INDEX FUTURES INTRODUCTION AND STOCK MARKET VOLATILITY: EMPIRICAL STUDY IN VIETNAM

SỰ XUẤT HIỆN CỦA HỢP ĐỒNG TƯƠNG LAI CHỈ SỐ VÀ SỰ BIẾN ĐỘNG CỦA THỊ TRƯỜNG: NGHIÊN CỨU THỰC NGHIỆM TẠI VIỆT NAM

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Abstract:

This paper aims at answering the question whether the VN30 index futures introduction has an impact on stock market volatility in Vietnam. Apply GARCH model of volatility with additive dummy variable from 28/7/2000 to 10/9/2020, the result shows that when the first listed index futures contract appears, it makes the volatility of VNIndex increases. The result is still robust after excluding the turmoil period of Vietnam stock market. This paper implies that policy maker should be more careful in promoting derivatives market in Vietnam.

Keyword: *GARCH, VN30 index futures, Vietnam*

Tóm tắt

Bài báo trả lời câu hỏi liệu rằng sự xuất hiện của hợp đồng tương lai chỉ số VN30 có tác động đến biến động trên thị trường cơ sở tại Việt Nam hay không. Áp dụng mô hình GARCH với biến giả trong giai đoạn từ 28/7/2000 đến 10/9/2020, kết quả nghiên cứu cho thấy khi hợp đồng tương lai chỉ số niêm yết đầu tiên xuất hiện, nó khiến cho biến động của chỉ số VNIndex gia tăng. Kết quả nghiên cứu vẫn vững chắc khi loại giai đoạn biến động của thị trường ra khỏi mẫu nghiên cứu. Bài báo hàm ý rằng những nhà hoạch định chính sách cần cận trọng khi thúc đẩy sự phát triển của thị trường phái sinh tại Việt Nam.

Từ khóa: *GARCH, Hợp đồng tương lai chỉ số VN30, Việt Nam.*

1. Introduction

From the first trading in 2000, Vietnam stock market has witnessed spectacular growth. In 2017, with the first index futures contract, Vietnam has become the fifth country in ASEAN (after Singapore, Indonesia, Malaysia and Thailand) which has derivatives market. Since then, derivatives market has drawn enormous attention from investors. For 3 years since the introduction of VN30 index futures, by the end of July 2020, 67.9 million futures contracts were traded. Vietnam derivatives market is particularly active when the underlying market is strongly volatile. The liquidity in derivatives market continuously surpassed the previous levels. In 2019, average trading volume on the derivatives market reached 88,740 contracts per session, increase by 12.6% compared to previous year.

VN30 index futures contract, though having attracted many investors, raises the concern

of increasing volatility in the spot market. Wang, Lin, Lin & Lai (2020) has pointed out that index futures become one of the mose popular speculative instruments nowadays. Bologna and Cavallo (2002) state that futures market promotes speculation which leads to increasing volatility in the underlying spot market. However, another group of literature argues that the futures market contributes to price discovery process, hence it has positive effect on underlying market. As the index futures become more widespread coupled with upcoming derivatives instrument in Vietnam market, the investigation of futures trading on stock market volatility is essential.

This paper investigates the impact of VN30 index futures introduction on Vietnam stock market volatility (representing by VNIndex volatility). Specifically, this paper first examines whether there is any difference in volatility before and after the trading of VN30 index futures. Then this paper tests whether the introduction of futures contract has an negative or positive influence on the stock market volatility. In this empirical analysis, this paper applies Generalized Autoregressive Conditional Heteroskedasticity (GARCH) to model volatility. Most of previous literature have been conducted in developed market (USA, UK, etc.) while a small number of studies relates to other countries. This is the first paper to examine this matter in Vietnam.

The paper structure is as follows: section 2 presents brief review of previous literature, section 3 describes data collection and methodology, section 4 presents results, section 5 provides discussion and conclusion on this study.

2. Literature review

There are two main strands in the theoretical researches debating about the impact of futures on the spot market.

One strand of literature argues that index futures introduction has negative influence on the spot market. Stein (1987) states that futures market has high degree of leverage, therefore, it attracts many uninformed traders. Such traders create noises in the market (Black, 2001), which make information level of futures traders lower compared to cash market traders, then increases the market volatility. Cox (1976), Finglewski (1981), Stein (1987), Cagan (1981) and Harris (1989) agree with this argument.

Another strand in the literature supports the argurments of futures trading benefits including price discovery (Schwart and Laatsch, 1991), increasing market depth and informativeness (Powers, 1976), hence promoting market efficiency (Stoll and Whaley, 1988). Danthine (1978) implies that futures trading increases market depth, therefore, stabilizes the market. Bray (1981) and Kyle (1985) also support the opinion that futures trading lowers spot market volatility and enhances market effficiency.

From the previous literature, both arguments are supported and the empirical question is getting more difficult to answer. Depending on each country condition, futures market introduction can have negative or positive influence on the spot market volatility. Figlewski (1981) when investigating the GNMA futures maket find that the market becomes more voltile after the futures introduction while Froewiss (1978) has come to an opposite conclusion. Following those researchers, many studies have been conducted on financial futures and its impact on spot market.

Most of the studies in this topic apply ARCH/GARCH family model and add dummy vari-

able for index futures introduction, such as Darrat and Rahman (1995), Pericli and Koutmos (1997), Antonioua and Holmes (1995), Illueca and Lafuente (2003), Panayiotis (2011), and so on. Whereas many researches have been conducted in a specific country, Gulen and Mayhew (2000) use country level data. They apply serveral GARCH models and add both additive and muplicative dummies. They find that in USA and Japan, index futures trading has a positive impact on market volatility while they can not find any significant results in other countries. In the contrary, Bologna and Cavallo (2002) investigate this issue in Italian market and show that futures trading stabilize the market.

While many researches have been done on developed as well as developing markets, the question about the impact of futures trading on spot market volatility is left unanswered in frontier markets. Vietnamese researchers have been familiar with ARCH/GARCH model and apply this type of method in forecasting the stock market (Vương Quân Hoàng, 2004; Hồ Thủy Tiên, Hồ Thu Hoài & Ngô Văn Toàn, 2017; Phạm Chí Khoa, 2017; and Lê Văn Tuấn & Phùng Duy Quang, 2020). However, there is no empirical question employing this method to investigate the futures market and its impact on stock market. This paper contributes to the existing literature in the way of considering Vietnam market, a frontier market which is at early stage of derivatives market development.

3. Data and methodology

This paper uses VNIndex as proxy for stock market in Vietnam. Daily closing prices of VNIndex from 28/7/2000 (the establishment of Vietnam stock market) till 9/10/2020 are collected. The final sample after data cleaning is consisted of 4580 observations of daily returns. All data are retrieved from the website http://www.hsx.vn. Data is processed using R software. For GARCH modelling, this paper uses R code provided by Perlin, Mastella, Vancin and Ramos (2020).

This paper uses continuous compounded rate of return as dependent variable in the mean model. Specifically, the rate of return is calculated as the difference of natural logarithm of two consecutive spot index prices.

$$R_{it} = ln(\frac{R_{it}}{R_{it-1}}) = ln(R_{it}) - ln(R_{it-1})$$

To examine whether volatility in the underlying market has changed after the futures introduction, this paper applies ARCH family of models. According to Engle (1982), the ARCH process gives the explanation of difference between conditional and unconditional variance. ARCH model allows the conditional variance to be time-varying while unconditional variance remains constant. ARCH (q) model is as follows:

$$y_t = \beta' X_t + u_t$$

$$h_t^2 = \omega + \sum_{i=1}^{q} \alpha_i u_{t-i}^2$$

Where , Xt is a vector including the information set , is error term, is the conditional volatility. Bollerslev (1986), student of Engle, suggests a generalized ARCH, which is called GARCH. In the GARCH (p,q) model, the conditional variance is specified as:

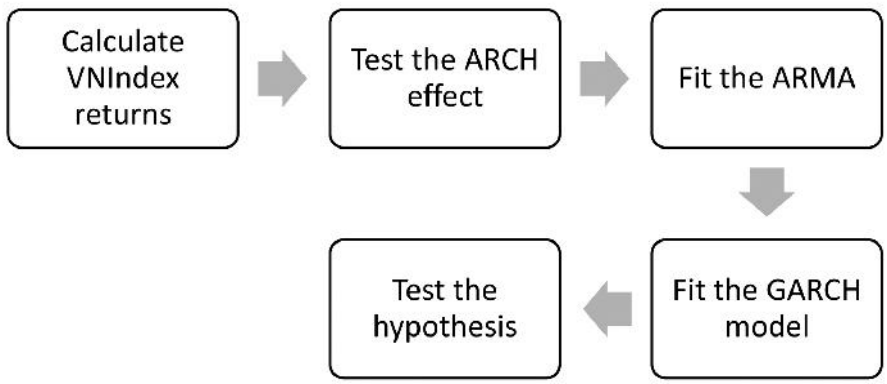
$$h_t^2 = \omega + \sum_{i=1}^{q} \alpha_i u_{t-i}^2 + \sum_{j=1}^{p} c_j h_{t-j}^2$$

GARCH model restricted that , and . provide information about the extent to which past returns can be used to explained current volatility. The sum (a+c) captures the volatility persistence and is restricted to be smaller than 1. If (a+c) > 1, the volatility is explosive. It means that a shock in volatility leads to even larger shock in the next period. Hồ Thủy Tiên et al (2017), Phạm Chí Khoa (2017), and Lê Văn Tuấn & Phùng Duy Quang (2020) find evidence that GARCH (1,1) is suitable to explain stock market volatility in Vietnamese market. In this paper, I will use the same approach in Vietnam context.

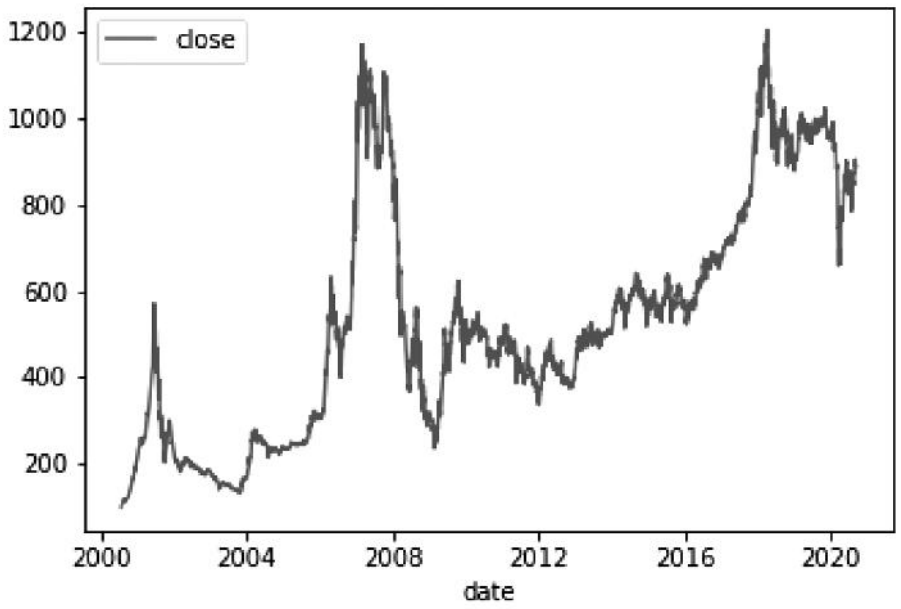
To explore the structural break in volatilty in Vietnam stock market when VN30 futures is introduced, dummy variable is added to the GARCH (1,1) model:

$$h_t^2 = \omega + \gamma_1 DUM \ + \ \alpha_1 u_1^2 + c_1 h_1^2$$

DUM is represented for dummy variable which takes value of 0 in the period of no index futures trading and value of 1 in the period of index futures trading. If the coefficient of DUM is significantly different from 0, the VN30 index futures introduction has influenced the stock market. Moreover, the sign of DUM's coefficient let us know whether this impact is positive or negative. The flow of this empirical analysis is summarized as follows:

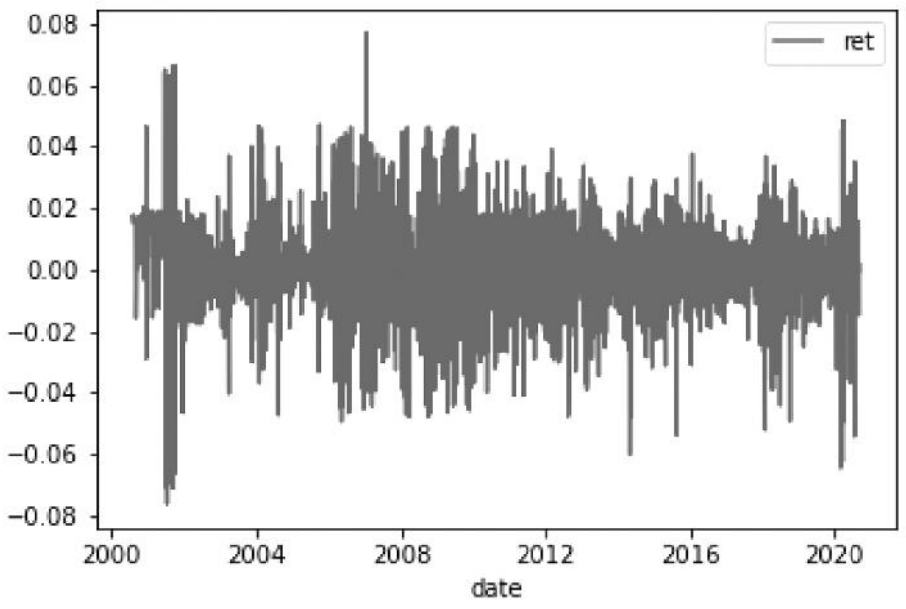


4. Result



(Source: author's calculation)

Figure 1: VNIndex close prices from 28/7/200 to 10/9/2020



(Source: author's calculation)

Figure 2: VNIndex continuous compounded rate of return from 28/7/200 to 10/9/2020

Vietnam stock market has officially established in 1998 with the appearance of HOST and HASTC. The first trading session occurred in 28/7/2000 with the trading of two stocks (REE and SAM) in Ho Chi Minh City Securities Trading Center. For 20 years, Vietnam stock market has

gone through many ups and downs: the explosive growth in 2007, negative impact from the worldwide financial crisis in 2008, an epic year 2017 with the doubled market capitalization stock market (Vietnam stock market capitalization is US$155 billion or VND 3.52 quadrillion, which equals to 72 percent of total GDP) and then the fear of a new crisis ahead. Through many good and bad times, it is undeniable that the development of Vietnam stock market has made great contribution to Vietnam economic growth. In 10/8/2017, the first index futures with VN30 as the underlying asset has been introduced in Vietnam stock market, providing market participants another instrument to hedge as well as to speculate.

Figure 1 demonstrates the development of VNIndex from the establishment of Vietnam stock market till 2020 with two peaks of the index in 2007 and 2017. Figure 2 illustrates VNIndex returns through 20 years. It can be seen from Figure 2 that a large change in returns is followed by a larger change. It is the sign of volatility clustering in VNIndex returns.

Table 2: Summary statistics

	Total sammple (2/7/2000 -10/9/2020	**Pre-futures period (28/7/2000 to 10/8/2017)**	**Post-futures period (10/8/2017 - 10/9/2020**
Obs	4850	4079	770
mean	0.000450	0.000502	0.000181
std	0.014945	0.015417	0.012163
min	-0.076557	-0.076557	-0.064820
25%	-0.005775	-0.006086	-0.004295
50%	0.000451	0.000315	0.001194
75%	0.007474	0.007751	0.00620
max	0.077414	0.077414	770.000000

(Source: author's calculation)

Table 2 presents summary statistics for VNIndex for the whole period (from 28/7/2000 to 10/0/2020) as well as two sub periods. The investiaged sample is divided into two sub-samples: pre-futures period and post-futures period. The volatility of the index measured by standard deviation of index returns has changed after the introduction of VN30 index futures. Specifically, the standard deviation of VNIndex returns has decreased from 0.0151 to 0.0121. However, more evidence is needed to conclude that the index futures introduction has stabilized the stock market.

Table 3. Lagrange Multiplier test for ARCH effect in VNIndex returns

Lag	**Chi-squared**	**p-values**
1	1422.7	0.0000
2	1622.5	0.0000
3	1709.2	0.0000
4	1778.7	0.0000
5	1848.9	0.0000

(Source: author's calculation)

This study tests the ARCH effect in VNIndex returns by performing Lagrange Multiplier test (LM test). The result is presented in Table 3. Null hypothesis of LM test is that there is no ARCH effect in the investigated sample. It can be seen that the p-values of all five lags are significant, the null hypothesis is rejected. It can be confirmed that there is ARCH effect in VNIndex returns.

By using two goodness-of-fit which are AIC and BIC, ARMA (2,2) ~ GARCH (1,1) are selected because this model yields the smallest AIC and BIC. However, when fitting the GARCH (1,1), coefficient of AR(2) is insignificant. ARMA (1,2) has been applied and showed a better results. Dummy variable is then added to GARCH (1,1) model to test the impact of futures introduction to stock market. The results presented in Table 5 show that coefficient of DUM is positive and statistically significant. This is the evidence that the VN30 index futures introduction has an impact on the stock market volatility. However, this paper result shows that when VN30 index futures appears, the stock market volatility increases. Instead of stabilizing the market, VN30 index futures trading seems to make the stock market more volatile than before.

Table 4: Selecting ARMA and GARCH model

lag_ar	lag_ma	lag_arch	lag_garch	AIC	BIC	model_name
0	0	1	1	-6.08344	-6.07809	ARMA(0,0)+GARCH(1,1)
0	0	2	2	-6.08600	-6.07797	ARMA(0,0)+GARCH(2,2)
0	0	3	3	-6.08662	-6.07592	ARMA(0,0)+GARCH(3,3)
0	0	4	4	-6.08691	-6.07354	ARMA(0,0)+GARCH(4,4)
0	0	5	5	-6.08716	-6.07111	ARMA(0,0)+GARCH(5,5)
1	1	1	1	-6.12150	-6.11348	ARMA(1,1)+GARCH(1,1)
1	1	2	2	-6.12179	-6.11109	ARMA(1,1)+GARCH(2,2)
1	1	3	3	-6.12269	-6.10932	ARMA(1,1)+GARCH(3,3)
1	1	4	4	-6.12271	-6.10666	ARMA(1,1)+GARCH(4,4)
1	1	5	5	-6.12194	-6.10321	ARMA(1,1)+GARCH(5,5)
2	2	1	1	-6.12986	-6.11916	ARMA(2,2)+GARCH(1,1)
2	2	2	2	-6.13021	-6.11683	ARMA(2,2)+GARCH(2,2)
2	2	3	3	-6.13101	-6.11496	ARMA(2,2)+GARCH(3,3)
2	2	4	4	-6.13124	-6.11251	ARMA(2,2)+GARCH(4,4)
2	2	5	5	-6.13080	-6.10940	ARMA(2,2)+GARCH(5,5)
3	3	1	1	-6.12917	-6.11580	ARMA(3,3)+GARCH(1,1)
3	3	2	2	-6.12953	-6.11348	ARMA(3,3)+GARCH(2,2)
3	3	3	3	-6.13034	-6.11162	ARMA(3,3)+GARCH(3,3)
3	3	4	4	-6.13047	-6.10908	ARMA(3,3)+GARCH(4,4)

3	3	5	5	-6.12963	-6.10555	ARMA(3,3)+GARCH(5,5)
4	4	1	1	-6.13101	-6.11496	ARMA(4,4)+GARCH(1,1)
4	4	2	2	-6.13068	-6.11196	ARMA(4,4)+GARCH(2,2)
4	4	3	3	-6.13142	-6.11002	ARMA(4,4)+GARCH(3,3)
4	4	4	4	-6.13164	-6.10756	ARMA(4,4)+GARCH(4,4)
4	4	5	5	-6.13059	-6.10385	ARMA(4,4)+GARCH(5,5)
5	5	1	1	-6.12966	-6.11093	ARMA(5,5)+GARCH(1,1)
5	5	2	2	-6.13005	-6.10865	ARMA(5,5)+GARCH(2,2)
5	5	3	3	-6.13085	-6.10677	ARMA(5,5)+GARCH(3,3)
5	5	4	4	-6.13237	-6.10562	ARMA(5,5)+GARCH(4,4)
5	5	5	5	-6.13083	-6.10140	ARMA(5,5)+GARCH(5,5)

(Source: author's calculation)

Table 5. GARCH (1,1) with dummy variable from 28/7/2000 to 10/9/2020

Coefficients	Estimates
	0.000003***
	(0.000004)
DUM	0.000002***
	(0.00000)
	0.197114***
	(0.002344)
	0.801668***
	(0.023029)
Assuming normal distribution. The standard errors are reported in parentheses. *** denotes significance at 1%.	

(Source: author's calculation)

In order to check the robustness of this result, the empirical analysis is performed again using the sample from 30/7/2007 (the day on which HOSE applied continuous order matching) till 10/9/2020. This sample choice is based on Lê Văn Tuấn & Phùng Duy Quang (2020)'s approach in the context of Vietnam.

According to Table 6, the coefficient of DUM is still positively and statistically significant. It confirms our previous result of positive impact of VN30 index futures introduction on market volatility in Vietnam.

Table 6. GARCH (1,1) with dummy variable from 30/7/2007 to 10/9/2020

Coefficients	Estimates
	0.000004***
	(0.000002)
DUM	0.000000***
	(0.00000)
	0.138258***
	(0.020793)
	0.843789***
	(0.051417)
Assuming normal distribution. The standard errors are reported in parentheses. *** denotes significance at 1%.	

(Source: author's calculation)

5. Discussion

This paper provides evidence about the influence of index futures introduction to stock market volatility. Follow previous literature of modelling volatility in Vietnam context, this paper employs GARCH (1,1) model with dummy variable to test for the structural break in volatility. While standard deviation in the pre-futures period is larger than post-futures period, GARCH model results show that VN30 index futures introduction has a significant positive impact on the stock market. The result is robust after turmoil period is excluded from the investigated period. It means that the index futures trading makes the stock market more volatile. Though futures market attracts more investors, policy makers should be careful and take into account its impact on spot market when promoting derivatives market development.

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