The Impact of Informationization Construction on Stock Price Synchronicity: Empirical Evidence from the "Pilot Zones of Integration of Information and Industrialization"[1, a]

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Abstract. Within the context of the rapid advancement of information technology, this study examines the effects of information construction in the "Pilot Zones of Integration of Information and Industrialization" on the synchronicity of stock prices. The research findings indicate that the development of information has a significant reducing effect on stock price synchronicity. This conclusion still holds after undergoing a series of robustness tests. Furthermore, the impact is more evident in enterprises with dual roles and in areas with lower levels of legal governance. Additional analysis suggests that information construction mitigates stock price synchronicity by improving corporate governance and ensuring the prompt and accurate representation of company-specific information. In conclusion, this research offers insights for policymakers regarding the promotion of informationization, the optimization of corporate governance frameworks, and the enhancement of capital market efficiency. It advocates for the strengthening of legal protections and oversight mechanisms to guarantee that informationization can effectively elevate corporate governance standards and market transparency.

Keywords: information construction, integration of information and industrialization, stock price synchronicity, corporate governance.

1. Introduction

Currently, information technology is advancing rapidly, and the Central Committee of the Party has elevated the concepts of "big data development" and "Internet Plus" to the level of national strategy. With the widespread dissemination and application of the Internet and social networks, the emerging digital information technology has nearly reshaped the infrastructure of Chinese enterprises, penetrating into all aspects of business management such as finance, human resources, production management, marketing, etc., with far-reaching impacts on the operational efficiency, compliance, profitability and development prospects of enterprises. Against this backdrop, the "Pilot Zones of Integration of Information and Industrialization", as a core concept put forward in 2008, despite its emphasis on the two-way interaction between informatization and industrialization, has become the main goal of improving enterprise informatization in the actual construction plan of the pilot zone, with the "Integration of Information and Industrialization" actually focusing more on industrial informatization[39]. Therefore, the study of the economic benefits of informatization construction in the context of the "Pilot Zones of Integration of Information and Industrialization" is not only related to the transformation and upgrading of enterprises themselves, but also to the modernization of the entire national industrial economy, and has far-reaching significance for the promotion of high-quality economic development. Based on the previous research, this paper explores the impact of informatization construction on stock price synchronization in the macro policy context of "Pilot Zones of Integration of Information and Industrialization".

Theoretically, information construction has a dampening effect on stock price synchronization in our market. The information efficiency hypothesis suggests that stock price synchronization is a reflection of the information efficiency of the market, and that in a market with high information efficiency, information about the characteristics of a company can be quickly and accurately reflected in the stock price[2]. Informatization on the one hand improves corporate governance through digital means to enhance internal information transparency and circulation efficiency, which in turn

improves information efficiency and enhances corporate governance[19]; on the other hand, it can strengthen internal control and risk management, as well as promote the exchange of information with external stakeholders, thus enhancing the level of corporate governance. Good corporate governance ensures timely and accurate reflection of idiosyncratic information, reduces information manipulation, attracts analysts' attention and improves stock liquidity, thereby reducing stock price synchronization.

In order to explore the actual impact of informationization construction on stock price synchronization, it is necessary to further test it through empirical analysis. Accordingly, this paper takes the data of China's A-share listed companies from 2003 to 2018 as the research object, and with the quasi-natural experiment of "Pilot Zones of Integration of Information and Industrialization", uses the time-varying difference in differences model to explore the differences in stock price synchronization between the enterprises in the pilot city and the enterprises in the non-pilot city, as well as the differences between the pilot city and the pilot city before and after the pilot. It is found that informationization can inhibit stock price synchronization to a certain extent, and this effect remains robust after using a series of tests such as the parallel trend test, changing explanatory variable measures, propensity score matching, and the placebo test. Further analysis shows that the inhibitory effect of informatization on stock price synchronicity is more significant in the sample of firms with two jobs and that the effect is more inhibitory in firms with regional rule of law levels. Finally, through the mechanism analysis, it is proved that informatization construction can inhibit stock price synchronization by enhancing corporate governance capacity. The above results are consistent with the previous statement that informatization construction reduces stock price synchronicity by improving corporate governance capacity, ensuring timely and accurate reflection of idiosyncratic information, reducing information manipulation, attracting analysts' attention and increasing stock liquidity under the information efficiency hypothesis.

Compared with previous literature, the potential contributions of this paper are: first, it expands the research on the policy effects of informatization construction. Existing studies have focused on the impact of informatization construction on corporate innovation and industry heterogeneity[6], the financial shared management model[16], as well as the mechanisms of easing corporate tax burden by reducing the degree of information asymmetry and regulating the efficiency of pricing in the capital market, etc., with a Focusing on the role played by enterprises from the perspective of spontaneous competition under the market game, but the regulation of macro policy on enterprise operation has not been sufficiently studied. Therefore, on this basis, this paper explores the policy effect of informationization construction on China's market under the quasi-natural experiment of "Pilot Zones of Integration of Information and Industrialization". Second, it expands the research field of the impact of informationization construction on stock price synchronization. Most of the existing literature focuses on the impact of securities analysts, information transparency, and market efficiency on stock price synchronization. Unlike previous studies, this paper examines the impact of informationization on stock price synchronization from the perspective of a quasi-natural experiment in "Pilot Zones of Integration of Information and Industrialization", expanding the understanding of informationization and stock price synchronization. Third, it has certain practical significance for policy making and enterprise management.

The main contents of this paper are organized as follows: the second part is the literature review, the third part is the institutional background, theoretical mechanisms and research hypotheses, the fourth part is the research design, the fifth part is the main empirical analysis and robustness test, the sixth part is the heterogeneity analysis and mechanism analysis, and the seventh part is the conclusion.

2. Literature review

Literature on factors affecting stock price synchronization. Stock price synchronization refers to the correlation between the fluctuation of the firm's own stock price and the overall movement of the capital market. If this indicator is too high, it will seriously affect the operational efficiency and

stability of the capital market. Some scholars have argued that differences in stock price synchronization are closely related to information transparency[1], and that in the absence of market information transparency, external investors are more inclined to value firms with reference to average market returns, which in turn improves stock price synchronization[15]. Based on this path, the impact of information disclosure on stock price synchronization has become a research focus of scholars at home and abroad. Mechanistic analysis and empirical studies have shown that information disclosure helps to alleviate corporate information asymmetry, improve innovation, and increase the attention of self-media and analysts[17], which in turn reduces stock price Synchronization.

In the direction of corporate fundamentals, institutional investors are able to discover more corporate idiosyncratic information through optimized information collation pathways and rigorous investment reasoning, thus enhancing internal governance, strengthening the quality of corporate information disclosure, and further reducing stock price synchronicity[7]. Some scholars adopt surplus smoothing as an assessment index of accounting information quality, and empirical research results show that stable institutional investors help to increase the degree of surplus smoothing of corporate information attributes, while suppressing the phenomenon of surplus smoothing of opportunistic attributes, and increasing the anti-takeover constraint behavior of firms[9], which reduces stock price synchronicity in the capital market[14]. However, some recent literature has similarly pointed out that due to the relatively low manipulation cost of qualitative information, management may exist to manipulate qualitative information to satisfy their own interests[12]. This behavior may negatively affect the investment efficiency, financing decisions and performance of listed companies, which in turn has a significant positive effect on stock price synchronization[13].

For other external governance factors, numerous scholars have explored the path of the degree of information mining by analysts, news media, and other media on stock price synchronization from an information mediation perspective. The study found that analysts have the ability to mine and interpret information. In particular, with the increase of star analysts, female analysts, and analyst fieldwork[3], the portion of the stock price that can be explained by firm idiosyncratic information increases subsequently, when stock price synchronization is enhanced. At the same time, the stronger the analyst's ability, the stock price synchronization decreases accordingly[17]. In addition, news media and self-media, under the guidance of the regulatory layer, actively fulfill their information disclosure obligations, which helps to regulate the disclosure of information in the market order and guide investors to rationally view the market fluctuations, thus reducing the stock price synchronicity[18].

Literature on informationization and "Integration of Information and Industrialization". In recent years, as the construction of informatization has been deeply promoted in China, more and more studies have focused on its impact on enterprise operation. Early scholars focused on analyzing the evolution of the internal control level of enterprise operation strategy, investment strategy, performance evaluation index system, etc. in the informationization environment from the perspective of organizational structure integration[19]. Scholars subsequently expanded their research at the macro-operational level, with part of the study dedicated to exploring the role of informatization construction in urban carbon emission reduction and enterprise innovation[4]; the other part of the study focused on analyzing the impact of the regional informatization system on the market-oriented operation of enterprises, with an emphasis on the national e-commerce demonstration cities, Cross-border E-commerce Comprehensive Pilot Zone, inclusive financial system[8] and other perspectives to measure the effect of informatization construction.

In summary, the previous studies discussed in detail the various influencing factors of stock price synchronization and the market mechanism of informationization construction, but there is little relevant literature describing the relationship between the two; in addition, there is no clear research conclusion on the policy and regulatory effects of the quasi-natural experiment of "Integration of Information and Industrialization" on China's securities market, further empirical analyses and studies have yet to be conducted, and further empirical analysis and research are still needed. Therefore, this paper attempts to fill this research gap from the impact path of informationization construction on

stock price synchronization under the background of "Integration of Information and Industrialization", with a view to providing useful references for the regulatory policies of China's securities market.

3. Institutional background, theoretical mechanisms and research hypotheses

Institutional context. With the integration of the global economy and the rapid development of information technology, the Government of China has in recent years attached great importance to the promotion of informatization and made it a key path to the realization of a new road to industrialization. The 16th Congress of the Party put forward the slogan of "driving industrialization by informationization and promoting informationization by industrialization". On this basis, the 17th National Congress of the CPC put forward for the first time the new concepts of "fusion of informatization and industrialization" and "informatization and industrialization, urbanization, marketization and internationalization", which profoundly grasps the mutual promotion of informatization and industrialization, This new idea profoundly grasps the internal logic that informatization and industrialization promote each other and are closely related.

In 2008, China's State Council restructured its institutions and established the Ministry of Industry and Information Technology (MIIT), with the aim of accelerating the process of integrating information technology with industrialization and thus promoting the construction of a new path of industrialization. In October of the same year, the government implemented a pilot policy of "Pilot Zones of Integration of Information and Industrialization". In March 2009, the Ministry of Industry and Information Technology (MIIT) held the "Work Training Conference of Pilot Zones of Integration of Information and Industrialization" in Beijing, and identified the first batch of national pilot zones for the integration of information technology and industrialization, which included Shanghai Municipality, Chongqing Municipality, Pearl River Delta (PRD) Region, Hubao and Eqiu Regions, Guangzhou Municipality, Nanjing Municipality, Qingdao Municipality, and Tangshan and Caofeidian Regions. Subsequently, in 2011, the second batch of eight national-level pilot zones for the integration of informationization and industrialization was also approved and began to actively carry out related work.

The development of new-generation information technology has provided technical support for the integration of informationization and industrialization, enabling the manufacturing industry to achieve more efficient production management and more accurate market response. With the implementation of the "13th Five-Year Plan", the work of "Pilot Zones of Integration of Information and Industrialization" further deepened, not only in the field of manufacturing, but also in the energy, green manufacturing, safety production and other industry sectors to promote the digital transformation. 2020 Government Work Report clearly put forward to promote the transformation and upgrading of the manufacturing industry and the development of new industries as a key task, which focuses on the development of industrial Internet and intelligent manufacturing. which focuses on the development of industrial Internet and intelligent manufacturing. At the same time, the report emphasizes the comprehensive and in-depth promotion of the "Internet Plus" strategy to shape new competitive advantages in the digital economy. During the "14th Five-Year Plan" period, the focus of "Pilot Zones of Integration of Information and Industrialization" has shifted to deepening application, accelerating innovation, leading change, and promoting the high-quality development of the manufacturing industry with digital transformation as the core.

Theoretical mechanisms and research hypotheses. The relationship between informationization and stock price synchronicity in the context of "Pilot Zones of Integration of Information and Industrialization" can be explored from the perspective of the information efficiency hypothesis. According to the information efficiency hypothesis, stock price synchronization reflects the information efficiency of the market. In a market with high information efficiency, information about the characteristics of a company can be reflected in the stock price quickly and accurately[2]. In contrast, information technology helps firms to improve their corporate governance capabilities with

the help of digitalization and other means, which in turn improves information efficiency and reduces stock price synchronicity.

In the context of the integration of the two, the impact of enterprise informatization construction on corporate governance is mainly manifested in the following aspects: first of all, informatization construction helps to improve the transparency and circulation efficiency of the company's internal information. By constructing and improving the information system, enterprises can collect, process and transmit internal operation data more efficiently, so that the management can obtain key business information in time and then make more accurate strategic decisions. Secondly, informatization can strengthen internal control and risk management. With the help of digital auditing and monitoring systems, enterprises can better identify and prevent potential financial risks and reduce information asymmetry problems, thus enhancing corporate governance. In addition, informatization also helps to facilitate information exchange between firms and external stakeholders, such as investors and regulators. By providing richer and more timely information, it enhances the effectiveness of external supervision and further optimizes the corporate governance structure[17].

The mechanism by which corporate governance affects stock price synchronization is then reflected in the improvement of information efficiency. Good corporate governance ensures that information about corporate traits is reflected in stock prices in a timely and accurate manner, thereby reducing stock price synchronization. With a sound corporate governance structure, management is more inclined to disclose true and complete information, which reduces the possibility of information manipulation and enables investors to make investment decisions based on the real situation of the company. In this way, a company's share price better reflects its intrinsic value and reduces the phenomenon of market participants trading based on common information (e.g., macroeconomic factors) rather than firm-specific information, thereby reducing share price synchronization. In addition, good corporate governance can attract more analyst attention and research, improve stock liquidity, further promote the information content of stock prices, and reduce stock price synchronicity.

Based on the above theoretical analysis, this paper presents the hypothesis:

Hypothesis H1: If stock price synchronization is consistent with the information efficiency hypothesis, then informationization construction in the context of "Pilot Zones of Integration of Information and Industrialization" is significantly and negatively related to stock price synchronization.

4. Research design

Empirical design. The core research question of this paper is the impact of informationization construction on stock price synchronization. Referring to the studies of scholars Yi Zhihong et al. (2019) and Li Junjie et al. (2023)[17, 9], this paper adopts the multi-period DID method for estimation and sets up the following regression model because the "Pilot Zones of Integration of Information and Industrialization" are set up in two batches:

$$Synch_{i,t} = \alpha + \beta Treat_i + \gamma IC_{i,t} + \delta' Control_{i,t} + IndustryFE + YearFE + \varepsilon_{i,t} \quad (1)$$

where $Synch_{i,t}$ is the explanatory variable, i.e., the stock price synchronization indicator. In the field of stock price synchronicity indicators, the vast majority of the literature refers to the methodology adopted by Morck et al. (2000)[2], which is based on a simplified capital asset pricing model that divides stock returns into components that are explained by a combination of market-level factors and firm-specific factors; the stock price is calculated by calculating the extent to which the market factors explain the movement of the stock price, i.e., by using a regression model's goodness-of-fit to compute stock price synchronicity. Based on the above theories, domestic scholars generally adopt the regression fitting of firm returns to market returns to measure stock price synchronization. Drawing on Zhu Hongjun et al. (2007)[20], equation (2) is used to obtain the fitting coefficients R^2. Due to the fact that the range of values $R_{i,t}^2$ is $(0,1)$, and the degree of differentiation between

different stocks is not high, so equation (3) is used for logarithmization to calculate the value of stock price synchronicity. Where $r_{i,d}$, and $r_{m,d}$ represent the yield of firm i at date d considering reinvestment of cash dividends and the weighted average yield of the market capitalization of all firms outstanding, respectively.

$$r_{i,d} = \alpha + \beta r_{m,d} + \varepsilon_{i,d} \tag{2}$$

$$Synch_{i,t} = ln(\frac{R_{i,t}^2}{1-R_{i,t}^2}) \tag{3}$$

$IC_{i,t}$ is the core explanatory variable, indicating that IC is the interaction term for Treat and $Post$, where $Treat$ is a dummy variable for "Pilot Zones of Integration of Information and Industrialization", if the area belongs to the pilot area, it is 1 and 0 otherwise; $Post$ is a dummy variable for policy implementation time, if the time is greater than or equal to the time of policy implementation in the pilot area, it is 1 and 0 otherwise. This paper focuses on the estimated regression coefficients β: if this estimate is significantly negative, then informatization construction in the context of "two-chemistry integration" has an inhibitory effect on the synchronicity of stock prices, thus verifying Hypothesis H1.

$Control_{i,t}$ are control variables at the regional level, including asset size (*Size*), gearing ratio (*Lev*), revenue growth rate (*Growth*), return on total assets (*ROA*), board size (*Board*), annual turnover rate (*Turnover*), age of the firm (*Age*), executive shareholding (*Executives*), audit opinion (*Audit*), annual report time lag (*Timelag*).$\varepsilon_{i,t}$ represents the residual term, and in addition the model controls for industry and year effects; to control for potential cross-section-related problems, the paper performs standard error clustering of firm dimensions in all regressions. See Table 1 for detailed definitions.

Table 1 Summary of variable definitions and descriptions

Variable type	variable name	notation	Variable Meaning
explanatory variable	stock price synchronization	*Synch*	See model for measurement methodology
core explanatory variables	"Pilot Zones of Integration of Information and Industrialization" policy	*IC*	Policy indicator, taking the value of 1 when the region where the sample enterprise is located has been included in the pilot zone, otherwise taking the value of 0
control variable	asset size	*Size*	Asset size, total assets are taken as the natural logarithm
	gearing ratio	*Lev*	Gearing ratio, total liabilities divided by total assets
	revenue growth rate	*Growth*	Ratio of current to prior year's operating income
	return on total assets	*ROA*	Net profit divided by total assets
	board size	*Board*	The total number of board members is taken as a natural logarithm
	annual turnover rate	*Turnover*	Ratio of turnover to outstanding share capital for the year
	age of the firm	*Age*	ln(current natural year - year of incorporation + 1)
	executive shareholding	*Executives*	Executives' shareholding as a percentage of total share capital
	audit opinion	*Audit*	1 if "standard unqualified opinion", 0 otherwise
	annual report time lag	*Timelag*	Number of days between the disclosure date of the annual report and the closing date of the previous fiscal year

Data sources. In order to ensure sufficient year-to-year control before and after the pilot policy of "Pilot Zones of Integration of Information and Industrialization", this paper selects the data of China's A-share listed companies in Shanghai and Shenzhen from 2003 to 2018 as the research sample, and treats the data as follows: (i) ST and *ST companies are excluded, so as to avoid the special impact of abnormal financial conditions on the synchronization of the stock price; (ii) missing or abnormal data fields are excluded; (iii) in order to eliminate the impact of extreme values on the research results, the stock price synchronization variables and control variables are Winsorized at 1% and 99%. Finally, 25714 firm-year observations are obtained. The company financial data and stock price data required for this paper are obtained from Wind and CSMAR databases, and the data on the pilot policy of "Pilot Zones of Integration of Information and Industrialization" are obtained from the website of the Ministry of Industry and Information Technology of the People's Republic of China.

Descriptive statistics. Table 2 reports the descriptive statistics of the main variables. The mean value of stock price synchronization (*Synch*) is -0.331, the standard deviation is 0.862, and the minimum and maximum values are -8.12 and 3.348, respectively, indicating that there are large differences in stock price synchronization among different companies. Meanwhile, the mean value of informationization construction (*IC*) is 0.242, indicating that about 24.2% of the companies were affected by the pilot policy of "Pilot Zones of Integration of Information and Industrialization" during the sample period.

Table 2 Descriptive statistics of main variables

variant	sample size	average value	standard deviation	minimum value	maximum values
Synch	25714	-0.292	0.748	-2.334	1.208
IC	25714	0.242	0.428	0	1
Size	25714	21.877	1.076	19.888	25.081
Lev	25714	0.445	0.190	0.074	0.851
Growth	25714	0.154	0.252	-0.408	1.164
ROA	25714	0.055	0.113	-2.986	10.616
Age	25714	0.059	0.049	-0.112	0.208
Board	25714	3.085	0.243	2.485	3.611
Turnover	25714	5.836	4.095	0.802	20.551
Executives	25714	5.027	6.976	0	19.088
Audit	25714	0.954	0.209	0	1
Timelag	25714	4.533	0.218	3.689	4.787

5. Empirical results and analysis

Analysis of baseline regression results. This paper applies model (1) to test the research hypotheses and the results of the benchmark regression are shown in Table 3. Column (1) presents the regression results of the benchmark model without the inclusion of control variables and without controlling for time and region fixed effects, while column (2) controls for time and industry fixed effects on this basis. Columns (3) and (4) further incorporate firm-level control variables.

From the regression results, the coefficient of the core explanatory variable informationization construction (*IC*) is significantly negative at the 1% level regardless of whether control variables or industry fixed effects are added, indicating that informationization construction has a significant inhibitory effect on the synchronization of stock prices under the background of "Pilot Zones of Integration of Information and Industrialization", thus verifying hypothesis H1.

Table 3 Benchmark regression analysis

variable name	(1) *Synch*	(2) *Synch*	(3) *Synch*	(4) *Synch*
IC	-0.367***	-0.140***	-0.353***	-0.122***
	(-17.997)	(-6.065)	(-16.178)	(-5.450)
Treat	0.214***	0.049**	0.212***	0.036*
	(10.138)	(2.271)	(10.209)	(1.757)
Size			0.094***	0.114***
			(15.489)	(18.532)
Lev			-0.001***	-0.001
			(-3.835)	(-1.387)
Growth			-0.000	-0.000
			(-0.390)	(-0.662)
ROA			-0.220***	-0.164**
			(-2.814)	(-2.178)
Board			0.126***	0.050*
			(4.587)	(1.956)
Turnover			-0.001	-0.008***
			(-0.587)	(-7.062)
Age			-0.224***	-0.065**
			(-8.256)	(-2.223)
Executives			-0.000	0.003***
			(-0.308)	(3.713)
Audit			0.231***	0.259***
			(7.982)	(9.682)
Timelag			0.017	0.050***
			(0.995)	(3.112)
Constant	-0.314***	0.152	-2.243***	-2.603***
	(-36.679)	(1.645)	(-14.777)	(-15.075)
observed value	25,714	25,714	25,714	25,714
R^2	0.013	0.241	0.042	0.275
Industry FE	uncontrolled	controlled	uncontrolled	controlled
Year FE	uncontrolled	controlled	uncontrolled	controlled

Note: *, **, and *** indicate that the regression coefficients are significant at the 10%, 5%, and 1% levels, respectively;

The t-values are in parentheses, where standard errors are adjusted for firm-level clustering. Same as below

Robustness tests. (i) Parallel trend test

The basis of the application of the double difference model lies in the establishment of the ex ante parallel trend assumption, i.e., the experimental group and the control group are required to have the same trend of development prior to the implementation of the policy in order to ensure the unbiasedness of the estimation results. Referring to the studies of Beck et al. (2010) and Jing Guowen (2023)[1, 7], this paper selects the sample base period as the benchmark group, and takes the year dummy variables for a total of 10 years before the policy implementation of 5 years and 9 years after as the explanatory variables, and employs the dynamic difference-in-differences method to verify the parallel trend hypothesis:

$$Synch_{i,t} = \alpha + \beta Treat_i + \sum_{k=-5}^{k=9} \gamma_k IC_{i,t_0+k} + \delta' Control_{i,t} + IndustryFE + YearFE + \varepsilon_{i,t} \quad (4)$$

Where k represents the first k year, and γ_k is the estimated coefficient of particular interest in this section, which captures the policy implementation in the first k difference in stock price

synchronization between the treatment and control groups in the year. Figure 1 shows the estimated results of the parallel trend test, where the dashed line indicates the 90% confidence interval. As can be seen from the figure, when$k < 0$ time the estimated coefficients are not significant in all years, indicating that in the first five years of the policy implementation, the trend of stock price synchronization between the treatment group and the control group is basically the same, satisfying the ex ante parallel trend hypothesis. In the third and subsequent years of policy implementation, the estimated coefficients passed the 10% significance level test, and the stock price synchronization of the treatment group declined significantly, indicating that the informationization construction in the context of "Pilot Zones of Integration of Information and Industrialization" has a long-term and stable inhibitory effect on stock price synchronization, but this effect has a certain lag.

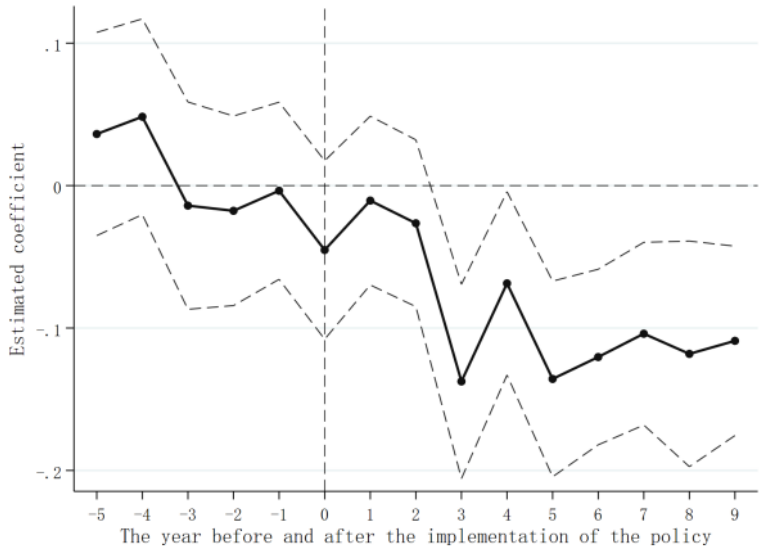

Fig. 1 Parallel trend test

(ii) Replacement of explanatory variable measures

Referring to the studies of Wang Yaping et al. (2009) and Yi Zhihong et al. (2019)[15, 17], the article uses two other mainstream computational methods to measure stock price synchronization. Distinguishing from equation (2), Wang Yaping et al. (2009) add the consideration of industry factors by including the return indicator of the weighted average of the outstanding market capitalization of the industry in which it operates in the explanatory variables (excluding the company itself)[15]; Yi Zhihong et al. (2019) lagged one period of the regression model based on the study of Wang Yaping and other scholars[17]. Separately, the above models were calculated R^2, again using equation (3) for logarithmization to obtain the indicators Synch2, Synch3. replacing to model (1) for testing, the results are consistent with the benchmark regression, and the estimation results are shown in columns (1) (2) of Table 4.

Table 4 Changing the stock price synchronization measure

variable name	(1) *Synch2*	(2) *Synch3*
IC	-0.093***	-0.063***
	(-4.507)	(-2.915)
Treat	0.030	0.014
	(1.579)	(0.729)
Size	0.099***	0.082***
	(17.464)	(13.832)
Lev	-0.001**	-0.002***
	(-2.232)	(-7.884)
Growth	-0.000	-0.000
	(-0.565)	(-0.971)
ROA	-0.171**	-0.357***
	(-2.495)	(-2.949)
Board	0.042*	0.061**
	(1.819)	(2.381)
Turnover	-0.006***	-0.010***
	(-5.980)	(-8.802)
Age	-0.060**	0.067**
	(-2.285)	(2.327)
Executives	0.003***	-0.000
	(4.588)	(-0.039)
Audit	0.213***	0.230***
	(9.192)	(8.151)
Timelag	0.045***	0.048***
	(3.042)	(2.725)
Constant	-2.103***	-2.978***
	(-13.364)	(-17.130)
observed value	25,714	25,714
R^2	0.283	0.364
Industry FE	controlled	controlled
Year FE	controlled	controlled

(iii)Propensity score matching

Theoretically, if the exogenous shocks are similar to those in randomized experiments, there should be no significant difference between the experimental group and the control group. However, in practice, the selection of "Pilot Zones of Integration of Information and Industrialization" is often affected by a number of factors, such as the financial status of city governments, resource conditions, and regional regulatory capacity. These inherent city differences may have different effects on the synchronization of stock prices over time, which may lead to estimation errors. To address this issue, the PSM radius matching method is used to match the control variables as covariates. By re-estimating the benchmark regression on the matched sample, the results are obtained as shown in Table 5. As can be seen from the table, the estimated coefficients of the core explanatory variable Synch are still significantly negative and do not show substantial differences compared with the results of the benchmark regression, further confirming the reliability of the conclusions of this paper.

Table 5 Propensity score matching

variable name	(1) *Synch*	(2) *Synch*	(3) *Synch*	(4) *Synch*
IC	-0.367***	-0.118***	-0.371***	-0.100***
	(-17.996)	(-4.458)	(-16.388)	(-3.872)
Treat	0.216***	0.032	0.219***	0.014
	(9.577)	(1.300)	(9.683)	(0.631)
Size			0.090***	0.111***
			(11.976)	(14.892)
Lev			-0.045*	-0.069***
			(-1.906)	(-2.680)
Growth			0.000	-0.000
			(0.321)	(-0.374)
ROA			-0.215*	-0.179
			(-1.943)	(-1.573)
Board			0.132***	0.060*
			(3.701)	(1.822)
Turnover			-0.003*	-0.010***
			(-1.950)	(-6.737)
Age			-0.169***	-0.036
			(-5.070)	(-1.058)
Executives			0.001	0.004***
			(0.616)	(3.698)
Audit			0.213***	0.218***
			(5.542)	(6.316)
Timelag			0.032	0.061***
			(1.301)	(2.748)
Constant	-0.317***	0.181	-2.342***	-2.589***
	(-26.833)	(1.302)	(-11.762)	(-11.381)
observed value	14,801	14,801	14,801	14,801
R^2	0.013	0.241	0.042	0.275
Industry FE	uncontrolled	controlled	uncontrolled	controlled
Year FE	uncontrolled	controlled	uncontrolled	controlled

(iv) Placebo test

In order to effectively distinguish random effects from real effects, so as to ensure the reliability of the study and avoid misleading conclusions, this paper refers to the practice of Li, Junjie and Zhou, Minliang (2023)[9], and randomly selects the relevant enterprises involved in the policy of "Pilot Zones of Integration of Information and Industrialization" from the sample, and conducts a placebo test. According to the implementation status of the policy, a list of enterprises in "Pilot Zones of Integration of Information and Industrialization" was constructed in the same proportion as the treatment group, and other enterprises as the control group. Subsequently, 1000 regression analyses were re-run, resulting in 1000 estimated coefficients of virtual informatization constructionβ_{random}. Figure 2 shows the distribution of the virtual estimated coefficients, and the image shows that the virtual estimated coefficients are concentrated around 0, deviating from the baseline estimates. This further validates that the inhibitory effect of informatization construction on stock price synchronization is not significantly affected by other relevant factors, thus ensuring the robustness of the findings.

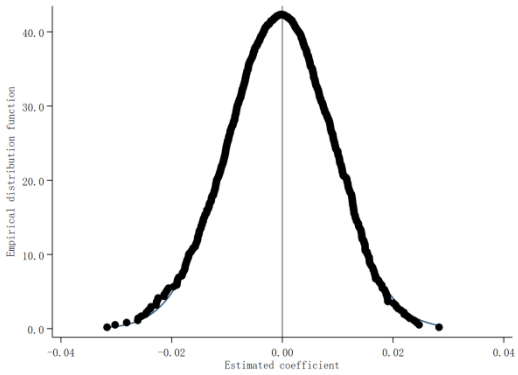

Fig. 2 Placebo test

6. Further Analysis

Heterogeneity analysis. (i) Dual role of the board chairman

Firms with two jobs tend to exhibit a more centralized power structure, and this leadership structure may weaken the board's ability to monitor management and affect the quality of corporate governance[11]. Some scholars have argued that dual-role firms may face higher information asymmetry risk in terms of disclosure and internal control because management may use its position of power to hide unfavorable information or make selective disclosure of information[5]. In addition, dual-role firms tend to be cautious about focusing on the level of informatization because it requires a large upfront investment and the benefits may not be immediately apparent, which may be inconsistent with management's goals of pursuing short-term performance[14].

In analyzing the inhibitory effect of informatization on stock price synchronization, it is noted that informatization in the context of "Pilot Zones of Integration of Information and Industrialization" may have a more significant effect in firms with two jobs due to their lower information efficiency. In two-job firms, due to the possible conflict of interest of the management, the enhancement of informatization is particularly important for improving corporate governance and external monitoring, which may further strengthen the inhibitory effect of informatization on stock price synchronization[10]. Therefore, we hypothesize that the inhibitory effect of informatization construction on helping investors and institutions to more accurately assess the value of the firm and thus reduce stock price synchronicity is more pronounced for firms with two jobs.

Referring to the research methodology of Han Hongyi (2023)[5], the indicator of two-job duality (*Dual*) is taken as 1 if the firm's CEO and chairman positions are held by the same person in that year, otherwise it is taken as 0. After that, the samples are grouped according to the dummy variable and the results of the test are shown in Table 6, columns (1) and (2). The regression results show that the coefficient of *IC* is significantly negative in firms with duals, while the coefficient of *IC* is insignificant in firms without duals. This suggests that in firms with two jobs, information technology construction is more likely to reduce information asymmetry by improving the transparency and accessibility of information, enabling firm-specific information to be incorporated into the stock price more effectively, validating the above hypotheses.

(ii) Regional level of rule of law

In exploring the impact of regional rule of law levels on the relationship between firms' information technology development and stock price synchronization, we find that regions with lower rule of law levels tend to be accompanied by weaker legal protection and monitoring mechanisms[16]. This environment may lead to greater challenges for firms in terms of information disclosure and internal control, as the lack of effective external oversight may make it easier for management to engage in information manipulation, thereby exacerbating information asymmetry[8]. Information construction, as a means to improve information transparency and circulation efficiency, can alleviate the information asymmetry problem and reduce stock price synchronization to a certain extent. However, this dampening effect may be more significant in regions with a lower level of rule of law, as

information technology construction provides a complementary mechanism to help investors penetrate the uncertainty of the legal environment and more accurately assess the value of firms. We thus expect that the role of informationalization is more critical in dampening stock price synchronization in regions with weaker rule of law environments.

Referring to the research method of Yu Minggui and Pan Hongbo (2008)[18], the article adopts the ratio of the number of cases closed in the year (cases) to the number of cases received in the current period (cases) as the indicator of the regional rule of law level (*Law*). After that, the samples are grouped according to the level of regional rule of law, and the test results are shown in Table 6, columns (3) (4). The regression results show that both columns IC coefficients are significantly negative, and the group with low level of rule of law IC coefficients are smaller. This suggests that in regions with a low level of rule of law, informatization is more effective in achieving the effect of reducing stock price synchronization, and the expected hypothesis is verified.

Table 6 Heterogeneity test

variable name	*Synch*			
	Existence of duality	Absence of duality	Low level of rule of law	High level of rule of law
	(1)	(2)	(3)	(4)
IC	-0.127***	-0.055	-0.139***	-0.092***
	(-5.083)	(-1.063)	(-4.475)	(-2.911)
Treat	0.044**	-0.046	0.041*	0.022
	(1.988)	(-0.944)	(1.923)	(0.599)
Size	0.116***	0.104***	0.123***	0.112***
	(16.863)	(7.746)	(17.318)	(13.639)
Lev	-0.000	-0.088**	-0.000	-0.082**
	(-1.200)	(-2.123)	(-0.966)	(-2.468)
Growth	-0.001*	0.000	-0.000	-0.000**
	(-1.673)	(0.528)	(-0.227)	(-2.111)
ROA	-0.146*	-0.455***	-0.148**	-0.202
	(-1.792)	(-3.641)	(-2.011)	(-1.426)
Board	0.022	0.122**	0.053*	0.044
	(0.773)	(2.252)	(1.783)	(1.159)
Turnover	-0.006***	-0.012***	-0.005***	-0.011***
	(-4.277)	(-5.730)	(-3.396)	(-6.824)
Age	-0.072**	-0.020	-0.053	-0.055
	(-2.148)	(-0.323)	(-1.533)	(-1.356)
Executives	0.002**	0.005***	0.002*	0.004***
	(2.391)	(3.299)	(1.879)	(3.469)
Audit	0.246***	0.263***	0.270***	0.195***
	(8.419)	(4.329)	(8.817)	(4.681)
Timelag	0.040**	0.078**	0.068***	0.027
	(2.218)	(2.206)	(3.538)	(1.112)
Constant	-2.506***	-2.801***	-2.887***	-2.596***
	(-12.830)	(-6.514)	(-13.927)	(-10.817)
observed value	20,047	5,667	12,897	12,897
R^2	0.269	0.309	0.172	0.340
Industry FE	uncontrolled	controlled	uncontrolled	controlled
Year FE	uncontrolled	controlled	uncontrolled	controlled

(ii) Mechanism analysis

According to the previous theoretical analysis, information technology can enhance corporate governance by increasing internal information transparency, strengthening internal control and risk management, and facilitating communication with external stakeholders, thus ensuring that firm-specific information is reflected in the stock price in a timely and accurate manner; such a governance structure can help to reduce information manipulation, attract the attention of analysts and increase

stock liquidity, which ultimately leads to a stock price synchronization Reduction in stock price synchronization.

Referring to the research method of Minghui Li (2009)[10], this paper uses the first type of agency costs, i.e., management expense ratio and total asset turnover ratio, as the proxy variables for corporate governance capability; the lower the management expense ratio and the higher the total asset turnover ratio, the stronger the corporate governance capability. The following model is constructed for validation:

$$GAFee_{i,t} \mid TAT_{i,t} = \alpha + \beta Treat_i + \gamma IC_{i,t} + \delta' Control_{i,t} + IndustryFE + YearFE + \varepsilon_{i,t} \quad (5)$$

Among them $GAFee_{i,t}$, and $TAT_{i,t}$ are mechanism variables, representing the management expense ratio and total asset turnover ratio, respectively. The data for the above mechanism variables are obtained from the CSMAR database, and the rest of the variables are consistent with the variable settings in the benchmark regression. Table 7 reports the estimation results of the mechanism analysis. The regression results show that the coefficient of *IC* in column (1) is significantly negative at the 5% level, and the coefficient of *IC* in column (2) is significantly positive at the 1% level, thus suggesting that the main mechanism of informatization is to enhance corporate governance by improving internal information transparency, strengthening internal control and risk management, and facilitating communication with external stakeholders to ensure that information about the firm's idiosyncrasies can be reflected in a timely and accurate manner in the stock price, thus reducing stock price synchronization and validating hypothesis H1.

Table 7 Mechanism analysis

	(1)	(2)
variable name	GAFee	TAT
IC	-0.012**	0.073***
	(-3.701)	(4.554)
Treat	-0.001	0.041***
	(-0.211)	(2.724)
Size	-0.013***	-0.004
	(-13.388)	(-0.724)
Lev	-0.042***	0.272***
	(-6.435)	(7.121)
Growth	-0.000	0.001
	(-1.453)	(0.953)
ROA	-0.238***	0.815***
	(-16.037)	(13.449)
Board	-0.001	0.033*
	(-0.319)	(1.927)
Turnover	-0.000	-0.001
	(-1.510)	(-1.301)
Age	0.010**	0.033
	(2.192)	(1.390)
Executives	0.000**	-0.001**
	(2.141)	(-2.343)
Audit	-0.043***	0.018
	(-6.301)	(0.870)
Timelag	0.003*	-0.019**
	(1.720)	(-2.013)
Constant	0.437***	0.265*
	(14.191)	(1.897)
observed value	23,930	23,930
R^2	0.296	0.269
Industry FE	controlled	controlled
Year FE	controlled	controlled

7. Conclusion

The purpose of this study is to investigate the effect of informationization construction on stock price synchronicity in the context of the pilot zone of "Pilot Zones of Integration of Information and Industrialization". Through empirical analysis, we find that information technology construction can inhibit stock price synchronization to a certain extent, and this effect remains robust after using a series of methods such as the parallel trend test, changing the explanatory variable measures, matching PSM propensity scores, and the placebo test. Further analysis shows that the inhibitory effect of informatization on stock price synchronicity is more significant in the sample of firms with two jobs, and the effect is more inhibitory in firms with lower levels of regional rule of law. The logic of this study is based on the information efficiency hypothesis that informatization construction reduces stock price synchronicity by improving corporate governance capabilities, ensuring timely and accurate reflection of idiosyncratic information, reducing information manipulation, attracting analysts' attention and increasing stock liquidity.

The findings of this paper provide useful references for policymakers in promoting informatization, optimizing corporate governance structure and improving capital market efficiency, suggesting that when formulating relevant policies, full consideration should be given to how to promote enterprises to increase their investment in informatization through policy guidance and incentives, especially in regions with weak rule of law environments, where legal protections and supervisory mechanisms should be strengthened to ensure that informatization is able to effectively enhance corporate governance and market transparency. At the same time, for enterprises with governance structure characteristics such as the existence of two positions, the policy should pay more attention to the role of informatization construction in enhancing the quality of information disclosure and internal control, with a view to reducing the synchronicity of share prices and enhancing the stability and healthy development of the capital market.

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