

Determinants of Shadow Banking Growth – Evidence from CEE Countries

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Abstract

The focus of this paper is placed on shadow banking as a less regulated segment of the financial system recognizable by its increasingly significant presence in the countries of Central and Eastern Europe with a tendency of further accelerated growth in recent years. Despite the significant contribution by providing alternative sources of liquidity and alternative funding to the real economy, shadow banking can be a significant source of systemic risk. The subject of this paper is to examine the relationship between selected macroeconomic and financial variables and the size of the shadow banking system by applying the regression with fixed effects in seven Central and Eastern European countries over the period 2007-2021 with a quarterly dataset. Empirical results confirm that shadow banking positively correlates with traditional banks, complementing the demand for financial products that the banking sector, adhering to strict regulatory requirements, abstains from supporting. Our study aims to highlight the threat, more excellent orientation towards strengthening the bank's capital requirements to cause further expansion of the activities in the non-banking part of the financial sector beyond the sight of the regulators, as well as the necessity to identify the challenge of making this less regulated part of the financial system more stable and sustainable.

Keywords: Shadow Banking, Banking Sector, Regulatory Requirements, Systemic Risk

JEL Classification: E44, E52, F62, G21, G23

Introduction

Financial market conditions and stricter capital and liquidity requirements have recently affected an increase in activities outside the regulated banking system in a new parallel system called shadow banking. They are financial intermediaries that, like traditional banks, carry out activities related to the term, credit, and liquidity transformation. But because they are not subject to conventional banking regulation, nor do they have traditional savers whose funds are covered through deposit insurance funds, they are thought to operate in the “shadow”.

Providing investors with alternative sources of liquidity and/or appropriate asset placement, shadow banks appear as innovators in the financial markets contributing significantly to their development. In practice, even traditional banks use shadow banking to avoid stricter capital and liquidity requirements while increasing the return on their capital. However, since it is a complex phenomenon that has become increasingly and actively present in the last two decades, it takes work to give a clear and accepted definition of what exactly shadow banking is (Claessen & Ratnovski, 2012).

There are many discussions and attempts to define shadow banking precisely. The “Financial Stability Council” in 2012 defined shadow banking as “credit intermediation (fully or partially) involving entities and activities outside the regulated banking system”. Bakk-Simon et al. (2012) proposes an aggregate of the shadow banking system, which is a variation of the institutional

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sector in the Eurosystem's financial accounts, known as "Other Financial Intermediaries" (OFIs). The OFIs sector comprises all financial institutions except those included in the industry of monetary financial institutions, Central Banks in the Eurozone, credit institutions, money market funds, insurance companies, and pension funds.

Shadow banking symbolizes one of the most critical failures of the financial system, with a vital role in the global financial crisis (2007-2009). Since then, there has been a growing recognition that shadow banking can be a source of systemic risk despite its significant contribution to the financial system. In the context of the expansion of the shadow banking system, Krugman (2008) notes that politicians and government officials should act to overcome the vulnerability created by these new institutions. Referring to the lack of controls on this segment of the financial sector, he points to the necessity of applying a simple rule that anything that functions similarly as banks, everything that should be rescued in a crisis the way banks are, should also be regulated like a bank.

Considering the increasingly significant presence of shadow banking in the CEE countries, this paper aims to complement the literature investigating this issue through an empirical analysis. Through an econometric model, we will analyse the impact of several macroeconomic and financial variables with shadow banking in selected CEE countries to indicate the connection of the development of this less-regulated segment with the overall financial system.

This paper continues with a review of the previous literature that researched this problem. Then a setup of the econometric model and a presentation of the obtained results follow. Finally, after their interpretation, summary conclusions and recommendations aspire to achieve the paper's goal.

Literature Review

The shadow banking challenges may differ between developed and emerging markets. Due to the more extensive base of available data (high level of transparency) and the complexity of credit intermediation, researchers prefer to focus on analysing developed markets. On the other hand, shadow banking is still not so widespread in developing countries, and the process and steps are simplified.

In most of the published empirical papers, the size of the banking sector positively affects the growth of shadow banking. Countries with a higher growth rate of the traditional banking sector tend to have a higher increase in shadow banking as well, which indicates a complementarity between these two sectors (IMF 2014).

The IMF (2014) comprehensive econometric study covering the period from 1990 to 2013 and a sample of 29 most developed economies (according to the FSB database) and aiming to identify the main determinants of shadow banking growth indicates a negative relationship between real short-term interest rates and the development of shadow banking. Lower returns on financial markets motivate investors to seek more attractive returns in riskier areas, such as products offered by the shadow banking system, thus confirming the yield-seeking hypothesis.

According to Adrian and Shin (2010), Duca (2016) and Gorton and Metrick (2012), the decrease in liquidity leads to a reduction in the value of the total assets of shadow banking, while in conditions of high liquidity, this segment of the financial sector records growth. Furthermore, Duca (2016) also indicates that shadow banking is very vulnerable to liquidity shocks and is very pro-cyclical, raising financial and macroeconomic stability issues.

Many authors have recognized the negative impact of capital and liquidity requirements on banks. For example, according to Kashyap, Stein and Hanson (2010), regulatory burdens, in the form of increased capital requirements and greater scrutiny, can reduce the balance sheet capacity of traditional banks and thus result in the migration of banking activities to unregulated shadow banks. Therefore, increased regulation of the shadow banking sector should be seen as an essential complement to the reforms contemplated for banks and other large financial institutions. Discussing the incentives of financial institutions to avoid taxes, accounting rules, or capital requirements as one of the primary motivations for the growing importance of shadow banking, Adrian and Ashcraft (2012) indicate the threat of significant increases in the overall level and risk sensitivity of capital to provide strong incentives for credit intermediation to be funded outside of the banking system.

Barbu et al. (2016) paper aims to investigate the impact of shadow banking on macroeconomic fundamentals in a background where the tight banking regulations and

the decreasing trend recorded by interest rates in the postcrisis period create prospects for shadow banking sector growth. The analysis covers 15 European Union countries, using quarterly data from 2008 to 2015. The shadow banking system is used as a proxy by monetary funds due to breaks in the series or an unbalanced number of observations across selected countries. Based on the results of the panel regression, it was found that stock index dynamics and long-term interest rates positively determine the shadow banking total assets' variation.

Malatesta et al. (2016) investigate the size and evolution over time of shadow banks in the euro area, focusing on their role in the funding of non-financial corporations. According to the results obtained, the euro-area shadow banking system has grown in importance since the outburst of the global financial crisis, and its interconnectedness with the regulated banking system has increased over time. The comparative study of Girasa (2016) explores how shadow banking differs from the traditional banking system, focusing on international financial institutions' efforts to protect consumers and curtail irresponsible shadow banks, with an eye toward the effects of these actions on future banking practices. Du and Wang (2017), examining a particular form of shadow banking business in China and CEE's transition economies, in which firms borrow to lend, confirm that a better development of the financial market and the legal system prevents firms from engaging in re-lending business. They also indicate that Chinese firms participate less actively in re-lending if they have better growth prospects. As identified by Hodula et al. (2017), in the case of Spain, the traditional banking sector, affected by the yield motive, initiates securitization activities seeking more profitable sources of income in a period of downward trends of interest rates.

Apostoaie and Bilan's (2020) empirical analysis quantitatively assesses some of the determinants of shadow banking dynamics in 11 EU countries from Central and Eastern Europe over 2004–2017, showing that shadow banking is sensitive to all macroeconomic conditions in CEE countries. Their findings confirm the pro-cyclicality and high liquidity hypotheses, the search for higher yield hypothesis, and the complementarity hypothesis by concluding that economic growth positively influences the expansion of this segment of the financial sector. In addition, in a low-interest rate environment, the search for yield makes investors turn to shadow banks. At the same time, the development of the shadow

banking sector is also found to be complementary to the development of the rest of the financial system.

The results of the Kjosevski, Petkovski and Stojkov (2020) empirical study, covering 11 new EU member states and using annual data for the period from 1999 to 2018, show that the development of the financial sector (investment and pension funds), the banking sector, the money markets rate as well as the economic growth are the main factors affecting the shadow banking. On the other hand, they have determined that the global financial crisis of 2007–2008 had a negative impact on the growth of shadow banking.

The results of the panel analysis of Hodula, Melecký and Macháček (2020), which includes a sample of 24 European countries from 2004 to 2017, align with the hypothesis of pro-cyclicality of shadow banking due to the positive correlation with the growth of real GDP. Furthermore, their findings complement the debate on the role of monetary policy in maintaining financial stability by discussing another channel through which monetary policy may influence the financial system's stability. In addition, they show that the functionality of factors of shadow banking development may vary significantly among countries, with country-specific effects playing a role.

Objective and Methodology of the Research

The purpose of this paper is, based on an econometric model, to determine whether selected macroeconomic and financial variables determine the size of shadow banking in seven countries from Central and South-Eastern Europe (Latvia, Lithuania, Slovenia, Slovakia, Czech Republic, Poland, and Hungary) for the period from q1, 2007 to q2, 2021. Using regression with time-fixed effects and a quarterly data set compiled from several publicly available data sources (ECB, OECD, and Yahoo Finance), authors alternatively evaluate the impact of seven macroeconomic and financial variables.

The authors start by presenting the collected data; then, the paper will refer to a descriptive analysis of the variables used. Finally, there will follow an explanation of the assumptions on which the model is based. Table 1 shows the variables used in the econometric model accomplished by explaining the premises for their expected relationship with the dependent variable.

Table 1: Specification of the Variables Used in the Empirical Analysis

Type of Variable	Specification	Description of Variables	Expected Result
Dependent variable	Total assets of Other Financial Institutions (OFI)	Aggregate of the shadow banking system comprises all financial institutions except those included in the sector of monetary financial institutions, money market funds, as well as insurance companies and pension funds.	
Independent variable	Gross Domestic Product (GDP)	Gross domestic product at market prices	(+)
	Government Spending (GOV)	Total financial resources of the government	(+)
	Yields on long-term government bonds (YGOVBONDS)	Interest rates on 10-year government bonds	(+)
	Short-term money market interest rates (IRMM)	Money market interest rates	(-)
	EUROSTOXX 600 (EUROSTOXX)	A stock index with a fixed number of 600 components (stocks) representing companies among 17 European countries	(+)
	Money supply (M4)	A wider money supply that includes cash, deposits with an agreed maturity of up to 2 years, demand deposits of up to three months, repo and debt securities with a maturity of up to two years	(+)
	Loans to monetary financial institutions (MFIs)	Total loans approved by IFIs excluding the European System of Central Banks)	(+)

Source: ECB Statistical Data Warehouse, OECD data, Yahoo Finance.

The following is a discussion of the expected research results for each variable used:

(GDP) The shadow banking procyclicality hypothesis with GDP raises several financial and macroeconomic stability questions. Consequently, we include this macroeconomic indicator in the empirical model expecting a positive correlation between the trend of GDP movement and shadow banking.

Government Spending (GOV). Since there is a growth of public debt due to the issuance of government securities in circumstances of increased government spending, many banks seeking a reliable placement tend to substitute their lending with government investments. In addition, pressures. Pressure on bank interest rates caused by restricted bank lending creates room for the growth of shadow banking as an alternative source of financing the real sector for the portion of the bank assets redirected to the state. Consequently, we expect a positive relationship between government spending and shadow banking.

Yields on long-term government bonds (YGOVBONDS). We expect a positive correlation between shadow

banking and yields on long-term government bonds (YGOVBONDS), as a reflection of the investors' confidence in the stability of the country as well as the ability of institutions to repay their debt.

Short-term money market interest rates (IRMM). In an environment of continuously decreasing interest rates, when the demand for higher returns may motivate investors to seek alternative sources outside the traditional system, we expect a negative relationship between money market interest rates and shadow banking.

The Eurostoxx 600 Index (EUROSTOXX). Considering that the stock markets tend to perform procyclical (with the highest average monthly returns in the pre-crisis period of upward trends in a whole economy followed by considerable drops evidenced in the period of crises and downward trends), we expect a positive correlation between the performance of financial markets (represented by Eurostoxx 600 index as an economic determinant used in the model) and the growth of shadow banking.

Money supply (M3). We analyse the money supply growth, in our case measured through the wider monetary

aggregate M3, as a higher amount of funds available for lending in the economy. Considering the strengthened regulations of the banking sector, we expect a positive relationship with the growth of shadow banking as an alternative financing channel of the real sector.

Loans to monetary financial institutions (MFIs). Considering the positive correlation between the burden caused by the regulatory capital requirements at traditional banks and the development of shadow banking, in the

continuation of the paper, we will test the hypothesis of complementarity between these two segments. Consequently, we expect a negative relationship between loans to monetary financial institutions and shadow banking.

Table 2 shows the dataset's descriptive statistics and includes measures of central tendency: mean and median, the minimum and maximum value of the data, and the standard deviation.

Table 2: Descriptive Statistics of the Dataset

<i>Variables</i>	<i>Mean</i>	<i>Median</i>	<i>Std. Dev.</i>	<i>Min</i>	<i>Max</i>
OFls	7429000000	7543	19480000	2691	123000000
GDP	31556	18982	33052	4055	149400
GOV	17097	159	279600	-1287000	3281000
YGOVBONDS	3,515	3,34	2,724	-0,42	14,5
IRMM	1,82	0,8266	2,635	-0,5425	15,7
EUROSTOXX	323,8	337,6	61,2	176,5	429,6
MFI	15001	5422	20743	333	110500
M3	98,34	92,95	20,71	46,51	179,4

Source: Authors' calculations.

Table 3 shows the correlation coefficients between the variables of the model. We can notice that OFIs' total funds have the highest correlation with the aggregate M3, then with government spending and the yields of long-term government bonds. At the same time, the lowest

correlation was determined with GDP and EUROSTOXX 600. However, correlation does not mean causality, so in the further part of the paper, we examine deeper the influence of these variables on the total funds of OFIs.

Table 3: Correlation Matrix

	<i>OFls</i>	<i>GDP</i>	<i>GOV</i>	<i>YGOVBONDS</i>	<i>IRMM</i>	<i>EUROSTOXX</i>	<i>MFI</i>	<i>M3</i>
OFl	1,00	-	-	-	-	-	-	-
GDP	-0,02	1,00	-	-	-	-	-	-
GOV	0,18	-0,01	1,00	-	-	-	-	-
YGOVBONDS	0,16	-0,02	0,02	1,00	-	-	-	-
IRMM	0,10	0,11	-0,02	0,78	1,00	-	-	-
EUROSTOXX	0,06	0,10	0,01	-0,68	-0,47	1,00	-	-
MFI	0,08	0,44	0,03	-0,13	0,06	0,20	1,00	-
M3	0,28	-0,06	0,07	-0,60	-0,51	0,56	0,28	1,00

Source: Authors' calculations.

The empirical approach in this paper aims to estimate the parameters of each independent variable and determine the relationship between the independent variables and the total assets of OFIs. Therefore, let's define the following:

y_{it} = total assets of OFIs, where $i = 1, 2, \dots$,

$N \wedge t = 1, 2, \dots, T$

$X' = [(x_1, x_2, \dots, x_k)]$, where each x_k represents a single independent variable

$i = 1, 2, \dots, N$, where $i = 1$ is the first and N is the 7th individual country in the database

$t = 1, 2, \dots, 56, T$, where $t = 1$ is the first quarter of 2007 and $t = T$ is the second quarter of 2021

The decomposition of the form of the primary regression function allows us to determine and quantify the connection between the selected determinants and the total assets of OFIs. We tried to estimate the parameters using regres-

sion with time-fixed effects for seven macroeconomic and financial indicators in the selected sample of 7 countries for 14 years. To avoid the multicollinearity with the initial value of the functions in the system, in this model, we use the assumption that the individual fixed effects are equal to zero for each arbitrary “i” entry. Consequently, the re-

$$\begin{pmatrix} y_{1,1} \\ y_{1,2} \\ y_{1,3} \\ \vdots \\ y_{N,T} \end{pmatrix} = \begin{pmatrix} 1x_{1,1,1} & \cdots & x_{1,k,T} \\ \vdots & \ddots & \vdots \\ 1x_{N,1,1} & \cdots & x_{N,k,T} \end{pmatrix} \begin{pmatrix} \beta_0 \\ \beta_1 \\ \beta_2 \\ \vdots \\ \beta_k \end{pmatrix} + \begin{pmatrix} t_{1,1} & \cdots & t_{1,T} \\ \vdots & \ddots & \vdots \\ t_{N,1} & \cdots & t_{N,T} \end{pmatrix} \begin{pmatrix} d_1 & 0 & \cdots & 0 & 0 \\ 0 & d_2 & \cdots & 0 & 0 \\ 0 & 0 & \ddots & 0 & 0 \\ \vdots & \vdots & \ddots & \vdots & \vdots \\ 0 & 0 & \cdots & d_{T-1} & 0 \\ 0 & 0 & \cdots & 0 & d_T \end{pmatrix} + \begin{pmatrix} e_{1,1} \\ e_{1,2} \\ e_{1,3} \\ \vdots \\ e_{N,T} \end{pmatrix}$$

To complete the multiplication of the matrix, the only equation for the entire system would be as follows:

$$y_{i,t} = \beta_0 + x_{1,i,t}\beta_1 + x_{2,i,t}\beta_2 + \cdots + x_{k,i,t}\beta_k + t_{i,t}d_t + e_{i,t}$$

Results and Discussion

Table 4 presents the results of the applied econometric

gression function is defined as:

$$Y = XB + TD + e$$

Y = total assets of OFIs XB = independent variables

TD = parameter vector e = residuals

Or in a decomposed form of a matrix:

model. We have applied a regression with time-fixed effects. Also, the robustness of the model was confirmed through two partially robust models: Pooled OLS Time-control model and Pooled OLS Cross-section-control model. Through test statistics for normal distribution, a normal distribution of model residences has been confirmed.

Table 4: Results of the Basic Model

Independent Variable	Coefficient	Std. Error	T-Ratio	P-Value
Constant	-1,32061	1,37809	-0,9583	0,3386
Time effect	0,01129	0,00217	5,187	3,60e-07***
log(GDP)	0,36251	0,11903	3,045	0,0025***
GOV	2,90E-08	3,13E-08	0,9268	0,3547
YGOVBONDS	0,03710	0,008070	4,599	5,92e-06***
IRMM	0,03985	0,008156	4,886	1,56e-06***
log(EUROSTOXX)	0,06360	0,067267	0,9454	0,3451
log(M3)	1,71428	0,126242	13,58	4,23e-034 ***
log(MFI)	0,03164	0,017450	1,813	0,0706 *

Source: Authors' calculations.

According to the results, we can conclude that in the same direction as our expectations previously explained, shadow banking is in significant and positive correlation with economic growth (GDP), long-term government bond yields, money supply M3, and loans from monetary financial institutions. We have also noted a positive correlation between government spending and the EUROSTOXX 600 stock index, but not statistically significant. Contrary to our expectations and the hypothesis of the search for yields, a one-directional link between short-term interest rates and total assets of OFIs has been

obtained, with a statistically significant confidence level. We also found a growth in shadow banking throughout the sample countries, maintaining everything else constant (time effect).

The time effect, i.e., the growth of shadow banking over the years, in everything else constant, shows a significant statistical link to the dependent variable. In the same direction, Malasta (2016), using the ECB's entity-based definition, shows in its analysis that shadow banking in the Eurozone continuously grew in absolute and relative terms after the financial crisis.

The growth of the wider monetary aggregate M4 (broad money) has a strong and positive effect on the total size of OFI's funds. This coefficient has the lowest p-value and the highest magnitude parameter within the independent variable system. The broad money (M4), as a wider monetary aggregate, is controlled by central banks. After the global financial crisis and the European debt crisis, quantitative easing programs affected a significant increase in the monetary aggregate (M4) in Europe and other developed economies worldwide. The increased availability of money supply in the economy has a strong and positive effect on the total OFIs assets, in compliance with previously set expectations. The sectoral analysis of M4 deposits made by the Bundesbank (2014) indicates that in the period before the 2007 financial and economic crisis, in parallel with the increased importance of shadow banks, the short-term OFI's deposits in total M4 deposits also increased. Consequently, the monetary analysis should consider that the increased participation of deposits kept by shadow banks in the commercial banking sector affects the overall volatility of monetary aggregates.

The yields on long-term government bonds (YGOVBONDS) have a significant and positive connection with the OFI's total assets, i.e., when long-term bond yields decrease, the total assets of shadow banking are also reduced. Long-term government bond yields reflect investors' confidence in the country's stability and the institutions' ability to repay their debt. Lower long-term interest rates relate to lower risk premiums. Additionally, countries assessed as less risky in capital markets have seen less involvement of shadow banking in the loan-making process. Barbu (2016) also confirms the positive link between shadow banking and long-term interest rates, pointing to the existence of a scheme in investors' behaviour of being focused on identifying alternatives to invest that generate higher yields.

GDP growth affects an increase in OFIs. These results are compatible with the previously explained expectations in the paper as well as consistent with the hypothesis of shadow banking pro-cyclicality, analysed by Adrian and Shin (2009) and empirically supported by Duca (2016), Hodula, Machacek and Melecky (2017), Kjosevski, Petkovski and Stojkov (2020).

The results do not align with our expectations and theoretical assumptions regarding the impact of short-

term interest rates. However, the obtained positive link between short-term interest rates and shadow banking can also be confirmed by the detected direction of trend lines for most of the period in which, based on empirical data, these two variables are analysed. The trend of pro-cyclicality between short-term interest rates and shadow banks' assets indicates increased activity of shadow banks during periods of upward interest rate movements and strained monetary policy and lower activity during periods of lower interest rates, relaxed monetary policy, and accelerated growth in bank loans. This suggests that in the short term, lenders demonstrate low-interest elasticity, and when traditional banks abstain from lending, they find an alternative, more expensive source of funding from shadow banks.

The loans to monetary financial institutions (MFIs) show a positive but still weak relationship with the size of the OFIs. This can also be confirmed through performed analysis based on the available empirical data where trends in the same direction for these two variables are detected. Although not with high statistical significance, in accordance with the previously explained expectations, the hypothesis of complementarity between shadow banking and the traditional banking system is visible.

The empirical model found a positive link that is not statistically significant between shadow banking as a dependent variable on one side and government spending and the stock index as independent variables on the other. Accordingly, in the context of the financial markets' performances, we should consider that the countries from the analysed sample share the exact characteristics of bank-centric financial sectors and less developed financial markets compared to the more developed EU countries.

Conclusion

The subject of this paper is the relationship between selected macroeconomic and financial variables and the size of the shadow banking system by applying the regression with time-fixed effects in seven countries of Central and South-Eastern Europe in the period from the first quarter of 2007 to the second quarter of 2021. Although the shadow banking system contributes to improving the efficiency of the financial markets and supporting the availability of credits to the real sector, strengthening the interconnection with other segments

of the financial system may also influence an increase in systemic risk.

The empirical analysis showed a significant statistical relationship with most of the analysed financial and macroeconomic variables. Shadow banking has experienced rapid growth, maintaining everything else constant. As expected, pro-cyclicality was proven by the variables representing GDP, long-term interest rates, credits of monetary financial institutions, and monetary aggregate M4. On the other hand, a statistically insignificant relationship was observed between government spending and the stock market index. Contrary to the yield hypothesis and previously set expectations, a positive and significant relationship with short-term interest rates were detected.

Referring to the short terms, the trend indicates increased activity of the shadow banks in periods of upward interest rates and restrictive monetary policy and lower activity during periods of downward interest rates, relaxed monetary policy, and accelerated growth of the bank loans. Additionally, increased capital and liquidity requirements and a focus on increased profitability followed by greater certainty led to a substitution of bank lending with increased investment in government securities. Excessive regulation of the banking sector redirects financial services users outside the official banking channels to a less regulated segment of the financial sector.

In such conditions, shadow banking acts countercyclically and complementary to the banking sector, supplementing the portion of the financial products demand not supported by the banking sector due to regulatory requirements. Precisely this was the main goal of this paper - to point out that the threat of more excellent orientation towards strengthening the capital regulations of banks to further expansion of activities in the non-banking part of the financial sector outside the sight of regulators, as well as the need to address the challenge of making this less regulated part of the financial system more stable and sustainable.

For the following research, the challenge will be to analyse the impact of regulatory requirements as one of the critical determinants that cause further expansion of the activities outside the regulated system. The challenge of strengthening the regulation of the financial sector should be in the non-banking segment, not as an attempt to eliminate the shadow banking system but as an

orientation towards its greater sustainability and stability. Trying to eliminate shadow banking at the expense of further strengthening traditional banking regulations may cause unintended consequences and create a potential “new shadow banking system”, with banks less concerned about their reputation and more oriented to taking risks.

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