.5	7.69	28.81	41.91	57.36						
14	2001/04/13	49	51.5	47.3	50	61.5	47.3	19.01	25.55	36.46	55.58						
15	2001/04/20	50	54.5	49	53.5	61.0	47.3	45.26	32.12	35.01	52.89						
.....																	
193	2004/10/01	20.7	20.9	20.3	20.9	24.1	20.3	15.79	18.58	23.33	21.55						
194	2004/10/08	21.3	21.6	20.6	20.7	24.1	20.3	10.53	15.89	20.85	21.47						
195	2004/10/15	20.5	20.7	20	20	24.1	20.0	0.00	10.60	17.43	21.28						
196	2004/10/22	20.1	20.6	19.8	20.3	24.1	19.8	11.63	10.94	15.27	20.83						
197	2004/10/29	20	20.2	19.3	20.2	23.9	19.3	19.57	13.81	14.78	20.07						
198	2004/11/05	20.2	21.4	19.5	21.2	22.4	19.3	61.29	29.64	19.74	19.30	B					
199	2004/11/12	21.2	21.2	20.1	20.5	22.4	19.3	38.71	32.66	24.05	19.51		21.20			0.030210001	
200	2004/11/19	20.6	21.9	20.4	21.5	21.9	19.3	84.62	49.98	32.69	19.25						
201	2004/11/26	21.2	21.3	20	20	21.9	19.3	26.92	42.29	35.89	19.90						
202	2004/12/03	20	20.6	19.8	20.4	21.9	19.3	42.31	42.30	38.03	20.07						
203	2004/12/10	20.4	20.5	19.8	19.9	21.9	19.3	23.08	35.89	37.32	20.34	S					
204	2004/12/17	20	20.4	19.7	20.1	21.9	19.3	30.77	34.18	36.27	20.35			20	-6.21		0.0885
205	2004/12/24	19.9	20.1	19.7	20	21.9	19.3	26.92	31.76	34.77	20.36						
206	2004/12/31	20	20.5	19.8	20.5	21.9	19.5	41.67	35.06	34.87	20.33						
										Return	-41.73%		18	18	-41.73	0.84	2.52
										cost	3.36						
										Var	3.004%						

T17: The abstract of calculation process for 2303 strategy W9β

No	Date	Open	High	Low	Close	9WHigh	9WLow	RSV	K	D	KD cross	B/S	Buy price	Sell price	Return rate	Tax for buying	Tax for selling	
1	2001/01/05	46.8	53	45.8	52	70.0	42.3	35.02	21.30	18.82	46.14	B	49.00			0.069825		
2	2001/01/12	51	53.5	50.5	52	64.5	42.3	43.69	28.76	22.13	44.27							
3	2001/01/18	52	59.5	51.5	58.5	59.5	42.3	94.19	50.57	31.61	41.22							
4	2001/02/02	58.5	60	54	58.5	60.0	42.3	91.53	64.22	42.48	42.12							
5	2001/02/09	57.5	58	52	54.5	60.0	42.3	68.93	65.79	50.25	45.69							
6	2001/02/16	54	61.5	54	59.5	61.5	42.3	89.58	73.72	58.07	47.44							
7	2001/02/23	58	61	54	54.5	61.5	42.3	63.54	70.33	62.16	51.10							
8	2001/03/02	54	54.5	50	51	61.5	43.6	41.34	60.67	61.66	54.99	S		51	3.47		0.225675	
9	2001/03/09	51	56	50.5	53.5	61.5	45.8	49.04	56.79	60.04	56.25	BS	55.00	53.50	-3.30	0.078375	0.2367375	
10	2001/03/16	52	55.5	51	54	61.5	50.0	34.78	49.46	56.51	58.12							
11	2001/03/23	53.5	55.5	51.5	54.5	61.5	50.0	39.13	46.01	53.01	57.71							
12	2001/03/30	55.5	56.5	52.5	53	61.5	50.0	26.09	39.37	48.46	57.66							
13	2001/04/06	53	53	48.5	49.5	61.5	48.5	7.69	28.81	41.91	57.36							
14	2001/04/13	49	51.5	47.3	50	61.5	47.3	19.01	25.55	36.46	55.58							
15	2001/04/20	50	54.5	49	53.5	61.0	47.3	45.26	32.12	35.01	52.89							
.....																		
193	2004/10/01	20.7	20.9	20.3	20.9	24.1	20.3	15.79	18.58	23.33	21.55							
194	2004/10/08	21.3	21.6	20.6	20.7	24.1	20.3	10.53	15.89	20.85	21.47	BS	21.60	20.70	-4.73	0.03078	0.091597503	
195	2004/10/15	20.5	20.7	20	20	24.1	20.0	0.00	10.60	17.43	21.28							
196	2004/10/22	20.1	20.6	19.8	20.3	24.1	19.8	11.63	10.94	15.27	20.83							
197	2004/10/29	20	20.2	19.3	20.2	23.9	19.3	19.57	13.81	14.78	20.07							
198	2004/11/05	20.2	21.4	19.5	21.2	22.4	19.3	61.29	29.64	19.74	19.30	B	20.10				0.0286425	
199	2004/11/12	21.2	21.2	20.1	20.5	22.4	19.3	38.71	32.66	24.05	19.51							
200	2004/11/19	20.6	21.9	20.4	21.5	21.9	19.3	84.62	49.98	32.69	19.25							
201	2004/11/26	21.2	21.3	20	20	21.9	19.3	26.92	42.29	35.89	19.90							
202	2004/12/03	20	20.6	19.8	20.4	21.9	19.3	42.31	42.30	38.03	20.07	SB	20.40	19.90	-1.57	0.029069999	0.0880575	
203	2004/12/10	20.4	20.5	19.8	19.9	21.9	19.3	23.08	35.89	37.32	20.34	S		20	-2.53		0.0885	
204	2004/12/17	20	20.4	19.7	20.1	21.9	19.3	30.77	34.18	36.27	20.35	BS	20.40	20.10	-2.05	0.02907	0.088942502	
205	2004/12/24	19.9	20.1	19.7	20	21.9	19.3	26.92	31.76	34.77	20.36							
206	2004/12/31	20	20.5	19.8	20.5	21.9	19.5	41.67	35.06	34.87	20.33							
										Return	-11.52%			43	43	-11.52	1.87	5.82
										cost	7.69							
										Var	1.007%							

T18: The abstract of calculation process for 2303 strategy W9γ

No	Date	Open	High	Low	Close	9WHigh	9WLow	RSV	K	D	KD cross	B/S	Buy price	Sell price	Return rate	Tax for buying	Tax for selling	
1	2001/01/05	46.8	53	45.8	52	70.0	42.3	35.02	21.30	18.82	46.14	B	52			0.0741		
2	2001/01/12	51	53.5	50.5	52	64.5	42.3	43.69	28.76	22.13	44.27							
3	2001/01/18	52	59.5	51.5	58.5	59.5	42.3	94.19	50.57	31.61	41.22							
4	2001/02/02	58.5	60	54	58.5	60.0	42.3	91.53	64.22	42.48	42.12							
5	2001/02/09	57.5	58	52	54.5	60.0	42.3	68.93	65.79	50.25	45.69							
6	2001/02/16	54	61.5	54	59.5	61.5	42.3	89.58	73.72	58.07	47.44							
7	2001/02/23	58	61	54	54.5	61.5	42.3	63.54	70.33	62.16	51.10							
8	2001/03/02	54	54.5	50	51	61.5	43.6	41.34	60.67	61.66	54.99	S		51	-2.50		0.225675	
9	2001/03/09	51	56	50.5	53.5	61.5	45.8	49.04	56.79	60.04	56.25							
10	2001/03/16	52	55.5	51	54	61.5	50.0	34.78	49.46	56.51	58.12							
11	2001/03/23	53.5	55.5	51.5	54.5	61.5	50.0	39.13	46.01	53.01	57.71							
12	2001/03/30	55.5	56.5	52.5	53	61.5	50.0	26.09	39.37	48.46	57.66							
13	2001/04/06	53	53	48.5	49.5	61.5	48.5	7.69	28.81	41.91	57.36							
14	2001/04/13	49	51.5	47.3	50	61.5	47.3	19.01	25.55	36.46	55.58							
.....																		
193	2004/10/01	20.7	20.9	20.3	20.9	24.1	20.3	15.79	18.58	23.33	21.55							
194	2004/10/08	21.3	21.6	20.6	20.7	24.1	20.3	10.53	15.89	20.85	21.47							
195	2004/10/15	20.5	20.7	20	20	24.1	20.0	0.00	10.60	17.43	21.28							
196	2004/10/22	20.1	20.6	19.8	20.3	24.1	19.8	11.63	10.94	15.27	20.83							
197	2004/10/29	20	20.2	19.3	20.2	23.9	19.3	19.57	13.81	14.78	20.07							
198	2004/11/05	20.2	21.4	19.5	21.2	22.4	19.3	61.29	29.64	19.74	19.30	B	21.2			0.03021		
199	2004/11/12	21.2	21.2	20.1	20.5	22.4	19.3	38.71	32.66	24.05	19.51							
200	2004/11/19	20.6	21.9	20.4	21.5	21.9	19.3	84.62	49.98	32.69	19.25							
201	2004/11/26	21.2	21.3	20	20	21.9	19.3	26.92	42.29	35.89	19.90							
202	2004/12/03	20	20.6	19.8	20.4	21.9	19.3	42.31	42.30	38.03	20.07							
203	2004/12/10	20.4	20.5	19.8	19.9	21.9	19.3	23.08	35.89	37.32	20.34	S		19.9	-6.68		0.088057498	
204	2004/12/17	20	20.4	19.7	20.1	21.9	19.3	30.77	34.18	36.27	20.35							
205	2004/12/24	19.9	20.1	19.7	20	21.9	19.3	26.92	31.76	34.77	20.36							
206	2004/12/31	20	20.5	19.8	20.5	21.9	19.5	41.67	35.06	34.87	20.33							
											Return	-20.10%	17	17	-20.10	0.80	2.43	
											cost	3.22						
											Var	2.630%						