Journal of Business and Economics, ISSN 2155-7950, USA
March 2012, Volume 3, No. 3, pp. 189-197

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Financial Integration and International Diversification of East and South Mediterranean Stock Markets

Saoussen Kouki
(Faculty of Economic Sciences and Management, Tunisia)

Abstract: In this work we will try to test out the level of financial integration, to analyze the volatility of financial series at the international diversification. By developing an asymmetrical of the GARCH multivariate model of De Santis and Gérard (1997, 1998), in order to test the conditional version of CAMP International, we will test the dynamical interactions between the volatility of every market of the east-south Mediterranean countries and the European market. This model is assessed for eight stock markets of the East and South of the Mediterranean (Algeria, Morocco, Turkey, Tunisia, Syria, Jordan, Libya and Egypt) and five European stock markets (Germany, France, Spain, Italy and the United Kingdom). The model is assessed over the period from January 1980 to December 2009, simultaneously for all the markets. Our findings show that the existence of transmissions on average and variance increases the interdependence of the markets and reduces the benefice of the international diversification.

Key words: financial integration; international diversification; transmission of chocks; transmission of volatility chocks; GARCH multivariate

JEL codes: F36, G12, G15

1. Introduction

Following the movements of liberalizations towards the end of the eighties and from the 1990s, the emerging countries knew a tremendous economic growth and a spectacular development of their stock markets. From 1996 on, the net flow of private capitals on the emerging-markets increased. This influx of foreign investments generated a decrease of volatility of these emerging markets as well as a decrease of the cost of the capitals thus allowing the development of an integration movement among them as well as developed markets (Albuquerque, Loyza and Serven, 2003).

Consequently, opening the emerging markets helps attract foreign investors and increase the flow of capitals into them. Thus, Bekaert and Harvey (2000), Bailey and Lim (1992) noticed an increasing integration of these emerging markets into the international market, subsequently, the correlation with the developed markets increased and the rate of return declined. According to Henry (2000), the liberalization of emerging economies, allows for the growth of the number of foreign investors which favors the escalation of the liquidity which permits in its turn the diminution of the cost of the debt and the improvement of the profitability of certain projects.

Saoussen Kouki, Ph.D, Department of Quantitative Methods, Faculty of Economic Sciences and Management, Tunisia; research areas: international business, autoregressive models. E-mail: takofrane@gmail.com.

Therefore, great economic transformations imposed by the globalization marked this period, especially during the two last decades. Such context is characterized by commercial liberalization and by the progressive liberalization of the flow of capitals, the relaxing of the system of change control and the convertibility of currencies. This new economic architecture affected most of the countries of the east-south Mediterranean because of their insertion in the process of commercial liberalization and financial globalization. This market suffered from its small size, relatively feeble attraction and dynamism which constituted an important handicap to their development in a competitive context.

Empirically, Arouri (2006, 2007) studied the financial integration of some emerging markets. The results show that these markets are partially integrated within the international market. On the other hand, DeFusco, Geppert and Tsetsekos (1996) demonstrated that the American market and the emerging markets of the pacific basin, of Latin America and of the Mediterranean are not integrated among themselves. This independence implicates the existence of long-term profits thanks to the international diversification of these markets.

The objective of this paper consists thus in measuring the financial integration of the stock markets of the countries of the east-south Mediterranean with the European market and to conclude whether there are any gains from the international integration among them, especially with the growing willingness to start fruitful relationships with third Mediterranean countries. Consequently, the partnership agreements finalized between the European Union and the east-south Mediterranean countries at the occasion of the "Barcelona Process" underlines the willingness of the participants to establish among them "a global partnership, a Euro-Mediterranean partnership through a reinforced, regular political dialogue, a development of economic and financial cooperation, a growing enhancement of the social, cultural and human dimensions". The economic and financial aspects of this new partnership, in particular, were very ambitious, setting as objective the building around the Mediterranean of a "shared prosperity zone", notably through the progressive instauration of a free trade area. One of the objectives of the Barcelona Process is to create an environment suitable for foreign investments which is considered an essential factor of development and which can contribute to the modernization of the countries of the south and east of the Mediterranean in an integrated world hence the need to achieve their international integration.

Thus the financial integration of the national markets makes, on the one hand, the international diversification of portfolios more effective by facilitating the passage from one market to another and by increasing the efficiency of the sock markets. On the other hand, financial integration would have increased the correlations between the national stock markets which would reduce the benefits of the strategies of international diversification.

The global effect of the international financial integration on the return of the strategies of diversification would be ambiguous. Therefore, we developed an asymmetrical extension of the model multivariate GARCH of De Santis and Gérard (1997) by using a conditional version of the model of balance of the financial assets (CAMP) to quantify the evolution of the benefits of financial integration according to the degree of integration in the stock markets. Our study concerns thirteen markets (four European markets: France, Great Britain, Germany, Spain and Italy) and eight markets of the east-south Mediterranean (Algeria, Morocco, Turkey, Tunisia, Syria, Jordan, Libya and Egypt) and cover the period 1980–2009. The model is estimated simultaneously for the thirteen markets.

Thus, our purpose is to determine the link between the degree of integration of the stock markets of the east-south Mediterranean and with the European markets and the profit expected of the international diversification of the portfolios. If the markets are integrated then the potential profits will be low. If the markets are segmented or partially integrated so the international diversification plays an important role: what is the degree

of integration of the East-South Mediterranean countries in the European market? And what is the impact of the level of integration of these markets on the profits of the international diversification and on the sensitivity of the market of the East-South Mediterranean to the information and uncertainties of the European market.

So we try in the empirical part to test the dynamic interactions between the volatility of the countries of east-south Mediterranean and between the European countries and to determine the conditional correlations between these two markets.

2. Empirical Study

Most of the researchers used the international CAMP and especially the conditional international CAMP to test the degree of financial integration of different stock markets and also to determine the profits of the international integration.

2.1 Test of the Degree of Financial Integration

When the markets are strictly segmented the investors run only specific risks. In that case the same investment in two different countries can have different returns because the sources of risk and their cost can be different. In the models of evaluation of the assets with strict segmentation, the expected profitability of financial assets is determined by the local sources of risk. We can for example cite the domestic models of Sharpe (1964), Lintner (1965), Black (1972) and of Merton (1973).

If we go by the models of Sharpe (1964) and Lintner (1965) the risk premium of the title *A* is related to the risk of the national market *i*:

$$E(R_{it}^{A}\text{-}R_{ft}/\varphi_{t-1})=\lambda_i \mathrm{cov}(R_{it}^{A},R_{it}/\varphi_{t-1}) \quad (1)$$

With R_{it}^{A} the profitability of the title *A* (in the country *i*), R_{ft} is the profitability of the market of the country *i,* R_{ft} is the profitability of the risk free asset, and λ_i is the local price of risk. All the anticipations are conditional on the informational vector φ_{t-1} available to the investors at the instant (t-1).

Accordingly the markets are said to be perfectly integrated if there are no barriers to the movements of capitals between the countries and the exterior. Thus we say that the countries are perfectly integrated if and only if the systematical risks are remunerated in the same way in all the countries. Generally if the markets are perfectly integrated, the assets subject to the same risks must have the same price even if they are treated in different markets. In perfectly integrated markets, the investors run common risks and risks specific to their countries, but they are only remunerated for the common sources of risk because the specific risks are totally diversifiable. Therefore, if the market is perfectly integrated the risk premium expected on the given assets equal the world unit risk price multiplied by the exposition of this asset to the risk of the portfolio of the international market. If we suppose moreover that the Purchasing Power Parity is not verified, the model must include the premiums linked to the risk of the exchange rate. In that case a model of the type of Adler and Dumas (1983) at *L+1* countries can describe the expected profitability:

$$E(R_{it}/\varphi_{(t-1)}) - R_{ft} = \lambda_e \mathrm{cov}(R_{it}, R_{et}/\varphi_{t-1}) + \lambda_k \mathrm{cov}(R_{it}, R_{kt}/\varphi_{t-1}) \quad (2)$$

With R_{et} as the profitability of the portfolio of the European market and λ_k as the price of the European risk. R_{kt} is the profitability of the exchange rate of money of the country. *k* against that of the country of exchange and λ_k is the risk price of the exchange of the money *k*.

In reality, the international financial markets are partially integrated. Econometrically the two extreme cases

can be combined to give birth to a model of change a probabilistic regime described by the relation:

$$E(R_{it}/\varphi_{t-1}) - R_{ft} = \Omega^{i}_{t-1}[\lambda_e \mathrm{cov}(R_{it}, R_{et}/\varphi_{t-1}) + \lambda_k \mathrm{cov}(R_{it}, R_{kt}/\varphi_{t-1})] + (1 - \Omega^{i}_{t-1}[\lambda_i \mathrm{Var}(R_{it}/\varphi_{t-1})] \quad (3)$$

With the coefficient Ω^{i}_{t-1} which is interpreted as a conditional measure of the degree of financial integration of the stock markets of the countries of the East-South of the Mediterranean with the European market. The level of integration is supposed to vary in time. If $\Omega^{i}_{t-1} = 1$, so the stock market is perfectly integrated. If $\Omega^{i}_{t-1} = 0$, so the stock market is a strictly segmented market. And if $[\Omega^{i}_{t-1}] > 1$, we are in between the two regimes. The stock market is then partially integrated.

2.2 Dynamic of the Conditional Variance and Covariance

Econometrically, we can describe the equation (3) as follows and under the hypothesis of rationalization:

$$E(R_{it}/\varphi_{t-1}) - R_{ft} = \Omega^{i}_{t-1}[\lambda_e h_{iet} + \lambda_k h_{ikt}] + (1 - \Omega^{i}_{t-1})[\lambda_i h_{iit}] + \varepsilon_{it} \quad (4)$$

h_{iet}, h_{ikt}, and h_{iit} are the colons of the matrix of variances and covariances H_t, of size (N, N), measuring the expositions to risk of the European market to the risk of exchange of every country k and the local market. ε_{it} are the errors conditional to the degree of financial integration at the date t-1. These errors follow the normal distribution $N(0, H_t)$ of average null and of variance H_t. The choice of the model of multivariate GARCH allowed us to assure a matrix of variance-covariance defined positively and to understand the transformation in variance and covariance.

Engle and Kroner (1995) present several models of MGARCH. For our work we chose the model BEKK because it presents a very important characteristic in allowing conditional variances and covariances of the returns and of the changes of the exchange rate to influence one another and at the same time, it doesn't necessitate the estimate of a large number of parameters (Karolyi, 1995). Thus the equation can be written as follows:

$$H_t = C^{*'} C^{*} + \sum_{k=1}^{k} A^{*'}_{k} k\, \varepsilon_{t-1}\varepsilon^{*}_{t-1} A^{*} + \sum_{k=1}^{k} B^{*'}_{k} H_{t-1}\, B_k \quad (5)$$

With C designated an (N, N) symmetric matrix, which guarantees the positivity of the variance-covariance matrix. A* and B* are two matrix of (N, N) dimension. Specifically, the diagonal elements of matrix A (a_{11} and a_{22}) measure shock persistence in stock returns. The diagonal elements of matrix B (b_{11} and b_{22}) measure time persistence in conditional stock returns volatilities. The off-diagonal elements a_{12} of the symmetric (N, N) matrix A measure the Effect of transfer of the volatility, and the elements b_{12} and b_{21} of the symmetric (N, N) matrix B indicate the persistence in conditional volatility. This can be expressed through the case of the BEKK:

$$\begin{pmatrix} H_{11t} & H_{12t} \\ H_{21t} & H_{22t} \end{pmatrix} = CC' + \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix} \begin{pmatrix} \varepsilon^2_{1t-1} & \varepsilon_{1t-1} & \varepsilon_{2t-1} \\ \varepsilon_{2t-1} & \varepsilon_{1t-1} & \varepsilon^2_{2t-1} \end{pmatrix} \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix} + \begin{pmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{pmatrix}' \begin{pmatrix} H_{11t-1} & H_{12t-1} \\ H_{21t-1} & H_{22t-1} \end{pmatrix} \begin{pmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{pmatrix} \quad (6)$$

Where H_t is a linear function of its own, as well as a lagged value of the squared innovation, both of which allow for own market and cross-market influences in the conditional variance (Karolyi, 1995).

So equations 7 and 8 determined the cross effects in the variance and covariance equations implied by the BEKK specifications.

$$H_{11,t} = c^2_{11} + a^2_{11}\varepsilon^2_{1,t-1} + 2a_{11}a_{21}\varepsilon_{1.t-1}\varepsilon_{2.t-1} + a^2_{21}\varepsilon^2_{2,t-1} + b^2_{11}H_{11,t} + 2b_{11}b_{21}H_{12.t-1} + b^2_{21}H_{22,t} \quad (7)$$

$$H_{22,t} = c^2_{12} + c^2_{22} + a^2_{12}\varepsilon^2_{1,t-1} + 2a_{12}a_{22}\varepsilon_{1.t-1}\varepsilon_{2.t-1} + a^2_{22}\varepsilon^2_{2,t-1} + b^2_{12}H_{11,t} + 2b_{12}b_{22}H_{12.t-1} + b^2_{21}H_{22,t} \quad (8)$$

$$H_{12,t} = c_{11}c_{21} + a_{11}a_{12}\varepsilon^2_{1,t-1} + (a_{21}a_{12} + a_{11}a_{22})\varepsilon_{1,t-1}\varepsilon_{2,t-1} + a_{21}a_{22}\varepsilon^2_{2,t-1} + b_{11}b_{12}H_{11.t-1} + (b_{21}b_{12} + b_{11}b_{22})H_{12,t} + b_{21}b_{22}H_{22.t-1} \quad (9)$$

The estimate of this system by the method of the quasi-maximum of likelihood allows recovering for every national market i the conditional variance and the conditional covariances with the European market and with the exchange rates.

3. Results and Discussions

In this section we present the analysis to the results of our research.

3.1 Results of the Degree of Integration of the East-South Mediterranean Stock Markets

In this study the major sources of risk of the European market and to the local market are simultaneously integrated in the same model (CAMPI). The latter allows the coefficient of integration (Ω_{t-1}^{i}) to vary in the course of time to detect the dynamic of financial integration and the convergence or not of every market towards that of the European market.

According to equation (3), we estimate the series of stock profitability in linear function of instrumental variables: the risk premium of the European market, the risk premium of exchange (global factors) and the risk premium of the markets of East-South of the Mediterranean (specific factors), with the help of the estimation method of ordinary least squares. The estimated coefficients help us determine the degree of integration of East-South Mediterranean stock market. The results of the estimation are summarized in Table 1.

Table 1 Estimate the Degree of Integration by OLS

Variable	Coefficient Ω_{t-1}^{i}	Std. Error	T-Statistic	Probability
Global factors	1.033331	0.406675	2.540929	0.0117
Specific factor	0.030273	0.144312	0.209774	0.8340

We found $[\Omega_{t-1}^{i}] > 1$(Sum of the coefficients 0.030273 +1.033331>1), so the stock markets of the East-South Mediterranean stock market is partially integrated with the European stock market. This result conforms with the results of the previous works of Bekaert and Harvey (1995, 1997), Karolyi and Stulz (2002), Dumas, Harvey and Ruiz (2003), Barr and Priestley (2004), Boubakri (2009), so that all the stock markets of emerging countries are partially integrated with the stock markets of developed countries. On this market the total risk premium consists mainly of the international risk premium and the local market converges towards the euro zone. The stock returns of the portfolio of the local market is rather influenced by the economic fluctuations coming from the exterior than by the variations of the financial and monetary aggregates linked to the local market. What we can notice after this estimation is that the global factors have a greater influence on the degree of integration of the stock markets of east-south Mediterranean countries than the specific factors of these markets (global factors (1.033331)> specific factors (0.030273)).

3.2 Results of the Dynamic Interactions between the Volatility of the Markets of the East-South Mediterranean and the European Market

The Table 2 which presents the coefficients of correlations between the profitability of the stock indexes of the markets of the East-South Mediterranean countries and the European market shows that:

The markets of the European zone are strongly correlated among themselves. The most elevated correlation is 88.30% between France and Germany followed by Italy and Germany with a coefficient of correlation of 85.90%.

The coefficients of correlation between the returns of the stock indexes of the markets of the East-South

Mediterranean countries are weak and sometimes negative. These coefficients varied from -37.3% between the Libyan and Jordanian markets to 59.80% between Jordan and Egypt. This result confirms the independence of these markets among themselves.

Similarly, the coefficients of correlation between the profitability of the markets of the east-south Mediterranean countries and the European market are very weak and sometimes negative. This shows that the markets of east-south Mediterranean countries are weakly correlated with the markets of the Euro zone. The most elevated level of correlation is registered between Germany and Morocco with 45.40%, followed by the German and Egyptian market with 45.20%. Consequently, the weakest coefficient of correlation is of -22.2% between Germany and Turkey. Hence, the markets of the euro zone that presents a strong correlation among themselves indicating thus a strong integration among them, while the markets of the east-south Mediterranean countries show a weak relationship of independence among themselves as well as with the European market. This allows making great profits from the international diversification on these markets of the east-south Mediterranean countries.

Table 2 The Unconditional Correlations of the Profitability of the Returns

	Algéria	Turkey	Tunisia	Syria	Morocco	Jordan	Libya	Egypt	Germany	France	Italy	United Kingdom	Spain
Algéria	1	0.026	0.020	0.32	0.067	0.024	0.036	0.043	0.060	0.054	0.040	0.051	0.33
Turkey		1	-0.146	0.093	0.011	-0.280	0.114	-0.182	-0.222	-0.184	-0.069	-0.120	-0.133
Tunisia			1	0.185	-0.209	-0.099	0.110	0.059	-0.048	-0.037	0.037	-0.017	-0.012
Syria				1	-0.006	0.510	-0.290	0.550	0.053	0.055	0.040	0.106	-0.048
Morocco					1	0.187	0.415	0.527	0.454	0.410	0.348	0.364	0.518
Jordan						1	-0.373	0.598	0.163	0.152	0.068	0.186	0.140
Libya							1	-0.050	0.175	0.137	0.163	0.107	0.143
Egypt								1	0.452	0.414	0.334	0.386	0.408
Germany									1	0.883	0.859	0.772	0.678
France										1	0.815	0.787	0.732
Italy											1	0.855	0.826
United Kingdom												1	0.815
Spain													1

Source: Datastream.

Notes: The table displays the sample periods and the sectors under investigation, in eight stock markets of East and South of the Mediterranean (Algeria, Turkey, Tunisia, Syria, Jordan, Libya and Egypt) and five European stock markets (Germany, France, Spain, Italy and the United Kingdom).

Also, the results reproduced above show that Algeria, Morocco, and Egypt are characterized by a significance of the different components of the matrix. This positivity is based on the analysis of the volatility of the financial series and the dynamic interdependences between the volatility in order to bring into consideration the interactions between the stock markets and to verify the persistence of the shocks on one of these markets. This study will be devoted to a model GARCH bivariate.

The coefficient of the matrix variance-covariance a_{ij} et b_{ij} allows us to determine the dynamic interaction between every market of the East-South Mediterranean countries and the European market and we can notice that the transmission of the volatility explains the sensitivity of every market to the information and uncertainties of the European market.

According to Hamao and Masulis (1990), Koutmos and Knif (2004), the markets are more and more

dependent in variance since there is more information in the volatility of the prices of the assets than in the prices themselves. The transmissions in average and in variance increase the interdependence of the markets and limit their financial integration.

According to this estimation (see Table 3) we can conclude that:

The average transmissions of shocks (the components of matrix A) are significant only for the case a_{21}, thus there is a certain persistence of the effect. This is explained by the great influence of the performances of the European market on the market of the East-South Mediterranean countries and the importance of the financial liberalization of these markets. These transmissions show that the specific shocks to the European market are a global factor to all the markets of the east-south Mediterranean countries.

The transmission of volatility shocks (the components of matrix B) is significant. These results show that the stock markets become more volatile with the financial integration. This sensitivity of the stock markets is linked to the negative effects of financial liberalization for the markets of the East-South Mediterranean countries. In this case, the real structures (degree of diversification of the economy, specialization and rare factors and technological factors) where decisive when it comes to the success of liberalization politics. According to Krugman (1998), the shortcomings of these resources did not allow to absorb the shocks generated by a fast opening and the speed of the liberalization. Moreover, this sensitivity increased with the last financial crisis in 2007. The latter is called "contagion"; Erichengreen and Jeffrey (1996), defined the contagion as the modification of the probability of crisis in a country in the aftermath of a crisis in another. This crisis developed by the commercial link and the macroeconomic similarities between the countries.

Table 3 Estimation of the Model GARCH Bivariate

Transmission of the volatility							
	Turquie	Algérie	Syrie	Tunisie	Maroc	Jordanie	Egypte
b_{11}	0.4625	0.4674	0.4309	0.0044	0.4725	0.4531	0.4555
	(0.0000)	(0.0000)	(0.0000)	(0.0004)	(0.0000)	(0.0000)	(0.0000)
b_{21}	0.0084	0.0060	0.0045	0.0012	0.0006	0.0058	0.0132
	(0.0000)	(0.6883)*	(0.3125)*	(0.0000)	(0.0000)	(0.0000)	(0.0001)
b_{12}	0.0030	0.0024	0.0025	0.0044	0.0018	0.0008	0.00083
	(0.0000)	(0.00002)	(0.0003)	(0.0000)	(0.0000)	(0.1554)*	(0.00016)
b_{22}	0.4646	0.4411	0.4511	0.4556	0.4719	0.4163	0.4574
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Effect of transfer of the volatility							
a_{21}	0.0000	0.0554	0.0024	0.0024	0.0002	0.0242	0.0541
	(0.1766)*	(0.2572)*	(0.8725)*	(0.0000)	(0.3967)*	(0.0000)	(0.0000)
a_{12}	0.0013	0.0095	0.0063	0.0021	0.0040	0.0048	0.0015
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Obstinacy of the volatility							
a_{11}	1.3367	1.4074	1.3213	1.4268	1.4843	1.4673	1.3733
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
a_{22}	1.4226	1.3668	1.3914	1.4899	1.4856	1.3552	1.4082
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)

Soucre: DataStream.

Notes: Table 2 displays the bivariate VAR (1)-BEKK estimation results for general indices and trade—weighted exchange rates in Algeria, Egypt, Jordan, Morocco, Syria, Tunisia and Turkey. Panel B reports the estimates of conditional variance—covariance parameters; a_{11} and a_{22} estimate the persistence of the volatility, respectively, b_{11}, b_{22}, b_{12} and b_{21} estimate the Transmission of the volatility, respectively; a_{12} and a_{21} estimate the Effect of transfer of the volatility.*Non significant (more than 5%). We did not present the Libyan market because we found that there is no interaction with the European market.

4. Conclusion

In this paper we tried first to determine the degree of integration of the east-south Mediterranean countries by developing and estimating an international modal of evaluation of financial assets with a degree of integration that varies across time. We evaluated this model by resorting to the econometrics of the data of the panel/sample. The use of the data of the panel/sample particularly presents the three following advantages: increase the size of the sample, take into consideration the effects of the individual specificities on the degree of financial integration and test the validity of the evaluation model in the individual and temporal dimensions.

Our results prove that the European markets are integrated among themselves while the markets of the East-South Mediterranean countries are partially integrated among themselves as well as in the euro zone. These conclusions conform with the majority of studies conducted on the theme of integration of the financial markets like those of Gilmore and McManus (2002), Bekaert, Harvey and Ng (2003) and Arouri (2007).This means that these markets of the east-south Mediterranean countries still represent an important source of international diversification of portfolio. Nevertheless, one must take into consideration the transmissions of shocks following several crises that struck the financial markets these last years (the crisis of 1997 in the markets of the south and the Asian markets, and the events of the 11th of September 2001 and their effect on the American market and the global crisis of 2007). The shocks are rapidly transmitted and affect significantly the other markets of the East-South Mediterranean countries. These crises are characterized by the development of a powerful contagion effect which affects negatively the potential profits of the international diversification.

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