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GRDP Projection Analysis Using the ARIMA Model: A Case Study of West Java

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Abstract: One of the provinces in Indonesia with abundant potential is West Java. The province has strong prospects in the creative economy sector, as evidenced by West Java's Creative Economy GRDP contribution, which reaches 20.73% of the national GDP in the same sector. This study aims to analyze the projected growth of West Java's GRDP using a quantitative method. Forecasting is conducted using the ARIMA model, which relies solely on a single time series variable to project the GRDP growth of West Java from the fourth quarter of 2024 to the fourth quarter of 2025. The prediction results using the ARIMA method show a positive projection for the region's economic development over the next two years. The forecast indicates fluctuating growth, with the highest percentage occurring in the third quarter of 2025 and the lowest in the first quarter of 2025. This study provides practical contributions for policymaking and program development by the West Java provincial government, while also supporting private investment and workforce absorption.

Keywords: GRDP, ARIMA, West Java, Forecasting

INTRODUCTION

Indonesia is well known for its abundant natural resources and local wisdom, which can be utilized to support national income. Each region in Indonesia has its own advantages and potential, making it the responsibility of the government, the private sector, or the community to utilize and manage these potentials in order to enhance economic activities. One of the provinces in Indonesia that holds abundant potential is West Java Province. West Java is located on the island of Java, covering an area of more than 3.5 million hectares, consisting of 27 regencies/cities, with a population of 48.27 million in 2023 (Jabarprov, 2023). West Java Province has great potential in the creative economy sector, as reflected in the contribution of West Java's Creative Economy GRDP, which reaches 20.73% of the national GDP from the same sector (Kemenparekraf, 2023). In addition, West Java Province also excels in several other sectors, including agriculture, livestock, horticulture, fisheries, forestry, and mining (Bapanas, 2022; Suri & Indrianawati, 2016).

Based on the GRDP data of West Java Province, there are three sectors that served as the largest contributors to West Java in 2023. First, the manufacturing industry contributed more than 715 trillion rupiah, with the majority of revenue coming from the Transportation Equipment Industry subsector, which generated more than 152 trillion rupiah. Second, the Wholesale and Retail Trade; Repair of

Motor Vehicles and Motorcycles sector contributed more than 240 trillion rupiah to West Java's GRDP. Third, the construction sector generated revenue reaching 133 trillion rupiah (BPS, 2024).

The explanation regarding the potential of various sectors in West Java Province provides new insight into the importance of GRDP growth data to be analyzed and used as a basis for decision-making. This GRDP growth data will offer greater benefits if forecasting can be conducted on the GRDP growth that will be achieved in one or more upcoming periods (Usmia & Noeryanti, 2021). Forecasting the percentage of GRDP growth will provide benefits in the form of early knowledge regarding conditions predicted to occur in the future. The forecasting results can be utilized to take anticipatory measures if the predicted GRDP data in the future shows low values or does not meet expectations, allowing the government, through various programs and policy instruments, to prevent such conditions from occurring in the future (Heryati, 2022). Therefore, forecasting the GRDP growth variable is important as an effort to describe and enhance the role of each economic sector. This study uses the ARIMA method for the prediction process.

Several previous studies conducted in 2024 using the ARIMA method have produced fairly accurate predictions, with various potential future outcomes depending on the sample data used. A prior study that applied the ARIMA method was used to forecast the prices of three food commodities: shallots, garlic, and chili. The prediction results showed that the price of shallots tended to remain stable at around Rp50,000 per kg throughout the year; garlic experienced a significant downward trend from the beginning-of-year price of around Rp48,000 to Rp44,000 per kg by the end of the year; and chili also showed a significant decline from around Rp72,000 at the beginning of the year to Rp59,000 per kg at the end of the year (Sihombing et al., 2024). Meanwhile, another study forecasted the Gross Regional Domestic Product (GRDP) of the Mining and Quarrying sector in South Kalimantan, with results showing an increase in output in the mining and quarrying sector of South Kalimantan Province from the second quarter of 2024 to the fourth quarter of 2025 (Hayati & Agustina, 2024). Another study used ARIMA as a method to project economic growth in Maluku Province, resulting in a forecast showing fluctuating economic growth from 2020 to 2024 (Tutupoho et al., 2024).

Unlike previous studies, this research produces GRDP prediction data for West Java Province that is beneficial for the region's economic development and growth. The objectives of this study are to: (1) forecast the GRDP growth data of West Java Province for the next two years, (2) examine the influence of residual values and previous period variables on the GRDP variable, and (3) determine the best ARIMA model to forecast the GRDP growth data of West Java for the next two years. The forecast results can serve as a reference for the West Java Province RPJMD to improve or address the decline in GRDP value in the future.

LITERATURE REVIEW

Endogenous Economic Growth

Endogenous economic growth is the change in the amount of goods and services produced by a region that is influenced not only by external factors but also by internal factors within the region itself. Economic growth is related to the utilization of internal factors owned by a region, such as human capital, natural potential, skills, innovation, and research. Efforts in conducting research that lead to innovation are important to be carried out by the government because they serve as a main driving factor for economic growth. Therefore, all efforts in creating quality human resources through training, socialization, and education can provide a multiplier effect for the overall economy of a region. This also applies to efforts in exploring and utilizing local potential to increase the GRDP growth of West Java Province through forecasting, thereby providing projections to establish current programs or policies (Brilyawan & Santosa, 2021).

Regional Economic Growth

Regional economic growth is the change in the added value of all goods and services produced by a region. Regional economic growth also implies that there is a change in the employment absorption rate, which results in a comprehensive increase in community income. The calculation of regional economic growth can use regional income at constant prices in the base year so that the magnitude of change can be seen without being affected by inflation factors. Regional income can also be used as an illustration of the level of prosperity, as seen through the function of regional income as compensation for all production factors used, consisting of natural resources, human resources, capital, technology, and entrepreneurial skills. Knowledge of GRDP growth projection is useful to determine the level of inflation and the compensation for all production factors, making it a foundation for economic planning in several upcoming periods (Tarigan, 2018).

Autoregressive Integrated Moving Average Model

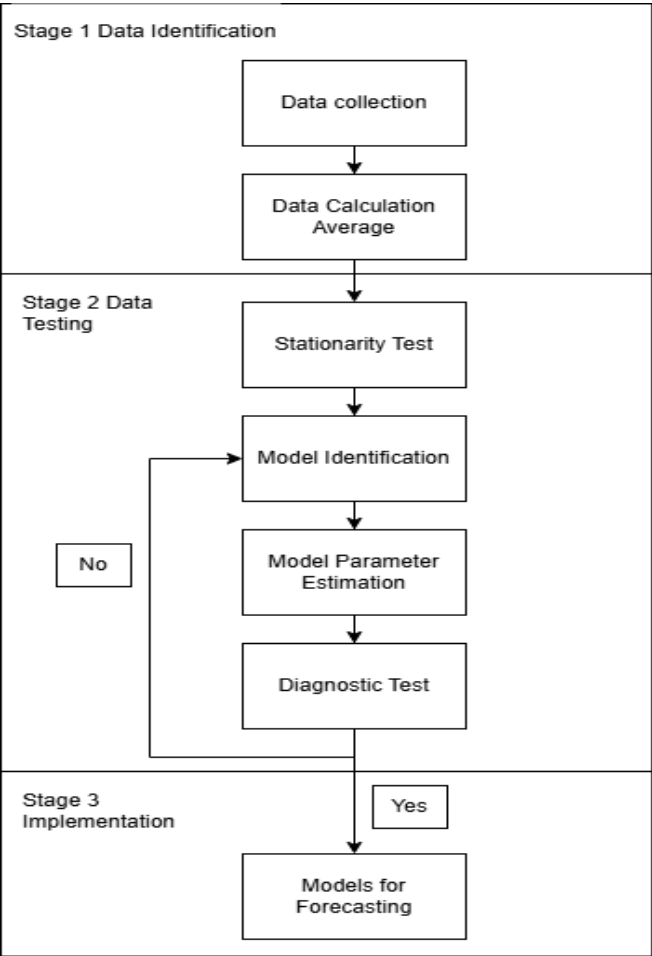
The Autoregressive Integrated Moving Average (ARIMA) model is a forecasting or prediction method by observing the behavior of a single time series variable. Observing the behavior of one variable implies that the variable can influence itself over a certain period without any influence from other variables, making it difficult to be explained by economic theories. The ARIMA model projects the future value of a variable using an iterative method to determine the best model through the estimation of three parameters, consisting of AR (Autoregressive), MA (Moving Average), and stationarity tests. The AR model explains that the dependent variable can be influenced by its own value in the previous period. Meanwhile, the MA model defines that the dependent variable can be influenced by the residual values in previous periods. The projection of GRDP growth data for West Java Province using the ARIMA model aims to see the extent to which regional income in previous periods affects future GRDP gains (Benvenuto et al., 2020).

METHOD

This study aims to analyze the GRDP projection of West Java Province using a quantitative method. The forecasting or projection is carried out using the

ARIMA model, which utilizes only one time series variable. The variable used is the quarterly growth data of Gross Regional Domestic Product (GRDP) at constant prices by industrial origin for West Java Province, covering the period from the first quarter of 2010 to the third quarter of 2024. The data used is classified as secondary data; therefore, data collection was conducted through the official website of Badan Pusat Statistik (BPS). The data processing in this study is conducted using Eviews 13 software. The stages of the research are explained based on Figure 1.

Figure 1
Research Stages



Stationarity Test

In using the ARIMA model, one of the conditions that must be met is that the time series data must pass the stationarity test. The stationarity test is an assessment that examines the aspects of the mean, variance, and covariance within the data or variable. If the data is declared to have passed the stationarity test, then all three aspects have constant values. There are several types of tests in the stationarity assessment, but the most commonly used is the Augmented Dickey-Fuller (ADF) test. In addition, there are three levels of testing that must be performed sequentially until the data becomes stationary, starting

from level, first difference, and second difference. The null hypothesis (H_0) is rejected when the p-value is greater than 0.05 or when the data has passed the stationarity test. The ADF stationarity test equation is formulated as follows.

$$t = \frac{\delta}{SE(\delta)} \quad (1)$$

Where t is the ADF test statistic, δ is the AR coefficient, and $SE(\delta)$ is the standard error of δ .

Model Identification

The ARIMA model is a forecasting technique by determining the best model parameters. These parameters include (p, d, q) where p = AR order, d = stationarity level, and q = MA order. The value of “d” can be determined through the stationarity test by observing the level: level = 0, first difference = 1, or second difference = 2, depending on which stage the data becomes stationary. Next, the value of “p” can be obtained through the correlogram stationarity test by identifying the lag level with the highest PAC (partial autocorrelation) value. Likewise, the value of “q” can be determined from the correlogram stationarity test by identifying the lag level with the highest AC (autocorrelation) value. Negative and positive values in the correlogram do not represent the magnitude, so the highest value is seen from the numerical values in PAC and AC. The ARIMA model equation can be seen in the following linear function:

$$Y_t = \beta_0 + \beta_1 Y_{t-1} + \beta_2 Y_{t-2} + \dots + \beta_p Y_{t-p} + \alpha_1 e_{t-1} + \alpha_2 e_{t-2} + \dots + \alpha_q e_{t-q} \quad (2)$$

Where Y is the dependent variable, e is the residual, and t is the lag.

Model Parameter Estimation

This stage is used to estimate all the model parameters (p, d, q) that have been previously determined using the least squares method. The estimation step functions to assess the significance level of variable Y in previous time periods and/or the residual values of previous periods on the current value of variable Y . The ARIMA model parameter estimation stage is similar to the general regression analysis process but uses a single variable that affects itself.

Diagnostic Test

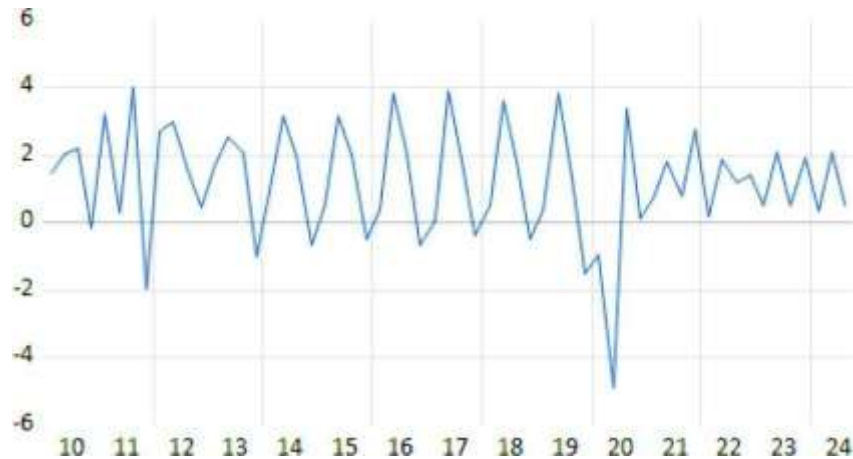
The diagnostic test is a variable assessment aimed at evaluating how well the selected model can explain the data accurately. This test is carried out by observing whether the obtained residuals are random (white noise), so they do not hold significance and therefore pass the diagnostic test. The method for analyzing the residual significance level is by evaluating the PAC and AC values in the residual correlogram. If the PAC and AC values are greater than 0.05 or H_0 is accepted, then it can be concluded that the model has passed the diagnostic test.

RESULTS

The Gross Regional Domestic Product (GRDP) data of West Java Province is categorized as the third-highest GRDP among provinces in 2023, following DKI Jakarta and East Java Provinces. Based on the data in Figure 2, the GRDP of West Java Province shows a fluctuating movement from 2010 until the third quarter of 2024. An anomaly is observed in West Java’s GRDP in 2020, which was caused by the COVID- 19 pandemic that led to a decline in economic activity. Although the data plotting appears to be fluctuating, the GRDP trend over the past 14 years is classified as stagnant.

In addition, there is a seasonal pattern or repeating pattern in the data that indicates the rise or fall of GRDP figures can be predicted through movement patterns from previous years. For example, the GRDP figures of West Java from the first to the third quarter tend to grow positively, whereas in the fourth quarter, they experience negative growth.

Figure 2
Plotting West Java Province's GRDP Growth



Source: writer, 2024

Next, the data used was examined using a stationarity test with the ADF test type. The results of the stationarity test showed that the GRDP data of West Java was stationary at the level stage. The p-value of the data was 0.000, which is indicated to be smaller than the alpha value (0.05), or reject H_0 . In addition, the data being stationary at the level stage also provides information about one of the model parameters, “d”, which has a value of 0.

Table 1
Data AC and PAC

Lag	Value	
	AC	PAC
1	-0,145	-0,145

2	-0,197	-0,222
3	-0,106	-0,186
4	0,389	0,321
5	0,097	0,204
6	-0,411	-0,312
7	-0,078	-0,122
8	0,343	0,206
9	0,057	-0,028
10	-0,296	-0,108

Source: writer, 2024

Other parameters, such as the AR and MA orders, can be identified using the correlogram. Based on Table 1, the AR value indicating the best model parameter is found at PAC lag-4 with the highest value of 0.321. Meanwhile, the MA value can be observed at AC lag-6, which has the highest value of -0.411. After identifying all the parameter values, the best model for the data can be determined to assess the significance level of each parameter. The best model selected for estimating the WestJava GRDP data is the ARIMA model with order (2,0,4) and an AIC (Akaike Info Criterion) value of 3.71921450333.

The best model obtained was then estimated to acquire significance data. Based on the estimation results, it was recorded that the Y value from two previous periods, AR(2), significantly affects the Y variable with a coefficient value of -0.908684. In addition, the residual value from two periods, MA(2), also significantly affects the Y variable with a coefficient value of 0.984834. The obtained estimation results were followed by a diagnostic test. The result of the test showed that the residuals are random and have no significance, thus passing the diagnostic test and accepting H_0 .

The data prediction was conducted to project the percentage growth of the GRDP of West Java Province from the fourth quarter of 2024 to the fourth quarter of 2025. Based on Table 2, the overall GRDP data for West Java over the next two years shows positive growth. Moreover, the prediction data also indicates fluctuation and tends to be stagnant. The lowest projected GRDP growth is predicted to occur in the first quarter of 2025, as shown in Figure 3, at 0.9%, while the highest growth is expected to occur in the third quarter of 2025, at 1.47%.

Figure 3

Plotting Data for Forecasting the Growth of West Java Province's GRD

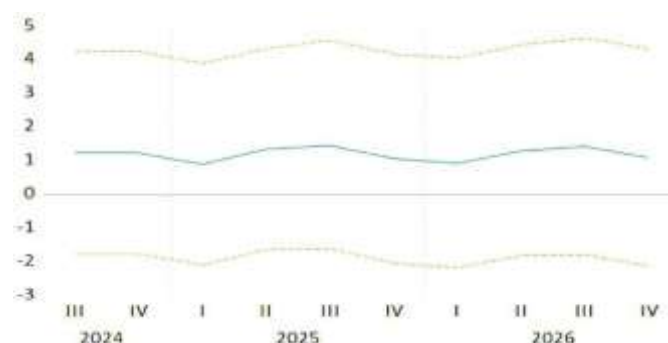


Table 2
Prediction Data

Period	Forecasting	Upper Limit	Lower Limit
2024 Q4	1,250384	2,750746	-0,249979
2025 Q1	0,904077	2,398799	-0,590645
2025 Q2	1,356151	2,855366	-0,143065
2025 Q3	1,477827	3,033170	-0,077515
2025 Q4	1,071126	2,627016	-0,484764
2026 Q1	0,946888	2,512220	-0,618444
2026 Q2	1,312274	2,882611	-0,258062
2026 Q3	1,437451	3,045989	-0,171086
2026 Q4	1,109639	2,725149	-0,505872

Source: writer, 2024

DISCUSSION

The growth rate of the Gross Regional Domestic Product (GRDP) of West Java Province has shown an increase or remained positive in every quarter. The results of this study further strengthen the evidence that West Java Province plays a significant role in Indonesia’s economic growth (BPS, 2022). Other studies using the ARIMA method, with research objects focused on GDP or GDP per capita in various countries, have also resulted in positive future projections (Agarwal et al., 2024; Nyoni & Bonga, 2019; Nyoni & Muchingami, 2019; Sharma et al., n.d.; Singh, 2024; Voumik & Smrity, 2020). To realize the projected outcomes, contributions from all parties are required to achieve or even exceed the predicted figures. The West Java government holds a central role in formulating policies to improve the regional economy of West Java Province. Several economic policy focuses that can be implemented include increasing the amount of investment from both domestic and foreign sources, promoting local products, and establishing cooperation with international parties in conducting research or developing innovative technologies.

The overall predicted GRDP growth data of West Java Province indicates an increase in contributions from the economic sector, particularly from the potential sectors in West Java Province. The West Java Provincial Government must play a role in creating an economic environment that supports the development of economic sectors, especially the manufacturing industry, construction, as well as Wholesale and Retail Trade, and the Repair and Maintenance of Motor Vehicles and Motorcycles (BPS, 2024). The West Java Provincial Government can strive to provide infrastructure, manage regional budgets, and evaluate economic development plans. The projected GRDP data of West Java, which shows positive growth over the next two years, can also be used as an instrument for both the private sector and the government to attract investors to invest in West Java. An increase in investment value will bring benefits in the form of increased economic activity, which can be advantageous for all parties, including the government, the private sector, and the general public (Arfah, 2021; Deleidi et al., 2023; Yang et al., 2022).

CONCLUSION

The prediction of GRDP growth data for West Java Province using the ARIMA method has provided a positive projection for economic development in the region over the next two years. The growth rates sequentially consist of 1.25% in the fourth quarter of 2024; 0.9% in the first quarter of 2025; 1.35% in the second quarter of 2025; 1.47% in the third quarter of 2025; 1.07% in the fourth quarter of 2025; 0.94% in the first quarter of 2026; 1.31% in the second quarter of 2026; 1.43% in the third quarter of 2026; and 1.1% in the fourth quarter of 2026. These results provide a positive outlook and hope for enhancing economic activity for the government, private sector, and society.

The rate of change in the GRDP growth variable of West Java Province is influenced by the GRDP variable from the two previous periods AR(2) and the residual values from the two previous periods MA(2). The interpretation above was obtained through the estimation of the best ARIMA model with order (2,0,4) and an AIC (Akaike Info Criterion) value of 3.71921450333.

Implication

This article can be beneficial as scientific knowledge and literature review for all parties, including academic communities, government, and the private sector. For the government, this study provides practical contributions to the formulation of policies and programs of the West Java Provincial Government as an effort to prepare for and enhance economic support. For the private sector, the data produced can be a tool to increase the value of business investment by highlighting the economic potential that shows positive growth throughout 2024 to 2026. Society will benefit from the private sector in the form of employment opportunities in companies. Meanwhile, from the government, the public has the potential to receive support in the form of policies, empowerment programs, skills training, infrastructure development, and financial assistance.

Limitation and Future Direction

The limitation of this study is the inability to elaborate on how much GRDP growth in West Java can influence various economic components such as investment, consumption, government spending, and others. The expectation for future researchers is to use other calculation models to provide a more comprehensive explanation of the impacts or causes of GRDP growth in West Java Province.

REFERENCES

- Agarwal, S. K., Agarwal, A., & Agarwal, A. (2024). Forecasting India's Gdp Using Arima: Factors Contributing To India's Growth. *Journal of Informatics Education and Research*, 4(3). <https://doi.org/10.52783/jier.v4i3.1502>
- Arfah, A. (2021). The Effect of Labor, Private Investment and Government Investment on Productivity in the Industrial Sector. *Golden Ratio of Social*

- Science and Education*, 1(1), 50–60.
<https://doi.org/10.52970/grsse.v1i1.118>
- Bapanas. (2022). *Apresiasi Capaian Pangan Jabar, NFA Serahkan Fasilitas Cold Chain untuk Perkuat Stok Pangan Daerah*. <https://badanpangan.go.id/blog/post/apresiasi-capaian-pangan-jabar-nfa-serahkan-fasilitas-cold-chain-untuk-perkuat-stok-pangan-daerah>
- Benvenuto, D., Giovanetti, M., Vassallo, L., Angeletti, S., & Ciccozzi, M. (2020). Application of the ARIMA model on the COVID-2019 epidemic dataset. *Data in Brief*, 29, 105340. <https://doi.org/10.1016/j.dib.2020.105340>
- BPS. (2024). *PDRB Atas Dasar Harga Konstan Menurut Lapangan Usaha Provinsi Jawa Barat (Milyar Rupiah), 2024*. <https://jabar.bps.go.id/id/statistics-table/2/MTEzIzI=/-seri-2010-pdrb-atas-dasar-harga-konstan-menurut-lapangan-usaha-provinsi-jawa-barat.html>
- Brilyawan, K., & Santosa, P. B. (2021). PENGARUH INFRASTRUKTUR SOSIAL DAN EKONOMI TERHADAP PERTUMBUHAN EKONOMI INDONESIA TAHUN 2015 - 2019. *DIPONEGORO JOURNAL OF ECONOMICS*, 10.
<https://doi.org/10.53825/jmbjayakarta.v2i2.54>
- Deleidi, M., Iafrate, F., & Levrero, E. S. (2023). Government investment fiscal multipliers: Evidence from Euro-area countries. *Macroeconomic Dynamics*, 27(2), 331–349. <https://doi.org/10.1017/S1365100521000419>
- Hayati, L. A., & Agustina, N. (2024). Aplikasi Model ARIMA dalam Peramalan Produk Domestik Regional Bruto (PDRB) Pertambangan dan Penggalian Kalimantan Selatan. *Seminar Nasional Official Statistics*, 2024(1), 981–992. <https://doi.org/10.34123/semnasoffstat.v2024i1.2055>
- Heryati, Y. (2022). Analisis Proyeksi Dan Trend Nilai Produk Domestik Regional Bruto Kabupaten Mamuju Untuk Tahun 2022 – 2031. *SEIKO : Journal of Management & Business*, 5(2), 744–756. <https://doi.org/10.37531/sejaman.v6i1.3765>
- Jabarprov. (2023). *Rencana Kerja Pemerintah Daerah (RKPD) Provinsi Jawa Barat Tahun 2023*. [https://file.jabarprov.go.id/live/media/img/1694571438-RKPD-Jabar-2023---Part-2-\(Hal-59-497\).pdf](https://file.jabarprov.go.id/live/media/img/1694571438-RKPD-Jabar-2023---Part-2-(Hal-59-497).pdf)
- Kemenparekraf. (2023). *Potensi Ekonomi Kreatif Jawa Barat*. <https://tasransel.kemenparekraf.go.id/kompromi1-potensi-ekonomi-kreatif-jawa-barat/show>

- Nyoni, T., & Bonga, W. G. (2019). Modeling and Forecasting GDP per capita in Rwanda. *Journal of Economics and Finance (DRJ-JEF)*, 4(2), 2520–7490. www.dynamicresearchjournals.org
- Nyoni, T., & Muchingami, L. (2019). Modeling and forecasting Botswana's Growth Domestic Product (GDP) per capita. *DRJ-Journal of Economics & Finance*.
- Sharma, S., Bansal, M., & Saxena, A. K. (n.d.). *Forecasting of GDP (Gross Domestic Product) Per Capita Using (ARIMA) Data-Driven Intelligent Time Series Predicting Approach*.
- Sihombing, E. I., Suhendra, C. D., & Marini, L. F. (2024). Analisis Data Time Series Untuk Prediksi Harga Komoditas Pangan Menggunakan Autoregressive Integrated Moving Average. *KLIK: Kajian Ilmiah Informatika Dan Komputer*, 4(6), 2711–2720. <https://doi.org/10.30865/klik.v4i6.1863>
- Singh, D. B. (2024). Predicting the per-capita Income of Nepal with the help of the ARIMA model. *Interdisciplinary Journal of Management and Social Sciences*, 5(2), 83–101. <https://doi.org/10.3126/ijmss.v5i2.69448>
- Suri, D. P. R., & Indrianawati, -. (2016). Pemetaan Potensi Sumber Daya Perkebunan untuk Komoditas Strategis di Provinsi Jawa Barat. *Reka Geomatika*, 2016(1), 21–33. <https://doi.org/10.26760/jrg.v2016i1.1835>
- Tarigan, R. (2024). *Ekonomi Regional Teori dan Aplikasi*. PT. Bumi Aksara.
- Tutupoho, A., Azis Laitupa, A., & Duwila, U. (2024). Analisis Peramalan Pertumbuhan Ekonomi Di Provinsi Maluku Dengan Metode Arima. *ManagementStudies and Entrepreneurship Journal*, 5(2), 6187–6195. <http://journal.yrpioku.com/index.php/msej>
- Usmia, N., & Noeryanti. (2021). Peramalan Data Produk Domestik Regional Bruto Daerah Istimewa Yogyakarta Menggunakan Kombinasi Fuzzy Time Series Chen Dengan Particle Swarm Optimization. *Jurnal Statistika Industri Dan Komputasi*, 6(2), 123–131. <https://ejournal.akprind.ac.id/index.php/STATISTIKA/article/view/3648>