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The Impact of Market Maker Competition on Price Efficiency Features in the Tunisian Stock Market

F. Hachicha
University of Sfax, Sfax, Tunisia

ABSTRACT

The **purpose** of this study — is to determine the relationship between market maker competition and stock price efficiency in TSE (Tunisian Stock Exchange) market. The proxy for competition was determined as the number of market makers and the parameters investigated were transaction costs, information asymmetry and profit. The high positive correlation between competition and stock price efficiency is demonstrated by the negative impact of competition on all the variables studied. In addition, the price efficiency increased considerably after the introduction of new market makers by using the difference-in-difference (DID) model. Also, the competition between market makers has a significant negative impact on price efficiency through transaction costs, asymmetry information and level of experience. Thus, it can be concluded that the stock price efficiency can be improved by increasing the competition of market makers in Tunisia.

Keywords: market maker competition; price efficiency; transaction cost; information asymmetry; TSE

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ОРИГИНАЛЬНАЯ СТАТЬЯ

Влияние конкуренции маркетмейкеров на ценовую эффективность тунисского фондового рынка

Ф. Хачича
Университет Сфакса, Сфакс, Тунис

АННОТАЦИЯ

Цель исследования — определить зависимость ценовой эффективности акций от влияния конкуренции маркетмейкеров на фондовом рынке Туниса. Показателем конкуренции определено количество маркетмейкеров, а исследуемыми параметрами — транзакционные издержки, информационная асимметрия и прибыль. Высокая положительная корреляция между конкуренцией и ценовой эффективностью акций показана через отрицательное влияние конкуренции на все исследуемые переменные. Кроме того, эффективность ценообразования значительно возросла после внедрения новых рыночных факторов с использованием модели дифференциации (DID). При этом конкуренция между маркетмейкерами оказывает негативное влияние на эффективность цен через транзакционные издержки, информационную асимметрию и уровень опыта. Таким образом, можно сделать **вывод**, что ценовая эффективность акций может быть улучшена путем усиления конкуренции маркетмейкеров в Тунисе.

Ключевые слова: конкуренция маркетмейкеров; ценовая эффективность; транзакционные издержки; информационная асимметрия; прибыль

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INTRODUCTION

With the digital revolution, financial markets gradually evolved into electronic markets. This development has significantly improved the information dissemination mechanism as well as the transparency of price formation. With this evolution, several investors now have the ability to place their orders via electronic terminals. Despite these advantages, the transition from markets to the electronic world was not without undesirable side effects. In particular, the growing participation of ATMs in financial exchanges has heightened the risks of adverse selection, price manipulation and stock market crashes. In order to cope with these risks, the main world stock exchanges now use specialized agents called market makers. These are intermediate institutions that intervene in the liquidity flow of a given transferable security Ingo [1].

The advantage of these intermediaries as regards direct negotiation in exchange markets is that they allow them to process orders for the profit of their clients and capture the order flow.

Several empirical studies have dealt with the impact of competition between market makers. However, the literature has not thoroughly addressed this issue and its impact on the stock exchange. Only perfect competition or monopoly has been considered in the market microstructure investigation. W.G. Christie and R.D. Huang [2] shed light on the competition between market makers in the Nasdaq stock market.

The impact of competition between market makers on price efficiency is sought in this work through several parameters, notably transaction costs, asymmetric information and profit by providing evidence from the Tunisian market. We wanted to study the impact of market makers competition on price efficiency in a less developed market than the most prominent ones, such as the Nasdaq and China's NEEQ [3].

In Tunisia, the Tunis Stock Exchange (TSE) fully manages the stock market. Established as a private entity, its shareholders are stock market intermediaries. Since 1996, TSE has operated as a purely electronic order-driven market. Investors place orders through market makers. TSE functions as a continuous market for active stocks and a call auction for less liquid ones.

Information asymmetry leads to inefficient economic outcomes, such as investment and finance decisions, and encourages managerial expropriation (T. Chen et al. [4]).

As for transaction costs, the effects of a decline on the structure and performance of organizations and markets have been treated by V. Gurbaxani and S. Whang [5]. A few studies have considered negative effects of reduced transaction costs, especially on intermediaries, but even here the replacement of traditional intermediaries with electronic interaction is socially beneficial, even if it reduces the profitability of existing intermediaries.

Our study extends the prior literature as it links market maker competition with stock price efficiency.

Our starting point was to study the microstructure of the Tunisian financial market through different channels. So far, no researcher has addressed this issue in the Tunisian market. The choice of this market was not arbitrary. The aim was to study the impact of the competition of the market maker on the efficiency of stock market in Tunisia and compare it to developed markets like China's NEEQ and NASDAQ.

The rest of this paper flows as follows: in Section 2, the related literature is surveyed and hypotheses are suggested. Section 3 explains the variables and methods. The data and statistical tools are displayed in Section 4. We present and analyze the obtained results in Section 5. The conclusions are drawn in Section 6.

LITERATURE REVIEW AND HYPOTHESES

Price efficiency is the timely and exact reflection of information about a stock price [6]. The present work investigates the impact of market maker competition on price efficiency through three channels.

Channel 1: Transaction cost

The effects of a decline in transaction costs on the structure and performance of organizations and markets has been a central theme in the information systems literature for many years, as stated in the paper V.A. Belyaev [6].

The effects of a decline in transaction costs on the structure and performance of organizations and markets has been a central theme in the information systems literature for many years [7].

For the most part, research on this topic suggests that lower transaction costs are almost always beneficial. Reductions in transaction costs have been linked to direct cost savings, indirect benefits through improvements in agency costs, monitoring or coordination within existing organizations and markets, and even the creation of new types of market structures that are more efficient [7, 8].

Transaction costs are measured using bid-ask spreads, illiquidity, and trading volume. Market maker competition decreases the transaction costs of stocks, which facilitates the trading of informed orders and a higher efficiency of pricing [9–11].

Hypothesis 1. Market maker competition affects price efficiency through transaction costs. There exists a negative relationship between competition and the transaction costs of a stock.

Channel 2: Information asymmetry

Information asymmetry has been widely reported to affect dealerships. Information-based microstructure models include those by D. Easley and M. O'Hara [12], D.F. Foster and S. Viswanathan [13].

Proxy information asymmetry has been introduced by A. Elbadry et al. [14]. It includes bid-ask spreads, volatility, trading volume and trading value as information asymmetry measurements, market maker competition was found to foster the information asymmetry.

These theoretical models yield two important empirical predictions: the asymmetry is positively related to the bid-ask spread and to the price impact of a trade.

Hypothesis 2. Market maker competition affects price efficiency through asymmetry information. There exists a negative relationship between competition and asymmetry information.

Channel 3: Profit

The trading profits of market makers is affected by competition increase. In our study, we introduce market makers' trading experiences as a key determinant of the competition effect. Our study extends the prior literature as follows. It unprecedentedly investigates the relationship between market maker competition and stock price efficiency. The available literature on this relationship considers market makers in general [15]. The present work however focuses on actual instances of market makers. We consider competition detrimental to price efficiency, as well as other factors indicated in the literature [16]. The relation between market maker competition and price efficiency is herein deemed positive as the former decreases stocks' transaction costs and further incorporates information. In the literature, results are contradictory. Some works claim that competition increases transaction costs [17], while others assert that it decreases costs [11].

Hypothesis 3. Market maker competition affects price efficiency through the channel of trading profit. A stronger negative relationship between competition and total trading profits should be observed in the market maker group with high experience.

REGRESSIONS PARAMETERS AND CALCULATION

Competition

Following R. Winne [18], the level of completion was determined in terms of the evolution of the number of market makers for a given stock during a definite period. Three variables are considered to calculate the price efficiency as related to completion.

Price Efficiency

The first variable has two proxies: pricing errors and price delay, as they have been proven accurate for this type of investigation in the literature [19]. The first proxy was accounted for in accordance with the work of J. Hasbrouck [20]. The second was determined via the method of K. Hou and T. J. Moskowitz [21].

According to J. Hasbrouck [20]. The estimate of the variance of price errors is:

The standard variance of the transaction price for price efficiency proxy is calculated as follows:

We calculate on each trading day per stock.

On the other hand, K. Hou and T. J. Moskowitz [21] define price delays as the delay in firms' stock return responses to market returns. We compute the price efficiency using the following equation:

This relation suggests that a greater value of refers to a decrease in price efficiency. However, it fails to consider the length of lags or the precision of the estimates. Thus, the following adjustment was also employed:

Trading Cost

Trading costs are estimated in terms of bid-ask spread, illiquidity and volume. The spreads are analyzed as a function of a dealer's cost and market structure, as described in the paper by R. Castellano and R. Cerqueti [22]. We calculate the daily average spread for each sample as a proxy for transaction cost. According to T. Chordia et al. [23], the spread it is determined for sample *i* at transaction time t as follows: where is the bid price and is the ask price at time *t*, and is the average spread for sample i on transaction day *d*.

We follow Y. Amihud [24] in measuring illiquidity (*ILLIQ*) and volume as proxies for market transaction costs. Volume is the average daily volume of a sample during the trading period. *ILLIQ* is calculated using return and volume, as follows:

Where D denotes the trading days of the sample period; denotes sample *i* return on day *d*; is the share volume of sample *i* on day *d*; and the value of *ILLIQ* denotes the illiquidity in the sample and is negatively related to liquidity level, whereas volume is positively related to liquidity level.

Trading Information Asymmetry

Different proxies have been suggested in the literature. K. Kanagaretnam et al. [25] examine other proxies, specifically earnings forecast dispersion and forecast revision volatility. In the present work, we followed A. Elbadry et al. [14] who use four proxies, namely volatility, bid-ask spread, share volume and trade value.

Trading Profits

According to O. Hansch et al. [26], market makers' total trading profit is calculated as: where denotes the trading profit of market makers of sample *i* in transaction time *t*, denotes bid price, denotes ask price, and denotes sell and buy volumes, respectively.

At the methodological level, we tried to test each time the impact of market maker competition on the efficiency of markets through the different channels.

DATA DESCRIPTION AND STATISTICS

In our study, the shares come from the TSM. On 31 December 2018, 80 companies were listed on the Tunisian stock market (TSM), most of which were small and medium-sized enterprises. We will use the daily data relating to listed companies. Data collection is from the TSM and the Data Stream. We use the R software (R studio) to derive the empirical results.

Table 1

Summary Statistics of Samples (Period 1)

Market maker	Price	Volatility	Turnover	Volume	Market Cap
1	22.26	2.7	0.50	24.68	10.74
2	31.13	5.28	0.37	51.2	12.56
3	15.93	4.74	0.14	29.2	6.14
4	22.4	1.54	0.21	34.74	8.24
5	7.06	1.11	0.07	10.15	10.72
6	31	3.73	0.3	16.82	11.5
7	59.53	5.68	0.39	31.01	12.68
8	32.33	7.64	0.24	82.13	10.96

Source: Compiled by the author.

Note: Summary statistics of samples provide summary data for 80 samples divided by the number of market makers as different groups. In each group, we calculate the average values of price, volatility, turnover and market capitalization. Market maker represents the number of market makers in the samples for the first period (02.01.2017 until 31.12.2017). The price represents the daily closing price in the samples. Volatility represents the standard deviation of the closing price in the samples. Turnover is calculated as the daily share volume divided by the number of shares outstanding. Market cap (in million Tunisian dinars) represents the market capitalization for the samples.

Our final sample contains 12 market makers and 80 companies from different sectors estimated over 2 periods: the first period going between 02.01.2017 and 31.12.2017 and the second period going between 02.01.2018 and 12.31.2018. The market makers are: BIAT Capital, Amen Invest, STB Finance, Attijari intermédiation, BNA Capitaux, BEST Invest, UIB Finance, UBCI Bourse, Compagnie gestion et finance, Maxula Bourse, MENA Capital Partner, Union Financières.

- **Descriptive statistics**

For a better understanding of samples, we provide descriptive statistics in *Table 1* and *Table 2*. We classify samples according to the number of market makers. The statistical variables are sample size, average price, standard variance of price, turnover, share volume, and market capitalization. In *Table 1*, we show the average value of the statistical variables in different market maker groups.

At the start and for the first year, we set a market maker number of around 8 (*Table 1*). Subsequently, we added 4 grades to see their impact on price efficiency (*Table 2*).

Table 1 presents descriptive statistics for the first period (02.01.2017 until 31.12.2017) for 8 market makers. We find that the stock price is different between the 8 market makers it varies between 7.06 and 59.53. We also see that volatility is modest globally, ranging between 1.11% and 7.64%, and transaction volume ranges between 10.15 and 82.13.

Table 2 shows that the number of samples decreases as the number of market makers increases. Most samples have no more than six market makers. With the market maker increasing, we find that turnover, share volume, RMB volume, and market capitalization exhibit an increasing trend.

This table provides summary data for 80 samples divided by the number of market makers as different groups. In each group, we calculate the average values of price, volatility, turnover, share volume, and market capitalization. Market maker represents the number of market makers in the samples: period 1 includes 8 market makers (January 2017 — December 2017) and period 2 includes 12 market makers (introduction of 4 new market makers) in January 2018 — December 2018.

We note from this analysis that the Tunisian financial market is well influenced by the entry of new market makers.

Summary Variable Statistics

We also provide summary statistics of the dependent and explanatory variables of the 80 samples in *Table 3*. It provides summary statistics of the variables used in our study. Number represents the number of market makers in the samples. Spread represents the difference between the bid and ask prices. *ILLIQ* represents the inverse liquidity level. Profit (in million Tunisian dinars) represents the total trading profit of market makers in each sample.

It is observed that the mean value and standard deviation are close and at the same level, and they are much smaller than the other three efficiency proxies. Profits are positive in 75% of the samples, indicating that most market makers earn money from trading. The two proxies for market makers' ability show a large difference between the maximum and the minimum, implying that some market makers may have information advantages over the other two efficiency proxies.

The descriptive statistics in *Table 3* show that the number is positive with a high standard deviation. The

Table 2

Summary Statistics of Samples for Totality Period

Market maker	Price	Volatility	Turnover	Volume	Market Cap
1	33.41	4.05	0.76	37.03	16.12
2	46.74	7.93	0.56	76.22	18.85
3	23.96	7.12	0.21	43.85	9.22
4	33.66	2.32	0.32	52.12	12.36
5	10.68	1.67	0.11	15.23	16.09
6	46.56	5.62	0.45	25.23	17.25
7	89.35	8.52	0.59	46.52	19.02
8	48.54	11.46	0.36	123.22	16.45
9	103.93	14.98	0.86	129.81	23.06
10	106.36	15.03	0.95	107.32	23.12
11	104.23	12.04	0.46	113.99	22.51
12	103.25	14.09	0.45	106.23	20.63

Source: Compiled by the author.

Note: Summary statistics of samples provide summary data for 80 samples and we add four market makers as different groups. In each group, we calculate the average values of price, volatility, turnover and market capitalization. Market maker represents the number of market makers in the samples for the second period (January 2018 — December 2018). Price represents the daily closing price in the samples. Volatility represents the standard deviation of the closing price in the samples. Turnover is calculated as the daily share volume divided by the number of shares outstanding. Market cap (in million Tunisian dinars) represents the market capitalization for the samples.

efficiency proxies are respectively positive with an equal standard deviation.

Also, we provide statistics on the correlation coefficients between the main variables in *Table 4*. The results show that the two price efficiency proxies are highly correlated and range from 0.77 to 0.95. The number of market makers has a negative correlation coefficient with price efficiency (in the range of –0.25 to –0.39), which implies that the number of market makers might increase the price efficiency of the stock.

It calculates the correlation coefficients between variables and proxies for price efficiency (*Table 4*).

RESULTS AND ANALYSIS

Impact of Market Makers on Price Efficiency

The results of regression (2) are provided in *Table 5*. The independent variables are and, all of which are proxies for price efficiency.

From these results, we find that the number of market makers has a negative relationship with all coefficients are highly significant and have t-values greater than 5. The results imply that stocks with one more market maker, will decrease by 0.003 units. These results reflect the finding that the positive impact of market maker competition on price efficiency is both statistically and economically significant.

We find that the number of market makers has a negative relationship with the two efficiency proxies. All the coefficients are significant and have t-values greater than 5%: (–0.003), (–0.015) and (–0.09). We also notice that the control variables are respectively (the turnover, negative market capitalization and volatility with efficiency proxies.

These results measure the negative impact of competition from Tunisian market makers on price efficiency, which is both statistically and economically significant.

Impact of the New Entry of Market Makers

To provide a robustness test, we use DID to test the impact of the entry of new market makers on price efficiency. The regression is introduced in regression (3), and the details of the test are as follows. We choose stocks that only one market maker joined in during the trading period. A total of 80 qualified stocks constitutes the experimental group. We divide the experimental group stocks into two periods according to the date when the new market makers joined and calculate the price efficiency of each period.

Finally, we have 80 stocks that meet these requirements for the control group. There are 160 pairwise stocks for the DID test. *Table 6* provides statistics on the differences in size and efficiency measurements between pairwise stocks before new market makers entered. Panel A shows the value of the differences, and panel B shows the absolute value of the differences. *Table 6* shows the results of regression (3). The coefficient of After ExpG is negative and highly

Table 3

Summary Statistic of Variables

	Mean	Std.dev	Median	Max	Min
Number	9.230	8.223	6.293	66.234	4.256
E^{H}	0.089	0.046	0.063	0.620	0.031
E^{HW1}	0.622	0.456	0.849	0.923	0.009
E^{HW2}	0.982	0.189	0.304	0.123	0.123
Spread	0.012	0.018	0.023	0.089	0.004
ILLIQ	2.985	1.258	3.258	5.486	0.049
Profit	3.286	2.369	1.298	7.236	2.212
Asym	0.236	0.289	0.896	4.223	0.015

Source: Compiled by the author.

Note: Summary statistics of variables provide summary statistics of the variables used in our study. E^{H}, E^{HW1}, E^{HW2} are the proxies for price efficiency. Number represents the number of market makers in the samples. Spread represents the difference between the bid and ask prices. ILLIQ represents the inverse liquidity level. Profit (in million Tunisian dinars) represents the total trading profit of market makers in each sample. Asym represents the average profitability of market makers in each sample.

Table 4

Correlation Statistics Between Variables

	E^{H}	E^{HW1}	E^{HW2}	Nombre	Spread	ILLIQ	Volume	Asym
E^{HW1}	0.46							
E^{HW2}	0.26	0.29	−0.96					
Nombre	−0.56	−0.32	0.32					
Spread	0.28	0.23	0.22	−0.56				
ILLIQ	0.43	0.39	−0.28	−0.48	0.38			
Volume	−0.25	−0.23	0.23	−0.36	0.96	0.48		
Asym	0.89	0.36	0.56	0.23	0.28	0.25	0.87	
Profit	0.06	0.08	0.05	−0.09	0.23	0.18	0.43	0.78

Source: Compiled by the author.

Note: Correlation statistics between variables calculate the correlation coefficients between variables. E^{H}, E^{HW1}, E^{HW2} are the proxies for price efficiency. Number represents the number of market makers in the samples. Spread represents the difference between the bid and ask prices. ILLIQ represents the inverse liquidity level. Volume represents the number of trading shares in the sample. Profit represents the total trading profit of market makers in each sample. Asym represents the share and the trade volume.

significant (−6.60) for EH and is negatively significant for the other three efficiency measurements, at least at the 5% level. These results suggest that price efficiency significantly increased after the new market makers entered. The results of the DID test are consistent with the conclusions of regression (2), in which the number of market makers is a proxy for competition.

Table 6 impact of the entry of new market makers on price efficiency. It provides the results of regression (3). The independent variables are all proxies for price efficiency. The coefficient After ExpG is negative and highly significant (−0.023) for and negatively significant for the other two efficiency measures (−0.105) and (−0.088) at least at the 5% level.

It is observed that the entry of a new market maker in the Tunisian equity market results in a significant negative increase in turnover, market capitalization and volatility.

Table 5

Impact of Market Maker Competition on Price Efficiency

	E^H	E^{HW1}	E^{HW2}
Intercept	0.022*** (4.27)	0.668*** (6.23)	0.705*** (11.30)
Number	−0.003*** (−6.71)	−0.015*** (−5.88)	−0.09*** (−5.08)
Turnover	−0.010** (−1.01)	−0.089*** (−4.91)	−0.033*** (−3.54)
Market cap	−0.005** (−1.53)	−0.015** (−2.03)	−0.007 *(−1.27)
Volatility	−0.003*** (−3.21)	−0.014*** (−2.01)	−0.006*** (−1.13)
R^2	0.123	0.198	0.39
Observations	80	80	80

Source: Compiled by the author.

Note: Impact of market maker competition on price efficiency. It provides the results of regression (2). The independent variables are E^H, E^{HW1}, E^{HW2}, all of which are proxies for price efficiency. Number represents the number of market makers. Turnover is calculated as daily share volume divided by number of shares outstanding. MarketCap represents the market capitalization for the samples. Volatility is the standard deviation of the closing price in the samples. The t-statistics are reported in parentheses. Single, double, and triple * indicate the 90%, 95%, and 99% levels of significance, respectively, based on the t-values.

These results suggest that price efficiency increased considerably after the arrival of new market makers.

Hypothesis 1 is well verified, namely that competition between market makers has a significant negative impact on efficiency. Our results are also consistent with the work of W. Zhang et al [3].

Market Maker Competition and Transaction Cost

To address the question of why market maker competition affects price efficiency, we first test the possible channel by which market maker competition affects transaction costs. *Table 7* shows the results of regression (4).

We see from *Table 7* that the number of market makers has a significant negative impact on the two different measures of transaction costs: spread and ILLIQ. The coefficient linked to the number is −0.025 for the spread,—0.044 for the ILLIQ and has a positive and significant impact on the volume of 0.205, and all of them are very significant, with a T value greater than 10%.

The result is consistent with Hypothesis 1, i.e. competition between market makers has a significant negative impact on price efficiency through transaction costs (competition lowers transaction costs). Our result is also consistent with studies by R. Winne [18].

Market Maker Competition and Information Asymmetry

We first test the possible channel by which market maker competition affects transaction costs. *Table 8* shows the results of regression (5). We see in *Table 8* that the number has a significant negative impact on the 3 measures of information asymmetry: spread, volatility, trade volume and trade value. We note that market capitalization, price and volatility have a significant negative impact on spread, ILLIQ and volume

The results are consistent with Hypothesis 2. That is, the asymmetry of information has a negative impact on competition from Tunisian market makers.

Market Maker Competition and Trading Profit

The results of regression (6) for each group are shown in *Table 9*. In line with Hypothesis 3, we find that the results of the three groups are very different. In the median and low experience groups, the number of market makers has no significant relationship with trading profits. No obvious learning behavior occurs when market makers compete with the less experienced.

Table 6

Impact of the Entry of New Market Makers on Price Efficiency

	E^H	E^{HW1}	E^{HW2}
Intercept	0.072 (0.17)	0.186 (0.45)	0.374 (6.22)
After	0.002 (0.61)	0.038 (1.23)	0.022 (1.02)
Exp	0.006 (0.89)	0.009 (1.16)	0.056 (2.86)
After x Exp	−0.023*** (−4.04)	0.105*** (−2.51)	−0.088*** (−3.67)
Turnover	0.015*** (−2.09)	−0.156*** (−3.10)	−0.068*** (−4.21)
Marketcap	−0.009** (−1.27)	0.056 (0.12)	0.008 (0.08)
Volatility	−0.002** (−1.75)	0.021*** (−3.70)	−0.007*** (−2.13)
Observation	80	80	80
R^2	0.104	0.286	0.207

Source: Compiled by the author.

Note: Impact of the entry of new market makers on price efficiency. It provides the results of regression (3). The independent variables are E^H, E^{HW1}, E^{HW2}, all of which are proxies for price efficiency. After is a dummy variable equal to 1 if the sample period starts after the change in the number of market makers. ExpG is a dummy variable equal to 1 if the sample belongs to the experimental group. Turnover is calculated as daily share volume divided by number of shares outstanding. MarketCap represents the market capitalization for the samples. Volatility represents the standard deviation of the closing price of the samples. The t-statistics are reported in parentheses. Single, double, and triple * indicate the 90%, 95%, and 99% levels of significance, respectively, based on t-values.

Across different experience groups (high, medium, and low), the number of market makers showed non-significant associations with trading profits, with values of –4.029,—3.067, and –2.062 in the high, medium, and low experience groups, respectively. Conversely, in all three experience groups, there was a notable adverse correlation between yield and trading profits. The strong experience group exhibited a performance coefficient of 23.042, while the medium and weak experience groups displayed coefficients of –31.010 and –61.306, respectively.

We find that competition from market makers has a strong negative impact on trading profits.

The results found in this market are of practical importance and relevance. Through this research, it has been shown that although the microstructure of this market is different compared to developed markets (liquidity, volatility, transaction volume, market capitalization, number of market makers, etc.), the market maker competition has a significant impact on price efficiency.

CONCLUSION

Our study uses data from TSE market to test the relationship between market maker competition and price efficiency.

We further find that the competition among market makers with stronger research abilities increases price efficiency. Our study also discusses the channels of price efficiency that are affected by market maker competition. We tested three channels from the literature: transaction costs, profit and asymmetric information. We use bid-ask spreads, illiquidity, and volume as proxies for transaction costs and show that market maker competition decreases transaction costs. Furthermore, the asymmetry of information has a negative impact on competition

Table 7

Impact of Market Maker Competition on Transaction Costs

	Spread	ILLIQ	Volume
Intercept	0.023 (3.25)	1.102 (12.04)	2.134 (6.11)
Number	−0.025*** (−12. 73)	−0.044*** (−13.02)	0.205*** (11.41)
Market cap	−0.004*** (−11.02)	0.098*** (−15.94)	0.757*** (10.98)
Price	−0.005*** (−11.23)	0.004 (0.64)	−0.072*** (−4.13)
Market return	−0.235 (−1.23)	−4.987 (−2.41)	23.25 (5.23)
Observations	80	80	80
R^2	0.325	0.226	0.263

Source: Compiled by the author.

Note: The impact of market maker competition on transaction costs provides the results of regression (4). The independent variables are Spread, ILLIQ, and Volume, all of which are liquidity measurements. Number represents the number of market makers. MarketReturn represents the average return of the market index during the trading days in the sample. The t-statistics are reported in parentheses. Single, double, and triple * indicate the 90%, 95%, and 99% levels of significance, respectively, based on t-values.

Table 8

Impact of Market Maker Competition on Information Asymmetry

	Spread	Trade volume	Trade value	Volatility
Intercept	0.010*** (2.95)	2.47*** (5.46)	1.003*** (7.34)	1.47*** (3.46)
Number	−0.005*** (−4.73)	−0.109*** (−8.11)	−0.004*** (−2.62)	−0.239*** (−5.11)
Market cap	−0.07*** (−3.40)	−0.076*** (−3.28)	−0.08*** (−4.94)	−0.234*** (−1.38)
Price	−0.007*** (−5.73)	−0.0216*** (−2.51)	−0.005*** (−1.09)	−0.0543*** (−3.51)
Market return	−0.591*** (−6.21)	−0.177*** (−5.23)	−0.652*** (−9.62)	−0.2899*** (−3.84)
Observations	80	80	80	80
R^2	0.125	0.369	0.567	0.369

Source: Compiled by the author.

Note: The impact of market maker competition on information asymmetry provides the results of regression (5). The independent variables are Spread, Trade volume, Trade value and Volatility. Number represents the number of market makers. MarketCap represents the market capitalization of the samples. Price represents the average closing price in each sample. MarketReturn represents the average return of the market index during the trading days in the sample. The t-statistics are reported in parentheses. Single, double, and triple * indicate the 90%, 95%, and 99% levels of significance, respectively, based on t-values.

Table 9

Impact of Market Maker Competition on Trading Profit

	High experience	Median experience	Low Experience
Intercept	13.030*** (3.06)	16.310*** (3.14)	24.004*** (3.04)
Number	−4.029 (−3.42)	−3.067 (−1.22)	−2.062 (−0.91)
Stock return	−23.042*** (−3.04)	−31.010*** (−4.12)	−61.306*** (−5.16)
Market cap	0.267*** (2.23)	2.298*** (3.68)	4.621*** (5.15)
Turnover	−11.256 (−0.51)	−14.650 (−0.77)	−15.237 (−0.87)
Observations	27	26	27
R^2	0.226	0.218	0.256

Source: Compiled by the author.

Note: The impact of market maker competition on transaction costs provides the results of regression (6). The independent variables are High experience, Median experience and Low Experience. Number represents the number of market makers. The t-statistics are reported in parentheses. Single, double, and triple * indicate the 90%, 95%, and 99% levels of significance, respectively, based on t-values.

from Tunisian market makers. Additionally, the group of market makers with high trading experience has an impact on price efficiency. Also, we find that competition from market makers has a strong negative impact on trading profits.

It is true that the Tunisian market is not considered a developed market like that of NYSE, Nasdaq and China NEEQ, but the results prove that despite the reduced number of companies as well as market makers, there is a relationship between competition's market maker and price efficiency through different channels. Also, the results imply that price efficiency can be improved by enhancing the competition of market makers with high research ability and experience.

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ABOUT THE AUTHOR / ИНФОРМАЦИЯ ОБ АВТОРЕ

Fatma Hachicha **—** Assoc. Prof., Department of Finance, Institute of High Business Studies of Sfax, Sfax, Tunisia
Фатма Хачича — доцент, кафедра финансов, Институт высших бизнес-исследований Сфакса, Сфакс, Тунис
http://orcid.org/0000-0002-0999-0448
hachicha_fatmaa@yahoo.com

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