Dynamics between islamic banking performance and CO2 emissions: evidence from the OIC countries

Mahmood, Nihal and Masih, Mansur

INCEIF, Malaysia, INCEIF, Malaysia

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Nihal Mahmood [1] and Mansur Masih[2]

Abstract

This paper is an humble initial attempt at studying the effects of Islamic Banking performance on CO_2 Emissions among OIC countries. Recently, there has been increasing awareness surrounding Sustainability Development Goals (SDG), which is what inspired this study. While SDG data is quite limited, there is a substantial record of CO_2 Emissions, which is one of the components in calculating the SDG index. While extensive research has been done on environmental performance and firm profitability in the conventional space, there are limited studies on this area in the Islamic Finance space.

The core issue that will be investigated in this paper is to assess if Islamic Banking performance is impacted or influenced by CO_2 emissions. Islamic Bank Performance will be measured using aggregate Return on Equity (ROE), and Return on Asset (ROA) figures for all banks in the OIC region. This study employs GMM Panel Technique given the dynamic nature of the data. The main contribution of this paper is it is among the first attempts at examining this unique area. Islamic Finance is not only about Shariah compliant product structures, but also its overall impact on society itself (CO_2 emissions serves as a measure of this). The key conclusion is that there is a correlation between Islamic Bank performance and CO_2 emissions. However, in some cases the correlation was found to be positive (when examining ROA) and in others negative (when examining ROE). Policy makers need to study the trends in order to provide guidelines that would motivate the Islamic Banking industry to reduce emissions.

[1]Graduate student in Islamic finance at INCEIF, Lorong Universiti A, 59100 Kuala Lumpur, Malaysia.

[2] **Corresponding author**, Professor of Finance and Econometrics, INCEIF, Lorong Universiti A, 59100 Kuala Lumpur, Malaysia. Email: mansurmasih@gmail.com

Introduction

There has been a long-standing academic debate on the link between environmental impact and financial performance. Neoclassical economics and the majority of management theories are based on the assumption profit maximization is a key corporate objective (Eccles, Ioannis, Serafeim). The shareholder is considered the key stakeholder; as such resources are allocated in order to satisfy this group. Trying to satisfy any other stakeholder groups, would negatively impact firm performance (Brown, 2006). However, not all companies place the same level of importance on shareholders. Some care more than others on the externalities of their operations, and how this affects other stakeholders (Paine, 2004). In addition, over the past few decades, there is increasing willingness by corporations to get involved in social and environmental issues and to make it a part of the business strategy (Eccles, Ioannis, Serafeim). Contrary to traditional management theories, academics that companies can perform well by "doing good". By having a positive social and environmental impact, this benefits various stakeholders, and ultimately creates direct value for shareholders (Freeman et al., 2010, Porter and Kramer, 2011). Furthermore, the Environmental Kuznets Curve is an alternative theory that explains the relationship between environmental quality and economic development. In the initial phase of development, some environmental degradation will occur as the firm is trying to reach a certain standard. Once this standard is reached, then negative environmental impact is reduced (Riaz, 2016). Evidently, there are various views on the link between CO_2 Emissions and firm performance from a theoretical standpoint.

A number of empirical studies have been conducted in this area. In a study in South Africa, the Environmental Kuznets Curve hypothesis was found to be true (Shahbaz, 2013). Depending on the stage of economic development, CO_2 Emissions varied. In general, CO_2 Emissions were found to decrease over the long-term. In another study (Riaz, 2016), it was found that expansions in economic output essentially lead to higher energy consumption. This of course meant higher CO_2 Emissions. On the contrary, financial development can also encourage investment into green technologies. Evidently, even among empirical research, there is no clear

consensus on the exact role CO_2 Emissions and firm performance, and which one exactly is leading or lagging.

There are a couple of key questions that will be explored in this study. Firstly, this study will delve deeper into the relationship between CO_2 Emissions and Islamic Banking Performance. By examining the dynamic between these variables, policymakers can make more effective decisions. In addition, this study will be examining 2 different indicators for Islamic Banking performance, namely ROE and ROA. The relationship between each performance indicator will be studied uniquely with CO_2 Emissions. This will hopefully shed light on which indicator is more influenced by CO_2 Emissions (and vice versa).

This study is a simple one, and the unique value it brings is bringing in the environmental (or sustainability) aspect into the space of Islamic Banking. This study is the first attempt in investigating the relationship between Islamic Banking performance and CO_2 Emissions applying the two-step dynamic GMM estimator. As such there is a need to study this area more.

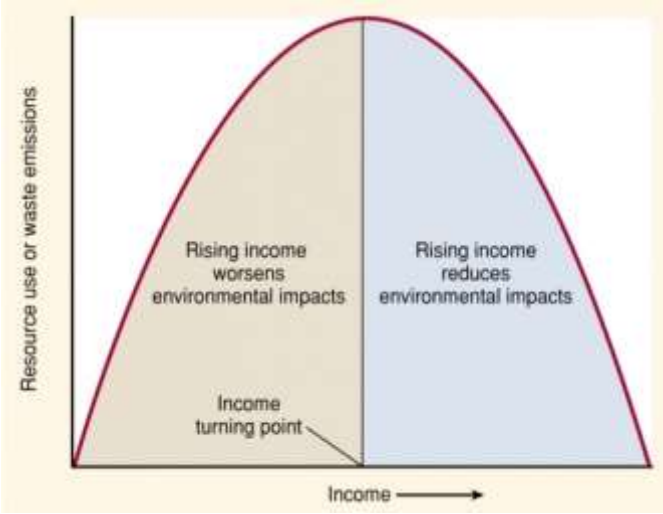
There is in fact a relationship between CO_2 Emissions and Islamic Banking performance, and the long run relationship is significant.

This paper is organized in 5 sections. The first section will examine literature review from a theoretical and empirical standpoint. The second section will discuss the methodology applied. The third section will discuss the results or findings. And the last section will conclude by drawing key lessons and what this means for policy makers.

Literature Review

There is quite a lot of literature out there that examines the relationship between economic (or firm) performance and environmental factors. In this chapter, various arguments from theoretical and empirical findings will be explored to gain a holistic understanding of the issue.

The Environmental Kuznets Curve (see diagram below, Environmental Science 2016) is a hypothesis that examines the relationship between environmental quality and economic development. In the early phase, pollution increases along with economic growth degradation. This occurs as a country is initially attempting to enhance its standard of living (Riaz, 2016). However, past a certain level of income (per capita), the opposite is true. Thus, at higher income levels, economic growth contributes to environmental improvement. As such, the Environmental Kuznet Curve is a U-shaped function (Stern, 2003). Among literature however, there has been conflicting results with respect to this hypothesis.



On the contrary, traditional profit maximization theories assert that assert that Marginal Cost must equal Marginal Revenue. As such, the main goal of any organization is to achieve the most profit possible. In this model, the environmental aspect is not taken into account, and in fact is seen as a hindrance to firm success.

In a study by Shahbaz et al. (2013) on the Environmental Kuznets Curve hypothesis for South Africa, it was found that emissions decreased in the domestic credit to private sector in the long and short run. Furthermore, the study was extended to the Indonesian economy, specifically examining CO_2 emissions economic and financial variables. The results indicated that in the long run, real domestic credit to private sector reduced CO_2 emissions. Similarly in Malaysia, the private sector

credit reduced the impact on CO_2 emissions, however foreign direct investment had the opposite effect.

Moreover, a study done by Riaz (2016) on the effects of CO_2 emissions and financial development in an emerging economy was examined using an augmented VAR approach. The study focused on small emerging economies. The long run results indicated that economic growth and financial sector development did in fact lead to higher emissions, as a result of increased energy consumption. On a related note, the increased development of the stock market lead to reduced liquidity constraints (as part of financial sector development). In the short run, it was found that the 'growth in per capita incomes' increased as CO_2 emission did. Furthermore, an increase in private sector loans lead to higher CO_2 emissions as well.

One of the factors that were highlighted is the change in the size and structure that takes place in the financial sector. Its growth impacts the ability to adopt green technologies (Riaz, 2016). To further elaborate, as the financial sector begins to grow, so does the stock market. In fact, the stock market becomes increasingly important in comparison to the banking sector. This is an example of structural transformation that may affect CO_2 emissions, however the literature is inconclusive on this (Demirguc-Kunt).

With respect to economic development and CO_2 emissions, there is conflicting literature. On the one hand, academics argue that CO_2 emission increase when there is a reduction on credit constraints. As a result, economic output expands in turn resulting in higher energy consumption. Simply put, financial development ultimately leads to higher CO_2 emissions (Riaz, 2016). On the other hand, critics argue that financial sector development actually encourages investment in green technology. For instance, by attracting greater foreign direct investment, this can be chanelled towards research and development of more efficient technologies. As such, this would ultimately reduce CO_2 emissions (Frankel and Romer, 1999). Evidently, there are mixed results, and it is unclear as to which one prevails.

Corporate Social Responsibility (CSR) is in fact a financial burden some companies choose to carry, and is questionable as to whether such firms are putting themselves at an economic disadvantage in terms of expenditures compared to other

companies. In a study based on UK companies, annual reports and stand-alone CSR reports of 62 environmentally sensitive FTSE 100 companies were studied (Liu, Zhou, Yang, Hoepner; 2016). It was found that corporate carbon emissions had a negative relationship with financial performance, which is an indication that carbon emission performance is recognized and responded to by the market. This sheds light on the direct impact. In terms of the indirect impact, it was found there is a positive relationship between corporate carbon emissions and carbon disclosures. In other words, companies with higher emissions had more disclosure. There also appeared to be a positive correlation between corporate carbon disclosures and higher share returns. In terms of the indirect impact, the results show that corporate carbon emission is positively related to the level of corporate carbon disclosures (companies with more carbon emissions make more extensive disclosures), and also show that a significant positive relation exists between corporate carbon disclosure and corporate financial performance (more carbon disclosures lead to higher subsequent share return for the company). This is quite interesting; as it shows that higher emissions can be 'compensated' for via more disclosure.

Furthermore, in a study by Clarkson et al. (2011), in which the researcher seeks to answer the question, 'Does it pay to be green?' 242 companies from four most polluting industries were studied from 1990 to 2003. Corporate environmental performance was measured by the amount of toxic release inventory (in pounds) per cost of goods sold. The results indicated that companies who experienced improved environmental performance also benefited from an increase in Tobin's Qs (which is the ratio between physical asset's market value and its replacement value), profitability, liquidity and sales growth in subsequent periods.

There is also quite a bit of debate as to whether CSR positive or negatively impacts shareholder value. On the one hand, by not meeting the needs and expectations of stakeholders, shareholder value may decrease due to consumer boycotts and even potentially incurring fines (Eccles, Ioannou, Serafein). On the contrary, not adopting environmental policies can destroy shareholder wealth, which has been argued by many scholars as well.

It is apparent that there is extensive theoretical and empirical literature for

both sides of the coin when it comes to firm performance and CO_2 Emissions. There is in fact substantial evidence to support both side's, given the results/theories are inconclusive.

Data, Methodology and Model Specification

The data set used in this study is the aggregate ROA, ROE figures for Islamic Banks, GDP growth (in percentage), and CO_2 emissions using data from the World Bank. The study was conducted from 2000 to 2013, for all OIC countries. Most of the countries had sufficient data, with the exception of Afghanistan, Palestine, Somalia, Syria, Guinea-Bissau, Comoros, Kyrgyztan, Tajikistan, and the Ivory Cost. CO_2 emissions were essentially used as a proxy for environmental performance/impact.

Key variables used:

i. Aggregate ROE for all Islamic Banks in OIC
ii. Aggregate ROA for all Islamic Banks in OIC
iii. GDP growth (in percentage)
iv. CO_2 emissions

Two different models were used, given ROE and ROA are both very similar measures for Islamic Banking performance.

Panel Cointegration Test

A panel cointegration test is conducted in order to see if there is a long-run cointegrating relationship between CO_2 emissions and banking performance. This establishes a theoretical relationship between the variables.

The Levin and Lin (LL) test in Table 1 below (highlighted in green), is a pooled ADF test with homogeneous slope coefficient of lagged Y for all countries. The null hypothesis for this test is that the series is not stationary. One of the restrictions of this test is that it does not allow for heterogeneity. In Table 1, for the ROE series, the p-value is 0.2341, so in this case we fail to reject the null. In Table 2, for the differenced ROE series, the p-value is 0.0006, so in this case we reject the null.

The Im, Pesaran and Shin (IPS) test extends the LL test, as it allows heterogeneity for

the slope coefficient of lagged Y for countries. The null hypothesis is that the series are non-stationary processes under the alternative that at least one individual series in the panel is assumed to be stationary. There is a restriction, in that this test assumes that time period for all countries is the same. In Table 1, IPS has a high p-value, of 0.4963. Therefore, we fail to the reject the null. In Table 2, IPS has a p-value of 0.0031, which means we reject the null.

Furthermore, the Augmented Dickey Fuller (ADF) – Fisher test (as proposed by Maddala & Wu) and Phillips and Peron (PP) tests were conducted. The ADF test is performed on unbalanced panel. The null hypothesis is a unit root in the residuals, as in no cointegration. In Table 1, ADF test shows a p-value of 0.68; therefore we fail to reject the null. In Table 2, this is not the case as the p-value is far lower; therefore the null is rejected in the second case. The PP test is a non-parametric correction to the t-statistic. The null hypothesis is a series is integrated of order 1. In Table 1, the null hypothesis cannot be rejected, whereas in Table 2 it can be.

Table 1: Unit Root Test (ROE)

Panel unit root test: Summary

Series: ROE

Date: 18/05/17 Time: 14:07

Sample: 2000 2013

Exogenous variables: Individual effects, individual linear trends

User-specified lags: 1

Newey-West automatic bandwidth selection and Bartlett kernel

Balanced observations for each test

Method	Statistic	Prob.**	Cross-Sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.72535	0.2341	11	132
Breitung t-stat	-0.73622	0.2308	11	121

Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.00925	0.4963	11	132
ADF - Fisher Chi-square	18.4327	0.68	11	132
PP - Fisher Chi-square	42.9909	0.0047	11	143

** Probabilities for Fisher tests are computed using an asymptotic Chi -Square distribution. All other tests assume asymptotic normality.

Table 2: Unit Root Test (DROE)

Panel unit root test: Summary

Series: D (ROE)

Date: 18/05/17 Time: 14:08

Sample: 2000 2013

Exogenous variables: Individual effects, individual linear trends

User-specified lags: 1

Newey-West automatic bandwidth selection and Bartlett kernel

Balanced observations for each test

Method	Statistic	Prob.**	Cross-Section	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-3.22004	0.0006	11	121
Breitung t-stat	-3.58642	0.0002	11	110

Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.73401	0.0031	11	121
ADF - Fisher Chi-square	43.2839	0.0044	11	121
PP - Fisher Chi-square	140.5	0	11	132

** Probabilities for Fisher tests are computed using an asymptotic Chi -Square distribution. All other tests assume asymptotic normality.

Descriptive Statistics

Descriptive Statistics				
	CO2_EMISSIONS	GDP_GROWTH_ANNUAL____	ROA	ROE
Mean	23146.63	5.542252	15.33643	125.4358
Median	5656.348	4.551505	5.79	74.185
Maximum	134215.9	34.5	276.78	1625.87
Minimum	168.682	-2.126029	-202.76	-645.17
Std. Dev.	32530.21	5.22703	43.23282	275.8437
Skewness	1.869552	3.212812	1.537051	1.874263
Kurtosis	5.673089	16.65909	20.87208	10.9904
Jarque-Bera	123.2367	1329.18	2110.194	499.8454
Probability	0	0	0	0
Sum	3240528	775.9153	2361.81	19317.11
Sum Sq. Dev.	1.47E+11	3797.737	285968.8	11641727
Observations	140	140	154	154

The descriptive statistics shows a wide random of information above. Given that some of the data was in percentage and some was not, it is difficult to make direct comparisons. It is interesting to note the variation between ROA and ROE. ROE has a higher standard deviation of 275.8437, indicating higher fluctuation around the mean. ROE is likely more sensitive to changes in the economy. With regards to Kurtosis, ROA has the highest value at 20.872. Kurtosis is the sharpness of the peak for a frequency distribution. This may be due to returns being concentrated around certain assets, since assets are generally illiquid.

Correlation				
	CO2_EMISSIONS	GDP_GROWTH_ANNUAL____	ROE	ROA
CO2_EMISSIONS	1			
GDP_GROWTH_ANNUAL	-0.01579	1		
ROE	0.306487	0.110837	1	
ROA	0.182687	0.160405	0.480529	1

The correlation table above shows the the highest correlation is between ROE and ROA, which is not surprising since they are both valid measures of Islamic Bank

performance. CO_2 Emissions is most highly correlated with ROE at 0.306487. This means these 2 variables move together in the same direction (since it's a positive correlation). GDP Growth (%) and CO_2 have a negative correlation of (0.01579), which is a bit surprising. Further investigation would be needed to understand the cause of this relationship or correlation movement.

Fixed Effects and Random Effects

Table 3: Final Results (ROE)

	Dependent variable: ROE					
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	Fixed Effect	Random Effect	Robust Fixed Effect	Difference GMM2	System GMM2
L.ROE	0.274+	0.142+	0.274+		-0.057	0.350
	[0.04]	[0.05]	[0.04]		[0.46]	[0.32]
CO2 Emissions	0.062*	0.063	0.062*	0.071-	0.040	0.059-
	[0.03]	[0.04]	[0.03]	[0.04]	[0.04]	[0.03]
GDP Growth Annual (%)	0.000	0.000-	0.000	0.000*	0.000	0.000-
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Constant	0.941+	1.097+	0.941+	1.303+		0.846-
	[0.09]	[0.12]	[0.09]	[0.09]		[0.45]
Observations	468	468	468	534	374	468
R-squared	0.118	0.048		0.018		
Adjusted R-squared	0.112	-0.064		0.014		
Pseudo R-squared						
Number of Instruments					8	12
Number of Groups		47	47	47	47	47
Arellano-Bond: AR(1)					0.45	0.09
Arellano-Bond: AR(2)					0.92	0.41
Sargan test (p-val)					0.11	0.00
Hansen test (p-val)					0.08	0.04
F Stats					0.56	0.00
Pilot Static & Dynamic Panel regression estimation for OIC Member States						
="- p<0.1	* p<0.05	+ p<0.01"				

The dynamic panel methodology was applied for this study. The 'N' is relatively large since it includes all the OIC countries, and the number of instruments is smaller. Traditional OLS could not be applied in this case, given the issues it faces with respect to autocorrelation problems, heteroskedasticity and endogeneity bias.

Before diving into the dynamic relationship, let's briefly examine the static models, which include Fixed Effects (FE) and Random Effects (RE). These models assume the relationship is static, which is not the case. However it is interesting to

note that ROE was found to be significant at the 1% evel under both FE and RE (please refer to Table 3). CO_2 Emissions was found to be significant at the 5% significant level under RE.

In Table 4, where ROA is used the main bank performance indicated, ROA is found to be significant at the 1% level under both FE and RE.

Table 4: Final Results (ROA)

Dependent variable: ROA						
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	Fixed Effect	Random Effect	Robust Fixed Effect	Difference GMM1	System GMM1
L.ROA	0.992+	0.874+	0.992+		0.948+	0.976+
	[0.00]	[0.02]	[0.00]		[0.04]	[0.04]
CO2 Emissions	0.005	0.005	0.005	0.038*	0.001	0.010
	[0.00]	[0.01]	[0.00]	[0.02]	[0.01]	[0.02]
GDP Growth Annual (%)	0.000	0.000	0.000	-0.000	-0.000	0.000
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Constant	0.104+	1.249+	0.104+	9.606+		0.251
	[0.02]	[0.19]	[0.02]	[0.04]		[0.32]
Observations	536	536	536	579	450	536
R-squared	0.997	0.802		0.018		
Adjusted R-squared	0.997	0.782		0.015		
Pseudo R-squared						
Number of Instruments					8	12
Number of Groups		47	47	47	47	47
Arellano-Bond: AR(1)					0.00	0.00
Arellano-Bond: AR(2)					0.82	0.81
Sargan test (p-val)					0.76	0.57
Hansen test (p-val)					0.54	0.73
F Stats					0.00	0.00
Pilot Static & Dynamic Panel regression estimation for OIC Member States						
="- p<0.1	* p<0.05	+ p<0.01"				

Estimation Using Two-Step Dynamic System GMM

Arellano and Bond (AR) initially proposed the Standard or Differenced GMM. Standard GMM is unique in that it corrects for endogeneity and simulataneity bias in OLS. AR uses "first difference lag levels for each variable as instrumental variables". This eliminates bias from omitting variables from the cross-section data. However this model presents its own limitation, such as the lagged levels of regressors may be weak instruments for the differenced variables. The system GMM was then introduced, which adds level form moment conditions on top of difference form

moment conditions.

To validate the findings, the Sargan and Arellano-Bond (AR) autocorrelation test were conducted. The Sargan test is used for over-identifying restriction, where the null hypothesis is the independence of the instruments and the error terms. This test ensures the validity of the instruments used in the model. The Sargan test has a p-value that is higher than 5% under Difference GMM when ROE is the dependent variable, which means the result is insignificant. As such, the null hypothesis cannot be rejected. However under System GMM the null hypothesis can be rejected. Evidently the instruments used under Difference GMM are found to be valid. In the second model where ROA is the dependent variable, both System and Difference GMM are found to have a p-value that is higher than 5%. As such the null cannot be rejected under both. In this case, instrumental variables estimated under Difference and System GMM is accurate.

The second test is the AR test, which examines the absence of first and second order serial correlation in the differenced residuals. It tests the serial correlations for the error terms, where the null hypothesis is the independence of the instruments and the error term. In Table 3, AR (2) is found to be 0.92 and 0.41, under Differenced GMM and System GMM respectively. In Table 4, AR (2) is 0.82 and 0.81 respectively.

Out of the two GMM Models, System GMM is superior in the case of unbalanced panel data, since Standard GMM has the weakness of magnifying gaps. Also, System GMM is more appropriate in the case where N is greater than T and the autoregressive parameter is low. In this study, N is certainly greater than T. This is evident in Table 3 and 4, since the number of instruments is lower than the number of groups.

From the results above, in Table 3, it is evident that under System GMM, CO_2 emissions is significant at the 10% level, indicating there is a relationship between emissions and return on equity. When examining Table 4, whereby ROA is the dependent variable, ROA was found to be significant at the 1% significance level under both Difference and System GMM. In examining the R-Squared for both models, it is apparent in table 1 it is rather low. Only 11.8% of the variation in the data can be explained by ROA. However in table 2 the R-Squared is quite high since the model can explain 99.7% of the variation in the data. There is sufficient evidence to show that

there is a long-run relationship between CO_2 Emissions and Islamic Bank Performance. In Table 3, there is a negative correlation between ROE and CO_2 Emissions, which is consistent for both Differenced and System GMM. In Table 4 however, ROA has a positive correlation with CO_2 Emissions, so they move in the same direction.

Out of all of the models above System GMM (Table 3) seems to be the most pertinent, as all the variables are significant at the 10% level, and all the variables have a negative relationship with ROE.

Conclusion and Policy Implications

There is in fact a relationship between CO_2 Emissions and Islamic Banking performance, and the long run relationship is significant. There are several policy implications as a result of these findings. When CO_2 Emissions rise it increases the economy's carbon footprint. Policymakers can use the trends studied in this study, to set policies that encourage Islamic Banks to improve the environment. Furthermore, rising per capita incomes should be considered when policy makers are making sustainable development plans. It is also important to note, that emerging economies tend to face structural transformation. Financial development generally contributed to increasing emissions, as opposed to decreasing it. This is different to financing in developed nations.

The topic of study for this paper is highly under researched and there are many related areas that are worth exploring. Islamic Finance is not only about ensuring Shariah compliant product structures, but also the overall impact on the society. Policy makers should consider this in incentivizing Islamic Banks to be more wholly environmentally conscious. This study provides unique insight on the dynamics between Islamic Banking performance and CO_2 Emissions, which can assist policymakers make more effective decisions.

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