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Analysis of Malaysia's Single Stock Futures and Its Spot Price

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ABSTRACT

Single Stock Futures (SSFs) was introduced in Bursa Malaysia on 28th April 2006. There have been many studies on derivative instruments in Malaysia; however, none is on SSFs. Various statistical methods have been used to analyse the SSFs and its spot returns, namely Descriptive Statistics, Unit Root test, VAR, Johansen and Juselius Co-integration test, Granger Causality test, Variance Decomposition test, VECM, and GARCH model. This study analyses the SSFs and spot returns of eight companies listed in Bursa Malaysia. It found that Berjaya Sports Toto Bhd and Genting Bhd have no long-run and short-run causality (Genting Bhd has bi-directional causality) while AirAsia Bhd and AMMB Holdings Bhd's spot returns' volatility decreased after the introduction of SSFs; it increased in the other seven companies. In addition, only AMMB Holdings Bhd futures return did not affect its spot return. Bursa Malaysia Bhd and RHB Capital Bhd spot returns lead their futures returns

Keywords: Single Stock Futures, SSF, VAR, Granger Causality, GARCH

INTRODUCTION

Futures are linked to two types of financial market: The Equity (known as Stock Market) and the Futures Market. Futures can be a driver to hedge a portfolio and to capture market opportunities. Basically, the value of derivatives is derived in a contractual manner from one or more underlying asset while Single Stock Futures (SSFs), as explained by Securities Commission Malaysia, is an agreement that the price of a stock, either to buy or sell in a future time, is agreed today and that particular underlying stock is listed on the exchange. Just like any other futures contracts, each SSFs has its expiry date. Investors are said to be able to have the rights in the underlying stock even though they do not own its shares and able to benefit from the rise in value of the price. However, because SSFs' holders are not

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the real shareholders of the company, they do not have the right to receive dividends as well as any other rights. The SSFs are also standardised contracts of exchange-traded derivatives which are easier to deal because no discussion nor negotiation are involved outline the contract's specifications, terms and conditions. Since the futures markets are considered to be more volatile than the spot market, they can also be a source of volatility for the spot market. This study investigates whether the stock futures increases or decreases the spot market's volatility.

Awan and Rafiq (2013) stated that that derivatives generally increases stock prices. However, due to mixed empirical evidence, there is no agreement among researchers on this matter. Isa (2003) for instance, examined the impact of the introduction of derivative instruments on the cash markets of Bursa Malaysia. He concluded that the market efficiency has increased while the level of volatility has decreased. In this study, the relationship between Single Stock Futures and the underlying stock and the volatility level after the introduction of Single Stock Futures is examined and to discover whether the movement of Single Stock Futures price affects the underlying asset price, or vice versa.

LITERATURE REVIEW

The introduction of SSFs in the market has increased the force of arbitragers (Ang & Cheng, 2005). They found stock returns decreased resulting in lowest interest for investors while the arbitrages were more interested in trading. There are different types of risks as well as the restriction on investors, making it difficult to fully identify the impact of futures in the stock market (see McKenzie, Barailsford & Faff, 2001; Antonio, Koutmos & Pericli, 2005). Khan (2006) studied the effect of futures trading in Pakistan to identify their volatility. He stated that futures market influenced the spot market in terms of integrating new information. In addition, futures market does not affect spot market's volatility, and also the outgrowth of spot market affects the volatility of futures market. Khan and Hijazi (2009) found that the volatility of stock price declined after the introduction of futures trading. They noted a positive relationship between volatility of spot and volumes of spot. Mazouz and Bowe (2006) used GARCH (1,1) to investigate the futures trading's volatility effect, and found that there was an increase on residual variance in current news, and they proved that the listing of futures market improves the stock market. There was also a bidirectional causality between the spot market and futures market (Pizzi, Oconomopoulos & O'Neill, 1998). They also found that the spot led the futures for three to four minutes, while the futures led the spot for 20 minutes.

DATA AND METHODOLOGY

A qualified sample must not have any missing data (Chang, Cheng Pinegar, 1999). Data from ight companies was used for this research. Maxis Communications Bhd and Scomi Group Bhd were rejected because in the middle of observations, both companies were delisted from SSFs. The daily end spot prices data was retrieved from Datastream of UiTM between 17th March 2005 and 31st December 2013 because of data availability. The daily end futures prices data for the study was from 1st January 2007 to 31st December 2013 because even though SSFs was introduced on 28th April 2006, not all counters began their trading on that date. All eight

counters had complete data starting 1st January 2007, with 1,826 observations. Statistical analysis will use data from 1st January 2007 to 31st December 2013, except for GARCH model; the spot prices from 17th March 2005 to 8th June 2007 was used. Before the analysis began, the logarithmic returns were calculated for both spot prices and futures prices to prevent the non-stationary problem in raw data that usually happens to monetary data. Natural logarithm of two following after one another (consecutive) days is as follows:

$$R_t = \ln\left(\frac{P_t}{P_{t-1}}\right) \tag{1}$$

R_t is the SSFs return for the given period of t, P_t is the SSFs end price at time t, and P_{t-1} is the SSFs closing price at time $t-1$. Descriptive statistic is use to explain the behaviour of SSFs data, or in other words, it is the SSFs's characteristics summarisation. In this research, Johansen and Juselius Co-integration test will be used. This test depends on two types of test: trace test and maximum-eigenvalue test. Vector auto regression (VAR) of order n will be assumed as it consists of the trace test and maximum-eigenvalue test on SSFs data. The null hypothesis states that there are no cointegration between the SSF and its spot if the trace value is less than the critical value (0.05) and vice versa.

Granger Theorem's principal explains that there is a causal relationship between two variables, two or at least one direction, if that two variables are co-integrated. However, the co-integration does not interpret the lead relationship that is essential in price discovery, even though it does capture the existence of a long-run relationship. The Granger Cause is to detect whether, x precedes y, y precedes x, or if the movement occurs at the same time. Variance Decomposition test provides information on the importance of each random innovation that affects variables in VAR. The variance decomposition test explains the proportion of the movements in one variable (dependent variable) that are due to its own shocks versus shocks due to the other variables (independent variable). The variance decomposition is considered a better tool for the cumulative effect of shocks. Vector Error Correction Model (VECM) captures the short-term relationship of the SSFs. A VECM is part of multiple time series model that approximate the speed of SSFs to get back to equilibrium after the changes in spot market. There are three things that can be interpreted from the VECM result, namely the long-run causality, short-run causality and coefficient value. Null hypothesis states that there is a long-run causality for spot and futures returns if the first coefficient, C (1), is negative and the probability is less than 0.05. The null hypothesis states that there is short run causality if the probability for the chi-square is less than 0.05 (accept null hypothesis) and vice versa (there is no short-run causality between spot and futures returns of the SSFs if chi-square is more than 0.05). The coefficient value indicates the correcting disequilibrium from previous day to current day, or in other words, how fast the changes from yesterday will affect today's SSFs price. The greater the value, the faster the change will be.

In the GARCH Model, volatility is measured through variance. A bigger value of variance indicates a high volatility and the market is said to be riskier. It can be used to detect the difference before and after the introduction of SSFs and in this study, the latter's pre-event variance and post event variance. The assumption of expected value of residual must be

zero, it is a constant variance of residual terms (heteroskedasticity), and also there is no auto-correlation in the data series like the assumptions made in OLS regression. The basis for ARCH and GARH models is the breach of homoscedasticity assumption. The ARCH effect must not have heteroskedasticity. The null hypothesis for heteroskedasticity test is that there is no ARCH effect if the probability value is more than 0.05 (accept null hypothesis) and vice versa. Therefore, the GARCH model can be used in the analysis. Basic GARCH (1, 1) specification:

The mean equation;

$$y_t = \alpha + \beta y_{t-1} + \varepsilon_t \ldots\ldots\ldots \varepsilon_t(0, h_t) \tag{2}$$

Where y_t the return on SSFs and its spot is, α is a constant, βy_{t-1} is the autoregressive coefficient explanatory (lagged), ε_t is the residual term. Brooks in 2008 explained the variance equation as:

$$h_t = \omega + \alpha\varepsilon_{t-1}^2 + \beta h_{t-1t} + \theta D_t \ldots\ldots\ldots \omega > 0, \alpha > 0, \beta \geq 0 (10) \tag{3}$$

Whereby h_t represent the conditional variance in period t, ω is the constant, βh_{t-1} is then the persistence coefficient GARCH(1,1) term and θD_t is the dummy variable. Thus, the unconditional constant variance of error term:

$$\text{var} = \frac{\omega}{1 - \alpha - \beta} \tag{4}$$

The variance equation consists of three terms, namely a constant, ω, information regarding previous period volatility (ARCH term) and forecasted variance of last period (GARCH term).

$$\text{var}(\varepsilon_t) = \frac{\omega + \delta}{1 - \alpha - \beta} \tag{5}$$

δ represent the coefficient and D_t represents the dummy variable on the tested data series. The use of dummy in the variance equation is because of it is assumed that mean structure or volatility break is the cause of event. Economic researchers believe a long-term stable mean structure is better in the calculation of economic time series, as the temporary events should not be easily affecting. Finally, if the total GARCH parameters ($(\alpha + \beta)$ is greater than 0.9 it is an indication that the persistence of the shock to the volatility is permanent (Engle & Bollerslev, 1986).

ANALYSIS

Descriptive Statistics

Descriptive statistics was applied to both spot and futures returns (eight companies) with a total of 1,826 observations as seen in Table 1. The results show that in terms of spot return, the top three companies, namely Telekom Malaysia Bhd, RHB Capital Bhd, and AMMB Holding, have the highest average daily returns of 0.0589%, 0.0469%, 0.046% with 1.39%,1.67% and 1.62% risk level respectively. However, their futures return recorded a – 0.031%, 0.0459%,

and 0.045% with risk level of 3.01%, 1.68%, and 1.51% respectively. AirAsia Bhd and IOI Corporation Bhd futures return record an average daily returns of 0.0215%, 6.84% with 2.37% -and 0.074% risk level respectively, whereas their spot average daily returns are 0.0206%, 0.0264% with 2.13% and 1.98% risk level respectively. Same goes to Genting Bhd and Bursa Malaysia Bhd where the average daily spot returns are higher than average daily futures returns, yet, their futures returns' risk level are higher than spot returns' risk level. Berjaya Sports Toto Bhd recorded negative average daily returns for both spot return (-0.00432%) and futures return (-0.00944%), with 1.5% and 0.78% risk level respectively. Only AirAsia Bhd spot and futures, Bursa Malaysia Bhd futures, Genting Bhd spot, RHB Capital Bhd spot and futures, and Telekom Malaysia Bhd spot have positive value in skewness (long right tail, higher tendency or probability of positive returns).

Table 1
Results of Descriptive Statistics

	Mean	**Std. Dev.**	**Skewness**	**Kurtosis**	**Prob.**
AA_FR	0.0002150	0.0237	2.4453	65.8105	0
AA_SR	0.0002060	0.0213	0.1014	6.4679	0
AMMB_FR	0.0004500	0.0151	-2.4784	150.1889	0
AMMB_SR	0.0004600	0.0162	-0.2785	12.3041	0
BM_FR	0.0000081	0.0202	2.3506	128.7121	0
BM_SR	0.0000121	0.0183	-0.0183	9.2133	0
BST_FR	-0.0000944	0.0078	-1.6392	85.9735	0
BST_SR	-0.0000432	0.0150	-0.3664	117.0728	0
G_FR	-0.0006330	0.0410	-33.1577	1308.9740	0
G_SR	0.0002420	0.0189	0.3025	5.8990	0
IOI_FR	-0.0007400	0.0684	-7.2668	507.1818	0
IOI_SR	0.0002640	0.0198	-0.0743	19.5952	0
RHB_FR	0.0004690	0.0167	0.3605	97.9842	0
RHB_SR	0.0004590	0.0168	0.2826	10.3678	0
TM_FR	-0.0003100	0.0301	-31.1359	1179.0600	0
TM_SR	0.0005890	0.0139	0.9867	51.2713	0

The remaining returns are negatively skewed (long left tail, higher probability of negative returns). All companies show kurtosis value of more than 3, and it is known as leptokurtosis to explain that all companies have fatter tail and lesser risk of extreme outcomes. Any small changes are less likely to happen. However, it is not favoured by conservative investors who tend to overestimate at high levels of significance, whereas in a normal distribution, low levels of significance will usually be overestimated. The reported probability is the probability for Jarque-Bera. Since all the returns have 0 probabilities, which is less than 0.05, it means that the returns are not normal.

Unit Root, Vector Auto Regression, Co-Integration & Granger Causality

Figure 1 shows the illustration of granger causality test. There are two unidirectional granger cause, one bi-directional granger cause and five no causality. Based on Table 2 and Table 3, we rejected the null hypothesis since the probability values are less than 0.05, no co-integration equation, and there is one co-integration equation. The probability values are all less than 0.05, hence, we rejected the null hypotheses to show that all eight companies have a long-run relationship.

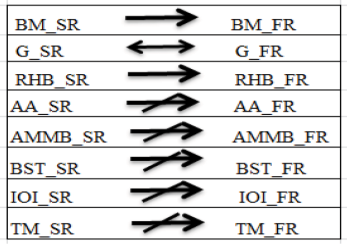

Figure 1. Simplified Granger Causality Test

Table 2
Trace Test

Company	Hypothesised No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.
AA	None *	0.194064	652.8156	15.49471	0.0001
AMMB	None *	0.175497	632.0589	15.49471	0.0001
BM	None *	0.194372	682.251	15.49471	0.0001
BST	None *	0.237961	827.031	15.49471	0.0001
G	None *	0.191526	711.5693	15.49471	0.0001
IOI	None *	0.225153	644.5632	15.49471	0.0001
RHB	None *	0.192731	665.3697	15.49471	0.0001
TM	None *	0.170849	575.7637	15.49471	0.0001

Table 3
Maximum Eigen-value Test

Company	Hypothesised No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
AA	None *	0.194064	392.8833	14.2646	0.0001
AMMB	None *	0.175497	351.4068	14.2646	0.0001
BM	None *	0.194372	393.5778	14.2646	0.0001
BST	None *	0.237961	494.8703	14.2646	0.0001
G	None *	0.191526	387.157	14.2646	0.0001
IOI	None *	0.225153	463.4991	14.2646	0.0001
RHB	None *	0.192731	389.8742	14.2646	0.0001
TM	None *	0.170849	340.9829	14.2646	0.0001

Hence, we can say that the spot returns may forecast the futures returns for Bursa Malaysia Bhd and Genting Bhd. While the futures return of Genting Bhd and RHB Capital Bhd may forecast their spot returns and play an important role in price discovery (determining the spot price).

Variance Decomposition Test & Vector Error Correction Model

Impulse or shock to futures returns are said to be 100% of variation explained by its own lag returns than by the lag returns of spot. We can say that all eight companies are in an exogenous (determined by external factors) market as majority of the shocks are explained by their own innovations, or in other words, the shocks can be explained by the decision of the company. The standard error for all eight companies are lower, which also means it is good because the smaller the standard error, the more it will represent the sample population, as it measures accuracy.

Table 4 shows the results of Vector Error Correction Model. There is a long-run causality for spot and futures returns if the first coefficient is negative and the probability is less than 0.05. Therefore, we can say that only Berjaya Sports Toto Bhd has no long-run causality while the remaining seven companies have a long-run causality. The coefficient values also indicate the percentage of correcting disequilibrium from previous day to current day. It is quite fast for five companies: 66.4183% for AirAsia Bhd, 35.2816% for AMMB Holdings Bhd, 79.6967% for Bursa Malaysia Bhd, 48.3434% for IOI Corporation Bhd, and 50.499% for Telekom Malaysia Bhd. It is very slow for the remaining three companies. From Table 5, there is no short-run causality between spot and futures returns for both Berjaya Sports Toto Bhd and Genting Bhd; because the probability for the chi-square is more than 0.05, we reject the null hypothesis.

Table 4
Vector Error Correction Model Results

	Coefficient	Std. Error	t-Statistic	Prob.
AA	-0.664183	0.034005	-19.53196	0
AMMB	-0.352816	0.026085	-13.5257	0
BM	-0.796967	0.036085	-22.08585	0
BST	-0.001908	0.003468	-0.550196	0.5823
G	-0.000992	0.000495	-2.005356	0.0451
IOI	-0.483434	0.029657	-16.30108	0
RHB	-0.072357	0.011996	-6.031744	0
TM	-0.502499	0.02946	-17.05679	0

Table 5
Short Run Causality

	Chi-square	Probability
AA	206.7796	0
AMMB	105.1169	0
BM	161.9309	0
BST	0.182172	0.9129
G	1.257373	0.5333
IOI	167.4725	0
RHB	33.28363	0
TM	140.6512	0

Table 6
Results of GARCH Test

		ω	α	β	Volatility	$\alpha + \beta$
AA	Before	0.8942	0.1750	0.0000	1.0411	0.1750
	After	0.0964	0.0000	0.0000	0.3105	0.0000
AMMB	Before	0.2032	0.1067	0.2037	0.5428	0.3104
	After	0.0054	0.0000	0.0000	0.0735	0.0000
BM	Before	0.4642	0.3063	0.0000	0.8180	0.3063
	After	0.8045	0.0000	0.0000	0.8969	0.0000
BST	Before	0.0844	0.0016	0.0952	0.3057	0.0968
	After	0.8769	0.0000	0.0000	0.9364	0.0000
G	Before	0.2724	0.0000	0.0000	0.5219	0.0000
	After	0.7280	0.0000	0.0000	0.8532	0.0000
IOI	Before	0.1181	0.0478	0.0000	0.3522	0.0478
	After	0.9535	0.0000	0.0000	0.9765	0.0000
RHB	Before	0.6825	0.2381	0.7675	0.0000	1.0056
	After	0.2990	0.0019	0.0000	0.5473	0.0019

Table 7
Futures Return Affecting Spot Return

Hypothesis	Probability
AA_FR Affects AA_SR	0.7484
AMMB_FR Affects AMMB_SR	0
BM_FR Affect BM_SR	0.1007
BST_FR Affects BST_SR	0.9252
G_FR Affects G_SR	0.1287
IOI_FR Affects IOI_SR	0.1058
RHB_FR Affects RHB_SR	0.3874

GARCH Model

Table 6 shows that before the introduction of SSFs, AirAsia Bhd, AMMB Holdings Bhd, Bursa Malaysia Bhd, and RHB Capital Bhd, the previous day's information does not influence the current day's volatility. However, after the introduction of SSFs, those companies' previous information does affect the current day's volatility. On the other hand, the remaining companies' volatilities are affected by the previous day's information. From Table 7, it can be concluded that only AMMB Holdings Bhd futures return does not affect its spot return whereas, the remaining seven companies' futures returns affect their spot returns.

CONCLUSION

The study has achieved its objectives, where we know that even though all eight companies' spot and futures returns are moving together in the long-run because the price of futures is determined by the price of stock market, both Berjaya Sports Toto Bhd and Genting Bhd have no long-run and short-run causalities. In addition, the volatility of majority of spot returns increases after the introduction of SSFs, except for AirAsia Bhd and AMMB Holdings Bhd Only AMMB Holdings Bhd futures return does not affect its spot return while the remaining companies' spot returns are affected by their futures returns. The study also shows that Bursa Malaysia Bhd and RHB Capital Bhd. spot returns lead their futures returns and Genting Bhd has bi-directional causality.

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REFERENCES

Ang, J. S., & Cheng, Y. (2005). Single stock futures: Listing selection and trading volume. *Finance Research Letters*, *2*(1), 30-40.

Antoniou, A., Koutmos, G., & Pericli, A. (2005). Index futures and positive feedback trading: Evidence from major stock exchanges. *Journal of Empirical Finance*, *12*(2), 219-38.

Awan, A., & Rafiq, A. (2013). The Volatility effect of Single Stock Futures Trading on Pakistani Stock Market. *Business Review, 8*(1), 94 – 122.

Chang, E. C., Cheng, J. W., & Pinegar, J. M. (1999). Does futures trading increase stock market volatility? The case of the Nikkei stock index futures markets. *Journal of Banking & Finance, 23*(5), 727-753.

Engle, R. F., & Bollerslev, L. (1986). Modelling the persistence of conditional variance. *Econometric Reviews*, *5*(1), 1-50.

Isa, Z. (2003). The Impact of the Introduction of Derivatives Instruments on the Level of Spot Market Volatility: An empirical Study on Bursa Malaysia. *Sains Malaysiana*, *35*(1), 95-105.

Khan, S. (2006). Role of the futures market on volatility and price discovery of the spot market: Evidence from Pakistan's Stock Market. *The Lahore journal of Economics*, *11*(2), 107-21.

Khan, S., & Hijazi T. S. (2009). Single stock futures trading and stock price volatility: Empirical analysis. *The Pakistan Development Review, 48*(4), 553-563.

Marzuki, R. M. (2015). *Relationship of single stock futures with the spot price*. (Master's Thesis). Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA, Malaysia.

Mazouz, K., & Bowe, M. (2006). The volatility effect of futures trading: evidence from LSE traded stocks listed as individual equity futures contracts on LIFFE. *International Review of Financial Analysis*, *15*(1), 1-20.

McKenzie, M., Brailsford, T., & Faff, R. (2001). New insights into the impact of the Introduction of futures trading on stock price volatility. *Journal of Futures Markets*, *21*(3), 237-255.

Pizzi, M. A., Economopoulos, A. J., & O'Neill, H. M. (1998). An examination of the relationship between stock index cash and futures markets: A cointegration approach. *Journal of Futures Markets*, *18*(3), 297-305.