DOES MARKET TIMING MAKE SENSE IN TAIWAN?

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ABSTRACT

This study investigates whether investors can effectively time the stock market in Taiwan. Test results uniformly favor a simple market timing trading strategy guided by discount rate changes. It outperforms both buy-and-hold and sector rotation strategies in the two subperiods as well as the entire sample period. Thus, this study supports market timing as a time-proven, useful investment tool and discount rate changes as an effective market timing indicator. In contrast, the research casts doubt on sector rotation as a viable market timing strategy, particularly once transaction costs and sector ETFs and mutual funds scarcity in Taiwan are factored in.

Keywords: discount rate changes, market timing, sector rotation, buy and hold, Taiwan

I. INTRODUCTION

Conventional wisdom in finance posits that no one can consistently beat the market. This, in turn, leaves buy and hold as a logical investment choice. However, this strategy has faced its challenges from time to time, most recently in the post-millennium era. Due to the 2000-2002 and 2007-2009 bear markets, a buy-and-hold portfolio formulated at the peak of 2000 in the U.S. would still be in the red today. In contrast, market timers argue that market timing, an actively managed investment strategy, should yield a better performance than a passive buy-and-hold strategy. As a result, market timing strategy has been closely studied in finance literature.

Previous empirical work suggests that stock returns are significantly related to monetary policy changes. Thus, market timers frequently rely on monetary policy indicators such as bank reserves, discount rate, federal funds rate, and money supply as signals to enter or exit the market. If market timing is productive, investors over the dreary past decade might have been better off had they followed certain economic indicators and formed market timing strategies accordingly.

Reference [35] finds that investors can benefit from a market timing trading strategy that is guided by discount rate changes. Specifically, investors following the strategy will enter the market upon an initial discount rate cut and stay fully invested until the rate cut runs its complete course. Once the discount rate change reverses its direction, investors will liquidate their position in the market and switch their entire portfolio holding to riskless assets such as short-term Treasury securities until the next round of discount rate increases. It shows that the formulated market timing trading strategy (the standard market timing trading strategy hereafter) clearly outperforms the benchmark market portfolio. Reference [7] extends [35] to the investigation of seven developed countries and produces similar empirical support for market timing.

Reference [10] suggests that changes in Federal Reserve monetary policy serve as an effective economic indicator to guiding asset allocations. Reference [11] reveals that expansive monetary policy favors cyclical stocks while restrictive monetary policy benefits noncyclical stocks. It, in turn, proposes a sector rotation strategy that bases its asset shifts among U.S. equity sectors on changes in monetary policy. In specific, the monetary-policy-guided portfolio rotates between cyclical industry sectors during expansive monetary periods and noncyclical industry sectors during restrictive monetary periods. It concludes that the monetary policy is successful at guiding the sector rotation strategy, which outperforms the market as a whole.

Extending [11] [35], this study evaluates the performance of the two respectively proposed active trading strategies—standard and sector rotation—against each other as well as in comparison to the buy-and-hold market portfolio. Several factors motivate this study. First of all, empirical evidence addressing the effectiveness of market timing has been mixed. Furthermore, virtually all research on market timing examines data of the U.S. and other developed countries and is at least ten years old. Thus, the resulting empirical findings may not be readily applicable to emerging markets such as Taiwan or to the latest decade in which we have witnessed two catastrophic financial downturns with no significant relief to the second one in sight. In addition, most empirical work is performed on monthly returns, the usage of which has been documented as a plausible cause for the ambiguity surrounding market timing studies. Also, a majority of empirical research in the field either focuses on the market timing ability of mutual funds or involves market timing strategies that require fund allocation among multiple asset classes or sectors or involve the use of complex or proprietary software and thus are not easy or economical for individual investors to duplicate. Last but not least, most market timing studies examine the strategy's effectiveness against a passive benchmark instead of comparing the performance of two active trading strategies with respect to each other.

In light of the observations noted above, this research studies daily security return data from February 1995 to December 2008 in Taiwan, an emerging financial market, for the performance evaluation of two active trading strategies in relation to each other and in comparison to a passive buy-and-hold strategy. This research makes significant contribution to finance literature because its empirical findings would provide more insight into the effectiveness of discount rate changes as a market timing indicator, the merit of market timing, and the superiority/inferiority of the two active trading strategies with respect to each other in terms of risk-return tradeoff. For robustness, the entire sample period is further divided into two subsample periods, pre-March 2000 and post-February 2000 periods, and six evaluation measures are employed for performance analysis and comparison purposes.

The rest of the paper is organized as follows. Section 2 provides literature review. Section 3 covers data and methodology. Section 4 presents empirical findings. Section 5 concludes this study.

II. LITERATURE REVIEW

Significant relationship between monetary policy changes and stock returns in the U.S. and other developed countries are illustrated in [3] [9] [10] [22] [23] [34] [39]. The same conclusion is reached in [8] for the stock market in Taiwan. Justifiably, professionals often rely on monetary policy indicators such as discount rate changes, federal funds target, monetary aggregate, and reserve aggregate, to name a few, to guide their investment decisions. Notably, changes in discount rate are advocated by [28] to signal monetary policy. It cites three main reasons for discount rate changes to be favored as a signal for monetary policy. First, discount rate changes are perceived as a leading indicator for future monetary policy and economic development. Second, discount rate does not undergo changes frequently. This infrequency affords cost effectiveness for trading strategies guided by the indicator. Third, discount rate change's binary (up and down) feature and well-publicized nature make the signal identification easy and unambiguous. Subsequently, [10] [20] [23] [25] [26] adopt the measure and categorize monetary environments accordingly as either expansive or restrictive. General consensus is that stocks produce higher return and exhibit lower return variability following discount rate decreases and turn the opposite upon rate increases.

Reference [21] suggests that monetary policy influences certain industries more greatly than other industries. In general, it finds that high beta stocks perform better than average following discount rate decreases while low beta stocks fare better than average following rate increases. Reference [10] documents that cyclical stocks possess much higher sensitivities to changes in monetary conditions than noncyclical stocks. Reference [11] further shows that cyclical stocks prosper during expansive monetary periods while noncyclical stocks prevail in restrictive monetary environments. Reference [4] promotes a sector rotation strategy that demands investment in the cyclical sectors during economic upswings and in the defensive sectors during economic downturns. Thus, monetary policy shifts signaled by discount rate changes should play a prominent role in sector-based portfolio rotation strategies.

Reference [13], however, finds that the well documented significant relationship between monetary policy and stock market in finance literature has vastly disappeared over the recent past for most of its 16 sample countries, including the U.S. Reference [2] reaches a similar conclusion. Reference [32] also cautions the practice of basing stock return explanation and forecast in various monetary conditions on monetary policy variables. Reference [14] further suggests that investors are unlikely to benefit from exploiting past or anticipated Federal Reserve decisions.

While market timing is a method frequently explored and examined as a potentially effective investment strategy to beat the market, empirical work has produced mixed results. References [1] [6] [12] [15] [17] [31] study mutual fund performance and find little evidence in support of fund managers' market timing ability. In contrast, [29] concludes that fund managers possess superior ability to time the market. Reference [37], based on its observation and dissection of the Dow Jones Industrial Average from January 1946 to December 1991, claims that market timing outperforms buy and hold. However, no guidance is provided in the study for investors to effectively time the market. Reference [27] proposes a discrete regression model (DRM) and argues that market timers following the DRM can enhance their portfolio return by actively rotating their funds between cash and common stocks. Reference [35] finds that a market timing trading strategy guided by discount rate changes outperforms the benchmark market portfolio. In specific, the formulated market timing portfolio calls for a full investment in the market upon an initial discount rate cut and a complete pullout from the market with an exclusive holding of riskless assets instead upon an initial rate increase. Reference [38] illustrates the dominance of a market timing strategy via the use of a proprietary computerized model. Reference [11] shows that expansive monetary policy favors cyclical stocks and restrictive monetary policy benefits noncyclical stocks. It, in turn, proposes a sector rotation strategy and examines the efficiency of the strategy. Under the scheme, industry sectors are first classified into cyclical and noncyclical sectors based on their respective market betas. Investors following this active trading strategy then closely monitor the monetary policy and rotate their portfolio holdings accordingly between the two broad sectors. In essence, an initial discount rate cut signals an exit from the defensive sectors and a simultaneous entrance to the cyclical sectors while an initial discount rate increase prompts exactly the opposite. Empirical evidence derived from the study's sample period of January 1973-December 2005 supports dominance of the sector rotation strategy over two passive strategies, including the buy and hold.

All studies cited above in support of market timing are performed on return data of the U.S. and other developed countries. Thus, the results may not be readily applicable to emerging markets such as Taiwan. This represents a void that merits attention. With the exception of [7] [11], test data examined in the existing studies in favor of market timing are at least 10 years old. For its latter subsample period of 1993-2004, [7] finds some weak evidence backing a simple buy-and-hold strategy. Reference [38] also fails to detect market timing ability over its last subsample period of 1993-1999. Therefore, it is necessary to reexamine the effectiveness of market timing by updating the data set, a point validated by [13] [14]. Using data covering time periods of 1986-2000 and 2001-June 2004, respectively, the two studies portend that Federal Reserve policy no longer bears relevance to stock returns. Reference [15] claims that most standard timing tests are misspecified and yield downward bias due to their usage of monthly instead of daily data. Reference [5] also shows that the timing skill of market timers can be masked when monthly data in lieu of daily data are used.

TABLE 1
Discount Rate Change Series: February 1995-December 2008

Series	Monetary Policy	Date	Discount Rate	Rate Change	Rate Change Sequence in Series
1	Restrictive	02/01/1995	5.8	I	1
2	Expansive	07/01/1995	5.5	D	3
		05/01/1996	5.25	D	
		08/01/1996	5	D	
3	Restrictive	08/01/1997	5.25	I	1
4	Expansive	09/01/1998	5.125	D	4
		11/01/1998	5	D	
		12/01/1998	4.75	D	
		02/01/1999	4.5	D	
5	Restrictive	03/01/2000	4.625	I	2
		06/01/2000	4.75	I	
6	Expansive	12/29/2000	4.625	D	15
		02/02/2001	4.375	D	
		03/06/2001	4.25	D	
		03/30/2001	4.125	D	
		04/23/2001	4	D	
		05/18/2001	3.75	D	
		06/29/2001	3.5	D	
		08/20/2001	3.25	D	
		09/19/2001	2.75	D	
		10/04/2001	2.5	D	
		11/08/2001	2.25	D	
		12/28/2001	2.125	D	
		06/28/2002	1.875	D	
		11/12/2002	1.625	D	
		06/27/2003	1.375	D	
7	Restrictive	10/01/2004	1.625	I	16
		12/31/2004	1.75	I	
		03/25/2005	1.875	I	
		07/01/2005	2	I	
		09/16/2005	2.125	I	
		12/23/2005	2.25	I	
		03/31/2006	2.375	I	
		06/30/2006	2.5	I	
		09/29/2006	2.625	I	
		12/29/2006	2.75	I	
		03/30/2007	2.875	I	
		06/22/2007	3.125	I	
		09/21/2007	3.25	I	
		12/21/2007	3.375	I	
		03/28/2008	3.5	I	
		06/27/2008	3.625	I	
8	Expansive	09/26/2008	3.5	D	5
		10/09/2008	3.25	D	
		10/30/2008	3	D	
		11/10/2008	2.75	D	
		12/12/2008	2	D	

Notes: Discount rate information is retrieved from the Central Bank of China's Web site, www.cbc.gov.tw. Over the full sample period from February 1995 to December 2008, the CBC has changed the discount rate 47 times—20 increases and 27 decreases. We define a rate series as a sequence of consecutive rate changes in the same direction. This results in eight rate-change series, four expansive monetary periods characterized by discount rate decreases and four restrictive monetary periods featured with discount rate increases.

III. DATA AND METHODOLOGY

This study examines the performance of two active trading strategies by using daily security return data prevailing in Taiwan from February 1995 to December 2008. Adopting the framework of [11] [35], we rely on discount rate changes implemented by the Central Bank of China in Taiwan (CBC hereafter) to guide both the standard market timing strategy and the sector rotation strategy. In this classification scheme, the absolute level of the discount rate does not carry much significance. Rather, it is the direction of the last rate change which signifies future monetary policy shift that matters. Thus, only rate-change series are relevant and considered. The CBC is assumed to be under the same monetary policy (expansive vs. restrictive) until a discount rate change in the opposite direction takes place. The period following a discount rate increase is classified as a restrictive environment; the period following a discount rate decrease is categorized as an expansive environment. The standard market timing portfolio consists of the market portfolio during periods of credit easing and is fully invested in riskless assets during periods of credit tightening. The sector rotation strategy entails investors switching their investment holdings between the cyclical sectors during expansive monetary policy periods and the noncyclical sectors during restrictive monetary policy periods. The benchmark buy-and-hold strategy calls for the investment in and continued holding of the market portfolio throughout the entire sample period. Thus, returns of the buy-and-hold strategy over the sample period are equal to concurrent market returns.

Discount rate, risk-free instrument rate, and stock market index are needed for the implementation of the standard market timing strategy. Treasury bills are undoubtedly the ideal proxy for the risk-free investment vehicle when its rate information is available. Otherwise, secondary market of repurchase agreements on 31-90-day government bonds or Commercial First Bank one-month time deposit is used to proxy the risk-free asset. The Taiwan Stock Exchange composite index (TWSE), a value-weighted index, serves as the proxy for the market portfolio in this study. For the sector rotation strategy, we rely on 19 Taiwan industry indices (Automobile, Cement, Chemicals, Construction, Electric and Machinery, Electrical Appliance Cable, Electronics, Finance, Foods, Glass and Ceramics, Others, Paper and Pulp, Plastics, Rubber, Steel and Iron, Textiles, Tourism, Transportation, and Wholesale and Retail). Discount rate information is retrieved from the CBC's Web site at *www.cbc.gov.tw*. Data for the risk-free rate, TWSE, and the industry indices are from the financial database of the Taiwan Economic Journal.

Table 1 lists key information related to the discount rate-change series. Following [21], this study removes the first two days of every rate-change series from the sample to avoid any announcement-period effect. The conservative approach minimizes the opportunity that investors may react to and capitalize on the announcement of a change in monetary policy. As the table shows, over the full sample period from February 1995 to December 2008, the CBC has changed the discount rate 47 times, 20 increases and 27 decreases, and yielded eight rate-change series, four expansive monetary periods characterized by discount rate decreases and four restrictive monetary periods featured with discount rate increases. The last rate-change series started on September 26, 2008 and was continuing at the onset of this research. Since both market timing strategies adopted in this study require portfolio reconstruction whenever a discount rate change reverses its direction, the two respectively, actively managed portfolios rebalance seven times in 14 years or every two years on average.

Before performing any statistical test to evaluate the two market timing strategies, a simple and preliminary analysis is conducted to determine if monetary policies categorized by the direction of discount rate changes as expansive (restrictive) effectively signal positive (negative) news for the capital market. We expect stock returns during monetary loosening periods to be on average higher than those during monetary tightening periods if discount rate changes serve as a useful barometer for monetary environments and thus, as a good signal for the implementation of the market timing strategies. In contrast, Treasury bills should in general yield more under a restrictive monetary policy than under an expansive monetary policy. Statistics presented next in Table 2 vastly support this contention and provide justification for the intuition of the two proposed market timing strategies.

Table 2 contains the respective number of days expansive and restrictive stances are in place and the associated annualized mean returns for Treasury bills and stock market over the entire sample period and the two subperiods. The stock

TABLE 2
Annualized Mean T-Bill Rate and Mean Stock Market Return in Expansive and Restrictive Monetary Environments

	Number of Days		T-bill Rate (%)		Stock Market Return (%)		Difference in Stock Market Return (%)
Sample Period	Expansive Period	Restrictive Period	Expansive Period	Restrictive Period	Expansive Period	Restrictive Period	Expansive - Restrictive
2/1995-12/2008	1985	1630	3.43	3.08	13.82	-18.79	32.61 (2.62)***
2/1995-2/2000	995	414	4.97	5.69	30.78	-31.55	62.33 (3.06)***
3/2000-12/2008	990	1216	1.90	2.21	-1.03	-13.92	14.95 (0.79)

Notes: The table contains the number of days during which the monetary policy is expansive and restrictive, respectively, for the entire period and the two subperiods. Also reported are the annualized mean T-bill rate and mean stock market return under the two monetary policies for the three sample periods. The mean returns are annualized by compounding average daily returns by 250. Data for the risk-free rate and the stock market are retrieved from the financial database of the Taiwan Economic Journal. The two-sample t-test is conducted to investigate if the mean stock market return difference between the two monetary periods is statistically significant. The numbers in parentheses are the t-statistics.

market consistently generates a higher mean return during expansive monetary periods than during restrictive monetary periods. The two-sample t-test is conducted to see if the mean stock market return difference between the two monetary periods is statistically significant. The reported t-test results indicate that the mean returns associated with the two monetary policies are significantly different from each other at the 1% significance level for the entire sample period and for the pre-March 2000 period. As projected, the mean T-bill rate is higher in the restrictive monetary environment than in the expansive monetary environment for both subperiods. The only notable exception resides in the T-bill rate for the entire sample period when its average associated with the expansive periods is greater than that pertaining to the restrictive periods. This disparity reflects CBC's relatively aggressive take on rate decrease in the pre-2000, high-rate environment and its relatively aggressive pursuit of rate increase in the post-2000, low-rate environment.

In addition to the determination of an effective economic indicator, proper classification of industries to capture their sensitivities to the economic environment is essential to the implementation of the sector rotation strategy. Reference [4] specifies that the cyclical sectors are characterized by industries with above-average sensitivities to the state of the economy and thus above-average betas. The opposite holds true for the noncyclical sectors. We adopt this proposition and use beta, β, for the sector classification purpose. For each sample industry, the derivation of beta is based on the capital asset pricing model (CAPM) of [30] [36] and the regression expressed next:

$$R_t - R_{f,t} = \alpha + \beta\left(R_{m,t} - R_{f,t}\right) + \varepsilon_t \qquad (1)$$

where α is the regression intercept term and $R_{f,t}$, $R_t - R_{f,t}$, $R_{m,t} - R_{f,t}$, and ε_t are risk-free rate, industry excess return, market excess return, and error term, respectively, for any given day *t*. Table 3 lists regression results in descending order of the betas derived for the 19 industries over the entire sample period. The equally-weighted beta across all 19 sample industries is 0.85. To ensure sufficient differentiation between cyclical and noncyclical sectors, we categorize industries with the two highest betas, Electronics and Electrical Appliance Cable, as cyclical, and industries with the two lowest betas, Wholesale and Retail and Tourism, as noncyclical. In sequence, the sector rotation portfolio is constructed by equally weighting the two cyclical industries during expansive monetary periods and the two noncyclical industries during restrictive monetary periods.

Motivated by lack of consensus on a generally accepted statistical method for performance evaluation, we adopt several measures in this study. The multiple-evaluation approach also allows the capitalization on measure-specific merits and guards against methodology related bias. For robustness check, the entire sample period is further divided into pre-March 2000 and post-February 2000 subperiods and performance tests are performed on both subperiods as well. In consideration of Haugen [18], five risk-adjusted indices—Jensen's alpha [24], Treynor measure [40], Sharpe ratio [36], and the two Graham-Harvey measures, *GH1* and *GH2* [16]—are employed to account for and reflect on respective portfolio risk and performance. In addition, a two-beta regression model proposed by [19] [33] is adopted. For performance analysis and comparison purposes, all mean returns are annualized by compounding average daily returns by 250 and all standard deviations are annualized by multiplying the respective daily standard deviations by the square root of 250. A brief description for each undertaken performance evaluation method follows next.

Jensen's Alpha

Jensen's alpha captures the performance of a portfolio under evaluation relative to the overall capital market, i.e. the market portfolio. Thus, it allows direct performance comparison between a market timing strategy and the buy-and-hold strategy. To derive the statistic, a linear

TABLE 3
Market Sensitivity of Industry Returns

$$R_t - R_{f,t} = \alpha + \beta\left(R_{m,t} - R_{f,t}\right) + \varepsilon_t$$

Industry Index	Constant	Beta	R^2
Electronics	0.03 (1.74)*	1.12 (77.13)***	0.78
Electrical Appliance Cable	-0.03 (-1.35)	1.02 (59.27)***	0.60
Finance	-0.02 (-0.78)	0.98 (57.45)***	0.69
Textiles	-0.01 (-0.49)	0.94 (57.40)***	0.61
Construction	-0.02 (-0.78)	0.91 (38.95)***	0.43
Rubber	0.01 (0.49)	0.91 (47.07)***	0.49
Cement	0.00 (0.13)	0.91 (36.97)***	0.45
Plastics	0.01 (0.59)	0.87 (50.09)***	0.55
Transportation	-0.00 (-0.10)	0.87 (42.29)***	0.48
Paper and Pulp	-0.03 (-1.25)	0.86 (40.49)***	0.43
Chemicals	-0.01 (-0.28)	0.84 (49.96)***	0.57
Foods	0.00 (0.18)	0.80 (40.14)***	0.48
Electric and Machinery	-0.01 (-0.76)	0.77 (59.03)***	0.64
Glass and Ceramics	-0.02 (-0.87)	0.77 (33.75)***	0.38
Others	0.00 (0.07)	0.76 (58.34)***	0.62
Steel and Iron	-0.00 (-0.08)	0.71 (35.17)***	0.41
Automobile	-0.01 (-0.47)	0.71 (35.82)***	0.39
Wholesale and Retail	0.00 (0.14)	0.70 (35.21)***	0.49
Tourism	0.01 (0.19)	0.66 (22.79)***	0.30

Note: Data for the industry indices are retrieved from the financial database of the Taiwan Economic Journal. The average beta across all 19 sample industries is 0.85. The *t*-statistics are in parentheses. The asterisks (*) and (***) denote statistical significance at the 10% and 1% significance levels, respectively.

regression in the form of Eq. (1) noted earlier is performed on the two market timing portfolios, respectively. In specific, for each market timing portfolio over the sample period, its return in excess of the risk-free rate is regressed on the market risk premium. α , the regression intercept term, is Jensen's alpha. A positive α indicates that the market timing portfolio should be preferred because it has, on average, generated a higher return than the buy-and-hold portfolio. The opposite favors the passive buy-and-hold strategy.

Treynor Measure

Treynor measure, T_p , is a reward-to-risk measure that shows the risk premium earned per unit of market risk. Eq. (2) illustrates the calculation of the ratio by dividing the average excess return of a portfolio by its market risk.

$$T_p = \frac{(R_p - R_f)}{\beta_p} \tag{2}$$

where $R_p - R_f$ and β_p are the portfolio's average excess return and market risk, respectively. Beta of the buy-and-hold strategy, by design, equals to one. For each market timing strategy, beta is estimated by running Jensen's alpha regression illustrated in Eq. (1). The trading strategy yielding the highest T_p is the most dominating one.

Sharpe Ratio

Even though market risk is the only risk that investors should be compensated for, total risk or standard deviation is what investors bear and thus what matters in performance evaluation. This calls for total risk-adjusted return measures such as Sharpe ratio. As displayed in Eq. (3), Sharpe ratio, S_p , is a reward-to-risk ratio that captures the risk premium earned per unit of total risk and is derived by dividing the average excess return of a portfolio by the standard deviation of its returns.

$$S_p = \frac{(R_p - R_f)}{\sigma_p} \tag{3}$$

where σ_p is the standard deviation of the portfolio's returns. The trading strategy associated with the highest S_p is the most outperforming one.

Graham-Harvey Measures

Reference [16] recognizes the fact that the investment with the highest Sharpe ratio does not necessarily carry a risk desired by investors. As a result, it proposes another two risk-adjusted performance measures that, like the Jensen's alpha, allow a direct return comparison between paired investments and therefore, unambiguously identifies the optimal portfolio for any desired risk level.

The two Graham-Harvey measures, *GH1 and GH2*, are similar to each other by design. Both involve matching the total risks of the portfolios under comparison. The two measures differ in the choice as to which portfolio's total risk is the one to match with. To illustrate, assume that the two portfolios under comparison are an active market timing portfolio and the passive buy-and-hold portfolio.

For *GH1*, it is the volatility of the market timing portfolio that we intend to match with. This entails levering up or down the buy-and-hold (i.e. market) portfolio by investing σ_p / σ_m in the market portfolio and the remaining ($1-\sigma_p / \sigma_m$) in risk-free securities. The resulting *GH1*, as shown and simplified in Eq. (4), is then calculated as the mean return difference between the market timing portfolio and the levered buy-and-hold portfolio.

$$\begin{aligned} GH1 &= R_p - [\frac{\sigma_p}{\sigma_m} R_m + (1 - \frac{\sigma_p}{\sigma_m}) R_f)] \\ &= R_p - [R_f + (\frac{\sigma_p}{\sigma_m})(R_m - R_f)] \end{aligned} \tag{4}$$

A positive (negative) *GH1* indicates the outperformance (underperformance) of the market timing strategy relative to the buy-and-hold strategy.

For *GH2*, the volatility of the buy-and-hold portfolio is the basis for the risk match. This, in turn, requires leveraging or unleveraging the market timing portfolio by investing σ_m / σ_p in the actively managed portfolio and the remaining ($1-\sigma_m / \sigma_p$) in risk-free securities. This practice leads to the derivation and simplification of *GH2* in Eq. (5), where the mean return of the buy-and-hold portfolio is subtracted from the mean return of the levered (unlevered) market timing portfolio.

$$\begin{aligned} GH2 &= [\frac{\sigma_m}{\sigma_p} R_p + (1 - \frac{\sigma_m}{\sigma_p}) R_f] - R_m \\ &= [R_f + (\frac{\sigma_m}{\sigma_p})(R_p - R_f)] - R_m \end{aligned} \tag{5}$$

As with *GH1*, a positive (negative) *GH2* reveals the superiority (inferiority) of the market timing strategy relative to the buy-and-hold strategy.

Two-beta Regression Model

In order to distinguish market timing ability from skills that are not market timing related, a two-beta (up-market beta and down-market beta) regression model proposed by [19] [33] is also adopted in this study. Skilled market timers in response to anticipated market upturns (downturns) would adjust and shift their portfolios to high (low) risk securities. High-risk securities are, in general, more responsive to market movements than low-risk securities. Therefore, portfolio beta in up markets, up-market beta, should be greater than that in down markets, down-market beta. Equation (6) expresses the two-beta regression model.

$$\begin{aligned} R_{p,t} - R_{f,t} &= \alpha_1 + \beta_1 (R_{m,t} - R_{f,t}) \\ &\quad + \beta_2 Max[0, -(R_{m,t} - R_{f,t})] + e_{p,t} \end{aligned} \tag{6}$$

where $R_{p,t} - R_{f,t}$ and $R_{m,t} - R_{f,t}$ are daily excess returns of the market timing portfolio and the buy-and-hold portfolio, respectively, α_1 is the intercept term, and $e_{p,t}$ is the error term. Eq. (6) can be simplified into to Eq. (7) when the market is up and $R_{m,t}$ presumably is greater than $R_{f,t}$.

$$R_{p,t} - R_{f,t} = \alpha_1 + \beta_1 (R_{m,t} - R_{f,t}) + e_{p,t} \tag{7}$$

where β_1 is the up-market beta. Eq. (6) would transform into Eq. (8) when the market is down and $R_{m,t}$ presumably is less than $R_{f,t}$.

$$R_{p,t} - R_{f,t} = \alpha_1 + (\beta_1 - \beta_2)(R_{m,t} - R_{f,t}) + e_{p,t} \quad (8)$$

where $(\beta_1 - \beta_2)$ is the down-market beta, and β_2 measures the change in the beta when market timers respond to an anticipated market downturn by effectively lowering the risk exposure of their portfolios. Thus, a significantly positive β_2 indicates effective market timing.

rotation—and the passive buy-and-hold strategy are compared with one another. To investigate if the performance pattern persists over time, the entire sample period is further divided into two subsample periods, pre March-2000 and post February-2000 eras. Evaluation outcomes for the subsample periods as well as for the entire study period are contained in Table 4.

Test results displayed in Table 4 over the entire study period provide strong support for the two market timing strategies. All five risk-adjusted performance methods, with the exception of insignificantly positive Jensen's alpha, α, associated with the sector rotation, suggests the outperformance of the two actively managed portfolios over

TABLE 4
Risk-Adjusted Performance Measures

		Regression for Jensen's Alpha		
	Time Period	α	β	$\bar{R}^2$
Standard Market Timing	2/1995-12/2008	0.03 (2.65)***	0.58 (71.01)***	0.58
	2/1995-2/2000	0.05 (3.10)***	0.69 (55.97)***	0.69
	3/2000-12/2008	0.02 (1.02)	0.53 (49.80)***	0.53
Sector Rotation	2/1995-12/2008	0.03 (1.63)	0.92 (88.99)***	0.69
	2/1995-2/2000	0.03 (1.38)	0.95 (63.73)***	0.74
	3/2000-12/2008	0.02 (1.03)	0.90 (65.42)***	0.66
	Time Period	***Treynor Measure***		***Sharpe Ratio***
Standard Market Timing	2/1995-12/2008	9.57		0.30
	2/1995-2/2000	25.66		0.94
	3/2000-12/2008	-2.51		-0.07
Sector Rotation	2/1995-12/2008	1.71		0.06
	2/1995-2/2000	11.63		0.44
	3/2000-12/2008	-3.92		-0.14
Buy-and-Hold	2/1995-12/2008	-5.52		-0.22
	2/1995-2/2000	2.96		0.13
	3/2000-12/2008	-10.43		-0.40

		Graham-Harvey Measures	
	Time Period	***GH1***	***GH2***
Standard Market Timing vs. Buy-and-Hold	2/1995-12/2008	9.78%	12.28%
	2/1995-2/2000	15.21%	18.35%
	3/2000-12/2008	6.26%	8.60%
Sector Rotation vs. Buy-and-Hold	2/1995-12/2008	7.71%	6.94%
	2/1995-2/2000	7.81%	7.06%
	3/2000-12/2008	7.69%	6.90%
Standard Market Timing vs. Sector Rotation	2/1995-12/2008	4.49%	6.54%
	2/1995-2/2000	9.36%	12.49%
	3/2000-12/2008	1.24%	1.89%

Notes: Performance measures cover the entire sample period and the two subsample periods of pre-March 2000 and post-February 2000. Jensen's alpha is the intercept term derived from regressing the risk premium of the market timing portfolio on the market risk premium. A significantly positive α suggests superior market timing ability. Treynor measure is a reward-to-risk measure that shows the risk premium earned per unit of market risk. Sharpe ratio is a reward-to-risk ratio that captures the risk premium earned per unit of total risk. To illustrate the two Graham-Harvey measures, *GH1 and GH2*, assume that the two portfolios under comparison are an active market timing portfolio and the passive buy-and-hold portfolio. *GH1* captures the mean return difference between the two portfolios after the buy-and-hold portfolio is levered up or down to match the resulting risk with that of the market timing portfolio. A positive (negative) GH1 indicates the outperformance (underperformance) of the market timing strategy relative to the buy-and-hold strategy. *GH2* reflects the mean return difference between the two portfolios after the market timing portfolio is leveraged or unleveraged to match the resulting risk with that of the buy-and-hold portfolio. As with *GH1*, a positive (negative) *GH2* reveals the superiority (inferiority) of the market timing strategy with respect to the buy-and-hold strategy. The asterisk *** denotes statistical significance at the 1% significance level.

IV. EMPIRICAL RESULTS

Table 4 reports statistics derived from the five risk-adjusted evaluation methods employed in this study—Jensen's alpha, Treynor measure, Sharpe ratio, and the two Graham-Harvey measures, *GH1* and *GH2*. The two active, market timing trading strategies—standard market timing and sector

the benchmark market portfolio. Jensen's alpha, α, for the standard market timing portfolio is significantly positive at the 1% significance level, indicating its superiority to the passive buy-and-hold market portfolio. The slope coefficient, β, lies between zero and one for both active trading strategies. This is consistent with the expectation of lower

risk for the two market timing portfolios than for the buy-and-hold portfolio due to the significant amount of time market timers take defensive stance. The respective coefficients of determination, 58% and 69%, suggest that the regression model represents a good fit for the data. Both Treynor measure and Sharp ratio are higher for the two market timing portfolios than for the passive benchmark. As a matter of fact, both statistics for the buy-and-hold portfolio are negative. Thus, investors holding the market portfolio from February 1995 to December 2008 would have incurred a negative return. The positive Graham-Harvey measures, *GH1* and *GH2*, derived for the respective comparison of the two market timing strategies with the passive buy-and-hold further favor the two active trading strategies.

Table 4 also documents the standard market timing's dominance over the sector rotation for the full sample period. Jensen's alpha, α, suggests that the standard market timing strategy yields significantly higher-than-market return. The same conclusion cannot be drawn for the sector rotation strategy. The standard market timing portfolio possesses more positive Treynor measure and Sharpe ratio and thus, provides better risk-return tradeoff than the sector rotation portfolio. Similarly, the positive Graham-Harvey measures, *GH1* and *GH2*, generated for the evaluation of the two active trading strategies relative to each other indicate that when risk is held constant, the standard market timing produces higher return than the sector rotation.

Evaluation results reported in Table 4 for the pre-March 2000 era are virtually the same as those for the entire sample period. With the exception of the positive but insignificant Jensen's alpha, α, associated with the sector rotation strategy, all evaluation indicators lend strong support for the two active trading strategies. The significantly positive Jensen's alpha, α, for the standard market timing strategy signifies its superior performance in comparison to the buy-and-hold strategy. The fact that both Treynor measure and Sharpe ratio are higher for the two market timing strategies than for the buy-and-hold strategy further suggests that market timing produces better risk-return tradeoff than buy and hold. The same conclusion can also be drawn from the positive Graham-Harvey measures.

When the two active trading strategies are compared with each other for the pre-March 2000 period, the standard market timing once again prevails, reaching the same conclusion as that for the full sample period. Jensen's alpha, α, for the standard market timing over the subperiod is significantly positive. Thus, unlike the sector rotation, the simple market timing strategy delivers a significantly higher risk-adjusted return than the market as a whole during the pre-March 2000 period. The standard market timing portfolio's dominance over the sector rotation portfolio for the period is also substantiated by the fact that its Treynor measure and Sharpe ratio are more positive than their counterparts for the sector rotation portfolio. Moreover, both Graham-Harvey measures, *GH1* and *GH2*, generated for the evaluation of the two active trading strategies relative to each other are positive. This further shows that holding risk constant, the standard market timing delivers higher return than the sector rotation.

Test results covered in Tables 4 for the post-February 2000 period basically reach the same conclusion as that for the entire sample period and the pre-March 2000 period and are in favor of the two active trading strategies over the passive buy and hold. However, the supporting evidence is not as strong as that documented for the other two periods. Although Jenson's alpha, α, is positive for both market timing strategies, neither is statistically significant. This suggests that investors following either market timing strategy for the latter subsample period gain minimal edge over buy-and-hold investors. While all the other four risk-adjusted evaluation methods point to the superiority of the two market timing portfolios to the benchmark market portfolio, the dominance, as evidenced in the consistently less negative Treynor measure and Sharpe ratio, resides on loss reduction rather than wealth accumulation. Hence, investors pursuing either of the two active trading strategies would have incurred less loss than investors following the passive buy-and-hold strategy. Similarly, the positive *GH1* and *GH2* reflect the respective loss that investors would have evaded if they had adopted the two active market timing strategies in lieu of the passive buy-and-hold strategy while matching the risk between the active and passive strategies.

Between the two active trading strategies, empirical evidence presented in the table for the post-February 2000 period clearly favors the standard market timing, an observation noted earlier for the other two test periods. While Jensen's alpha, α, fails to differentiate the two market timing trading strategies due to the two alphas' statistical insignificance, the other four risk-adjusted measures unanimously support the standard market timing approach. Even though both strategies yield negative Treynor measure and Sharpe ratio, they are less negative for the standard market timing approach. This suggests that investors adopting the standard market timing strategy would have incurred less loss per unit risk wise than those employing the sector rotation strategy. The positive Graham-Havery measures, *GH1* and *GH2*, derived for the comparison of the two active trading strategies further confirm that investors exposed to the same level of risk would be better off by following the standard market timing strategy than taking on the sector rotation strategy. Given negative Treynor measure and Sharpe ratio associated with both strategies, the positive *GH1* and *GH2* depict how much loss investors could have avoided if they had practiced the standard market timing strategy and stayed away from the sector rotation strategy.

In short, empirical results contained in Table 4 clearly show that the standard market timing is the most dominating strategy. While Jensen's alpha suggests a diminishing dominance of the strategy over the latter subperiod, it should not come as a surprise. References [2] [13] [14] [32] document disconnection between monetary policy variables and security returns when fairly recent data are used. Reference [7] in its study of seven developed countries finds empirical evidence against the standard market timing strategy, albeit weak, over the period of January 1994-Auguest 2004. Nonetheless, given overwhelming support over the entire sample period and the former subsample period, and strong backing over the latter subsample period for the standard market timing strategy, investors should consider adopting this strategy to optimize their risk-return tradeoff. In contrast, empirical results indicate that the passive buy-and-hold is the least effective strategy. Among the three alternative trading strategies,

investors passively holding the market portfolio would incur the least gain over the pre-March 2000 era and would suffer the most loss during the post-February 2000 period, per unit risk wise.

TABLE 5
Two-Beta Regression Model

$$R_{p,t} - R_{f,t} = \alpha_1 + \beta_1(R_{m,t} - R_{f,t}) + \beta_2 Max[0, -(R_{m,t} - R_{f,t})] + e_{p,t}$$

	Time Period	α_1	β_1	β_2	$\bar{R}^2$
Standard Market Timing	2/1995-12/2008	-0.04 (-2.00)**	0.65 (43.83)***	0.13 (5.31)***	0.59
	2/1995-2/2000	-0.00 (-0.12)	0.74 (33.70)***	0.11 (3.04)***	0.69
	3/2000-12/2008	-0.06 (-2.34)**	0.60 (31.08)***	0.13 (4.23)***	0.53
Sector Rotation	2/1995-12/2008	0.06 (2.66)***	0.89 (47.46)***	-0.06 (-2.11)**	0.69
	2/1995-2/2000	0.06 (2.00)**	0.92 (34.20)***	-0.06 (-1.45)	0.74
	3/2000-12/2008	0.06 (1.89)*	0.87 (34.70)***	-0.07 (-1.63)	0.66

Notes: In the model, the dependent variable is the risk premium of the market timing portfolio and the independent variables are the market risk premium and a variable that equals to the maximum of zero and the negative amount of the market risk premium. By design, the beta difference between the up and down markets is captured by β_2. A significantly positive β_2 is perceived as favorable evidence for the market timing strategy. The asterisks *, **, and *** denote statistical significance at the 10%, 5%, and 1% significance levels, respectively.

To further validate the supremacy of the standard market timing strategy, the two-beta regression proposed by [19] [33] is performed. In the two-regression model expressed in Eq. (8), β_1 is the up-market beta and $(\beta_1 - \beta_2)$ is the down-market beta. By design, the beta difference between the up and down markets is captured by β_2. A significantly positive β_2 suggests effective market timing. The two-beta regression results exhibited in Table 5 lend additional support for the standard market timing strategy. The positive and statistically significant β_2 in Table 5 for the strategy over all three test periods shows that market timers following the strategy are persistently effective at anticipating market movement and adjusting risk accordingly. The displayed empirical findings also suggest that discount rate changes function effectively as a market timing indicator and market timers should take it into consideration when formulating their investment strategies. In contrast, empirical evidence presented in the table paints a different picture for the sector rotation strategy. Investors following the strategy fail to effectively adjust their portfolio risk exposure in response to anticipated market conditions. Over the three sample periods, β_2 associated with the sector rotation strategy is consistently negative. The negative coefficient is statistically significant at the 5% significance level for the full sample period, portending the sector rotation portfolio's higher possession of risk during market downturns than during market upturns. In summary, empirical results presented in Table 5 clearly favor the standard market timing strategy and disfavor the sector rotation strategy.

V. CONCLUSION

This study uses daily financial return data from February 1995 to December 2008 in Taiwan to evaluate the performance of two market timing strategies—standard market timing and sector rotation—and a passive buy-and-hold strategy. The two market timing strategies are guided by the discount rate changes. The standard market timing strategy calls for full investment in the market portfolio in a rate declining environment and in riskless securities in a rate rising environment. The sector rotation strategy involves shifting investment into the sector of cyclical industries during expansive monetary periods and switching the fund to the sector of noncyclical industries during restrictive monetary periods. The buy-and-hold strategy entails constant holdings of the market portfolio. Six statistical measures are employed for performance comparison and evaluation purposes.

Empirical evidence derived from the six analytical methods provides strong, uniform support for the superiority of the standard market timing strategy over the entire sample period. When the full study period is divided into pre-March 2000 and post-February 2000 subsample periods, two observations stand out. First, the standard market timing strategy outperforms the other two strategies in both subsample periods even though its dominance has weakened somewhat over time. Second, while the standard market timing strategy, compared with the buy-and-hold strategy, allows investors to accumulate significantly more wealth in the pre-March 2000 era, the strategy has transformed its supremacy to the form of loss reduction in the post-February 2000 era. Both can be attributed to the two catastrophic financial downturns of the latest decade. Nonetheless, despite the unprecedented financial meltdown and uncharted territory, the standard market timing strategy has fared remarkably well. This is encouraging especially in consideration of the ease and cost effectiveness in implementing the strategy by individual investors. Thus, market timing may still be a worthwhile investment tool in emerging markets even though some empirical evidence in recent finance literature suggests that the strategy might have lost its steam in developed countries.

The study also illustrates that discount rate changes function effectively as a market timing indicator. Therefore, market timers should pay close attention to the monetary policy set by the Central Bank of China in Taiwan. While empirical results in general support the superiority of the sector rotation strategy to the passive buy-and-hold strategy, the strategy does not provide the same promise as the standard market timing. Transaction costs and scarcity of sector ETFs and mutual funds in Taiwan cast further doubt on sector rotation as a viable market timing strategy.

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