



Impacts of The Macroeconomic Environment on Financial Markets--Empirical Study Based on VAR Modeling

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Abstract. In the modern economic system, the interactions between macroeconomic variables and financial markets constitute a complex and closely related network of relationships. This study aims to systematically analyze the impact of macroeconomic variables on China's financial market and its transmission mechanism. In this paper, the monthly total import and export, consumer price index (CPI), money supply (M2) and unemployment rate from January 2018 to April 2024 are selected as the main macroeconomic indicators, and the SSEC composite index and interbank lending rate are taken as the representative variables of the financial market, and a vector autoregression (VAR) model is constructed to reveal how the above macroeconomic variables affect the financial market through multiple paths of The VAR model is constructed to reveal how the above macroeconomic variables affect the dynamics of the financial market through multiple paths. Finally, it is concluded that the total amount of import and export, money supply and unemployment rate have a negative impact on the interbank lending rate, while the consumer price index has a positive impact on it; the SSEC index is weakly affected.

Keywords: Macroeconomics; financial markets; vector autoregressive model

1 Introduction

In modern economic systems, the interaction between macroeconomic variables and financial markets constitutes a complex and closely related network of relationships. Macroeconomic fluctuations not only directly affect the behavior of economic agents, but are also transmitted to the financial market through various mechanisms, thus affecting asset prices, market liquidity and investor expectations. This study aims to systematically analyze the impact of macroeconomic variables on China's financial market and their transmission mechanisms. In this paper, total imports and exports, consumer price index (CPI), money supply (M2) and unemployment rate are selected as the main macroeconomic indicators, while SSEC composite index and interbank lending rate are selected as the representative variables of the financial market. The vector autoregressive model is the main methodological choice for this study due to its ability to deal with the dynamic relationship of a multivariate system and capture

the interactions and feedback mechanisms between variables in time series data. The model not only helps to identify the shock transmission paths, but also quantifies the short- and long-term impacts of macroeconomic shocks on the financial market through tools such as impulse response functions and variance decompositions. This paper first summarizes the relevant studies in recent years and describes the source of the model. Subsequently, it introduces the data sources and data processing methods, and conducts variance decomposition and impulse response analysis based on the processed data. Finally, conclusions and recommendations are made based on the results of the modeling.

2 Thesis Review

In recent years, researchers have made extensive use of high-frequency data and advanced econometric models to analyze in-depth the impact of macroeconomic variables on financial markets. Stavroula and Vasiliki, Yi, Yang and Li investigated the impact of macroeconomic uncertainty on financial market volatility using a machine learning model [1-2]. They found that macroeconomic policy uncertainty significantly affects investor confidence, which leads to market volatility. This finding has important implications for understanding how policy changes affect markets through investor expectations.

Regarding the impact of total exports and imports on financial markets, DeLisle and Wang, Yüksel, Atawnah, Balachandran and Duong, & Podolski et al. showed that international trade has a significant impact on domestic financial markets [3-4]. They found that export growth usually signals improved corporate profitability, which drives up the stock market, while increased imports are also seen as a signal of strong domestic demand, which positively affects market sentiment. These results emphasize the spillover effects of global trade on a country's financial markets.

Thorbecke analyzed the impact of deflation on the stock market [5]. The study shows that highly expansionary policies create financial instability by pushing investors into riskier, higher yielding assets, which underperform when the Federal Reserve tightens its policies.

Olaschinde-Williams, Olanipekun, & Özkan, study stated that the change in money supply under quantitative easing policy has a significant effect on financial markets [6]. The causal effect of quantitative easing policy on stock market volatility and return becomes significant during the exceptional period and the causal effect of stock market return and volatility varies over time; it also has a greater effect on stock market return than on stock market volatility.

Deven B., Riza D., Rangan G., and Kevin K. find that the influence of money market dynamics on fluctuations in unemployment is similar to the effect of exchange rate changes on firms' investment choices, which then influence labor market trends [7]. The relationship between exchange rates and unemployment may also indicate the impact of monetary policy decisions, which then affect financial markets. There are significant information spillovers between the labor market and money market, which have critical implications for policy formulation.

Vector autoregressive (VAR) model is a multivariate time series model that is widely used in macroeconomic research. Sims first proposed the VAR model with the aim of overcoming the limitations of the traditional single-equation model by considering the dynamic relationship of multiple variables simultaneously [8]. Lütkepohl elaborated the theoretical basis and application method of the VAR model in detail in his work, pointing out that the VAR model has a analyzing the interaction of macroeconomic variables has high explanatory power and predictive ability [9]. In recent years, the application of VAR model has been further developed and improved. For example, Ji used the VAR model to analyze the dynamic transmission effects of the stock market, monetary policy and the macroeconomy in their study, and found that the VAR model was able to effectively capture the relationships in the complex economic system [10].

3 Data sources and processing

The money supply serves as a direct indicator of a nation's monetary policy and influences a wide array of factors, including financial markets, economic activities, and price levels. Fluctuations in the money supply can swiftly impact market liquidity, which in turn affects short-term interest rates and stock market performance. As such, it stands as one of the most critical metrics for gauging monetary policy and overall economic vitality. Inflation, on the other hand, is a key determinant in shaping economic dynamics. Persistent price increases directly raise production costs for businesses and reduce consumers' purchasing power, thereby influencing market demand and corporate profitability. Furthermore, inflation rates are a primary reference point for central banks when adjusting monetary policy, and interest rate shifts are often tightly correlated with inflation, consequently affecting stock and bond markets. Thus, inflation plays an essential role in analyzing the macroeconomic-financial market relationship. Total imports and exports serve as vital indicators of a country's reliance on external demand and its global competitiveness. Variations in trade volumes not only mirror shifts in global demand but also provide insight into domestic production and consumption trends. This is especially relevant for economies like China, where foreign trade plays a significant role. Changes in trade flows can influence exchange rates, liquidity, and capital market performance, making trade a key variable when studying the intersection of financial markets and macroeconomic trends. Unemployment stands as a crucial barometer of economic health. Elevated unemployment rates often coincide with economic downturns or slow growth, reflecting weakened demand and declining corporate profitability. Shifts in unemployment not only impact consumption levels but also shape investors' perceptions of the economy, which in turn reverberates through financial markets. Consequently, the unemployment rate, as a core labor market indicator, provides valuable insights into financial market movements. In summary, these four macroeconomic variables—money supply, inflation, trade, and unemployment—span various aspects such as monetary policy, price levels, international trade, and labor market conditions. Together, they offer a more comprehensive perspective on the

effects of macroeconomic factors on financial markets, making them ideal for empirical analysis.

3.1 Data Sources

The data used in this study include macroeconomic variables and financial market variables, and the sample is monthly data from January 2018 to April 2024. The sources are as follows: Macroeconomic variables, including total imports and exports, money supply M2, unemployment rate, and consumer price index are from the National Bureau of Statistics. The financial market variables, including the SSEC and SHIBOR are obtained from the Cathay Pacific database. The raw data are daily data, which are averaged by month and transformed into monthly data. The consumer price index is denoted by cpi, broad money supply by m2, total imports and exports by t, unemployment rate by ur, SSEC index by sh, and interbank lending rate by shibor.

3.2 Data Processing

The organized data were imported into Eviews and unit root tests were performed separately to determine the smoothness of each variable. The test results are shown in Table 1. Among them, the original series of broad money supply, total import and export, SSEC index and unemployment rate are not smooth, and based on table 1, they are smooth after the first-order difference treatment. The ADF test is used for all except the generalized money supply. The generalized money supply needs second-order differencing to be smooth under the ADF test, but for an economic variable, the second-order differencing is not economically significant, so the results of the PP test are used.

Table 1. Test of stationarity

variable	ADF test			conclusion	point
	t-statistic	1% threshold	5% threshold		
cpi	-7.17022	-3.52031	-2.90067	Y	I(0)
m2	2.054567	-3.52158	-2.90122	N	I(1)
$\Delta m2$	-12.0249	-3.52158	-2.90122	Y	I(0)
t	-2.33632	-3.52289	-2.90178	N	I(1)
Δt	-9.40258	-3.52423	-2.90236	Y	I(0)
ur	-2.58671	-3.52158	-2.90122	N	I(1)
Δur	-7.46031	-3.52289	-2.90178	Y	I(0)
sh	-2.39039	-3.52031	-2.90067	N	I(1)
Δsh	-8.86978	-3.52158	-2.90122	Y	I(0)
shibor	-3.10037	-3.52158	-2.90122	Y	I(0)

4 Empirical Analysis

4.1 Granger Causality Test

After obtaining the smooth series, Granger causality test is conducted and the results are shown in Table 2. First, since the primary focus of this analysis is the effect of macroeconomic variables on SSEC returns and interbank lending rates, these two variables are positioned last. Second, when excluding these two factors, it becomes evident that the weak exogeneity of the money supply growth rate is more pronounced. This is because, during the same time frame, the money supply growth rate is only influenced by changes in the unemployment rate, whereas the unemployment rate is also impacted by changes in the money supply. This is why the money supply growth rate is prioritized. Additionally, the growth rates of CPI and total imports and exports are only affected by changes in the money supply, which is why they are ranked after it. Generally, based on the cost pass-through principle, the state of import and export trade influences domestic consumer goods prices, so the growth rate of total imports and exports is placed ahead of CPI. Finally, the unemployment rate change is ranked after these three variables. It can be determined that the Cholesky decomposition order is basically as follows:

$$\Delta m2 \rightarrow \Delta t \rightarrow cpi \rightarrow \Delta ur \rightarrow shibor \rightarrow \Delta sh$$

Table 2. Results of the Granger causality test

H0: A is not the reasons for Granger of B						
explanatory variable (A)	predicted variable (B)					
	cpi	$\Delta m2$	Δt	Δur	shibor	Δsh
cpi	---	Y	Y	N	Y	Y
$\Delta m2$	N	---	N	N	Y	Y
Δt	Y	Y	---	N	Y	Y
Δur	Y	N	Y	---	Y	Y
shibor	Y	Y	Y	Y	---	Y
Δsh	Y	Y	Y	Y	Y	---

4.2 Model Building

According to this order, the VAR model can be ordered. The evaluation results of different lag orders corresponding to different information criteria are shown in Table 3. From the results, lag order 1 and lag order 2 of the VAR model are the better choices. Since a larger order affects the degrees of freedom of the model, which in turn affects the validity of the parameter estimation, order 1 is chosen as the optimal lag order in the case that order 1 and order 2 are equally optimal. Subsequently, the model was subjected to unit root test, and the test results are shown in Figure 1. Therefore, impulse response analysis and variance decomposition can be performed.

Table 3. VAR lag order selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	438.3987	NA	9.99e-14	-12.90742	-12.70999	-12.82930
1	517.5477	141.7594 68.05315	2.77e-14 2.36e-	-14.19545	12.81341*	13.64858*
2	559.7659 *		14*	-14.38107	-11.81441	-13.36544
3	594.8906	50.32792	2.59e-14	-14.35494	-10.60367	-12.87056
4	632.3225	46.92953	2.82e-14	-14.39769	-9.461806	-12.44455
5	673.2203	43.94988	3.07e-14	-14.54389	-8.423398	-12.12200
6	727.6681	48.75922	2.58e-14	-15.09457	-7.789468	-12.20392
7	786.1737	41.91448	2.40e-14	15.76638*	-7.276667	-12.40698
8	817.4546	16.80765	7.29e-14	-15.62551	-5.951187	-11.79736

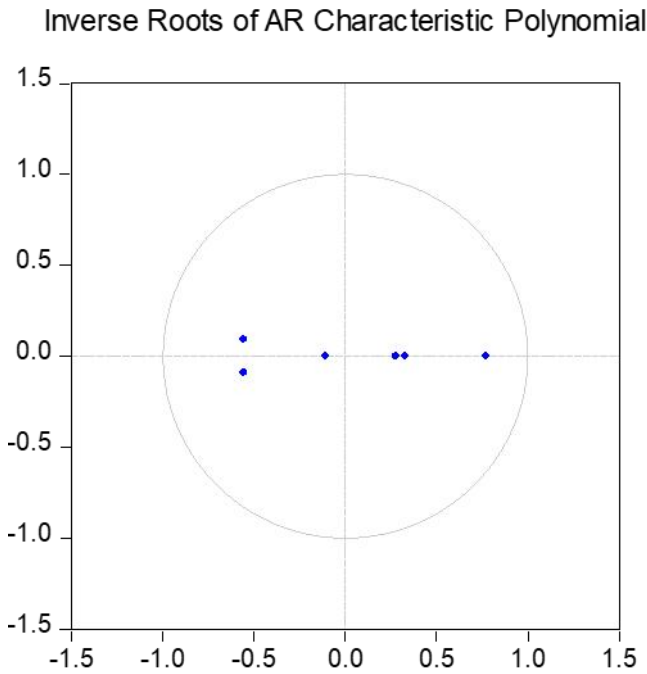


Figure 1. Unit root test results (Picture Credit: Original)

4.3 Impulse Response Analysis

Since the broad money supply, total import and export, unemployment rate, and SSE index have been processed by logarithmic difference, the following discussion of the percentage changes of broad money supply, total import and export, unemployment rate, and SSE index all refer to the percentage changes relative to the original series;

SHIBOR and CPI have not been processed by logarithmic difference, and the unit of the original series are both %, so the following discussion of the percentage changes of SHIBOR and CPI are all changes in absolute sense. CPI percentage changes are all changes in an absolute sense. Let's first analyze the impact of macroeconomic factors on the interbank lending rate (Figure 2). It can be seen that a 1% shock to the broad money supply will negatively affect SHIBOR by 0.24%, a 1% shock to the CPI will positively affect SHIBOR by 0.20%, a 1% shock to total imports and exports will negatively affect SHIBOR by 0.21%, and a 1% shock to the unemployment rate will negatively affect SHIBOR by 0.33%. Turning to the impact of macroeconomic factors on the SHIBOR (Figure 3). a 1% shock to the broad money supply would have a negative impact of 0.5% on the SHIBOR, a 1% shock to the CPI would have a negative impact of 0.4% on the SHIBOR, a 1% shock to total imports/exports would have a negative impact of 0.6% on the SHIBOR, which would then fade to zero, and a 1% shock to the unemployment rate would have a negative impact of a negative impact of 0.11%, which then declines to 0.07%. The results of the variance decomposition show that the variance of the SSE index return and the interbank lending market rate is overwhelmingly self-induced, and that in the long run financial market indicators are limited in their impact by these macroeconomic factors. (Figure 4).

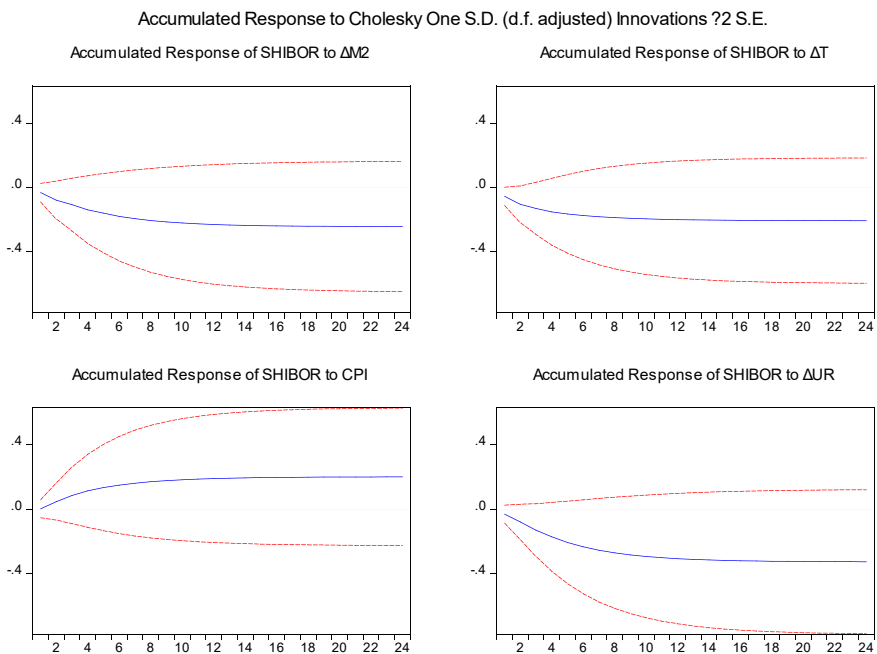


Figure 2. Cumulative impulse response plot to interbank lending rate (Picture Credit: Original)

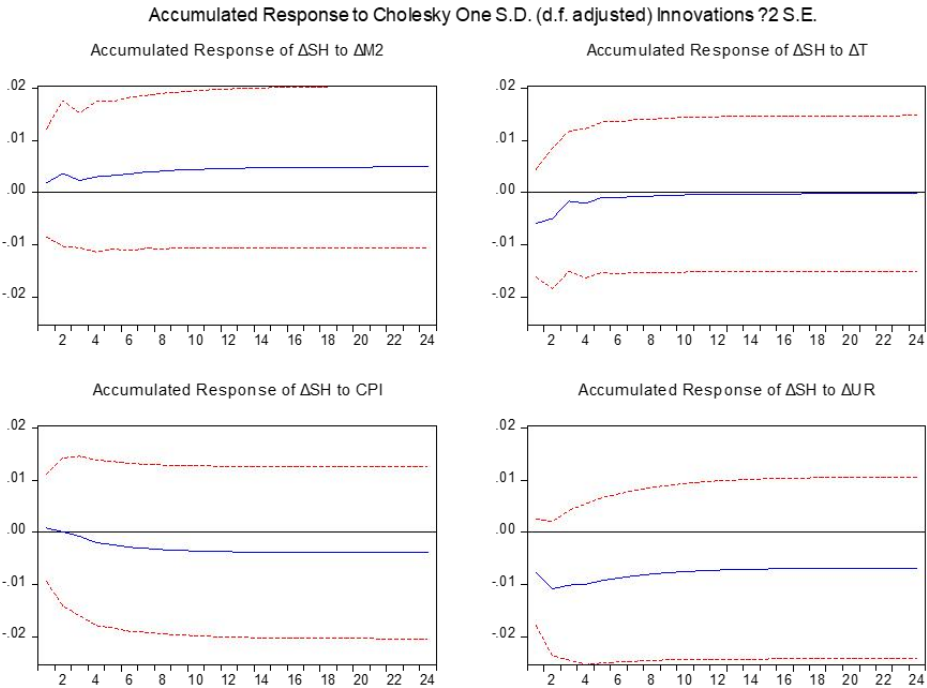


Figure 3. Cumulative Impulse Response Plot to the SSEC Index (Picture Credit: Original)

Variance Decomposition using Cholesky (d.f. adjusted) Factors

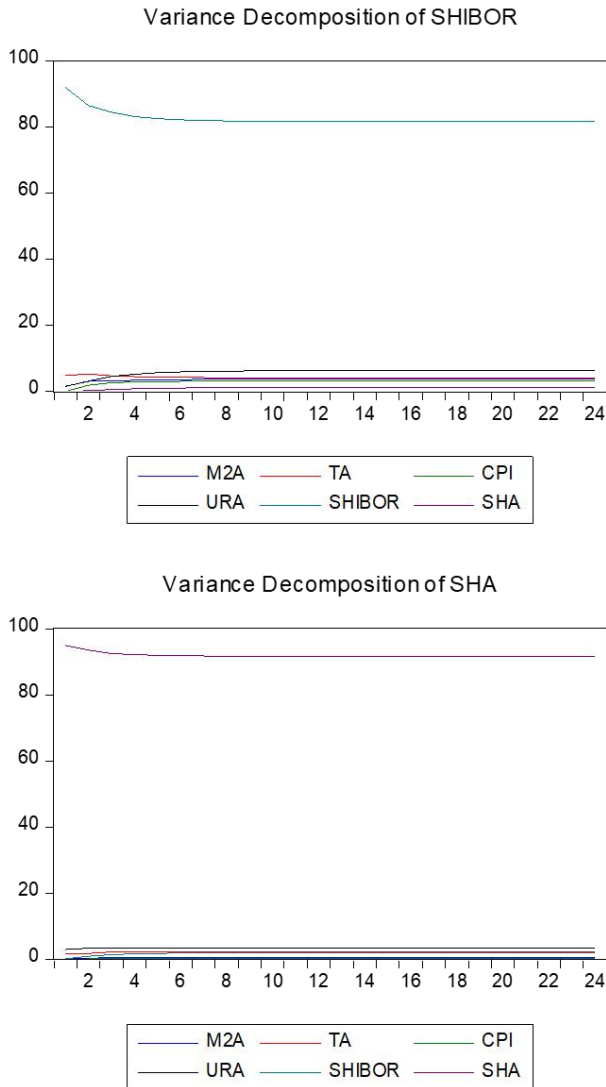


Figure 4. variance decomposition (Picture Credit: Original)

5 Conclusions

An increase in the money supply usually leads to a decrease in short-term interest rates, mainly because of the increase in market liquidity, which makes interbank borrowing less costly and the market more well-funded. This phenomenon can be explained by the monetary easing policies of central banks, which usually stimulate the economy by increasing the money supply, especially in times of economic

downturn or deflationary risks. However, it is important to note that an excessive increase in money supply may raise inflationary risks and weaken long-term economic stability, and thus needs to be carefully weighed in practice. Rising inflation often leads to higher short-term interest rates. This is because heightened inflationary expectations may trigger the central bank to adopt a tight monetary policy, such as raising interest rates to curb inflation and prevent the economy from overheating. However, a sustained rise in inflation will increase the production costs of companies, weakening their profitability, which in turn will have a negative impact on the stock market. In particular, in a high inflationary environment, the expected return of the stock market tends to be dampened as investors' confidence in future economic growth declines, which in turn reduces stock investment. Increases in total exports and imports generally contribute to stronger economic activity and may increase market liquidity, thereby lowering short-term borrowing rates. In particular, an increase in exports may reflect a rise in the international competitiveness of domestic firms, which is somewhat favorable to economic development. However, the impact of international trade on the stock market is relatively complex and may create uncertainty in the short term, especially when the global economic situation is volatile, for example, by protectionist policies or global supply chain disturbances. In the long run, however, stable and growing international trade can have a more significant impact on the stock market, boosting market confidence in the economic outlook. A rise in unemployment usually signals a fall in economic expectations, which in turn leads to a fall in short-term market interest rates. This may be due to the fact that rising unemployment erodes consumer demand and business investment confidence, and central banks may adopt loose monetary policies to stimulate the economy. However, a rise in unemployment rate also implies a slowdown in economic activity, which is usually a negative sign for the stock market and may lead to a fall in share prices. High unemployment rate not only affects the level of consumption, but also weakens corporate profitability, which in turn depresses investors' expectations of economic growth.

The results of the variance decomposition show that the vast majority of the variance of the SSE index return and the interbank lending market rate is caused by their own factors, suggesting that these financial market indicators are more likely to be affected by endogenous factors in the market in the short term, rather than relying exclusively on external macroeconomic variables. This implies that despite the influence of macroeconomic factors on these financial variables, in the long run, these market indicators are more dominated by endogenous market fluctuations. Therefore, the short-term intervention effect of macroeconomic policies on the market may have a lagging effect, and the market's ability to self-regulate cannot be ignored. Based on the above analysis, this paper argues that when formulating macroeconomic policies, it is necessary to take into account various factors such as money supply, inflation, imports and exports as well as the unemployment rate, and to adopt balanced monetary and fiscal policies in order to avoid excessive impacts on the financial market. Particularly during the economic recovery phase, policy uncertainty may trigger sharp market fluctuations, so policymakers need to carefully weigh short-term stimulus against long-term stability. In addition, investors should pay close attention

to changes in macroeconomic indicators, especially the dynamics of money supply and inflation, when making investment decisions. These factors tend to have a direct impact on the market's short-term interest rates and stock market performance, which in turn affect investment returns. At the same time, investors should also give due consideration to the potential impact of indicators such as total imports and exports and the unemployment rate. In optimizing their investment portfolios, they should strengthen risk management and maintain diversification of their investments to cope with potential market volatility. Through in-depth analysis of financial markets and macroeconomic variables, this study provides important insights for policymakers and investors, helping them make more rational and robust decisions in a complex market environment. Follow-up studies can further explore the dynamic impact of different macroeconomic variables on the financial market in different periods to provide more empirical evidence for policymaking. A more comprehensive study combining other economic variables, such as fiscal policy and international market dynamics, is recommended to better understand the complex impact of macroeconomic factors on financial markets.

There are also some shortcomings in the article. Follow-up studies can further explore the dynamic impact of different macroeconomic variables on financial markets in different periods to provide more empirical evidence for policy formulation. A more comprehensive study combining other economic variables such as fiscal policy and international market dynamics is recommended to better understand the complex impact of macroeconomic factors on financial markets.

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