

Research on Secure Corporate Investment against Inflation Impact

Ming Zhang¹ and Tao Gong^{2,3}

¹ Management Institute, Donghua University, Shanghai 200051, China

² College of Information S. & T., Donghua University, Shanghai 201620, China

³ Engineering Research Center of Digitized Textile & Fashion Technology, Ministry of Education, Donghua University, Shanghai 201620, China

taogong@dhu.edu.cn

Abstract

The inflation often impacts the economy of a country such as China, and then the inflation can decrease the corporate investment. In this paper, the affecting relationship between the inflation and the corporate investments of the listed corporations in the Chinese stock market was modeled. After analyzing various factors of the investment decisions in this model, we tested the data of the companies, which traded in the Shanghai and Shenzhen stock exchange markets from January 1, 2004 to September 30, 2012. The calculation results show that the inflation and the corporate investments are significantly negatively correlated. When the inflation increased, the corporate investments decreased. However, the decline of income tax rates sometimes would stimulate the increase of the corporate investments in the inflation environment. So the secure corporate investment is to choose the most irrelative corporate investment with the inflation, using the declining income tax rates.

Keywords: Inflation; Secure corporate investment; Income tax rates; Relativity

1. Introduction

As we know, as the general price level in a certain period, the inflation is an important indicator to measure the state of the economy. For example, China is confronted with a serious inflation, which began since 2010 and made the GDP number of China fall about 3% in 2012. In fact, Chinese economy has faced with several serious inflations with some economic fluctuations, since China transformed its planned economy to a new market economy in the 1980s. So it is a big problem for the Chinese government to reduce the negative impact of the inflation.

First, the inflation can increase the uncertainty of the future revenue for the investment. Sheshinski and Weiss proposed the Menu Cost Model to show that the inflation can increase the production cost continuously, but the price is difficult to increase [1]. When the cost reaches the threshold, the price would jump up to a new level. This will make the demand unpredictable, and the company will reduce the supply when the inflation is high [2]. The inflation may reduce a company's long-term contract, which increases the uncertainty and reduce the discount rate. Finally the inflation can decline the investment profit [3]. To avoid this negative effect, the company must postpone the investment according to the real option theory. Therefore, the inflation can reduce the investment.

Second, the income tax rate of the company can also suppress the investment, and the corporate income tax affects only the nominal price. Feldstein found the interaction of both the inflation and the taxes had a significant negative impact on the United States' investments

from 1953 to 1978, and in fact this effect decreased the half of the investment in the 1970s [4].

The Chinese economic system and its listed companies are different from those companies in Europe and USA. The above theories are used to test the impact of the inflation to the investments of the Chinese companies.

2. Model of Secure Corporate Investment against Inflation Impact

Suppose H_0 represents the corporate investment, which is negatively correlated with the inflation and the income tax ratio under this inflation. The dependent variables are used to measure the investment behavior. The company has a variety of investment behaviors: the long-term equity investment, the trading financial assets, and the investment in fixed assets. Because we focus on the new project investment, the fixed asset is taken as a dependent variable. Two measures could be used: one is the increased fixed assets from the balance sheet; the other is cash outflow of fixed assets investment from cash flows statement. The increased fixed asset is nominal amount, while the cash outflow is the real payment.

This variable Gdzc represents the increased fixed asset, which is calculated below:

$$\text{Gdzc} = (\text{current period fixed asset} - \text{last period fixed asset} + \text{current period depreciation}) / (\text{last period total asset}) \quad (1)$$

This variable Gdxj represents the cash outflow of fixed asset investment, which is calculated below:

$$\text{Gdxj} = (\text{current period cash outflow of fixed asset investment}) / (\text{last period total asset}) \quad (2)$$

The independent variables include the inflation, the debt ratio, the current ratio and other variables. We use the CPI to measure the inflation [5], and Figure 1 shows the time series of the CPIs in China from 1990 to 2012, according to the data of the CSMAR database. Because the inflation is a time series that impacts the investment for a long time, we choose different CPIs in the time dimension: the current month (CPI), three month ago (CPI3), six month ago (CPI6), one year ago (CPI12), half and one year ago (CPI18), two years ago (CPI24).

Zcfzl represents the debt ratio, as calculated below.

$$\text{Zcfzl} = (\text{total debt}) / (\text{total asset}) \quad (3)$$

Ldbl represents the current ratio, as calculated below.

$$\text{Zcfzl} = (\text{current asset}) / (\text{current debt}) \quad (4)$$

$$\text{Yyzzl} = (\text{current period turnover} - \text{last period turnover}) / (\text{current period turnover}) \quad (5)$$

$$\text{Qbzcsh} = (\text{Net cash flow from operating activities}) / (\text{total asset}) \quad (6)$$

$$\text{Mgsy} = (\text{net profit}) / (\text{stock shares}) \quad (7)$$

$$\text{Yymll} = (\text{turnover} - \text{cost}) / (\text{turnover}) \quad (8)$$

$$\text{Zcbcl} = (\text{net profit} + \text{interest}) / (\text{total asset}) \quad (9)$$

$$\text{Zbmjd} = (\text{total asset}) / (\text{turnover}) \quad (10)$$

Zczl represents the control variable, which equals to $\log(\text{total asset})$.

The variable Sdsbd represents the dummy variable. For example, because the income tax rate reduced to 25% in 2008, before 2008 the variable Sdsbd is 0, after 2008 the variable Sdsbd is 1.

The variable Jcbl is the interaction of the inflation and the tax rate, as calculated below.

$$Jcbl = Sdsbd \times CPI12 \quad (11)$$

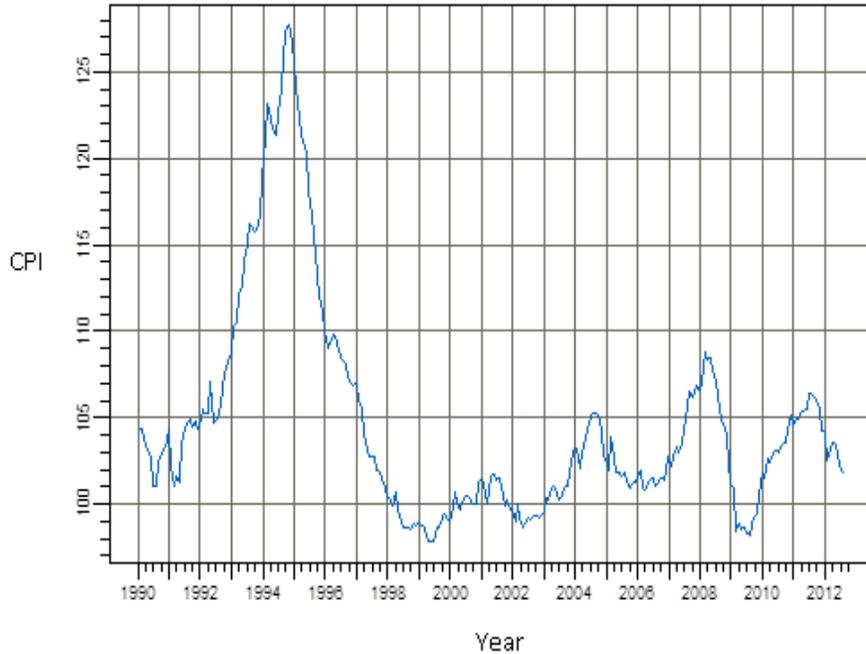


Figure 1. CPIs of China from 1990 to 2012

$$\begin{aligned} Gdzc = & \beta_0 + \beta_1 CPI + \beta_2 CPI3 + \beta_3 CPI6 + \beta_4 CPI12 + \beta_5 CPI18 + \beta_6 CP24 + \beta_7 Zcfzl \\ & + \beta_8 Ldbl + \beta_9 Yyzzl + \beta_{10} Qbzcs + \beta_{11} Mgsy + \beta_{12} Yymll + \beta_{13} Zcbcl \\ & + \beta_{14} Zbmjd + \beta_{15} Zczl + \beta_{16} Sdsbd + \beta_{17} Sdsbd \times CPI12 \end{aligned} \quad (12)$$

$$\begin{aligned} Gdxj = & \alpha_0 + \alpha_1 CPI + \alpha_2 CPI3 + \alpha_3 CPI6 + \alpha_4 CPI12 + \alpha_5 CPI18 + \alpha_6 CP24 + \alpha_7 Zcfzl \\ & + \alpha_8 + \alpha_9 + \alpha_{10} + \alpha_{11} + \alpha_{12} + \alpha_{13} + \alpha_{14} Zbmjd + \alpha_{15} Zczl + \alpha_{16} Sdsbd + \alpha_{17} Sdsbd \times CPI12 \end{aligned} \quad (13)$$

3. Experimental Results

With the dependent variable Gdzc, we take 666 companies, which were listed in the Chinese stock market from Jan 1, 2004 to Jun 30, 2012 [6]. With the dependent variable Gdxj, we take 995 companies, which were listed in the Chinese stock market from Jan 1, 2004 to Sep 30, 2012 with the data from the CSMAR database.

We use the panel data method to analyze the sample, as shown in Table 1 and Table 2.

Table 1. The Impact of the Inflation to the Increased Fixed Asset

Gdzc	Coef.	Std. Err.	<i>t</i>	<i>P> t </i>
CPI	-.0153489	.001841	-8.34	0.000
CPI3	.0182138	.0028062	6.49	0.000
CPI6	-.0110236	.0021938	-5.02	0.000
CPI12	-.0122808	.0018049	-6.80	0.000
CPI18	.0019396	.0009817	1.98	0.048
CP24	-.004649	.0008913	-5.22	0.000
Zcfzl	.0031085	.0044128	0.70	0.481
Ldbl	-.0005304	.000469	-1.13	0.258
Yyzzl	.0000222	.0000194	1.14	0.253
Qbzcsh	.0855732	.0149648	5.72	0.000
Mgsy	.0146284	.0040965	3.57	0.000
Ymll	.0030834	.0042951	0.72	0.473
Zcbcl	-.0130049	.011474	-1.13	0.257
Zbmjd	5.53e-09	1.00e-07	0.06	0.956
Zczl	.0570908	.0060075	9.50	0.000
Sdsbd	-.7083346	.1597027	-4.44	0.000
Sdsbd×CPI12	.0068432	.0015576	4.39	0.000
_cons	1.869318	.2632708	7.10	0.000

The data in Table 1 show that the different period CPIs have different impacts on the increased fixed asset. The current month CPI, half year ago CPI; one year ago CPI and two year ago CPI are negatively correlated with new fixed asset. However, the three month ago CPI and half and a year ago CPI have opposite effect. Usually the inflation is persistent rising. Take different period CPI together, we found the coefficient of negative is higher than the positive. In this way, CPI would decrease the new fixed asset investment, which confirms the hypothesis.

Another confirmation is the interaction of inflation and decline income tax rate with positive increased fixed asset. However, the variable Sdsbd is negative, which was caused by the worldwide financial crisis form 2008. Even if the tax rate is decline, the whole economy recession reduces the company's ability to take new investment.

Among other independent variables, only the variable Qbzcsh and the variable Mgsy are statistically significantly positively with increased fixed asset. It suggests if the company could generate more money and profit per share, they would catch more lucrative projects. The data in Table 2 show that the different period CPIs also have different impacts on the cash outflow of fixed asset investment. Except for the half year ago inflation, almost all CPI variables has the same effect on the fixed asset investment. Take different period CPI together, we found the coefficient of negative is higher than the positive. The inflation also has negative impact on the cash outflow of fixed asset investment.

Table 2. The Impact of the Inflation to the Cash Outflow of the Fixed Asset Investment

Gdxj	Coef.	Std. Err.	<i>t</i>	<i>P> t </i>
CPI	-.0041035	.0004416	-9.29	0.000
CPI3	.0022011	.0005494	4.01	0.000
CPI6	.0014658	.0004959	2.96	0.003
CPI12	-.0049014	.0005484	-8.94	0.000
CPI18	.001534	.0003893	3.94	0.000
CP24	-.0024077	.0003331	-7.23	0.000
Zcfzl	.0021316	.0004745	4.49	0.000
Ldbl	.0000126	.0002346	0.05	0.957
Yyzzl	.0000108	6.21e-07	17.42	0.000
Qbzcsh	.0777083	.0056708	13.70	0.000
Mgsy	.0248582	.0015336	16.21	0.000
Yymll	9.29e-06	.0000349	0.27	0.790
Zcbcl	-.0121623	.0027103	-4.49	0.000
Zbmjd	-6.15e-08	4.84e-08	-1.27	0.204
Zczl	.0291932	.0020307	14.38	0.000
Sdsbd	-.1460839	.0450105	-3.25	0.001
Sdsbd×CPI12	.0013317	.0004382	3.04	0.002
_cons	.3979185	.0668405	5.95	0.000

Influenced by the economy recession, the variable Sdsbd is negatively correlated with the cash outflow. However, the inflation with the income tax rate decline would promote the cash outflow of the investment. These outcomes are same as the increased fixed asset. The variable Qbzcsh and the variable Mgsy have same effects on the cash outflow of the investment. However, the higher is debt ratio, the more cash outflow of investment is made. This means that the company inclined to borrow money to fund new fixed asset, for the debt's interest has tax shield effect. The lower return on asset is made, the more cash outflow of investment is given. It indicates that less efficient companies would expand their capacity to get more profit.

Other independent variables have no significant effect, such as Ldbl, Yymll and Zbmjl. It means the investment behavior would not be affected by the pressure of short-term debt, the nature of the industry or whether the company is capital intensive.

4. Conclusions

The paper empirically studied how the inflation affects the investment of the corporations in the Chinese stock market. After analyzing various factors of the investment decision, we use the panel data method to test the companies, which traded in the Shanghai and Shenzhen stock exchange markets from January 1, 2004 to Sep 30, 2012. The study found that the inflation and the investment are significantly negatively correlated. However, the decline in the income tax rates would increase the companies' investments against the inflation. We can conclude that the secure corporate investment is to choose the most irrelative corporate investment with the inflation, using the declining income tax rates.

References

- [1] E. Sheshinski and Y. Weiss, "Inflation and Costs of Price Adjustment", *Review of Economic Studies*, vol. 44, no. 2, (1977), pp. 287-303.
- [2] R. E. Jr Lucas, "Expectations and the Neutrality of Money", *Journal of Economic Theory*, vol. 4, no. 2, (1972), pp. 103-124.
- [3] P. Reagan and R. Stulz, "Contracting Costs, Inflation, and Relative Price Variability", *Journal of Money, Credit and Banking*, vol. 25, no. 3, (1993), pp. 585-601.
- [4] M. Feldstein, "Inflation, Tax Rules, and Investment: Some Econometric Evidence", *NBER Working Papers*, (1980), pp. 0577.
- [5] R. Ibarra, "Do disaggregated CPI data improve the accuracy of inflation forecasts?", *Economic Modelling*, vol. 29, no. 4, (2012), pp. 1305-1313.
- [6] M. G. Yunusoglu and H. Selim, "A fuzzy rule based expert system for stock evaluation and portfolio construction: An application to Istanbul Stock Exchange", *Expert Systems with Applications*, vol. 40, no. 3, (2013), pp. 908-920.

Authors



Ming Zhang is a PhD student at Donghua University and her major is financial management.



Tao Gong received the MS degree in Pattern Recognition and Intelligent Systems and PhD degree in Computer Science from the Central South University respectively in 2003 and 2007. He is an associate professor of computer sciences at Donghua University, China, and he was a visiting scholar at Department of Computer Science and CERIAS, Purdue University, USA. He is the General Editors-in-Chief of the first leading journal *Immune Computation* in its field, and an editorial board member of some international journals such as *Journal of Computers in Mathematics and Science Teaching*, *International Journal of Security and Its Applications*, and *International Journal of Multimedia and Ubiquitous Engineering*. He is a Technical Committee Chair of ISEEIP 2012, and a Publicity Chair of ISA 2012. He is also a program committee member of some international conferences such as IEEE ICNC 2011, IEEE BMEI 2011, WMSE 2011, ICARIS 2012, AITS 2012, CCA 2012, ASP 2012, IST 2012, ISA 2012 and SIS2013 etc. He is a Life Member of Sigma Xi, The Scientific Research Society, a Vice-Chair of IEEE Computer Society Task Force on Artificial Immune Systems, and Chen Guang Scholar of Shanghai. He has published over 70 papers in referred journals and international conferences, and over 20 books such as *Artificial Immune System Based on Normal Model and Its Applications* etc. He is also a committee member of intelligent robots committee and natural computing committee in the Association of Artificial Intelligence of China.