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Qinghong Shuai

Lu Xie

Yu Tang

Hongxin Hu

Weiting Wang

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Research on the Third-party Payment Risk in the Background of Nets Union Clearing Platform: The Case of Alipay

(Full Paper)

Qinghong Shuai, Southwestern University of Finance and Economics, China, 707104807@qq.com
Lu Xie, Southwestern University of Finance and Economics, China, 846717636@qq.com
Yu Tang*, Southwestern University of Finance and Economics, China, 18145136030@163.com
Hongxin Hu, Southwestern University of Finance and Economics, China, 395688812@qq.com
Weiting Wang, Southwestern University of Finance and Economics, China, 492796550@qq.com

ABSTRACT

Third-party payment has become an important part of the current payment method in China. However, there are many risks associated with the development of the third-party payment network. The establishment of the Nets Union in 2017 had a significant impact on the standardization of the entire third-party payment market. By further researching the third-party payment risk under the background of Nets Union Clearing Platform, combining with the empirical analysis for the case of Alipay, this paper constructs the third-party payment risk model by AHP and fuzzy comprehensive evaluation, then making some recommendations for Third-party payment risk control management.

Keywords: The third-party payment, China Nets Union Clearing Corporation, Alipay, risk control.

*Corresponding author

INTRODUCTION

From the first intermediary platform serving online transactions had been introduced at the end of the last century in China, the third-party payment and e-commerce had grown together. After decades of development, they have achieved impressive results in both user usage and transaction scale. However, the third-party payment still exposes a lot of risks during the development stage. Although the third-party payment in China has gone from the earliest regulatory omission to various laws and regulations, the supervision of China is far behind the rapid development demand even if the Nets Union was established to support the liquidation for online payment of non-bank payment agencies in 2017.

As for the risk of third-party payment, a great deal of useful research has been done by predecessors. However, the focus of this paper is the development of the market and industry under the rapidly changing conditions, especially with the newly established Nets Union over the past year, and to discuss the risk management and risk analysis of third-party payment under this background. This paper select the case of Alipay as an example to perform the risk analysis through theoretical and empirical way, in order to better identify and manage those risks and prepare to take preventive measures.

LITERATURE REVIEW

For the foreign literature, the research of e-commerce and third-party payment in developed countries have started in earlier time than China. Those researches involved payment model, third-party payment security index, and risk measurement evaluation, which possessed values of reference to the depth and breadth.

For domestic literature, Chinese scholars have done a lot of research on the risks of third-party payment as well. Che (2015) claimed that the risk of third-party mobile payments mainly consisted of external and internal aspects. External risks included industry-related administrative laws, regulations, policies and the creditworthiness. Internal risks were mainly determined by the safety of funds and the compliance of technologies and operations. Wang and Guo (2011) classified the third-party payment risk into four major components: the third-party payment platform itself, the security of the system network and the internet, and the precipitation and virtual currency risks closely related to the transaction. Xie (2010) suggested that promoting and supporting third-party payment agencies to access inter-bank payment and settlement systems could facilitate the supervision and management of the entire industry. Zhang (2011) took Alipay as an example to discuss the problems of ownership for deposit interest of third party payment platform. Wu, Yu and Wang (2010) pointed out that it is necessary to supervise online transactions, establish an online trading database to record transaction information, and analyze the data information to effectively reduce the risk impact on the anti-money laundering system. Since the Nets Union was firstly established in China in 2017, there are only a few related research information in domestic and abroad.

To sum up, most of those researches only qualitatively analyzed the third-party payment risk, and did not conduct quantitative and comprehensive evaluation on the third-party payment risk in the new situation. This paper comprehensively review the research results both at home and abroad, summarizing the possible risk factors of the third-party payment in the context of the

Internet. Then it design and construct the model using analytic hierarchy process, fuzzy comprehensive analysis, and take Alipay as an example to come with quantitative analysis results under the background of third party payment risk empirical research.

THIRD PARTY PAYMENT RISK FACTORS UNDER NETS UNION

Network Alliance Clearing Limited, or "Nets Union", was formally incorporated in 2017. The principal business scope of Nets Union includes the construction and operation of a unified national clearing system to provide liquidation of online payment transactions for non-bank payment institutions. Before the establishment of Nets Union, every third-party payment agency set up a network system themselves that directly connected with the bank, which was considered to circumvent the supervision of the national central bank. Due to the founding of Nets Union, the cleaning system will be processed on the network platform of Nets Union, which allows the financial data becoming more transparent and is able to be effectively regulate by the national regulatory authorities. Therefore, it can be said that the establishment of Nets Union have great impact on the standardization of third-party payment.

Based on the background of the establishment of Nets Union, the previous research theories, and the Basel Accord, combining with the specific features of third-party payment, this article will analyze the five dimensions consist of financial risk, market risk, credit risk, policy regulatory risk, and security technology risk, to discuss the risk of third-party payment.

Financial Risk

Financial risks mainly include five dimensions considering to be the risks of depositing capital, cash, money laundering, liquidity and virtual currency. First of all, the third-party payment agencies have a great incentive to divert funds from settling deposits and the deposits during the custody of securities market, which poses a security risk. Secondly, third-party payments may use the virtual nature of the internet for fraudulent transactions that create a cash-for-cash risk. Thirdly, due to the network environment, third-party payment coupled with the opaque nature of data and information, provide a space for criminals to use the platform to launder money with the opaque nature of data and information under internet environment. Fourthly, the liquidity risk mainly lies in the reserve for bank deposits. Finally, there are a number of "virtual currencies" in the payment process, and the easiness of payment by third parties results in more frequent transactions which increase the velocity of the currency. This may increase the base currency and break the original stable financial order, resulting in a virtual currency risk.

Market Risk

Market risks mainly include the risks of loss of customers, rejection of cooperation by banks, potential entrants, industry competitors and industry replacement. Firstly, businesses and users, as the third-party payment customers, have the characteristics of large cardinality with low loyalty, and the diversification of platforms leads to more cruel competition and contributing to the loss of customers. Secondly, the business of third-party payment is carried out with the bank docking service port. Those business will be difficult to carry out once the bank refuses to cooperate. Thirdly, as the e-commerce platform, mobile operators, and banks get into the third-party payment field, market competition trends to be fiercer. Moreover, at the end of 2016, 255 non-bank payment agencies in China had obtained payment licenses. Those numerous industry participants led to brutal competition. Finally, with the advances of technology, new connotations and methods will emerge in the future, which means similar and better product or services will emerge, bring a tremendous risk to third-party payments market.

Credit Risk

This paper discusses the credit risk from the four aspects of the defaults of buyers, sellers, banks and third-party platforms. First of all, the inability of buyers to pay in full will lead to an increase in the credit cost of the service provider, as well as the bad user rate. Secondly, as the seller cannot provide or not promptly provide the products or services requested by the buyer, the transaction revocation occurs and the seller's credit value is lowered, resulting in bad industry influence. Moreover, due to delayed settlement of the bank led to the funds cannot be credited in time, affecting the user experience and platform reputation. Finally, due to third-party payment of poor management, lacking of risk control and other reasons caused by the failure to perform, misappropriation of funds and other circumstances also result in the loss of users.

Policy and Regulation Risks

This paper discusses policy and regulatory risks from aspects of policies, laws and regulations. On the one hand, At present, China holds the attitude of support and encouragement for the innovation and development of the third-party payment industry, so the policy risk is relatively small. However, with the continuous change of policies, the possibility of policy risks will also change. On the other hand, compared to the alarming rate for development of third-party payment, the existing laws and regulations are far behind to effectively monitor the user's legitimate rights. Right of interests cannot be really protected, which will become a stumbling block for further development of the industry.

Security and Technology Risk

Security technology risks mainly include the aspects of system security, technology, and operation. On the one hand, third-party payment relies on the development of internet technology, and the normal operation of the security system possess a great importance at any stage of its development. Once a technology loophole is exploited by hackers or other criminals, it will trigger a chain reaction of information security and endanger citizen’s personal property safety and national security. On the other hand, users and staffs of third-party payment platforms are exposed to instantaneous risks due to mistakes in technical operations during payment.

THE CASE OF ALIPAY

Alipay is the industry leader of third-party payment in China depending on its popularity, influence, and the proportion of the scale in the market. Therefore, this paper choose Alipay as a representative in the context of the Nets Union to study the third party payment risk assessment system.

For the risk assessment of third-party payment, interviews and surveys were used to take this study. 40 scholars and veteran practitioners in the financial industry as experts were invited to take the example of Alipay in the form of a questionnaire to give feedback on the risk rating of third-party payment in the context of the Nets Union. Through the analytic hierarchy process and the fuzzy comprehensive method, the conclusion of overall evaluation for third-party payment risk under the reality of Nets Union would be finally drawn.

The Third Party Payment Risk Evaluation Index System under Nets Union

Based on the above analysis of the third-party payment risk in the context of Nets Union, the evaluation index system of Alipay is designed as Table 1.

Table 1: The Third Party Payment Risk Evaluation Index System under Nets Union

No.	Target level	Primary Indicator	Secondary Indicator
1	X Risk of third-party payment under Nets Union	X1Finacial Risk	X11Precipitation funds risk
2			X12Cash out risk
3			X13Money laundering risk
4			X14Liquidity risk
5			X15Virtual currency risk
6		X2Market Risk	X21Customer loss risk
7			X22Bank cooperation risk
8			X23Potential entrants risk
9			X24Industry competition risk
10			X25Alternative risk
11		X3Credit Risk	X31Buyer risk
12			X32Seller risk
13			X33Bank risk
14			X34Payer default risk
15		X4Policy and Regulation Risk	X41Policy risk
16			X42Laws and regulations risk
17		X5Security and Technology Risk	X51System security risk
18			X52Technical and operational risk

Evaluation Process

Build A Judgment Matrix.

Analytic Hierarchy Process (AHP) compares the importance of each two evaluated objects individually, and assigns importance to the two objects according to 1-9 scale. Based on the matrix of importance of judgment matrix, a judgment matrix is constructed respectively for the secondary indicator relative to the primary indicator and the primary indicator relative to the target level.

Calculate The Weighted Vector.

This paper use column and inversion method to calculate the weighted vector: If a_{ij} is the importance scale of the judgment matrix, that is, the importance scale of the j^{th} indicator relative to the i^{th} indicator, the calculation steps are as follows:

Firstly, set m order judgment matrix as：

$$A = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1m} \\ a_{21} & a_{22} & \cdots & a_{2m} \\ \vdots & \vdots & \cdots & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mm} \end{bmatrix} \quad (1)$$

Secondly, calculate the weight of each element in the column(i=1,2,…,m):

$$b_{ij} = \frac{a_{ij}}{\sum_{j=1}^{m} a_{ij}} \quad (2)$$

Thirdly, Normalize$\sum_{i=1}^{m} b_{ij} = b_j$, that is, to obtain the weight of each indicator

$$u_k^{(j)} = \frac{b_j}{\sum_{k=1}^{m} b_k} \quad (3)$$

$u_k^{(j)} = (u_1^{(j)}, u_2^{(j)}, \ldots, u_n^{(j)})^T$ is the weight vector of the indicator under the j^{th} indicator layer, $u^{(j)} = (u^{(1)}, u^{(2)}, \ldots, u^{(m)})^T$ is the index layer relative to the target layer of the weight vector, the same can be calculated under the other indicators of the index weight $u_k^{(j)}$。

Check the Consistency of Judgment Matrix.
Check the consistency of judgment matrix based on the step (3) to get the step (4),that is :

$$CR = \frac{\lambda - n}{(n-1)RI} \quad (4)$$

To determine the maximum eigenvalue of the matrix, n is the number of objects to be evaluated, and RI is the average random consistency indicator. In general, if the consistency ratio CR≤0.1, the judgment matrix is considered to be passed the consistency check; otherwise, the judgment matrix needs to be reconstructed.

Results of Weight Calculation.
Based on the step (1), (2), (3), the weight of primary indicator is：

$$u_k^{(j)} = (0.45, 0.09, 0.13, 0.05, 0.28)^T$$

Similarly, calculate the weight vector of the secondary indicators under the other primary indicators, listed in the ninth column of Table 2.

Table 2: Indicator judgment matrix and weight

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	X	X	X1	X2	X3	X4	X5	Weight $u^{(j)}$	
2		X1	1	5	3	7	3	0.45	λ_{max}=5.23
3		X2	1/5	1	1/2	3	1/5	0.09	RI=1.1185
4		X3	1/3	2	1	3	1/3	0.13	CR=0.05
5		X4	1/7	1/3	1/3	1	1/5	0.05	
6		X5	1/3	5	3	5	1	0.28	
7	X1	X1	X11	X12	X13	X14	X15	Weight $u_k^{(j)}$	
8		X11	1	3	3	2	5	0.40	λ_{max}=5.13
9		X12	1/3	1	1	1/2	3	0.14	RI=1.1185
10		X13	1/3	1	1	1/3	3	0.14	CR=0.03
11		X14	1/2	2	3	1	3	0.26	
12		X15	1/5	1/3	1/3	1/3	1	0.06	
13	X2	X2	X21	X22	X23	X24	X25	Weight $u_k^{(j)}$	
14		X21	1	6	5	3	2	0.42	λ_{max}=5.17
15		X22	1/5	1	1/2	1/3	1/4	0.06	RI=1.1185
16		X23	1/5	2	1	1/3	1/5	0.08	CR=0.04
17		X24	1/3	3	3	1	1/2	0.16	
18		X25	1/2	4	5	2	1	0.27	
19	X3	X3	X31	X32	X33	X34		Weight $u_k^{(j)}$	
20		X31	1	1/2	1/5	1/3		0.08	λ_{max}=4.16
21		X32	2	1	1/4	1/3		0.12	RI=0.8931

22		X33	5	5	1	3	0.55	CR=0.06
23		X34	3	3	1/3	1	0.25	
24	X4	X4	X41	X42			Weight $u_k^{(j)}$	λ_{max}=2.00
25		X41	1	1/3			0.25	RI=0
26		X42	3	1			0.75	CR=0.00
27	X5	X5	X51	X52			Weight $u_k^{(j)}$	λ_{max}=2.00
28		X51	1	5			0.83	RI=0
29		X52	1/5	1			0.17	CR=0.00

Consistency Check.
According to step (4), the judgment matrix is checked for consistency, and the results are listed in the tenth column of Table 2, showing CR≤0.1 which means those all pass the consistency test.

Determine the Evaluation Factor Set.
According to Table 1, the fuzzy comprehensive evaluation factor set is:
$X=\{X_1,X_2,X_3,X_4,X_5\}$;$X_1=\{X_{11},X_{12},X_{13},X_{14},X_{15}\}$;$X_2=\{X_{21},X_{22},X_{23},X_{24},X_{25}\}$;$X_3=\{X_{31},X_{32},A_{33},X_{34}\}$;$X_4=\{A_{41},X_{42}\}$;$X_5=\{A_{51},X_{52}\}$.

Determine the Remark Set.
Remark set $V=\{V_1,V_2,\ldots,V_5\}$, represent the rating level from high to low five levels, which are: low risk, relatively low risk, medium risk, relatively high risk, high risk.

Determine the Set of Evaluation Indicators Weight.
According to AHP to determine the weight vector U=[0.45,0.09,0.13,0.05,0.28], $U^{(1)}$=[0.40,0.14,0.14,0.26,0.06], $U^{(2)}$= [0.42,0.06,0.08,0.16,0.27], $U^{(3)}$=[0.08,0.12,0.55,0.25],$U^{(4)}$=[0.25,0.75],$U^{(5)}$=[0.83,0.17] see the details in Table 2.

Determine the Evaluation Matrix R and Ri.
Combined with matrix construction and judgment to determine the evaluation matrix.

Conduct Fuzzy Comprehensive Evaluation.
The fuzzy vector of the evaluation index and the evaluation matrix constituted by step (4) are synthetically transformed. The comprehensive evaluation results are as follows:

$$B = U \times R \tag{5}$$

Fuzzy evaluation set $B_i=\{B_{i1},B_{i2}\ldots,B_{in}\}$,$Bi_n$ is the B_i membership of the i^{th} indicator comment set V_i to the fuzzy comprehensive evaluation set. According to the principle of maximum degree of membership, the corresponding fuzzy comprehensive evaluation results are obtained:

$$M_i = \max(B_{i_1}, B_{i_2}, \ldots, B_{i_n}) \tag{6}$$

By the same token, the fuzzy comprehensive evaluation results of each criterion layer can be calculated.

Questionnaire Results and Statistical Analysis.
Firstly, we make the construction of single evaluation fuzzy matrix.
Based on the results obtained through questionnaire survey, the statistical results of each index in each evaluation center are determined to calculate the weight. According to step (5) and the weight vector $U^{(i)}$ of the index under each criterion layer in AHP, the fuzzy evaluation set B_i of the criterion layer can be obtained, that is,:

$$B_1 = U^{(1)} \times R_1 = [0.40,0.14,0.14,0.26,0.06]\begin{bmatrix}0.00 & 0.10 & 0.60 & 0.30 & 0.00\\ 0.00 & 0.15 & 0.85 & 0.00 & 0.00\\ 0.00 & 0.00 & 0.70 & 0.30 & 0.00\\ 0.00 & 0.10 & 0.20 & 0.55 & 0.15\\ 0.00 & 0.20 & 0.30 & 0.50 & 0.00\end{bmatrix}$$
$$= [0.000,0.099,0.527,0.335,0.039]$$

According to the principle of maximum membership degree, it is calculated by step (6):
$M_1=max(0.000,0.099,0.527,0.335,0.039)=0.527$

The "medium risk" level of membership has the largest membership degree.

$$B_2 = U^{(2)} \times \mathrm{R}_2 = [0.42,0.06,0.08,0.16,0.27]\begin{bmatrix}0.00 & 0.30 & 0.55 & 0.15 & 0.00\\ 0.00 & 0.30 & 0.70 & 0.00 & 0.00\\ 0.00 & 0.85 & 0.15 & 0.00 & 0.00\\ 0.30 & 0.55 & 0.15 & 0.00 & 0.00\\ 0.15 & 0.50 & 0.25 & 0.10 & 0.00\end{bmatrix} = [0.089,0.435,0.377,0.090,0.000]$$

According to the principle of maximum membership degree, it is calculated by step(6):

M_2=*max*(0.089,0.435,0.377,0.090,0.000)=0.435

The "relatively low risk" level of membership has the largest membership degree.

$$B_3 = U^{(3)} \times \mathrm{R}_3 = [0.08,0.12,0.55,0.25]\begin{bmatrix}0.90 & 0.10 & 0.00 & 0.00 & 0.00\\ 0.90 & 0.10 & 0.00 & 0.00 & 0.00\\ 0.05 & 0.35 & 0.60 & 0.00 & 0.00\\ 0.00 & 0.25 & 0.75 & 0.00 & 0.00\end{bmatrix} = [0.208,0.275,0.518,0.000,0.000]$$

According to the principle of maximum membership degree, it is calculated by step(6):

M_3=*max*(0.208,0.275,0.518,0.000,0.000)=0.518

The "medium risk" level of membership has the largest membership degree.

$$B_4 = U^{(4)} \times R_4 = [0.25,0.75]\begin{bmatrix}0.00 & 0.20 & 0.60 & 0.20 & 0.00\\ 0.00 & 0.00 & 0.60 & 0.40 & 0.00\end{bmatrix} = [0.000,0.050,0.600,0.350,0.000]$$

According to the principle of maximum membership degree, it is calculated by step(6):

M_4=*max*(0.000,0.050,0.600,0.350,0.000)=0.600

The "medium risk" level of membership has the largest membership degree

$$B_5 = U^{(5)} \times \mathrm{R}_5 = [0.83,0.17]\begin{bmatrix}0.00 & 0.00 & 0.05 & 0.80 & 0.15\\ 0.00 & 0.00 & 0.55 & 0.45 & 0.00\end{bmatrix} = [0.000,0.000,0.135,0.741,0.125]$$

According to the principle of maximum membership degree, it is calculated by step(6):

M_5=*max*(0.000,0.000,0.135,0.741,0.125)=0.741

The "relatively high risk" level of membership has the largest membership degree.

Secondly, we make the analysis of comprehensive evaluation results.

Based on the individual evaluation result of each level indicator layer obtained from the single evaluation, after combining the five primary indicator's membership vector, the fuzzy comprehensive evaluation matrix R is obtained as follows:

$$R = \begin{bmatrix}B_1\\ B_2\\ B_3\\ B_4\\ B_5\end{bmatrix} = \begin{bmatrix}0.000 & 0.099 & 0.527 & 0.335 & 0.039\\ 0.089 & 0.435 & 0.377 & 0.090 & 0.000\\ 0.208 & 0.275 & 0.518 & 0.000 & 0.000\\ 0.000 & 0.050 & 0.600 & 0.350 & 0.000\\ 0.000 & 0.000 & 0.135 & 0.741 & 0.125\end{bmatrix}$$

At the same time, according to AHP calculated the weight of each level indicators U=[0.45,0.09,0.13,0.05,0.28], and the evaluation model $B=U\times R$，to get the Fuzzy comprehensive evaluation set B，that is：

$$B = U \times R = [0.45,0.09,0.13,0.05,0.28]\begin{bmatrix}0.000 & 0.099 & 0.527 & 0.335 & 0.039\\ 0.089 & 0.435 & 0.377 & 0.090 & 0.000\\ 0.208 & 0.275 & 0.518 & 0.000 & 0.000\\ 0.000 & 0.050 & 0.600 & 0.350 & 0.000\\ 0.000 & 0.000 & 0.135 & 0.741 & 0.125\end{bmatrix} = [0.035,0.122,0.406,0.384,0.052]$$

According to the principle of maximum membership degree, it is calculated by step(6):

M=*max*(0.035,0.122,0.406,0.384,0.052)=0.406

He "medium risk" level of membership has the largest membership degree.

CONCLUSION

According to the result of empirical analysis and the principle of maximum subordination, the security and technology risk is considered to be "relatively high risk" level, and market risk belongs to "relatively low risk" level among the primary risk indicators. The rest of financial risk, credit risk and policy& regulation risk are considered to be "medium risk" level. Overall, the results of this research which takes Alipay as an example is considered to be "medium risk" level under the background of establishment of Nets Union. The results also highlight that the security and technology risk should be focused, especially for the platform of Nets Union which has demand for higher requirement of technology.

At the same time, related agencies should also strengthen the management of medium risks such as financial risk, credit risk and policy and regulatory risk, with particular attention to the secondary indicators: capital inflow under financial risk, buyer risk under credit risk and risk of laws and regulations under the risk of policies and regulations. Of course, the relatively low risks such as market risk, should not be relaxed vigilance. In conclusion, although the overall management of the third-party payment risks may have some beneficial effects due to the establishment of the Nets Union, there is still some space for improvement in risk prevention and security in the context of overall medium risk.

SUGGESTION

Based on the above empirical results, this paper puts forward the following suggestions on the third party payment risk control.

Strengthen The Management of Sedimentary Funds

Through the implementation of the provisions from the national central bank, opening a dedicated way of payment of equipment can be separated from the settlement funds and the basic account. For banks, it can take a variety of measures to prevent third party payment agencies from diverting funds for settling funds, such as setting up detailed ledgers for users, strengthening the disclosure mechanism, and increasing the frequency of issuance of deposited funds.

Implement Anti-Money Laundering and Anti-Cashing Work

After the establishment of the Nets Union, with a clearer financial flow, more comprehensive screening and management of anti-money laundering and anti-cash-out efforts can be achieved. At the same time, it is necessary to strengthen the examination of customers and businesses. For example, they can verify and identify users, and strengthen online trading review and supervision through internet technology.

Enhance Security Supervision and Measures

At present, most third-party payment platforms use the SSL protocol for data encryption and transmission. However, advanced technologies may also have vulnerabilities or risk of being outdated and hacked. Therefore, continuous improvement in the hardware and software of payment platforms cannot be ignored.

Strengthen The Supervision and Management of Credit Risk

The implementation of credit rating agencies and individuals' evaluation measures allow related agencies to strengthen the supervision and management of credit risk. This also can ensure that all aspects of online payment can participate in mutual supervision and improve the awareness of integrity.

Improve Laws and Regulations and Strengthen Enforcement

In China, there is no legal law to determine the ownership of the interest accruing from the sedimentary capital formed by the payment of the third party, and the data and disposal of deposited funds in the third party payment account has never been disclosed to the public. Therefore, it is urgent and necessary to formulate and improved the regulation of relevant reserve management system.

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