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THE CASE OF MIST COUNTRIES RISK DECOMPOSITION IN FINANCIAL MARKETS

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Abstract

Risk management involves awareness of risks, predicting them and minimizing losses or transforming them into opportunities. Its instruments that emerged with the improvement of the financial system are looming large every passing day. For corporate purposes, risk management, as well as risk measurement, is a useful and essential issue. The research aims to compare the risk structures of the MIST countries (Mexico, Indonesia, South Korea, and Turkey) and the US indexes (S&P 500) in terms of risk concepts. This study measures the risks of the national stock market indexes of the MIST (Mexico, Indonesia, South Korea, and Turkey) countries using the monthly closing data for the 2010-2021 period based on the US markets. The S&P 500 index is determined as the market index. Thus, the total risks of the securities market indexes of MIST countries are estimated and categorized as unsystematic and systematic. Moreover, beta coefficients indicating sensitivity to market fluctuations are estimated using the 144-month data. Findings: It is indicated that the unsystematic risks of the securities markets in the MIST country group based on index are, in general, quite low, and the systematic risk factor constitutes the majority of the risk.

Keywords: Financial Markets, Risk Decomposition, MIST Countries
JEL Classification: D81, G15, G32

MİST ÜLKELERİNİN FİNANSAL PİYASALARINDA RİSK AYRIŞMASI

Öz

Risk yönetimi, risklere karşı farkındalığı, onları tahmin etmeyi ve kayıpları en aza indirmeyi veya bir fırsata dönüştürmeyi içerir. Finansal sistemin gelişmesiyle ortaya çıkan enstrümanları her geçen gün daha da büyümektedir. Kurumsal amaçlar için, risk yönetiminin yanı sıra risk ölçümü de yararlı ve gerekli bir konudur. Araştırma, MİST ülkelerinin (Meksika, Endonezya, Güney Kore ve Türkiye) risk yapılarının ve ABD endekslerinin (S&P 500) risk kavramları açısından karşılaştırmalı bir analizini yapmayı amaçlamaktadır. Yöntem: Bu çalışmada, ABD piyasaları baz alınarak, 2010-2021 dönemi aylık kapanış verileri kullanılarak MİST (Meksika, Endonezya, Güney Kore ve Türkiye) ülkelerinin ulusal borsa endekslerinin riskleri ölçülmektedir. S&P 500 endeksi piyasa endeksi olarak belirlenmiştir. Böylece, MİST ülkelerinin menkul kıymetler piyasası endekslerinin toplam riskleri tahmin edilmekte ve sistematik olmayan ve sistematik olarak kategorize edilmektedir. Ayrıca 144 aylık veriler kullanılarak piyasadaki dalgalanmalara duyarlılık gösteren beta katsayıları tahmin edilmektedir. Bulgular: MİST ülke grubunda yer alan menkul kıymet piyasalarının endeks bazında sistematik olmayan risklerinin genel olarak oldukça düşük olduğu ve sistematik risk faktörünün riskin çoğunluğunu oluşturduğu belirtilmektedir.

Anahtar Kelimeler: Finansal Piyasalar, Risk Ayrışması, MİST Ülkeleri
JEL Sınıflandırması: D81, G15, G32

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1. Introduction

Risk is quite an important issue that has attracted the attention of various scientists and researchers for a long time and led them to investigate. These studies have brought up certain questions about whether the risk is an objective or a subjective concept. The response to this question is still not fully given. Risk, which is one of the usual elements of life, can also be defined as the possibility of a negative outcome. Generally, it is of great importance for companies. To them, risk describes the probability of an event different from the forecast in the future regarding any company activity. This situation may be positive or negative for the company. But the term "risk" is often perceived as negative and the possibility of harm occurring. Financial and capital markets have been influenced by competition, changes in financial assets and the increase in the number of transactions, along with the globalization experienced today, causing the formation of an intensely mixed and interacting financial structure.

This situation has usually caused financial companies to become more sensitive to the market's risks posed by price volatility. Therefore, companies have accelerated their workload on identifying, measuring, supervising and constantly renewing their risks and tried to find an effective risk management system. The increase in financial crises has led companies to take precautions and develop new methods on this issue. At the same time, to conduct the right activities in the financial markets, it is necessary to analyze and analyze the economic data of the countries to be traded, make forward-looking evaluations and act in the direction of these evaluations. Another issue to be considered at this point is the need to make detailed comments, taking into account the tendencies of the international economy rather than examining one or more economies. In other words, the need to think globally and act by taking into account the conditions of the companies is stated with the phrase "Think nationally, act locally" (McDougall, 2021: 869).

To determine sound risk management activities and to take urgent measures when necessary, it is mandatory to measure the net size of the risks healthily. If the measurement of the magnitude of the risks is not done correctly, it is not possible to take the right measures. Therefore, the undesired consequences of financial risks would be detrimental to the company. Along with the realization of risks, measures should be taken to reduce possible negative effects and risk avoidance plans should be established. Today, as the importance of risk measurement increases, different methods are employed to measure the size of risks. In this case, it is very important to determine which risk measurement techniques should be used in which situation (Gallati, 2022: 56).

The methods employed in risk measurement have been differentiated and begun to be used in the financial market. The use of more complex models such as option pricing models, simulation techniques, and sensitivity analysis has increased among risk management techniques. The value at Risk (VaR) method is one of the complex risk measurement tools based on the concept of statistics, which has recently become more common in determining market risk. Three methods gain importance in the academic and sectoral fields, namely, Monte Carlo Simulation (MCS), Variance-Covariance (V-C), and Historical Simulation (HS methods). These methods are not superior to each other, but they have different strengths and weaknesses compared to each other. Companies can measure risk by identifying their needs and choosing the most appropriate method (Chen and Hsieh, 2010: 139).

This research study aims to make a comparative analysis of the risk structures of the MIST (Mexico, Indonesia, South Korea, and Turkey) countries and the US indexes (S&P 500) in terms of risk concepts. Financial investors encounter systematic and unsystematic risks upon considering their savings. To properly manage the risks they would meet, savers should define and classify the risks they assume in portfolio investments and develop solutions to reduce them accordingly. To reduce the risk, which is the subject of risk management, the risks encountered should be distinguished. MIST countries are in the position of economically growing and developing

countries. Being considered developing countries, they have different characteristics such as population, economy, development potential, high growth, etc. These countries have similar economic conditions such as growth rate and ability to attract foreign direct investments, high inflation, and population, making it possible to compare these countries and reveal the importance of them and the study. Accordingly, it is crucial to reach these countries, whose national stock markets are also developing and in demand for investors, with the S&P 500 stock market index by making risk measurements. The study would be beneficial for international investors in terms of portfolio management and would also contribute to the literature. It is thought that the findings on which the markets of these country group would attract investors with different risk perceptions is included in the study results. These countries, which have an important share in the world economy as economic and social indicators, enhance the importance of the study.

2. Literature Review

Numerous studies have been found in the literature on financial risk analysis and capital and financial markets of developing countries. In this part, a summary of the studies in the literature is given.

Professor William Sharpe was the first to introduce the separation of total risk into its components in securities in the literature. Sharpe (1963), in his portfolio theory study, in which he provided a different perspective, divided the total risk of an asset into its components as systematic and unsystematic risks.

According to the study conducted by Black (1972), it was observed that a positive interaction existed between beta, which is a systematic risk measure, and the return of securities, and only the beta of the financial asset was effective as a risk factor.

Van Zijl (1987) stated that the risk decomposition should have been done with the standard deviation, not the variance; however, the study discovered that if the beta coefficient was lower than zero, the variance decomposition was not correct, and in this case, the non-diversifiable risk was not estimated correctly.

Mausser and Rosen (1999) investigated the concept of risk decomposition and tried to determine the contribution amount of an investor's position to the portfolio risk using risk decomposition and concluded that if there was a difference in the risk of the investor's position, there would have also been a difference in the total risk of the portfolio.

Aygören and Sarıtaş (2007) stated in their study that the beta coefficient, which has an important place in systematic risk measurement, did not have sufficient stability and recommended correction methods for beta coefficient prediction. The study's findings were more accurate when the 8-9 years of beta coefficient, whose 5-year data were assumed remarkable in practice, were considered.

Şahin (2018) created a hypothetical portfolio of equities with equal weights. The portfolio was analyzed in two stages. First of all, the risk of the portfolio of both periods was measured. Afterward, the calculated risk level, considering the portfolio effect, was divided into systematic and unsystematic risks. Value at Risk method was employed during the risk measurement of portfolios. First of all, the Marginal Value at Risk, and then the Value at Risk amounts were calculated using the Financial Asset Pricing Model, and a systematic and unsystematic risk separation was made. It was seen that the hypothetical creation of the portfolio influenced the calculations and the more balanced stock distribution of the portfolio, predominantly consisting of financial institutions and manufacturing industry sectors, would have led to a decline in all risk types. It was determined that keeping the number of observations more equal and choosing a more balanced security for the sectors could have resulted in increased risk in compliance with the expectations in the post-global economic crisis period.

Upon examining the related literature, it is seen that the risk decomposition of portfolios consisting of securities has been made. Unlike other previously conducted studies, risk decomposition of country-specific securities market indexes has brought innovation to the studies on this subject. It is thought that it would be beneficial for the development of the subject to conduct the risk decomposition using financial assets and renewed data.

3. Research Methodology

3.1. Population and the Sample

MIST, considered emerging economies and one of the groupings, was coined for the first time by Goldman Sachs economist Jim O'Neill; it consists of Mexico, Indonesia, South Korea and Turkey (Boz et al., 2019: 1114). In this research, the securities market indexes of the countries included in the MIST group are chosen as the sample, and the US stock exchange index (S&P500) is chosen as the market index. The MIST securities indexes include IPC-MXSE (Mexico), JKSE (Indonesia), KOSPI (South Korea), and BIST (Turkey). Recently, countries such as Mexico, Indonesia, South Korea, and Turkey have grown rapidly in economic terms and have become the primary preference of foreign investors for investment as important elements of the global economic structure by being separated from other countries with these economic features.

MIST countries are considered to be an important power in terms of geo-economics and population and it is aimed to contribute to the global economy by gathering in the same group (Güllü and Yakışık, 2017: 240). It is not possible to mention a regional classification in the grouping. These economies are located in distant geographical locations from each other. These economies, which have recently been growing rapidly, attracting the majority of foreign investors and increasing their power to influence the global world, create high growth opportunities due to cheap labor and, accordingly, low production costs; they are able to attract foreign direct (both financial and capital) investments along with the rapid increase in their exports, foreign exchange reserves, and national incomes.

Probitas Partners, one of the investment institutions of the USA, included the MIST countries in its report published in 2011 and described these countries as the leaders of emerging markets in the future. In the formation of these country groups, the advantages of the countries and especially their development potentials are taken into account. In this regard, the fact that the countries are members of the G20 and that the member countries are close to the USA, Europe, and China, assumed a crucial task in the formation of the group. Both their activities in financial markets and their high level of openness are critical in forming the MIST group. However, the fact that they have young and dynamic population groups, their developing social structures, and consumption structures are developing day by day, as well as the fact that a middle class with a certain consciousness is on the rise, is one of the important factors in the creation of the MIST group. The existence of stable and controllable inflation rates in terms of macroeconomics, the presence of a developing middle class in the private sector, and the positive atmosphere of business circles are important factors in the formation of the MIST group (Gök and Gök, 2016: 2).

They were being a part of a group such as the MIST is important for a country like Turkey that tries to provide diversity in international politics and economic relations. Many problems experienced by developing economies are also valid for Turkey. Although Turkey and the MIST countries are far from each other, they are getting closer to each other in economic and political matters. Along with globalization, developments in the field of technology have also caused countries in different geographies to interact with each other in economic, social, and political aspects (Saygın, 2021: 10). Other countries, which are geographically distant from each other can be affected by economic events such as crisis environments, ups and downs in financial structures, and devaluations in any country (de Boyrie and Pavlova, 2016: 569). On the other hand, it is seen that Turkey's trade with the other MIST countries has increased rapidly and that in the last 20 years, Turkey has indicated economic development and growth similar to the MIST

countries, which are expected to have great economic power in the future. From the economic perspective of 2022, Turkey is expected to be one of the countries that have a say in the world economy, with economic development.

In this study, the reason for comparing the indexes of MIST countries and the USA is that the USA is the financial center with the largest and highest transaction volume in international markets. Therefore, any problem that may occur in these markets can affect the whole world. The recently experienced global financial crises clearly demonstrated this situation. On the other hand, most of the world's capital and financial movements are made through US investors. However, the fact that the markets of developing countries have more growth goals than developed ones has increased the capital movements toward these markets (Hacıoğlu et al., 2014: 76).

The S&P500 is a weighted index based on the market value of the 500 most important companies in the US stock market and includes leading companies from every sector. By courtesy of the design and continuous oversight of the S&P committee, it is recognized as a successful representative of the entire US securities market (S&P Global, 2017). Besides, it has been observed that the impacts of the global financial crises experienced do not have immediate effects on the developing country markets, whereas some developing country economies did not suffer from these crises. On the contrary, they grew rapidly during crisis periods (Demirgüç-Kunt et al., 2020: 7).

Although there are a variety of methods related to risk decomposition, the Financial Asset Pricing Model (FAPM) is preferred in this study since the FAPM indicates the relationship between the expected value of any asset and its risk, and this model particularly guides investors in the process of measuring systematic risk. In this study, index returns and risks are estimated based on the closing prices obtained throughout 144 months over the period 01.01.2010 and 31.12.2021, based on the S&P 500 index and the national securities market indexes of the MIST countries. First of all, the descriptive statistics of the variables are examined in the study. Through these indicators, it is determined whether the financial time series have a normal distribution. The fact that the series does not have a normal distribution indicates that the risk analyses based on the normal distribution estimation are also inconsistent. The standard deviation, kurtosis, and skewness values are examined to detect whether the financial time series have a normal distribution. Research data were obtained from www.investing.com. In the analysis, index risks were measured using SPSS 22.0, and Excel 2016 program and these risks were decomposed.

3.2. Data Analysis

In the study, first of all, the risks of the national index of Turkey and five different countries are estimated, then the correlation matrix of the indexes is created, the beta values are calculated, and the risks are decomposed.

3.2.1. Descriptive Statistics

Table 1 presents the descriptive statistics of country indexes. Upon analyzing Table 1, it is seen that the securities market of the country with the highest average monthly return belongs to Turkey, and the securities market of the country with the lowest average monthly return belongs to the USA. Lowering the standard deviation indicates lower deviations from the mean and lower risks and *vice versa*. In this case, the riskiest and most highly volatile securities markets belong to Turkey and Mexico. The measure of total risk is variance or standard deviation. Here, the total risk of the monthly returns of the country indexes which are examined in the analysis, is determined by calculating the standard deviation. Upon ranking by standard deviation ratios, South Korea, which has the lowest total risk, is followed by the USA, Indonesia, Mexico, and Turkey, respectively. Nonetheless, since the values of the examined securities market indexes are

quite different, its interpretation would not be highly accurate. In this case, examining the coefficients of variance of the indexes may yield more accurate results.

Table 1: **Descriptive Statistics of Country Indexes**

Countries	Standard Deviation	Variance	Skewness	Kurtosis	Average Monthly Returns
The USA	582.30	328,635.7	0.189	- 1.094	1,354
Mexico	11,214.4	128,773,874.1	0.592	0.193	38,670.34
Indonesia	6,816.7	49,931,568.38	0.301	-0.745	16,626
South Korea	548.7	291,735.7	0.638	0.739	1,829
Turkey	21,074.8	438,739,447.5	-0.373	0.85	54,038

3.2.2. Coefficient of Variation

The coefficient of variation is calculated by dividing the standard deviation by the arithmetic mean. Since the standard deviation gives information about only one series, it does not provide much information upon comparing different series (Abdi, 2010). The coefficient of variability measures the risk taken for one unit of return. It is used to choose between risk levels and expected returns in more than one security (Shechtman, 2013: 43). The coefficient of variation formula is as follows.

$$\text{Coefficient of Variation} = \sigma / \chi$$

$$\sigma = \text{Standard Deviation}$$

$$\chi = \text{Arithmetic Mean}$$

Table 2: **Coefficients of Variation for the Country Indexes**

Countries	Coefficient of Variation
The USA	0.43
Mexico	0.29
Indonesia	0.41
South Korea	0.30
Turkey	0.39

Upon examining Table 2, it is determined that the countries with the lowest coefficient of variance are Mexico and South Korea, whereas the countries with the highest coefficient of variance are the USA, Indonesia, and Turkey. When the coefficients of variance are examined, South Korea's coefficient of variance is 0.30. It is observed that South Korea is the country with the lowest standard deviation, as well as the country with the lowest risk per unit of return. Although the standard deviation of Mexico is high, the risk of return per unit is low at 0.29. Although the standard deviation of the USA is small, the coefficient of variance is 0.43, rendering it the country with the highest risk per return. Although Turkey has the highest standard deviation, its coefficient of variance is 0.39, making it a country with a high risk per return. Indonesia's risk per return is high at 0.41. Considering these results, risk-averse investors are expected to invest in the securities markets of countries such as Mexico and South Korea. According to these results, investing in the USA, Indonesia, and Turkey securities markets may be the right choice for risk-tolerant investors.

3.2.3. Correlation Matrix

The correlation between the indexes is estimated in Table 3. The country indexes that indicate close relations with each other are observed. Upon examining the correlations between the indexes, it is observed that the Turkish securities market index has a positive and strong correlation with the Indonesian and the US securities market indexes. In contrast, there is a negative correlation with the South Korean securities market index. Investors investing in

countries with a positive correlation may invest in countries with a negative and weak correlation when the markets of these countries are adversely affected.

Table 3: **Correlation Matrix**

	The USA	Mexico	Indonesia	South Korea	Turkey
The USA	1	0.427	0.981	0.419	0.884
Mexico	0.427	1	0.524	0.256	0.492
Indonesia	0.981	0.524	1	0.506	0.881
South Korea	0.419	0.256	0.506	1	0.397
Turkey	0.884	0.492	0.881	0.397	1

3.2.4. Estimating the Beta (β) Coefficients

The beta coefficient is a systematic risk measure that calculates the sensitivity of securities to market risk. Beta coefficient is calculated as follows (Akça, 2008: 24):

$\beta i = COV_{i,m} / VAR_m$

$VAR_m =$ Variance of the Market Index

$COV_{i,m} =$ Covariances of the Indexes

Here, the beta values of the country indexes that are the subject of the study based on the US (S&P 500) index, which is thought to represent the market, are given in Table 4.

Table 4: **Coefficients of Variation for the Country Indexes**

Countries	Beta (β) Values
Mexico	0.87
Indonesia	0.87
South Korea	0.69
Turkey	0.81

Securities with a beta coefficient equal to 1 are the ones that react in the same direction as the market to the decrease or increase that may occur in the market. Upon calculating the beta coefficients in the study, the US S&P500 index is used as the market index, and the coefficients are calculated accordingly. A 1% increase in the indexes with a beta coefficient equal to 1 would cause the market index to move at the same rate in these indexes.

Indexes with a beta coefficient lower than 1 would react in the same direction to a 1% decrease or increase that would occur in the market, but the rates of increase or decrease would be at a lower level. In the study, the beta coefficient of all MIST countries remained below 1. Upon examining beta values, it is observed that Mexico, Indonesia and Turkey are sensitive to the US market, whereas South Korea has lower sensitivity.

3.2.5. Decomposition of the Total Risk into Components

The total risk is decomposed into components using the beta values in this part. Here, to find the unsystematic risk on an index basis, the product of the beta value of the indexes and the standard deviation of the market returns is subtracted from the standard deviation of the returns of the indexes. This process can be formulated as follows (Sarıtaş and Kaya, 2012: 46).

$\varepsilon = \sigma_a - \beta_a (\sigma_b)$

ε: Unsystematic risk

σ_a: Standard deviation of the security A

β_a: Beta value of the security A

σ_b: Standard deviation of the market index

Table 5: **Decomposition of the Total Risk**

Indexes	Standard Deviation of the Index	Beta Value of the Index	Standard Deviation of the Market Index	Unsystematic Risk	Systematic Risk
Mexico	11,214.4	0.87	582.30	10,707.79	506.601
Indonesia	6,816.7	0.87	582.30	6,310.09	506.601
South Korea	548.70	0.69	582.30	146.913	401.787
Turkey	21,074.8	0.81	582.30	20,603.14	471.663

When Table 5 is examined, it is seen that the countries with the highest standard deviation are Turkey and Mexico, whereas the country with the lowest standard deviation is South Korea. It is also seen that the total risk of the securities market indexes of Turkey, Mexico, and Indonesia mostly consists of unsystematic risks; that is, it stems from the internal dynamics of the countries and the systematic risk ratio is low. It is observed that the total risk of the South Korean securities market index is mainly constituted by systematic risks. Using the values in Table 5, the total risk of each index is assumed to be 100; it is also possible to express systematic and unsystematic risks as a percentage of total risk, as shown in Table 6.

Table 6: **Percentage Decomposition of Total Risk**

Indexes	Total Risk	Systematic Risk	Unsystematic Risk
Mexico	100	4.52	95.48
Indonesia	100	7.43	92.57
South Korea	100	73.22	26.78
Turkey	100	2.24	97.76

4. Empirical Findings

When the results are analyzed as a percentage, it is observed that the systematic risk is generally relatively low in the total risk based on MIST country indexes, and most of the risk consists of unsystematic risks. While it is observed that Turkey and Mexico are the countries with the lowest systematic risk among the others, the systematic risk is seen to be relatively higher in Indonesia. It is determined that the total risks of these countries mainly consist of microeconomic variables. In the South Korean securities market index, it is determined that the systematic risk is high and the unsystematic risk is low, and depending on this result, it is observed that the South Korean securities market index is highly affected by macroeconomic changes.

5. Conclusion

The definition of risk is generally the probability of encountering the consequences caused by unforeseen events. Risk also means indeterminate limits that reduce the predictive function. Studies on the concept of risk, financial activities in the global world, and the ups and downs in economic data always bring this concept to mind. The development of markets and the increase in financial institutions and investment instruments have increased the number of financial risks and their complexity. For this reason, systematic and unsystematic risks are integrated in the capital markets. Investors must distinguish between the two risk types and create portfolios that aim for optimal risk in this context. The decomposition of financial risk, as a form of risk management, is intensively studied in the foreign finance literature today. Risk management has become much more important with the effect of the global economic crisis in recent years.

Effective risk management aims to minimize the effects of risk factors on investment portfolios. In this case, investors need descriptive statistical data of the risks they will face while making financial decisions. In this study, the risks of the indexes were measured using the closing prices of the national securities market indexes of the USA and the MIST countries over the years

2010-2021, and systematic and unsystematic risks were calculated by decomposing the risks. Financial Asset Pricing Model was used for the risk decomposition of the indexes. Within the scope of the research, 144 closing values were taken into account and the S&P 500 was assumed to represent the market index.

In the first stage of the study, the monthly returns were calculated based on the stock market indexes of the five countries used in the research and the monthly closing values of the S&P500 index, and then the standard deviations and descriptive statistics of the MIST countries as well as the S&P 500 stock index were found. Upon analyzing the results, it is observed that the total risks of Turkey, Mexico, and Indonesia are mainly composed of unsystematic risks, whereas systematic risks mainly caused the total risk of the South Korean securities market index.

After the beta coefficients were estimated, the percentages of systematic and unsystematic risks in the total risks assumed by the MIST countries were also examined in the study. Upon examining the results, it is observed that the systematic risk is generally relatively low in the total risk based on MIST country indexes, except for South Korea, and most of the total risk consists of unsystematic risks.

As a result of the correlation analysis, although it was determined that the Turkish stock market index had positive and strong correlations with the Indonesian and the US securities market indexes, it was observed that a negative correlation existed with the securities market indexes of South Korea and Mexico. It can be claimed that similar results were obtained by Kılıç and Dilber (2017), who determined a strong dynamic relationship with the BRICS countries. The high correlation coefficients between the countries' stock exchanges were not only for Turkey but also for the investor who invests in any two MIST countries simultaneously, which can be considered an important risk.

Investors may minimize the portfolio risk by diversifying, and certain conditions, they can completely eliminate the unsystematic risk and bring the total risk of their portfolios to the systematic risk level.

Upon examining the coefficients of variation of the indexes, it would be asserted that risk-averse investors can include securities from the South Korean and Mexican stock markets in their portfolios upon creating their portfolios. Risk-tolerant investors, however, are advised to invest in the securities market indexes of these countries based on these data since the USA and Indonesia have high risks per return.

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