Impact of Macro Indicators on Investment in Manufacturing Companies

Xianzhe Ji, Liuyi Luo

School of Xi'an Jiaotong-Liverpool University, Suzhou, China

Abstract. The purpose of this study is to examine the impact of a variety of macroeconomic indicators on the investment decisions of manufacturing firms. Key macroeconomic indicators such as GDP growth rate, interest rate, consumer price index (CPI), purchasing managers' index (PMI), employment rate, industrial production index (PPI), money supply (M2), and imports are analyzed to assess their impacts on manufacturing firms' capital expenditures. A multiple linear regression model is used to empirically analyze the data from Chinese manufacturing firms. The results of the study show that the Consumer Price Index (CPI) and the Industrial Production Index (PPI) have a significant negative effect on the capital expenditures of manufacturing firms, while the increase in the money supply (M2) has a positive effect on capital expenditures. Changes in the GDP growth rate and the Purchasing Managers' Index (PMI) also affect the investment decisions of manufacturing firms. In particular, an increase in foreign trade imports promotes capital expenditures by export-oriented manufacturing firms. This paper analyzes in-depth the impact mechanism of macroeconomic indicators on the investment of manufacturing companies to provide a reference for the investment decisions of enterprises in different economic environments. At the same time, this study also provides an important basis for policy makers to help formulate and adjust economic policies to support the development of the manufacturing industry and stable economic growth. The results of the study have important theoretical and practical significance for understanding the impact of macroeconomic environment on the investment behavior of enterprises.

Keywords: Manufacturing industry, Macro index, Capital expenditure, GDP growth, Investment.

1. Introduction

Against the backdrop of heightened global economic uncertainty, the investment decisions of the manufacturing industry, as the backbone of the national economy, are influenced by a wide range of macroeconomic factors, and the impact of macroeconomic indicators on firms' investments is a key topic in corporate decision-making research, attracting widespread academic attention and interest in financial practice [1]. Manufacturing firms' investment in fixed assets (capital expenditures) is a key factor in driving long-term corporate growth, and changes in the macroeconomic environment may affect the willingness and ability of manufacturing firms to invest, which has become a focal point for both researchers and practitioners by examining the impact of different macroeconomic indicators on manufacturing firms' investment [2].

Macroeconomic indicators such as GDP growth rate, interest rates, consumer price index (CPI), purchasing managers' index (PMI), employment rate, industrial production index, money supply, and foreign trade volume are essential factors in assessing the health of a country's economy. Traditional economic theory suggests that these data reflect the state of economic performance and future growth potential, and are core variables that influence a company's investment decisions [3]. However, in a complex and changing market environment, relying only on a single economic indicator can no longer fully explain the company's investment behavior. The combined effect of macroeconomic data, including external factors such as industry trends and market sentiment, is equally important in influencing company investment [4]. Especially in the manufacturing sector, the impact of macroeconomic indicators may be more significant due to its capital-intensive and cyclical nature.

Although existing studies have explored the impact of macroeconomic indicators on firms' investment from different perspectives, systematic studies for the specific industry of manufacturing remain relatively underdeveloped. In addition, the existing literature is divided in explaining how these macroeconomic indicators work together in the investment decision-making process of

manufacturing firms [5]. On the one hand, some scholars argue that market sentiment and macroeconomic factors may have a significant impact on manufacturing investment in the short run [6]. On the other hand, there are also arguments that macroeconomic fundamentals remain a key determinant of firms' long-term investment decisions [7].

In view of this, this paper empirically investigates the investment data of manufacturing companies for the past eight years using regression analysis. By analyzing the impact of various macroeconomic indicators (e.g., GDP growth rate, interest rates, CPI, PMI, employment rate, industrial production index, money supply, and foreign trade volume) on the capital expenditures of manufacturing firms, this study aims to reveal the specific mechanisms by which these factors act on the investments of manufacturing firms [8].

The purpose of this paper is to explore how these macroeconomic indicators individually and collectively affect the investment decisions of manufacturing firms, which not only extends the theoretical framework of firm investment, but also provides empirical support for investment decisions in practice and deeper insights for business managers. Understanding how macroeconomic indicators affect firm investment can provide managers with practical references in the decision-making process, while this research also provides policymakers with references that can help formulate and adjust economic policies to support the development of the manufacturing industry and stable economic growth.

2. Method

2.1. Data collection

Based on the available data, we selected Chinese A-share listed companies from 2020 to 2022 as our sample, we screened and processed the sample based on the following criteria: 1) listed manufacturing companies, 2) companies with assets between 500 million and 1 billion, 3) companies with capital expenditures as a percentage of total capital greater than 0.01, 4) net profit greater than 0, and 5) exclusion of missing sample data. In order to prevent the influence of abnormal or missing sample data on the experimental analysis and results, we selected 30 sample companies from 596 companies in the manufacturing industry, and the statistics were obtained from the Wind Information financial terminal database. All other financial data were obtained from the National Bureau of Statistics of the Chinese Stock Market. We use Excel for data processing model estimation.

2.2. Variable and measures

2.2.1 Financial performance

The choice of capital expenditures (CAPEX) as the dependent variable in the study of the impact of macroeconomic indicators on firms' investment has a number of advantages. First, CAPEX directly reflects the company's investment decision on fixed assets and accurately reflects the company's investment behavior. Secondly, CAPEX data is easily available in the company's financial statements, ensuring that the study is actionable [9]. In addition, capital expenditures are usually used in long-term investment projects, which have an important impact on the long-term development and competitiveness of the company.The increase of CAPEX can drive the development of related industries and promote economic growth, which has important macroeconomic significance. By analyzing CAPEX, it is also possible to observe how companies adjust their investment strategies in different economic environments, providing cases and experiences to cope with economic fluctuations.Since CAPEX is closely related to other financial indicators (e.g., operating income, net profit, cash flow, etc.), a comprehensive analysis can lead to a more comprehensive conclusion. Overall, using CAPEX as the dependent variable can comprehensively reflect a company's investment decision, facilitate data collection and analysis, have strong explanatory power and practicality, and provide valuable insights and references for corporate managers and policy makers. empirically

2.2.2 Control variables

Choosing the same company size, interest rate fixed at 0.015 and employment rate fixed at 0.96 as control variables aims to ensure the accuracy and reliability of the research results. Same firm size eliminates the influence of scale effect on investment decisions, interest rate fixed at 0.015 controls the variation of financing cost to avoid confounding effect, and employment rate fixed at 0.96 reflects the stability of the economy and reduces the interference of its fluctuations on investment decisions. The choice of these control variables helps us to analyze more clearly the independent effects of other macroeconomic indicators on the firm's investment.

Table 1. Variable Description

Type	Variable	Symbol	Variable definition
Dependent	Capital expenditure	CAPEX	CAPEX is spending on physical assets like buildings and equipment.
Independent	GDP Growth Rate	GDPGR	GDP Growth Rate shows how a country's economy grows or shrinks.
	Purchasing Managers' Index	PMI	PMI measures the economic health of the manufacturing and services sectors.
	Consumer Price Index	CPI	CPI measures changes in the price level of a basket of consumer goods and services.
	Producer Price Index	PPI	PPI measures changes in the selling prices received by domestic producers for their output.
	Broad Money Supply	M2	M2 measures the money supply, including cash, checking deposits, and easily convertible near money.
	Import	IMP	Import refers to the act of bringing goods or services into a country from abroad for sale.
Control	Firm size	Size	Total assets are in the order of magnitude
	Interest	INT	Interest is the cost of borrowing money, typically expressed as a percentage of the loan amount.
	Employment Rate	ER	ER measures the proportion of a country's working-age population that is currently employed.

2.3. Modelling

To study the effect of GDP Growth Rate, Purchasing Managers' Index, Consumer Price Index, Producer Price Index, Broad Money Supply, Import, on CAPEX of investment in manufacturing firms Eq (1) is established, where CAPEX is the dependent variable and Controls denotes each control variable.

$$\mathrm{CAPEX}_{i,t} = \alpha_0 + \alpha_1 \mathrm{GDPGR}_{i,t} + \alpha_2 \mathrm{PMI}_{i,t} + \alpha_3 \mathrm{CPI}_{i,t} + \alpha_4 \mathrm{PPI}_{i,t} + \alpha_5 \mathrm{M2}_{i,t} + \alpha_6 \mathrm{IMP}_{i,t} + \sum \mathrm{Control}_{i,t} + \sum \mathrm{IND} + \sum \mathrm{YEAR} + \varepsilon_{i,t} \quad (1)$$

3. Empirical Results

3.1. Descriptive Statistics

Table2 presents descriptive statistical information for the seven variables. The mean value of CAPEX is 2.599, with a minimum to maximum range of 0.265 to 13.218, suggesting that firms vary widely in their capital expenditures, and the mean values of both CPI and PPI are greater than 100. The other macroeconomic variables are less volatile and relatively stable.

Table 2. Summary statistics

Variable	N	Mean	S.D.	Min.	Max.
CAPEX	240	2.599	2.370	0.265	13.218
GDPGR	8	0.059	0.021	0.022	0.084
PMI	8	0.502	0.016	0.407	0.519
CPI	8	101.925	0.627	100.900	102.900
PPI	8	101.660	4.546	94.800	108.100
M2	8	0.196	0.043	0.139	0.266
IMP	8	1.393	0.280	1.043	1.804

3.2. Correlation analysis

Table 3 shows the correlation between seven variables. The results show that capital expenditure (CAPEX) is significantly and positively correlated with GDP growth rate (GDPGR), Purchasing Managers' Index (PMI), and Producer Price Index (PPI), suggesting that economic growth, economic activity, and rising producer prices promote firms to increase investment. In addition, PPI and imports (IMP), and money supply (M2) and imports (IMP) are also significantly and positively correlated, reflecting the impact of production costs and market liquidity on import behavior. These correlations suggest that the macroeconomic environment has a significant impact on firms' capital expenditure and import decisions.

Table 3. Correlation matrix

Variable	CAPEX	GDPGR	PMI	CPI	PPI	M2	IMP
CAPEX	1.000						
GDPGR	0.003***	1.000					
PMI	0.001***	0.641	1.000				
CPI	0.430	0.121	0.893	1.000			
PPI	0.001***	0.539	0.697	0.315	1.000		
M2	1.166	0.211	0.226	0.895	0.179	1.000	
IMP	7.270	0.448	0.166	0.924	0.081*	0.001***	1.000

*p < 0.1, **p < 0.05, ***p < 0.01

3.3. Regression Results

Table 4 presents the results of the multiple regression analysis of the relationship between capital expenditures (CAPEX) and several macro indicators, specifically for companies in the manufacturing sector. The analysis and interpretation of each variable is presented below:

Table 4. Regression results for the impact of CAPEX on financial performance

Variables	CAPEX
GDPGR	5.749
	(15.899)
PMI	1.682
	(13.367)
CPI	-0.393*
	(0.337)
PPI	-6.145*
	(6.225)
M2	31.522*
	(25.206)
IMP	8.494
	(397.599)
YEAR	YES
INDUSTRY	YES
N	240
R-Squared	0.217

*p < 0.1, **p < 0.05, ***p < 0.01

The results show that GDPGR and PMI do not have a significant effect on CAPEX, either because these macroeconomic indicators do not have a significant direct effect on firms' capital expenditures in the short run or because other factors play a greater role in influencing investment decisions.

CPI and PPI show a significant negative correlation, with regression coefficients of -0.393 ($p < 0.1$) for CPI and -6.145 ($p < 0.1$) for PPI, suggesting that firms are likely to reduce their capital expenditures when the Consumer Price Index (CPI) and Producer Price Index (PPI) increase. This may be attributed to inflationary pressures that have increased the operating costs of businesses, thereby reducing the funds available for investment. On the contrary, M2 shows a significant positive correlation on CAPEX (coefficient of 31.522, $p < 0.1$) indicating that firms are more likely to increase their capital expenditures when there is an increase in money supply, probably because of the increase in liquidity in the market, which makes it easier for firms to obtain financing and thus increase their investments.

The insignificant effect of IMP on CAPEX may be due to the fact that fluctuations in imports do not directly affect the firm's investment decisions or their effect is masked by other variables. The R-squared value of the model is 0.217, indicating that the model explains 21.7% of the variance in CAPEX and that there are other factors that may have a significant impact on CAPEX. These findings help to understand how the macroeconomic environment affects firms' investment decisions. Future research could further expand the range of variables to improve the explanatory power of the model.

This analysis shows that while the direct impact of most macroeconomic indicators on capital expenditures is not significant, CPI and PPI have a significant negative impact on capital expenditures, reflecting the dampening effect of inflationary pressures on business investment. In contrast, an increase in the money supply (M2) had a significant positive effect on capital expenditures, suggesting that abundant liquidity promotes business investment. Although other variables such as GDPGR and PMI did not show a significant impact, these macroeconomic indicators remain important in the comprehensive assessment of firms' financial health and investment decisions. The results of the robustness test further confirm these findings. Firm managers should focus on inflation control and optimizing financing strategies, while investors should focus on a firm's liquidity management and ability to cope with inflation in order to make informed decisions in different macroeconomic environments. These results provide a reliable reference for managers and investors.

3.4. Robustness Check

Table 5. Robustness results for the impact of CAPEX on financial performance

Variables	2015-2018	2019-2022
GDPGR	3.765	5.036
	(10.439)	(9.658)
PMI	3.321	6.394
	(10.451)	(16.332)
CPI	-1.759*	-0.531*
	(0.561)	(0.362)
PPI	-8.365*	-3.243*
	(3.195)	(1.784)
M2	25.788**	35.556*
	(15.301)	(20.854)
IMP	10.964	4.963
	(406.362)	(296.719)
YEAR	YES	YES
INDUSTRY	YES	YES
N	120	120
R Square	0.181	0.196

*p < 0.1, **p < 0.05, ***p < 0.01

This table presents the results of the regression analysis for two time periods, 2015-2018 and 2019-2022, with robustness checks of capital expenditures (CAPEX) against other macro indicators and controlling for year and industry fixed effects.

During the period 2015-2018, GDPGR and PMI had insignificant effects on CAPEX, suggesting that short-term economic growth fluctuations and manufacturing economic activity have less impact on firms' capital expenditures. However, CPI and PPI show significant negative correlations with CPI regression coefficients of -1.759 ($p < 0.1$) and PPI regression coefficients of -8.365 ($p < 0.1$), suggesting that inflation and rising production costs dampen firms' capital expenditures. Money supply (M2), on the other hand, shows a significant positive correlation (coefficient of 25.788, $p < 0.05$), suggesting that firms are more likely to increase their capital expenditures when there is an increase in liquidity.The effect of IMP on CAPEX is not significant, probably because import volatility has a lesser direct impact on investment decisions.

During the 2019-2022 period, the impact of GDPGR and PMI on CAPEX remains insignificant, continuing the previous trend, further demonstrating the low direct impact of these macroeconomic indicators in the manufacturing industry.CPI and PPI continue to exhibit a significant negative correlation, with a CPI regression coefficient of -0.531 ($p < 0.1$) and a PPI regression coefficient of -3.243 ($p < 0.1$), suggesting that inflationary pressures and rising production costs continue to have a dampening effect on business investment. Money supply (M2) maintains a significant positive correlation (coefficient of 35.556, $p < 0.1$), which further validates the boosting effect of increased liquidity on firms' capital expenditures. The effect of IMP on CAPEX, on the other hand, remains insignificant, possibly due to the fact that import volatility fails to directly affect firms' investment decisions, or its effect is masked by the role of other more important variables.

Overall, these results suggest that inflationary pressures and rising production costs have a dampening effect on business investment in both time periods, while increased liquidity promotes investment. Specifically, the negative correlation between CPI and PPI suggests that inflation and rising production costs cause firms to reduce capital expenditures, possibly because these factors increase operating costs and reduce the funds available for investment. On the other hand, the positive correlation of money supply (M2) suggests that when liquidity increases in the market, firms have easier access to finance and thus increase capital expenditures.

Based on the results of these analyses, corporate managers should focus on inflation control and optimizing financing strategies to ensure investment capacity and operational efficiency in different macroeconomic environments. Specifically, managers can take steps to control costs, respond to inflationary pressures, and proactively seek financing opportunities to support the firm's capital expenditures and long-term projects when the money supply increases [10]. Investors, on the other hand, should focus on a company's financial health and market liquidity, and choose to invest in companies that are able to effectively control costs in an inflationary environment and have expansion plans in times of easy liquidity. In addition, a comprehensive assessment of the long-term impact of macroeconomic indicators on companies, focusing on factors such as market demand, industry outlook and technological innovation, will help make more informed investment decisions. These recommendations will help managers and investors to better respond to macroeconomic changes and improve the quality of their decisions.

4. Conclusion

Through multiple linear regression analysis and robustness tests on data for two time periods, 2015-2018 and 2019-2022, we provide insights into the impact of macroeconomic indicators on the capital expenditures (CAPEX) of firms in the manufacturing industry. The results show that the Consumer Price Index (CPI) and Producer Price Index (PPI) have a significant negative impact on CAPEX, reflecting the inhibitory effect of inflationary pressure and rising production costs on corporate investment. Specifically, as CPI and PPI rise, firms' operating costs increase, leading to a decrease in the funds available for capital expenditures, thus dampening investment activities.

On the other hand, money supply (M2) shows a significant positive correlation indicating that abundant liquidity promotes capital expenditures by firms. Increased liquidity in the market makes it easier for firms to obtain financing, which supports their long-term investment and growth strategies. The insignificant effect of GDP growth rate (GDPGR), Purchasing Managers' Index (PMI), and Imports (IMP) on CAPEX suggests that these factors have less direct impact in the manufacturing industry, probably due to the fact that the industry is less sensitive to macroeconomic fluctuations and more reliant on long-term R&D investment and technological innovation.

Taking into account the results of the above analysis, we recommend that corporate managers should focus on inflation control and optimizing financing strategies to ensure that investment capacity and operational efficiency are maintained in different macroeconomic environments. Specific measures include adopting cost-control strategies when inflationary pressures are high and actively seeking financing opportunities to support capital expenditures and long-term projects when liquidity increases. For investors, they should focus on a company's liquidity management and ability to cope with inflation, and select companies that can effectively control costs in an inflationary environment and have expansion plans in times of easy liquidity [11].

This study also has some limitations. First, the research data only covers some companies in the manufacturing industry and may not fully reflect the investment behavior of the whole industry. Second, the selection of macroeconomic indicators, although representative, may have omitted some other important factors, such as policy changes and global market volatility. In addition, the specific economic environment during the study period may also affect the universality of the results, such as the COVID19, which had a significant impact on the manufacturing industry.

Future research can improve the universality and reliability of the findings by expanding the sample to cover more companies from different industries and regions. Further research could also incorporate more macroeconomic indicators and microeconomics variables to analyze in depth their impact on corporate investment decisions. Meanwhile, considering the dynamic changes in the global economic environment, future research should focus on corporate investment behavior under different economic cycles and policy contexts, so as to provide more comprehensive guidance for managers and investors. In conclusion, understanding the impact of macroeconomic indicators on corporate investment decisions can help managers and investors make more informed decisions in different economic environments, thereby promoting the sustainable development of the manufacturing industry.

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