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Does Covid-19 Change the Stock Market Relationship with Interest-Exchange Rate?

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Abstract

Research Originality: Despite numerous studies conducted on similar topics, this study uniquely examines the short- and long-run dynamics of the interest rate, exchange rate, and stock prices in China under two distinct epochs: pre- and Covid-19 periods.

Research Objectives: This study compares the impact of interest and exchange rates on the Chinese stock market during the COVID-19 and pre-COVID-19 periods. Furthermore, the study also investigated the speed of adjustment towards equilibrium following short-run shocks in the stock market.

Research Methods: This study employs monthly data on the Chinese stock market and the autoregressive distributed lag model-error correction model (ARDL-ECM) approach on a separate period.

Empirical Results: On COVID-19, the interest rate and exchange rate are not jointly and individually cointegrated significantly in explaining the stock prices. Nevertheless, the short-run relationship is identified as significant for both variables. Meanwhile, during COVID-19, the variables are jointly significant, with the exchange rate also identified to explain the stock market movement in the long run individually. In the short run, despite the greater impact of the exchange rate, the interest rates have a hysteretic impact.

Implications: The findings suggested that policymakers should leverage the exchange rate instrument as a better predictive tool in devising effective future policy-making.

Keywords:

stock price; auto regressive distributed lag model; covid-19

How to Cite:

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INTRODUCTION

Historically, many research have been conducted on the relationship between the financial industry, particularly interest rates and stock prices. Most studies show that changes in interest rates have the most direct and immediate impact on the stock market. This is because interest rates have a substantial impact on firm stock values. Interest rate fluctuations can affect a company's borrowing costs. On the other side, as interest rates rise, market investors and fund managers may transfer from clearing equities to financial vehicles like bank savings or bonds, which are known for their consistent yields, resulting in lower stock demand and lower stock prices. Thus, when interest rates fall (Musawa & Mwaanga, 2017; Sia et al., 2025), stock prices rise. For example, Pokhrel et al. (2020) investigated the relationship between interest rates and the Nepal stock index and discovered a short-term negative correlation. El Abed and Zardoub (2019) show that interest rates have a considerable negative impact on the returns of German stocks. Türsoy (2019) found in Türkiye's financial market that there is a significant negative dynamic correlation between stocks and domestic interest rates. In Malaysia, this negative correlation is equally significant in both the short and long term (Qing & Kusairi, 2019).

Although research findings suggest that interest rates need to be a key determinant of stock price levels, in some developing countries, this relationship does not seem theoretically absolute. Assefa et al. (2017) studied the stock returns of 19 developing economies and 21 developed economies between 1999 and 2013. They found that interest rates have a statistically significant negative impact on stock returns in developed countries. In developing markets, stock returns largely depend on international investment portfolios, which is consistent with the assumption of expected cash flows. Wang and Li (2020) found that the puzzling positive correlation between interest rates and the Chinese stock market may indicate that the Chinese stock market is relatively underdeveloped and inefficient. Similar findings are not uncommon in China (Fang et al., 2016; Hu et al., 2020; Wang & Li, 2020).

Furthermore, exchange rate fluctuations are another key factor to consider when analyzing factors that affect the stock market. However, evidence from countries and regions with different levels of development suggests that the impact of exchange rate fluctuations of sovereign currencies on stock prices varies greatly depending on national and market conditions. (E'zazi and Sadegh, 2015; Nguyen, 2019; Türsoy, 2017; Bahmani and Saha, 2018; Liu and Lee, 2022; Bhargava & Konku, 2023). For example, Türsoy (2017) used portfolio integration technology and the ARDL boundary test to find that the fluctuation of Türkiye's real exchange rate will affect the short-term changes in stock prices. E'zazi and Sadegh (2015) found a significant short-term and positive impact of the overall German stock market index on exchange rates. Bahmani and Saha (2018) pointed out that the asymmetric effect between exchange rates and stock prices has been overlooked in previous literature.

The above investigations almost only captured significant short-term dynamic relationships rather than long-term evidence, but there are also many studies indicating the

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existence of long-term relationships between exchange rate fluctuations and stocks (Khan et al., 2017; Gong & Dai, 2017; Sajor et al., 2023; Neifar, 2023; Bhattacharjee & Das, 2023). In addition, the positive and negative effects of exchange rates on stock markets vary significantly in different countries. For example, in some developing countries, exchange rate fluctuations have been found to have a positive impact on stock prices (Khan et al., 2017; Javangwe & Takawira, 2022; Sajor et al., 2023). This means that the impact of exchange rates on the stock market is specific to the dynamics of countries and market reactions, so traditional conclusions about these relationships are not always consistent, as their effects depend on current market scenarios.

Figure 1: Stock prices & Interest rate (pre-Covid)

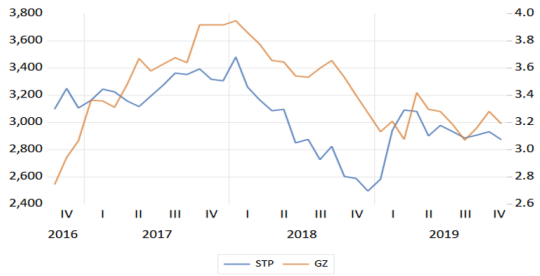


Figure 2: Stock prices & Exchange rate (pre-Covid)

Figure 3: Stock prices & Interest rate (Covid-19)

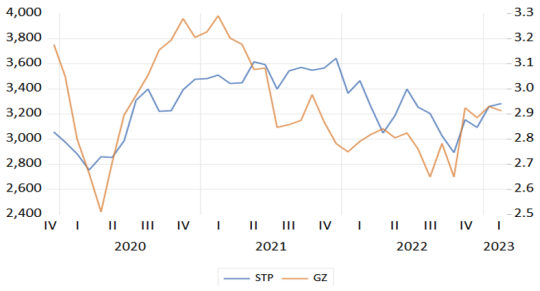
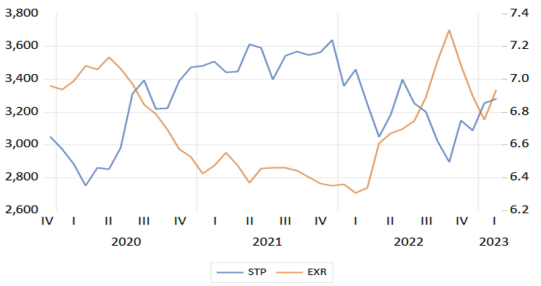


Figure 4: Stock prices & Exchange rate (Covid-19)



Sources: Author's creation

Recently, in the research on issues during Covid-19, the study on the relationship between these financial variables has also received attention from different countries (Cox et al., 2020; Rahmayani & Oktavilia, 2020; Nurmasari & Nur'aidawati, 2021; Ikhsan et al., 2022; Gao et al., 2022; Tabash et al., 2022; Goh & Henry, 2024). For example, research from the early stages of COVID-19 in China and the United States shows that the Chinese stock market seems less sensitive to changes in domestic interest rate policies at different levels, which is opposite to the situation in the United States. However, investigations in both countries have found that interest rate changes seem insignificant compared to daily confirmed cases (Gao et al., 2022), and the intense stock market drive does not seem to be generated by interest rate fluctuations (Cox et al., 2020; Ikhsan et al., 2022). On the other hand, exchange rate fluctuations have shown a more severe impact on stock price fluctuations during COVID-19 (Lee et al., 2021; Nwosa, 2021; Rai & Garg, 2022; Ikhsan et al., 2022; Alimi & Adediran, 2023; Goh

& Henry, 2024), and even during non-pandemic periods, there is still a clear negative relationship between exchange rates and stock prices (Tabash et al., 2022).

Although the aforementioned studies include early examinations of this issue within their respective countries, most of them only focus on the pandemic period (Cox et al., 2020; Rahmayani & Oktavilia, 2020; Nwosa, 2021; Tabash et al., 2022), lacking a direct comparison between the pandemic and non-pandemic periods (Tabash et al., 2022). Moreover, although previous studies have explored the impact of the pandemic on the Chinese stock market (Gao et al., 2022), there is almost no evidence regarding the differences in the effects of exchange rates and interest rates on stock prices before and after the pandemic. Instead, they focus more on the impact of Covid-19 on stock price fluctuations themselves rather than the dynamic relationship between stock prices and other financial variables (Liu et al., 2020; He et al., 2020; Tan et al., 2022).

Therefore, this study will fill this research gap. Furthermore, this study differs from previous research in that we will directly examine and compare the variables of interest before and during the pandemic, rather than considering only the pandemic period. The objectives of this study are to (1) compare the differences in the impact of exchange rate and interest rate on stock prices before and after Covid-19, and examine the changes in the long-term and short-term dynamic relationship between the two sub cycles; (2) compare the short-term adjustment speed and long-term multiplier of each sub cycle; and (3) highlighting the structural fracture caused by Covid-19. The novelty of the study lies in (1) comparing the changes in the relationship between stock prices and exchange rates under shocks before and during Covid-19; (2) evaluating the changes in coefficient differences between variables affected by shocks during these two sub periods; and (3) uniquely examine the short-and long run dynamics of the interest rate, exchange rate and stock prices. Finally, our results indicate that during the pandemic, the short-term and long-term impact of exchange rate shocks on stock prices significantly increased. In contrast, the impact of interest rates on the stock market was almost ineffective. This finding is of great significance for macro financial policy design in times of crisis.

METHODS

The data of the pre-COVID-19 period selected in this paper is the monthly index of the Shanghai Stock Exchange in October, which returned to a stable trend after the collapse of China's stock market in 2015, as the starting time for Model 1. The data during COVID-19 is based on the first news coverage of COVID-19 in 2019 as the starting time, on February 23, 2023, experts from the epidemic response and disposal leadership group of the National Health Commission of China announced that "the epidemic is basically over". Therefore, we will use February 2023 as the end time for Model 2. The selected data are the closing prices of monthly market transactions. The U.S. dollar to RMB exchange rate is used in the foreign exchange data as a representative example for foreign exchange rates. The monthly closing price is used from the Shanghai (securities) composite index, and the yield of China's 10-year Treasury bonds will be

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our interest rate. The data format is logarithmic, with Lnstp representing the Shanghai Composite Index price, Lnexr representing the USD/RMB exchange rate, and Lngz representing the interest rate. Due to the lack of suitable control variables during the investigation process, this study did not include control variables for examination. Table 1 shows more details about the data.

Our method involves applying the Phillips-Perron test and the Augmented Dickey Fuller unit root tests to determine the stationary nature of the time series. The lag order selection criteria in the VAR model are employed to determine the most efficient order for the variable lag.

Table 1. Descriptions of the variables

Variable	Description	Unit of measure	Source of data	Model 1 period	Model 2 period
Lnstp	Log form Shanghai Securities Index	Point	East Money investment information website	2016/10-2019/11	2019/12-2023/02
Lnexr	Log form U.S. dollar against RMB	CNY	Investing website	2016/10-2019/11	2019/12-2023/02
Lngz	Log form 10-year treasury bond bonds	CNY	Investing website	2016/10-2019/11	2019/12-2023/02

The research investigates the interconnection among various economic factors through the application of empirical methods. In this research, long-run relational assessments will employ Auto-regressive Distributed Lag Model (ARDL) bound testing. The ARDL model, as a time series analysis method, is commonly used to analyze the degree to which a variable is influenced by other variables and the long-run cointegration between all series. It is considered an extension of the ARIMA model and allows the model to include exogenous and lagged variables. Compared with early johansen cointegration tests and vecm error correction estimates, the ardl method has more relaxed requirements for the stationarity of variables, allowing for mixed stationarity between variables (Androniceanu et al., 2023). In addition, the ARDL method performs well in small sample situations and eliminates autocorrelation issues (Adebayo et al., 2021), making it suitable for the available data scale in this study.

Research by Pesaran, Shin, and Smith (Guan et al., 2015), as well as Shin and Pesaran (Tian et al., 2017), revealed the ARDL model's expression to be as follows:

$$\Delta \mathrm{lnstp}_t = \beta_0 + \sum_{i=1}^{k} \beta_{1i}\, \Delta \mathrm{lnstp}_{t-i} + \sum_{i=1}^{k} \beta_{2i}\, \Delta \mathrm{lnexr}_{\text{t-i}} + \sum_{i=1}^{k} \beta_{3i}\, \Delta \mathrm{lngz}_{t-i} + \delta_1 \mathrm{lnstp}_{\text{t-1}} + \delta_2 \mathrm{lnexr}_{\text{t-1}} + \delta_3 \mathrm{lngz}_{\text{t-1}} + \varepsilon_t \quad (1)$$

This examination includes an F-test to verify the enduring interconnection among the variables, assessing the combined importance of lagged variable coefficients. The theory asserting the absence of a prolonged balance among the variables is termed the null hypothesis. Based on equation (1), we use Pesaran et al.'s (2001) F-statistic boundary cointegration null hypothesis as follows:

$$H_{F0}: \beta_1 = \beta_2 = \beta_3 = 0.$$

Should the F-test value surpass the upper critical limit (UCB), the null hypothesis gets discarded, leading to the co-integration of the variable under study. This criterion dictates whether to dismiss or retain the null hypothesis. Dismissing the null hypothesis becomes redundant, since the F-value is smaller than the lower value (LCB). We consider the hypothesis:

$$H_{F1}: \delta_1 \neq 0, \text{ or } H_{F1}: \delta_2 \neq 0, \text{ or } H_{F1}: \delta_3 \neq 0.$$

The short-run dynamics coefficient of the variables is denoted by β_1, β_2, and β_3, the error factor by ε_t, and the coefficient indicative of the long-run relationship is symbolized by δ_1, δ_2, and δ_3. Δ represents differential operation. For evaluating the prolonged interplay among variables, the ARDL model proves superior to the conventional co-integration test and is applicable to both I(0) and I(1) unit root processes with identical order.

The error correction model (ECM) serves to characterize short-run correlations:

$$\Delta \text{lnstp}_t = \beta_0 + \sum_{i=1}^{p} \beta_i \Delta\, lnstp_{t-i} + \sum_{i=1}^{p} \delta_i \Delta\, lnexr_{t-i} + \sum_{i=1}^{p} \lambda_i \Delta\, lngz_{t-i} + \alpha_1 ECM_{t-1} + \varepsilon_t \quad (2)$$

The α_1 represents the ECM_{t-1} term's coefficient (adjustment amplitude), while the ECM_{t-1} term's statistical significance lies in the primary difference element of residual in the initial sequence regression model. The significance of ECM_{t-1} indicates the speed of adjustment of the model to move back into the long-run relationship or equilibrium[1].

RESULTS AND DISCUSSION

The main finding of the study is that interest rates are positive in the short run, but there is a lag effect during COVID-19. The impact of exchange rates on the stock market is much greater than that of interest rates, especially during the COVID-19 pandemic. During Covid-19, the speed of correction of the impact of interest rates and exchange rates on stock prices is about 2.5 times that of pre-Covid-19 periods.

The amount of stationarity of the variables is examined using the Phillips-Perron and Augmented Dickey-Fuller methods. As shown in Appendix 1, the variables display mixed levels of stationarity, with the Shanghai stock market price and exchange rate stationary at I(1). Meanwhile, the interest rate remains stable at I(0). This supports the use of the ARDL model between the variables. Every variable from the Covid-19 era disproves the null hypothesis at the level-order difference; all are classified as I(1), which differs from pre-Covid-19.

Selecting an appropriate lag length is necessary before running the ARDL bound test. Furthermore, care should be taken when choosing a lag length because using the wrong one can produce biased results. The AIC, Akaike Information Criterion, looks for both models with the fewest free parameters that still interpret data the best. Appendix 2 shows that Vector Auto-regression Estimates were used to determine the best order

[1] To test the validity of the analyses, this paper includes the serial correlation, heteroskedasticity, normality and stability of the models.

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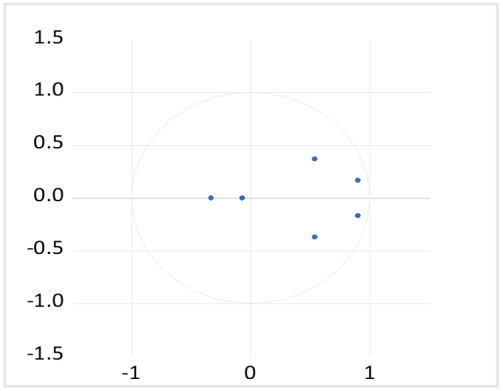
of lag for the ARDL model, and all information criteria show that the first-order lag is the optimal order and is supported by the results of the polynomial graph (Figures 5 and 6). In this investigation, the AIC is primarily considered.

Figure 5: AR polynomial test of VAR



6. AR polynomial test of VAR

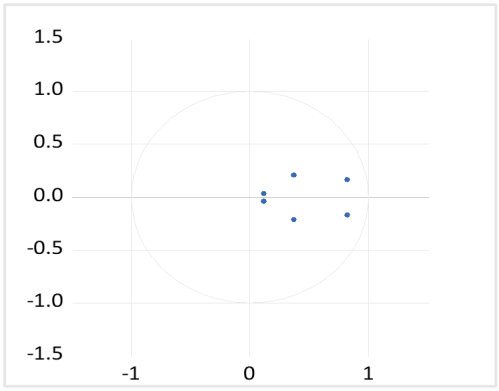


Table 2. Joint long run relationship

Statistic of Test	Value	Level	Critical Values(Pre Covid)		Critical Values(Covid)	
			(0)	(1)	(0)	(1)
Pre- Covid-19 Model		10%	2.63	3.35	2.63	3.35
F-Statistics	2.460254	5%	3.1	3.87	3.1	3.87
Covid-19 Model		2.5%	3.55	4.38	3.55	4.38
F-Statistics	2.676823*	1%	4.13	5	4.13	5

* 10% significance, ** 5% significance, *** 1% significance

The ARDL bound tests indicate that the F-statistic stands at 2.460254, equating to or falling short of the critical I(1) or I(0) value threshold of 10%. The null hypothesis of a lack of level relationship among the variables remains accepted in conjunction with the K-statistic. Consequently, this implies the absence of prolonged co-integration links among the variables before the pandemic. In Covid-19, bound test indicates that a 10% F-statistic value of 2.676823 exceeds the threshold set by the critical value I(0). Therefore, we infer that the Covid-19 scenario involves long-run co-integration connections.

Table 3. Individual Long Run Relationship

DV: Stock Market Price (Pre Covid-19)				DV: Stock Market Price (Covid-19)		
IV	coefficient	t-value	Pro.b	coefficient	t-value	Pro.b
Lnexr	-3.181886	-1.504028	0.1427	-1.19635***	-3.722712	0.0007
Lngz	-1.346162	-1.118639	0.2719	0.257649	1.244592	0.2220
C	15.74850***	2.947038	0.0060	10.09257***	14.06001	0.0000

*** 1% significance

Table 3 findings indicate a lack of significant for the individual impact of the selected variables on the stock market in the long run before Covid-19, even though the coefficients of the interest rate are negative. In Covid-19, the trend of the exchange rate is reverse to that of the stock market. Throughout a prolonged duration, a 1% increase in the exchange rate results in stock value being impacted and reduced by 1.196%. Yet, throughout Covid-19, there was still a lack of significance in the interest rate, despite a positive interest rate coefficient.

The data in table 4 reveal that the model demonstrates an average fitting effect, with D(Lnexr) and D(Lngz) being significant at the 5% levels, The elastic coefficient of D(Lngz) for D(Lnstp) is 0.4325, and the elastic coefficient of D(Lnexr) for D(Lnstp) is 0.92776. Respectively, R^2 value of 0.40225, the P-value for the F-statistic stands at 0.0173, meeting the significance threshold of 0.05, signifying the model's overall significance.

In this case, the error correction component of the standard ECM model is labeled as ECM(-1). The ECM(-1) P-value holds statistical significance at a 5% level. The ECM(-1) has a coefficient of -0.246029, suggesting the model's swift return to equilibrium at a pace of -0.246029. However, the findings from interest rate studies appear to be quite prevalent in instances within China (Hu et al., 2020; Wang & Li, 2020; Fang et al., 2016). To address this, further elaboration will be provided in the discussion segment.

Table 4. Short run Relationship ECM model

ECM Model DV: D(LNSTP)				
Variables	**coefficient**	**S. E**	**t-value**	**Pro.b**
ECM (-1)	-0.246029**	0.097225	-2.530499	0.0173
D(Lnstp (-1))	0.020154	0.170967	0.117884	0.9070
D(Lngz)	0.432516**	0.188401	2.295718	0.0294
D(Lnexr)	-0.927759**	0.439064	-2.113037	0.0436
D(Lnexr (-1))	-0.428404	0.493309	-0.868429	0.3925
D(Lnexr (-2))	-0.640549	0.418704	-1.529836	0.1373
C	-0.002093	0.005969	-0.350665	0.7285
R^2	0.402253	Prob. F	0.017561	
Adjusted R^2	0.274165			

* 10% significance, ** 5% significance

Table 5 presents the ECM estimation results for the Covid-19 period. The R2 and adjusted R2 are both higher than the pre-COVID-19 model. At the significance level of 1%, the P-value by ECM(-1) is statistically significant. The model will rapidly converge back to equilibrium at a rate of -0.583994, which is nearly 2.5 times faster than pre-COVID-19 convergence, according to the coefficient of the ECM(-1).

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Table 5. Short run Relationship ECM model (Covid-19 period)

ECM Model DV: D(LNSTP)				
Variables	**coefficient**	**S. E**	**t-value**	**Pro.b**
ECM (-1)	-0.583994***	0.174748	-3.341922	0.0024
D(Lnstp (-1))	0.132674	0.179712	0.738256	0.4667
D(Lnexr)	-1.313890***	0.391492	-3.356111	0.0024
D(Lnexr (-1))	0.161483	0.525583	0.307246	0.7610
D(Lnexr (-2))	0.681786	0.437478	1.558448	0.1308
D(Lngz)	0.145517	0.154878	0.939559	0.3558
D(Lngz (-1))	-0.029043	0.144756	-0.200631	0.8425
D(Lngz (-2))	0.319061**	0.150941	2.113810	0.0439
C	0.004457	0.005405	0.824612	0.4168
R^2	0.601448	Prob. F	0.000625	
Adjusted R^2	0.483359			

** 5% significance, *** 1% significance

However, in the Covid-19 period, the D(Lnexr) show significant coefficients as usual. However, the interest rate showed a significant positive lag, with an elasticity coefficient of 0.32 with stock market D(Lnstp) and an elasticity coefficient of 1.314 with the exchange rate D(Lnexr), which had a much greater impact than the interest rate. Both coefficients of influence are greater than the pre-COVID-19 period and the exchange rate, but the current elasticity of interest rates D(Lngz) did not show significance in the COVID-19 period.

Table 6. Serial Correlation, Heteroskedasticity, and Normality Tests

(Pre Covid-19 Model)	Statistic	Prob.	(Covid-19 Model)	Statistic	Prob.
BG - LM Test 1 lag	0.01423	0.9059	BG - LM Test 1 lag	1.35E-05	0.9971
BG - LM Test 2 lag	0.00693	0.9931	BG - LM Test 2 lag	0.25273	0.7786
Heteroskedasticity Test	0.00247	0.9609	Heteroskedasticity Test	1.212324	0.3292
Normality Test	1.03691	0.5963	Normality Test	0.847141	0.6547

Furthermore, we tested models 1 and 2 using a variety of diagnostic testing techniques. Table 6 provides more information about the compatibility of the ARDL-ECM regression model for two statistically significant models. Furthermore, the verification methods for the stability tests of CUSUM and CUSUMSQ are provided. The results were presented in Figures 7 and 8 and Figures 9 and 10.

Figure 7 and 8. Model 1 CUSUM and CUSUMSQ

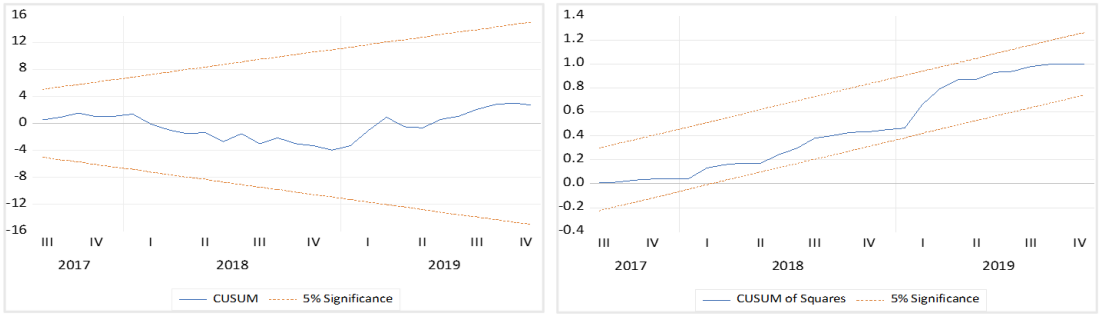
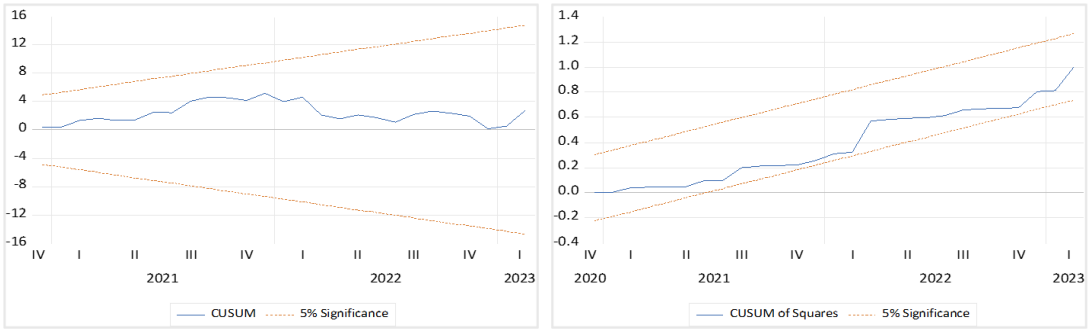


Figure 9 and 10. Model 2 CUSUM and CUSUMSQ



Throughout the results, we found a puzzling phenomenon: whether during COVID-19 or before COVID-19, the significant impact of interest rates seems to be positive. Compared with theoretical predictions and empirical results in developed markets, the situation is precisely the opposite, and this observation seems to have become a characteristic of financial markets in developing countries (Wang & Li, 2020; Assefa et al., 2017; Hu et al., 2020; Ikhsan et al., 2022; Sajor et al., 2023). The central bank's interest rate hike (rate cut) has a positive (negative) impact on the Chinese stock market (Fang et al., 2016; Hu et al., 2020). This phenomenon may be because when central banks raise interest rates, their targets are often driven by strong economic growth and rising inflation. However, in the context of strong economic growth, this also means an increase in corporate profits and leads to increased investor enthusiasm for stocks, thereby driving up the stock market. Therefore, this also leads to a positive impact of interest rates on stocks in the short term.

Furthermore, when the market is prosperous, deviations from expected returns and risk perception can affect investors' judgments. Compared with the adjustment of interest rate hikes, the expected increase in stock prices brought about by the expected returns of listed companies cannot reduce investors' enthusiasm for buying stocks. At the same time, in this situation, professional traders or institutions may push up stock prices, attracting individual investors to buy stocks, and the prosperity of the market will have an irrational impact on investors. Similarly, when the market is depressed, such as during COVID-19, the action or policy of lowering interest rates will further reduce investors' expectations of future market development and future earnings of listed

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companies, leading to this strange phenomenon. Some argue that the phenomenon leading to differences in empirical evidence may be attributed to different proxies of interest rates chosen by researchers (Endres, 2020; Sajor et al., 2023).

However, during COVID-19, short-term fluctuations in interest rates had a lagged impact on stock prices by two periods, which was not the case during regular times. This discovery reflects the fact that during a pandemic, stock prices exhibit a very insensitive dynamic to current changes in interest rates (Cox et al., 2020). This result is similar to that of an investigation conducted in the early period of the COVID-19 pandemic (Gao et al., 2022). They believe that during the COVID-19 epidemic, the stock market is not sensitive to changes in domestic interest rate policies. The impact of interest rate policies on stock market volatility mainly exists in the short and medium term rather than the long run, which provides more favorable support for our Covid-19 model results. In the long run, neither of our two models has evidence to suggest that interest rates have a significant impact on stock prices, which is also different from the results observed in other markets (Musawa & Mwaanga, 2017; Qing & Kusairi, 2019; El ABED and Zardoub, 2019; Sia et al., 2025).

Finally, the results of the first and second models we studied both support the views of Gong and Dai (2017), Lee et al. (2021), and Tabash et al. (2022) that an increase in RMB/USD (RMB depreciation) will have a significant short-term negative impact on the stock market, especially during pandemics. The relationship seems to have been strengthened (Nwosa, 2021; Rai & Garg, 2022; Alimi & Adediran, 2023; Goh & Henry, 2024), and exchange rate fluctuations have a more pronounced impact on the stock market than interest rates. The exchange rates have a significant impact on stock prices, depending on whether the company is a multinational corporation. Variations in currency exchange rates influence the share values of global trading firms, as fluctuations in exchange rates alter the worth of the company's foreign operations. Besides that, under a floating exchange rate system, the stock market responds positively. According to a survey by the Chinese Ministry of Commerce, 2276 companies in the Chinese stock market disclosed their overseas business transactions with a total revenue of 667.31 billion yuan. During this period, the total number of listed companies in the stock market was 3760, accounting for over 60%. The rise in exchange rates may lead to a decrease in the competitiveness of domestic products internationally, which will lower the prices of company stocks.

Therefore, this is also why exchange rate fluctuations in the Chinese market have a more sensitive impact on the stock market than interest rates. However, in normal times, this long-term relationship does not seem significant (E'zazi & Sadegh, 2015; Türsoy, 2017). The standard norm theory in economics holds that exchange rates can affect a country's import and export, international trade balance, and subsequently impact corporate investment and national economy, which in turn affects stock prices in the capital market. For example, an increase in the local currency exchange rate may lead to a decrease in the competitiveness of domestic products internationally, which may lower the price of a company's stock. Transnational trading companies faced two challenges during the Covid-19

pandemic: on the one hand, they must deal with the situation of production reduction due to layoffs or internal stagnation; on the other hand, in order to meet the requirements of governments on import and export safety regulations, they must deal with the risks caused by additional import and export processes and health inspections.

During the Covid-19 period, the volatility of global trade (not to mention China, a major trading country) may have a greater impact on the stock market than the fluctuation of the exchange rate. The increase in R2 further indicates that exchange rate fluctuations have had a greater impact on import and export business as well as investors' expectations throughout the entire pandemic period. During the crisis period of the pandemic, China's long-term blockade policy resulted in insufficient demand in the overall internal market, while the loose monetary policy of the central bank increased the competitiveness of exported products overseas by devaluing the local currency to ensure export trade, thereby driving up the stock prices of enterprises. It is worth noting that in the short-term model, we also found that the ECM model reported a faster correction speed during the COVID-19 period. This result indicates that during the pandemic, the stock market has shown greater sensitivity in the short term and increased concerns about future uncertainty than before (Liu et al., 2020; Baker et al., 2020; Chowdhury et al., 2022).

CONCLUSION

Based on the comparison of the differences in the impact of exchange rate and interest rate on stock prices before and after COVID-19, this study uses the ARDL-ECM method to find that in the normal period, exchange rate and interest rate are not cointegrated with the stock market. However, during the pandemic, the joint cointegration relationship exists. Whether during Covid-19 or before Covid-19, the significant impact of interest rates is positive in the short run without a long-run impact. Thirdly, the stock market's response to short-term interest rate fluctuations has become very insensitive during the pandemic. Whether during normal or pandemic periods, the impact of exchange rate fluctuations on the stock market has shown greater elasticity in the short term than interest rates. In addition, the elasticity of exchange rates relative to the stock market has shown long-run significance during the pandemic, while this situation is not significant during normal periods. Finally, the short-run dynamics will converge to a long-run equilibrium state at a faster rate during the pandemic.

For macroeconomic policymakers (government, central bank) who need to intervene in the stock market or stabilize prices, priority should be given to monetary policy regulatory measures (such as open market operations, reserve requirement adjustments, and exchange rate intervention window guidance) rather than overly relying on fiscal stimulus (such as large-scale government spending or tax cuts). Monetary policy is more flexible and targeted, able to respond more quickly to market changes, while significant exchange rate fluctuations should be viewed as key macroprudential signals. When adjusting interest rates, the primary goal is to maintain the stability and predictability of interest rate policies, ensuring the smooth operation of the credit market (especially

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corporate loans) and domestic investment activities, while focusing on maintaining a stable interest rate environment to safeguard credit to the real economy and create a predictable market environment.

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Appendix 1. Unit root test

	Pre Covid-19 period				Covid-19 period			
	ADF		P-P		ADF		P-P	
Variables	Trend Intercept	None	Trend Intercept	None	Trend Intercept	None	Trend Intercept	None
lnstp	-2.02410	-0.31838	-2.08792	-0.32445	-1.83254	0.24892	-1.87153	-0.28171
lnexr	-1.99483	0.38525	-1.64591	0.30496	-1.46726	0.07719	-1.19223	-0.06691
lngz	-3.35818*	4.55462	-3.69018**	0.41285	-1.97025	-0.47211	-2.27492	-0.47211
Δlnstp	-5.93647***	-6.07929***	-5.93647***	-6.07811***	-6.02884***	-6.12433***	-6.39159***	-6.17015***
Δlnexr	-4.56539***	-4.54844***	-4.56261***	-4.53271***	-4.44435***	-4.17574***	-3.48300*	-3.67554***
Δlngz	-6.43073***	-5.97232***	-6.44080***	-5.98095***	-5.50761***	-5.65899***	-5.50991***	-5.65617***

*** 1% significance

Appendix 2. Information criteria test

Lag	LogL	LR	FPE	AIC	SC	HQ
Pre- Covid-19 Model						
0	156.0665	NA	1.88e-08	-9.276755	-9.140709	-9.230980
1	229.7499	129.5042*	3.74e-10*	-13.19696*	-12.65278*	-13.01386*
2	237.2811	11.86737	4.15e-10	-13.10795	-12.15562	-12.78752
3	244.1714	9.604692	4.91e-10	-12.98009	-11.61963	-12.52233
4	252.5465	10.15156	5.50e-10	-12.94221	-11.17361	-12.34713
Covid-19 Model						
0	176.3930	NA	7.46e-09	-10.19959	-10.06491	-10.15366
1	239.9190	112.1047*	3.03e-10*	-13.40700*	-12.86829*	-13.22328*
2	246.6961	10.76365	3.50e-10	-13.27624	12.33349	-12.95474
3	251.9635	7.436261	4.52e-10	-13.05667	-11.70989	-12.59738
4	255.9239	4.892237	6.52e-10	-12.76023	-11.00940	-12.16315

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