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Policy Impact on the Chinese Stock Market: From the 1994 Bailout Policies to the 2015 Shanghai-Hong Kong Stock Connect

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Abstract: From the 1994 bailout policies to the 2015 Shanghai-Hong Kong Stock Connect, the policy impact on the Chinese stock market has changed over time. By May 2015, global investors can directly invest in a more legalized and normalized Chinese stock market, whereas they are still concerned about the policy-oriented market and its attendant risks. In this study, we employ the family of GARCH models to investigate the structural changes in risks with the implementation of a series of policies. Our results show that although many policies improve or stabilize the stock market, certain policies lead to substantial volatility. Among them, macro-control policies and transaction cost adjustments are a double-edged sword, which should be used with caution. Furthermore, with opening-up policies being launched recently, the Chinese stock market has entered a new stage in which it affects international capital markets. However, the increased risks, which may result in a sharp turnaround, cause worry.

Keywords: Chinese stock market; policy and regulation; Shanghai-Hong Kong Stock Connect; volatility; GARCH

JEL Classification: G00; G10; G18

1. Introduction

On 17 November 2014, securities regulators in China and Hong Kong issued a policy called the Shanghai-Hong Kong Stock Connect, allowing hundreds of Shanghai-listed companies to be traded in Hong Kong with limited quotas and vice versa. In addition, foreign investors have been allowed to short A-shares via this program since 2 March 2015. Investors on both sides are able to trade shares they could not before, and global capital is expected to flow into interested Shanghai-listed companies that trade at compelling valuations. The program means further progress in relaxing capital controls [1] and freeing market pricing across the markets. Combined with the following Shenzhen-Hong Kong Stock Connect, the program enables China to further integrate its domestic and offshore markets, and promote the efficiency of financing and investment.

The Chinese stock market comprises the Shanghai, Shenzhen, and Hong Kong stock markets. The Shanghai and Shenzhen security exchanges, formed in 1990, are in Mainland China and have experienced great growth since the early 1990s [2]. More specifically, the domestic stock market has experienced several major stages. In the early 1990s, the embryonic stock market and related policies were just getting started. To stabilize and manage the stock market, the China Securities Regulatory Commission (CSRC) was established. Then, during 1997–2005, the legal structure of the market was established and the delisting system was launched. The QFII scheme (Qualified Foreign Institutional

Investors), which allows foreign investors to invest in domestic securities, was introduced in 2003. Next, the reform of the split-share structure began in 2005. By the end of 2007, A-shares were no longer divided into tradable and non-tradable shares. After the transition stage from 2008 to 2010, the Chinese stock market entered into a stage of deepening reform and opening-up. The IPO reform began on August 2010, intended to allow the market to play a decisive role in IPOs. Furthermore, the government has intensively launched a series of opening-up policies to connect the Chinese stock market to international capital markets since 2012.

As the second largest economy, China has entered its golden period of gradual standardization and modernization as various regulations are implemented. The current Chinese stock market is experiencing endogenous reforms driven by policies and is showing a new pattern from a closed market to a more open market. Furthermore, China is becoming increasingly integrated with the world economy [3,4].[1] The standards for market institutions in China are gradually aligning with those of mature markets. At the same time, the Chinese stock market is increasingly playing an influential role in international capital markets as it opens [6]. However, since to some degree China remains a centrally planned economy, the excessive government control is the most conspicuous peculiarity, significantly different from the situation in capitalist countries.

Previous studies show that the Chinese stock market is a typical "policy-oriented market" [7,8]. Ma et al. [9] selected nine policy events occurring between 2000 and 2003, and found that China's stock market is significantly impacted by policy effects. Since the stock market policies have an endogenous dynamic inconsistency, some policies may cause fluctuations [10] while others may stabilize the stock market [11]. However, prior studies concentrate primarily on the responses of stock returns triggered by either monetary policies or several events. Hence, the field lacks an overall review of the effects of a series of policies over a wide time span.

This study thus investigates how a series of policies affects the Chinese stock market between 1994 and May 2015. Furthermore, this study examines not only the impacts of each individual policy but also the impacts of each stage on the stock market. We explore the impact of major policies and stages from the 1994 bailout policies to the 2015 Shanghai-Hong Kong Stock Connect by employing the family of GARCH models. The results suggest that the Chinese stock market may have over-reacted to the policy implementation in earlier years, while its fluctuation shrinks in recent years. To a certain degree, the stability of the Chinese stock market has improved after the government's efforts.

Nevertheless, certain policies cause extreme volatility. Particularly, the attendant risks of the recent opening-up policies increase substantially. The peak during November 2014 to May 2015 has the second largest potential risk from the period between 1994 to May 2015. By contrast, the largest risk occurred during the 2007 global financial crisis. Hence, the increased risks may surface in the near-term.

Given the gradually increasing role of the Chinese stock market in international capital markets, our research is significant for global investors who either directly invest in the Chinese stock market or are affected by information from the Chinese stock market. Most importantly, when investing in a policy-oriented market, its attendant risks cannot be ignored. Considering China's unique national conditions, the stock market is not free from being driven by policies. Research on the changes in the Chinese stock market after government policy changes and how these policies affect the market under different market conditions are significant for both domestic investors and global investors. Moreover, this study provides a reference for policy-makers to enhance market development and prevent large fluctuations in the stock market. Based on the findings of this research, when implementing and designing policies, policy-makers can consider strictness, timing, and types of the policies more cautiously.

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[1] In addition, the Chinese currency has potential to become a global currency [3,5].

The remainder of this paper proceeds as follows. First, we review the previous studies. Then, we describe our data and methodology. Next, we present the empirical results and discuss the policy implications of our findings. Finally, we conclude the paper. Based on our empirical findings, we formulate policy recommendations to enhance market development not only for China, but also for other emerging markets.

2. Literature Review

There are several reasons for Chinese government intervention in the stock market. First, government intervention is widely used to complement markets. According to Stiglitz [12], government intervention in financial markets to resolve market failure is pervasive around the world. In the transition and reform stage, the immature Chinese stock market, with its intense volatility, needs effective government intervention to maintain stability. Second, government intervention can reduce systematic risk in the stock market and protect the entire economy under certain circumstances. Lu [13] demonstrates that, through establishing norms and guiding the development of the stock market, the ultimate policy goal for the Chinese government is to enable the stock market to serve the economy. Third, government intervention can protect the rights and interests of investors, especially small and medium investors. When abnormal fluctuations occur in the market, government action helps investors recover their confidence and prevents large-scale panic. Although this protection may result in investors expecting government intervention and becoming dependent on government policies [14], the balance between market forces and government controls is vital to China [15]. Not all government intervention should be criticized.

To date, the Chinese government has made great efforts in promoting the stable development of the stock market in order to boost economic development. Since 1990, many regulation changes which improve the legal framework or reduce barriers to trade have been made [16]. In 2014, to enhance the efficiency of resource allocation in the capital market, the government lifted the restrictions on listing access and improved the delisting system of listed companies. This drew fund flows into value stocks and growth stocks, and led them away from junk stocks. The implementation of IPO reform in 2012 helped to guide rational investment. China launched the stock index futures in 2010 to provide a hedging mechanism for systemic risk, and launched the securities margin trading business in the same year to implement long and short two-way trading.[2] In 2009, the Chinese Growth Enterprise Market was officially listed in Shenzhen in order to help young growing firms go public and raise external capital [18,19].[3] The market is an important complement to the main board market. The implement of the split-share structure reform since 2005 is considered to be the most far-reaching reform measure in China's stock market. On 30 July 1994, the CSRC issued three bailout policies: a temporary stop to issue new stocks, strict control of the scale of rights offerings, and measures to widen the fund channels. It was the first time that the Chinese government attempted to intervene massively to prop up the securities market after the establishment of the market.

Most studies of the Chinese stock market agree that policy factors affect the stock market. Han and Tang [21] claim that the Chinese stock market and government policies are inextricably linked. Wang et al. [22] show that the Chinese stock market overreacts to policy information and that it is an obvious "policy market". Peng and Xiao [23] conclude that more than 60% of the policies resulted in great stock market volatility from 1991 to 2001. Zou et al. [24] demonstrate that policy factors are the primary reason for market movements in a similar period with 16 huge market fluctuations, whose amplitudes exceeded 20%. Chan and Chang [8] find that policy factors commonly influence the Chinese stock market.

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[2] To some extent, short sales improve market efficiency [17].
[3] See also Fung et al. [20].

Nevertheless, how policies affect the stock market remains inconclusive. Guo et al. [7] contend that the impact of policies on the Chinese stock market is large and can make the market jump. Xu and Li [25] observe that compared with continuous policies, most short-term policies generate more direct impact and cause more shocks. Du [10] proposes that policy interventions increase volatility. However, after studying the volatility of the Chinese stock market caused by the "New National Ten", Tsai et al. [11] find that the announcement and execution of the policy are effective in stabilizing the stock market.

According to the literature, research on the effects of policy factors on the Chinese stock market focuses primarily on some policies such as price limits, short selling, or monetary policies [26–28]. Although there are a few studies on a series of typical policy events, most have not further explored the long-term structural changes brought by stock market policies. This is where we intend to contribute. This study investigates the impacts and implications of 76 major reform, stabilization, bailout, and macro-control policies over a wide time span from 1994 to May 2015. Furthermore, to examine the long-term structural changes in volatility, we divide our sample period into several market stages according to the market development, policy initiation, and previous studies. Many studies select dividing points close to 1997, 2001, 2005, and 2008, including those of Chen et al. [29], Green [30], and Neftci and Ménager-Xu [31]. Our stage division is largely consistent with those found in the most recent studies, Ni et al. [32] and Chen et al. [33].

Note that policy factors in the security market cover broad categories. Among them, stock market policies, including reform, stabilization, and bailout policies, are the main factors that affect the stock market. In addition, because security analysts predict the stock market, usually on the basis of important macroeconomic conditions [34], we also take macro-control policies into consideration but still pay more attention to the stock market policies.

3. Data and Methodology

3.1. Data Description

Data for policy implementation are hand-collected from official news releases. Table 1 lists the comprehensive policy events in the Chinese stock market between July 1994 and May 2015. Trading data for the stock indices and the stock index futures are obtained from the Wind database. The data comprise daily closing prices of the Shanghai Composite Index and the Shanghai A-share Index from 19 December 1990[4] to 29 May 2015. In addition, according to Yang et al. [35], the issuance of stock index futures contracts has a great impact on the volatility of the stock index. Therefore, we collect the daily closing prices of the short-term maturity of CSI 300 stock index futures contracts (one-month) of the same period to incorporate its effect into our models in the latter analyses.

Table 1. Major policy changes in China from 1994 to 2015.

Time	Policy Measure
2 March 2015	Foreign investors were allowed to short A-shares by the Shanghai-Hong Kong Stock Connect.
17 November 2014	The Shanghai-Hong Kong Stock Connect was officially launched.
4 June 2014	Opinions of the State Council on Promoting Fair Market Competition and Maintaining the Normal Market Order were issued. The opinions included lifting the restrictions on listing access and improving the delisting system of listed companies.
10 April 2014	The Shanghai-Hong Kong Stock Connect program is first announced by Premier Li Keqiang.
21 March 2014	Measures for the Pilot Administration of Preferred Stock were issued by CSRC.
30 November 2013	Comments concerning Further Promoting the Reform of New Stock Issuance System were issued by CSRC.

[4] The Shanghai Composite Index and the Shanghai A-share Index are officially released on 15 July 1991 and 21 February 1992 respectively, but both base dates are 19 December 1990.

Table 1. *Cont.*

Time	Policy Measure
15 November 2013	The Third Plenary Session of the 18th Central Committee of the Communist Party of China announced Decision of the CCCPC on Some Major Issues Concerning Comprehensively Deepening the Reform.
28 April 2012	CSRC formulated the Guiding Opinions on Further Reforming the Issue System of New Shares.
16 December 2011	Measures for Pilot Domestic Securities Investment Made by Renminbi Qualified Foreign Institutional Investors of Fund Management Companies and Securities Companies were announced.
5 December 2011	The central bank lowered the deposit reserve ratio seven times during 5 December 2011–5 February 2015.
23 August 2010	Guiding Opinions on Further Reforming the Issue System of New Shares (Exposure draft) were introduced by CSRC.
14 May 2010	Several Opinions of the State Council on Promoting and Guiding the Healthy Development of Private Investment (New Article 36) were launched.
16 April 2010	Launched the CSI 300 stock index futures.
31 March 2010	Launched margin trading and short selling business.
18 January 2010	The central bank raised the deposit reserve ratio twelve times consecutively during 18 January 2010–4 December 2011.
23 October 2009	Chinese growth enterprise market was officially listed in Shenzhen.
22 May 2009	The first stage of reforming the issue system of new shares improved the quotation constraint mechanisms for price inquiry and subscription.
5 November 2008	Premier Wen Jiabao chaired a State Council executive meeting. The meeting introduced 10 measures to expand domestic demand and promote economic growth. The state announced a 4 trillion yuan investment plan.
25 September 2008	The central bank lowered the deposit reserve ratio four times during 25 September 2008–17 January 2010.
18 September 2008	Three bailout policies: The 1‰ stamp duty on purchases of shares would be abolished, while the equivalent tax on sales of shares would remain; Central Huijin Investment Ltd repurchased the stocks of three major state-owned commercial banks; and the State Council supported central enterprises to repurchase shares of their holding companies.
27 August 2008	Decision on Amending Article 63 of the Administrative Measures for the Takeover of Listed Companies came into force.
24 April 2008	The stamp duty on share transactions was reduced from 3‰ to 1‰.
9 January 2008	China launched the gold futures trading on the Shanghai Futures Exchange.
27 November 2007	The central government took actions to curb inflation and prevent economic overheating.
5 July 2007	Trial Measures for the Administration of Overseas Securities Investment by Qualified Domestic Institutional Investors came into force.
30 May 2007	The stamp duty on share transactions was increased from 1‰ to 3‰.
17 September 2006	Measures for the Administration of Securities Offering and Underwriting were introduced and would come into force on 19 September 2006.
18 May 2006	Measures for the Administration of Initial Public Offering and Listing of Stocks came into force.
15 January 2006	CSRC Promulgated Measures for the Administration of Equity Incentive Plans of Listed Companies.
27 October 2005	The Securities Law and the Companies Law was revised by the Standing Committee of the National People's Congress. The revised version went into effect on the first day of 2006.
29 April 2005	Notice of the China Securities Regulatory Commission on Piloting the Share-trading Reform of Listed Companies was issued. The split-share structure reform was begun.
7 December 2004	CSRC announced Circular of China Securities Regulatory Commission on Issuing the Provisions on Strengthening the Protection of the Rights and Interests of the General Public Shareholders.
4 November 2004	Revised Administrative Measures for Stock-Pledged Loans of Securities Companies.
13 September 2004	Premier Wen Jiabao said government would promptly implement Some Opinions of the State Council on Promoting the Reform, Opening and Steady Growth of Capital Markets.
31 January 2004	Some Opinions of the State Council on Promoting the Reform, Opening and Steady Growth of Capital Markets were implemented.
28 October 2003	Law of the People's Republic of China on Securities Investment Fund was issued by the Standing Committee of the National People's Congress.
21 September 2003	The central bank raised the deposit reserve ratio twenty times during 21 September 2003–24 September 2008.
29 August 2003	CSRC announced the Interim Measures for the Administration of Bonds of Securities Companies.
4 April 2003	The Shanghai and Shenzhen Stock Exchanges issued a notice that stocks with delisting risks would be designated by "ST" marks.
20 March 2003	Investment rules for qualified foreign institutional investors were clarified.
10 January 2003	The Shanghai Stock Exchange block trading platform was launched.

Table 1. *Cont.*

Time	Policy Measure
7 November 2002	Interim Measures on the Administration of Domestic Securities Investment by Qualified Foreign Institutional Investors were promulgated.
6 June 2002	Rules for the Establishment of Foreign-shared Securities Companies were promulgated.
28 January 2002	CSRC announced the initial results of the reduction of state-owned stocks.
4 December 2001	Delisting system was officially launched.
22 October 2001	CSRC announced to provisionally stop reducing state-owned stocks.
12 June 2001	The State Council issued Interim Measures on the Management of Reducing Held State Shares and Raising Social Security Funds. Note: On 23 June 2002 the central government announced cancellation of the policy.
28 February 2000	Initiation of Measure for Punishment of Illegal Financial Acts.
22 February 2000	Notice on the Issue of Placing New Shares to the Secondary Market Investors was issued by CSRC.
2 February 2000	Initiation of Administrative Measures for Stock-Pledged Loans of Securities Companies.
27 October 1999	Policies concerning the reduction of state-owned stocks were announced. The reduction would be achieved through placement.
22 September 1999	State Share Hold Reduction was cleared, which opened the way to the equity division reform.
9 September 1999	CSRC allowed state-owned enterprises and the listed companies to issue shares and trade stocks.
1 July 1999	Securities Law of the People's Republic of China came into force.
19 May1999	The editorial in People's Daily was entitled "Keep the Faith and Regulate Development."
16 May 1999	Request of CSRC on further promoting and regulating the development of the securities market was approved by the State Council.
29 December 1998	Securities Law was adopted by the Standing Committee of the National People's Congress.
25 November 1998	Notice on the Cessation of Employee Share Issuance was promulgated. The notice prohibited any issuance of employee shares when a company makes a public offering.
12 June 1998	The stamp duty on share transactions was reduced four times between 12 June 1998 and 29 May 2007 from 5‰ to 1‰.
5 November 1997	Interim Measures on the Management of Securities Investment Funds were adopted by the State Council.
15 August 1997	The State Council decided that the Shanghai and Shenzhen Stock Exchanges were managed directly by CSRC.
6 June 1997	Assets owned or controlled by banks were banned from being used to purchase stocks.
22 May 1997	State-owned enterprises and listed companies were banned from conducting stock trading.
10 May 1997	The stamp duty on share transactions was increased from 3‰ to 5‰.
16 December 1996	CSRC set the daily price limit at 10%.
2 December 1996	Investment funds were steadily developed with regulation.
14 November 1996	Bank loans were banned from being used to invest in stocks by the Central Bank.
3 October 1996	Reduction in commissions for stock and fund trading.
24 July 1996	The government took actions to cool the market. The actions included announcing Measures for the Administration of Stock Exchanges, Notice on Firmly Preventing Such Behaviors as Overdraft in Stock Issuance, and Notice on Several Issues Concerning Regulating the Behaviors of Listed Companies.
30 April 1996	Regulating insider ownership of listed companies.
20 June 1995	Commercial banks were banned to enter stock and trust businesses.
18 May 1995	CSRC banned the trading of futures on Treasury Bonds.
1 January 1995	Initiated T + 1 trading procedure.
5 October 1994	CSRC announced that T + 1 trading procedure would be initiated on the first day of 1995.
5 September 1994	Foreign institutions were permitted to buy A-shares by setting up funds.
30 July 1994	CSRC issued three bailout policies: measures to widen fund channels; halting issuance of new stocks; and controlling the scale of rights offerings.

Let P_t, P_{t-1} represent the closing prices of the Shanghai Composite index in period t, $t-1$; r_t represents the daily yield rate of the Shanghai Composite Index in period t; and f_t represents the daily yield rate of the CSI 300 stock index futures in period t. All the daily index prices employ a natural logarithm (ln) to calculate r_t:

$$r_t = 100 \times (lnP_t - lnP_{t-1}) \quad (1)$$

Similarly, we can obtain f_t, the daily yield of the CSI 300 stock index futures in period t.

Table 2 shows the statistical characteristics of the daily yield rate of the Shanghai Composite Index, r_t. The specific findings are summarized as follows. First, both the mean and median of r_t are positive, which indicates the overall Chinese stock market displays an upward trend. Second, r_t has a negative skewness (–0.3330) and represents a spike (Kurtosis = 7.9655). In addition, the Jarque-Bera equals 3780.3170 with a p-value < 0.01. These statistics mean that the distribution of the r_t series is not a normal distribution and has fat tails. Third, to test the stationarity of the r_t series, we follow the process of the Augmented Dickey-Fuller unit root test. The test statistic for the Shanghai Composite Index is –73.5561, with a p-value < 0.01. Therefore, we reject the null hypothesis that the r_t series contains a unit root. Finally, the characteristics of the Shanghai A-share index present similar results.

Table 3 provides the results of the Lagrange multiplier test. The r_t series has high-order ARCH (autoregressive conditional heteroscedasticity) errors, thus rejecting the null hypothesis of homoscedasticity. These results suggest that we should use high-order ARCH models, such as GARCH (generalized ARCH) or EGARCH (exponential GARCH) models, to conduct the following analyses.

Table 2. Statistical characteristics of the stock indices returns.

Statistical Characteristics	Shanghai Composite Index	Shanghai A-Share Index
Mean	0.0631	0.0639
Median	0.0684	0.0722
Maximum	71.9151	74.5174
Minimum	–17.9050	–18.4271
Standard Deviation	2.3828	2.4617
Skewness	–0.3330	–0.3431
Kurtosis	7.9655	8.0067
Jarque-Bera	3780.3170	3810.1050
p-value for JB	<0.0001	<0.0001
Augmented Dickey-Fuller	–73.5561	–73.5488
p-value for ADF	<0.0001	<0.0001

This table presents the summary and test statistics for the Shanghai Composite Index returns and the Shanghai A-share Index returns, respectively.

Table 3. Lagrange multiplier test.

Heteroscedasticity Test: ARCH	Shanghai Composite Index		Shanghai A-Share Index	
	Observations × R-Square	Probability Chi-Square	Observations × R-Square	Probability Chi-Square
q = 1	2.92830	0.0870	3.13373	0.0767
q = 2	12.24356	0.0022	14.03321	0.0009
q = 3	23.13311	0.0001	23.61153	0.0000
q = 4	27.26228	0.0000	30.10914	0.0000
q = 5	27.42634	0.0000	30.27091	0.0000
q = 6	28.95957	0.0001	32.03559	0.0000
q = 7	30.13364	0.0001	33.36778	0.0000
q = 8	30.51586	0.0002	33.79508	0.0000
q = 9	31.48474	0.0002	34.80817	0.0001
q = 10	31.80851	0.0004	35.24752	0.0001

3.2. Methodology

The GARCH-M model is employed to account for heteroscedastic variance and its effect on returns. The variance equation allows for both GARCH and ARCH components. The specification of the GARCH(p,q)-M model is

$$r_t = x_t'\beta + \tau\sqrt{\sigma_t^2} + \epsilon_t; \quad \epsilon_t = \sqrt{\sigma_t^2} \times v_t; \quad v_t \sim IID(0,1); \tag{2}$$

$$\sigma_t^2 = \omega + \sum_{i=1}^{p} \gamma_i \sigma_{t-i}^2 + \sum_{j=1}^{q} \pi_j \epsilon_{t-j}^2; \quad E(v_t v_s) = 0 \ (t \neq s); \quad \gamma_i \geq 0, \ \pi_j \geq 0; \tag{3}$$

where $\sigma_t^2 = var(\epsilon_t | \vartheta_{t-1})$ is conditional variance and ϑ_{t-1} is all the information during and before the period t–1.

In the model selection, we examine different kinds of commonly used combinations of ARMA(p,q)-GARCH(p,q)-M according to the two most commonly used criteria, the Akaike information criterion and the Schwartz Bayesian criterion, and the underlying assumptions of the GARCH model. The results suggest that ARMA(1,1)-GARCH(1,1)-M is an appropriate model to describe our data. Table 4 provides the results of the assumption checks for the GARCH(p,q) selection process. Of the four most commonly used GARCH models for measuring stock volatility, only GARCH(1,1)-M is valid because γ_i and π_j should be positive.

Table 4. Model selection process.

Models	ω	γ_1	γ_2	π_1	π_2
GARCH(1,1)	0.027521 *** (0.006970)	0.826759 *** (0.011198)	—	0.126448 *** (0.011442)	—
GARCH(1,2)	0.024795 *** (0.006437)	0.839972 *** (0.011915)	—	0.139366 *** (0.022693)	–0.023319 (0.023693)
GARCH(2,1)	0.028819 *** (0.008222)	0.737607 *** (0.174520)	0.078753 (0.149354)	0.133600 *** (0.133600)	—
GARCH(2,2)	0.003826 ** (0.001649)	1.483441 *** (0.089682)	–0.513139 *** (0.081835)	0.167343 *** (0.022625)	–0.146477*** (0.020245)

This table shows some coefficients of the GARCH(p,q) models: $\sigma_t^2 = \omega + \sum_{i=1}^{p} \gamma_i \sigma_{t-i}^2 + \sum_{j=1}^{q} \pi_j \epsilon_{t-j}^2 + \sum_{k=1}^{76} \varphi_k D_k + \theta f_t$. Standard errors are in parentheses. *** and ** represent statistical significance at the 1% and 5% levels, respectively.

Based on the results of the GARCH modeling, we also employ ARMA(1,1)-EGARCH(1,1)-M to consider the asymmetric effect further. Therefore, we use GARCH family models (GARCH-M and EGARCH-M) to account for heteroscedastic variance and its effect on returns. The mean equation of the models is

$$r_t = c + \beta_1 r_{t-1} + \tau \sqrt{\sigma_t^2} + \beta_2 \epsilon_{t-1} + \epsilon_t \tag{4}$$

The variance equations of the GARCH(1,1)-M and EGARCH(1,1)-M models are of the following forms, respectively:

$$\sigma_t^2 = \omega + \gamma \sigma_{t-1}^2 + \pi \epsilon_{t-1}^2 + \sum_{k=1}^{76} \varphi_k D_k + \theta f_t, \tag{5}$$

$$\ln \sigma_t^2 = \omega + \gamma \ln \sigma_{t-1}^2 + \pi \left| \frac{\epsilon_{t-1}}{\sigma_{t-1}} \right| + \delta \frac{\epsilon_{t-1}}{\sigma_{t-1}} + \theta f_t, \tag{6}$$

where γ and π are the parameters for GARCH and ARCH terms. π allows us to observe the clustering phenomenon of the time series. The total influence of the information shocks, $\gamma + \pi$, measures the persistence of the market response to the changes in the recent and past information. δ describes the asymmetric effect of negative and positive shocks.

Among the exogenous variables, we use the indicator variables, $D_k (k = 1, 2, \ldots, 76)$, to examine the influence of the implementation of the policies on the stock market volatility as

$$D_k = \begin{cases} 1 & \textit{during the implementation period} \\ 0 & \textit{the other period} \end{cases} \tag{7}$$

Therefore, φ_k captures the effect of the implementation of the policy (D_k) on volatility. Following a similar technique as in Yang et al. [35], we use f_t as the control variable; hence, θ controls for the effect of the stock index futures (f_t).[5]

Furthermore, to examine the structural changes in volatility for different policy stages, we divide our sample into several subsamples according to the market development and policy initiation. Specifically, we use the corresponding subsamples to estimate the EGARCH-M models and then compare their distinct features of volatility to investigate the implications between these stages.

To sum up, considering that the r_t series has high-order ARCH effects, we use GARCH models to parsimoniously capture the characteristics. However, the GARCH models have some restrictions on their parameters. Accordingly, in the model selection process, we consider the Akaike information criterion, the Schwartz Bayesian criterion, and these restrictions, simultaneously. In addition, to control for policy impacts on returns, we further employ GARCH-M models. The reason is that policies affect volatility and then impact returns through the volatility term in the mean equation (GARCH-M). Hence, to some degree, we can investigate the volatility effects controlling for the return effects of policies. Moreover, to capture the asymmetric effects of information shocks, we also employ EGARCH-M models. Accordingly, in this study, we use GARCH family models (GARCH(1,1)-M and EGARCH(1,1)-M) to conduct the following analyses by taking into account the r_t series characteristics, the parameter restrictions, the model selection criteria, the asymmetric effects, and the control effects.

4. Empirical Analysis

4.1. Analysis of Policies with Extreme Volatility

The results of the implementation of the policies are as follows:

$$r_t = 0.074947 + 0.967408 r_{t-1} - 0.001942\sqrt{\sigma_t^2} - 0.909314\epsilon_{t-1} + \epsilon_t, \tag{8}$$

$$\begin{array}{lccccccccc} \sigma_t^2 = & 0.027521 & + & 0.826759\sigma_{t-1}^2 & + & 0.126448\,\epsilon_{t-1}^2 & + & \sum_{k=1}^{76}\varphi_k D_k & - & 0.021182 f_t, \\ & (0.006970) & & (0.011198) & & (0.011442) & & & & (0.026941) \end{array} \tag{9}$$

The results provide several findings. First, the returns of the stock market conform to the ARMA(1,1) process, which means that the returns are influenced by yesterday's information. Second, γ, π, and τ are significant, meaning that using the GARCH(1,1)-M model to describe the volatility of the r_t series is reasonable. Third, $\gamma + \pi = 0.953207$ indicates that the influence of the shocks lasts for a long period ($\gamma + \pi$ is close to 1). Fourth, almost all the coefficients of D_k are significant, suggesting that the implementation of these policies does affect the stock market. A coefficient with a larger value means that on average the policy implementation period has higher volatility than the other periods, ceteris paribus. The impact of each individual policy is detailed in Table 5.

Most policies affect the Chinese stock market because they influence trading behavior on the stock market by changing stock market volume, altering the availability of financing for trading,

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[5] Our research controls for other factors in three ways. First, when we estimate the effect of one policy, the effects of the other policies are controlled. We incorporate all policy variables into the GARCH model simultaneously, allowing us to estimate each policy effect controlling for the effects of the other policies. Second, according to the properties of the GARCH model, the model describes the influence of all past and recent information shocks on volatility, capturing the total effect of the other factors at that time. When we incorporate the policy effects as explanatory variables of volatility, we separate out the policy impacts from the other effects. In other words, to some extent, we estimate policy effects while controlling for the total effect of the other factors indirectly. Third, we also perform tests which incorporate economic variables such as PMI, PPI, and GDP as explanatory variables into our model (i.e., directly control for the economic factors), but the results of the policy effects are almost the same. Not only are none of these economic variables statistically significant, but they also do not affect the coefficients and significance of the policy variables. These results further show that the Chinese stock market is a typical policy-oriented market. Considering that economic factors are not the focus of this study, we do not demonstrate the relevant results for clarity. However, these tests can be regarded as alternative robustness tests.

influencing the expectations of investors, and so on. For examples, changes in transaction costs affect stock market volume. The adjustments of the deposit reserve ratio affect the availability of financing for trading. Initiating measures to punish illegal acts enhances the confidence of investors, and introducing measures to expand domestic demand conveys a positive signal to investors. However, the impacts of these policies on volatility differ [36]. Moreover, the stock market may respond differently to similar policies under different market conditions.

Table 5. Effects of policy implementation.

Date	Effect	Date	Effect	Date	Effect
D_1: 1 August 1994	0.07189 *** (0.01201)	D_{27} : 14 February 2000	0.03604 *** (0.00936)	D_{53} : 27 November 2007	0.02892 *** (0.01201)
D_2: 5 September 1994	0.07873 *** (0.01239)	D_{28} : 22 February 2000	0.03596 *** (0.00935)	D_{54} : 9 January 2008	0.02944 *** (0.01209)
D_3: 5 October 1994	0.07152 *** (0.01197)	D_{29} : 28 February 2000	0.03595 *** (0.00935)	D_{55} : 24 April 2008	0.02708 ** (0.01190)
D_4 3 January 1995	0.07049 *** (0.01178)	D_{30} : 12 June 2001	0.05668 * (0.03898)	D_{56} : 27 August 2008	0.02611 ** (0.01182)
D_5 : 18 May 1995	0.06611 *** (0.01140)	D_{31} : 22 October 2001	0.04320 *** (0.01054)	D_{57} : 18 September 2008	0.02578 ** (0.01179)
D_6 : 20 June 1995	0.06615 *** (0.01139)	D_{32} : 4 December 2001	0.04436 *** (0.01061)	D_{58} : 18 September 2008	0.10327 ** (0.05987)
D_7 : 30 April 1996	0.05717 *** (0.01055)	D_{33} : 28 January 2002	0.04154 *** (0.01045)	D_{59} : 5 November 2008	0.02549 ** (0.01176)
D_8 : 24 July 1996	0.05626 *** (0.01044)	D_{34} : 6 June 2002	0.04011 *** (0.01035)	D_{60} : 22 May 2009	0.02377 ** (0.01164)
D_9 : 3 October 1996	0.05445 *** (0.01030)	D_{35} : 7 November 2002	0.04240 *** (0.01073)	D_{61} : 23 October 2009	0.02069 ** (0.01154)
D_{10} : 14 November 1996	0.05379 *** (0.01024)	D_{36} : 10 January 2003	0.04095 *** (0.01071)	D_{62} : 18 January 2010	0.03317 * (0.02315)
D_{11} : 2 December 1996	0.05345 *** (0.01021)	D_{37} : 20 March 2003	0.04266 *** (0.01085)	D_{63} : 31 March 2010	0.01943 ** (0.01163)
D_{12} : 16 December 1996	0.05242 *** (0.01367)	D_{38} : 28 March 2003	0.04180 *** (0.01082)	D_{64} : 16 April 2010	0.01914 * (0.01170)
D_{13} : 12 May 1997	0.01528 (0.02824)	D_{39} : 29 August 2003	0.04564 *** (0.01131)	D_{65} : 14 May 2010	0.01828 * (0.01168)
D_{14} : 22 May 1997	0.02747 * (0.02132)	D_{40} : 22 September 2003	0.05151 *** (0.01830)	D_{66} : 23 August 2010	0.01767 * (0.01172)
D_{15} : 6 June 1997	0.05134 *** (0.00997)	D_{41} : 28 October 2003	0.04519 *** (0.01153)	D_{67} : 5 December 2011	0.01205 (0.01265)
D_{16} : 15 August 1997	0.05025 *** (0.00986)	D_{42} : 2 February 2004	0.04279 *** (0.01146)	D_{68} : 16 December 2011	0.01199 (0.01268)
D_{17} : 8 October 1997	0.04938 *** (0.00980)	D_{43} : 13 September 2004	0.03911 *** (0.01147)	D_{69} : 28 April 2012	0.01054 (0.01290)
D_{18} : 12 June 1998	0.01699 ** (0.00961)	D_{44} : 4 November 2004	0.03852 *** (0.01142)	D_{70} : 15 November 2013	0.00772 (0.01725)
D_{19} : 25 November 1998	0.04447 *** (0.00958)	D_{45} : 7 December 2004	0.04017 *** (0.01157)	D_{71} : 2 December 2013	0.00976 (0.01778)
D_{20} : 29 December 1998	0.04238 *** (0.00956)	D_{46} : 29 April 2005	0.03733 *** (0.01157)	D_{72} : 21 March 2014	0.00632 (0.01960)
D_{21} : 17 May 1999	0.03928 *** (0.00952)	D_{47} : 27 October 2005	0.03496 *** (0.01149)	D_{73} : 10 April 2014	0.00732 (0.02015)
D_{22} : 15 June 1999	0.03877 *** (0.00949)	D_{48} : 16 January 2006	0.03593 *** (0.01180)	D_{74} : 4 June 2014	0.02044 (0.02480)
D_{23} : 1 July 1999	0.03846 *** (0.00947)	D_{49} : 18 May 2006	0.03467 *** (0.01205)	D_{75} : 17 November 2014	0.18300 ** (0.11052)
D_{24} : 9 September 1999	0.03811 *** (0.00941)	D_{50} : 19 September 2006	0.03648 *** (0.01225)	D_{76} : 2 March 2015	0.16633 (0.19693)
D_{25} : 22 September 1999	0.03829 *** (0.00942)	D_{51} : 30 May 2007	0.21434 ** (0.10981)		
D_{26} : 27 October 1999	0.03735 *** (0.00936)	D_{52} : 20 August 2007	0.03078 *** (0.01214)		

This table presents estimated policy effects, D_k, for the GARCH model: $\sigma_t^2 = \omega + \gamma\sigma_{t-1}^2 + \pi\epsilon_{t-1}^2 + \sum_{k=1}^{76} \varphi_k D_k + \theta f_t$. The estimation of the parameters is examined with the t-distribution assumption for the innovations. Standard errors are in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

Our findings show that many policies have great effects on the stock volatility. We give explanations for policies with extreme volatility one by one below, along with the market conditions at that time. Figure 1 plots the effects of D_k to display volatility evolvement in the Chinese stock market. The robustness of the estimation of the parameters is examined with two distributional assumptions for the innovations; *t*-distribution and GED (Generalized Error Distribution). Both distributions better capture the fat-tailed characteristic of the r_t series. Panel A of Figure 1 presents nine extreme points (points I to IX).

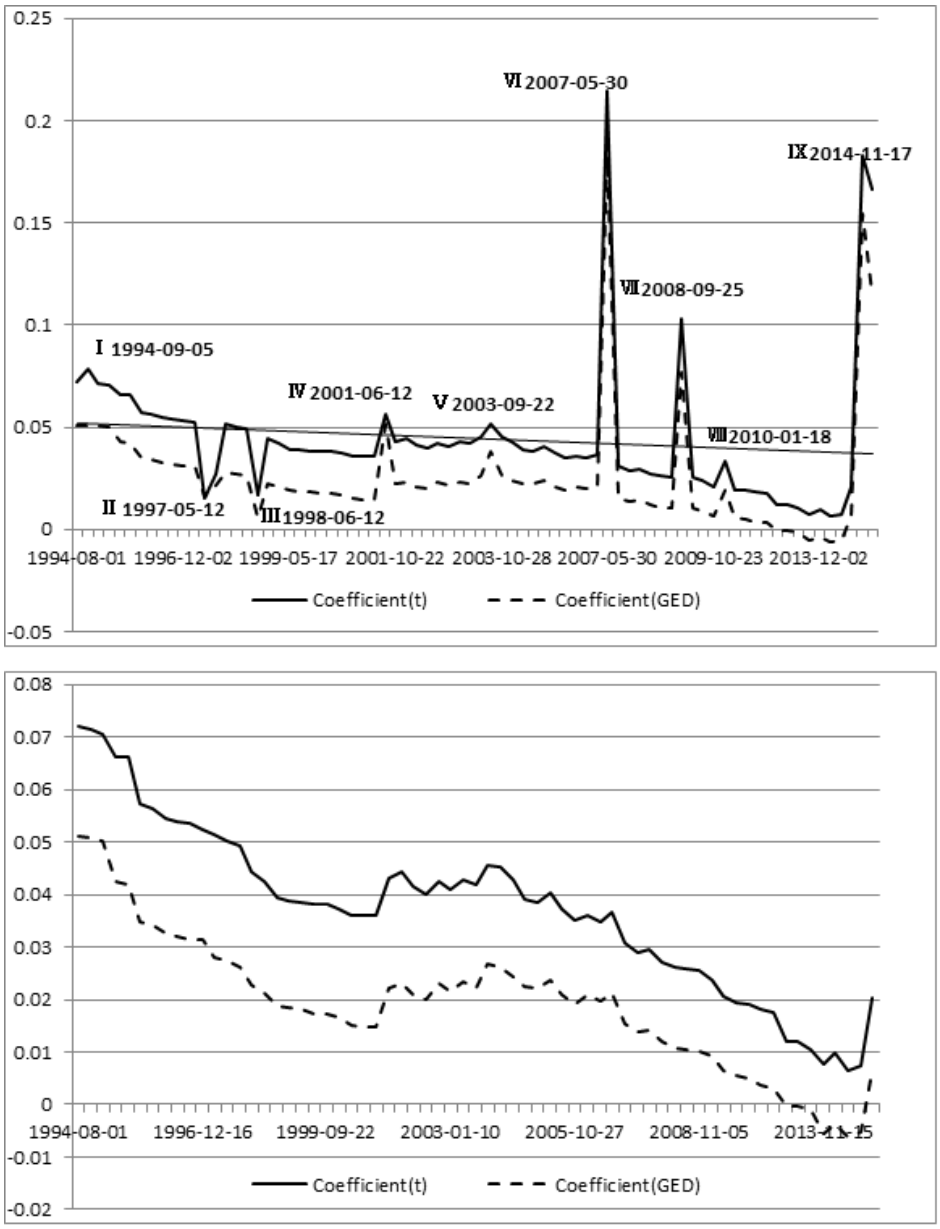

Figure 1. Response of market volatility to policy execution. This figure displays volatility evolution in the Chinese stock market. The robustness of the estimation of the parameters is examined with two distributional assumptions for the innovations; *t*-distribution, and GED (Generalized Error Distribution). Panel A (top one) includes all policies. Panel B (bottom one) excludes the policies with extreme values.

On 5 September 1994 (point I), foreign institutions were permitted to buy A-shares by setting up funds, which led to a significant increase in volatility. This not only shows that the introduction of

foreign capital increases Chinese stock market volatility[6], but also involves a continuing effect from the three bailout policies beginning on 30 July 1994. The bailout policies included several measures to widen the fund channels. The government attempts to develop domestic mutual funds, foster domestic institutional investors, and attract foreign funds into the A-shares market by the pilot project of joint venture fund management companies. Although these policies boost stock returns, they increase the potential risks.

Similarly, on 17 November 2014 (point IX), the Shanghai-Hong Kong Stock Connect program was officially launched. Then on 2 March 2015, foreign investors were allowed to short A-shares via this program. This means that investors from around the world could invest directly in the Chinese stock market. With a series of opening-up policies for foreign investors and an explosion of margin lending for domestic investors, the Shanghai Composite Index surged nearly 120% from the second half of 2014 to May 2015. However, our results show that the unsettled stock market boom may result in a sharp turnaround in the near-term because the attendant risks of the explosive stock market increased dramatically. The peak during November 2014 to May 2015 has the second largest potential risk between 1994 and May 2015. By contrast, the largest one occurred during the 2007 global financial crisis.

The highest extreme point cannot be ignored (point VI). With the double impact of the adjustment of stamp duty and the 2007 global financial crisis, the Chinese stock market slumped and its risks increased significantly. The adjustment of the stamp duty meant a change in transaction costs, further affecting stock market volume [38]. The adjustment is considered one of the government measures to stabilize the stock market in some stages (for examples, at points II and III). However, in China this measure is not consistently effective. For example, on the eve of 30 May 2007, to curb the overheated stock market, the Ministry of Finance suddenly announced that the stamp duty on share transactions would be adjusted from 1‰ to 3‰ on 30 May. Accompanying the following global financial crisis, the risks increased substantially.

In contrast to the largest and second largest extreme points, the third largest extreme point (VII) is related to the adjustment of the deposit reserve ratio. The adjustment changed the amount of money in circulation. Since retail investors play the main role in the Chinese stock market[7] and they react to changes in government regulations and to the availability of financing for trading, the adjustment, therefore, had a great impact on the market (points V, VII, and VIII). Further, point VII is also affected by the three policies on 18 September 2008 (the stamp duty on purchases of shares is abolished, Central Huijin Investment Ltd repurchased the stocks of three major state-owned commercial banks, and the State Council supported central enterprises to repurchase shares of their holding companies). These policies, following one after another, enlarged the stock market volume and volatility dramatically.

Finally, point IV is the first time in the history of the Chinese stock market that the central government policy was rejected by the market. On 12 June 2001, the State Council announced a policy of the reduction of state-owned stocks to fund the social security system. The reduction is an important reform and is moving in the right direction. However, the implementation measures, such as selling shares at market prices, caused widespread controversy. The market responded negatively to the related measures. The Shanghai Composite Index plunged over 32% until 22 October. On 22 October, CSRC announced that the policy is provisionally stopped until they work out appropriate measures. Then, the market volatility gradually stabilized. In the end, the State Council formally cancelled this policy on 23 June 2002.

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[6] Wang and Shen [37] demonstrate that opening up to the inflow of foreign investment increases volatility in stock returns and thus related policies may bring challenges.

[7] Retail investors hold over 80% of the total market value on average from 2006 to 2011 in the Chinese stock market. By contrast, in developed stock markets, institutional investors usually take the majority share of the total stock market value and contribute to rational adjustments of the stock prices. Moreover, after 2007, investors in China have a greater tendency to herd.

Although several policies had great impacts on the market, the effects of most policies were stable. Except for the nine extreme points, the overall volatility of the stock market indicates a decreasing trend, as shown in Panel B of Figure 1. Generally, the fluctuation steadily grows smaller. The stability of the Chinese stock market has improved after the government's efforts.

Many empirical studies also offer perspectives similar to those of our findings on the Chinese stock market. Guo et al. [7] argue that the impact of policy events on the Chinese stock market is greater than the impact of economic events and natural disasters, implying that the Chinese stock market is a policy-oriented market. Du [10] states that policies increase volatility because of the distemperedness of market mechanisms and the information asymmetry among market participants. Peng and Xiao [23] find that due to the incoherence of certain policies and their inconsistency with public expectations, the policies result in great stock market volatility. Zou et al. [24] demonstrate that government policies cause Chinese stock market fluctuations because they represent dynamic games with incomplete information between government and investors. Although the control of policy implementation in the Chinese stock market tends to be more mature [25], the government should pay greater attention to the increased risks with a series of opening-up policies.

4.2. Analysis of Policy Stages

In this section, we first explain the six stages of the Chinese stock market and highlight the important policies of each stage. We then explore the structural changes in the volatility of these stages.

From the enactment of the Securities Law, the establishment of the delisting system, the accomplishment of the split-share structure reform, the improvement of the IPO mechanism, to the initiation of opening-up policies, the Chinese stock market experienced several major stages. This stage division is chosen because it is characterized by the market development and policy initiation. The five chosen dividing points of the six stages, 1997, 2001, 2005, 2008, and 2010, are compatible with those identified in Chen et al. [29], Green [30], Neftci and Ménager-Xu [31], Ni et al. [32], and Chen et al. [33]. In each stage a series of government policies have defined goals, depending on the needs and the characteristics of the stage. Namely, the tasks of policies are different in each stage. Therefore, by using these policy "landmarks" as stage divisions, the explanations and implications of the analysis results are more meaningful.

According to the market development and policy initiation, the Chinese stock market has experienced the following six stages. The first stage (1990–1996) was an embryonic stage when the stock market and related policies were just getting started. The Shanghai and Shenzhen stock exchanges were formed in 1990. The CSRC was established in 1992. In addition, the T + 1 trading procedure was initiated on the first day of 1995. The policy meant that stocks bought today cannot be sold until tomorrow. This policy, still used today, reduces intra-day speculation to stabilize the market, especially when the market was not mature. Furthermore, since 16 December 1996, CSRC has imposed a daily price limit of 10%, which also plays a role in stabilizing the market.[8]

In the second stage (January 1997–June 2001), the Securities Law of the People's Republic of China played a primary role in establishing the legal structure of the market. On 1 July 1999, the Securities Law, the first comprehensive securities legislation, became effective. The law, addressing issuance and trading of securities, acquisition of listed companies, stock exchanges, securities firms, regulatory authorities, and so on, is an important legislative milestone for the market.

In the third stage (July 2001–March 2005), the delisting system was officially launched on December 4, 2001. Then, on 4 April 2003, the Shanghai and Shenzhen stock exchanges issued a notice that stocks with delisting risks would be designated by "special treatment" ("ST") marks. The system improves the quality of listed companies and protects the interests of investors. Furthermore, in this stage, China entered the WTO (World Trade Organization) on November 2001. The QFII scheme

[8] Price limits restrict large price movements and give market participants time to reconsider their trading strategy [39].

(Qualified Foreign Institutional Investors) was introduced in 2003. The scheme boosted the domestic market by allowing such foreign investors to invest in domestic securities.

Next, the fourth stage (April 2005–June 2008) is the key stage of a reform of split-share structure. Prior to the reform, A-shares were divided into tradable and non-tradable shares. Among them, the non-tradable shares were about two-thirds of the listed shares and were held by the state or legal persons with much lower acquisition costs than market prices. The structure caused many problems such as incentive conflicts, share illiquidity, and manager entrenchment. To solve the problems, the Chinese government initiated the reform in April 2005 to transform non-tradable shares into tradable shares. However, holders of non-tradable shares should compensate holders of tradable shares. Because the compensation acted as a buffer, most listed firms, whose aggregate market value was over 97% at the time, had completed the reform by the end of 2007 (for details, see Li et al. [40]).

The fifth stage (July 2008–July 2010) is the transition stage between the fourth and the final stages. In the stage, the stamp duty on purchases of shares was abolished on September 2008. The Chinese Growth Enterprise Market was officially listed in 2009. The margin trading and short selling business were permitted on 31 March 2010. The CSI 300 stock index futures were launched on 16 April 2010.

The final stage (August 2010–May 2015) is the deepened reform and opening-up stage. In the stage, CSRC started the IPO reform on 23 August 2010. On 30 November 2013, CSRC issued related comments to promote the marketization issuance mechanism for new stocks. China planned to gradually convert the current approval system for IPOs to a registration system. It intended to move toward allowing the market to play a decisive role to obviate the CSRC role as the approval agency. Furthermore, in this stage China intensively launched opening-up policies. Among these policies, the Shanghai-Hong Kong Stock Connect, officially launched on November 2014, was the first to offer international investors an approach to investing directly in the Chinese stock market.

We then explore the structural changes of volatility in the six stages of the Chinese stock market by using EGARCH-M models. Table 6 provides the results. The results are examined with t-distribution and GED (Generalized Error Distribution) assumptions for the innovations in Panels A and B, respectively. Both distributional assumptions better capture the fat-tailed characteristic of the r_t series. Panels A and B present similar results. First, the decrease in π as time goes by shows that investors are less sensitive to the new information shocks. Second, the decrease in $(\gamma + \pi)$ means that the persistence of the market response to the changes in the recent and past information falls. Third, the value of δ is negative, which implies that bad (good) news increases (decreases) volatility. Furthermore, the absolute value of δ indicates the intensity of the asymmetric effect. Fourth, θ controls for the effect of the stock index futures. The increase in θ shows that the influence on the stock volatility has increased since the launch of stock index futures in the fifth stage. Fifth, the long-term constant of the volatility, ω, is negative except in the final stage.

Notably, the volatility of the final stage, the deepening reform, and opening-up stage has a distinct structure. The stage has the smallest π and $(\gamma + \pi)$, the second largest absolute value of δ, larger θ, and the largest ω (much larger than the second one). In other words, in this stage, the past information has a less persistent influence and good news greatly decreases the volatility. However, bad news causes immediate violent fluctuation. The trading in stock index futures also results in greater fluctuations of the stock market.[9] Meanwhile, the long-term constant of the volatility increases dramatically. All these features may be early warnings. Combining these results with a bull market from the second half

[9] Yan and Dong [41] analyze high frequency trading data via the EGARCH model and conclude that CSI 300 stock index futures increase the fluctuations of the Chinese stock market. The Chinese securities market is an emerging market with imperfect regulation where the number of speculators exceeds the number of investors [42]. Among these, irrational speculators speculating in the futures market not only makes the stock market have less liquidity but also makes the futures market deliver more volatility to the spot market [43]. Particularly, sharp changes in the prices of the stock index futures in the final stage (the sixth stage) caused the futures market to contribute great fluctuations to the stock market. Furthermore, several studies investigating stock markets outside China also found that stock index futures may increase the stock price volatility because such futures accelerate information transmission [44–46].

of 2014 to May 2015, investors neglect the high long-term constant of the volatility and the higher influence of stock index futures. In addition, the high asymmetric effect causes the market volatility to decrease greatly under a bull market. However, once the bad news occurs, the volatility will increase dramatically. Therefore, the market is vulnerable and a market reversal may occur.

Table 6. Structural changes of volatility in different stages.

Period	ω	γ	π	δ	θ
Panel A *t*-Distribution					
December 1990– December 1996	–0.190599 *** (0.014931)	0.988806 *** (0.003862)	0.353131 *** (0.039696)	–0.161909 *** (0.030805)	—
January 1997– June 2001	–0.209631 *** (0.032672)	0.948557 *** (0.014569)	0.346169 *** (0.050859)	–0.055816 ** (0.029334)	—
July 2001– March 2005	–0.124276 *** (0.034270)	0.934201 *** (0.021163)	0.223578 *** (0.048664)	–0.128893 *** (0.034145)	—
April 2005– June 2008	–0.104431 *** (0.026569)	0.982297 *** (0.009627)	0.178860 *** (0.041866)	–0.024260 (0.027322)	—
July 2008– July 2010	–0.106470 *** (0.036241)	0.972607 *** (0.018163)	0.175952 *** (0.049455)	–0.032081 † (0.030730)	–0.099305 *** (0.038615)
August 2010– May 2015	3.792457 *** (0.998503)	0.028839 (0.048223)	0.028660 (0.054407)	–0.130973 ** (0.064163)	0.043270 *** (0.011006)
Panel B GED					
December 1990– December 1996	–0.196597 *** (0.015461)	0.977684 *** (0.004532)	0.369153 *** (0.036288)	–0.036288 *** (0.030873)	—
January 1997– June 2001	–0.201044 *** (0.032217)	0.957429 *** (0.013192)	0.317254 *** (0.048456)	–0.026757 (0.026205)	—
July 2001– March 2005	–0.131681 (0.120007)	0.975563 *** (0.037236)	0.201374 *** (0.057750)	–0.049551 ** (0.024432)	—
April 2005– June 2008	–0.101185 *** (0.025936)	0.985470 *** (0.009163)	0.162179 *** (0.037685)	–0.018591 (0.025732)	—
July 2008– July 2010	–0.101834 *** (0.039060)	0.965988 *** (0.020951)	0.179319 *** (0.053614)	–0.033866 † (0.032412)	–0.110725 *** (0.043718)
August 2010– May 2015	1.546475 *** (0.057063)	0.039902 *** (0.005929)	0.001938 † (0.001618)	–0.041610 *** (0.005128)	0.092210 *** (0.007494)

This table presents the EGARCH parameter estimates for different stages of the Chinese stock market. The results are examined with two distributional assumptions for the innovations, *t*-distribution and GED, in Panels A and B, respectively. $\ln \sigma_t^2 = \omega + \gamma \ln \sigma_{t-1}^2 + \pi \left| \frac{\epsilon_{t-1}}{\sigma_{t-1}} \right| + \delta \frac{\epsilon_{t-1}}{\sigma_{t-1}} + \theta f_t$. The sample is divided into six subsamples according to different stages of the Chinese stock market. Standard errors are in parentheses. ***, **, and † represent statistical significance at the 1%, 5%, and 15% levels, respectively.

Furthermore, we also examine the robustness of the estimates using other stage division methods. The total trends of the EGARCH parameter estimates are similar (under either *t*-distribution or GED assumptions). Although the estimates for each stage slightly change in values as the dividing points are altered, the results do not devalue our inference. The reason is that we examine structural volatility changes among different stages mainly based on the trends of the parameter estimates rather than their values. For example, when we use the time periods between policies with extreme risks in Panel A of Figure 1 (the market structure may alter after these policies) as alternative market stages to perform the analysis, we still obtain the similar inferences. Therefore, the results are robust.

Finally, we examine the policy impact by type. The policies are classified as four types: reform, stabilization, bailout, and macro-control policies. In this part, we exclude the nine policies with extreme volatility because we have analyzed their effects in detail. Table 7 presents the impacts of these four types of policies. The coefficients of E_1 and E_2 are both significantly negative, which implies that reform and stabilization policies generally reduce the stock volatility. That is, the reform and stabilization

policies appear to play a vital role in stabilizing the stock market. By contrast, the coefficients of E_3 and E_4 are significantly positive, which means bailout and macro-control policies generally cause the market to fluctuate. Among these, macro-control policies, which may not be targeted at the stock market, are implemented to regulate economic activity. However, these policies usually have great impact on the stock market. Therefore, the policies may be a double-edged sword, which should be used with caution. Regarding bailout policies, the policies are executed in severe market situations. Because the market volatility is already high and the intensity of the policies must be strong, it is reasonable that the double impact causes the market to fluctuate. Our findings show that different types of policies have different impacts on the stock market, which is consistent with the findings of Ma et al. [9], Xu and Li [25], and Lv et al. [34], especially for macro-control and bailout policies. For examples, Lv et al. [34] demonstrated that China's official interest rate changes have great impact on the stock market. Ma et al. [9] argued that bailout policies cause the stock market fluctuations because they are usually highly utilitarian. Note that the results of the analyses in this study are robust to using the Shanghai Composite Index or the Shanghai A-share Index as proxy variables. The results are almost the same.

Table 7. Implementation effects of different types of policies.

Type	Effect (*t*)	Effect (GED)
E_1: Reform policies	–0.012925 *** (0.003988)	–0.012812 *** (0.004030)
E_2: Stabilization policies	–0.004791 * (0.003159)	–0.005341 * (0.003371)
E_3: Bailout policies	0.081247 *** 0.020450	0.077100 *** 0.020894
E_4: Macro-control policies	0.015515 † 0.013736	0.016733† 0.014157

This table presents estimates of the effects of the four types of policies, E_k, for the GARCH model: $\sigma_t^2 = \omega + \gamma\sigma_{t-1}^2 + \pi\epsilon_{t-1}^2 + \sum_{k=1}^{4} \varphi_k E_k + \theta f_t$. The estimation of the parameters is examined with two distributional assumptions for the innovations; *t*-distribution and GED (Generalized Error Distribution). Standard errors are in parentheses. ***, *, and † represent statistical significance at the 1%, 10%, and 15% levels, respectively.

5. Conclusions

In this study, we investigate policy impacts on the Chinese stock market from 1994 to May 2015. From the enactment of Securities Law, establishment of the delisting system, accomplishment of the split-share structure reform, improvement of the IPO mechanism, to initiation of opening-up policies, the Chinese stock market has experienced different stages. We investigate not only the impacts of each policy and type but also the structural changes of each stage. The results suggest that in addition to stabilization policies, reform policies, which help to improve the long-term development of the market, are effective in reducing market volatility. By contrast, volatility increases severely when bailout policies are implemented, due to the double impact of the severe market situations at that time and the strong intensity of the policies. Moreover, macro-control policies and transaction cost adjustments may cause the market to fluctuate when used inappropriately.

Notably, with a series of opening-up policies since 2010, long-term constant volatility has increased dramatically, trading of stock index futures has caused higher fluctuation, and the strong asymmetric effect has made the market highly sensitive to negative shocks. Particularly after the Shanghai-Hong Kong Stock Connect program was launched in November 2014, the Shanghai Composite Index increased nearly 90% in 7 months. However, the attendant risks reached the second largest peak between 1994 and May 2015, where the largest one occurred during the 2007 global financial crisis. Therefore, although opening-up policies stimulate stock market growth, the unsettled situations with extreme risks may be the early warnings.

To improve market development, China's government should pay more attention to its attendant risks and avoid unnecessary intervention. After our sample period, the Chinese stock market crashed in June 2015, causing severe market fluctuations. The crash confirms our opinion that the attendant risks of the stock market have reached a high level since November 2014. Accordingly, a deeper understanding of what drives China's 2015–2016 stock market surges and turmoil is needed for future research. In the future, if the government can note early warning signs and take action to ameliorate unsettled situations, such crises may be avoided. In addition, the government should continuously improve the market infrastructure, gradually enhance the legal system, and further upgrade the market standardization. With opening-up policies, the linkages among domestic and foreign markets will intensify. Turmoil in the Chinese market may cause fluctuations in foreign markets. Therefore, the formulation and implementation of policies should be more cautious.

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