

## **The Impact of Stock Price and Interest Rate on the REIT Market in Japan**

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### **ABSTRACT**

This paper analyzes the impact of stock prices and interest rates on the Real Estate Investment Trust (REIT) market in Japan. The entire sample is divided into two sub samples. Sample A runs from March 31, 2003 to May 31, 2007, and Sample B from June 1, 2007 to January 10, 2013. Sample B includes financial stress events such as the collapse of Lehman Brothers and the fiscal crisis in the euro zone. The positive impact of stock prices is larger in Sample B. On the other hand, negative impact of interest rates is larger in Sample B. This is because the financial stresses during the period of Sample B made it difficult for REIT companies to procure funding. The negative impact of swap rates is larger than that of Japanese Government Bond yields, particularly for Sample B. This is consistent with the fact that benchmark interest rates for mid- and long term- loan are based on swap rates.

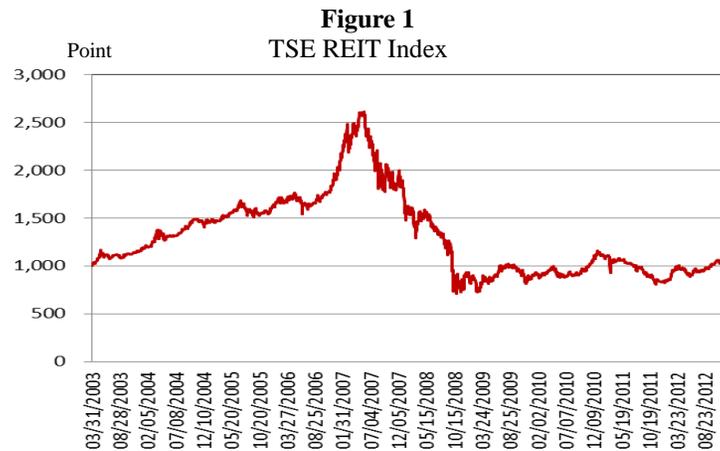
*JEL Classifications:* E43, G12

*Keywords:* financial crisis; interest rate swap; JGB; REIT; stock price

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## I. INTRODUCTION

The first two REITs (Real Estate Investment Trust) were listed on the TSE (Tokyo Stock Exchange) in Japan on September 10, 2001<sup>1</sup>. Since its launch at the end of March 2003, the TSE REIT Index increased over several years before the sub-prime loan crisis in the US. The announcement by HSBC Holdings on February 7, 2007 that its 2006 charges for bad debts from US housing loans would be more than \$10.5 billion was a surprise, being 20 % higher than financial analysts had anticipated. The suspicion that subprime loan might be a big problem was disseminated in the financial markets the same day. Figure 1 shows the movement of the TSE REIT Index from March 31, 2003 to January 10, 2013. It can be seen that the Index peaked at 2612.98 on May 31, 2007. After the end of May, it began to decline, reducing further after subsidiaries of BNP Paribas announced on August 9, 2007 that they were suspending liquidations due to the difficulty of obtaining fair values for ABS (Asset Backed Securities) related assets under market pressure.



Notes: Sample period is from March 31, 2003 to January 10, 2013.

After the collapse of Lehman Brothers on September 15, 2008, the REIT Index tumbled amid concerns as for the tightening of fund procurement. It declined to a record low of 704.46 on October 28, 2008. On October 9, 2008 the New City Residence Investment Corporation had filed a petition for protection with the Tokyo District Court under the Corporate Rehabilitation Law because it became difficult to procure funds. This was the first bankruptcy of a REIT listed on the TSE. Pacific Holding, owner of two REIT investment corporations (the Japan Commercial and Japan Residential Investment Corporations), also filed a petition for protection with the Tokyo District Court under the Corporate Rehabilitation Law on March 10, 2009 because of difficulty procuring funds<sup>2</sup>.

The Joint Corporation, owner of the Joint REIT Corporation, filed a similar petition on May 29, 2009. After this case, the REIT market began to recover gradually because concerns over the procurement of funds were progressively alleviated. The Great East Japan Earthquake on March 11, 2011 cast a shadow over the REIT market,

but the gradual recovery continued. After newly elected Prime Minister Sinzo Abe announced anti-deflationary measures in December 2012, the REIT market began to demonstrate an upward trend. The TSE REIT Index increased to 1,110.13 on December 21, 2012, thereby surpassing its closing price of 1,092.29 on March 10, 2011, the day before the Great East Japan Earthquake. This was partially due to market speculation that the BOJ (Bank of Japan) was about to introduce an inflation targeting policy to bring the Japanese economy out of deflation<sup>3</sup>. The BOJ therefore decided to introduce a price stability target under the framework for the conduct of monetary policy on January 22, 2013. This target was set at 2 percent in terms of the year-on-year rate of change in the consumer price index (CPI)<sup>4</sup>.

According to the ARES (Association for Real Estate Securitization) (2012), in November 2012, the portfolio asset size of the REIT market in Japan, which represents the total acquisition price of REIT-owned properties, reached ¥9 trillion. It had taken 1.4 years for the REIT industry to add ¥1 trillion properties to the portfolio since its size had reached the ¥8 trillion in June 2011. That compares to the 3.3 years it took to increase from ¥7 to ¥8 trillion, indicating an accelerating period of growth. The number of listed investment corporations by the end of 2012 was 37.

According to ARES (2013), at the end of 2012, the equity market capitalization of J-REIT stood at ¥4.51 trillion, a rise of 53.4 percent from the previous year end figure of ¥2.94 trillion.

This paper focuses on the impact of stock prices and interest rates on the REIT market in Japan. It examines two important issues. Firstly, it looks at the relationship between the REIT market and stock prices. Investors are supposed to hold REIT and stock as risk assets. Kapopoulos and Siokis (2005) suggest that one of the mechanisms that can be used to interpret the relationship between real estate investment and stock is the wealth effect. Investors making gains in share prices will invest in real estate. Hence, the stock market will lead the real estate market. Ross and Zisler (1991), Ennis and Burik (1991), and Gyourko and Keim (1992) all conclude that returns on REIT are highly correlated with stock market returns.

Secondly, the paper also looks at how the REIT market is related to interest rates. The REIT investment corporations procure funding via loans up to a certain Loan to Value (LTV) ratio. They usually set the upper limit of LTV at about 60 % to 70%. Thus a higher interest rates cause a difficulty for fund management by increasing costs. Previous studies have concluded that the returns of real estate and REIT are influenced by interest rate movements. The results of studies by Chen and Tzang (1988), Chan et al. (1990), Mueller and Pauley (1995), Liang and Webb (1995), Ling and Naranjo (1997) and Brooks and Tsolacos (1999) generally support the idea that interest rates are significant factor in the REIT pricing.

This paper makes three original contributions to the related literature. Firstly, Su et al. (2010) is the only previous study to focus on REITs in Japan, but their sample period ends before the collapse of Lehman Brothers. This paper covers the period from March 31, 2003 to January 10, 2013, so events such as the collapse of Lehman Brothers and the fiscal crisis of the EU countries are included. Secondly, the entire sample period is divided into two around the point when the TSE REIT index hit a record high at 2612.98 on May 31, 2007. Accordingly, it is possible to investigate the asymmetrical impacts of stock prices and interest rates on the REIT market. Thirdly, this paper uses six types of interest rates in the analysis, namely Japanese Government Bond (JGB)

yields and swap rates of 2, 5, and 10 years. As He et al. (2003), Chen and Tzang (1988), and Allen et al. (2000) indicate that the real estate sector uses long-term liabilities as financing sources, it is relevant to compare the impacts of different interest rates on the REIT market.

## II. LITERATURE REVIEW

So far, very limited analysis has been carried out on the relationship of the REIT market with stock prices and interest rates in Japan. Su et al. (2010) conduct a comparative analysis between Japan and the US. They investigate whether the behavior of REITs is more like that of common stocks or bonds by inspecting the conditional variance of the stock market. They find that the volatility of the stock market on REIT returns has an important impact.

The remaining studies in this area focus on REIT markets other than Japan. Chen and Tzang (1988) analyze whether the US REIT market is sensitive to changes in short- and long-term interest rates. They find only the latter are significant over the period from 1973 to 1979, but from 1980 to 1985 the sensitivity to both types of rate change is evident.

Chan et al. (1990) conclude that three factors, namely unexpected inflation, changes in the risk and term structures of interest rates and the percentage change in the discount on closed-end stock funds, consistently drive equity REIT returns in the US. Ross and Zisler (1991) indicate that real estate risk lies plausibly midway between that of stocks and bonds, in the 9 to 13 percent range. Ennis and Burik (1991) show that during the last half of the 1980s, the correlation coefficient of US stocks and REITs was 0.79. Gyourko and Keim (1992) indicate that the stock market appears to accurately reflect information about the risks and returns faced by different type of real estate firms.

McCue and Kling (1994) indicate that movements in nominal interest rates account for more than 36 percent of the variations found in real estate returns. Muller and Pauley (1995) analyze the movement of REIT price changes during past interest-rate cycles in the US. Their results indicate that REIT price movements have a lower correlation with interest rates and changes in rates than with shifts in the stock market as a whole.

Liang and Webb (1995) conclude that mortgage REITs are interest-rate sensitive because of the nature of their asset portfolios, and point out that levels of sensitivity have changed over time. Ling and Naranjo (1997) identify the growth rate in real per capita consumption, the real Treasury-bill (T-bill) rate, the term structure of interest rates, and unexpected inflation as fundamental drivers or state variables that systematically affect real estate returns. Brooks and Tsolacos (1999) point out that unexpected inflation, and the interest rate term spread, both have explanatory power for the UK property market.

Marcus et al. (2000) estimate the sensitivity of REIT returns to stock market and interest rate changes in US. They propose and implement a model for testing whether differences in asset structure, financial leverage, management strategy, and degree of specialization in REIT portfolios are related to their sensitivity to interest rate and market risk.

Swanson et al. (2002) investigates several aspects of the relationship between

daily REIT stock risk premiums and various interest rates in the US. Consistent with previous research, their findings generally indicate that interest rates do impact the REIT market. Liow et al. (2003) examine the relationship between interest rate risk and returns of traded property stocks from an asset pricing perspective in Singapore. They also reveal that the pricing of interest rate risk is sensitive to prevailing market conditions.

Chaney and Hoesli (2010) focus on the interest rate sensitivity of real estate and find that for a typical office property this stands 13.1 percent, with a standard deviation of 7.8 percent. Lean and Russe (2012) examine the dynamic linkages among the REIT market, interest rates and stock prices in Malaysia over the period 2006 to 2009. They suggest that the housing market leads the stock market. Over their study, the prices of real estate and stock surged in tandem.

### III. DATA

The data used for the analysis are closed prices on a daily basis. The TSE REIT Index is used as a price for the REIT market. It is a weighted aggregate market price type index for all REITs listed on the TSE. The Index is calculated, with the base date set as March 31, 2003 (closing price). It assumes the aggregate market price on that day to be 1,000 by creating an index for the aggregate market price after the base date.

The Tokyo Stock Price Index (TOPIX) is used to obtain stock price. The TOPIX is a free-floating adjusted market capitalization weighted index calculated based on all the domestic common stocks listed on the TSE First Section. It provides a measure of

**Table 1**  
Descriptive statistics of data

Variable	Average	SD	Min	Max	Median
<b>Sample A</b>					
REIT	1,536.35	351.30	1,000.00	2,612.98	1,523.58
TOPIX	1,304.93	288.17	773.10	1,816.97	1,184.20
J2Y	0.32	0.30	0.04	0.98	0.15
J5Y	0.79	0.34	0.15	1.51	0.67
J10Y	1.46	0.31	0.44	1.99	1.49
S2Y	0.42	0.32	0.09	1.12	0.25
S5Y	0.91	0.38	0.18	1.72	0.79
S10Y	1.55	0.37	0.43	2.25	1.55
<b>Sample B</b>					
REIT	1,126.44	371.09	704.46	2,582.90	976.78
TOPIX	981.44	279.71	695.51	1,792.23	869.45
J2Y	0.34	0.28	0.09	1.08	0.20
J5Y	0.62	0.35	0.16	1.58	0.52
J10Y	1.24	0.28	0.69	1.97	1.28
S2Y	0.61	0.30	0.20	1.45	0.47
S5Y	0.81	0.37	0.26	1.80	0.71
S10Y	1.32	0.34	0.68	2.17	1.33

Notes: Sample A is from March 31, 2003 to May 31, 2007. Sample B is from June 1, 2007 to January 10, 2013. REIT = TSE REIT Index, TOPIX = TSE Stock Price Index. J2Y = JGB 2 year yield, J5Y = JGB 5 year yield, J10Y = JGB 10 year yield. S2Y = Swap 2 year rate, S5Y = Swap 5 year rate, S10Y = Swap 10 year rate.

current market capitalization assuming that this is set at 100 at the base date of January 4, 1968. JGB yields and swap rates for 2, 5, 10 years are used as interest rates. These data of interest rates are provided by the Mitsubishi UFJ Morgan Stanley Securities.

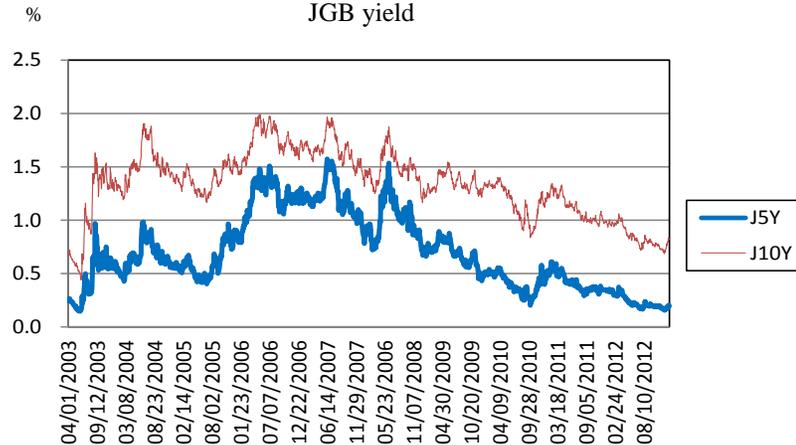
The entire sample from March 31, 2003 to January 10, 2013 is divided into two sub samples around May 31, 2007 the date when TSE REIT Index hit the record high of 2,612.98. Sample A runs from March 31, 2003 to May 31, 2007 and Sample B runs from June 1, 2007 to January 10, 2013. The descriptive statistics of the data are provided in Table 1. The movements of TOPIX, JGB yields and swap rates are provided in Figures 2, 3, and 4, respectively.

**Figure 2**  
TOPIX

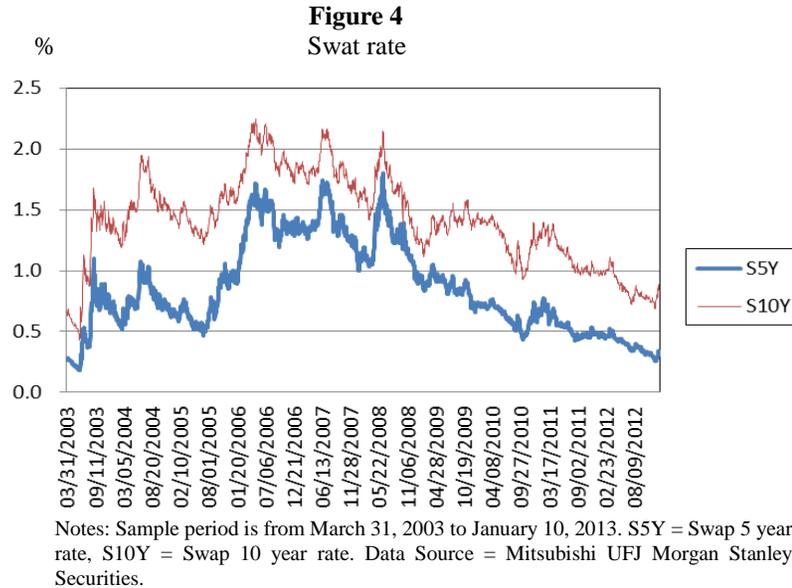


Note: Sample period is from March 31, 2003 to January 10, 2013

**Figure 3**  
JGB yield



Notes: Sample period is from March 31, 2003 to January 10, 2013. J5Y = JGB 5 year yield, J10Y = JGB 10 year yield. Data Source = Mitsubishi UFJ Morgan Stanley Securities.



#### IV. METHODOLOGY AND RESULTS

##### A. Methodology

This section sets out how to analyze the relationship of stock prices and interest rates with the REIT market. OLS (Ordinary Least Square) is used to estimate equation (1). The serial correlations and heteroscedasticity of  $\varepsilon_t$  are adjusted by using the method of Newey and West (1987). The lag periods of twelve are used. Equation (1) explains the impact of stock prices and interest rates on the REIT market. One type of interest rate from the JGB yields or swap rates of 2, 5, or 10 years is used so that the sensitivity of a particular interest rate of a different maturity to the REIT market can be measured. The analysis for each sample period is then conducted.

$$\ln(\text{REIT})_t = \alpha + \beta_1 \ln(\text{TOPIX})_t + \beta_2 \ln(\text{Interest Rate})_t + \varepsilon_t \quad (1)$$

where REIT= TSE REIT Index; TOPIX = TSE Stock Index; Interest Rate = JGB yields or swap rates of 2, 5, or 10 years.

##### B. Interpretation of Regression

Four sets of results using OLS regression can be assumed as shown in Table 2. When we look at the results of Case 2 on the condition that all the coefficients of the regressions are statistically significant, it can be concluded that an increase in stock prices have a positive impact and an increase in the interest rate has a negative impact on the REIT index.

**Table 2**  
Interpretation of regression

Case	$\beta_1$	$\beta_2$	Impact of Stock Price	Impact of Interest Rate
1	Positive	Positive	Positive	Positive
2	Positive	Negative	Positive	Negative
3	Negative	Positive	Negative	Positive
4	Negative	Negative	Negative	Negative

### C. Result

The results of the regression analysis on Sample A indicate that all the coefficients of TOPIX and the interest rate, except for JGB yield and swap rate of two years are statistically significant at the one percent level. JGB yield and swap rate of two years are not statistically significant within 10 percent level. The coefficients of TOPIX are positive and of interest rate negative. The results are shown in Table 3.

The results of the regression analysis on Sample B indicate that all the coefficients of TOPIX and the interest rate are statistically significant at the one percent level. The coefficients of TOPIX are positive and of interest rate negative. The results are shown in Table 4.

A comparison of Samples A and B show that the positive (negative) impact of stock prices (interest rates) on the REIT market is larger for Sample B. For Sample B in particular, the negative impact of the swap rates is larger than that of the JGB yields.

**Table 3**  
Result of regression analysis (Sample A)

Interest Rate	$\alpha$	$\beta_1(\text{TOPIX})$	$\beta_2(\text{Interest Rate})$	$R^2$	SER
J2Y	0.562 (0.535)	0.939 (7.714)***	-0.024 (-0.620)	0.764	0.105
J5Y	-0.546 (-0.648)	1.093 (9.347)***	-0.126 (-3.098)***	0.779	0.102
J10Y	0.575 (0.337)	0.948 (10.975)***	-0.117 (-2.598)***	0.771	0.105
S2Y	0.536 (0.587)	0.943 (7.679)***	-0.038 (-0.871)	0.764	0.105
S5Y	-0.575 (-0.695)	1.010 (9.514)***	-0.133 (-3.208)***	0.781	0.101
S10Y	0.470 (0.725)	0.963 (10.278)***	-0.111 (-2.569)***	0.771	0.104

Notes: Sample A is from March 31, 2003 to May 31, 2007. Values in the parenthesis are t statistics. \*\*\*, \*\*, \* indicates significance at 1%, 5% and 10% levels respectively. The serial correlation and heteroscedasticity of errors are adjusted by the method of Newey and West (1987). REIT = TSE REIT Index, TOPIX = TSE Stock Price Index. J2Y = JGB 2 year yield, J5Y = JGB 5 year yield, J10Y = JGB 10 year yield. S2Y = Swap 2 year rate, S5Y = Swap 5 year rate, S10Y = Swap 10 year rate.

Table 4  
Result of regression analysis (Sample B)

Interest Rate	$\alpha$	$\beta_1(\text{TOPIX})$	$\beta_2(\text{Interest Rate})$	$R^2$	SER
J2Y	-1.968 (-5.084)***	1.285 (23.875)***	-0.010 (-5.529)***	0.884	0.094
J5Y	-2.523 (-9.122)***	1.369 (34.909)***	-0.188 (-11.680)***	0.917	0.079
J10Y	-2.437 (-9.939)***	1.388 (38.251)***	-0.504 (-15.247)***	0.933	0.070
S2Y	-2.678 (-8.518)***	1.388 (31.363)***	-0.238 (-10.299)***	0.917	0.079
S5Y	-3.008 (-10.508)***	1.445 (35.330)***	-0.280 (-13.278)***	0.933	0.071
S10Y	-3.249 (-12.157)***	1.512 (38.018)***	-0.553 (-15.802)***	0.941	0.067

Notes: Sample B is from June 1, 2007 to January 10, 2013. Values in the parenthesis are t statistics. \*\*\*, \*\*, \* indicates significance at 1%, 5% and 10% levels respectively. The serial correlation and heteroscedasticity of errors are adjusted by the method of Newey and West (1987). REIT = TSE REIT Index, TOPIX = TSE Stock Price Index. J2Y = JGB 2 year yield, J5Y = JGB 5 year yield, J10Y = JGB 10 year yield. S2Y = Swap 2 year rate, S5Y = Swap 5 year rate, S10Y = Swap 10 year rate.

## V. CONCLUSION

This paper focuses on the impact of stock prices and interest rates on the REIT market in Japan. It examines two important issues, namely the relationship of the REIT market with stock prices and interest rates. The sample period is divided into two sub samples around the date May 31, 2007, when the TSE REIT index hit a record high of 2612.98. Sample A runs from March 31, 2003 to May 31, 2007 and Sample B from June 1, 2007 to January 10, 2013. In Sample A, the TSE REIT Index showed an uptrend. In Sample B, it declined to a record low of 704.46 on October 28, 2008.

The results of this paper are consistent with most of the related literatures looking at the non-Japanese markets with the exception of Su et al. (2010). The findings that the impact of stock prices is positive indicate that wealth effect holds and that the stock market leads the REIT market. When we compare Samples A and B, the positive impact of stock price is larger in Sample B. As Kapopoulos and Siokis (2005) show, one of the mechanisms through which the relationship between investment in real estate and stock can be interpreted is the wealth effect. This is true of the Japanese REIT market.

The findings that the impact of interest rates is negative indicate that an increase of interest rates causes a decline in REIT prices. When we compare Samples A and B, this negative impact is larger in Sample B. This is consistent with the existence of financial crises leading to difficulty in procuring funds.

The fund procurement of a REIT investment corporation is made by loans up to a certain level of LTV. As He et al. (2003), Chen and Tzang (1988) and Allen et al. (2000) indicate, the real estate sector uses long-term liabilities as financing sources.

This is true of the REIT market in Japan as well because the negative impacts get larger as the maturities of interest rates increase.

This study also identifies another aspect of the impact of interest rates. For Sample B in particular, the negative impact of the swap rates on the REIT market is larger than that of the JGB yields. This indicates that the cost of procuring funds for a REIT is more closely connected with swap rates than with JGB yields. This is consistent with the fact that benchmark interest rates for mid- and long-term loan are based on swap rates.

These findings have implications for monetary policy in terms of stabilization of the financial system. As the central bank, the BOJ needs to pay more attention to swap rates than to JGB yields especially in times of financial crisis when REIT investment corporations have difficulty in procuring funds.

This study has used the TSE REIT Index as the REIT price. Further work may wish to replicate this investigation using the prices of individually listed REITs on TSE. The impact of REIT purchase by the BOJ can also be an interesting topic for further study.

#### ENDNOTES

1. In November 2000, amendments made to the Investment Trust and Investment Corporation Law expanded the allowable use of capital by investment trusts to include real estate and thereafter made possible funds comprised of REIT schematic. The Tokyo Stock Exchange Group, Inc. ("TSE Group") and Osaka Securities Exchange Co., Ltd. ("OSE") agreed on November 22, 2011 to enter into a business combination agreement. Accordingly, in August 2012, TSE Group acquired 66.67 percent of OSE's stock in a takeover bid (TOB) until the companies finally merged finally on January 1, 2013. (<http://www.jpx.co.jp/en/index.html> )
2. Both corporations survived because they successfully procured funds before the end of March.
3. The REIT purchase announced by the BOJ on October 28, 2010 further reinforced the market.
4. The details of the policy are available from the BOJ website (<http://www.boj.or.jp/>).

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