Iranian Economic Review, Vol.15, No.29, Spring 2011

The Use of Financial Ratios as Measures of Risk in the Determination of the Bid-Ask Spread in Tehran Stock Exchange

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Received: 2009/10/29 Accepted: 2011/04/24

Abstract

Many recent studies accounts for the relationship between market risk measures and accounting risk measures. There is also a relationship between risk and bid-ask spread. Therefore some researchers have studied the relationship between financial information as measures of risk and bid-ask spread. The main goal of this paper is to review the relationship between financial information and bid-ask spread in Tehran Stock Exchange. Therefore 156 firms that their necessary information for a three years period was available are selected. Then information about 14 independent variables has been studied. Bid-Ask spread is also computed as dependent variable. Multivariate fixed effects panel data regression technique is used to examine the hypotheses. Signification of the models is examined by t and F statistics. The conclusions account for that the model measures more than twenty eight percent changes in Bid-Ask spread.

Keywords: Financial information, Bid price, Ask price, Bid-Ask spread.

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1- Introduction

The effect of financial reports on stock market behavior is a central issue of research in accounting and finance. A number of studies investigate how financial information becomes impounded in security prices and affects investment decisions. Market risk measures and accounting risk measures are the determinants of the bid-ask spread. Prior studies on the determinants of the bid-ask spread investigate the effect of market risk measures, and provide evidence that the bid-ask spread is a positive function of risk. Other studies report on an association between market risk measures and accounting risk measures. In terms of dividend payout (the ratio of the sum of cash dividends paid to common stockholders to the sum of income available for common stockholders), previous empirical studies report a positive correlation between stock prices and cash dividends (Aharony and Swary, 1980). Eades (1982) finds a clearly significant and negative relation between dividends and risk, consistent with that reported by Beaver et al. (1970), and Rozeff (1982) reports that an increase in dividend payout is associated with a decline in risk. Thus, as the dividend payouts increase, prices increase because this can be interpreted as "good news" by investors, with the expectation for the firm to generate higher future cash flows. As the firm's risk is reduced, the bid-ask spread decreases. The overall expected results are for a positive relation between risk and the bid-ask spread as proposed by Copeland and Galai (1983) and Glosten and Milgrom (1985). However, certain accounting ratios (dividend payout, asset size, and asset growth), despite being risk measures, are negatively related to the bid-ask spread. Studies on the determinants of the bid-ask spread use the Capital Asset Pricing Model as the basis for selecting the risk variables analyzed (Bagehot, 1971; Ho and Stoll, 1983; Copeland and Galai, 1983). Prior studies which examine the effect of risk on the bid-ask spread utilize market measures as proxies for risk in the analyses. The results of Ryan's study indicate that accounting risk measures, as proxies for risk, explain a significantly higher proportion of the variance in the bid-ask spread than market risk measures. Further, the explanatory power of a combined model with both accounting risk measures and market risk measures is higher than that of a model using either accounting or market risk measures alone, and higher than any of the models tested in previous studies. The findings

indicate that the use of financial ratios as risk measures enhances the predictive power of a model explaining variability in the bid-ask spread, and illustrate that a model with both accounting and market risk measures is better fitted than one using either accounting or market risk measures alone. The evidence presented in this study suggests that financial statement data provide information that reduces information asymmetry in the market, and indicates that investors should fully utilize this information set in assessing the potential riskiness of a security, and accordingly, in their investment decision-making. Ryan (1996) explains determinants of bid-ask spread. Ryan (1996) collected a random sample of 60 Over-the-Counter (OTC) firms for a three- year period, January 1, 1982 through December 31, 1984.

Bollen (2004) develops a simple, parsimonious model for the market maker's spread that accounts for the effects of price discreteness induced by minimum tick size, order processing costs, inventory-holding costs, adverse selection, and competition. Their model is tested empirically using NASDAQ stocks in three distinct minimum tick size regimes and is shown to perform well both in an absolute sense and relative to competing specifications.

2-Literature

The discussion of the cost components is organized in the manner of Stoll (1978), who posits that market maker costs fall into three categories: order processing costs, inventory-holding costs, and adverse selection costs. The components of bid-ask spread is as follows:

2-1- Order processing costs

Order-processing costs are those directly associated with providing the market making service and include items such as the exchange seat, floor space rent, computer costs, informational service costs, labor costs, and the opportunity cost of the market maker's time. Because these costs are largely fixed, at least in the short run, their contribution to the size of the bid/ask spread should fall with trading volume; that is, the higher the trading volume, the lower the bid/ask spread. To some degree, however, this relation may be weakened by the fact that market makers often make markets in more than one security. In such cases, fixed order-processing costs can be

amortized over total trading volume across securities. In addition, in a highly competitive market, bid/ask spreads should equal the expected marginal cost of supplying liquidity, in which case order-processing costs may be irrelevant.

2-2- Inventory-holding costs

Inventory-holding costs are the costs that a market maker incurs while carrying positions acquired in supplying investors with immediacy of exchange (liquidity). Here there are two obvious considerations: the opportunity cost of funds tied up in carrying the market maker's inventory and the risk that the inventory value will change adversely as a result of security price movements. With respect to the opportunity cost of funds, Demsetz (1968, p. 45) argues that price per share is a reasonable proxy. Spread per share will tend to increase in proportion to an increase in the price per share so as to equalize the cost of transacting per dollar exchanged. Otherwise, those who submit limit orders will find it profitable to narrow spreads on those securities for which spread per dollar exchanged is larger. His argument is that relative spread (bid/ask spread divided by bid/ask midpoint) should be equal across stocks, holding other factors constant, or the higher the share price, the higher the spread. Market makers try to reduce or close out positions before the close of trading each day, however. If positions are opened and closed in the same day, the marginal cost of financing is zero. Moreover, even if inventory is carried overnight, it is not clear whether it represents a cost or a benefit. If, during the day, most customer orders are buys, the market maker may be short inventory, in which case he will earn (not pay) interest overnight. Price-change volatility appears to have an unambiguous effect on the bid/ask spread. Market makers often carry inventory in the course of supplying liquidity, and hence bear risk. The size of the spread therefore must include compensation for bearing the risk. Demsetz includes trade frequency and the number of shareholders as proxies for this component of inventory-holding costs. Both variables, he argues, are direct proxies for the transaction rate. The higher the transaction rate, the lower the cost of waiting (price-change volatility equals the price-change volatility rate divided by trading frequency), and hence the lower the bid/ask spread. Tinic (1972) chooses to include a direct measure of volatility; that is, the standard deviation of price as a measure of inventory price risk. Tinic and West (1972) measure price risk as the ratio of the

difference between high and low prices to the average share price, Benston and Hagerman (1974) use the stock's idiosyncratic risk, Stoll (1978) uses the logarithm of the variance of stock returns, and Harris (1994) uses the standard deviation of returns.

2-3- Adverse selection costs

Adverse selection costs arise from the fact that market makers, in supplying immediacy, may trade with individuals who are better informed about the expected price movement of the underlying security. For an individual stock, it is easy to imagine that certain individuals possess insider information (e.g., advance news of earnings, restructurings, and management changes). While the intuition underlying why adverse selection may be an important determinant of spread is clear, the selection of an accurate measure of adverse selection costs is not. Branch and Freed (1977), for example, use the number of securities in which a dealer makes a market to proxy for adverse selection—the larger the number of securities managed, the less informed the dealer is, on average, about a particular stock. Stoll (1978) uses a measure of turnover (dollar trading volume divided by market capitalization)—the higher the turnover, the greater the adverse selection. Glosten and Harris (1988) use the concentration of ownership by insiders—the higher the concentration, the greater the possibility of adverse selection. Harris (1994) uses the market value of shares outstanding—the larger the firm, the more well known and hence the lower the possibility of adverse selection. Easley et al. (1996) use the volume of trading— the higher the trading volume, the greater the activity of uninformed traders relative to informed traders and the lower the adverse selection cost.

2-4- Internal researches

Izadinia and Rasaiian (2010) reviewed the relationship between ownership dispersion as an independent variable and bid-ask spread as dependent variable in Tehran Stock Exchange. Therefore 156 firms that their required data for a seventh year period was available were studied. The multivariate pooled regression model is used to examine the hypotheses. The conclusions indicate that there is no significant relationship between ownership dispersion and Bid-Ask Spread in Tehran Stock Exchange.

Markowitz, in his Portfolio selection theory, stated that investors select their portfolios according to two criteria of risk and return. Accordingly, he

presented his mathematical model. One of the criticisms of this model is that while investors, practically, consider different criteria in forming their portfolios, it only considers the return mean and returns standard deviation. Liquidity is one of the most important criteria in forming portfolios. Eslami Bidgoli and Saranji (2008) aimed at merging this criterion with Markowitz's suggested model in Iran's market using liquidity filtering, liquidity constraints and thus forming a model by using of which investors form a portfolio whose return, risk and liquidity is optimal. The research results show that liquidity in high levels has an effect on investors' decisions and their efficient frontiers (Eslami Bidgoli and Saranji, 2008).

Regarding the importance of the relationship between risk and return, Yahiazadehfar and Khoramdin (2008) investigated the effect of illiquidity risk and liquidity factors such as excess market return, firm size and book to market value ratio on excess stock return in their research. By using time series method, this investigation was conducted on Iranian companies listed in Tehran stock exchange monthly over the period 1999-2005. Portfolio construction approach is applied for the reduction of correlation coefficient among these variables. The results show that all of the applied independent variables have significant effect on the dependent variable. Namely, the impact of illiquidity and firm size on excess stock return is negative; however the effect of excess market return and book to market value ratio on excess stock return is positive.

Ghaemi and Vatanparast (2005) studied role of accounting information in decreasing of information asymmetry in Tehran Stock Exchange (TSE). Predicted Earnings per Share (PEPS) announcement is a type of information that listed companies publish. This paper studied existence of information asymmetric and its effect on stock prices and trading volume 21 days before 21 days after PEPS announcements. The samples are 121 PEPS announcement in 2002-2004 periods. The results show that information asymmetric was been in that period and its level in the period before announcement was higher than announcement. Also, they found information asymmetry was related to trading volume and stock price, so before the announcement, trading volume was increased and stock price was fluctuated.

3-Methodology

This study attempts to review the relationship between financial information and bid-ask spread. Therefore is an empirical study and use of ex-post design. The proportional bid-ask spread, which is represented by:

$$BA_{it} = \frac{(\text{ask price - bid price})}{\frac{(\text{ask price} + \text{bid price})}{2}}$$

is determined for each security over the three-year sample period, and then used as the dependent variable in several ordinary least squares (OLS) regressions to determine the factors affecting the bid-ask spread.

The Explanatory Variables

Previous theoretical and empirical studies report that the determinants of the bid-ask spread include the price of the security, its trading volume, (e.g., Demsetz, 1968; Benston and Hagerman, 1975; Stoll, 1978; and Glosten and Milgrom, 1985). Tinic and West (1972) show that spreads are negatively related to trading volume, while Glosten and Milgrom (1985) propose that the average spread tends to decline for large volumes of trade. Rial trading volume examined in this study, and expected to be positively related to bid-ask spread consistent with the results of previous studies such as Branch and Freed (1977) and Harris (1994). Tinic (1972), Tinic and West (1974), Barnea and Logo(1975) show that spreads are negatively related to percentage of the days that the firm's stock trades. Demsetz (1968) shows that spreads are negatively related to frequency of trading occurred in each day. Stoll (1978) shows that spread are positively related to daily turnover of firm's stock. Demsetz (1968), Tinic and West (1972) show that spread are negatively related to price. Roll (1984) presents a formulation of the bid-ask spread and empirically tests his model to determine the effect of firm size on the spread. His findings reveal an inverse relation between size and the bid-ask spread while Harris (1994) and Ryan (1996) show that spreads is positively related to market value. The present study uses market value as a proxy for size, and examines its effect on the spread. The second analysis examines the association between the spread and the market risk measures. The use of both price variability and market beta is intended to represent the total risk of a security as proxied by market variables. Positive coefficients for these variables are expected in the results, consistent with the theoretical

and empirical results of past research. Studies on the determinants of the bid-ask spread use the Capital Asset Pricing Model as the basis for selecting the risk variables analyzed (Bagehot, 1971; Ho and Stoll, 1983; Copeland and Galai, 1983). The studies which report on the relationship between accounting ratios and market risk measures identify the accounting risk variables examined in this study, as surrogates for the total variability of return on a firm's securities (Beaver et al., 1970). The third analysis extends the basic model to include these accounting risk measures, since previous research show that they are related to market risk measures for which there are a theoretical base. The overall expected results are for a positive relation between risk and the bid-ask spread as proposed by Copeland and Galai (1983) and Glosten and Milgrom (1985). However, certain accounting ratios (dividend payout, asset size, and asset growth), despite being risk measures, are negatively related to the bid-ask spread. In terms of dividend payout (the ratio of the sum of cash dividends paid to common stockholders to the sum of income available for common stockholders), previous empirical studies report a positive correlation between stock prices and cash dividends (Aharony and Swary, 1980). Eades (1982) finds a clearly significant and negative relation between dividends and risk, consistent with that reported by Beaver et al. (1970), and Rozeff (1982) reports that an increase in dividend payout is associated with a decline in risk. Thus, as the dividend payouts increase, prices increase because this can be interpreted as "good news" by investors, with the expectation for the firm to generate higher future cash flows. As the firm's risk is reduced, the bid-ask spread decreases. The empirical findings are expected to be consistent with these predictions. In terms of the asset variables (asset size - the natural log of total assets, and asset growth - the ratio of the natural log of total assets in time period t, to the natural log of total assets in time period t-1), prior research findings show that larger firms are usually more diversified in terms of lines of business and less susceptible to failure than smaller firms (Ohlson, 1980). Even though firms with larger asset sizes and higher asset growth rates are riskier than firms with smaller asset sizes and lower growth rates, these variables provide signals to investors and creditors about higher future cash flows. If investors value cash flows, they will trade more frequently in the stocks of firms with increasing asset growth rates and asset sizes, and the bid-ask spreads will decline. The other accounting risk variables (leverage -

the ratio of total senior securities to total assets, liquidity – the ratio of current assets to current liabilities, earnings variability - the standard deviation of the earnings-price ratio, are chosen because previous research show them to be good surrogates for risk. It is conceivable that investors use these ratios in predicting the future risk potential of a security, and positive signs on the coefficients for these variables are predicted in this study. Based on the foregoing description of the explanatory variables, the model to be analyzed is presented as follows:

$$BA = B_0 + B_1 CP + B_2 PDT + B_3 NDT, B_4 RTV + B_5 MV + B_6 DTU + B_7 PV + B_8 BET + B_9 AS + B_{10} AG + B_{11} DEP + B_{12} FL + B_{13} CR + B_{14} EV + e$$

$$H_0 : \beta_1 = \beta_2 = ... = \beta_{14}$$

$$H_1 : \beta_i \neq 0$$

Where:

BA = proportional bid-ask spread
CP = closing price per share
PDT = Percentage of the days that even have one trade occurred in variability
NDT = number of trading occurred in each day
BET = market beta
MV = market value
DEP = dividend payout
AG = asset growth
FL = Financial leverage
AS = asset size
CR = liquidity
EV = earnings
DTU = Daily turnover
PV = price variability
β_0 = intercept term
$\beta_1, \beta_2, \beta_3, .. \beta_{14}$ = regression coefficients
RTV=Rial trading volume

e = error term, assumed to be serially independent, normally distributed, and independent of the regressors

The model predicts that the coefficients on price, number of trading occurred in each day, Percentage of the days that even have one trade occurred in, daily turnover, and market value, and certain accounting variables (dividend payout, asset size, and asset growth) will be negative, while the coefficients on the other accounting risk variables (leverage,

liquidity, earnings variability, and the market risk variables (beta and price variability) and an other variable, Rial trading volume, will be positive.

The Data

Data for a three-year period, January 1, 2001 through December 29, 2003, were collected on a random sample of 156 firms of Tehran stock exchange. Other data requirements for selection include the following:

(1) Each firm had financial statement data available in Tehran stock exchange for the period 2001 through 2004;

(2) Daily ask and bid prices, as well as volume data for each firm were available on Compuserve Tapes for the period to be studied;

Summary statistics on the bid-ask spread were computed for each security. Several OLS regressions were then estimated using the bid-ask spread as the dependent variable, and price per share, number of trading occurred in each day, Percentage of the days that even have one trade occurred in, daily turnover, Rial trading volume and market value, accounting risk measures, and market risk measures as predictor variables. The variables in the model were measured either at the end of the year (market value of the firm, accounting risk measures, and market risk measures), or over the entire year (average of daily bid-ask spreads, prices, umber of trading occurred in each day, Percentage of the days that even have one trade occurred in, Rial trading volume, and daily turnover. Summary statistics on the bid-ask spread were computed for each security. OLS Fixed Effects regression was then estimated using panel data or pooled method.

4- Regression results of the model

The results of the model that are presented in table 1 are as follows:

Table 1: The Results of Examining the Model with Fixed Effect Approach

Dependent Variable: BA											
Variable				**Coefficient**		**Std. Error**		**t-Statistic**		**Prob.**	
AS				6.734702		2.928715		2.299542		0.0218	
AG				-52.97006		27.27303		-1.942214		0.0526	
CR				0.022235		0.040501		0.548984		0.5832	
FL				-0.076174		0.079966		-0.952585		0.3412	
DP				0.038169		0.022998		1.659679		0.0975	
BET				0.514455		0.459691		1.119130		0.2635	
PDT				-0.132244		0.054782		-2.414001		0.0161	
NDT				-0.044524		0.042773		-1.040920		0.2983	
CP				-0.000152		0.000125		-1.214599		0.2250	
RTV				-0.755467		0.855464		-0.883108		0.3775	
DTU				1.252827		3.261864		0.384083		0.7011	
EV				0.000829		0.001809		0.458099		0.6470	
MV				1.395015		2.139692		0.651970		0.5147	
PV				0.518765		0.857215		0.605175		0.5453	
Fixed Effects											
1-C	-23.2949	27-C	-21.5067	53-C	-18.7959	79-C	-10.8655	105-C	-15.64	131-C	-17.4967
2-C	-9.14631	28-C	-25.0093	54-C	7.186972	80-C	-12.6666	106-C	-10.1284	132-C	-34.5359
3-C	-2.20373	29-C	-18.1621	55-C	-9.83922	81-C	-16.1633	107-C	-6.86296	133-C	-21.6018
4-C	-5.84227	30-C	-28.3932	56-C	-14.6653	82-C	-14.728	108-C	18.81544	134-C	-26.3276
5-C	-24.4293	31-C	-30.6476	57-C	-21.1166	83-C	-16.7561	109-C	-7.92036	135-C	-12.383
6-C	17.51684	32-C	-38.2105	58-C	-13.4374	84-C	-8.50945	110-C	22.79751	136-C	-19.9317
7-C	-15.5336	33-C	-7.9177	59-C	-15.3572	85-C	-20.0652	111-C	-17.3256	137-C	-34.1935
8-C	0.916347	34-C	-31.8134	60-C	-2.58056	86-C	-7.2384	112-C	-11.2827	138-C	-23.3502
9-C	-4.0293	35-C	-7.75762	61-C	-18.0098	87-C	-2.90921	113-C	-9.75727	139-C	-6.57312
10-C	-8.38587	36-C	-18.8366	62-C	-14.9065	88-C	-24.2609	114-C	-17.6067	140-C	-21.0005
11-C	-17.7529	37-C	0.756198	63-C	-23.272	89-C	-11.1411	115-C	-8.73388	141-C	-14.3226
12-C	-33.5136	38-C	-24.8704	64-C	-25.4251	90-C	-17.5492	116-C	-16.0472	142-C	-31.6174
13-C	-37.6343	39-C	-16.917	65-C	-15.5251	91-C	-15.2199	117-C	3.560373	143-C	-16.4617
14-C	-39.7316	40-C	-31.3486	66-C	-24.8637	92-C	-11.333	118-C	-14.6127	144-C	-27.7821
15-C	-15.4167	41-C	-23.4286	67-C	-18.3583	93-C	-19.4728	119-C	-14.7011	145-C	-24.5503
16-C	-1.56382	42-C	-22.6098	68-C	-21.4855	94-C	-16.7877	120-C	-25.0648	146-C	-15.394
17-C	-11.7377	43-C	-18.9246	69-C	-17.7692	95-C	-5.30676	121-C	-8.52373	147-C	-22.057
18-C	-15.5311	44-C	-20.9782	70-C	-42.697	96-C	-24.3341	122-C	0.823844	148-C	-27.4792
19-C	-12.2491	45-C	-15.8312	71-C	-19.8188	97-C	-17.2567	123-C	-21.747	149-C	-24.6623
20-C	-11.8991	46-C	-13.4438	72-C	-34.4403	98-C	-19.5028	124-C	-17.144	150-C	3.904428
21-C	-24.2145	47-C	-23.9854	73-C	-24.2383	99-C	-32.4953	125-C	-23.9358	151-C	-24.7648
22-C	-17.8351	48-C	-16.4285	74-C	-16.5931	100-C	-26.408	126-C	14.02231	152-C	-21.4968
23-C	-32.5352	49-C	-9.73818	75-C	-8.87254	101-C	2.190843	127-C	-26.9063	153-C	-23.0265
24-C	-19.6569	50-C	-9.12823	76-C	-13.1258	102-C	-23.9006	128-C	-20.0761	154-C	-17.7187
25-C	1.70708	51-C	-10.0739	77-C	-12.8091	103-C	-6.5827	129-C	-28.0758	155-C	-15.4087
26-C	75.26313	52-C	-16.0672	78-C	-22.2884	104-C	-22.1484	130-C	-13.166	156-C	-14.4162

R-squared	0.545519	**Mean dependent var**	9.368290
Adjusted R-squared	0.287776	**S.D. dependent var**	14.71533
S.E. of regression	12.41876	**Sum squared resid**	45959.26
F-statistic	27.51481	**Durbin-Watson stat**	2.245943
Prob(F-statistic)	0.000000		

The results show that spreads are negatively related to percentage of the days that the firm's stock trades consistent with the results of previous studies such as Tinic (1972), Tinic and West(1974), Barnea and Logo(1975) and Stoll(1978). Spreads are positively related to firm assets size, inconsistent with the results of previous studies such as Ryan (1996). The results show that spreads are negatively related to assets growth, consistent with the results of previous studies such as Ryan (1996). Spreads are positively related to dividend payout, inconsistent with the results of previous studies such as Ryan (1996). Other variables have no significant relationship with bid-ask spread.

5-conclusions

This study attempts to build on prior research on the usefulness of accounting information. The findings (such as Ryan's research findings (1996)) indicate that the use of financial ratios as risk measures enhances the predictive power of a model explaining variability in the bid-ask spread, and illustrate that a model with both accounting and market risk measures is better fitted than one using either accounting or market risk measures alone. The evidence presented in this study suggests that financial statement data provide information that reduces information asymmetry in the market, and indicates that investors should fully utilize this information set in assessing the potential riskiness of a security, and accordingly, in their investment decision-making. The conclusions account for that the model measures more than twenty eight percent changes in Bid-Ask spread.

Table 2: The Relation between Bid -Ask Spread and the Variables that are Used in Most of the Researches:

Study	Abs/Rel	PDT	TV	DTV(RTV)	DTU	NDT	P	1/P	MV	PV	BET	NS	ND	NI
Demsetz (1968)	Abs		--			--	++					--		
Tinic(1972)	Abs	--	--				++			++				--
Tinic and West (1972)	Abs		--				++						--	
Tinic and West(1974)	Abs	-	--				++			0				
Benston and Hagerman (1974)	Abs						++					--	--	++
Barnea and Logo(1975)	Abs	--								++				
Hamilton (1976)	Abs						++					0		--
Branch and Freed(1977)	Rel		--	++				++						
Hamilton (1978)	Abs						++			+		-	--	--
Stoll(1978)	Rel	--	--		++		--				++		--	
Harris (1994)	Rel		--	++				++	++					
Ryan(1996)	Rel		--				--		+	-	+	-	+	
This study	Rel	--		-	+	-	-		+	+	+			

++ Positive and significant at the 0.05 level of α , - - negative and significant at the 0.05 level of α , + positive and insignificant, - negative and insignificant, 0 not significantly different than zero at 5% level, *significant at the 0.1 level of α . Abs: absolute bid-ask spread, Rel: relative bid-ask spread, PDT: percentage of days that trades occurred in, TV: trading volume, RTV (DTV): Rial trading volume (Dollar trading volume), DTU: daily turnover, NDT: number of daily trades, P: stock price, MV: market value, PV: price variability, BET: market beta, NS: number of shareholders, ND: number of dealers, NI: number of institutional shareholders.

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