The Vision of China's Stock Market——"Government Dependence Effect"

Yaoji Ju[1,*] and Fengjing Han[2]

[1]School of Management, Zhanjiang University of Science and Technology, Zhanjiang City, Guangdong Province ,524088, China
[2]School of Business, Lingnan Normal University, Zhanjiang, Guangdong Province, 524048, China

*juyaoji@126.com

Abstract. The government intervenes in the stock market through tangible or intangible methods. It can use the People's Daily to convey its views. The release of the People's Daily News will cause abnormal fluctuations in the stock market. This paper analyzes the reasons behind it and believes that there is a "government dependence effect". And the closing price of the "SSE Composite Index" is selected as the empirical data, and the intervention analysis model is established to analyze the fluctuations brought by the government's claims in 1996, 1999 and 2015 to the stock price, thus verifying the existence of "government dependence in the Chinese stock market." And analyze the impact of government dependence on the stock market.

Keywords: Intervention Analysis model, Stock Market, Government Dependence Effect.

1 Introduction

China's stock market has a history of more than 30 years, with the continuous development of China, our country's stock market has also gained a greater degree of development, which also brings more and more financial anomalies. The government's advocacy has always had a greater influence on the stock market. The People's Daily is an organ that conveys the views of the Party and the government's advocacy, and it can also reflect the government's views on how to deal with relevant events. Through the People's Daily and other organs, the government publishes its opinions and remarks to guide investors to follow the government's advocacy, and investors rely on the government's advocacy. For example: (1) On 13 December 1996, the People's Daily published an article entitled'Correct Understanding of the Current Stock Market' to guide investors in their investment decisions. After the publication of the article, the stock market showed an irrational surge, and on the day of the release of the news, the Shanghai and Shenzhen stock markets both fell by 10%, and on the following day, the stock market still fell by 10%. So, the whole stock market faced two drops, the People's Daily, as the organ of the government, its power can also be seen,

Y. K. Wong Eric et al. (eds.), *Proceedings of the 2024 4th International Conference on Business Administration and Data Science (BADS 2024)*, Advances in Computer Science Research 119,
https://doi.org/10.2991/978-94-6463-632-1_19

to the 25th of December when the broad market index fell to 855 points. (2) On 15 June 1999, the front page of the People's Daily published an article entitled ‘Firm Confidence, Regular Development’, which showed that the Government was ‘long’ at that time, guiding investors in the stock market to buy stocks. After the publication of the article, from 15 June - 30 June just 15 days between China's stock market began to show the phenomenon of rising, the Shanghai Composite Index rose from 1,378 points to 1,756 points, up 378 points, an increase of 27%. (3) On 30 March 2015, the People's Daily published an article entitled ‘A shares are already in a bull market, grasp the bull market “dividend”’, and on 1 April of the same year, the People's Daily published another article entitled ‘Stock market shocks do not change the “slow bull”’. Slow bull’ trend ’, two consecutive articles published 17 days later, the Shanghai Composite Index rose from 2754.66 to 3235.33, up 480.67, or 17.45%. On the same day the People's Daily Overseas Edition also published an article in support of China's stock market, indirectly suggesting that the stock market will usher in a slow bull trend and has the hope of hitting the 4,000-point mark in the short term.

2 The ‘Government Dependency Effect’ in the Stock Market

The government dependence effect has two implications. Firstly, it refers to the broad sense of government dependence effect caused by the introduction of relevant policies by the government[1]. Secondly, it refers to the narrow sense of government dependence effect where the government conveys relevant views through state media without the introduction of substantive documents. This article mainly analyzes the narrow sense of government dependence effect, therefore, variables are selected and data is purified through the ARIMA model to eliminate the influence of other factors, only considering the impact brought by articles published in People's Daily. The government dependence effect is defined in this paper as the fact that investors in the stock market believe in the government's claims and intentions, and have weak decision-making ability themselves, so investors tend to rely heavily on the government's claims and intentions. This paper analyses the statements published in the People's Daily in 1996, 1999 and 2014 to prove the existence of the‘government dependence effect’and analyse its impact on the stock market.

3 Research Methodology and Data Selection

3.1 Intervention Model Analysis Method

The volatility of the stock market is usually affected by unexpected events and some special events, such as policy changes, government claims, news media reports and so on. For the study of this kind of events we can use the intervention model analysis method[2]. The intervention model was first proposed by the American statisticians Box and Tiao, and it is suitable for analysing the impact of unexpected events or sudden government opinions on the stock market, and is widely used in the stock mar-

ket[3]. Intervention models need to be described by intervention variables, which are divided into two kinds:

Variables having the nature of continuous intervention, denoted as.

$$S_t^T = \begin{cases} 0, \text{Before the intervention event (t} < T) \\ 1, \text{After the intervention event (t} \geq \text{T)} \end{cases} \tag{1}$$

It indicates that it has been having an impact after the occurrence of the T-moment factual holiday.

Variables with transient intervention nature, denoted as.

$$P_t^T = \begin{cases} 0, \text{At the time of the intervention event} \quad (\text{t} = \text{T}) \\ 1, \text{ Other times} \qquad\qquad (\text{t} \neq \text{T}) \end{cases} \tag{2}$$

It indicates that it occurs at a certain moment in time and only has an effect on that moment in time[4].There are four forms of intervention events, because the government publishes the relevant claims are sudden, so this paper selects the form of intervention events for the sudden start and have a temporary impact, the mathematical model is expressed as follows:

$$Y_t = \frac{\omega B^b}{1-\sigma B} P_t^T, 0 < \sigma < 1 \tag{3}$$

3.2 Data Selection

The closing price of the SSE Composite Index from 7 August 1996 to 25 December 1997 is selected, with a total of 100 data, of which 90 data are used as the data before the intervention and 10 data are used as the data after the intervention; the closing price of the SSE Composite Index from 7 January 1999 to 10 August 1999 is selected , a total of 130 data, of which 100 data were used as pre-intervention data and 30 data were used as post-intervention data; and the closing prices of the SSE Composite Index from 10 February 2015 - 30 September 2014 were selected, a total of 145 data, of which 115 data were used as pre-intervention data and 30 data were used as post-intervention data. The meanings of the model parameters are shown in Table 1.

Table 1. Summary of model parameter meanings

Parameter symbols:	Meaning:
S_t^T	Step nominal variable
P_t^T	Impulse nominal variable
ω	Magnitude of the effect of the intervention event
B	Backward shift operator
B^b	Indicates the period b after which the intervention event begins to have an impact
y_t	Period t observations in the financial data series
y_{pre}	Level of the financial data series before the intervention event

y_{post}	Level of the financial data series after the intervention event
e_t	Random error term
I_t	Intervening variable S_t^T or P_t^Z
Z_t	Shocks from government claims

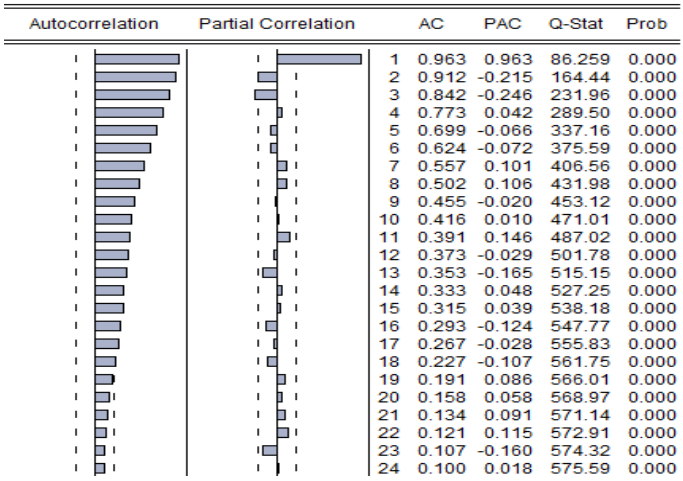
4 Empirical Analysis

Firstly, to analyse the stock market changes caused by the front-page commentaries published by the People's Daily in 1996, using the 115 closing prices of the Shanghai Composite Index before the People's Daily published the newspaper, to establish an ARIMA model for extrapolating the forecasts; secondly, the forecasts obtained from the calculation will be regarded as the values without the influence of the intervention; and finally the results of the influence of the intervention, i.e., the actual values minus the forecasts, can be obtained[5].

4.1 Establishment of ARIMA Model

Data Processing. A smoothness test was performed on this time series data and it was found to be not smooth as shown in Fig. 1.

Date: 08/05/18 Time: 18:01
Sample: 8/07/1996 12/13/1996
Included observations: 90



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.963	0.963	86.259	0.000
		2	0.912	-0.215	164.44	0.000
		3	0.842	-0.246	231.96	0.000
		4	0.773	0.042	289.50	0.000
		5	0.699	-0.066	337.16	0.000
		6	0.624	-0.072	375.59	0.000
		7	0.557	0.101	406.56	0.000
		8	0.502	0.106	431.98	0.000
		9	0.455	-0.020	453.12	0.000
		10	0.416	0.010	471.01	0.000
		11	0.391	0.146	487.02	0.000
		12	0.373	-0.029	501.78	0.000
		13	0.353	-0.165	515.15	0.000
		14	0.333	0.048	527.25	0.000
		15	0.315	0.039	538.18	0.000
		16	0.293	-0.124	547.77	0.000
		17	0.267	-0.028	555.83	0.000
		18	0.227	-0.107	561.75	0.000
		19	0.191	0.086	566.01	0.000
		20	0.158	0.058	568.97	0.000
		21	0.134	0.091	571.14	0.000
		22	0.121	0.115	572.91	0.000
		23	0.107	-0.160	574.32	0.000
		24	0.100	0.018	575.59	0.000

Fig. 1. Differential pre-correlation and partial correlation coefficient

The time series data for the smoothness test, found that it is not smooth, so the first-order difference processing, set Y for the first-order difference after the data[6], the graphs of the processed time series data are shown in Fig.2.

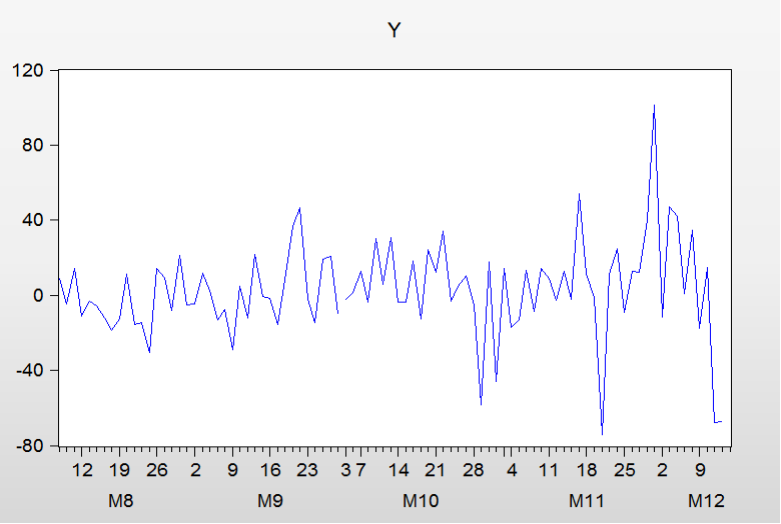


Fig. 2. Time trend graph after first-order difference

Then the first-order difference after the time series data for the ADF test[7].

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.962940	0.0000
Test critical values:	1% level	-3.506484	
	5% level	-2.894716	
	10% level	-2.584529	

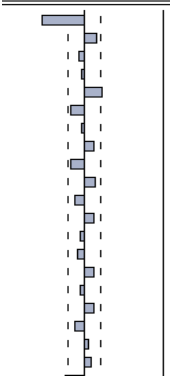
*MacKinnon (1996) one-sided p-values.

Fig. 3. ADF test results

From Fig.3, we can see that t=-7.962964, the critical value at 1% level is -3.506484, -7.962964 is smaller than -3.506484, so we can reject the original hypothesis of the existence of the unit is very much, and think that the first-order differencing time series is a smooth series, so d=1.

Model Identification by ARIMA(p,d,q). In the above, we carried out the first-order difference of the time series, resulting in d = 1, the next need to determine the value of p, q, p indicates that the partial correlation coefficient (PACF) in the P-order lag is not obvious before zero, and in the P-order after the lag term begins to gradually begin to approach zero; q indicates the autocorrelation coefficient (ACF), q value is also based on the lag term judgement[8]. The data after the first-order differencing of the closing price of the SSE index is used to calculate the ACF-PACF with Eviews 9.0 to obtain the optimised results as shown below:

Date: 08/05/18 Time: 18:39
Sample: 8/07/1996 12/13/1996
Included observations: 88



Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.562	-0.562	28.712	0.000
		2	0.161	-0.225	31.100	0.000
		3	-0.073	-0.137	31.595	0.000
		4	-0.042	-0.188	31.762	0.000
		5	0.223	0.167	36.511	0.000
		6	-0.175	0.098	39.478	0.000
		7	-0.028	-0.129	39.555	0.000
		8	0.115	0.042	40.861	0.000
		9	-0.172	-0.126	43.837	0.000
		10	0.138	-0.132	45.759	0.000
		11	-0.116	-0.103	47.147	0.000
		12	0.119	0.079	48.634	0.000
		13	-0.062	0.006	49.044	0.000
		14	-0.093	-0.130	49.963	0.000
		15	0.119	-0.020	51.498	0.000
		16	-0.053	-0.028	51.811	0.000
		17	0.125	0.111	53.558	0.000
		18	-0.124	0.048	55.296	0.000
		19	0.050	0.093	55.588	0.000
		20	0.092	0.171	56.583	0.000

Fig. 4. Optimised ACF-PACF coefficients

From Fig.4, it can be seen that the autocorrelation coefficient gradually converges to 0 after the 1st order, so q=1; while the partial correlation coefficient gradually converges to 0 after the 2nd order, so p=2. Because the ARMA model has the prerequisite assumption that the mean is zero, if the mean of the series is not zero, it is necessary to do the necessary transformation. We verify that the mean of the series is equal to zero by using Eviews[9]. The mean of the series was calculated to be -8.52E-05, standard error of the mean = 5.84E-05, therefore the original assumption of zero mean cannot be rejected, so there is no need to transform the series.

Parameter Identification of ARIMA(p,d,q). The p, d, q and time series data obtained above are entered into Eviews to calculate the model parameters. According to the parameter estimation and test results, $R^2 = 0.996731$, the value of DW statistic is 2.360674, the t-statistic passes the significance test, so it can be considered that the model fits better and is more satisfactory.

Model Test. From the Sub-correlation and partial correlation of the residual series figure and Time trend of residuals figure, it can be known that the residual series is white noise series, so the model passes the test.

4.2 Establishment of Intervention Analysis Model

Estimation of Intervention Model Parameters. According to the ARIMA(2,1,1) model established above, the closing price of the SSE Composite Index from 14 December 1996 to 20 January 1997 is predicted, then the actual value of the closing price is subtracted from the predicted value calculated by the model, and the difference obtained is the impact of the People's Daily's published remarks on the SSE index impact, noted as Z_t.

From the above table we can see that the government making relevant statements has a significant impact on the stock market, which is caused by the presence of government dependence effect in the stock market. Due to this:

$$Z_t = \frac{\omega B^b}{1-\delta B} P_t^T, 0 < \delta < 1 \tag{4}$$

Table 2. Comparison between actual and predicted closing prices

Date	SSE Closing Price Actual value	ARIMA Forecast Value	Government Advocacy Shock Effectiveness
16 December 1996	1000.02	1084.05	84.03
17 December 1996	905.57	1126.19	220.62
18December 1996	972.73	1139.06	166.33
19 December 1996	902.42	1146.23	243.81
20December 1996	885.23	1153.27	268.04
23December 1996	902.01	1169.65	267.64
24December 1996	865.57	1178.32	312.75
25 December 1996	895.17	1219.76	324.59

Therefore, the parameters are estimated as follows:

$$\omega = -275.461, \delta = 0.874 \tag{5}$$

Model Establishment and Result Analysis. The series will be purified and re-established ARIMA(2,1,1) model, the model is as follows:

$$Y_t = c + \emptyset_1 y_{t-1} + \emptyset_2 y_{t-2} + \varepsilon_t + \theta_1 \varepsilon_{t-1}, t = 1,2 \dots t \tag{6}$$

Namely:

$$Y_t = 10.374 + 1.769 y_{t-1} - 0.407 y_{t-2} + \varepsilon_t + 0.659 \varepsilon_{t-1}, t = 1,2 \dots t \tag{7}$$

The results of the analysis of the closing price of the Shanghai Stock Exchange Index in 1996 using the intervention analysis model are shown in Table 2, which indicates that the government's advocacy has a certain impact on the stock market. The 'visible hand' of the government always regulates the stock market explicitly and implicitly, and wanders away from the capital market. Using the same method to empirically analyse the articles published by the People's Daily about the stock market in 1999 and 2015, the predicted closing price and the actual closing price are the same as the actual closing price.The chart comparing the predicted closing price with the actual closing price is shown in Fig 5.

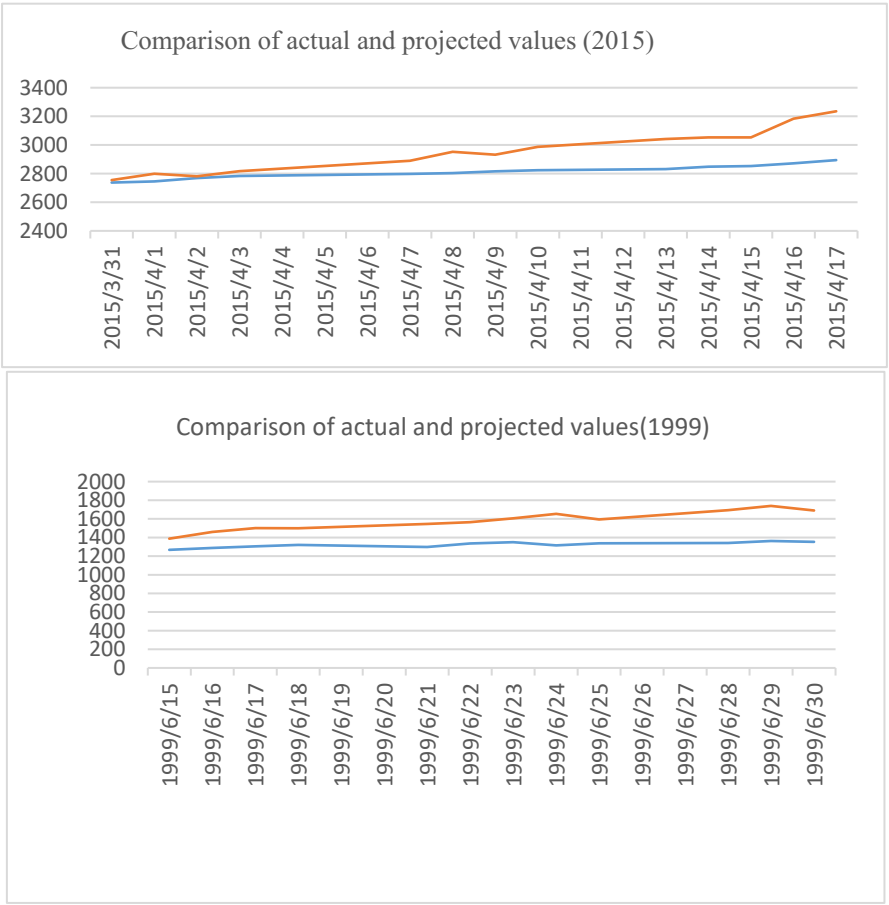


Fig. 5. Chart comparing predicted closing prices with actual closing prices

In the chart above, the blue line represents the predicted value and the orange line represents the actual value. We find that they both have a significant impact on the stock market, because investors are not completely rational, so most of them are unable to make decisions after careful thinking, and most of the time they rely on the government's claims to make decisions, which shows that investors have a certain degree of dependence on the government.

5 Countermeasures to Improve Government Dependency Effect to Promote Shanghai Stock Market Operation

The government's behaviour has a significant impact on investors in the Shanghai stock market and, at the same time, affects the healthy operation of the Shanghai stock market. The government usually plays multiple roles in the stock market: the

government is the direct provider of credit in the stock market; it is also the leader in maintaining the healthy development of the stock market; and it is the effective controller and regulator of the stock market. Countermeasures to improve the government's dependence effect to promote the operation of the Shanghai stock market mainly include: (1) the government should clarify the relationship between the organ media and the market, do not be kidnapped by the media, and safeguard the interests of investors, so that investors in the stock market can form a reasonable expectation; (2) strict requirements for the government media speech, the government media has a relatively large impact on investors, so the government media need to regulate the relevant speech, so as to avoid abnormal fluctuations in the stock market[10]; cultivate rational investors. Cultivate rational investors, first of all, cultivate rational small and medium-sized investors mainly through the enhancement of small and medium-sized investors' basic knowledge of securities investment, risk awareness, and relevant laws and regulations; secondly, the investment behaviour of institutional investors should be regulated to avoid their manipulation of the stock markett[11]. (3) The government should reasonably allocate the regulatory power of the stock market, pay attention to the regulation of self-regulatory organisations, make them independent, and appropriately delegate the power to do reasonable regulation of the stock market.

6 Conclusion

This paper is based on the relevant articles published by the People's Daily to represent the government's advocacy point of view, and takes the closing price of the Shanghai Stock Exchange Index as the time-series data to establish an intervention analysis model to judge the government dependence effect in the stock market, and analyses the impact that the effect brings to the stock market. And the following conclusions are drawn: (1) The government dependence in China's stock market is very strong, and the government's failure to introduce relevant policies just commenting on something will bring a greater impact on the stock market. (2) Investors are not completely rational, this kind of irrationality of investors leads them to rely on the government more easily. Rational investors should fully grasp the development status of the investment object before determining the investment decision, so as to avoid the loss caused by blindly following the trend and irrational investment. (3) The government dependence effect is a kind of behavioural anomaly in the stock market, which can be used by the government to regulate the stock market, but it is more difficult.

Acknowledgements

This research was supported by General Project of Philosophy and Social Sciences in Guangdong Province "Carbon sinks in the offshore areas of Guangdong: spatio-temporal evolution, impact effects, and amplification strategies" (GD22CYJ08); Lingnan Normal University talent project "Research on dynamic core competence

emergence of high-endequipment manufacturing enterprises based on organizational innovation" (ZW 2024).

References

1. Basu,S. Investment performance of common stocks in relation to their price-earnings ratios: a test of the efficient market hypothesis Journal of Finance, 1977, Vol. 32(3), 663-682.
2. Daniel, K., and S. Titman, Evidence on the Characteristics of Cross Sectional Variation in Stock Returns [J], Journal of Finance, 1997, 52(1).
3. L.L. He, X.P. Huang, and F.M. Zhu. A study on the long- and short-term effectiveness of government buy-in intervention during periods of abnormal stock market volatility [J], Journal of Huaqiao University (Philosophy and Social Science Edition) 2017:95-105.
4. Fan Y S, Jiang Q L, Zhou W. A Study on Abnormal Stock Market Volatility and Government Intervention Issues --- Taking the Abnormal Volatility of A-shares in Mid-2015 as an Example[J]. Northern Finance.2017(3):7-12.
5. Wu Yuxia, Wen Xin,Short-term stock price prediction based on ARIMA model[J]. Statistics and Decision Making.2016(23).
6. Wan Xia, Gong Jinjun, Analytical model of policy intervention in China's stock market[J]. Financial securities analysis.2005.
7. Siorkis F M. Stock market dynamics: before and after stock market crashes[J].Physica A: Statistical Mechanicsand its Applications, 2012, 391(4) : 15-22.
8. Banz R. The relationship between return and market value of common stocks[J]. Journal of Financial Economics, 1981, 9: 3-18.
9. Zhang Xiaotong, Eviews use guide and cases. Beijing: Machinery Industry Press, 2007.78-89.
10. Jegadeesh, Narasimhan, and Sheridan Titman, Returns to buying winners and selling losers: Implications for stock market efficiency, Journal of Finance, 1993, 48, 65-91.
11. Philip Bond, Itay Goldstein. Government Intervention and Information Aggregation by Prices, The journal of Finance, 2015, 70, pp. 2777 -2812.