The feasibility of using PMI as an economic forecasting indicator

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01 INTRODUCTION

Introduction

- **Why is it important to forecast economic development?**

  - A strong economy **drives a country’ s development**.
  - Economic conditions **affect countries, companies, and households.**
  - A country needs a strong economy to **support investments**.
  - Companies rely on it to **stay competitive**.
  - Families depend on it **for education, consumption, and healthcare.**

Introduction

- **Why is it important to forecast economic development?**

Forecasting economic trends helps governments plan policies.

Firms can adjust production and investment based on forecasts.

Households can plan savings and spending wisely.

Introduction

- **The critical role of manufacturing in China’s economic development.**

- Manufacturing is a key part of China’ s economy, making up about 30% of GDP.
- It creates many jobs, and the PMI shows companies’ hiring plans.
- Growth in manufacturing boosts investment, equipment purchases, and technology upgrades.
- The PMI helps predict future economic trends.

Introduction

• Significance of PMI

- China’ s manufacturing is shifting to high-end and intelligent production.
- Some low-value industries moving abroad reduce jobs and pressure upgrading.
- PMI tracks production, orders, employment, and inventories, signaling economic trends early.
- Governments, firms, and households can use PMI to guide decisions.

Introduction

- **Research Problem**

Can PMI indicate China's future economic trends?

- **Objectives**

- Analyze the relationship between China's PMI and economic indicators
- Test whether PMI has predictive power
- Provide managerial and policy implications

02 LITERATURE REVIEW

• Definition and composition of PMI

- PMI is a monthly index based on surveys of enterprise purchasing managers.
- It reflects the economic activity of a country or region and is internationally recognized.
- Covers manufacturing and non-manufacturing sectors, showing overall economic trends.
- Acts as a leading indicator, capturing economic turning points.
- PMI ranges from 0–100%: above 50% = expansion, below 50% = contraction.
- The further from 50%, the stronger the expansion or contraction.

• PMI and economic growth

- PMI signals economic trends earlier than GDP, making it useful for monitoring and short-term forecasting [2].
- PMI thresholds indicate different economic effects [3]:

  54.22 → industrial product prices (PPI) rise

  32 → consumer prices (CPI) rise

  37.6 → secondary industry value-added growth increases
- Financial markets respond quickly and asymmetrically to PMI announcements[4].

• The particularity of China's economy

- China’ s manufacturing drives ~30% of GDP and is highly export-oriented.
- Government policies support competitiveness (savings, exchange rate, tax incentives).
- Manufacturing cycles transmit changes in demand quickly, affecting employment and investment.
- High-frequency indicators like PMI are valuable for monitoring and forecasting economic trends.

03 DATA AND METHODOLOGY

• Data Sources

- Data are from China’ s NBS and publicly available.
- Monthly PMI, industrial value added, and exports from Jan 2020 to Nov 2025.
- Official and reliable for reproducible research.

DATA AND METHODOLOGY

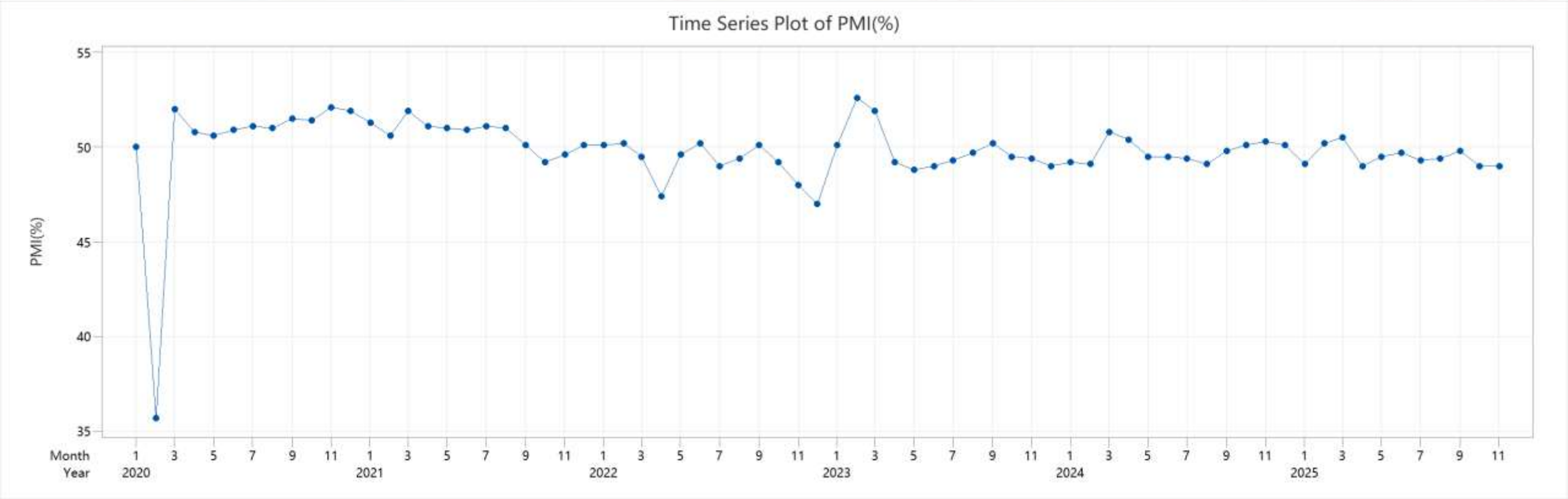
• Statistical Methods

- Analyze PMI and economic indicators using descriptive stats and Pearson correlation.
- Use regression to test relationship strength.
- Apply ARIMA and VAR to evaluate PMI’ s predictive power.

04 DATA ANALYSIS

DATA ANALYSIS

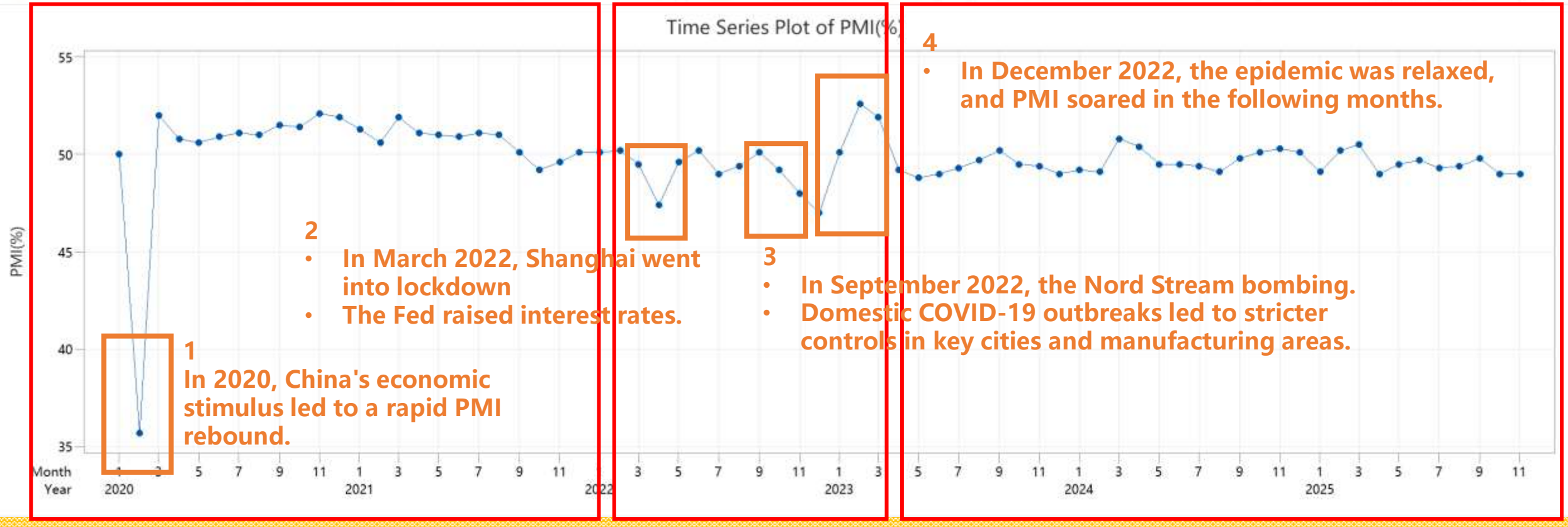
- **China PMI Trends (2020-2025)**



DATA ANALYSIS

• China PMI Trends (2020-2025)

2020-2022 | **2022-2023** | **2023-2025**



- Active fiscal and prudent monetary policy
- PMI stabilized in the 50% area

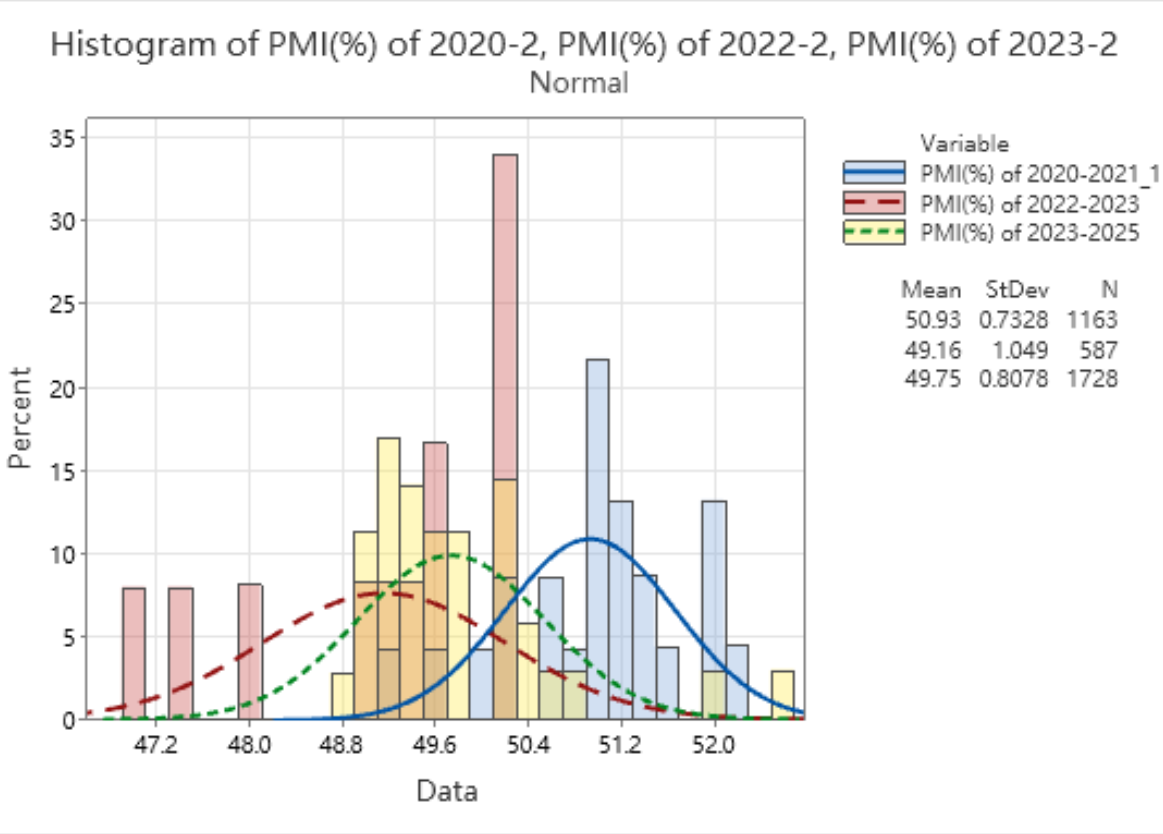
- The epidemic broke out
- The Federal Reserve raised interest rates

- In the post-epidemic era, fiscal policy is "more active"
- Monetary policy is "moderately loose". Most of the PMI is in the sub-50% zone。

DATA ANALYSIS

- **Histogram**

Histogram of PMI (%) of 2020-2021, PMI (%) of 2022-2023, PMI (%) of 2023-2025



- **Time periods based on PMI trends:**
  2020–2022: Early epidemic stage
  2022–2023: Epidemic deterioration
  2023–2025: Post-epidemic period
- **Data adjustment: Excluded February 2020 extreme value for clarity.**
- **PMI interpretation:**
  Above 50% → economic expansion
  Below 50% → economic contraction
- **Stage highlights:**
  2020–2022: Avg. PMI 50.93% → expansion
  2022: Avg. PMI 49.16%, SD 1.049 → contraction with high volatility
  2023–2025: Avg. PMI 49.75%, SD 0.81 → contraction with smaller fluctuations

Correlations Analysis

PMI vs Employee, Production, NewExport, Import, NewOrder

Correlations

	PMI(%)	Employee(%)	Production(%)	NewExport	Import
Employee(%)	0.847				
Production(%)	0.886	0.819			
NewExport	0.537	0.517	0.490		
Import	0.712	0.714	0.642	0.791	
NewOrder	0.798	0.817	0.747	0.646	0.832

- **PMI–Production**: r = 0.886 → very strong correlation; closely reflects industrial production.
- **PMI–Employee**: r = 0.847 → very strong correlation; reflects employment changes.
- **PMI–New Orders:** r = 0.798 → strong correlation; driven by new orders, indicating economic prosperity.
- **PMI–Import:** r = 0.712 → strong correlation; expansion in PMI corresponds to increased imports for production.
- **PMI–Export:** r = 0.537 → moderate correlation; exports influence PMI but are less significant than imports.

• Regression Analysis

Employee(%) versus PMI(%), Production(%), Import, NewOrder

Regression Equation

Employee(%) = 9.50 + 0.351 PMI(%) + 0.1550 Production(%) + 0.0350 Import + 0.2337 NewOrder

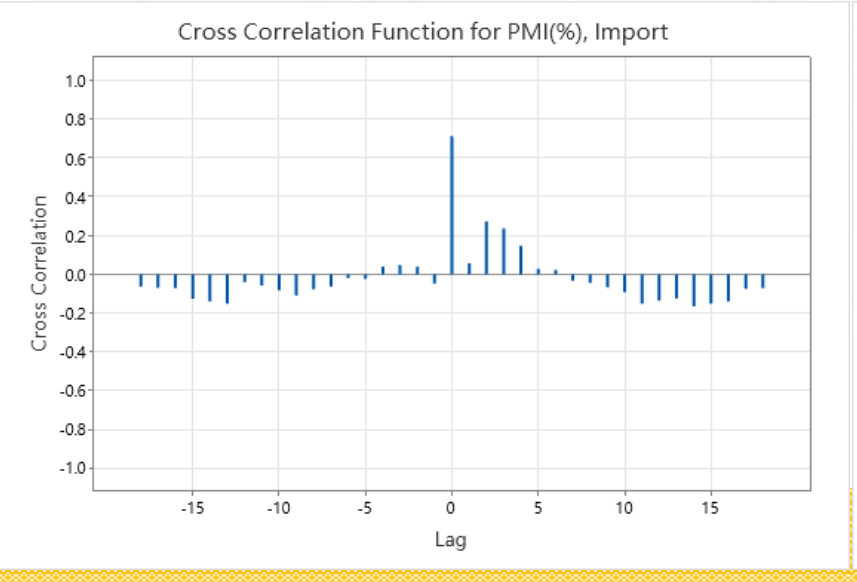
Coefficients

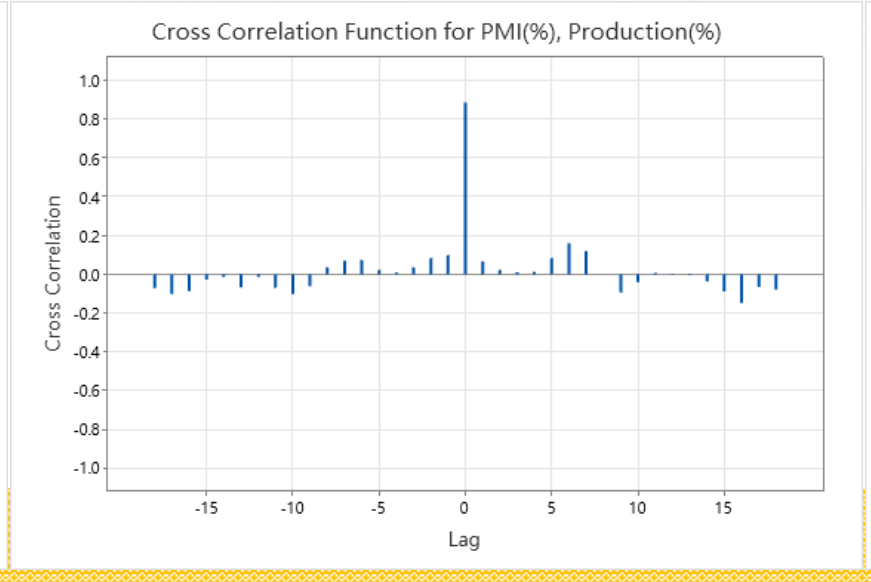
Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	9.50	3.74	2.54	0.013	
PMI(%)	0.351	0.150	2.35	0.022	5.93
Production(%)	0.1550	0.0757	2.05	0.045	4.79
Import	0.0350	0.0849	0.41	0.681	3.34
NewOrder	0.2337	0.0861	2.71	0.008	4.60

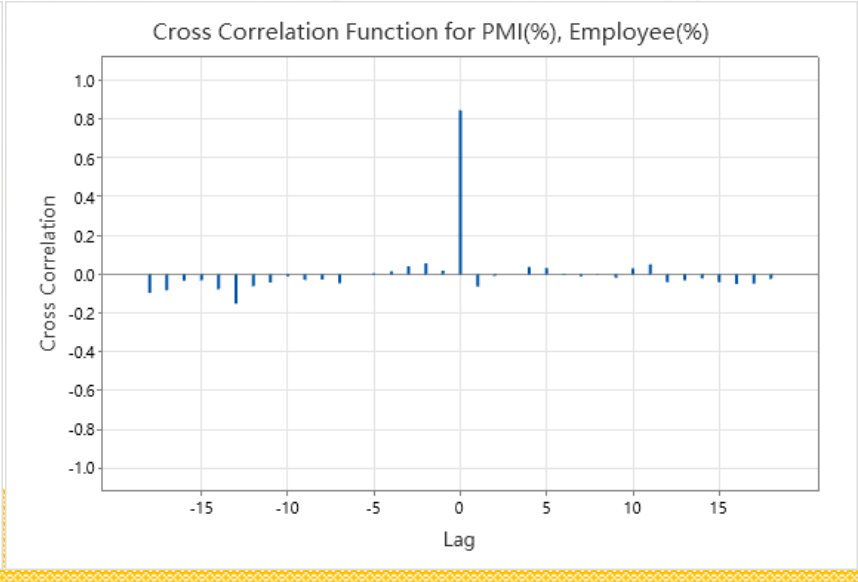
- PMI, production, and new orders are **highly correlated with employment (P < 0.05).**
- **Combining PMI with production and new orders improves forecasting capability.**
- **Government**: Can anticipate industrial output and employment pressures.
- **Enterprises:** Can adjust inventory and procurement plans.
- **Households:** Can anticipate employment risks and income trends.

• Cross Correlation

Employee(%) versus PMI(%), Production(%), Import, NewOrder



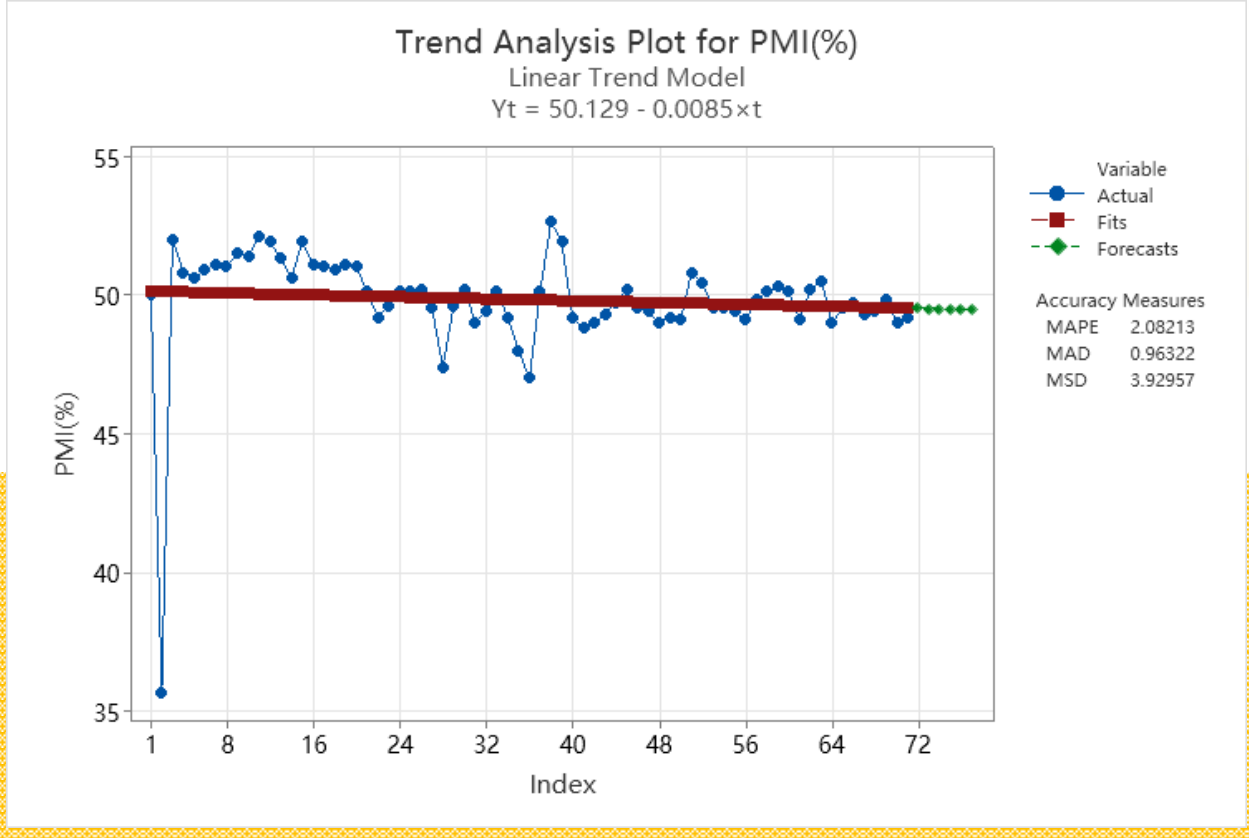




- PMI is highly in sync with production (CCF ≈ 0.88), employment (CCF ≈ 0.85), and imports (CCF ≈ 0.88).
- **Reflects current economic activity — a reliable real-time economic indicator.**
- **Government:** Guides fiscal and monetary policy decisions.
- **Enterprises:** Supports production planning, inventory, and workforce allocation.
- **Household:** Informs employment outlook and consumption decisions.

Model prediction results

Trend Analysis for PMI(%)



- PMI slowly declines from 49.51% to 49.47%, near 50%: **growth momentum weakens but still in expansion**.
- **Government:** Monitor slowdown; moderate fiscal stimulus; avoid over-investment.
- **Enterprises:** Control inventory; delay large investments; focus on cash flow and production-order alignment.
- **Households:** Adjust consumption; reduce risky investments; plan spending carefully.

PMI Analysis: Key Insights

- **PMI as an Indicator: Reflects economic prosperity and expansion/contraction trends.**
- **Can guide decisions at different levels:**

  Government: Adjust policies; monitor employment & investment.

  Enterprises: Optimize production, inventory, investment.

  Households: Assess jobs, income, consumption & investment.
- **Predictive Use:**

  Helps anticipate economic fluctuations and improve risk management.

  Must consider macro environment & shocks (e.g., epidemics, supply chains, international uncertainties).
- **Limitations:**

  Survey-based → subjective.

  Focuses on manufacturing → limited view of services.

  Correlation ≠ causation → use as reference, not absolute prediction.

Thanks