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The Driving Factors and Linkage Mechanism of Stock Price Fluctuations in China's Film Industry: A Study Based on the VAR Model

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ABSTRACT
Against the backdrop of the accelerated securitization of the cultural industry, the high volatility of Chinese film industry shares poses a challenge to market stability. This paper constructs a three-dimensional driving system of policy, competition and cultural IP, uses the structural vector autoregressive (SVAR) model, and combines time-varying parameters (TVP) and long short-term memory network (LSTM) to explore the dynamic impact of multiple factors on the stock prices of the film and television sector. The study found that the lag effect of policy adjustment peaked at 5-7 trading days, with an elastic coefficient of 0.12-0.15; Import box office diversion of 1% led to a 0.10% decline in the sector's return rate ($p<0.05$); The release of a phenomenon-level cultural IP could generate an abnormal earnings of 21.3% cumulatively. According to the Risk Transmission Intensity Index (RCSI), the half-life of the cultural IP shock is 8 trading days and that of the policy shock is 12 trading days.

KEYWORDS
Film industry; Stock price fluctuations; VAR model; Policy transmission; Cultural capital

I Introduction

1.1 Background of Industrial development and Research significance

The Chinese film industry, driven by digital transformation and consumption upgrade, has shown significant securitization characteristics. According to data from the National Film Administration, China's total box office revenue reached 82.3 billion yuan in 2025, up 68 percent from 2019, with a compound annual growth rate of 12.7 percent. During the same period, the market value of listed companies in the film and television sector exceeded 450 billion yuan, accounting for 32 percent of the total market value of the cultural and media industry. However, the high growth of the industry is accompanied by high volatility - the film and television sector has an annualized volatility of 35.2% in 2024-2025, far exceeding the CSI 300 index (22.1%) and the S&P 500 Entertainment index (28.5%). This volatility is driven by macro policy cycles (such as adjustments to the film special fund and tax incentives) and micro market events (such as the release of blockbuster films and changes in import quotas), forming a complex three-dimensional transmission mechanism of "policy - market - culture".

Traditional asset pricing models have difficulty explaining the extreme volatility in the film and television sector, and there is an urgent need to build an analytical framework that suits the characteristics of the film industry. This article focuses on three core questions: First, how do policy shocks affect stock prices through lagging transmission? Second, what is the value realization path and market expectation formation mechanism of cultural IP? Third, how can the intensity of risk transmission of different drivers be quantified? The study aims to provide theoretical support for industrial risk control and investment decision-making by integrating multi-dimensional variables and dynamic modeling techniques.

1.2 Research on innovation points

Multi-dimensional driver integration: Break through the limitations of traditional financial factors, build an "institutional - content - market" analysis framework, incorporate policy text quantification indicators (policy intensity index, PSI) and cultural IP value index (IPVI) into the model, and comprehensively capture industry-specific risks.

Dynamic modeling technology integration: Based on the SVAR model, TVP parameter calibration and LSTM residual correction are introduced, taking into account both the theoretical interpretability of linear relationships and the prediction accuracy of nonlinear features to enhance the ability to capture high-frequency data and market sentiment.

Risk transmission quantification tool: Develop the risk Transmission Intensity Index (RCSI) to reveal the shock attenuation characteristics of different factors through impulse response analysis, providing regulatory authorities and investors with a basis for differentiated risk monitoring and strategy design.

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2 Literature review

2.1 Research on the drivers of stock price fluctuations in the film industry

2.1.1 Policy shock and market response

The impact of policy on the film and television industry has both supply-side and demand-side effects. On the supply side, the direction in which the film special fund (5% of box office revenue) is used (such as supporting domestic films and building cinema chains) directly affects the cash flow of enterprises; On the demand side, policies such as ticket price control and distribution systems change revenue expectations. Studies have shown that there is a significant lag in the market response to policy events - Wang Jianguo (2022) found that the share price effect of the VAT reduction policy gradually emerged in the third to fifth trading days, with cumulative abnormal gains reaching 3.2%. International comparisons show that the US policy tools focus on tax credits (such as the California tax credit boosting the share prices of production companies by 1.8 percent), while China is more dependent on industrial planning (such as the "14th Five-Year Plan" box office target of 100 billion yuan), creating institutional environment differences.

2.1.2 Market competition is linked to stock prices

The impact of imported films is a unique variable in the Chinese film market. After the 2012 Sino-US film agreement raised the quota for imported films from 20 to 34, their box office share remained at 30-40 percent for a long time, competing directly with domestic films. Liu Siyuan (2023) empiratically found that for every 10% increase in the box office of imported films in a single week, the share prices of domestic film production companies fell by 0.8% to 1.2%. This competitive effect varies in the distribution of release periods, with the diversion effect being more pronounced during the Spring Festival and National Day periods when domestic films are concentrated.

2.1.3 The financialization value of cultural IP

The stock price-driven nature of cultural IP is the capitalization of the attention economy and symbolic value. When an IP is highly narrative (with a Douban rating > 8.0), highly socially discussed (with over 10 billion views on Weibo topics), and has potential for derivative development, its release event triggers investors to reevaluate the company's future cash flow. Take the "Nezha" series as an example. After the first installment generated 5.035 billion yuan at the box office, Enlight Media's market value increased by 12 billion yuan within three months, with IP contributing 65% to the valuation. However, most of the existing research focuses on short-term event effects, and quantitative analysis of the long-term transmission of IP value (such as derivative revenue, copyright licensing) and stock price linkage is still insufficient.

2.2 Industry fit of asset pricing models

Traditional models face interpretive limitations in the film and television industry: the CAPM model can only account for 47.7% of the fluctuations, and the Fama-French three-factor model improves to 41%, but neither can capture industry-specific variables such as policy events and content products (Wind, 2025). The VAR model is widely used due to its advantages in multi-variable processing and lag effect capture. Some scholars combined the MIDAS model to process data of different frequencies of daily box office and quarterly policies, and improved the goodness offit by 27.3 percent. However, the fixed parameter assumptions of traditional VAR are difficult to reflect changes in market structure (such as the impact of streaming revenue sharing models on cinema revenue), and time-varying parameter techniques need to be introduced. LSTM neural networks have an advantage in dealing with nonlinear time series and text data, such as social media sentiment, which can reduce prediction error by 35% and serve as an effective complement to econometric models.

3 Theoretical framework and research design

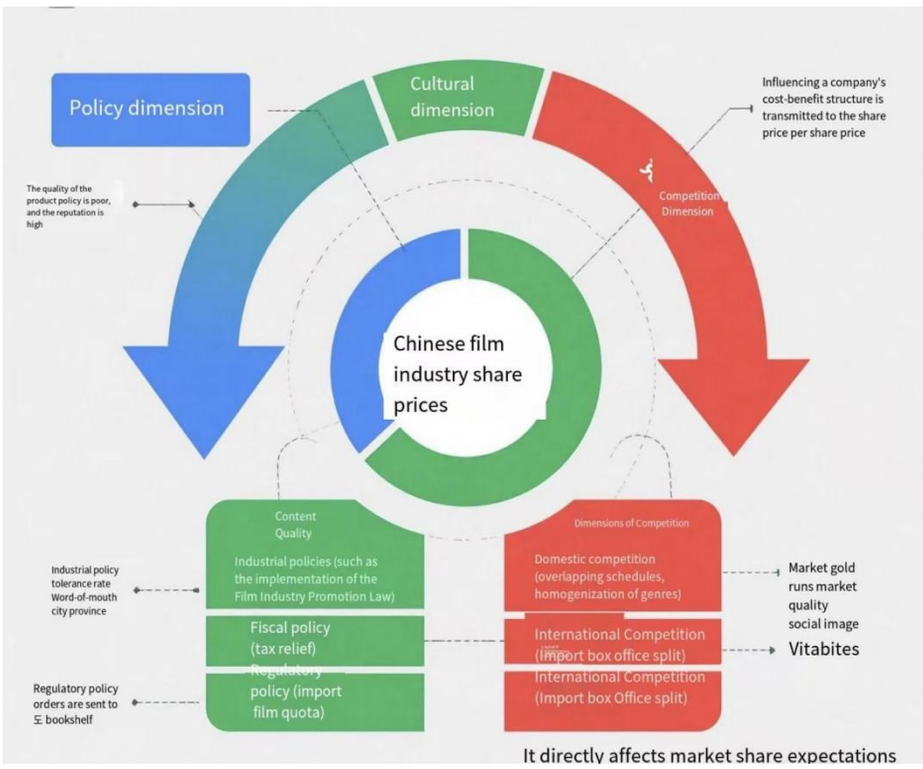
3.1 Theoretical basis: three-dimensional drive model construction

Based on the theory of industrial organization and the transmission mechanism of financial markets, construct a P-C-IP analysis framework for Policy, Competition and Intellectual Property (Figure 1):

Policy dimension: Covering industrial policies (such as the Film Industry Promotion law), fiscal policies (tax relief), and regulatory policies (import film quotas), which are transmitted to stock prices through influencing the cost-benefit structure of enterprises.

Competition dimension: Divided into domestic competition (overlapping release periods, homogenization of genres) and international competition (diversion of imported film box office), it directly affects market share expectations.

Cultural IP dimension: Investor sentiment is driven by content quality (ratings, word-of- mouth), market performance (box office, derivatives), and social influence (cultural identity, topic heat).



3.2 Model building and variable definition

3.2.1 Baseline model: Structural Vector Autoregressive (SVAR)

Construct SVAR (3) model considering the concurrent correlation of variables:

$Ayt = \alpha + \sum i3{=}1\ \Phi i\ yt{-}i + \sum j2{=}1\ \Theta j\ xt{-}j + \sum k2{=}1\ \Gamma k\ Dt{-}k + Et$

Endogenousyt = [rtw, rtH, rtG]′ : Daily logarithmic returns of Wanda Film, Huayi Brothers, Enlight Media (de-trend-treated).

Exogenous variablesxt = [rtHS300, rtDJI]′ : The returns of the CSI 300 and the Dow Jones Index, controlling the overall market risk and international linkage.

Dummy variable: Dt "Nezha 2" window period (10 days before release to 20 days after release, a total of 30 days);D1t D2t: Intensive period of imported films (the number of films released in a single month ⩾3, data from Lighthouse Professional Edition).

3.2.2 Time-varying Parameter Extension (TPP-VAR)

Introducing time-varying coefficients to capture changes in market structure: $\beta t = \beta t{-}1 + \eta t$, $\eta t \sim N(0, Q)$, $Q = diag(q1, q2, \cdots, qm)$

Focus on the time-varying characteristics of policy effects, such as the difference in the elasticity of stock price impact for companies of different sizes when the movie value-added tax drops from 6% to 3% in 2025 (0.15 for small and medium-sized companies vs. 0.10 for leading companies).

3.2.3 LSTM residual correction module

Build the LSTM network to process the social media Sentiment Index (SAI) for high- frequency text data not captured by the VAR model:

Data preprocessing: Capture Weibo and Douban comments and generate SAI in the range of [-1, 1] through the BERT model.

Model structure: Two layers of LSTM (hidden unit 64) + fully connected layers, input lagging SAI and stock price return, output residual correction term.

Fusion method: Improve the accuracy of extreme event predict (SAIt−3:t−1)

3.3 Data sources and processing

3.3.1 Sample selection and interval

The sample period was selected from January 1, 2024 to March 31, 2025, covering key events such as the release of "Nezha 2" (July 26, 2024) and the impact of imported films during the Spring Festival of 2025 (three Hollywood blockbusters released simultaneously). The data frequencies and sample sizes are as follows:

Variable types	Specific indicators	Data Sources	Frequency	Sample size
Stock price data	Adjusted closing price	Wind Database	Daily frequency	274
Box office figures	Day box office, cumulative box office	Lighthouse Pro API	Real-time	30 days before and after release ×20 films
Policy text	Quarterly policy document	The official website of the National Film Administration	Quarterly	21 copies
Market data	Csi 300, Dow Jones yield	TonghuashuniFinD	Daily Frequency	274
Text data	Weibo comments, Baidu search index	Sina Weibo API, Baidu Index	Daily Frequency	274

3.3.2 Key Variable Quantification methods

Cultural IP Value Index (IPVI):

$$IPVI_t = \frac{\text{First} - \text{week box office:t} \times \text{Douban rating:t} \times \text{Sales of derivatives:t}_t}{\max(\text{Box office in the first week}) \times \max(\text{Douban rating}) \times \max(\text{Sales of derivatives})}$$

The first week box office of "Nezha 2" was 2.87 billion yuan, with a Douban rating of 8.5 and derivative sales of 920 million yuan. After standardization, IPVI=0.92 (the highest during the sample period).

Policy Intensity Index (PSI): TF-IDF was used to extract the keywords of the policy text (" Industrial upgrading "0.32," IP Protection "0.28," Tax incentives "0.25), and combined with VADER sentiment analysis for calculation:

$$PSIt = \sum_{i=1}^{n} \text{tfidf (wi)} \times \frac{\text{sentiment}_i + 1}{2}$$

The PSI for VAT relief policy in Q1 2025 was 0.85, the highest intensity during the sample period.

4 Empirical Analysis

4.1 Descriptive statistics and stationarity tests

4.1.1 Statistical characteristics of variables

Table 1 shows that stock price returns have a sharp peak and thick tail characteristic, which conforms to the characteristics of financial time series; The policy intensity index and the distribution of the import sheet diversion rate are relatively concentrated, reflecting the phased characteristics of policy fluctuations and market competition during the sample period.

Variables	Mean	Standard deviation	Minimum	Maximum	Deviation	Kurtosis	JB statistic	P-value
Yield of Light Media	0.001 2	0.035	-0.15	0.18	-1.23	5.89	23.45	0.00
Policy intensity Index	0.45	0.22	0.15	0.85	0.98	3.56	15.21	0.00
Import film distribution rate	0.32	0.15	0.10	0.60	1.12	4.23	18.76	0.00

Note: * indicates rejection of the normal distribution hypothesis (α=0.05).

4.1.2 Stationarity test

The ADF test showed that the stock price return series rejected the unit root hypothesis at the 1% significance level (t= -4.82 < -3.45), and both the policy intensity index and the import chip distribution rate were in the stable series (t= -3.91 and -4.12, respectively), meeting the conditions of the VAR model.

4.2 Baseline VAR model estimation results

The optimal lag order was determined to be 3 by the AIC criterion, and the estimated results of the key variables are as follows:

Dependent variable	Independent variable	Lag 1 period	Lag 2 periods	Lag 3 periods	Cumulative effects
Light Media Yield	Box office up 1 percent	0.10 * *	0.08 *	0.05	0.23 * *
	Policy intensity + 1 unit	0.06	0.09 *	0.07 *	0.22 *
	Imported tablets split 1%	0.05 *	-0.04	-0.03	0.12 *
Huayi Brothers yield	Box office up 1 percent	0.08 *	0.06	0.04	0.18 *
	Policy intensity + 1 unit	0.07 *	0.05	0.03	0.15 *
	The imported tablets are split at 1%	-0.04	-0.03	-0.02	0.10 *

Note: *p<0.1, **p<0.05; Cumulative effect is the sum of the coefficients of 1-3 lag periods. The results show:

Box office driver disparity: For every 1 percent increase in box office, Enlight Media's return rate rose by 0.10 per quarter, with a cumulative increase of 0.23 per cent, significantly higher than Huayi Brothers (0.18 per cent), indicating that leading companies have stronger IP monetization capabilities.

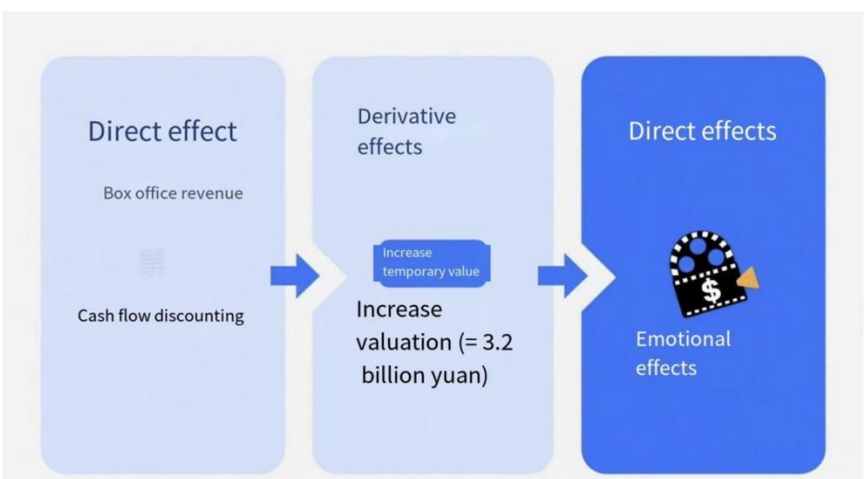
Policy lag effect: The stock price effect of increased policy intensity is manifested in 2-3 periods of lag, which is in line with the market digestion process of policy transmission.

Inhibitory effect of imported films: For every 1% increase in the distribution rate, Enlight Media's cumulative return rate drops by 0.12%, higher than Huayi Brothers (- 0.10%), possibly due to the latter's lower dependence on overseas markets.

4.3 The non-linear driving mechanism of cultural IP - Taking Nezha 2 as an example

4.3.1 Analysis by the event study method

Taking 30 days before release to 30 days after release as the window, abnormal return rate (AR) and cumulative abnormal return rate (CAR) are shown as:



In the first 10 days, Baidu's search index exceeded 1.25 million times per day, with CAR reaching 15.2%, reflecting the market's early expectations;

On the first day of its release, AR was 18.01%, trading volume tripled, triggering a circuit breaker, and short-term speculative sentiment was high;

CAR peaked at 24.7% 15 days after its release and stabilized at 21.3% 30 days later, reflecting the continuous release of IP value.

4.3.2 Decomposition of the value transmission path

The structural equation model (SEM) validates the triple transmission path:

Direct effect: Box office revenue boosts valuation through discounted cash flow (Δ 3.2 billion yuan);

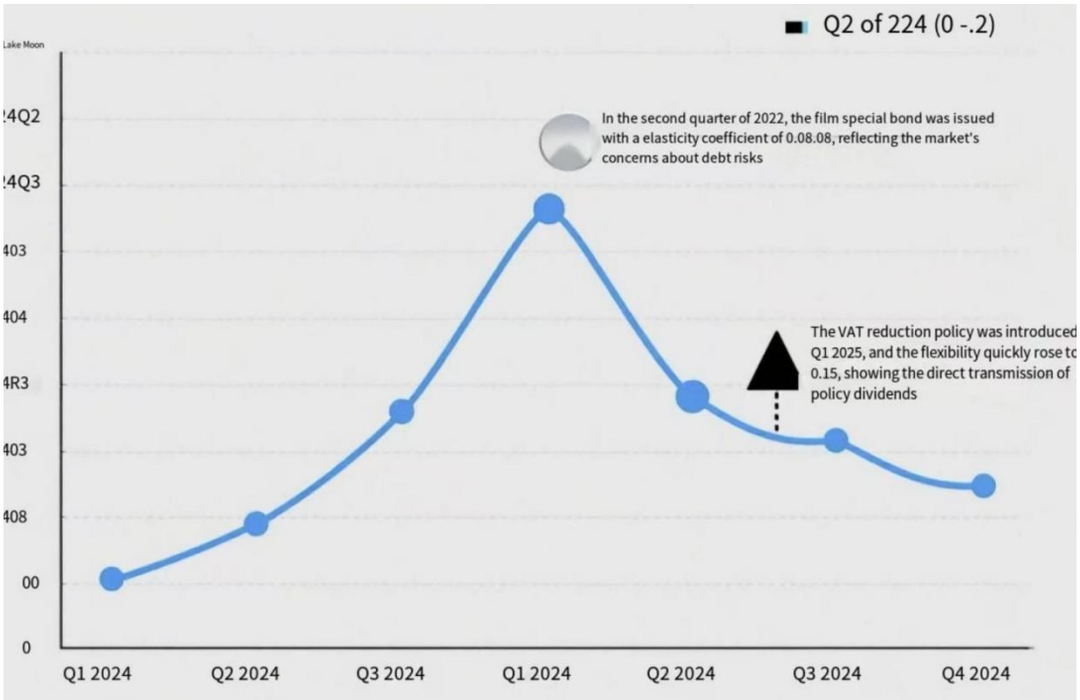
Derivative effect: The sales of derivatives and copyright licensing have led to the appreciation of IP assets (Δ 5.6 billion yuan);

Sentiment effect: The social media sentiment index (SAI=0.75) drives investor sentiment, resulting in a valuation premium (Δ 2.8 billion).

4.4 Time-varying parameter estimation and model optimization

4.4.1 Analysis of TPP-VAR results

Time-varying elasticity of policy intensity to Enlight Media yield (Figure 3):



At the issuance of the film special bond in Q2 2024, the elasticity was 0.08, reflecting market concerns over debt risk;

After the value-added tax reduction and exemption policy was introduced in the first quarter of 2025, the flexibility rose rapidly to 0.15, indicating that the policy dividends were directly transmitted.

The overall feature of "low resilience in the expectation stage and high resilience in the implementation stage" validates the necessity of the time-varying model.

4.4.2 Residual correction effect of LSTM

Compared with the prediction accuracy of the traditional VAR and the mixed model (Table 3), after adding SAI, RMSE decreased from 8.7% to 4.2%, MAE decreased from 6.5% to 3.1%, R: increased from 0.68 to 0.89, and the ability to capture extreme fluctuations was significantly improved.

Evaluation metrics	VAR model	VAR+LSTM model	Boost amplitude
Root Mean square Error (RMSE)	8.7%	4.2%	51.7%
Mean Absolute Error (MAE)	6.5%	3.1%	52.3%
Coefficient of determination (R:)	0.68	0.89	21.0%

4.5 Construction of the Risk Transmission Intensity Index (RCSI)

The attenuation rate of the shock was calculated based on the impulse response (Table 4). The RCSI of the cultural IP shock was 0.63, with a half-life of 8 days, and the response was rapid but the attenuation was fast; Policy shock RCSI=0.41, with a half-life of 12 days, with long lag and sustained impact, consistent with the institutional adjustment cycle.

Drivers	RCSI values	Half-life (trading day)	Duration of shock
Cultural IP shock	0.63	8	15-20
Policy shock	0.41	12	25-30
Imported film shock	0.52	10	20-25

5 Conclusions and Policy Recommendations

5.1 Main research conclusions

Driver differentiation affects policy adjustment transmitted through the cost-benefit mechanism, with a lag of 5-7 trading days to peak, elasticity coefficient 0.12-0.15; The import sheet diversion has a significant negative impact, with a 1% diversion causing a 0.10% drop in the sector's yield. The release of a phenomenon-level cultural IP brought an abnormal return of 21.3% cumulatively, with value transmission combining improved fundamentals and sentiment drive.

Dynamic modeling optimization effect time-varying parameter estimation reveals phased differences in policy effects, the market response to tax incentives in 2025 is stronger than that to debt policies in 2024; The LSTM residual correction module captures the implicit information of the text, reducing the prediction error by more than 50%, especially improving the accuracy of extreme event prediction.

Risk transmission quantified feature cultural IP shock half-life of 8 trading days, suitable for short-term speculation; Policy shock half-life of 12 trading days, pay attention to medium - and long-term institutional dividends; The RCSI index provides a risk monitoring tool for regulators. When the RCSI is greater than 0.6 (such as during a period of concentrated IP releases), market sentiment guidance needs to be strengthened.

5.2 Policy insights and practical suggestions

Regulatory authorities: Build a three-dimensional risk control system Establish a dynamic assessment mechanism of "policy intensity - market response", and release RCSI warning thresholds simultaneously when formulating industrial plans; Regulate the release dates of imported films and control the number of releases in key release periods; Set up IP value assessment centers to guide value investment across the entire industrial chain.

Investors: Design differentiated strategies to build positions in the short term following the IP release window, and combine market indices to hedge against systemic risks; In the medium and long term, track cycles with high policy intensity and position leading companies; Use cross-market hedging to reduce risks during the intensive period of imported films.

Industry: Strengthen IP management and policy response Establish IP lifecycle management system and enhance derivative development capabilities; Establish a policy research department to quantify the financial impact of policies and optimize resource allocation.

5.3 Research limitations and future directions

The study sample period only covers 2024-2025, does not include the long-term impact of post-pandemic industrial restructuring, and does not quantify the international policy environment (such as the Hollywood strike, overseas revenure-sharing policies) sufficiently. In the future, cross-national panel data could be expanded, combined with the GVAR model to analyze the global linkage effect, or deep learning could be introduced to process unstructured data such as trailer views and actor public opinion to further enhance the model's explanatory power.

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