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THE HEDGE PERIOD LENGTH AND THE HEDGING EFFECTIVENESS: AN APPLICATION ON TURKDEX-ISE 30 INDEX FUTURES CONTRACTS

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ABSTRACT

This study aimed at analyzing the hedging period effect on the hedging effectiveness of the TURKDEX-ISE 30 index future contracts. The findings of the study presented, that weekly hedge periods are more effective than daily hedges in terms of risk reduction criteria.

Keywords: *Index futures; hedging; hedge period*

Jel Classification: *G11; G17.*

1. Introduction

Hedging against potential losses is one of the basic needs of the investors trading in the financial markets. However, especially in the developing financial markets, hedging is not a simple process that can be accomplished by each investor.

The future contracts are one of the derivatives instruments that can be utilized for hedging purposes by each investor regardless of their portfolio size. In order to benefit from hedging activities an investor must decide on, at least, i) which future contract to take position; ii) the number of future contracts or the hedge ratio; iii) the hedging duration.

Since their introduction, financial futures presented a rapid improvement in developed financial markets; however their development was limited in developing financial markets. In most of the developing financial markets, it is not always possible to find an appropriate future contract to hedge the investors existing position. Although, the index future contracts are traded in most of the derivatives markets; single stock futures, interest rate futures, futures on durables and the others are not existing or actively traded. So, the first issue is to decide on which futures contracts to be used for hedging purposes and assessing the effectiveness of selected future contract.

When the appropriate contract is found the second issue arises, the investors should decide on the number of contracts or the hedge ratio. Different techniques can be adopted to decide the optimal hedge ratio. Among the alternative approaches naive hedging, OLS, ARCH, GARCH, MEG, M-MEG and several other approaches can be adopted.

Even when the first two issues are settled, the investor should decide on the length of hedging duration. Several studies presented that the changes in the length of hedging period effects the hedging effectiveness.

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This article will be addressing the first and the third issue by analyzing the hedging effectiveness of Turkish Derivatives Exchange (TURKDEX) traded TURKDEX-ISE 30 index future contracts. The hedging effectiveness of TURKDEX-ISE 30 index future contracts will be analyzed against the stocks of Securities Investment Trusts (SITs) traded in Istanbul Stock Exchange (ISE). The reason of selection of SITs is the assumption that SITs can minimize the risks by the use of well-trained and experienced specialists. Hence, the stocks of SITs present minimum level of unsystematic risk but subject to systematic risk. If these assumptions are accepted, after the hedging activities any reduction in risk measures of SITs stocks will present the effectiveness of TURKDEX-ISE 30 index future contracts for hedging against systematic risk.

The study is organized as follows: section two summarizes the literature on hedging with future contracts; section three provides the research design of the study; section four presents the empirical findings and the last section is conclusion.

2. Literature Review

Financial future contract transactions were introduced in 1972 in Chicago Mercantile Exchange with the currency futures; and the development continued with contracts for interest rates (Chambers, 1998: 6). Moreover, the index future contracts were introduced in 1980 (Erol, 1999: 181).

The theoretical framework of the hedging by the use of index futures contracts was developed at the beginning of 1980s (Weiner, 1981; Figlewski and Kon, 1982; Tosini and Moriarty, 1982). Several studies presented that the use of index future contracts decrease the risks associated with stock market investments. For example, Figlewski (1984) presented that the use of S&P500 index future contract could reduce the risk of a diversified portfolio of large capitalized stocks at a rate of 20-30%. In the same manner, Holmes (1996) presented that the FTSE-100 index future contracts could be utilized to reduce risk associated with spot stock positions. Moreover, Butterworth and Holmes (2001) studied the hedging effectiveness of FTSE-100 and FTSE-mid250 index future contracts for underlying indexes and stocks of 32 investment trust companies. The results of the study presented that the future contracts could reduce risks of underlying index at a rate between 50 to 70%. On the other hand, the risk reduction of investment trust company stocks was limited with 20% at most. In a similar findings were also presented in Laws and Thompson (2005).

Besides measuring the hedging effectiveness of the index future contracts, hedge period length on the hedging effectiveness were also investigated by some other studies. Among these studies, Yang and Allen (2004) studied on the Australian All Ordinaries Index (AOI) and the corresponding Share Price Index (SPI) futures contract. They calculated the hedging performances of several methods like OLS, VAR, VECM and MVGARCH for 5-10-15 and 20 day hedging periods. For all the methods, 5 days hedge presented the best results where, 15 days hedges were the worst. Although, Laws and Thomson (2005) arrived the same conclusion, they stated that the difference between short term and long term hedge were limited. In line with Laws and Thomson (2005), the findings of Bhaduri and Durai (2008) presented that the change in hedging effectiveness was limited for different hedging periods of 1, 5, 10 and 20 days.

While, Malliaris and Urrutia (1991) found that the hedging horizon and data frequency were important in hedging effectiveness, Benet (1992) stated that short hedging periods were more effective. Furthermore, Ripple and Moosa (2007) found that the use of most recent contract was more effective than the use of more distant contracts. On the other hand, Butterworth and Holmes (2005, 150-151) found that increasing hedging period length from daily to weekly and monthly increased the hedging effectiveness. Moreover, the hedge ratio approaches to 1 as the hedging period increased. This finding was also supported by In and Kim (2006).

Lien and Shrestha (2007) and Chung (2009) stated that the changes in the hedging period length changed the hedging effectiveness of hedge ratio estimation models, which were GARCH, minimum variance, and Wavelet methods.

3. Research Design

3.1. Data

The data set utilized in this study covers the daily stock and futures data from January 2007 to December 2008. The data for 2007 was utilized to develop a model and the data for 2008 was utilized to test the model. The periods from 2005, the opening of TURKDEX, to end of 2006 was not considered in the analysis in order to avoid any data problems related with thin trading.

The data related with TURKDEX-ISE 30 future contracts was taken from TURKDEX web site and the data for the stocks of SITs was taken from ISE by official correspondence.

3.2. Methodology

In order to hedge the SITs stocks, TURKDEX-ISE 30 index future contracts with the nearest time to maturity was utilized. The contract 5 trading days remained to maturity were rolled over with another contract, which had nearest time to maturity. The contracts were rolled over to overcome any problem due to thin trading when the maturity of a contract came closer.

The daily return series were calculated by taking the logarithmic differences for both stock prices and future contracts. Equation 1 presents the calculation:

$$R_M = \ln\left(F_{St}/F_{St-1}\right) ; R_V = \ln\left(F_{It}/F_{It-1}\right) \quad (1)$$

R_M and R_V stands for return for SITs stocks and TURKDEX-ISE 30 index future contracts respectively; F_{St} and F_{St-1} presents the daily closings for SITs stocks for day *t* and *t-1*, F_{It} and F_{It-1} presents the daily settlement for TURKDEX-ISE 30 index future contracts for day *t* and *t-1*.

So, the return for the hedged portfolio, which is composed of SITs stocks and TURKDEX-ISE 30 index future contracts, can be written as presented in equation 2 (Figlewski, 1984:660-661):

$$R_P = R_S - hR_I \quad (2)$$

Where R_P, R_S, and R_I stands for the return for hedged portfolio, return from spot SITs stock and return for and TURKDEX-ISE 30 index future contracts, respectively. The risk associated with hedged portfolio can be calculated as:

$$\sigma_P^2 = \sigma_S^2 + h^2\sigma_I^2 - 2h\sigma_{SI} \quad (3)$$

In equation 3 symbols σ_P^2, σ_S^2 and σ_I^2 denotes the variances of hedged portfolio, stock portfolio and futures portfolio; σ_{SI} denotes the covariance between the stock portfolio and future contracts; and hence *h* denotes the hedge ratio.

Determining the value of *h* is not an easy process. In the literature there are several debates on the methodology of calculating optimum hedge ratio. Although several advanced and complex methodologies, like ARCH, GARCH, MEG, M-MEG and others, have been advised, several researchers pointed out that simple methodologies are also as powerful as complex ones when comparing the cost and benefit of complex methodologies (Holmes, 1996:76; Lien, et.al.., 2002:795-796; Copeland and Zhu, 2006:10; Bhaduri and Durai, 2008: 133; Kavussanos and Visvikis, 2008:259).

The objective of this study is not to find out the optimum hedge ratio by comparing different methodologies. So, this study utilized the Ordinary Least Squares (OLS) method, which is less complex but effective in determining optimum hedge ratio, to estimate the optimum hedge ratio.

Accoriding to OLS methodology, the optimum hedge ratio was calculated by the use of equation 4:

$$R_S = \propto + h^* R_I + \varepsilon \tag{4}$$

Where α and h^* are the regression parameters and ε is the error term.

In order to compare the effectiveness of the hedging strategies, the risk reduction in the stock portfolios and hedged portfolios should be compared. Such comparison can be made by the use of equation 5 (Butterworth ve Holmes, 2001:61).

$$Risk\ Reduction = \left(\frac{\sigma_S^2 - \sigma_P^2}{\sigma_S^2}\right) \times 100 \tag{5}$$

4. Empirical Findings

This study investigated the effectiveness of the TURKDEX-ISE 30 index future contracts hedging effectiveness for SITs stocks. The analysis was designed to compare the daily and weekly hedging effectiveness. During the presentation of the research findings in the following papers, the names of the SITs will not be presented. Each SITs will be denoted by SIT-1, SIT-2 and so on.

Table 1 presents the regression coefficients of the OLS analysis. The analysis for daily data presents that all the beta (ß) coefficients are significant at 5% level, except SIT-23. On the other hand, for weekly analysis the betas of 8 stocks are insignificant. These stocks are SIT-7, SIT-13, SIT-18, SIT-19, SIT-21, SIT-23, SIT-25 and SIT-26. Those stocks, which have insignificant beta, will be omitted from the analysis in the calculation of the hedging effectiveness for the weekly analysis.

Table 1 OLS Regression Coefficients

SITs Symbol	Daily Regression Coefficients			SITs Symbol	Weekly Regression Coefficients		
	ß	t	Sig.		ß	t	Sig.
SIT-1	0.644	13.078	0.000	SIT-1	0.547	4.371	0.000
SIT-2	0.592	11.812	0.000	SIT-2	0.266	2.368	0.022
SIT-3	0.618	8.253	0.000	SIT-3	0.801	4.869	0.000
SIT-4	0.573	7.344	0.000	SIT-4	0.462	2.701	0.009
SIT-5	0.731	12.338	0.000	SIT-5	0.611	5.406	0.000
SIT-6	0.507	8.355	0.000	SIT-6	0.293	2.759	0.008
SIT-7	0.437	4.845	0.000	SIT-7*	0.364	1.484	0.144
SIT-8	0.460	4.463	0.000	SIT-8	0.907	3.900	0.000
SIT-9	0.674	13.755	0.000	SIT-9	0.805	7.920	0.000
SIT-10	0.659	12.023	0.000	SIT-10	0.396	3.723	0.000
SIT-11	0.577	6.131	0.000	SIT-11	0.487	2.745	0.008
SIT-12	0.712	9.203	0.000	SIT-12	0.478	2.408	0.020
SIT-13	0.327	4.034	0.000	SIT-13*	0.217	1.281	0.206
SIT-14	0.452	5.308	0.000	SIT-14*	0.281	1.460	0.150
SIT-15	0.774	10.899	0.000	SIT-15	0.539	3.920	0.000
SIT-16	0.558	5.036	0.000	SIT-16	0.790	2.797	0.007
SIT-17	0.593	6.612	0.000	SIT-17	0.522	3.490	0.001
SIT-18	0.550	10.360	0.000	SIT-18	0.440	4.285	0.000
SIT-19	0.690	6.309	0.000	SIT-19*	0.157	0.648	0.520
SIT-20	0.562	7.947	0.000	SIT-20	0.654	4.360	0.000
SIT-21	0.449	6.404	0.000	SIT-21*	0.241	1.589	0.118
SIT-22	0.630	10.400	0.000	SIT-22	0.549	3.871	0.000
SIT-23*	0.073	0.622	0.534	SIT-23*	0.283	0.885	0.380
SIT-24	0.623	11.558	0.000	SIT-24	0.455	4.604	0.000
SIT-25	0.616	3.119	0.002	SIT-25*	0.473	0.617	0.540
SIT-26	0.486	6.426	0.000	SIT-26*	0.196	1.124	0.266
SIT-27	0.507	11.313	0.000	SIT-27	0.389	3.772	0.000
SIT-28	0.508	9.798	0.000	SIT-28	0.547	5.290	0.000

*Presents the insignificant beta estimations at 0.05.

The stocks with significant daily and weekly beta are hedged by the use of TURKDEX-ISE 30 index futures contract for 2008 data set. After omitting the stocks with insignificant beta, there are 20 SITs remained in the analysis.

Table 2 presents the daily and weekly returns for SITs stocks, daily hedged portfolio and weekly hedged portfolio during 2008. As a result of global financial crises, all SITs stocks realized negative returns during 2008. The highest negative return was -121.91% and the lowest return was -41.37%; all SITs realized a negative return of -78.72% on average.

Table 2 Daily and Weekly Returns: Hedged vs. Unhedged

SITs Symbol	SITs Stock Return	Daily Hedged Return	Weekly Hedged Return	SITs Symbol	SITs Stock Return	Daily Hedged Return	Weekly Hedged Return
SIT-1	-65.21	-19.93	-26.73	SIT-15	-91.75	-33.14	-50.92
SIT-2	-110.48	-66.44	-90.66	SIT-16	-72.69	-31.69	-14.65
SIT-3	-90.32	-44.93	-31.46	SIT-17	-106.96	-63.37	-68.64
SIT-4	-91.96	-48.57	-57.02	SIT-18	-41.37	-1.24	-9.26
SIT-5	-96.75	-48.35	-56.29	SIT-19	-	-	-
SIT-6	-91.17	-53.94	-69.68	SIT-20	-79.37	-42.18	-36.05
SIT-7	-	-	-	SIT-21	-	-	-
SIT-8	-98.21	-61.86	-26.55	SIT-22	-73.29	-27.00	-32.94
SIT-9	-53.03	-1.01	9.15	SIT-23	-	-	-
SIT-10	-75.84	-25.61	-45.69	SIT-24	-59.13	-11.64	-24.44
SIT-11	-121.91	-79.53	-86.13	SIT-25	-	-	-
SIT-12	-50.78	-0.03	-16.69	SIT-26	-	-	-
SIT-13	-	-	-	SIT-27	-77.84	-40.60	-49.30
SIT-14	-	-	-	SIT-28	-70.31	-32.97	-30.12

When the hedged portfolio (spot position on stock and a future position) returns are investigated, it is quite clear that the use of future contracts limited the losses. For example, while the highest negative return is -121.91% on spot position for SIT-11, it can be decreased to -86.13 and to -79.53% by the use of weekly hedges and daily hedges respectively.

Other than reducing the losses in the spot position, it is also possible to attain more appealing results. For example, for SIT-9, while the loss on spot position is -53.03%; the use of daily hedge can reduce the loss to -1.01% and furthermore the use of weekly hedge can generate positive returns at a rate of 9.15%.

Table 3 Daily and Weekly Volatility: Hedged and Unhedged

SITs Symbol	Daily Volatility		Weekly Volatility		SITs Symbol	Daily Volatility		Weekly Volatility	
	Stock	Hedged Portfolio	Stock	Hedged Portfolio		Stock	Hedged Portfolio	Stock	Hedged Portfolio
SIT-1	7.01	5.48	36.03	20.16	SIT-15	9.72	6.71	50.66	30.66
SIT-2	7.00	3.62	29.37	17.44	SIT-16	13.80	10.64	77.09	56.78
SIT-3	9.79	6.80	39.60	20.29	SIT-17	14.09	10.26	56.36	36.54
SIT-4	18.30	13.40	112.99	93.58	SIT-18	10.24	8.90	45.17	30.38
SIT-5	10.98	8.90	53.97	28.61	SIT-19	-	-	-	-
SIT-6	11.07	8.39	39.57	31.20	SIT-20	8.59	7.10	36.97	25.51
SIT-7	-	-	-	-	SIT-21	-	-	-	-
SIT-8	9.56	7.14	32.48	19.12	SIT-22	13.94	10.87	64.52	50.01
SIT-9	14.83	12.00	60.33	39.91	SIT-23	-	-	-	-
SIT-10	6.47	3.40	27.55	10.94	SIT-24	10.24	8.06	42.22	27.17
SIT-11	17.02	13.83	112.91	90.49	SIT-25	-	-	-	-
SIT-12	19.74	17.68	53.23	46.40	SIT-26	-	-	-	-
SIT-13	-	-	-	-	SIT-27	6.25	3.31	19.48	7.17
SIT-14	-	-	-	-	SIT-28	7.78	6.05	31.63	19.03

For both daily and weekly hedges, the hedging activity can successfully reduce the losses in the spot position. The average loss for all SITs was 80.92% during 2008, while the hedged loss was limited to 36.70% and 41.62% for daily and weekly hedges respectively.

Table 3 presents the risks (volatility measured in terms of variance) for both spot position and hedged portfolios for daily and weekly hedges. It is obvious that in each and every case, the hedged portfolio risk is lower than the spot position regardless of the hedging period length.

For example, for SIT-2, the daily stock volatility is 7.00 on spot position; where it is 3.62 with daily hedging. Moreover, the weekly volatility on the same stock is 29.37 on spot position and again it is reduced to 17.44 with weekly hedging. Although, the rate of hedging effectiveness is subject to change for different SITs, as a general view both daily and weekly hedging strategy is successful.

Table 4 Risk Reduction

SITs Symbol	**SIT-1**	**SIT-2**	**SIT-3**	**SIT-4**	**SIT-5**	**SIT-6**	**SIT-7**
Daily Hedging	21.83	48.29*	30.54	26.78*	18.94	24.21*	-
Weekly Hedging	44.05*	40.62	48.76*	17.18	46.99*	21.15	-
SITs Symbol	**SIT-8**	**SIT-9**	**SIT-10**	**SIT-11**	**SIT-12**	**SIT-13**	**SIT-14**
Daily Hedging	25.31	19.08	47.45	18.74	10.44	-	-
Weekly Hedging	41.13*	33.85*	60.29*	19.86*	12.83*	-	-
SITs Symbol	**SIT-15**	**SIT-16**	**SIT-17**	**SIT-18**	**SIT-19**	**SIT-20**	**SIT-21**
Daily Hedging	30.97	22.90	27.18	13.09	-	17.35	-
Weekly Hedging	39.48*	26.35*	35.17*	32.74*	-	31.00*	-
SITs Symbol	**SIT-22**	**SIT-23**	**SIT-24**	**SIT-25**	**SIT-26**	**SIT-27**	**SIT-28**
Daily Hedging	22.02	-	21.29	-	-	47.04	22.24
Weekly Hedging	22.49*	-	35.65*	-	-	63.19	39.84*

The hedging effectiveness of the TURKDEX-ISE 30 index future contracts on SITs stocks is obvious; however it is not possible to compare which hedging length is more effective than the other. In order to see the effectiveness of daily and weekly risk reduction equation 5 is used and results are tabulated in table 4. The results presents that the ISE30 index future contract is able to reduce the risk of spot position at a rate of 25% for daily hedges and 35% for weekly hedges, approximately. The lowest risk reduction is 10.44% and 13.83% for daily and weekly hedges, respectively. On other hand, the highest risk reduction is 48.29% for daily hedges and 63.19% for weekly hedges.

When the hedging effectiveness of daily hedges and weekly hedges are compared, it is seen that weekly hedges are superior to daily hedges. In 17 observations, out of 20, weekly hedges performed better than daily hedges according to risk reduction criteria. On the other hand, in only 3 observations the daily hedges are able to beat the weekly hedges.

These findings present that both daily hedges and weekly hedges are able to reduce the risks of SITs stocks. In assumption, SITs are structured to manage diversified portfolios with experienced specialists; such that the risks inherit in SITs stocks are mostly the systematic risks. If this assumption is accepted, than it is true to put forward that the TURKDEX-ISE 30 index can reduce the systematic risks of SITs stocks.

However, it is not possible to claim that the risk associated with SITs stock investments are solely resemble from the systematic risk factors. Besides the assumption stated above, those stocks can also be carrying the

risks associated with unsystematic sources as well. Poor or superfluous diversification and inadequate portfolio management skills can also be observed in these stocks.

Hence, the findings of the study can be interpreted as: the TURKDEX-ISE 30 index future contracts can be used to reduce the riskiness of stock investment or stock market portfolios regardless of their level of diversification or portfolio management profession.

5. Conclusion

The index futures contracts were introduced to manage or hedge the systematic risk in the stock markets. For the time being, as a developing derivative market, TURKDEX is the only futures market that the investors can utilize to hedge their spot positions in Turkey. In this study the hedging effectiveness of the TURKDEX-ISE 30 index futures contract is analyzed and the effect of hedging period length on hedging effectiveness is examined.

The results of the study presented that the TURKDEX-ISE 30 index futures contract is effective in hedging the risks associated with the SITs stocks, which are assumed to be well diversified and managed by professional bodies.

In line with the findings of Lien and Shrestha (2007) and Chung (2009), it is found that the hedging effectiveness is subject change when the hedge periods change. Moreover, when the hedging period length is investigated it is obvious that the weekly hedges are more effective than daily hedges in terms of reducing risk of the spot position. However, reduction in risks of investment is also associated with the reduction returns (increasing losses). This finding are in line with Butterworth and Holmes (2005), but contrary to Yang and Allen (2004), Laws and Thomson (2005) and Bhaduri and Durai (2008).

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