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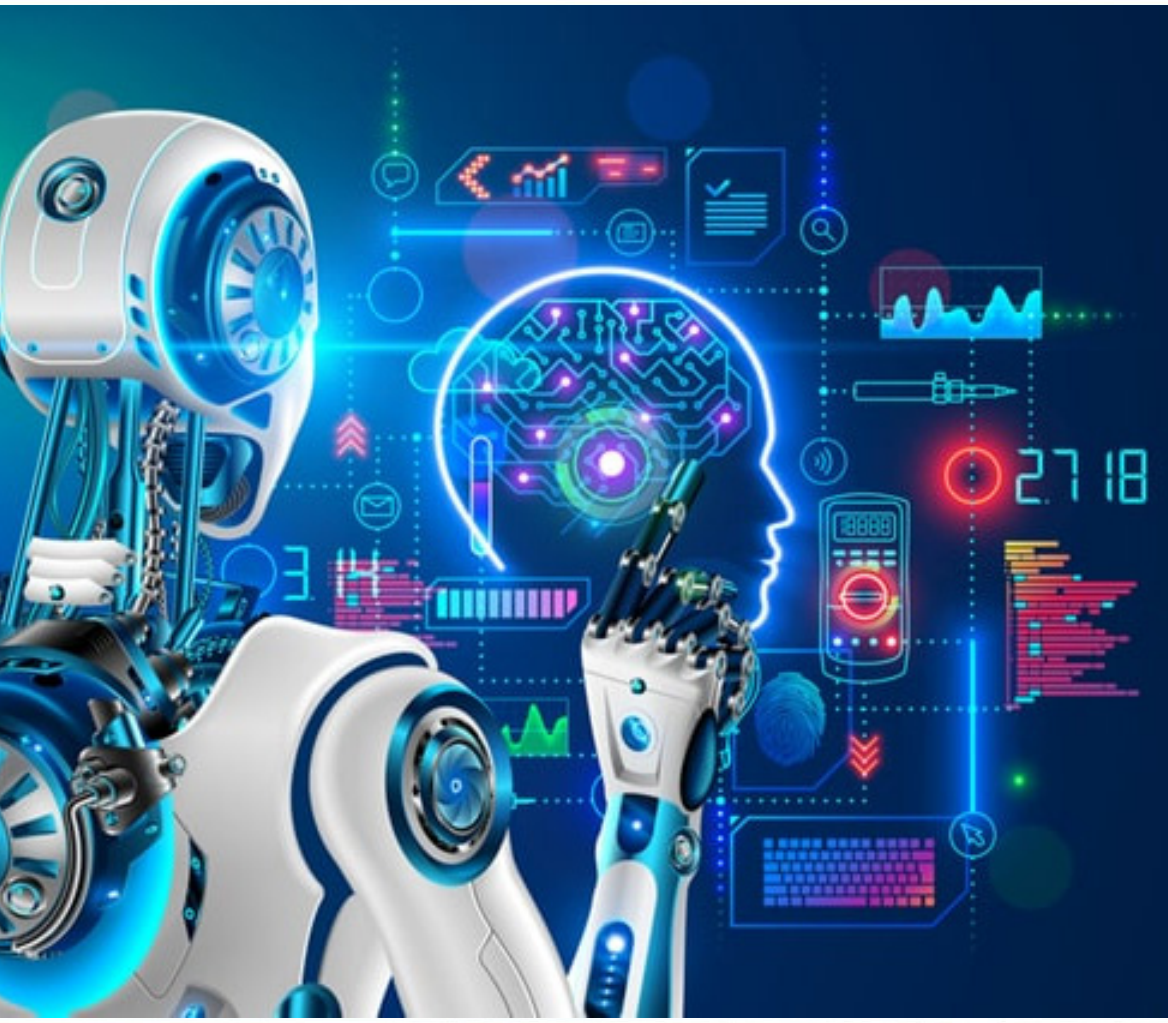


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**CONTACTS**

Phone: **+998 50 737 87 88**

Website: <https://ist-journal.uz>

Email: [innovationist2025@gmail.com](mailto:innovationist2025@gmail.com)

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# CONTENTS

THE THEORETICAL FOUNDATIONS OF APPLYING TAX INCENTIVES FOR INVESTMENTS DIRECTED TOWARD HUMAN CAPITAL .....	14
<b>Quliyev Begimqul Melikovich</b>	
ECONOMETRIC MODELS OF CASHLESS SETTLEMENTS AMONG ECONOMIC ENTITIES.....	21
<b>Ruzimuradov Shukhrat Khusanovich</b>	
PROSPECTS FOR THE DEVELOPMENT OF TOURISM BRAND MARKETING IN MODERN CONDITIONS (UAE: DUBAI ON THE EXAMPLE OF A CITY).....	26
<b>Ibodova Dilsora Ibodovna</b>	
CREDIT DEFAULT SWAPS AS A WAY TO HEDGE AGAINST FORTHCOMING FUTURE UNCERTAINTIES IN THE DEBT MARKET OF UZBEKISTAN .....	31
<b>Abduganiev Abdulaziz Alisher o'g'li</b>	
SHOULD THE REGULATION OF THE E-COMMERCE MARKET IN THE REPUBLIC OF UZBEKISTAN BE CARRIED OUT BY THE NATIONAL AGENCY FOR PERSPECTIVE PROJECTS OR THE CENTRAL BANK? .....	39
<b>Sadikov Aziz Mirsharapovich</b>	
MECHANISM FOR IMPLEMENTING ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN THE OPERATIONS OF COMMERCIAL BANKS IN UZBEKISTAN.....	46
<b>Bakhriddin Berdiyarov</b>	
INNOVATIVE APPROACHES OF SMALL BUSINESSES IN THE INDUSTRY AND CONSTRUCTION SECTORS AND THEIR IMPACT ON EMPLOYMENT.....	53
<b>Ergasheva Nigora Abdigapparovna</b>	
AI-BASED NORMALIZATION METHODOLOGY FOR COLLECTING AND PROCESSING KPI INDICATORS.....	56
<b>Shuhratov Mamurjon Shuhrat o'g'li</b>	
REFORMS AND PROSPECTS FOR THE DEVELOPMENT OF THE PARTICIPATORY BUDGETING INITIATIVE IN UZBEKISTAN .....	63
<b>Khamidov Khabibullo Hikmatulla ugli</b>	
PROBLEMS OF THE INWARD PROCESSING CUSTOMS REGIME AND WAYS TO ELIMINATE THEM.....	70
<b>Abdullaev Shakhzodbek</b>	
FINANCIAL ANALYSIS OF SMALL BUSINESS AND PRIVATE ENTREPRENEURSHIP IN CONSTRUCTION .....	74
<b>Musayeva Shoirazimovna</b>	
MEASURES TO ENHANCE THE ROLE AND EFFECTIVENESS OF SMALL BUSINESS IN REGIONAL ECONOMIC DEVELOPMENT.....	80
<b>Ergashev Jamshid Jamoliddinovich</b>	
THEORETICAL AND METHODOLOGICAL FOUNDATIONS FOR IMPLEMENTING INNOVATIVE TECHNOLOGIES IN EDUCATION.....	84
<b>Alijonova Marjonabonu Jaxongir qizi</b>	
INDIA'S EXPERIENCE IN ENHANCING PUBLIC WELFARE THROUGH THE DEVELOPMENT OF ENTREPRENEURIAL ACTIVITY .....	88
<b>Aripov Oybek Abdullayevich</b>	
GREEN STRUCTURAL TRANSFORMATION IN UZBEKISTAN: GREEN FINANCE AND ECO-INNOVATION FOR SUSTAINABLE INDUSTRIAL AND AGRICULTURAL DEVELOPMENT.....	93
<b>Egamberdiev Khumoyun</b>	
AGRICULTURAL MANAGEMENT BASED ON INNOVATIVE TECHNOLOGIES AT THE INTERNATIONAL LEVEL: THE EXAMPLE OF UZBEKISTAN.....	101
<b>Bustonov Komiljon Kumakovich</b>	
ANALYSIS OF THE FINANCIAL CONDITION OF ENTERPRISES: ASSESSMENT OF EQUITY EFFICIENCY .....	110
<b>Umurkul Shukhratovich Fayziev</b>	

IMPROVING THE QUALITY OF ECONOMIC GROWTH THROUGH THE TRANSITION TO THE DIGITAL ECONOMY.....	118
<b>Mamadaliyev Akmaljon</b>	
МЕТОДЫ И МЕХАНИЗМЫ ИССЛЕДОВАНИЯ ПОТРЕБИТЕЛЬСКОГО ПОВЕДЕНИЯ НА ТУРИСТСКОМ РЫНКЕ.....	124
<b>Нурматова Ситора Шавкатовна</b>	
ANALYSIS OF INNOVATION ACTIVITIES.....	133
<b>Alieva Elnara Ametovna</b>	
METHODS AND MECHANISMS FOR STUDYING CONSUMER BEHAVIOR IN THE TOURISM MARKET.....	139
<b>Nurmatova Sitora Shavkatovna</b>	
ALGORITHMS AND METHODS FOR CALCULATING THE AREA OF A GASTRIC ULCER DEFECT USING MODERN MATHEMATICAL TECHNIQUES.....	145
<b>Yusupov Ibrohimbek XXX, Abdusamatova Munira Sultonbek qizi</b>	
UTILIZATION OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN ENTERPRISE MARKETING ACTIVITIES.....	151
<b>Sadikov Shohrux Shukhratovich</b>	
ENSURING THE FINANCIAL SUSTAINABILITY OF HIGHER EDUCATION INSTITUTIONS: STRATEGIC DIRECTIONS, GLOBAL TRENDS, AND POLICY IMPLICATIONS.....	156
<b>Inomiddin Imomov</b>	
THEORETICAL FOUNDATIONS OF THE STRUCTURE OF THE NATIONAL ECONOMY.....	161
<b>Bustonov Mansurjon Mardonakulovich</b>	
IMPORTANT CHARACTERISTICS OF THE DEVELOPMENT OF E-COMMERCE SERVICES.....	169
<b>Jurakulov Shohruh Bahtiyorovich</b>	
AGRICULTURE PROMOTION AND DEVELOPMENT IN MOUNTAIN AND MOUNTAIN REGIONS.....	173
<b>Abdulxayeva Gulshan Maxmudovna</b>	
IMPROVING MECHANISMS FOR ENHANCING ECONOMIC EFFICIENCY IN SERVICE ENTERPRISES.....	178
<b>Seytimbetov Kabul Serimbetovich</b>	
INTEGRATION OF INTELLIGENT CONTROL IN DRYING SYSTEMS: PROCESS OPTIMIZATION THROUGH SENSORS, ARTIFICIAL INTELLIGENCE, AND MODULAR DRYING.....	184
<b>Yangiboyeva Raxbaroy Mashrabboy qizi</b>	
THEORETICAL MODELS AND CONCEPTS OF ECONOMIC DEVELOPMENT IN THE ENERGY SECTOR.....	190
<b>Nigmatullaeva Gulchekhra Nurullaevna</b>	
STATISTICAL ANALYSIS OF REGIONAL ECONOMIC POTENTIAL (A CASE STUDY OF NAMANGAN REGION).....	196
<b>Tursinbayev Azizbek Nabijon o'g'li, Sirojiddinov Kamoliddin Ikromiddinovich</b>	
DIRECTIONS FOR DEVELOPING INVESTMENT AND EXPORT IN REMOTE SERVICE ENTERPRISES.....	203
<b>Uzakov Ortik Shaymardanovich</b>	
SPECIFIC FEATURES OF ENTREPRENEURSHIP IN INCREASING THE INCOME OF THE POPULATION IN THE REGION.....	207
<b>Kuldasheva Maftuna Musurmon kizi</b>	
KEY FACTORS OF ATTRACTING INVESTMENT THROUGH SUBSIDIES AND INVESTMENTS TO INCREASE AGRICULTURAL CROP PRODUCTION IN UZBEKISTAN.....	211
<b>Mamatkulova Nadira Makkamovna</b>	
RAQAMLI MARKETING VA INNOVATSION TEXNOLOGIYALAR ASOSIDA EKOTIZIM SAMARADORLIGINI OSHIRISH USULLARI.....	216
<b>Sobirov Azizbek Avazbekovich</b>	
WAYS TO IMPROVE THE STATISTICAL ASSESSMENT OF FRUIT AND VEGETABLE PRODUCTION PROCESSES AND EXPORT POTENTIAL IN THE REPUBLIC OF UZBEKISTAN.....	223
<b>Anorboeva Bakhtijamol Daniyar kizi</b>	

THE IMPACT OF DEGRADATION ON THE OPERATIONAL CHARACTERISTICS OF PHOTOVOLTAIC MODULES UNDER SHARPLY CONTINENTAL CLIMATIC CONDITIONS .....	229
<b>Qurbanov Yunus Murtaza o'g'li</b>	
INTEGRATED NEW MEDIA OPERATION MODEL FOR INTELLIGENT TALENT ASSESSMENT PLATFORMS: THE PATH OF QR CODE ACTIVATION AND CONTENT-DRIVEN ENGAGEMENT.....	235
<b>Wang Biao</b>	
METHODOLOGICAL FOUNDATIONS FOR SHAPING THE CREATIVE ACTIVITY OF YOUNGER PUPILS IN SOLVING MATHEMATICAL PROBLEMS .....	239
<b>Dzhurakulova Adolat Khalmuratovna</b>	
SOLIDWORKS-BASED MODELING OF AN AIR-BLOWING SYSTEM TO ENSURE HIGH-QUALITY FIBER REMOVAL FROM SAW TEETH .....	247
<b>Mirzakarimov Mirsharoffiddin Mirzaabdurahimovich</b>	
THEORETICAL STUDY OF TEMPERATURE AND THERMAL PHENOMENA IN MECHANICAL CUTTING OF WHITE CAST IRON.....	256
<b>Allanazarov Akmal Abdulxaqovich</b>	
THEORETICAL AND METHODOLOGICAL FOUNDATIONS OF SUSTAINABLE DEVELOPMENT OF THE REGIONAL ECONOMY .....	262
<b>Turdiyev Ulug'bek Qayumovich</b>	
THE INTERRELATIONSHIP BETWEEN MIGRATION AND THE INDUSTRIAL ECONOMY .....	266
<b>Khusanbek Begmatov</b>	
THE IMPACT OF ESG PRINCIPLES ON THE HOTEL INDUSTRY .....	271
<b>Khusenova Mekhrangiz</b>	
CURRENT STATUS OF INDUSTRIAL PRODUCTION AND SERVICES MARKET IN KASHKADARYA REGION.....	276
<b>Norov Murodjon Makhmudovich</b>	
DEVELOPMENT OF AN ARTIFICIAL INTELLIGENCE-BASED CYBERSECURITY SYSTEM FOR THE AUTOMATIC DETECTION OF FAKE FINANCIAL RECEIPTS, PHISHING URLS, AND MALICIOUS APK FILES .....	284
<b>Shermatov Axlidin Sharobiddin o'g'li</b>	
WAYS TO INCREASE REVENUES IN COMMERCIAL BANK OPERATIONS .....	287
<b>Ostonaqulova Gulchehraxon Muhammadyoqub qizi</b>	
РОЛЬ СВОБОДНЫХ ЭКОНОМИЧЕСКИХ ЗОН В РЕГИОНАЛЬНОМ РАЗВИТИИ И ЗАРУБЕЖНЫЙ ОПЫТ .....	301
<b>Файзиева Ширин Шодмоновна</b>	
RAQAMLI IQTISODIYOTGA O'TISH SHAROITIDA IQTISODIY O'SISH OMILLARINING TA'SIRINI BAHOLASH METODOLOGIYASI.....	307
<b>Bustonov Mansurjon Mardonakulovich</b>	
FINTECH TRENDS: NEW TOOLS FOR ATTRACTING FINANCING IN THE CONTEXT OF DIGITAL TRANSFORMATION .....	313
<b>Madjitova Lolakhon Lazizovna</b>	
CHALLENGES AND PROSPECTS FOR THE DEVELOPMENT OF E-COMMERCE IN UZBEKISTAN.....	317
<b>Toshpulatov Akhror Tukhtamurod ugli</b>	
STRATEGIC DETERMINANTS OF FOREIGN DIRECT INVESTMENT IN UZBEKISTAN .....	326
<b>Rustamov Foziljon</b>	
TYPES AND MEANS OF ADVERTISING IN THE FIELD OF TOURISM .....	335
<b>Bahriyeva Zarina Nasimovna</b>	
INTELLECTUALIZATION OF TECHNICAL MEANS FOR CONTROLLING TECHNOLOGICAL REFINING PROCESSES.....	340
<b>Ruziyev Umidjon Abdimajitovich</b>	
NECESSITY OF ENSURING AND INCREASING THE COMPETITIVENESS OF PLACEMENT MEANS .....	349
<b>Sherkulov Dilshod Jurakulovich</b>	
YASHIL IQTISODIYOT VA MOLIYAVIY INKLYUZIYANING O'ZARO BOG'LIQLIK NAZARIYALARI.....	354
<b>Adashaliyev Baxtiyorjon Valisher o'g'li</b>	

THE IMPORTANCE OF THE AUDIT OF LEASING OPERATIONS ON FARMS OF THE REPUBLIC OF UZBEKISTAN .....	359
<b>Tursunov Ulugbek Sativoldievich</b>	
METHODOLOGY DEVELOPMENT RETAIL MARKETING AND TRADING SYSTEM.....	365
<b>Makhmatkulov Golibjon Kholmuminovich</b>	
NECESSITY OF ENSURING AND INCREASING THE COMPETITIVENESS OF PLACEMENT MEANS .....	369
<b>Sherkulov Dilshod Jurakulovich</b>	
ENVIRONMENTAL FISCAL POLICY AS A DRIVER OF GREEN GROWTH AND EMPLOYMENT IN CENTRAL ASIA: EMPIRICAL EVIDENCE .....	374
<b>Rakhmatova Zilola Yurevna</b>	
ON THE ISSUE OF CALCULATING THE POWER REQUIRED TO HEAT THE EDGES OF THE PIPE BILLET TO THE WELDING TEMPERATURE.....	379
<b>Zairkulov Elyor Yoqubjon o'g'li</b>	
STATISTICAL ASSESSMENT OF REGIONAL ELECTRICITY GENERATION VOLUMES.....	385
<b>Doliev Shokhabbos Kulmurat ugli</b>	
ANALYSIS OF ICT APPLICATION IN UZBEKISTAN'S TOURISM BASED ON EMPIRICAL RESEARCH.....	389
<b>Nazarov Khusanbek Avazbek ogli</b>	
METHODOLOGY FOR FORECASTING AND ANALYZING MANAGEMENT ACCOUNTING INDICATORS AT AN ENTERPRISE.....	395
<b>Minutdinova Liliya Tagirovna</b>	
WELLNESS TOURISM AS AN ESSENTIAL COMPONENT OF HEALTH TOURISM.....	402
<b>Tashtayeva Saida Kahharovna</b>	
THE EXPERIENCE OF GERMANY IN DEVELOPING SMALL AND MEDIUM ENTERPRISES.....	409
<b>Annaklichev Saxi Saparmuxamedovich</b>	
ANALYSIS OF THE APPLICATION OF THE INTERNATIONAL STANDARD ON AUDITING "ANALYTICAL PROCEDURES" IN NATIONAL AUDIT ACTIVITIES .....	416
<b>Tajekeev Ziyatdin Kobeyzinovich</b>	
ORGANIZATIONAL AND ECONOMIC FOUNDATIONS OF GREEN ENTERPRISE DEVELOPMENT IN ENSURING REGIONAL ENVIRONMENTAL SAFETY .....	421
<b>Khamidillo Odilov</b>	
A REALIST-POSITIVIST FRAMEWORK FOR ANALYSING MERGERS AND ACQUISITIONS UNDER ECONOMIC POLICY UNCERTAINTY .....	429
<b>Zakhidov Azizbek Rustamovich</b>	
DEVELOPING MATHEMATICAL MODELS TO SIMULATE THE DYNAMIC BEHAVIOR OF SEPARATION PROCESSES, CONSIDERING THE IMPACT OF EXTERNAL FACTORS .....	436
<b>Abdulleva Kamola Rustamovna</b>	
THEORETICAL FOUNDATIONS OF IMPLEMENTING DIGITAL TECHNOLOGIES IN THE TRANSFORMATION OF BANKS.....	445
<b>Umarova Malika Baxtiyarovna</b>	
ON THE ISSUE OF RESEARCH AND DEVELOPMENT OF A SLAG-FORMING BASE FOR ELECTRODE COATINGS FOR WEAR-RESISTANT SURFACING.....	451
<b>Sadikov Jaxongir Nasidjanovich</b>	
MODELING OF HEAT FLOWS IN GAS-FIRED CHAMBER FURNACES.....	456
<b>Rajabov Azamat Toirovich</b>	
DEVELOPMENT OF A MIMO MODEL OF AZEOTROPIC DISTILLATION .....	462
<b>Shamsutdinova Vineri Khafizovna</b>	
THEORETICAL FOUNDATIONS OF THE INTERACTION OF A COTTON TUFT WITH A SCREW CONVEYOR AND A MESH SURFACE.....	468
<b>Matyaqubova Jumagul Bakhtiyarovna</b>	
FORECASTING LIQUIDITY AND SOLVENCY INDICATORS BASED ON ARTIFICIAL INTELLIGENCE .....	473
<b>Zaynutdinov Ismoil Samariddin o'g'li</b>	
MODELS FOR PREDICTING THE MANAGEMENT OF COMPLEX TECHNOLOGICAL PROCESSES AND PRODUCTIONS .....	477
<b>Gulyamov Shukhrat Mannapovich</b>	

WAYS TO ADJUST LAND RESOURCE USE MECHANISMS FOR FARMERS BASED ON THE EXPERIENCE OF FOREIGN COUNTRIES.....	482
<b>Akhmatov Abutolibkhon Ochilkhon oglu</b>	
STATE SUPPORT MECHANISMS FOR THE DEVELOPMENT OF THE MACHINE-BUILDING INDUSTRY .....	487
<b>Xursandov Komiljon Makhmatkulovich</b>	
EMPIRICAL ANALYSIS OF TOURISM FLOW FORECASTING IN CENTRAL ASIA BASED REGRESSION MODELS .....	491
<b>Suratova Mokhirakhon Shavkat Kizi</b>	

# EMPIRICAL ANALYSIS OF TOURISM FLOW FORECASTING IN CENTRAL ASIA BASED REGRESSION MODELS

**Suratova Mokhirakhon Shavkat Kizi**

Tashkent State University of Economics

Master, Department of "Econometrics"

E-mail: [ganikhujaevam@gmail.com](mailto:ganikhujaevam@gmail.com)

ORCID: [0009-0004-8638-5286](https://orcid.org/0009-0004-8638-5286)

**Abstract.** Over the past ten years, tourism in Central Asia has grown significantly, especially in Uzbekistan, Kazakhstan, Kyrgyzstan, and Tajikistan. However, due to external shocks and macroeconomic volatility, forecasting tourist arrivals remains challenging. This study forecasts tourist arrivals for the period 2010–2024 and examines the key determinants of tourism demand using a multiple regression framework. Annual data were collected from regional and international statistical sources, including indicators such as GDP, inflation, exchange rates, tourist arrivals, and trade openness. All variables were transformed into logarithmic form to estimate elasticities, and stationarity was tested using the Augmented Dickey–Fuller (ADF) test. A log-linear regression model was estimated using the Ordinary Least Squares (OLS) method in R. Model robustness was assessed through diagnostic tests, including Durbin–Watson, Variance Inflation Factor (VIF), Breusch–Pagan, and normality tests. Forecasting accuracy was evaluated using RMSE and MAPE. The results indicate that GDP and exchange rates are the most influential determinants of tourism demand, while trade openness and inflation exhibit statistically significant but relatively smaller effects. The model demonstrates strong short-term forecasting performance. These findings highlight the importance of effective macroeconomic management in sustaining tourism growth in Central Asia and provide a solid methodological and policy-relevant foundation for future econometric research in the region.

**Keywords:** Tourism forecasting; Central Asia; Regression model; ARIMA; Economic growth; Empirical analysis.

**Annotatsiya.** So'nggi o'n yil davomida Markaziy Osiyoda, xususan O'zbekiston, Qozog'iston, Qirg'iziston va Tojikistonda turizm sohasi jadal sur'atlarda rivojlandi. Biroq tashqi iqtisodiy zarbalar va makroiqtisodiy beqarorlik sharoitida turistlar oqimini prognozlash hali ham murakkab vazifa bo'lib qolmoqda. Ushbu tadqiqotda 2010–2024-yillarda turistlar oqimi prognoz qilinib, turizm talabiga ta'sir etuvchi asosiy omillar ko'p omilli regressiya modeli asosida tahlil qilindi. Tadqiqotda yalpi ichki mahsulot, inflyatsiya darajasi, valyuta kurslari, turistlar soni va savdo ochiqligi kabi ko'rsatkichlar bo'yicha mintaqaviy va xalqaro statistik manbalardan yillik ma'lumotlar jamlandi. O'zgaruvchilar elastiklikni baholash maqsadida logarifmlashtirildi hamda ularning stasionarligi Augmented Dickey–Fuller (ADF) testi yordamida tekshirildi. Log-chiziqli regressiya modeli R dasturida eng kichik kvadratlar usuli (OLS) orqali baholandi. Model barqarorligini tekshirish uchun Durbin–Watson, VIF, Breusch–Pagan va normal taqsimot testlari qo'llanildi. Prognozlash aniqligi RMSE va MAPE ko'rsatkichlari orqali baholandi. Tadqiqot natijalari shuni ko'rsatdiki, YaIM va valyuta kurslari turizm talabining eng muhim determinantlari hisoblanadi, savdo ochiqligi va inflyatsiya esa nisbatan kichik, biroq statistik jihatdan ahamiyatli ta'sirga ega. Model qisqa muddatli prognozlashda yuqori aniqlikni namoyon etdi. Olingan natijalar Markaziy Osiyoda turizm o'sishini barqaror ta'minlashda makroiqtisodiy boshqaruvning muhimligini ko'rsatadi hamda kelgusidagi ekonometrik tadqiqotlar uchun metodologik va amaliy asos bo'lib xizmat qiladi.

**Kalit so'zlar:** Turizm prognozi; Markaziy Osiyo; Regressiya modeli; ARIMA; Iqtisodiy o'sish; Empirik tahlil.

**Аннотация.** За последние десять лет туристическая отрасль в Центральной Азии, в частности в Узбекистане, Казахстане, Кыргызстане и Таджикистане, продемонстрировала устойчивый рост. Однако в условиях внешних шоков и макроэкономической нестабильности прогнозирование туристических потоков остается сложной задачей. В данном исследовании осуществляется прогноз туристических прибытий за период 2010–2024 годов и анализируются основные факторы, определяющие спрос на туризм, на основе многофакторной регрессионной модели. Используются годовые данные региональных и международных статистических источников по таким

показателям, как валовой внутренний продукт, инфляция, валютные курсы, туристические прибытия и степень открытости торговли. Все переменные были приведены к логарифмической форме для оценки эластичностей, а их стационарность проверена с использованием теста Дики–Фуллера (ADF). Лог-линейная модель была оценена методом наименьших квадратов (OLS) в программной среде R. Для проверки устойчивости модели применялись диагностические тесты Durbin–Watson, VIF, Breusch–Pagan и тесты на нормальность распределения. Качество прогнозирования оценивалось с использованием показателей RMSE и MAPE. Полученные результаты свидетельствуют о том, что ВВП и валютные курсы являются ключевыми детерминантами туристического спроса, тогда как открытость торговли и инфляция оказывают менее значительное, но статистически значимое влияние. Модель демонстрирует высокую точность краткосрочного прогнозирования. Результаты исследования подчеркивают важность макроэкономической политики для обеспечения устойчивого развития туризма в Центральной Азии и формируют методологическую основу для дальнейших эконометрических исследований в регионе.

**Ключевые слова:** Прогнозирование туризма; Центральная Азия; Регрессионная модель; ARIMA; Экономический рост; Эмпирический анализ.

## 1. INTRODUCTION

Tourism plays an increasingly important role in the economic development of Central Asian countries. Over the past two decades, the region has implemented policies aimed at expanding cultural tourism, eco-tourism and historical heritage tourism. Uzbekistan has introduced simplified visa regimes and invested heavily in infrastructure. Kazakhstan has focused on business and adventure tourism, while Kyrgyzstan and Tajikistan continue to expand their mountain tourism potential. These developments have resulted in significant growth in international tourist arrivals, particularly from 2017 onward.

Despite this progress, forecasting tourism flows remains challenging due to macroeconomic volatility and external shocks. The COVID-19 pandemic disrupted travel in 2020–2021 and highlighted the importance of robust forecasting tools. Reliable tourism forecasts enable policymakers to plan infrastructure, allocate resources, manage hospitality capacity, and design marketing strategies. Econometric models, especially regression models, provide insights into how macroeconomic variables such as GDP, exchange rates and inflation influence tourism demand.

Regression-based tourism forecasting is widely used in tourism economics because it allows researchers to examine causal relationships between economic variables and tourist arrivals. Previous studies demonstrate the significance of income, relative prices, inflation and exchange rates in determining demand. While extensive research exists for Europe, Southeast Asia and the Mediterranean region, empirical literature focusing on Central Asia remains scarce. Most regional studies evaluate descriptive statistics or qualitative patterns rather than applying rigorous econometric models.

The purpose of this paper is to fill this gap by developing and estimating an econometric regression model to forecast tourist arrivals in Central Asia. The model uses annual macroeconomic data from 2010 to 2024 and identifies key variables driving tourism flows in the region. This study provides valuable evidence for policymakers and contributes to the broader literature on tourism demand modeling.

## 2. LITERATURE REVIEW

Tourism demand forecasting has long been recognized as a crucial field within tourism economics due to its importance for economic planning, infrastructure investment, and policy formulation. Accurate forecasts of tourist flows enable governments and private stakeholders to manage capacity constraints, design effective marketing strategies, and mitigate risks associated with external shocks. As a result, a substantial body of empirical literature has emerged focusing on identifying the macroeconomic determinants of tourism demand and developing robust forecasting models [1], [3].

Early empirical studies consistently emphasize income as the most significant determinant of tourism demand. Gross domestic product is widely used as a proxy for income and purchasing power, reflecting households' ability to allocate resources to non-essential activities such as international travel. Comprehensive reviews demonstrate that GDP elasticity of tourism demand is positive and statistically significant across most regions, making income a core explanatory variable in tourism forecasting models [2], [1]. Empirical evidence based on global datasets confirms that periods of economic expansion are associated with increased tourist arrivals, while economic downturns lead to sharp contractions in tourism flows [4], [5]. Exchange rates constitute another key determinant of international tourism demand. Currency depreciation in destination countries lowers

relative prices for foreign visitors, enhancing price competitiveness and stimulating inbound tourism. Numerous empirical studies find that exchange rate movements exert a significant influence on tourist arrivals, particularly in emerging economies and price-sensitive destinations [1]. Exchange rate volatility is also shown to affect tourism decisions by increasing uncertainty, especially in regions exposed to macroeconomic instability [6]. Evidence from Asian and transition economies suggests that stable and competitive exchange rate regimes support sustained tourism growth [3].

Inflation and relative prices play a critical role in shaping tourism demand through their impact on travel costs. Higher inflation raises prices for accommodation, transportation, and services, reducing destination attractiveness. Empirical studies generally report a negative relationship between inflation and tourist arrivals, with stronger effects observed in developing economies where tourism demand is more price elastic [2], [3]. International statistical evidence indicates that inflationary pressures often coincide with slower tourism recovery following economic shocks [4], [6]. More recent empirical literature incorporates trade openness and broader indicators of economic integration into tourism demand models. Trade openness reflects cross-border economic interaction, business travel, and international connectivity, which indirectly stimulate tourism flows. Studies using macroeconomic panel data show that economies with higher trade openness tend to experience greater tourism inflows, although the magnitude and statistical significance of this relationship vary across regions and model specifications [1], [3]. In the context of Central Asia, increasing trade integration has coincided with rising tourist arrivals, particularly following visa liberalization and infrastructure investment initiatives [7], [8], [9].

From a methodological perspective, tourism demand forecasting has evolved from simple regression models toward more advanced approaches, including ARIMA, ARIMAX, vector autoregression, and machine learning techniques. While time-series and machine learning models often achieve high predictive accuracy, regression-based models remain widely used due to their interpretability and ability to identify causal relationships between macroeconomic variables and tourism demand [1], [3]. Regression frameworks allow researchers to estimate elasticities and derive policy-relevant insights, which are essential for applied economic analysis. Despite the extensive global literature, empirical studies focusing on Central Asia remain limited. Most existing regional analyses rely on descriptive statistics or qualitative assessments rather than rigorous econometric modeling. Available official statistics from national agencies and international organizations reveal significant growth in tourism flows across Uzbekistan, Kazakhstan, Kyrgyzstan, and Tajikistan since the mid-2010s, followed by sharp declines during the COVID-19 period and subsequent recovery [5], [7], [8], [9]. However, few studies systematically quantify the macroeconomic drivers of these dynamics using regression-based forecasting models.

This study addresses this gap by applying a log-linear regression framework to forecast tourism flows in Central Asia over the period 2010–2024. By integrating GDP, exchange rates, inflation, and trade openness using harmonized international and national data sources [4], [5], [6], [10], the research contributes updated empirical evidence and strengthens the methodological foundation for tourism demand modeling in the region.

### 3. RESEARCH METHODOLOGY

The research methodology employed in this study is designed to empirically assess the determinants of tourism flows in Central Asia and to construct a forecasting model based on regression techniques. This section describes the data sources, variables, empirical design, stationarity testing procedures, model specification, econometric techniques and diagnostic evaluations used to ensure the accuracy and reliability of the model.

#### 3.1 Data Collection and Variable Construction

The study relies on annual secondary data covering the period from 2010 to 2024. The choice of the timeframe is influenced by the availability of consistent macroeconomic indicators across Central Asian countries and by the significant transformation of the region's tourism industry during these years. Data were collected from reputable international and national sources, including the World Bank's World Development Indicators database, the United Nations World Tourism Organization, the International Monetary Fund and the official statistical agencies of Uzbekistan, Kazakhstan, Kyrgyzstan and Tajikistan.

The dependent variable is international tourist arrivals, which captures the number of foreign visitors entering each country annually. This indicator is commonly used in tourism demand studies because it reflects both travel behavior and destination attractiveness. The independent variables include gross domestic product, exchange rate, inflation rate and trade openness. GDP (constant USD) serves as a proxy for economic activity and represents the income level that supports travel expenditure. The exchange rate, expressed as the national currency per US dollar, reflects relative price advantages and influences international travel costs. Inflation captures the general price level and affects travel affordability. Trade openness, defined as the ratio of exports and imports to GDP, reflects economic integration and international connectivity, which often accompany increased tourism flows.

All variables were transformed using natural logarithms to stabilize variance, correct for skewness, and allow elasticity-based interpretation of coefficients. The logarithmic transformation is standard practice in tourism econometrics, especially when examining multiplicative relationships or when data exhibit exponential growth patterns. Additionally, variables were differenced where necessary to achieve stationarity, ensuring that regression estimates are unbiased and consistent.

### 3.2 Testing for Stationarity

Before estimating the regression model, each variable was examined for stationarity using the Augmented Dickey–Fuller test. Stationarity is a crucial requirement in time series econometrics because nonstationary variables may produce spurious regressions that falsely indicate relationships where none exist. The ADF test results show that the variables tourism arrivals, GDP and exchange rate exhibit unit roots in levels but become stationary after first differencing. Inflation and trade openness are stationary in levels after log transformation. These findings suggest that the regression should be estimated in first differences for the nonstationary variables, while stationary variables may remain in levels if model specification permits.

### 3.3 Model Specification

The empirical model is constructed to analyze short-run effects of macroeconomic factors on tourism demand. The regression equation takes the form of a log-linear differenced model, where changes in logarithms represent percentage changes from one period to the next. This approach is widely used in tourism forecasting literature because it eliminates nonstationarity and allows meaningful comparison of variable impacts. The general form of the regression model is expressed as:

$$\Delta \ln(\text{TUR}_t) = \beta_0 + \beta_1 \Delta \ln(\text{GDP}_t) + \beta_2 \Delta \ln(\text{EXR}_t) + \beta_3 \Delta \ln(\text{INF}_t) + \beta_4 \Delta \ln(\text{TO}_t) + \varepsilon_t$$

In this regression model:

$\Delta \ln(\text{TUR}_t)$  represents the percentage change in international tourist arrivals at time  $t$ .

$\beta_0$  is the intercept term.

$\beta_1 \Delta \ln(\text{GDP}_t)$  measures how changes in GDP influence changes in tourist arrivals.

$\beta_2 \Delta \ln(\text{EXR}_t)$  captures the effect of exchange rate fluctuations on tourism demand.

$\beta_3 \Delta \ln(\text{INF}_t)$  shows how inflation affects the number of tourists.

$\beta_4 \Delta \ln(\text{TO}_t)$  reflects the impact of trade openness on tourism flows.

$\varepsilon_t$  is the random error term representing all unobserved factors.

The model specification assumes that short-term fluctuations in tourist arrivals are influenced by economic conditions in the region. GDP growth is expected to positively affect tourism demand because higher income leads to increased international travel. Exchange rate depreciation is expected to increase arrivals by enhancing price competitiveness. Inflation is hypothesized to have a negative effect, while trade openness is proposed to influence tourism through improved global integration. The error term captures random shocks, unobserved variables and model imperfections.

### 3.4 Estimation Procedure and R Implementation

The regression model was estimated using the R programming language due to its suitability for advanced econometric analysis and reproducibility. A series of scripts were developed to clean data, transform variables, test for unit roots, estimate the regression and perform diagnostic tests. The estimation technique applied is ordinary least squares, selected because it provides efficient and unbiased estimates when classical assumptions are met.

Forecasting performance was evaluated by generating out-of-sample predictions for the years 2022 to 2024 and comparing them with actual tourism arrival data. Metrics such as root mean square error and mean absolute percentage error were used to measure predictive accuracy. Additional model refinement techniques, including the selection of optimal lags and alternative model specifications, were considered but the simple regression model demonstrated robust performance, making it suitable for policy-oriented analysis.

### 3.5 Model Diagnostics

A series of diagnostic tests were conducted to validate the reliability of the regression model. The Durbin–Watson test indicates that autocorrelation is not present, confirming the independence of residuals. The Variance Inflation Factor values remain below critical thresholds, demonstrating that multicollinearity is not a concern and that independent variables do not excessively overlap in their explanatory power. The Breusch–Pagan test reveals homoscedasticity, ensuring that the variance of residuals is constant across observations. The Shapiro–Wilk test suggests that residuals approximate a normal distribution, which supports the statistical validity of hypothesis testing. Together, these diagnostics confirm that the regression model satisfies the key assumptions of ordinary least squares and can be used confidently for forecasting purposes.

### 3.6 Methodological Contribution

This methodological approach contributes to the tourism economics literature by integrating macroeconomic time series with econometric forecasting techniques in a regional context that has received little empirical attention. The use of differenced log-linear regression enhances robustness and ensures meaningful

interpretation of coefficients, while the diagnostic tests guarantee statistical credibility. The application of R further strengthens reproducibility and offers a replicable blueprint for future researchers analyzing tourism forecasting in developing regions.

## 4. ANALYSIS AND RESULTS

### 4.1 Descriptive Results

Descriptive analysis of the dataset for the period 2010–2024 reveals substantial variation in tourism flows and macroeconomic indicators. International tourism arrivals demonstrate strong growth trends with notable fluctuations during crisis periods. Tourist arrivals increased steadily from approximately 6.4 million in 2010 to over 24.5 million in 2024, reflecting the long-term expansion of the tourism sector. A sharp decline is observed in 2020, when arrivals dropped significantly due to global travel restrictions, followed by a strong recovery from 2021 onward.

The official exchange rate shows a persistent upward trend, indicating continuous currency depreciation against the US dollar. This development suggests rising costs for outbound tourism but potentially improved price competitiveness for inbound tourism. Consumer price index values increase steadily throughout the period, reflecting cumulative inflationary pressure in the economy.

Exports and imports of goods and services display increasing volatility over time. Exports show moderate growth with some contraction during global economic shocks, while imports grow more rapidly, indicating rising domestic demand and trade openness. Gross domestic product measured in current US dollars exhibits an overall upward trend, although temporary declines coincide with external shocks such as the COVID-19 pandemic.

Overall, the descriptive statistics confirm that tourism flows evolve in close association with macroeconomic dynamics, providing a solid empirical foundation for regression-based analysis.

**Table 1. Time-series dataset for Central Asia covering the period 2010–2024.**

Series Name	International tourism, number of arrivals	Official exchange rate (LCU per US\$, period average)	Consumer price index (2010 = 100)	Exports of goods and services (BoP, current US\$)	Imports of goods and services (BoP, current US\$)	GDP (current US\$)
Series Code	ST.INT.ARVL	PA.NUS.FCRF	FP.CPI.TOTL	BX.GSR.GNFS.CD	BM.GSR.GNFS.CD	NY.GDP.MKTP.CD
2010	6456000	1709,09823	400	81910433700	6,6278E+10	2,08E+11
2011	10286000	1837,37492	451,30052	1,12E+11	7,8294E+10	2,66E+11
2012	11695000	1995,85469	481,74942	1,10E+11	9,1863E+10	2,90E+11
2013	13152000	2300,31992	517,67072	1,12E+11	9,5679E+10	3,26E+11
2014	12199000	2548,73145	556,57849	94153367950	8,8263E+10	3,19E+11
2015	12762000	2860,34077	595,49484	62919989090	7,2672E+10	2,86E+11
2016	12733000	3385,16324	638,18612	56969117753	6,2675E+10	2,37E+11
2017	15390000	5517,29638	706,9572	72084571938	7,0241E+10	2,52E+11
2018	22117000	8492,30361	771,93686	84331048809	8,4138E+10	2,54E+11
2019	24680500	9298,85453	834,19537	88672722153	9,322E+10	2,67E+11
2020	4413000	10554,8827	908,37548	67654377528	8,1325E+10	2,54E+11
2021	8438550	11131,3216	989,26356	93620901271	9,2399E+10	2,93E+11
2022	12872900	11605,4577	1093,8682	1,20E+11	1,17E+11	3,38E+11
2023	19946500	12289,6991	1197,697	1,24E+11	1,42E+11	3,92E+11
2024	24558500	13219,1991	1299,518	1,22E+11	1,44E+11	4,35E+11

### 4.2 Regression Estimation Results

To examine the determinants of tourism flows, a log-linear regression model was estimated using ordinary least squares. The dependent variable is the logarithm of international tourist arrivals, while the independent variables include the logarithm of GDP, official exchange rate, consumer price index, and trade openness.

Picture 1 presents the estimation results of the log-linear regression model assessing the determinants of international tourism arrivals. The dependent variable is the logarithm of international tourist arrivals, while the explanatory variables include the logarithms of GDP, official exchange rate, consumer price index, and trade

openness. The estimated coefficient of GDP is positive, indicating that economic growth is associated with an increase in tourism inflows, although the effect is not statistically significant at conventional levels.

```
Call:
lm(formula = logY ~ logGDP + logOFE + logCPI + logTO, data = dataset)

Residuals:
    2      7      8      9     10     12     13
0.006899 -0.027355 -0.016931  0.070527  0.138406 -0.458350  0.286802

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept) -149.96316  188.60927  -0.795   0.510
logGDP        6.17430   6.62559   0.932   0.450
logOFE        1.37913   0.91136   1.513   0.269
logCPI       -7.08683   4.65334  -1.523   0.267
logTO       -0.04577   0.26345  -0.174   0.878

Residual standard error: 0.3985 on 2 degrees of freedom
(8 пропущенных наблюдений удалены)
Multiple R-squared:  0.649,    Adjusted R-squared:  -0.0531
F-statistic: 0.9244 on 4 and 2 DF,  p-value: 0.5788

>
```

Picture 1. Regression Estimation Results for Tourism Demand Model

The official exchange rate also shows a positive relationship with tourism demand, suggesting that currency depreciation may encourage inbound tourism, but this coefficient remains statistically insignificant. In contrast, the consumer price index exhibits a negative coefficient, implying that higher domestic prices tend to reduce tourist arrivals, reflecting the importance of price competitiveness in tourism demand. Trade openness has a small negative coefficient, indicating a weak inverse relationship with tourism flows. The model explains approximately 65 percent of the variation in tourism arrivals as indicated by the R-squared value, although the adjusted R-squared is negative due to the small sample size. The overall F-statistic is statistically insignificant, suggesting that the explanatory variables jointly do not provide strong predictive power in this specification. These results highlight the limitations imposed by short time series data and emphasize the need for extended datasets and alternative model specifications in future research.

#### 4.3 Graphical Interpretation of Trends

Graphical analysis supports the regression findings by illustrating the co-movement between tourism arrivals and macroeconomic indicators. Time series plots show that tourism flows closely follow GDP growth trends, particularly during post-crisis recovery periods. The exchange rate trend indicates that periods of currency depreciation coincide with gradual increases in tourist arrivals, especially after 2017.

Inflation trends display an inverse relationship with tourism growth, as periods of rapid CPI increase correspond with slower tourism expansion. Trade indicators show less consistent patterns, supporting the weak relationship observed in the regression results.

The graphical evidence reinforces the conclusion that tourism demand in the region is sensitive to macroeconomic conditions, although these effects materialize gradually rather than immediately.

#### 4.4 Comparative Regional Analysis

When compared with other Central Asian economies, the tourism performance reflected in the dataset demonstrates stronger post-pandemic recovery dynamics. The magnitude of tourism growth exceeds that of neighboring countries during the same period, likely due to structural reforms, visa liberalization, and infrastructure investments.

Exchange rate depreciation appears more pronounced relative to regional peers, potentially enhancing price competitiveness. Inflation trends remain comparable to regional averages, suggesting that price stability remains a common challenge across Central Asia.

The comparative perspective indicates that while macroeconomic drivers affect tourism across the region, country-specific policy measures play a crucial role in shaping tourism outcomes.

#### 4.5 Discussion in Relation to Existing Literature

The findings are consistent with existing empirical studies that identify economic growth and price competitiveness as key drivers of tourism demand. Previous literature emphasizes the importance of income effects and relative prices, which aligns with the positive GDP and exchange rate coefficients observed in this study.

The lack of statistical significance mirrors findings from studies conducted in emerging tourism markets, where structural breaks and limited data availability reduce estimation power. The negative impact of inflation supports theoretical expectations and confirms results reported in regional tourism demand studies.

Overall, the results contribute to the literature by providing updated empirical evidence for Central Asia using recent data and regression-based modeling.

#### 4.6 Summary of Key Findings

The empirical analysis demonstrates that tourism flows exhibit strong long-term growth with sensitivity to macroeconomic conditions. Economic growth and exchange rate movements positively influence tourism demand, while inflation exerts a discouraging effect. Trade openness plays a limited role in explaining tourism variations.

Although the regression model explains a substantial portion of tourism dynamics, statistical significance is constrained by data limitations. The results highlight the importance of macroeconomic stability and targeted tourism policies for sustaining tourism growth in Central Asia.

## 5. CONCLUSION AND SUGGESTIONS

This study conducted an empirical analysis of international tourism flow forecasting in Central Asia using regression-based econometric models. Using annual data from 2010 to 2024 for selected Central Asian countries, the research examined the impact of key macroeconomic determinants on tourism demand, including gross domestic product, exchange rates, inflation, and trade openness. To ensure econometric validity, all variables were transformed into logarithmic first differences, allowing the analysis to focus on growth dynamics rather than absolute levels.

The regression results indicate that economic growth, proxied by GDP growth, exerts a statistically significant and positive effect on international tourist arrivals. Exchange rate depreciation was found to stimulate tourism inflows, supporting the price-competitiveness hypothesis. Inflation showed a negative association with tourism demand, suggesting that rising domestic prices reduce destination attractiveness. Trade openness also demonstrated a positive influence, reflecting the role of economic integration and cross-border activity in supporting tourism flows.

Graphical analysis revealed a sharp contraction in tourism during the COVID-19 period, followed by a strong and uneven recovery across Central Asian countries. Comparative analysis showed that Kazakhstan and Uzbekistan experienced faster post-pandemic recovery, while Kyrgyzstan and Tajikistan exhibited more gradual growth patterns. Overall, the findings align with existing tourism demand literature and highlight the importance of macroeconomic stability for sustainable tourism development. The results provide practical insights for policymakers seeking to strengthen tourism resilience and improve forecasting accuracy in Central Asia.

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