IBFR
www.theIBFR.com

PERFORMANCE OF TECHNICAL ANALYSIS IN DECLINING GLOBAL MARKETS

Jogiyanto Hartono, Universitas Gadjah Mada
Dedhy Sulistiawan, University of Surabaya

ABSTRACT

The main objective of this research is to discuss the impact of declining global markets on technical analysis performance using international data. McKenzie (2007) shows that technical analysis performs well during the 1998 financial crisis. Technical analysis produces better performance in stock markets with high volatility and a downward trend than in stable and uptrend markets (Ahmed et al., 2000). This study uses OSIRIS and Yahoo Finance databases. The focus is in the year 2011 because global stock markets substantially decline in that year. The year 2010 was a non-decreasing year, and data for that year are used as a control sample. This study examines 21 countries around the world. The total numbers of technical analysis signals identified are 11,040. For robustness tests, this study employs some technical analysis methods. These are SMA5 (5 days Simple Moving Average), SMA10, SMA15, WMA5 (5 days Weighted Moving Average), WMA10, and WMA15. In addition, short and long strategies and the combination of both are used. The findings strongly suggest that technical analysis produces higher returns than buy and hold strategies in declining global markets.

JEL: G01, G15

KEYWORDS: Technical Analysis, Simple Moving Average, Weighted Moving Average, Declining Global Market

INTRODUCTION

This study addresses the issue of technical analysis performance in global market declining periods. This research examines the impact of declining global markets on technical analysis profitability. To test global markets, this study uses inter-country analysis involving many capital markets around the world.

This issue is important to technical analysis studies because only a few studies about technical analysis are related to different market situations. In a declining global market situation, a declining business trend stimulates investors looking for competing information of fundamental information. Earnings informativeness falls during a crisis or an economic downturn (Swanson et al., 2003; Bernard and Stober, 1989). Consequently, investors look for alternative information besides that found in earnings. They try to use technical analysis information as additional information. Flanegin and Rudd (2005) study shows that technical analysis indicators are popular analysis in the investment profession.

Technical analysis performed well during the 1998 financial crisis (McKenzie, 2007). Technical analysis produces superior performance in markets with high volatility and a downward trend (Ahmed et al., 2000). Similar to those studies, this study expects that technical analysis produces higher returns than buy and hold strategies in declining global markets.

The main objective of this research is to discuss performance of technical analysis when global markets decline. According to the objective, this study employs 1050 firms from 21 countries around the world. Using those data, this research presents that technical analysis indicators produce positive returns in global bearish (bullish) markets using short (long) strategies. Technical analysis produces positive returns when global markets decline. This study produces robust results after testing based on long, short, and long-short strategies. Using several indicators, this study concludes that technical analysis produces higher returns than buy and hold strategies in declining global markets.

This research generates several contributions. First, it contributes to technical analysis study by using declining global stock markets setting. The focus is in the year 2011, because global stock markets substantially decline. In bearish (bullish) markets, technical analysis can (not) beat buy and hold strategies. Second, it gives insight to global investment managers to adjust their trading strategies based on market condition. The results give benefit to investment communities.

The remainder of the document is organized as follow. Section II presents a literature review and hypothesis development. Sample and operational variable definitions are discussed in section III, while section IV provides statistical analyses and results. Concluding comments appear in the last section.

LITERATURE REVIEW

Technical analysis is less popular in academic communities than in investment communities (Flanegin and Rudd, 2005). Fama and Blume (1966) support that idea. Conversely, several studies of technical analysis show that technical analysis produces good performances, for example, Brock, Lakonishok, and LeBaron (1992) and Sweeney (1988).

Technical analysis is a competing information to fundamental information. Using Indonesian data, Sulistiawan and Hartono (2014) provide evidence that technical analysis signals produce a positive return around earnings announcements. Sulistiawan et al. (2014) also give evidence that those signals are competing information to earnings announcements. It absorbs price reaction on earnings announcements. Those results are similar to the Flanegin and Rudd (2005) findings. We also believe that market quality is an important determinant of technical analysis return. This belief is supported by Hartono and Sulistiawan (2014) and Fifield et al. (2005). Using international data, Hartono and Sulistiawan (2014) present that market quality is the determinant of technical analysis performance. They show that market capitalization negatively affect technical analysis returns. Using European market data, Fifield et al. (2005) also present similar conclusion. This study adopts those previous studies using market quality as controlling variable.

Using US and Greece data, Milionis and Papanagiotou (2008) present that technical analysis signals produce lower (higher) returns than those of buy and hold in US (Greece) market. They show that SMA5-SMA20 are good indicators for stock trading. This study uses SMA5, SMA10, and SMA15 as the main indicators, because simple indicators produce superior performances to more complex indicators (Metghalci et al., 2012). Loh (2006) and Chang et al. (2006) also present that moving average indicators produce profitable returns.

Ahmed, Beck, and Goldreyer (2000) give evidence that technical analysis produces superior performance in markets with high volatility and downward trend, except in US market. McKenzie (2007) also presents that technical analysis still produces good performances in 1997 crisis. Their studies present that economic crisis stimulates the usefulness of technical analysis indicators. Given those studies, this research believes that technical analysis becomes more important when global markets decline. This study uses the latest declining global stock market data.

The focus of this research is to confirm the studies of McKenzie (2007) and Ahmed et al. (2000) using

international data in 2011. In that year, stock markets declined. Declining business trends stimulate investors to find alternative information of fundamental information. That phenomenon explains why earnings informativeness falls in crisis or in economic downturn (Swanson et al., 2003; Bernard and Stober, 1989).

This study predicts that stock market condition affects technical analysis performances. Specifically, technical analysis indicators produce higher returns than buy and hold strategies in declining global markets.

DATA AND METHODOLOGY

This study observes companies around the world in 2010 and 2011. The focus is in the year 2011, because global stock markets substantially decline in that year. The year 2010 was a non-decreasing year and data for this year are used as a control sample. By using comparing years, this study may analyze the effect of global bearish markets to technical analysis profitability.

This research uses OSIRIS and Yahoo Finance databases. OSIRIS is financial database that is provided by Bureau Van Dick (bvdinfo.com). OSIRIS database skews to bigger firms in several countries (Lara et al., 2006). This study uses sample from many countries. Based on the availability, this study uses 21 countries that is available in Yahoo Finance database. According to technical analysis perspective, there are 11,040 technical analysis signals are detected in the sample as seen in Table 1.

Table 1 Number of Technical Analysis Signals for 21 Countries using Daily Data

Countries	LSMA5 2010	LSMA10 2010	LSMA15 2010	SSMA5 2010	SSMA10 2010	SSMA15 2010	LSMA5 2011	LSMA10 2011	LSMA15 2011	SSMA5 2011	SSMA10 2011	SSMA15 2011	TOTAL
Argentina	53	29	29	51	29	27	57	35	27	55	33	27	452
Australia	69	41	27	71	41	27	57	43	29	57	45	31	538
Austria	59	39	33	59	39	31	59	39	41	57	37	39	532
Belgium	53	47	29	55	47	29	65	49	37	63	49	37	560
Brazil	65	39	31	63	37	29	57	41	25	57	43	25	512
Canada	61	45	31	61	43	29	63	35	29	61	35	27	520
France	67	39	29	69	39	29	67	41	31	65	41	31	548
Germany	63	37	33	65	37	33	67	49	33	65	49	33	564
Greece	57	33	19	59	33	19	69	39	31	67	39	31	496
Hongkong	59	35	25	59	33	23	59	41	29	61	41	27	492
Indonesia	57	37	27	57	37	25	67	41	35	65	39	33	520
Israel	65	49	31	65	49	29	65	43	39	63	43	37	578
Malaysia	55	37	27	55	37	27	57	35	25	57	35	23	470
Mexico	65	27	23	65	25	21	59	41	33	57	39	31	486
Netherland	67	49	37	69	49	35	71	41	33	69	41	33	594
New Zealand	63	33	25	65	35	25	55	37	31	55	37	31	492
Singapura	63	31	25	65	29	23	63	43	37	65	43	37	524
Switzerland	59	43	31	61	43	31	63	47	31	61	47	31	548
Taiwan	65	37	25	65	37	23	53	41	31	53	41	31	502
UK	59	43	21	61	43	21	69	51	41	67	49	39	564
US	67	43	13	67	41	11	65	45	43	65	45	43	548
TOTAL	1291	813	571	1307	803	547	1307	877	691	1285	871	677	11040

This table shows the number of technical analysis signals in each country. LSMA52010 (LSMA102010/LSMA152010) indicates the number of signals using long strategy based on SMA5 (SMA10/SMA15) indicator in 2010. LSMA52011 (LSMA102011/LSMA152011) indicates the number of signals using long strategy based on SMA5 (SMA10/SMA15) indicator in 2011. SSMA52010 (SSMA102010/SSMA152010) indicates the number of signals using short strategy based on SMA5 (SMA10/SMA15) indicator in 2010. SSMA52011 (SSMA102011/SSMA152011) indicates the number of signals using short strategy based on SMA5 (SMA10/SMA15) indicator in 2011..

Empirical Models

The hypothesis is examined using both two-sample t-test and regression technique. The level of this study is not company level, but country level. The multivariate regression model used is as follows.

$$NETRET_{i,t} = \alpha + \beta1\, DYEAR_{i,t} + \beta2\, PMCAP_{i,t} + \beta3\, (DYEAR_{i,t}\, x\, PMCAP_{i,t}) + \varepsilon_{i,t} \quad (1)$$

$NETRET_{i,t}$ is adjusted technical analysis return for each country-i for each period-t. $DYEAR_{i,t}$ is a dummy variable to test the hypothesis, with the value of 1 for declining year and 0 otherwise. $PMCAP_{i,t}$ is the proportion of market capitalization (market size) for each country-i for each period-t to control the size effect. The interaction variable ($DYEAR_{i,t}$ x $PMCAP_{i,t}$) is an interaction between proportion of market capitalization ($PMCAP_{i,t}$) with dummy variable ($DYEAR_{i,t}$).

Variable Operational Definitions

Some variables are used. Variables are defined and measured as follows.

$NETRET_{i,t}$ is an adjusted technical analysis returns for each country-i for each period-t. Technical analysis returns (profitabilities) are determined by technical analysis signals. Adjusted technical analysis returns are technical analysis returns after deducted by buy and hold returns. The performances of technical analysis is represented by $NETRET_{i,t}$.

This study uses long, short, and long-short strategies to capture technical analysis performance. Long (short) strategies can be described as buy and sell (sell and buy) strategies. The main rule of the strategies is buy (sell) decision on a buy (sell) signal. Technical analysis returns for country-i, period-t, and signal on the day k is calculated from the difference between prices on sell signal on the day k for country-i in period-t ($P_{s,k,i,t}$) and price of buy signals stock-k for country-i in period-t ($P_{b,k,i,t}$). The equation (2) is for long strategy, and the equation (3) is for short strategy. In long (short) strategy, a buy (sell) signal is followed by a sell (buy) signal.

$$R_{sell-buy,k,i,t} = \frac{P_{s,k,i,t}-P_{b,k,i,t}}{P_{b,k,i,t}} \qquad (2)$$

$$R_{buy-sell,k,i,t} = \frac{P_{b,k,i,t}-P_{s,k,i,t}}{P_{s,k,i,t}} \qquad (3)$$

Technical analysis return for country-i in period-t is

$$R_{sell-buy,i,t} = \Sigma_1^k R_{sell-buy,k,i,t} \qquad (4)$$

$$R_{buy-sell,i,t} = \Sigma_1^k R_{buy-sell,k,i,t} \qquad (5)$$

$R_{sell-buy,i,t}$($R_{buy-sell,i,t}$) is cumulative returns generated from the a buy (sell) signal that is followed by a sell (buy) signal during one period-t for country-i. Returns of buy and hold strategy and adjusted technical analysis returns for each country-i for each period-t are calculated as follows. Equation (6) calculates a return of buy and hold strategy. Equation (7), (8), and (9) calculate an adjusted technical analysis return based on long, short, and long-short strategies.

$$R_{bh,i,t} = \frac{P_{end,i}-P_{begin,i}}{P_{begin,i}} \qquad (6)$$

$$NETRET_{i,t,long} = R_{sell-buy,i,t} - R_{bh,i,t} \qquad (7)$$

$$NETRET_{i,t,short} = R_{buy-sell,i,t} - R_{bh,i,t} \qquad (8)$$

$$NETRET_{i,t,long+short} = NETRET_{i,t,long} + NETRET_{i,t,short} \qquad (9)$$

There are many technical analysis indicators that can be used to generate buy or sell signals (Luca, 2000). This study uses not only Simple Moving Average (SMA) but also Weighted Moving Average (WMA). Both SMA and WMA indicators are also publicly available. The indicators are similar to the term of VMA (Variable-length MA), which means a distance of buy and sell signals is different for each signal. The formulas are presented as follow.

$$SMAn_i = \frac{\sum_1^n P_{i,n}}{n} \qquad (10)$$

$$WMAn_i = \frac{n.P_{i,1}+(n-1).P_{i,2}+(n-2).P_{i,3}+ \dots\dots+P_{i,n}}{\sum_1^n n} \qquad (11)$$

$P_{i,n}$ is the price n days ago based on market index i. The symbol of n represents the period used in technical analysis indicators, where n is 5,10, and 15 for SMA5, SMA10, SMA15, WMA5, WMA10, and WMA15, respectively.

The indicators of SMA and WMA generate buy and sell signals in the trading periods. Buy/sell signals are used to determine technical analysis returns. Buy (sell) signals that are followed by increasing (decreasing) price produce good performance of technical analysis. A buy signal occurs when the stock price the day 0 (P_0) crosses up SMA line, where P_0>SMA and P_{-1}<SMA_{-1}. A sell signal occurs when the stock price the day 0 (P_0) crosses down SMA line, where P_0<$SMAn$ and P_{-1}>SMA_{-1}. In WMA, a buy (sell) signal occurs when P_0 crosses up (down) WMA line, where P_0>WMAn and P_{-1}>WMA_{-1} (P_0<WMAn and P_{-1}<WMA_{-1}).

$PMCAP_{i,t}$ is the proportion of market capitalization for 50 companies for each country-i for each period-t to control the size effect. Measurement of market capitalization is the average of market capitalization of stocks in the sample in each country. Market capitalization proportion is measured by the each country's market capitalization ($MCAP_{it}$) divided by the total sum of the market capitalization all countries in the sample.

$$PMCAP_{i,t} = \frac{MCAP_{i,t}}{\sum MCAP_{i,t}} \qquad (12)$$

Robustness Tests

Robustness tests are conducted as follows. First, this study uses various technical indicators. There are SMA10, SMA15, WMA5, WMA10, and WMA15 indicators. Second, this study not only employs long strategy, but also uses short strategy, and the combination between long and short strategies, while for long and short strategy, return is calculated from the combination of short and long strategies. At the end of the measurement period, the last closing price is used as a reference price for calculating the last return.

The hypothesis is examined by paired sample t-test and regression analysis in equation (1). The hypothesis predicts that β1 coefficient is positive and statistically significant.

RESULTS AND DISCUSSIONS

Preliminary Results

Global stock market returns are presented in Table 2. The table shows that in 2011, except Indonesia, returns for declining period decrease. Conversely, returns for non-declining condition in 2010 are likely to increase.

Paired samples t-test is used to test the difference between years. The result shows that returns in 2011 and 2010 are statistically different. It means that both years are different.

Table 2: Global Stock Market Returns

	2011	2010	Returns Difference
Argentina	-0.31480	0.46700	-78.18%
Australia	-0.14770	-0.00860	-13.91%
Austria	-0.34990	0.14330	-49.32%
Belgium	-0.20290	0.00570	-20.86%
Brazil	-0.13210	-0.00740	-12.47%
Canada	-0.10130	0.12610	-22.74%
France	-0.18530	-0.05020	-13.51%
Germany	-0.15280	0.13850	-29.13%
Greece	-0.51750	-0.34910	-16.84%
Hongkong	-0.20010	0.04850	-24.86%
Indonesia	0.02460	0.42870	-40.41%
Israel	-0.18820	0.12210	-31.03%
Malaysia	-0.00170	0.18970	-19.14%
Mexico	-0.03060	0.17380	-20.44%
Netherland	-0.13130	0.05730	-18.86%
New Zealand	-0.01030	0.01230	-2.26%
Singapore	-0.17680	0.10050	-27.73%
Switzerland	-0.08370	-0.02930	-5.44%
Taiwan	-0.21490	0.09180	-30.67%
UK	-0.05240	0.07190	-12.43%
US	-0.00250	0.07960	-8.21%
Mean	**-0.15106**	0.086295	
t-statistic		**-6.471*****	

Table 3 shows technical analysis returns for all trading strategies in 2011 and 2010 using SMA indicators. The table shows that in declining global market period, long strategies produce negative returns for all SMA indicators (-5.37%, -10.85%, and -11.15% for SMA5, SMA10, and SMA15, respectively). All results are statistically significant. In contrast, group sample of non-declining global market period in 2010 shows that all returns are positive for all indicators (3.27%, 5.69%, and 9.82% for SMA5, SMA10, and SMA15) in long strategies. It means that short (long) strategies are suitable strategies in bearish (bullish) markets.

As expected, a long strategy in technical analysis does not work well in declining global markets condition. In bearish period, investors usually employ short strategies instead of long strategies for their stock investing. Table 3 shows that short strategies work well and produce profits in 2011 when global markets decline for all indicators (9.61%, 7.79%, 7.84% for SMA5, SMA10, and SMA15, respectively). It means that the use of short strategies in declining markets improve trading performance using technical analysis signals.

In contrast, in non-declining global markets condition in 2010, all indicators in short strategy generate negative returns; there are -4.85%, -4.99%, and -5.13% for SMA5, SMA10, and SMA15, respectively. It means that in bullish markets, short strategies are not recommended.

In Panel B, technical analysis returns are adjusted by buy and hold returns. Buy and hold returns are calculated based on different prices between the beginning of January and the ending of December. After adjusted buy and hold returns, in 2011, technical analysis returns are positive and significant in all indicators and trading strategies.

If both strategies are employed (long and short strategies), mean return in SMA5 indicator (19.16%) is the highest among others in declining global market condition in 2011. Conversely, in 2010, the use of SMA5 strategy is not recommended because it generates a negative return (-10.22%).

Table 3: Technical Analysis Profitability Around the World: SMA Indicators

n=21	Long SMA5	Long SMA10	Long SMA15	Short SMA5	Short SMA10	Short SMA15	Long Short SMA5	Long Short SMA10	Long Short SMA15
Panel A: $R_{bh,i,t}$									
Year: 2011									
Mean	-0.0537	-0.1085	-0.1115	0.0942	0.065	0.0605	0.0405	-0.0435	-0.0509
t statistics	-2.29**	-4.826***	-4.939***	3.138***	2.281**	1.918**	1.065	-1.551*	-1.532*
Year: 2010									
Mean	0.0327	0.0569	0.0982	-0.0485	-0.0499	-0.0513	-0.0159	0.007	0.0469
t statistics	1.308	2.162**	5.024***	-1.706*	-2.102**	-3.782***	-0.4	0.193	2.085**
Panel B: $NETRET_{i,t}$									
Year: 2011									
Mean	0.0974	0.0425	0.0396	0.2453	0.2161	0.2116	0.1916	0.1075	0.1001
t statistics	4.355***	2.182**	1.930**	4.540***	3.956***	3.752***	3.753***	2.391**	2.047**
Year: 2010									
Mean	-0.0536	-0.0294	0.0119	-0.1348	-0.1362	-0.0137	-0.1022	-0.0793	-0.0394
t statistics	-1.961**	-1.14	0.391	-2.292**	-2.531***	-2.981***	-1.848**	-1.649*	-0.953

The symbol ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively (one-tailed test). The symbol of n.s means that it is not statistically significant. All data are normally distributed based on Kolmogorov-Sminornov test.

To complement the results, Table 4 presents technical analysis returns using WMA indicators. These indicators are used to show that different indicators generate same conclusion. Long (short) strategy produce a positive return in 2010 (2011).

In Panel A, short (long) strategies produce positive returns in global a bearish (bullish) period. In 2010, WMA5, WMA10, and WMA15 indicators generate 3.16%, 5.1%, and 6.4% (-4.04%, -4.49%, and -4.85%) when long (short) strategy is used. Conversely, in 2011, WMA5, WMA10, and WMA15 indicators generate -3%, -10.41%, and -9.89% (11.75%, 5.3%, and 7.07%) when long (short) strategies are used.

Table 4: Technical Analysis Profitability Around the World: WMA Indicators

n=21	Long WMA5	Long WMA10	Long WMA15	Short WMA5	Short WMA10	Short WMA15	Long Short WMA5	Long Short WMA10	Long Short WMA15
Panel A: $R_{bh,i,t}$									
Year: 2011									
Mean	-0.0300	-0.1041	-.0989	0.1175	0.0530	0.0707	0.0875	-0.0511	-0.0282
t statistics	-1.108	-4.148***	-4.183***	3.445***	1.911**	2.011**	1.774**	-1.551*	-0.752
Year: 2010									
Mean	0.0316	0.0510	0.0640	-0.0404	-0.0449	-0.0485	-0.0088	0.0061	0.0155
t statistics	1.254	2.711**	2.610**	-1.234	-1.732**	-2.770***	-0.200	0.195	0.572
Panel B: $NETRET_{i,t}$									
Year: 2011									
Mean	0.1211	0.0470	0.0522	0.2686	0.2040	0.2218	0.2386	0.0999	0.1229
t statistics	4.796***	2.307**	2.244**	4.827***	3.860***	3.659***	4.056***	2.187**	2.241**
Year: 2010									
Mean	-0.0546	-0.0353	-0.0223	-0.1267	-0.1312	-0.1348	-0.0950	-0.0802	-0.0708
t statistics	-1.839**	-1.284	-1.135	-1.991**	-2.278**	-2.769***	-1.531*	-1.535*	-1.972**

The symbol ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively (one-tailed test). The symbol of n.s means that it is not statistically significant. All data are normally distributed based on Kolmogorov-Sminornov test.

In Panel B, all technical analysis indicators and trading strategies confirm the hypothesis. The results show that technical analysis returns produce higher returns than buy and hold returns in 2011. It means that buy and hold strategy is not suitable strategy in a declining trend. The use of technical analysis is recommended in a bearish market.

Multivariate Tests

Table 5 shows the results of multivariate tests. All DYEAR coefficients are positive for all SMA indicators. They are 0.162 (t test is 3.8 significant at 1%) for SMA5, 0.103 (t test is 2.785 significant at 1%) for SMA10, and 0.075 (t test is 2.221 significant at 5%) for SMA15. The interaction effects are also significant for SMA10 (coefficient is -0.65, t test is -1,484 significant at 10%) and SMA15 (coefficient is -0.997, t test is -1.955 significant at 5%). PMCAP (proportion of market capitalization) are also significant for SMA10 and SMA15 indicators. These results support the hypothesis that technical analysis returns are useful in declining markets.

Table 5: The Impact of Declining Market to Technical Analysis Performance for Long Strategy

	Long SMA5	Long SMA10	Long SMA15
Intercept	-.0043	-0.024	-0.002
Stat.t	-1.401**	-0.889	-0.066
PMCAP	-0.226	-.123	0.293
Stat.t	-0.606	-0.382	0.779
DYEAR	0.162	0.103	0.075
Stat.t	3.800***	2.785***	1.747**
DYEAR x PMCAP	-0.236	-0.650	-0.997
Stat.t	-0.466	-1.484*	-1.955*

The regression equation is $NETRET_{i,t} = \alpha + \beta1DYEAR + \beta2PMCAP_{i,t} + \beta3 (DYEAR\ x\ PMCAP_{i,t}) + \varepsilon_{i,t}$. Dependent variable is technical analysis return after adjusted buy and hold strategy. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively (one-tailed test). The symbol of n.s means that it is not statistically significant. PMCAP is proportion of market capitalization, that is represented by the average of market capitalization of companies in sample countries. DYEAR = 1 when year is 2011, and 0 otherwise. The residuals of those regressions are normally distributed.

Robustness Tests

Robustness tests are conducted for different trading strategies. Those are presented in Table 6. The results show that DYEAR coefficients are positive for both strategies and indicators. All of them are significant at 1%. Control variable PMCAP (proportion of market capitalization) are insignificant for short and long-short strategies for all SMA indicators, but the interactions are significant for SMA10 and SMA15 indicators using short and long-short strategies. These results support the hypothesis that technical analysis returns yield higher returns than those provided by buy and hold strategy. These results also give insight that as a moderating variable, DYEAR can affect the relation between market capitalization and technical analysis performance.

To complement the results, this study also presents robustness test using WMA indicators. Those are presented in Table 7. That table shows that declining years stimulate better performance of technical analysis signal. All coefficients DYEAR are significant at one percent.

McKenzie (2007) and Ahmed et al. (2000) studies demonstrate that technical analysis produce profitable returns in declining market. Using different trading strategies and technical analysis indicators, this study confirms those previous findings. Hartono and Sulistiawan (2014) also present that market quality affects technical analysis performances. This study complements those previous studies by explaining that declining market is an important moderating variable. It affects the relation between market capitalization and technical analysis performance.

Table 6: The Impact of Market Capitalization and Declining Market to Technical Analysis Performance for Short and Long-short Strategies

	SSMA5	SSMA10	SSMA15	LSSMA5	LSSMA10	LSSMA15
Intercept	-0.126	-0.144	-0.164	-0.074	-0.072	-0.071
Stat.t	-1.831**	-2.207**	-2.650***	-1.136	-1.329*	-1.336*
PMCAP	-.0183	0.164	0.565	-0.601	-0.152	0.665
Stat.t	-0.218	0.206	0.747	-0.762	-0.229	1.027
DYEAR	0.430	0.426	0.433	0.316	0.253	0.232
Stat.t	4.471***	4.681***	5.006***	3.493***	3.340***	3.134***
DYEAR x LnPMCAP	-1.040	-1.551	-1.771	-0.459	-1.384	-1.952
Stat.t	-0.913	-1.437*	-1.726**	-.0429	-1.543*	-2.220**
Durbin-watson	1.760	1.987	1.815	1.720	2.081	1.899

The regression equation is $NETRET_{i,t} = \alpha + \beta1\ DYEAR + \beta2\ PMCAP_{i,t} + \beta3\ (DYEAR\ x\ PMCAP_{i,t}) + \varepsilon_{i,t}$. Dependent variable is technical analysis return after adjusted buy and hold strategy.***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively (one-tailed test). The symbol of n.s means that it is not statistically significant. PMCAP is proportion of market capitalization, that is represented by the average of market capitalization of companies in sample countries. DYEAR = 1 when year is 2011, and 0 otherwise. Residuals are normally distributed. SSMA15 (SSMA5 and SSMA10) indicates long strategy based on SMA15 (SMA5 and SMA10) indicator. LSSMA15 indicates long and short strategies based on SMA15 (SMA5 and SMA10) indicator.

Table 7: Robustness Tests Using WMA Indicators

	LWMA5	LWMA10	LWMA15	SWMA5	SWMA10	SWMA15	SWMA5	SWMA10	SWMA15
Intercept	-0.048	-0.027	-0.022	-0.124	-0.138	-0.136	-0.077	-0.070	-0.063
Stat.t	-1.413*	-0.930	-0.890	-1.691**	-2.057**	-2.065**	-1.028	-1.180	-1.173
PMCAP	-.0135	-0.170	-0.010	-0.057	0.146	0.028	-0.385	-0.217	-0.174
Stat.t	-0.324	-0.477	-0.033	-0.064	0.178	0.035	-0.423	-0.300	-0.268
DYEAR	.0190	.101	0.112	0.449	0.402	0.428	0.363	0.227	0.264
Stat.t	3.981***	2.477***	3.279***	4.395***	4.296***	4.650***	3.483***	2.751***	3.545***
DYEARxPMCAP	-.0291	-0397	-0.790	-1.136	-1.411	-1.493	-0.610	-0.991	-1.467
Stat.t	-.0516	-0.819	-1.950**	-.937	-1.271	-1.369*	-0.494	-1.012	-1.664*
Durbin-watson	1.517	1.799	2.115	1.729	1.814	1.970	1.566	1.741	2.181

The regression equation is $NETRET_{i,t} = \alpha + \beta1\ DYEAR + \beta2\ PMCAP_{i,t} + \beta3\ (DYEAR\ x\ PMCAP_{i,t}) + \varepsilon_{i,t}$. Dependent variable is technical analysis return after adjusted buy and hold strategy. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively (one-tailed test). The symbol of n.s means that it is not statistically significant. PMCAP is proportion of market capitalization, that is represented by the average of market capitalization of companies in sample countries. DYEAR = 1 when year is 2011, and 0 otherwise. Residuals are normally distributed. SSMA15 (SSMA5 and SSMA10) indicates long strategy based on SMA15 (SMA5 and SMA10) indicator. LSSMA15 indicates long and short strategies based on SMA15 (SMA5 and SMA10) indicator.

In declining global market period (bearish), technical analysis performance are better than those of buy and hold strategy. Applying long trading strategy is not recommended when the markets are declining, resulting negative returns for both SMA and WMA indicators (see Panel A, Table 3 and 4, Year 2011). Even though returns provided by technical analysis are negative for all SMA and WMA indicators in declining global market period, returns obtained by buy and hold are more negative, resulted positive returns after technical analysis returns adjusted by buy and hold returns (see Table 3 and 4, Panel B). Applying short trading strategies are recommended when the markets are declining, resulting positive returns for all SMA and WMA indicators (see Panel A, Table 3, Year 2011). For long and short strategies, this study suggests using shorter SMA or WMA indicators, because shorter indicators generate higher returns that longer indicators. In this case, using SMA5 and WMA5 indicators are recommended.

In non-declining global market (bullish) period, technical analysis performance are not always better than those of buy and hold strategy. For all strategies and all indicators, adjusted technical analysis returns are

negative, except for SMA15 indicator (see Panel B, Table 3, Year 2010). These results suggest that returns generated from buy and hold strategies are greater than returns from technical analysis signals. It means, in a bullish market, buy and hold strategy is a recommended strategy. Applying long trading strategy is recommended for technical analysis when the markets are non-declining, resulting positive returns for all SMA and WMA indicators (see Panel A, Table 3, Year 2010). Applying short strategies for technical analysis are not recommended when the markets are bullish, resulting negative returns for all SMA and WMA indicators (see Panel A, Table 3 and 4, Year 2010).

CONCLUSIONS

The main goal of this study is to examine the impacts of declining global markets to technical analysis performance around the world. Using data of twenty-one countries around the world in 2011 and 2010, this study concludes that in declining global market period (bearish market), technical analysis performance are better than those of buy and hold strategy. In non-declining global market period (bullish market), technical analysis performances are worse than those of buy and hold strategy.

The results are very important to the development of technical analysis researches in investing area. This study explains that bullish or bearish condition can determine technical analysis returns. When bullish (bearish), technical-analysis returns are lower (higher) than buy and hold returns.

More variables are needed to deeply understanding about the determinants of technical analysis returns. Declining trend can decrease the usefulness of earnings data. Future study also needs to build a bridge between technical analysis and fundamental analysis studies.

REFERENCES

Ahmed, P., Beck, K. & Goldreyer, E. (2000) "Can Simple Moving Average Technical Trading Strategies Help in Volatile and Declining Markets? A Study of Some Emerging Asian Markets," *Managerial Finance,* vol. 26 (6), p. 49-62.

Bernard V.L. & Stober T.L. (1989) "The Nature of Information in Cash Flows and Accruals,"*Accounting Review*, vol 64, p. 624-652.

Bessembinder, H. & Chan, K. (1995) "The Profitability of Trading Rules in The Asian Stock Markets," *Pasific-Basin Finance Journal,* vol. 3, p. 257-284.

Brock, W., Lakonishok L. & LeBaron, B. (1992) "Simple Technical Trading Rules and the Stochastic Properties of Stock Returns," *Journal of Finance,* vol. 47 (5), p. 1731-1764.

Chang, Y., Metgalchi, M. & Chan, C. (2006) "Technical Trading Strategies and Cross-National Information Linkage: The Case of Taiwan Stock Market," *Journal of Business Finance & Accounting*, vol. 16, p. 731-743.

Eiteman D.K., & Smith, K.V. (1974) "A Portfolio analysis of teaching of investments," *Journal of Financial and Quantitative Analysis,* vol 9, p. 771-780.

Fama, E.F. & Blume, M.E. (1966) "Filter Rules and Stock-Market Trading," *Journal of Business,* vol. 39, p. 226-241.

Fifield, S.G.M., Power, D.M. & Sinclair, C.D. (2005) "An Analysis of Trading Strategies in Eleven European Stock Markets," *European Journal of Finance,* vol. 11, p. 531-548.

Flanegin F.R. & Rudd, D.P. (2005) "Should Investments Professors Join The "Crowd"," *Managerial Finance,* vol. 31 (5), p. 28-37.

Hartono J. &Sulistiawan, D. (2014) "The Market Quality to Technical Analysis Performance: Inter-Country Analysis," *Gadjah Mada International Journal of Business* (forthcoming).

Lara J.M.G., Osma, B.G. & Gill-de-Albornoz, B. (2006)"Effects of Database Choice on International Accounting Research," *Abacus*, vol. 42, no. 3-4, p. 426-454.

Loh, E. (2006) "A Proxy for Weak Form Efficiency Based on Confirming indicators in Technical Analysis," *The Business Review*, vol. 5 (1), p. 301-306.

McKenzie, M.D. (2007) "Technical Trading Rules in Emerging Markets and the 1997 Asian Currency Crises," *Emerging Markets Finance and Trade,* vol. 43 (4), p. 46-73.

Metghalchi, M., Chang, Y., & Gomez, X.G. 2012, "Technical analysis of the Taiwanese Stock Market," *International Journal of Economics and Finance*, vol 4 (1), p. 90-102.

Milionis, A.E.&Papanagiotou E. (2008)"On the Use of Moving Average Trading Rule Test for Weak Form Efficiency in Capital Markets,"*Review of Banking, Finance and Monetary Economics,*vol. 2, p. 181-201.

Sulistiawan D., Hartono, J., Tandelilin, E. & Supriyadi (2014) "Earnings Announcements and Competing Information: Indonesian Evidence," *Journal of Indonesian Economy and Business*" (forthcoming).

Sulistiawan D. & Hartono, J. (2014) "Can Technical Analysis Signals Detect Price Reactions around Earnings Announcements?: Evidence from Indonesia," *The International Journal of Business and Finance Research*, vol. 8 (1), p. 113-123.

Swanson E.P., Rees, L. & Valdes, L.F.J. (2003)"The Contribution of Fundamental Analysis after a Currency Devaluation,"*Accounting Review*, vol. 78, p. 875-902.

Sweeney R.J. (1988) "Some New Filter Rule Tests: Methods and Results," *Journal of Financial and Quantitative Analysis,* vol.2 (3), p.285-300.

Wong, W., Manzur M. & Chew B. (2003) "How Rewarding is Technical Analysis?: Evidence From Singapore Stock Market," *Applied Financial Economics,* vol.13, p. 543-551.

ACKNOWLEDGEMENT

BIOGRAPHY

Jogiyanto Hartono is a Professor of Accounting at Universitas Gadjah Mada. He received his Ph.D in Accounting from Temple University, USA. His research interest is market based accounting research. He can be contacted at Faculty of Economics & Business, Universitas Gadjah Mada, Jl. Sosio Humaniora No.1, Bulaksumur, Yogyakarta, 55281, Indonesia. His email is jogiyantohm@gmail.com.

Dedhy Sulistiawan is a Lecturer of Accounting at University of Surabaya. He received his Ph.D in Accounting from Universitas Gadjah Mada, Indonesia. His research interest is market based accounting research and behavioral finance. He can be contacted at Faculty of Business and Economics, University of Surabaya, Jl. Raya Kalirungkut, Surabaya, 60295, East Java, Indonesia. His email is dedhy@ubaya.ac.id.