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The role of algorithms in shaping prices and competition in digital markets

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Abstract:

The research concluded that algorithms, especially dynamic pricing algorithms, play a pivotal role in increasing price volatility (regression coefficient 0.415), and that there are statistically significant differences in the intensity of competition between platforms according to their level of algorithm use. The research also revealed a regulatory gap, namely the inadequacy of current competition laws (Law No. 65 of 2004) to keep pace with the challenges of the digital age, despite the positive steps taken with the issuance of the framework regulations for digital platforms and services in 2025. The research concluded with recommendations to update the legislative framework, establish a specialized unit to monitor digital markets, develop the infrastructure for electronic payments, and enact a law to protect personal data. It also emphasized the need for further field and comparative studies to enhance understanding of this phenomenon in Iraq.

Keywords: Algorithms, Dynamic Pricing, Competition, Digital Markets, E-commerce, Regulation of Digital Platforms, Price Volatility, Algorithmic Coordination.

Introduction:

The transformation stand algorithms as the primary driver reshaping pricing and competitive dynamics (1).

methodology combining theoretical analysis based on economic and legal literature with statistical analysis based on Iraqi digital market data and algorithm-related indicators (2).

To what extent are the Digital Platforms and Services Framework Regulations (2025) and the Communications and Media Commission Law No. 65 of 2004 sufficient in regulating the use of pricing algorithms?

Research Methodology:

The researcher adopted a mixed-methods approach, combining descriptive-analytical and quantitative methods. The research is applied, aiming to provide practical recommendations for decision-makers, regulatory bodies, and digital platforms in Iraq.

Research Population and Sample:

- Competition indicators and market share data for various platforms.

- Challenges related to electronic payments and consumer behavior.

Secondary data were also used from reports by the Central Bank of Iraq, the Central Statistical Organization, and the Communications and Media Commission, where available. The actual sample size subjected to statistical analysis was 18 observations distributed across different indicators, a sufficient number for conducting the planned statistical analyses given the nature of the available data.

Data Collection Tools:

The research relied on two main data collection tools:

Tool 1: Desk Survey and Secondary Data Collection

The desk survey was used to review previous literature, theoretical studies, and legal and economic references relevant to the research topic. This included:

- Analysis of relevant Iraqi laws and regulations (Communications and Media Commission Law No. 65 of 2004, Framework Regulation for Digital Platforms and Services 2025, E-Commerce Regulation No. 4 of 2025).

- Review of international reports issued by the Organisation for Economic Co-operation and Development (OECD) and the European Union on algorithms and competition (3).

- Review of previous academic studies published in peer-reviewed Arab and international journals.

Tool 2: Collection of Statistical Data from Available Secondary Sources

Quantitative data was collected from the following sources:

- ECDB database, which specializes in monitoring e-commerce globally.

- Wresearch reports on the e-commerce retail market and applications in Iraq.

- Annual reports of the Central Bank of Iraq (2024-2025).

- Publications of the Iraqi Communications and Media Commission.

Tables were designed to collect data that included the following indicators: annual e-commerce revenue, growth rates, internet and smartphone penetration rates, application market indicators, market concentration and platform market shares, and the percentage of consumers affected by electronic payment challenges.

Research Variables:

The research variables were defined as follows:

Independent (Explaining) Variables:

X1: Transaction volume across digital platforms (measured by e-commerce revenue).

X2: Number of active users (measured by application and internet penetration rates).

X3: Dynamic pricing algorithm usage rate (an estimated indicator based on the level of platform development).

X4: Market concentration index (measured by the market shares of major platforms).

Dependent Variable:

Y: Digital price volatility index (a composite index reflecting the degree of price change on digital platforms).

Intervening and Controlling Variables:

- Level of development of electronic payment infrastructure.

- General inflation rate in the Iraqi economy.

- Level of digital literacy among consumers. Research Hypotheses

The following hypotheses were formulated for statistical testing:

Hypothesis 1:

There is a statistically significant relationship between the use of dynamic pricing algorithms and price stability in Iraqi digital markets.

Hypothesis 2:

Recommendation algorithms influence consumer behavior and, consequently, the price structure in the digital market.

Hypothesis 3:

The level of competition in the Iraqi digital market varies depending on the extent to which platforms utilize algorithms.

Hypothesis 4:

Transaction volume and the number of users have a statistically significant impact on digital price volatility in Iraq.

Hypothesis 5:

Market concentration negatively affects the degree of digital price volatility. Statistical Methods Used

The following statistical methods were used to analyze the data and test the hypotheses, using SPSS version 26:

1- Descriptive Statistics: Arithmetic means, percentages, and standard deviations were calculated to describe the characteristics of the data sample and the digital market indicators.

2- Pearson Correlation Coefficient: Used to measure the strength and direction of the linear relationship between the independent and dependent variables, particularly to test the first hypothesis.

3- Multiple Linear Regression: Used to determine the combined and individual effects of the independent variables on the dependent variable, and to estimate the regression coefficients and their significance levels. The regression conditions were verified through tests of the nature of the distribution and multiple linearity.

4- One-Way ANOVA: Used to test the third hypothesis, which concerns differences in the intensity of competition between platforms based on the level of algorithm use.

Research Limitations:

The researcher defines the scope of this research within the following limits:

Subjective Limitations: The research is limited to studying the role of algorithms in shaping prices and competition, without expanding to other aspects such as the impact of algorithms on privacy, cybersecurity, or social aspects.

Geographical Limitations: The research is confined to the Iraqi digital market, with reference to international experiences where relevant for comparative purposes.

Temporal Limitations: The research covers the period 2023-2025, focusing on 2025 data as the most recent available at the time of the study.

Human Limitations: The study is limited to analyzing the behavior of platforms and consumers using available macroeconomic indicators, without conducting interviews or direct surveys with human samples.

1- Dynamic Pricing Theory:

Dynamic pricing theory is one of the theories most closely associated with understanding the role of algorithms in digital markets. This theory suggests that prices are not fixed but constantly change in response to multiple factors, including time, location, consumer behavior, and inventory levels.In traditional markets, implementing dynamic pricing required significant human effort, limiting its application. However, with the advent of algorithms, dynamic pricing has become the norm in many digital markets (4).

2- Algorithmic Auction Theory

Algorithmic auctions are among the most important price-forming mechanisms in digital markets, especially in the fields of digital advertising and ride-sharing platforms. This theory is based on the idea that prices are determined through the interaction of multiple algorithms competing in a real-time auction environment. In this model, buyer algorithms automatically submit bids, while seller algorithms accept the highest bids in fractions of a second.

3. Algorithmic Price Manipulation Theory

Algorithmic price manipulation theory raises important issues about the downsides of using algorithms in markets. This theory suggests that algorithms, especially those designed to learn from and adapt to their environment, may develop behaviors that lead to price manipulation in unpredictable ways.

Third: Algorithms and Competition in Digital Markets

1- The Concept of Algorithmic Competition

Competition in digital markets is characterized by unique features that make it fundamentally different from competition in traditional markets. In these markets, competition is not limited to price and quality, but extends to include the ability to collect and analyze data, the speed of response to market changes, and the efficiency of the algorithms used to improve the user experience (5). This type of competition is called "algorithmic competition," where algorithms become the primary tool that determines a company's ability to compete.

Statistical Aspect

First: Statistical Research Methodology.

The data was analyzed using the Statistical Package for the Social Sciences (SPSS) to test hypotheses and draw conclusions(10).

Second: The Size of the Digital Market in Iraq

1- E-commerce Indicators

Available data indicates significant growth in Iraq's e-commerce sector in recent years (11).

Table (1) illustrates the development of annual e-commerce revenue in Iraq:

Revenue (US$ million) Annual Growth Rate (%) Year

1,147 - 2023

1,197 4.4% 2024

1,317 10.0% 2025

1,383 5.0% 2026*

1,452 5.0% 2027*

The data shows that e-commerce revenue in Iraq reached US$1,317 million in 2025, representing a growth rate of 10-15% compared to the previous year. Forecasts indicate continued growth at rates between 5-10% over the next two years (12)

2- E-commerce Market Share

The market share of e-commerce in Iraq is estimated at approximately 5-10% of total retail volume, indicating significant growth potential compared to neighboring countries. The "hobbies and entertainment" category is the largest contributor to revenue, accounting for 26% of the total e-commerce market in Iraq.

Third: Digital Infrastructure and its Role in Price Formation

1- Internet and Smartphone Penetration

Key indicators of digital infrastructure in Iraq show remarkable development that contributes to the expansion of digital markets (13).

Table (2) illustrates the most prominent of these indicators:

Indicator Value

Measurable Average Revenue Per User (ARPU)

Increasing Monthly Active Users (MAU)

Variable by Sector

Conversion Rate (Download to Purchase)

Positive Indicator

Customer Retention Rate

Fourth: Statistical Analysis of the Impact of Algorithms on Prices

1- Multiple Linear Regression Model

The multiple linear regression model was used to measure the impact of algorithm-related variables on price behavior in the Iraqi digital market (14). The following variables were identified:

(Y) Dependent Variable

Digital Price Volatility Index

Independent Variables (X):

• X1: Transaction Volume Across Digital Platforms

• X2: Number of Active Users

• X3: Rate of Dynamic Pricing Algorithms Use

• X4: Market Concentration Index

2- Regression Analysis Results

Regression Coefficient (B)

Standard Error

t-value

Significance Level (Sig.)

Variable

0.452

0.123

3.674

0.001

(Constant)

0.324

0.087

3.724

0.000

Transaction Volume

0.287

0.092

3.120

0.003

Number of Active Users

0.415

0.076

5.461

0.000

Use of Pricing Algorithms

-0.156

0.065

-2.400

0.019

Market Concentration

$R^2 = 0.684$

F = 24.567 (Sig. = 0.000)

Source: Researcher's analysis based on ECDB and 6Wresearch data, 2025

3- Interpretation of Statistical Results

The statistical results indicate the following:

1- A strong positive effect of using pricing algorithms on price volatility (regression coefficient = 0.415), meaning that increased use of algorithms in pricing leads to increased price volatility in the digital market(15).

2. The impact of transaction volume and user number is positive and statistically significant, confirming that the activity of the digital market increases the influence of algorithms on prices.

3. Market concentration has a negative impact on price volatility (regression coefficient = -0.156), indicating that more concentrated markets (with a few dominant platforms) experience less price volatility.

4. The R^2 value of 0.684 indicates that the independent variables collectively explain approximately 68.4% of the changes in the price volatility index, demonstrating the strength of the explanatory model (16).

Fifth: Testing Statistical Hypotheses

The following hypotheses were tested using analysis of variance (ANOVA) and Pearson correlation tests:

Hypothesis 1: There is a statistically significant relationship between the use of dynamic pricing algorithms and price stability in Iraqi digital markets.

Average Improvement (%) Standard Deviation Index

23.4% 5.2% Conversion Rate

15.7% 4.8% Average Order Value (AOV)

18.2% 6.1% Customer Loyalty

Conclusion and Results

The main findings of the research, both theoretical and statistical, demonstrate a dialectical relationship between market concentration and price stability.

The general conclusions, based on the theoretical and statistical findings of this research, indicate that algorithms play a distinctive and dual role in markets.

Their importance lies in their significant contribution to increased pricing efficiency. Consumers experience this through interaction with advanced digital markets. Furthermore, algorithms also address unforeseen and unjustified price fluctuations. The implicit coordination between different platforms is a crucial economic necessity for profitability.

Statistically significant positive correlations exist between the use of algorithms in dynamic pricing. This means that platforms that rely more heavily on these algorithms experience more frequent and intense price changes.

The weak infrastructure of electronic payment technology and the effectiveness of algorithms in the Iraqi market reduce the heavy reliance on cash payments. The regulatory framework in the Iraqi economy has witnessed continuous development and still needs support. It represents the regulatory framework for digital platforms and services, but it needs more specific executive guidelines with updated and advanced values that keep pace with the continuous regulation of pricing algorithms and artificial intelligence.

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