PP7623/3/2005

CAPITAL MARKETS REVIEW

SPECIAL ISSUE

Contents:

Published by:

KLSE AND RIIAM

VOL. 11 NOS. 1 & 2, 2003

Vol. 11 Nos. 1 & 2, 2003

CAPITAL MARKETS REVIEW

SPECIAL ISSUE

Contents:

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DAILY RETURNS SEASONALITY AND IMPACT OF STOCK INDEX FUTURES: EVIDENCE FROM THE KUALA LUMPUR STOCK EXCHANGE

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ABSTRACT

This paper examines the impact of Stock Index Futures (SIF) trading on Day of Week (DOW) pattern of daily KLSE returns. We address a total of four research questions using both a simple OLS model and a GARCH (1,1) specification. Three daily return measures, CTC, OTC and CTO are used. The impact on DOW pattern of the new T+3 day settlement is also examined.

As documented in previous studies, we see evidence of a DOW pattern in daily stock returns in the period prior to SIF introduction. However, in the period following SIF introduction the DOW pattern diminishes. The null hypothesis that mean daily returns are equal across the week cannot be rejected. The T+3 Day settlement rule also had an impact on stock market DOW pattern. Between SIF and trading rule change, we find that while the SIF introduction reduced the DOW effect substantially, the T+3 implementation eliminated even the marginal individual day effects.

I. INTRODUCTION

The impact of the introduction of Stock Index Futures (SIF) on underlying market efficiency has received much attention. Broadly, there have been two contending arguments about the likely impact of SIF (and derivatives generally) on the underlying cash/stock market. The first is that,

SIF trading introduces *"destabilizing forces"*[1] by making it easy and cheap for speculators to undertake speculative activity. Such activity, it is argued, invariably leads to asset-bubbles, increased volatility and other excesses. The second argument takes the opposite view. Based on the *"Market Completion"* hypothesis, it argues that SIF introduction helps to complete markets, improve information flows and enhance overall market stability.

In evaluating these two arguments, academic research on the impact of SIF has focused on three key areas. These being the impact of SIF introduction on (i) underlying market volatility (ii) pricing efficiency and arbitrage possibilities and (iii) daily returns seasonality or Day-Of-the-Week (DOW) patterns. Researchers such as Pericli and Koutman (1997), Santori (1987), Edwards (1988a, 1988b) and Choi and Subramanyam (1994) found no significant impact of SIF introduction on underlying market volatility in the US. Others such as Bacha and Villa (1993), Lee and Ohk (1992) and Jalil, Khairuddin and Bacha (1998) found similar results in the case of Japan, Australia, HK and Malaysia respectively. The general concensus on pricing efficiency appears to be that while there is mispricing and arbitrage opportunity in the early years, efficiency improves and arbitrageable opportunities disappear after a while.

The third key focus area, has been the impact of SIF trading on daily return seasonals or DOW patterns of the underlying market. The examination of such an impact is also the focus of this paper. Previous work in this area, most notably that of Faff and Mckenzie (2002) and Hiraki, Maberly and Taube (1998), point to diminished DOW patterns in underlying market returns following SIF introduction. The former study, examines a total of seven developed markets. They find a noticeable weakening of the Monday effect in the US, UK, Switzerland and Germany and a parallel weakening of the Tuesday effect in Japan and Australia following SIF introduction. The study confirms the findings of Hiraki et al (1998), who document the disappearance of the Japanese Tuesday effect after the introduction of the Nikkei Stock Index futures contracts. Given that DOW patterns in stock market returns have been long documented, these findings are indeed interesting. If the introduction and trading of SIF led to the disappearance of DOW effects, it implies increased market efficiency (the existence of systematic patterns in returns violates random walk) and strong endorsement of the "market completion" hypothesis.

[1] See; Faff and McKenzie (2002)

Why SIF trading matters?

There are a number of reasons why the introduction of SIF trading can lead to diminished DOW patterns in the underlying stock market. It should be noted that most of the explanations provided for the existence of DOW patterns have revolved around market micro-structure, in particular trading and settlement rules.[2] If cash market trading and settlement rules are indeed the key, then it is logical that SIF trading should impact DOW patterns in stock market returns. This, due to the fact that though the underlying asset is the same stock index, index futures have different market microstructure and operate on different trading rules. In particular, stock market settlement rules are often T + 5 or T + 3, implying that the transaction must be settled in full by the fifth or third business day following transaction. Furthermore, stock market transactions are typically restricted by short selling prohibition and margin transactions. None of these apply to SIF markets. Thus, arbitrageable opportunities that could not be taken by cash market transactions would now be possible with SIF. Additionally, given the automatic leverage of margins and the lower transaction costs, even quasi arbitrage opportunities are possible. Given the features and flexibility of SIF contracts, systematic DOW patterns would be precisely the kind of arbitrageable opportunities that could now be taken. Thus, one could make the case that it is logical to expect diminished DOW patterns post SIF introduction.

Two factors have been the motivation for this paper. First is the fact that, there appears to be mounting evidence that SIF introduction has impacted cash market DOW patterns. As highlighted above, most of these findings have been documented for developed markets, not much appears to have been studied for the case of emerging markets. The second motivational factor is the fact that despite prior documentation of DOW patterns on the Kuala Lumpur Stock Exchange (KLSE) and a six year existence of SIF, there has been no previous work on the impact of SIF introduction on these DOW patterns.

Aside from the introduction of an SIF contract based on the KLSE's composite index (KLSE, CI)[3] on Dec. 15, 1995, there is one other change that we believe could have had meaningful impact on Malaysian stock market DOW patterns. This is the trading rule change from a T + 5 day settlement to T + 3 days. The switch to T + 3 settlement for all cash market transactions came into force effective 20th December 2000. Though the objective of this paper is to study the impact of SIF introduction, we also attempt to gauge the impact of the trading rule change

[2] The closed market effect and length of the weekend have also been suggested. (and rejected). See: Davidson and Peker (1997).

[3] The KLSE CI is a capitalization weighted index of 100 large cap stocks.

on KLSE daily returns seasonality. This paper is designed to address a total of four research questions. These being:

(i) Is there evidence of a DOW pattern in KLSE returns?

(ii) Has this pattern been affected by the introduction of SIF trading?

(iii) Is there evidence of a DOW pattern in the KLSE CI index futures (SIF) returns?

(iv) What has been the impact of the trading rule change from T + 5 to T + 3 on KLSE returns?

The remainder of this paper is structured as follows; Section 2 below, provides a review of relevant literature. Section 3, describes our data and methodology. Section 4, presents the results and analysis. The final section, Section 5 concludes.

II. LITERATURE REVIEW

This section provides an overview of existing literature relevant to our research questions. The review is organized sequentially in the order of afore mentioned four research questions.

DOW Pattern of Underlying Cash Market

Numerous studies have documented the Dow effect in the case of the United States (US), United Kingdom (UK), Japan and Hong Kong. Cross (1970) examined the daily return of S & P 500 from 1953 to 1970 and found that the mean return on Fridays was significantly positive whereas the mean return on Mondays was significantly negative. French (1980), replicated the study and extended the analysis of daily S &P Composite Index returns for the period of 1953 to 1978. He found the mean Monday returns to be significantly negative while the mean for other days of the week returns to be positive, with Wednesdays and Fridays having the highest positive returns.

Rogalski (1984), defined Monday returns as occurring between Monday's open to close (OTC) rather than since Friday's close (CTC). The returns that occur between the Friday opening and Monday close is essentially the weekend effect. For both the S & P 500 and DJIA, Rogalski found trading period return (OTC) to be insignificant for Mondays but significantly negative by the CTO (Close to Open) measure. The implication was that, the negative Monday returns found in earlier studies was really a negative weekend effect. Based on these findings, there

appears to be a consensus of the preponderance of negative weekend and positive Friday effect in the US market.

Investigation of Dow and weekend effects outside the US seems to have yielded mixed results. Condoyanni, O'Hanlon and Ward (1987), examined both Dow and weekend effects in Australia, Canada, France, Japan, Singapore, UK and US. They report a negative weekend effect for the UK and US, and negative Monday returns for Canada and France. Using the OTC measure for the US, they too did not find any negative effect for Monday trading period returns.

Annuar and Shamsher (1987) was the first Malaysian study of the existence of DOW patterns. Using daily data from the New Straits Times Industrial Index for the period July 1975 to end December 1985, they found that both Monday and Tuesday returns were significantly negative on the KLSE. Fridays on the other hand, had the highest positive returns. Wong, Hin and Chan (1992), using the KLSE Industrial and Commercial Index for the period 1975 – 1988 and employing the non-parametric Mann-Whitney test, documented that Monday and Tuesday results were significantly different from other days of the week.

Othman Yong (1995) examined the influence of the end of week performance of the NYSE and the Tokyo Stock Exchange on the beginning-of-the-week performance of the KLSE. He confirmed the significant negative Monday returns or weekend effect on the KLSE. The negative Monday returns were also confirmed by Mansor (1997).

The apparent consensus surrounding the evidence of DOW pattern in KLSE returns was broken by Davidson and Peker (1997). Using a GARCH (I, I), time varying volatility model popularized by Conolly (1989), they found *no* evidence of a DOW effect. These results however, were contradicted by Kok (1999) and Foo (2001)[4] who found negative Monday returns. Kok (1999) had used both on OLS regression and GARCH (I, I) modeling.

Impact of SIF Introduction on DOW Pattern of Underlying Stock Market

Kamara (1997) investigated the impact of the introduction of S & P 500 index futures on the daily mean returns of the US market index. Using daily price data from 1962 to 1993, he found that the daily seasonal effect of the S & P 500 diminished substantially post futures introduction. He argued that the observed decline in DOW pattern is consistent with the fact that futures trading greatly reduces transaction cost.

[4] This study examined the existence of DOW pattern among KLSE second board companies.

Hiraki, Maberly and Taube (1998) conducted similar analysis for the Japanese Stock Market. They observed that trading of the Nikkei SIF had significantly affected daily index returns seasonality. They found that while the previously documented Tuesday effect appeared to disappear in the post-SIF period, a Monday effect seemed to take place. They further argued that such effects are basically the result of heightened information flows that stem from futures trading.

Faff and McKenzie (2002) examined the impact of futures trading on daily returns seasonality of seven countries. Using a GARCH modeling framework they studied the impact of futures trading on DOW pattern of the Australian, German, Spanish, Swiss, UK, US and Japanese stock markets. In general, their findings were consistent with that of Hiraki et al (1998) and Kamara (1997). The Monday effect is observed to be weakening in the Swiss and US markets, while the Tuesday effect in mean returns is considerably reduced. Like previous studies, Faff and Mckenzie (2002) rationalized that the weakening daily seasonal returns after introduction of futures is due to lesser mispricing in the underlying stock market. The lower transaction costs has made it easier for traders to take advantage of arbitrageable opportunities.

Evidence of DOW Pattern in SIF Returns

Keim and Smirlock (1987) investigate S & P 500 cash and futures data as well as the VLCI futures from 1982 to 1984. Using both CTO and OTC prices, they detect a DOW pattern in both the cash and futures market and claim that the DOW pattern of the stock market was being carried over into Index futures returns. Nonetheless, the DOW pattern in SIF differed from that of cash as the price in SIF does not rise on Fridays as observed for cash markets. Though in line with Dyl and Maberly (1986), these results were in contrast to Cornell (1985) who found no systematic pattern in SIF returns.

That cash market DOW patterns carry over into SIF returns has also been documented for the Japanese markets by Ziemba (1990). In examining the Nikkei Stock Index Futures and the Osaka Kabusaki 50 Futures with their respective underlying assets, he found both SIF contracts to have the same DOW patterns as that of their underlying markets. With the exception of Cornell (1985), the early studies of SIF DOW patterns appear to show index futures contracts to have DOW patterns similar to that of their underlying cash markets.

Interestingly, the latter studies appear to go against this result. Infact, DOW patterns were shown not to exist even where they had previously been documented. Najand and Yung (1994) and Davidson and Perker (1997) are two such examples. Reexamining the distributional properties of S & P 500 Futures prices for the period 1982 to 1989, Najand and Yung show that when the

leptokurtic nature of returns and conditional heteroskedacity is adjusted for, by means of a GARCH specification, the previously documented DOW and weekend patterns disappear! In similar vein, Davidson and Perker (1997), reexamine the DOW effect documented for KLSE stock returns. Again using a GARCH (I, I) specification, they show that once time varying volatility of the KLSE is modeled, there is infact no DOW effect.

III. DATA AND METHODOLOGY

Our data set consists of daily, open and close prices of both the cash and futures market. Daily price data of the KLSE Composite Index for the eleven year period Jan. 1990 to Dec. 2001 is used.[5] Our futures market data begins from SIF introduction on 15th December 1995 until December 2001. Thus, our data spans a total of 11 years for the cash market and 5 years for the futures contract. In addressing our latter research questions, we segment the cash market data into three segments. i) Pre SIF introduction, ii) Post SIF introduction and where necessary, iii) post T + 3 implementation.[6] Three return measures are used, these being (a) Close to Close (CTC) returns (b) Open to Close (OTC), trading period returns and (c) Close to Open (CTO), overnight/ non trading period returns.

Following Najand and Yung (1994), returns are measured using logarithmic returns as;

$In(C_t/C_{t-1})$, $In(C_t/O_t)$, *and* $In(O_t/C_{t-1})$, respectively.

Recall from our review of previous literature in Section 2 that, in several markets where the DOW pattern had been documented using the OLS methodology had subsequently been invalidated by studies using GARCH models. Given this, in testing for the existence of the day-of-the-week (DOW) effect in the cash and SIF markets, we use both, the OLS model and a GARCH (I,I) model. Several authors, notably Najand and Yung (1994), have argued that the GARCH specification is more appropriate than standard OLS regression, for two key reasons. First, the GARCH specification is consistent with leptokurtic return distributions. Second, the method allows for a long-term memory in the variance of conditional return distributions. Such specification it is argued, is capable of mimicking the statistical features of time series returns data. Our objective in using both models is twofold. First, to confirm previous findings of DOW patterns[7] and second to contrast the results produced by both the models.

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[5] Until Jan. 1993, only closing prices were reported for the index. From 1993, both open and close prices were available.

[6] The first segment is approx. 59½ months, the second, 72½ months and the T + 3 rule change applies for the last one year period of our study. (Dec. 2000 – Dec. 2001).

[7] For the Cash (KLSE) market.

Our first model, the OLS Regression Model is estimated as follows

$$R_t = \alpha + \beta_1 Tue + \beta_2 Wed + \beta_3 Thurs + \beta_4 Friday + \in \quad \text{.....(1)}$$

Where,

R_t is the return to the stock market index,

α is a dummy variable representing Mondays that take the value unity if the day is a Monday and zero otherwise.

$\beta_1, \beta_2, \beta_3$ and β_4 are dummy variables or coefficients to be estimated for Tuesdays, Wednesdays, Thursdays, and Fridays.

Augmenting Eq. (1), our GARCH (1,1) model is specified as follows:

$$R_t = \alpha + \beta_1 Tue + \beta_2 Wed + \beta_3 Thur + \beta_4 Fri + \beta_5 R_{t-1} + \in_t$$

$$h_t = \alpha_0 + \alpha_1 \in^2_{t-1} + \alpha_2 h_{t-1} \quad \text{.....(2)}$$

Both models are estimated using each of the three return measures, CTC, OTC, and CTO. The mean equation of both models are tested using the F-test for the null hypothesis that there is no difference in returns across the days of the week.[8] Pair wise t- tests are used wherever paired comparisons are necessary. Both the OLS and GARCH models are run using daily SIF returns in testing for DOW patterns in the SIF market.[9]

IV. RESULTS AND ANALYSIS

In this section we present the results of our tests using the two abovementioned models. The results are discussed in the order of our questions. Recall that our first research question was to explore for evidence of DOW pattern in KLSE returns, whereas the second question, to determine if these return patterns have been impacted by the introduction of SIF trading.

Dow Pattern of KLSE Returns; Pre and Post SIF

Table 1 shows the results of our DOW test on KLSE returns using both the simple OLS and GARCH (I, I) models. The F-statistic testing for equality of daily returns across the week is shown for the overall and subperiods. We see some interesting results. By the OLS model, for

[8] The Wald-test was also computed for the GARCH model, however the results were identical to the computed F-statistics.

[9] Given the low liquidity of later maturities, we focused solely on spot month contracts.

the overall period and the period before the introduction of SIF contracts, there is clear evidence of a DOW pattern. The hypothesis that returns are equal across all days of the week is rejected by the CTC and OTC measure. By the CTO measure which captures overnight/non trading period returns, the hypothesis cannot be rejected. Clearly, DOW patterns in the CTC measure are the result of trading period differences.

What is interesting about these results is that by all three measures, the differences in mean daily returns disappears post SIF introduction. Based on F statistics, results from the GARCH (I, I) models are consistent with that of the OLS. It appears from these results that whatever seasonality there was in KLSE daily returns, the introduction of SIF has had an important impact.

The nature of the Cash Market DOW pattern is shown in Table 2. The top half of Table 2 shows the results of the OLS. Going by the OLS model, for the overall period, Mondays are very significantly negative, while Wednesdays and Fridays have positive returns. Both the CTC and OTC measures have identical return patterns. The overnight return, CTO, shows no pattern whatsoever. These results are consistent with previously documented evidence of DOW patterns for the KLSE. When the overall period is split into pre and post SIF introduction, we see results consistent with that of Table 1. With the exception of negative OTC returns on Mondays, none of the others are significant. While the pre-SIF period shows daily return patterns identical to the overall period, the DOW pattern disappears in the post-SIF period.

DOW Pattern in SIF returns

As noted in the literature review, several perious studies, notably, Ziemba (1990) and Keim and Smilock (1987) have shown evidence of DOW patterns in SIF returns. Additionally, it has also been argued that the DOW pattern of the underlying stock market gets carried over to the SIF market. Yet others, such as Junkus (1986), Najand and Yung (1994) are among the group of researchers who argue in line with Cornell, that there is no DOW effect in SIF.

Table 3 shows the results of our analysis of SIF returns. Panel A shows the F statistics testing for equality of returns across the week. Panels B and C, show the mean return coefficients by day of week using the OLS and GARCH (1,1) models. By all three return measures, the F statistics of Panel A show mean daily returns that are similar across the week. – i.e. no DOW seasonality. Panels B and C show the lack of statistical significance in the daily mean returns. The exception being CTO returns for Tuesday. As in the case of the underlying stock market,

Mondays are negative while Fridays have the highest returns. However, unlike the stock market, especially, in the pre – SIF period, none of these mean daily returns are statistically significant. Thus, based on these results, we can only conclude that there is no evidence of DOW pattern in the KLSE SIF returns. Our results therefore, appear more in line with the group of previous studies that show that SIF returns are not subject to systematic DOW patterns.

That SIF returns do not display DOW patterns should not be entirely surprising. Justification for the absence of patterns in SIF returns have been based on two broad arguments. The first, has to do with the distributional properties of SIF returns while the second, on institutional / settlement procedures. Proponents of the first line of reasoning, notably Najand and Yung (1994), argue that it is the leptokurtic nature of futures prices and its time varying volatility that cause the absence of DOW patterns. The second line of reasoning is based on the arguments put forth to explain the existence of systematic patterns in the cash/stock market. Institutional, in particular settlement procedures have been used to explain the existence of Cash Market DOW patterns. Therefore, since the payment and settlement rules of the SIF market is very different from that of the cash/stock market, it would follow that, the stock market patterns need not carry over. While stock markets have a T + X day delivery/settlement system which can lead to systematic long and short covering positions, the SIF markets work on margins and daily marking to market processes. Margin calls, once triggered require immediate payment and do not provide the luxury of either a T + 3 or T + 5 day time frame. Yet a third factor for absence of patterns in SIF markets may have to do with transaction costs. Since transactions costs are much lower with SIF, systematic patterns in cash market returns that may not be profitably arbitrageable with stock markets may be arbitrageable in SIF.

As is evident from Table 3, the KLSE CI futures returns display no systematic returns and no carry over of the pattern from the cash market. If anything, we see something quite different, in that, the only significant return appears to be the Tuesday overnight, CTO returns. We find it difficult to explain this unique feature. We do however venture these two plausible explanations, first, as in Philip-Patrick and Schneeweis (1998), it is possible that investors usually institutional ones, could compensate net short positions in the Monday trading session of the stock market with net long positions in the SIF market in the following overnight period.

Under this scenario, the markedly negative Monday OTC returns of the stock market and the significantly positive returns in the SIF Tuesday CTO returns would be in sync. The second explanation for the significant Tuesday CTO return is that this period would be the very first segment of the week that coincides with Monday trading in New York.

Impact of Trading Rule Change on DOW Patterns

In this subsection we examine the impact of the KLSE trading rule change on cash market DOW patterns. Two previous studies have examined the same issue, albeit at different times and of different rule changes. Davidson and Peker (1996) examined the impact on KLSE DOW patterns of the change in trading system – i.e. , from open outcry to a semi automated system. Their study covering the period 1986 – 1993 finds no impact on KLSE DOW pattern resulting from the trading system change.

Yet another study by Claire, Ibrahim and Thomas (1998) investigated the effect of the new fixed delivery and settlement system (FDSS). Implemented in January 1990, the FDSS was essentially a T + 7 rolling settlement system. Using a ARCH-M model on daily KLSE closing data for the period January 1983 to July 1993, they argue that seasonal variations that were strong prior to FDSS implementation, disappeared subsequently. These results were clearly contrary to that of David and Peker (1996), though the study periods overlapped.

In line with other developed exchanges, the KLSE went on to shorten the settlement cycle from the abovementioned T + 7 to T + 5 in August 1997 and then to T + 3 on 20th December 2000. The introduction of a Central Depository System (CDS) and Scriptless trading in the mid 1990s made this shortening possible. The benefits of shortened settlement being a reduction in market risk and increased liquidity.

Where DOW patterns are concerned, a switch in settlement can have a substantial impact. We examine whether this has indeed been the case. We examine a one year period, immediately before and after 20th December 2000 for evidence of change in DOW pattern. Our choice of this two-year window period is dictated by the need to avoid other confounding effects while maintaining a reasonably long period. Recall that in late 1997, a switch had been made from T + 7 to T + 5.

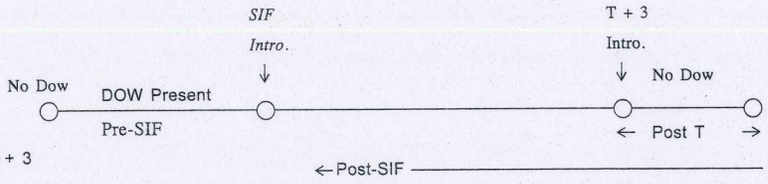
Table 4, shows the results of our F-tests for equality of mean returns for the KLSE by subperiod[6]. For the overall two year period and the one year prior to T + 3, the hypothesis of equal mean returns would have to be rejected by the CTC measure. In other words, a DOW pattern though weak, persists in the one year period immediately prior to T + 3. However, in the one year following, the pattern disappears.

[6] The GARCH (1,1) model was not used here, given the shorter time frame.

The F values are substantially lower (post vs pre) while the probability values substantially higher. The impact of T + 3 implementation on DOW pattern is even clearer when a day-by-day analysis is done – see Table 5. Whereas in the one year prior we see evidence of DOW patterns, the pattern disappears totally post T + 3 introduction. It appears from these results that the change in settlement rules to T + 3 eliminated pre-existing Cash Market Dow Patterns[7].

SIF introduction Vs T + 3 Implementation

We concluded above that the implementation of T + 3 had a significant impact on pre-existing DOW pattern. Recall that this was also our conclusion to our second research question. We saw in Section 4.1 that following the introduction of SIF trading in December 1995, the DOW pattern disappeared for the last 6 years of our study, the final one year of which was also the post T + 3 period. The timeline below shows the time segments.



One could ask if the diminution of DOW pattern post SIF introduction was really due to T + 3 introduction rather than the SIF. To resolve this, we looked at the 5 year period post SIF introduction but prior to T + 3 implementation. This should isolate the impact of SIF alone. Table 6 shows the results of our F-tests and probability values for the GARCH (1,1) model. What is clear is that by all three measures and for both models, the null hypothesis of equality of mean returns will have to be accepted. Thus, even prior to T + 3 implementation the DOW pattern is diminished. When we looked at day-by-day analysis (Table 5), there were sporadic rejections (by T-test) for some days especially by the GARCH (1,1) model. In the post T + 3 period even this disappears. Notice that in Panel 3 of Table 5, not a single day has significant t-statistics by all the three measures. Based on these, we conclude that SIF introduction substantially reduced the DOW effect on KLSE returns but with T + 3 implementation even the marginal individual day impact was eliminated.

[7] We had tested for the impact of T + 3 settlements on SIF returns, as expected we found no impact whatsoever.

V. CONCLUSION

This paper examined the impact of SIF trading on the DOW pattern of daily KLSE returns. The impact following introduction of a new T + 3 day settlement was also examined. We address a total of four research questions using both a simple OLS model and a GARCH (1,1) specification. Three return measures, CTC, OTC and CTO are used.

As documented by previous studies, we see evidence of a day of week pattern in daily stock market returns in the period prior to SIF introduction. These were most evident by the CTC and OTC measures. However, in the period following SIF introduction, the F-tests of both the OLS and GARCH models show the DOW pattern to have diminished. Our findings are consistent with that of Hiraki, Maberly and Taube (1998) and Faff and Mckenzie (2002). Both these studies document the disappearance of daily return seasonals following SIF introduction. As pointed out by Faff and Mckenzie (2002), we believe the diminished DOW pattern has to do with lower transaction costs in SIF which makes it easier for traders to take advantage of arbitrageable opportunities.

Examining daily SIF returns for evidence of DOW patterns, we find no evidence of systematic patterns. This too is consistent with results documented in other markets. For example, Junkus (1986) and Najand and Yung (1994) show that there is no DOW effect in SIF returns.

Our final research question examined the impact of a trading rule change that happened within our study period. We find the T+ 3 day settlement rule to have had significant impact on cash market DOW pattern. Between SIF introduction and the trading rule change, we find that the SIF introduction reduced the DOW effect substantially, but with the T + 3 implementation, even the sporadic marginal individual day impact was eliminated.

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Table 1

Impact of SIF on DOW Pattern
KLSE Composite Index F-tests for Equality of Mean Return Across Week Days

	Constant Vol. OLS Model			*GARCH (1,1) Model*		
Panel 1 : Overall (Jan 90 - Dec 01)	*F-test*	*P-value*		*F-test*	*P-value*	
CTC	3.0571	0.0159	*	2.65	0.0314	*
OTC	3.9093	0.0036	**	3.49	0.0075	**
CTO	1.0295	0.3904		0.52	0.7211	
Panel 2 : Pre-SIF (Jan 90 - 15 Dec 95)						
CTC	2.6339	0.0327	*	2.63	0.0329	*
OTC	5.8562	0.0001	**	6.59	0.0000	**
CTO	0.1499	0.9631		0.00	1.0000	
Panel 3 : Post-SIF (15 Dec 95 – Dec 01)						
CTC	1.1676	0.3233		0.7179	0.5797	
OTC	1.1889	0.3138		0.6963	0.5945	
CTO	1.0383	0.3861		3.98	0.0032	**

The above table shows the results of the F-tests conducted using constant volatility OLS model
and the GARCH (1,1) Model.
It shows cases where the null hypothesis of equal daily stock return is rejected.
*, (**) - denotes significance at 5%, (1%)

Table 2

Impact Of SIF on Individual Days of Week
KLSE Composite Index Returns: Individual Day-of-the-Week Statistics

Panel A: Constant Volatility OLS Model

	Mon	*Tue*	*Wed*	*Thurs*	*Fri*
Overall (Jan 90 - Dec 01)					
CTC	-0.0018 *	0.0018	0.0029 **	0.0014	0.0032 **
OTC	-0.0028 **	0.0020	0.0037 **	0.0016	0.0040 **
CTO	0.0003	0.0120	0.0001	0.0002	0.0002
Pre-SIF (Jan 90 - 15 Dec 95)					
CTC	-0.0014	0.0017	0.0026 *	0.0014	0.0032 **
OTC	-0.0039 **	0.0037 *	0.0058 **	0.0025	0.0060 **
CTO	0.0005	-0.0001	-0.0003	0.0002	0.0001
Post-SIF (15 Dec 95 - Dec 01)					
CTC	-0.0022	0.0020	0.0032	0.0014	0.0032
OTC	-0.0023 *	0.0012	0.0027	0.0011	0.0029
CTO	8.1E-05	2.4E-02	5.1E-04	2.6E-04	2.9E-04

Panel B: GARCH (1,1) Model

Overall (Jan 90 - Dec 01)					
CTC	-0.0012 **	0.0018 **	0.0021 **	0.0021 **	0.0023 **
OTC	-0.0019 **	0.0021 **	0.0029 **	0.0018 **	0.0029 **
CTO	0.0000	0.0002	-0.0002	0.0007 **	0.0003
Pre-SIF (Jan 90 - 15 Dec 95)					
CTC	-0.0011 *	0.0014	0.0019 *	0.0020 **	0.0023 **
OTC	-0.0028 **	0.0024 *	0.0045 **	0.0020 *	0.0047 **
CTO	0.0003	-0.0000	0.0000	0.00005	-0.0002
Post-SIF (15 Dec 95 - Dec 01)					
CTC	-0.0014 *	0.0026 **	0.0021 *	0.0021 *	0.0023 *
OTC	-0.0012	0.0017	0.0018	0.0015	0.0017
CTO	0.0001 **	-0.0000	-0.0003 **	0.0054 **	-0.0055 **

The above table shows the results of mean daily coefficient by day of week and significance of t-statistics.
*, (**) - denotes significance at 5%, (1%).
We also include once-lagged return in the regression to capture infrequent trading. The results, however were similar.

Table 3

DOW Pattern in SIF Returns
KLSE Stock Index Futures F-tests for Equality of Mean Returns Across Week Days

	Constant Vol. OLS Model		*GARCH (1,1) Model*	
Panel A :				
Overall *(15 Dec 95 - Dec 01)*	***F-test***	***P-value***	***F-test***	***P-value***
CTC	0.5130	0.7262	0.24	0.916
OTC	0.4725	0.7560	0.166	0.956
CTO	2.1258	0.0754	0.93	0.445

Table 3(a)

DOW Pattern in SIF Returns
KLSE Stock Index Futures Returns: Individual Day-of-the-Week Statistics

Panel B : Constant Volatility OLS Model	***Mon***	***Tue***	***Wed***	***Thurs***	***Fri***
CTC	-0.0018	0.0027	0.0018	0.0009	0.0023
OTC	-0.0017	0.0009	0.0008	0.0004	0.0026
CTO	-0.0001	0.0018 *	0.0010	0.0005	-0.0003
Panel C: GARCH (1,1) Model					
CTC	-0.0011	0.0018	0.0021	0.0009	0.0016
OTC	-0.0010	0.0000	0.0015	0.0010	0.0017
CTO	0.0002	0.0012 **	0.0003	-0.0001	0.0005

Panel A shows the results of the F-tests for SIF returns using constant volatility OLS and GARCH (1,1) models for equality of mean returns across the week.

Panel B and C show the daily coefficients by day of week and significance of t-statistics for OLS and GARCH (1,1) Model.

*, (**) - denotes significance at 5%, (1%)

Table 4

Impact of T + 3 Day Settlement
KLSE Composite Index F-tests for Equality of Mean Returns Across Week Days

Constant Volatility OLS Model			
Overall *(20 Dec 99 – 19 Dec 01)*	***F-test***	***P-value***	
CTC	2.4173	0.0478	*
OTC	1.7557	0.1366	
CTO	1.6699	0.1557	
Pre-T+3 *(20 Dec 99 - 19 Dec 00)*			
CTC	2.5091	0.0426	*
OTC	1.9902	0.0966	
CTO	0.8652	0.4854	
Post-T+3 *(20 Dec 00 - 19 Dec 01)*			
CTC	0.5806	0.6770	
OTC	0.5224	0.7194	
CTO	0.8543	0.4921	

The above table shows the results of the F-tests analyzing the impact of settlement rule change, T+3 on KLSE DOW pattern.

*,(**) - denotes significance at 5%, (1%)

Table 5

Impact of T + 3 on Days of Week
KLSE Composite Index Returns: Day-of-the-Week Statistics (OLS Model)

		Mon	*Tue*	*Wed*	*Thurs*	*Fri*
Panel 1 : Overall (20 Dec 99 - 20 Dec 01)						
CTC	Coefficient	-0.0032568	0.003644	0.0055979	0.0023315	0.0034662
	t-stats	-2.4535226	1.951432	3.0044168	1.2355546	1.8603327
	p-value	0.0144929	0.051573	0.0027969	0.217215	0.0634361
	significance	**	*	***		*
OTC	Coefficient	-0.0024117	0.002077	0.0044236	0.0015407	0.0022177
	t-stats	-1.9922246	1.219671	2.6033727	0.8953316	1.3051268
	p-value	0.0468997	0.22317	0.0095105	0.3710485	0.192461
	significance	**		***		
CTO	Coefficient	-0.0008451	0.001567	0.0011743	0.0007907	0.0012486
	t-stats	-1.8082018	2.38315	1.7898885	1.1900919	1.9031022
	p-value	0.0711868	0.017544	0.0740879	0.2345854	0.0576118
	significance	*	**	*		*
Panel 2 : Pre-T+3 (20 Dec 99 - 19 Dec 00)						
CTC	Coefficient	-0.0048459	0.006568	0.0073608	0.0028283	0.0053385
	t-stats	-2.5420326	2.460408	2.7570016	1.0270212	1.9701895
	p-value	0.0116405	0.014571	0.0062743	0.3054275	0.0499475
	significance	**	**	***		**
OTC	Coefficient	-0.0040179	0.004834	0.0061807	0.0020405	0.0041231
	t-stats	-2.3180687	1.991620	2.5460776	0.8149128	1.6735508
	p-value	0.0212732	0.047527	0.01151	0.4159169	0.0955004
	significance	**	**	**		*
CTO	Coefficient	-0.000828	0.001734	0.0011801	0.0007878	0.0012153
	t-stats	-1.1880665	1.776685	1.2090036	0.7824787	1.2268495
	p-value	0.2359623	0.07686	0.2278317	0.434692	0.2210617
	significance		*			
Panel 3 : Post-T+3 (20 Dec 00 - 19 Dec 01)						
CTC	Coefficient	-0.0019582	0.000900	0.0038595	0.0017879	0.0017064
	t-stats	-1.028066	0.337679	1.4479731	0.674134	0.6465629
	p-value	0.3049713	0.735904	0.1489517	0.5008859	0.5185431
	significance					
OTC	Coefficient	-0.0010249	-0.000556	0.0026564	0.0009427	0.0003298
	t-stats	-0.5883947	-0.228137	1.0897921	0.3886849	0.1366233
	p-value	0.5568301	0.819736	0.2769162	0.6978597	0.891445
	significance					
CTO	Coefficient	-0.0009333	0.001456	0.0012031	0.0008452	0.0013767
	t-stats	-1.4381582	1.60350	1.3248006	0.9353762	1.5310306
	p-value	0.1517139	0.110161	0.1865186	0.3505506	0.1271012
	significance					

The above table shows the daily coefficients by day of week and significance of t-statistics for OLS Model.

*** indicates Dow effect is significant at 1% level, (** at 5% level) and (* at 10% level)

Table 6

Impact of T + 3 Day Settlement (GARCH)
KLSE Composite Index F-tests for Equality of Mean Returns Across Week Days

GARCH (1,1) Model			
Overall (15 Dec 95 - 19 Dec 01)	*F-test*	*P-value*	
CTC	0.7179	0.5797	
OTC	0.6963	0.5945	
CTO	3.9800	0.0032	**
Post SIF, Pre-T+3 (15 Dec 95 - 19 Dec 00)			
CTC	0.4280	0.7885	
OTC	0.5812	0.6772	
CTO	0.1629	0.9571	
Post-T+3 (20 Dec 00 - 19 Dec 01)			
CTC	0.4846	0.7534	
OTC	0.3213	0.8644	
CTO	0.8037	0.5238	

The above table shows the results of the F-tests analyzing the impact of settlement rule change, T+3 on KLSE Dow pattern.

*,(**) - denotes significance at 5%, (1%)