

Does Fundamental and Technical Analysis Reduce Investment Risk for Growth Stock? An Analysis of Taiwan Stock Market

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Abstract

In this paper, we implement methodology to empirically identify how individual trader can make profits by applying combined strategies of identifying fundamental and technical risk management. Our data is from Taiwan Economic Journal Database (TEJ), and covering information from 1991 to 2009. Proper risk management skills employed increase the momentum portfolio returns. We explore investment opportunity by examining firm level of financial factors, including profitability, operating efficiency, accounting conservatism and solvency. When investors obtain quotations and identify potential stocks, volume data of the key attributes of stocks usually goes overlooked as price-to-earnings ratio, market size, or even ex-dividend date even comes in priority. In order to justify the optimal timing of investment, we use the covariance between price and volume as a buying signal to filter portfolios for technical analysis. Result confirms selected portfolios earn significant excess returns which beat the market with long term holding period.

Keywords: growth stocks, fundamental analysis, momentum strategy, score system

1. Introduction

Efficient market theory and rational expectation are the cores of traditional finance, in which illustrate how stock price adjusts accordingly. Even when the stock price deviates, the arbitrageur could possibly obtain excess return systematically in the market. Along with the accumulation of abnormal phenomena, attempted studies exploring feasibility of explaining stock market anomalies lie in the shaping of investment strategy on account of financial behavior. For example, investors use heuristics to implement some subjective mark and classified as an important investment decision criteria to obtain abnormal return. Such an idea of earning abnormal return by style investment has deviated from the basic finance discipline rationalizes returns on account of systematic risk.

In the previous study, the style investment can be generally divided into value investment strategy and momentum investment strategy. Investors of value investment strategy consider that investors overreact so that value stocks are undervalued and growth stocks are overvalued. Market overreaction brings forward momentum investment strategy in which investors construct a buy-and-hold portfolio based on past return. Not only confined to individual investor who is always hindered by information asymmetry, Cowen et al. (2006) suggest that the methods used to fund research affect the level of professional analyst optimism. Generally, value stocks and growth stocks are defined by finding price-to-book ratio, where high proportions are growth stocks and low proportions are value stocks. To make the strategy more effectively and convincingly implemented, Piotroski (2000) constructs a scoring system, which uses fundamental analysis to filter value stocks and thus form a value style portfolio. Such portfolio combined with fundamental financial factors and price-to-book ratio, complementing behavioral heuristics and biases, and consequently it is more conducive for investors to make strategic decision.

Fundament analysis provides investors information to identify the merits of stock. Analysis form numerous studies find the link between past trading volume and future performance (Conrad, Hameed and Niden, 1994; Datar, Naik & Radcliffe, 1998). Jegadeesh and Titman (1993) propose that stock market exist the phenomenon of underreaction, therefore momentum happen in the mid-term return persistence, and indeed it means past winners achieve positive return in the future. Furthermore, Lee and Swaminathan (2000) propose momentum life cycle,

in which the portfolios form based on past trading volume, make performance assessment meaningful. Kuo and Fan (2004) mention that based on the fundamental difference, the growth stock is not entirely trial value stock's fundamental analysis. Therefore, Kuo and Fan improve the value stock scoring system which was created by Piotroski (2000) for growth stock in Taiwan stock market and the performance is better than value stock. Mohanram (2005) proposes a growth stock scoring system making significant excess return for global market. And this system is also improved by Piotroski's value stock scoring system.

While Chen, et al. (2011) use fundamental analysis and technical analysis to develop a combined portfolio from the data of NYSE and AMEX stocks in the 1982 to 2008 sample period and obtain good performance. Yeh (2012) applies the combined concept from Chen et al. (2011) to find out an application portfolio for value stock in Taiwan stock market. The result shows that combined strategy can provide higher positive return and lower negative returns compared with other constructed portfolios, and thus enhance the long-term reward.

Our study contributes by providing investment strategy combining fundamental analysis and technical analysis in Taiwan stock market for growth stocks. When investors obtain quotations and identify potential stocks, volume data of the key attributes of stocks usually goes overlooked as price-to-earnings ratio, market size, or even ex-dividend date even comes in priority. In spite of the fact that many investors inattention to analyzing trading volume before making decision, the fluctuation of interaction, namely covariance between price and volume serves as the clicking signal. Good investment targets, such as small and medium sized firms with relatively higher volatility of stocks price frequently soared in the past. Growth stocks, even with consideration of volume factor, do not necessarily perform worse than value stock. Rouwenhorst (1999), Nijman et al. (2004), Doukas and McKnight (2005) provide more evidence of strong return momentum in developed European markets. Chan et al. (2007) show that non-negative earnings surprises more associated with growth firms than opposed to value firms. Chui, Titman and Wei (2010) document positive relationship between individualism and trading volume, volatility, and the magnitude of momentum profits. We combine growth scoring system and technical analysis (past trading volume, past return), and try to generalize a systematic trading strategy on growth stocks in Taiwan. We exam whether these portfolios can earn excess return in different holding periods and compare which growth scoring system in an international emerging market.

2. Literature Review

2.1 Scoring System

In the efficient market theory, stock price reflects information. Even if there is deviation in the short term, market will eventually reach equilibrium in the long run. Investors won't be able to obtain excess return through historical information or technical analysis. However, with more and more abnormal phenomenon repeatedly challenges the efficient market theory, using the financial statement analysis to forecast future earnings is inevitable, especially for the short term. Piotroski (2000) proposes a simple accounting-based fundamental analysis winning strategy of value stock (high book-to-market firms). For the value stock, by measuring three areas of the firm's financial condition: profitability, financial leverage / liquidity and operating efficiency, each firm's signal realization is classified as either "good" or "bad" depending on the signal's implication for future prices and profitability. The aggregate signal measure, F_SCORE, is the sum of the nine binary signals. The result shows that the mean return earned by a value stock investor can be increased by at least 7.5% annually. Kuo and Fan (2004) consider that growth stock and value stock are different in fundamental. Especially in Taiwan, growth stocks led the strong economic growth economy for 10 years from 1992 to 2001, and the performances of growth stock are better than value stock in both fundamental of financial ratios and stock market returns. They construct a scoring system based on Piotroski's F_SCORE for growth stocks and named G_SCORE. Empirical results indicate that G_SCORE can not only obtain significant abnormal returns in different periods but also the performances are much higher than F_SCORE in Taiwan stock market.

Mohanram (2005) combines traditional financial analysis, such as income, cash flow, earnings growth, R&D, capital expenditures and advertising expenditure to construct an investment indicator, G_SCORE. Although the returns mainly come from short position, using this strategy still obtain 20.6% excess return. Robust results hold for a variety of partitions, including large, well followed, and liquid stocks, for which short selling would be less difficult.

2.2 Technical Analysis- Momentum Strategy

The main theoretical foundations of momentum strategy are underreaction and information asymmetry. When the market new message arrives, the prices fluctuate. Jegadeesh and Titman (1993) develop sixteen different investment periods from the monthly data of NYSE stocks. Trading strategies that buy past winners and sell past losers earns significant abnormal returns over the 1965 to 1989 period. Moreover, the result is not due to

systematic risk or the lead-lag effects. However, the evidence is consistent with delayed price reactions to firm-specific information. Rouwenhorst (1998) forms internationally diversified portfolios of stocks from twelve European countries from 1978 through 1995. He finds that the portfolio of past winners outperformed the past losers by about 1 percent per month. The European evidence is remarkably similar to findings for the U.S. sample firms of Jegadeesh and Titman (1993). This empirical result confirms momentum is not an individual event.

Lee and Swaminathan (2000) select annual industry-adjusted returns for portfolios based on price momentum and change in trading volume use data on NYSE, AMEX stocks from 1968 to 1995. They propose Momentum Life Cycle through observation of each momentum strategy portfolio and find the outcome reversal. The directional predictions based on past performance and stock trading volume, allowing investors to make profit by implementing contrarian strategy. Both High volume losers and high volume winners outperform within the next 3 to 12 months. However, low volume winners take longer to significantly outperform high volume winners in the long-term period (more than 12 months). The result shows that past trading volume provides an important link between “momentum” and “value” strategies. Wu (2007) proposes an explanation for the cause of Momentum Life Cycle phenomena. The author considers the market with information asymmetry existing fixed transaction cost. Those will deter uninformed investors to revealed information through price and induces further adverse selection. The author uses covariance of past trading volume and returns to test the strength of momentum, named BOS ratio. In this paper, we mainly center on this specific technical information as our evaluation factors of portfolio.

3. Methodology and Data

3.1 Methodology

In fundamental analysis, we have two scoring system to apply, first one proposed by Kuo and Fan (2004) and the other one constructed in Mohanram (2005). For the technical analysis, we adopt BOS ratio (Wu, 2007) to determine which investment strategy to use. First of all, we will sort market stocks by price-to-book ratio and take the top half of the total sample as growth stocks. After that we classify the fundamental characteristics of stocks on both scoring system (Kuo & Fan, 2004; Mohanram, 2005). In classification, we will give score within different factors and give a point for the excellent part; otherwise, zero, that is, the higher score, the better evaluation on the fundamental analysis. For distinguishing purpose, we name Ku’s G_SCORE as KG_SCORE, and Mohanram’s G_SCORE as MG_SCORE. We then form winner portfolios separately by select the higher points group and named KG winner and MG winner. We further construct combined strategies by filtering winner stocks with high BOS ratio and name these combined strategies as KG portfolio and MG portfolio.

3.2 KG_SCORE

Piotroski (2000) proposes F_SCORE for value stock which has excellent performance. Kuo and Fan (2004) modify the F_SCORE and divide the measurement of firm’s financial condition into three areas: Profitability, operating efficiency and solvency. There are ten fundamental signals to measure financial condition of the high price-to-market firms in these three areas and describe as follows. Each signal can get a point if reached, zero otherwise, and KG_SCORE is an aggregate score of these ten signals, the range from zero to ten where ten (zero) showing the firm with more (less) good signals. Table 1 illustrates the various factors in KG_SCORE and the equation shows as follows:

$$KG_SCORE = \sum_{i=1}^{10} KG_i \quad (1)$$

Let i denote the indicators, KG_SCORE denotes the sum of ten indicators, which is used to detect the fundamental health of growth stocks. Therefore, each growth stock has one total score.

Table 1. Fundament signals for KG_SCORE

Signals	Definition description	KG _i =1	KG _i =0
KG1	ROA	ROA > 0	ROA ≤ 0
KG2	ΔROA	ΔROA > 0	ΔROA ≤ 0
KG3	ACCRUALS	CFROA > ROA	CFROA ≤ ROA
KG4	ΔOperating margin	ΔOperating margin > 0	ΔOperating margin ≤ 0
KG5	ΔTotal asset turnover	ΔTotal asset turnover > 0	ΔTotal asset turnover ≤ 0

KG6	Δ Gross profit margin	Δ Gross profit margin > 0	Δ Gross profit margin ≤ 0
KG7	Δ R&D	Δ R&D > 0	Δ R&D ≤ 0
KG8	Δ Current ratio	Δ Current ratio > 0	Δ Current ratio ≤ 0
KG9	Capital ratio	Capital ratio > 1	Capital ratio ≤ 1
KG10	Cash flow from investing activities	Cash flow from investing activities > 0	Cash flow from investing activities ≤ 0

Signals for KG_SCORE are specified.

KG1: ROA (Net income before taxes /Average assets) gets one point when greater than zero, and zero otherwise. Observing the profitability of companies and level of cash flow help understand the company's ability of generate internal capital. If the company earns profits and capital aggressively, we can speculate it has better competitive advantages.

KG2: Δ ROA ($ROA^t - ROA^{t-1}$) gets one point when greater than zero, and zero otherwise. It will be better if the profitability of company sustainably grow year after year.

KG3: Accruals (CFROA – ROA) get one point when CFROA is bigger than ROA, and zero otherwise. Earning is critical accounting information. However, earning is composed of many elements, possibly suspected of manipulation. Sloan (1996) separates earning into accrual and cash flow, and discusses which one is more reflective on performance. The empirical result confirms earning persistence of cash flow is better than earning persistence of accrual. Because cash flow has less manipulation, it is able to reflect the real performance of companies.

KG4: Δ Operating margin ($(\text{Operating income}/\text{Net sales})^t - (\text{Operating income}/\text{Net sales})^{t-1}$) gets one point when greater than zero, and zero otherwise. It is relatively important to focus on core business operations than others for the stock still in growth stage.

KG5: Δ Total asset turnover ($(\text{Net sales}/\text{Total asset})^t - (\text{Net sales}/\text{Total asset})^{t-1}$) gets one point when greater than zero, and zero otherwise. Higher ratio means more efficiently to produce higher revenue.

KG6: Δ Gross profit margin ($(\text{Gross profit}/\text{Net sales})^t - (\text{Gross profit}/\text{Net sales})^{t-1}$) gets one point when greater than zero, and zero otherwise. Gross profit margin represents the company's competition status.

KG7: Δ R&D ($(\text{R\&D expense}/\text{Net sales})^t - (\text{R\&D expense}/\text{Net sales})^{t-1}$) gets one point when greater than zero, and zero otherwise. For growth stock, a company's R&D expense is a good indicator for expanding.

KG8: Δ Current ratio ($(\text{Current assets}/\text{Current liabilities})^t - (\text{Current assets}/\text{Current liabilities})^{t-1}$) gets one point when greater than zero, and zero otherwise. Current ratio is a liquidity ratio that measures a company's ability to pay short-term obligations. The higher the current ratio, the more capable the company is able to pay its obligations.

KG9: Capital ratio ($(\text{Long-term debts} + \text{Total equity})/(\text{Long-term investment} + \text{Total fixed assets})$) gets one point when greater than one, and zero otherwise. Capital ratio observes whether the company uses the short-term funding to cover long-term funding.

KG10: Cash flow from investing activities gets one point when greater than zero.

Firm with higher score has better performance. We select the companies which total score is more than five as a company with potential, and the total scores below three as sluggish.

3.3 MG_SCORE

Mohanram (2005) presents MG_SCORE which is an aggregate score of eight signals. The range is from zero to eight where eight means the firm with better signals. Compared to KG_SCORE, MG_SCORE highlights incorporates contemporaneous median in the same industry. Table 2 illustrates the various factors in MG_SCORE, as follows:

$$MG_SCORE = \sum_{i=1}^8 MG_i \quad (2)$$

Let i denote the indicators, MG_SCORE denotes the sum of ten indicators, which is used to detect the fundamental characteristics of growth stocks. Therefore, each growth stock has one total score.

Table 2. Fundament signals for MG_SCORE

Signals	Definition description	MGi=1	MGi=0
MG1	ROA	ROA > ind. median ROA	ROA ≤ ind. median ROA
MG2	CFOROA	CFOROA > ind. median CFOROA	CFOROA ≤ ind. median CFOROA
MG3	ACCRUALS	CFOROA > ROA	CFOROA ≤ ROA
MG4	VARROA	VARROA < ind. median VARROA	VARROA ≥ ind. median VARROA
MG5	VARSGR	VARSGR < ind. median VARSGR	VARSGR ≥ ind. median VARSGR
MG6	RDNIT	RDNIT > ind. median RDNIT	RDNIT ≤ ind. median RDNIT
MG7	CAPINT	CAPINT > ind. median CAPINT	CAPINT ≤ ind. median CAPINT
MG8	ADINT	ADINT > ind. median ADINT	ADINT ≤ ind. median ADINT

Signals for MG_SCORE are specified and ind. median is contemporaneous median.

MG1: ROA ((Net income before taxes / Average assets) gets one point when greater the contemporaneous median ROA for all low BM firms in the same industry and zero otherwise.

MG2: CFROA (Cash flow from operating activities / Total assets) gets one point when greater the contemporaneous median for all low BM firms in the same industry and zero otherwise.

MG3: Accruals (CFROA – ROA) gets one point when CFROA exceeds ROA, and zero otherwise.

MG4: VARROA gets one point when a firm's earnings variability is less than the contemporaneous median for all low BM firms in the same industry and zero otherwise.

MG5: VARSGR gets one point when a firm's sale growth variability is less than the contemporaneous median for all low BM firms in the same industry and zero otherwise.

MG6, MG7 and MG8 are defined as R&D, capital expenditure and advertising intensity respectively, and get one point respectively when greater than the contemporaneous medians of the corresponding variables for all low BM firms in the same industry and zero otherwise. The last three items mainly reflect the activities which may reduce current earning and book value, but growth in the future. Conservatism in accounting standards makes firms expense outlays such as R&D and advertising intangible assets. These unrecorded intangible assets will cause underestimation of book values.

3.4 BOS Ratio

In the assumption of market with information asymmetry and fixed transaction costs, Wu (2007) proposes that the uninformed investors in the market cause adverse selection. The result of adverse selection makes stock prices deviate from the original standard and then cause momentum. Wu propose BOS ratio, using past return and trading volume to estimate the level of information asymmetry, and then gauge the strength of momentum. The equation shows as follows:

$$BOS\ ratio = cov(r_t^i, \pi_t^i) \quad (3)$$

in which

$$\pi_t^i = \frac{|v_t^i|}{E[|v_t^i|]} \quad (4)$$

Let r_t^i denote the monthly return for the i^{th} stock, π_t^i denote the ratio, v_t^i denote the aggregate volume of dollar trades for the i^{th} stock in month t , and $E[|v_t^i|]$ denote the cross section average volume of dollar trades on all stock in portfolio in month t . Therefore, let π_t^i indicate the relative change in the past trading volume of respective stock.

For winners, higher level of information asymmetry concentrating in a small number of investors while informed investors can have long position and expect to unload their holding after the positive shock become public. However, numerous amounts of uninformed investors eager to purchase after the information reached, adverse selection thus happened. Price might not correct simultaneously.

3.5 Sample Selection and Data Description

Our sample comes from Taiwan Stock Market from Taiwan Economic Journal Database (TEJ) covering 1991 to

2009. We select top half of price-to-book ratio stocks as our growth stocks when calculating KG_SCORE/MG_SCORE. Definition of KG_SCORE is from five to ten and MG_SCORE is from four to eight as good performance. Performance of portfolios is calculated for one, two, three and four years holding periods. Winner stocks are the top half of the companies with highly past twelve-month cumulative returns. In terms of defining suitable momentum strategy, Lee and Swaminathan (2000) present low volume winner significantly outperform high volume winners in longer holding period. We use companies with low BOS ratio as the ratio is defined as covariance between past return and past relative trading volume. Finally, the portfolios are sorted by the past returns, the BOS ratio and the fundamental indicators KG_SCORE/MG_SCORE respectively. Table 3 and 4 provide the sample size for the final portfolio. For example, for the portfolio in 2001, we first choose the top half of price-to-book ratio in 2000 as our growth stocks (N=287), and select stocks with good fundamental in KG_SCORE/MG_SCORE (N=134/128) through annual report in 2000. We then use top half past twelve cumulative return during May 2000 to April 2001 to sort our winner stocks in good fundamental stocks (N=51/39). Finally, we choose bottom half of companies with the size (N=17/10).

Table 3. Sample size of KG portfolio (number of stocks)

Sample Period	Firms	Growth Stocks	KG winner	KG winner \cap past cumulative returns	KG winner \cap past cumulative returns \cap BOS ratio	KG Portfolio
1991/5	183	91	39	23	4	4
1992/5	213	106	46	21	9	9
1993/5	237	118	60	25	9	9
1994/5	260	130	77	32	15	15
1995/5	298	149	83	42	12	12
1996/5	336	166	70	28	13	13
1997/5	371	183	99	48	13	13
1998/5	423	211	123	59	21	21
1999/5	497	248	103	43	20	20
2000/5	545	218	133	54	17	17
2001/5	590	287	134	51	17	17
2002/5	647	322	149	71	24	24
2003/5	676	338	212	66	29	29
2004/5	685	342	214	97	37	37
2005/5	689	341	222	89	37	37
2006/5	695	345	212	100	28	28
2007/5	703	346	222	109	45	45
2008/5	701	211	220	58	20	20
2009/5	723	360	100	25	9	9
Total	9472	4512	2518	1041	379	379

The growth stocks are those stocks in the top of price-to-book ratio twelve months ago. The KG winner means the firms with KG_SCORE of 5,6,7,8,9,10 which are classified as high. The KG winner \cap past cumulative returns means the intersection of high KG_SCORE and top past cumulative returns which is the top half of past cumulative returns in growth stocks. The KG winner \cap past cumulative returns \cap BOS ratio also is KG portfolio means the intersection of high KG_SCORE, top past cumulative returns and bottom of BOS ratio which is the bottom half of covariance between past return and past relative trading volume.

Table 4. Sample size of MG portfolio (number of stocks)

Sample Period	Firms	Growth Stocks	MG winner	MG winner∩past cumulative returns	MG winner∩past cumulative returns∩BOS ratio	MG Portfolio
1991/5	183	91	77	16	5	5
1992/5	213	106	43	24	10	10
1993/5	237	118	65	26	12	12
1994/5	260	130	71	32	16	16
1995/5	298	149	82	44	16	16
1996/5	336	166	85	39	17	17
1997/5	371	183	103	56	19	19
1998/5	423	211	110	63	25	25
1999/5	497	248	131	52	24	24
2000/5	545	218	144	60	18	18
2001/5	590	287	128	39	10	10
2002/5	647	322	176	78	23	23
2003/5	676	338	195	57	26	26
2004/5	685	342	207	100	49	49
2005/5	689	341	218	88	38	38
2006/5	695	345	215	93	24	24
2007/5	703	346	211	91	40	40
2008/5	701	211	218	55	19	19
2009/5	723	360	136	42	14	14
Total	9472	4512	2615	1055	405	405

The growth stocks are those stocks in the top of price-to-book ratio twelve months ago. The MG winner means the firms with MG_SCORE of 4,5,6,7,8 which are classified as high. The selected return in (MG winner∩past cumulative returns) means the intersection of high MG_SCORE and top past cumulative returns in growth stocks. The selected return in (MG winner∩past cumulative returns∩BOS ratio) means the intersection of high MG_SCORE, top past cumulative returns and bottom of BOS ratio which is the bottom half of covariance between past return and past relative trading volume.

4. Empirical Results

4.1 Performance Analysis

Portfolio average return and annualized portfolio return for KG system and MG systems are built on the basis of financial annual report. We use Central bank interest rate for one year holding period as risk-free rate and market return means the performance on Taiwan Stock Exchange Corporation Capitalization Weighted Stock Index (TAIEX). The holding period from the portfolio is in May to the year of maturity in April and hold for one to four years. To calculate average annual return on the investment portfolio t composed of n kind of stocks and hold for Y year is in table 5 and 6. The equation is as follows:

$$R_{i,t+Y} = \frac{\sum_{i=1}^n P_{i,t+Y} - \sum_{i=1}^n P_{i,t}}{\sum_{i=1}^n P_{i,t}}, Y = 1, 2, 3, 4 \quad (5)$$

Let P means the stock price, and $R_{i,t+Y}$ denotes at time t, the yearly average rate of return for purchase i stock with holding period for Y year. In Table 5 and 6, the portfolio average return of KG portfolio and MG portfolio for holding one to four years from May 1991 to April 2009 is presented. The arithmetic average returns of KG portfolios for one to four holding period are 4.33%, 6.84%, 15.12% and 19.62%. In addition, the arithmetic average returns for MG portfolios are 9.83%, 15.81%, 27.66% and 26.93% during one to four holding periods. And the market returns are 6.3%, 10.46%, 14.42% and 17.46% in different holding period. The result shows that the MG portfolios have better performance and can earn about 3 to 9% excess return in different holding period. This result is consistent with what Dong and Guo (2013) find that portfolios of growth stocks gain positive returns.

Table 5. Portfolio average return of KG portfolio and MG portfolio

Risk-free rate	1.36%			
(%)	MR1	MR2	MR3	MR4
Market Return AAR	6.3	10.46	14.42	17.59
Market Return GAR	3.45	7.17	9.99	11.53
(%)	KP1	KP2	KP3	KP4
AAR	4.33	6.84	15.12	19.62
GAR	-0.17	1.03	2.69	4.30
Std.	29	33.64	46.69	56.74
Min.	3.07	4.24	23.84	12.31
(%)	MP1	MP2	MP3	MP4
AAR	9.83	15.81	27.66	26.93
GAR	6.82	11.58	17.55	15.14
Std.	26.09	32.26	51.08	55.48
Min.	5.04	11.31	14.56	23.58

Risk-free rate from Central bank interest rate for one year holding period. Market return comes from the performance on Taiwan Stock Exchange Corporation Capitalization Weighted Stock Index (TAIEX). MR1 (MR2/MR3/MR4) represents market return for holding one (two/three/four) year(s). KP1 (KP2/KP3/KP4) represents KG portfolio for holding one (two/three/four) year(s). MP1 (MP2/MP3/MP4) represents MG portfolio for holding one (two/three/four) year(s). AAR (GAR) denotes the Arithmetic (Geometric) average return.

Table 6. Performance in average return of KG portfolio and MG portfolio across time

Sample period	MR1	MR2	MR3	MR4	KP1	KP2	KP3	KP4	MP1	MP2	MP3	MP4
1991/5	-24.42	-22.32	-5.92	3.27	-7.89	-35.68	-25.66	-47.34	-8.24	-31.64	-22.8	-41.33
1992/5	3.99	25.94	38.24	30.59	4.70	-14.11	-32.71	-32.15	5.04	7.91	-0.34	-0.91
1993/5	26.69	39.06	31.37	91.12	22.54	1.48	5.97	87.71	41.97	19.59	14.56	91.68
1994/5	4.51	-1.27	43.63	48.35	-1.6	-2.65	93.94	109.13	0.05	-7.64	108.67	108.85
1995/5	2.4	48.97	53.87	29.43	-19.58	36.08	40.92	-10.51	-6.55	55.07	84.27	53.25
1996/5	42.09	46.75	23.44	56.5	65.29	73.39	37.19	49.79	60.08	72.22	45.3	49.91
1997/5	7.84	-9.29	15	-32.59	26.63	8.3	25.14	-29.72	19.01	-5.78	9.44	-38.29
1998/5	-10.17	13.89	-33.25	-23.92	-62.72	-64.63	-82.10	-79.83	-11.58	31.39	-24.48	-22.72
1999/5	24.84	-26.83	-16.6	-40.71	39.34	-10.63	-8.29	-42.51	32.98	-17.41	-14.7	-42.38
2000/5	-36.68	-27.83	-48.69	-23.13	-29.05	-15.59	-53.72	-28.9	-35.12	-29.71	-60.37	-43.25
2001/5	21.36	-13.72	29.26	13.94	16.87	1.41	23.84	14.9	26.15	7.08	14.89	-17.44
2002/5	-22.06	16.77	2.93	21.59	-19.13	12.76	6.3	60.76	-17.75	11.31	4.69	54.35
2003/5	54.33	36.04	60.69	85.02	28.91	25	68.86	115.86	45.14	21.28	127.89	126.26
2004/5	-0.6	17.41	35.19	50.18	-1.51	56.36	71.25	95.96	4.57	75.67	98.17	116.53
2005/5	17.04	34.76	49.7	-3.47	23.96	47.22	84.47	36.51	28.69	57.14	61.88	23.58
2006/5	12.2	24.64	-19.64	13.05	-10.08	7.44	-24.88	12.31	-11.34	8.75	-23.14	11.45
2007/5	9.78	-29.21	-0.43	9.57	3.07	-33.52	3.74	9.33	11.14	-22.82	14.55	28.13
2008/5	-35.76	-9.63	-0.55	-14.47	-21.51	4.24	28.56	10.59	-27.33	15.26	61.75	10.57
2009/5	22.26	34.54	15.71	19.85	24.08	33.14	24.53	40.97	29.78	32.82	25.33	43.33

This table presents the portfolio average return of KG portfolio and MG portfolio for holding one to four years in sample period from May 1991 to April 2009. MR1 (MR2/MR3/MR4) represents market return for holding one (two/three/four) year(s). KP1 (KP2/KP3/KP4) represents KG portfolio for holding one (two/three/four) year(s). MP1 (MP2/MP3/MP4) represents MG portfolio for holding one (two/three/four) year(s).

4.2 Paired Sample T Test

Table 7 presents the paired sample t-test on performance of individual portfolio and Taiwan Stock Exchange Corporation Capitalization Weighted Stock Index (TAIEX). Under this premise we propose eight hypotheses to test whether the performance of individual portfolio can significantly beat the market. We use Taiwan Stock Exchange Corporation Capitalization Weighted Stock Index as the benchmark.

Based on the result KG portfolio for one (two) year holding period can beat the market. However, the performance of KG portfolio for three (four) holding period can not significantly generate better return than market.

Table 7. Performance between individual portfolio and Taiwan Stock Exchange Corporation Capitalization Weighted Stock Index (TAIEX)

	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6	Test 7	Test 8
Mean	0.069	0.036	0.021	0.019	0.056	0.036	0.026	0.019
SD	0.158	0.102	0.083	0.070	0.108	0.057	0.060	0.052
T-stat	1.902**	1.547*	1.119	1.201	2.272***	2.772****	1.899**	1.616*

*, **, ***, **** represent statistical significance using paired sample t-test at the 10%, 5%, 2.5%, 1% levels. This table presents paired sample t-test on performance between individual portfolio and Taiwan Stock Exchange Corporation Capitalization Weighted Stock Index (TAIEX) at 10%, 5%, 2.5%, 1% level.

The following eight hypotheses are used to exam whether the performance of our combined portfolio can significantly beat the market in different holding period. Test 1 is H1: Return of KG portfolio for one year holding period is higher than TAIEX. Test 2 is H1: Return of KG portfolio for two year holding period is higher than TAIEX. Test 3 is H1: Return of KG portfolio for three year holding period is higher than TAIEX. Test 4 is H1: Return of KG portfolio for four year holding period is higher than TAIEX. Test 5 is H1: Return of MG portfolio for one year holding period is higher than TAIEX. Test 6 is H1: Return of MG portfolio for two year holding period is higher than TAIEX. Test 7 is H1: Return of MG portfolio for three year holding period is higher than TAIEX. Test 8 is H1: Return of MG portfolio for four year holding period is higher than TAIEX. Mean denotes the mean of different yearly return. T-stat means the paired sample t statistic.

After comparing the return with the market respectively, we want to investigate which strategy is more profitable in Taiwan stock market. Therefore, we propose another four hypotheses to test whether the performance of MG portfolio can significantly beat the performance of KG portfolio in different holding periods and the result shows in Table 8. Table 8 presents paired sample t-test on performance between KG portfolio and MG portfolio. Results show that no significant difference between MG portfolio and KG portfolio.

Table 8. Performance between KG portfolio and MG portfolio

	Test 9	Test 10	Test 11	Test 12
Mean	0.013	0.000	-0.005	0.000
SD	0.078	0.058	0.049	0.040
T-stat	0.722	0.005	-0.427	-0.004

*, **, ***, **** represent statistical significance using paired sample t-test at the 10%, 5%, 2.5%, 1% levels. This table presents paired sample t-test on performance between KG portfolio and MG portfolio at 10%, 5%, 2.5%, 1% level. We try to exam whether the differential yearly rate of return in both portfolios is significant from zero. Test 9 is H1: Return of KG portfolio for one year holding period is lower than the Return of MG portfolio for one year holding period. Test 10 is H1: Return of KG portfolio for two year holding period is lower than the Return of MG portfolio for two year holding period. Test 11 is H1: Return of KG portfolio for three year holding period is lower than the Return of MG portfolio for three year holding period. Test 12 is H1: Return of KG portfolio for four year holding period is lower than the Return of MG portfolio for four year holding period. Mean denotes the mean of different yearly return. T-stat means the paired sample t statistic.

5. Conclusions

Setting loss and profit point is often difficult for individual trader. We propose not only technical analysis, but fundamental analysis can also play an essential role in timing risk. The results of analysis from Taiwan stock market show that portfolio formed based on MG system earn excess return in different holding period. Bases on the momentum life cycle theory, BOS ratio employing low trading volume produces better performance than the market index does with excess long- term return in decreasing rate. In addition to portfolio which investors rely on annual report and technical information such as trading volume, the empirical results demonstrate that our portfolio formed based on risk-adjusted winning strategy for growth stocks serve as alternative sustaining strategy.

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