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# Motor Vehicle Growth in Guyana (2000–2025): Statistical Trends, Forecasting, And Infrastructure Implications

**Bibi Sherriza Ali[1], Jason Phillips[2]**
[1]Department of Mathematics, Physics & Statistics, Berbice Campus, University of Guyana, Guyana
[2]Jason Phillips, Department of Computer Science. Berbice Campus, University of Guyana, Guyana

**ABSTRACT:** Motor vehicle registrations are a key indicator of transport demand, economic development, and infrastructure pressure. This study examines long-term trends in motor vehicle registrations in Guyana from 2000 to 2025 and generates forecasts for 2026–2030 using time-series modelling, including an ARIMA (0,1,0) model with drift.

The results show a strong and sustained increase in total vehicle registrations over the study period, rising from relatively low levels in the early 2000s to 38,346 vehicles in 2025. Growth is characterised by marked year-to-year volatility but a clear upward structural trend, particularly after the mid-2010s and the post-2020 period. Private cars remain the dominant category throughout, followed by motorcycles, both of which drive the overall expansion of motorisation. Commercial and specialised vehicle categories such as lorries, vans, buses, and hire cars show more moderate and stable growth patterns, reflecting their close link to economic activity.

Correlation analysis reveals consistently strong positive relationships across vehicle categories, indicating broad-based expansion of motorisation rather than isolated growth. Forecast results suggest that total vehicle registrations will continue to rise steadily, increasing from approximately 39,666 in 2026 to 44,948 in 2030. Diagnostic tests confirm the adequacy of the ARIMA model, with residuals behaving as white noise and acceptable forecast accuracy.

Overall, the findings indicate structurally persistent motorisation in Guyana, with significant implications for road infrastructure capacity, transport planning, and sustainable mobility policy.

**KEYWORDS:** Motor Vehicle Registration, ARIMA Forecasting, Transport Demand, Guyana, Time-series Analysis.

## INTRODUCTION

Registration is one of the most important indicators of transportation, economic development and city planning. With the expansion of the economy and urbanization, the number of privately and commercially registered vehicles tends to also grow, creating more needs for road infrastructure, traffic management systems, and services. Therefore, an analysis of the trend of vehicle registrations can give insight in the mobility behaviour, infrastructural stress and policy requirements of any country.

Vehicle growth affects several aspects in the context of developing countries and small islands, such as higher road use, higher maintenance costs, congestion risks, as well as environmental pressures. The importance of long-term forecasting for transport planning has been demonstrated in empirical studies, which showed that economic expansion and urban development are positively related to vehicle ownership (Zhao & Bai, 2019). Likewise, the analysis of data from China shows that motorization has been subject to long-term increasing trends that are associated with the structural shift in the economy, which makes the importance of predictive modelling clearly relevant for infrastructure planning (Ma et al., 2019).

Even in light of these observations, the long-term forecasting of vehicle registration is limited in SIDS, where transport systems are often constrained by structural limits and increasing mobility pressures (Soomauroo et al., 2020). The empirical literature has also confirmed that statistical models like ARIMA have been successfully applied for transportation demand forecasting because they have the ability to include trend and time-structured structures in historical data. But there is still a significant lack of studies that comprehensively address the Caribbean region and those that rely on data collected over more than 20 years for projecting future vehicle populations and infrastructure requirements.

The development of the economy, the rate of urbanisation and the transformation of the transport sector in Guyana are important reasons why it's such an interesting case for study. The data analysis for the annual registration data between 2000 and 2025 delivers a longitudinal data set suitable for strong statistical analysis, identification of trends, calculation of growth rates and the forecasting of future trends. This research aims to not only describe the growth of vehicles in Guyana in the past, but also predict the future trajectory of this growth, as it will inform infrastructure needs, urban planning and transportation policy planning.

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The aims of the present study are thus threefold:

1. To analyse historical trends in motor vehicle registrations in Guyana from 2000 to 2025, identifying growth patterns and fluctuations.
2. To forecast future vehicle registration numbers for the next five years using statistical modelling (including regression and ARIMA time series methods).
3. To discuss the implications of these trends and forecasts for infrastructure needs, such as road network capacity, parking facilities, traffic management, and policy interventions within the Guyanese context.

The researcher seeks to contribute to the existing body of knowledge, provide empirical-based recommendations for policy and urban planning in Guyana, and highlight the use of the powerful statistical and forecasting tools which can be applied in a Caribbean setting.

## MATERIALS ANS METHOD

This study employed a quantitative research design using secondary data sourced from the Bureau of Statistics, Guyana [1]. The dataset contains annual records of motor vehicle registrations in Guyana spanning the years 2000 to 2025. These data provide a valuable longitudinal perspective for assessing historical growth trends and forecasting future developments in the nation's motor vehicle population. Before analysis, data were examined for accuracy, completeness, and consistency. Since the dataset was fully complete with no missing or inconsistent entries, no imputation procedures were required. Year-over-year percentage changes were computed to capture annual growth rates, and a three-year moving average was calculated to smooth short-term fluctuations, thereby revealing long-term patterns in vehicle registrations [2].

The study also explored the implications of anticipated growth in the vehicle population on the transport infrastructure in Guyana. Road capacity, parking spaces, and traffic congestion have direct links to the increased vehicle ownership. Thus, projected growth was compared to the potential demands placed on the nation's road network, urban parking facilities, and traffic management systems. These projections were discussed in the context of sustainable transport planning and policy formulation, based on the empirical evidence that there is a strong connection between the growth of vehicle ownership and the structural development pattern and transportation demand pressure [3] [4].

While this study has several advantages, there are also some drawbacks to consider. The data presented is not broken down by vehicle type (e.g. private cars, commercial vehicles, motorcycles). Also, external factors like economic growth, population growth and policy changes were not explicitly modeled, thus limiting the causal interpretation of the observed trends. Finally, the analysis drew infrastructure implications from the vehicle growth projections but did not factor in spatial/geographic information to improve planning accuracy.

## DATA ANALYSIS

Descriptive statistical analysis was first conducted to summarize the dataset using measures of central tendency (mean and median) and dispersion (standard deviation, minimum, and maximum values). These statistics provided a foundational understanding of the distribution and variability of vehicle registrations over time [5].

To assess the overall trend, a simple linear regression was performed, with year as the independent variable and number of registered vehicles as the dependent variable. The slope coefficient of the regression line indicated the average annual increase in registrations, reflecting the pace of motorisation in Guyana [5].

For forecasting, the study adopted the Auto-Regressive Integrated Moving Average (ARIMA) model, a widely used time-series forecasting technique that accounts for trend, autocorrelation, and potential seasonality in longitudinal data [6]. The modelling process involved several steps. First, the Augmented Dickey-Fuller (ADF) test was conducted to determine whether the time series was stationary or required differencing. Next, model parameters (p, d, q) were identified using autocorrelation (ACF) and partial autocorrelation (PACF) plots. Competing models were compared using the Akaike Information Criterion (AIC) to select the optimal fit. Once the best model was established, forecasts were generated for the years 2026 to 2030, accompanied by 95% confidence intervals to reflect prediction uncertainty.

All statistical analyses and visualizations were conducted using R software (version 4.x), which provides robust tools for time-series and regression analysis through packages such as forecast, tseries, and ggplot2. Data preprocessing and visualization steps were performed using dplyr and ggplot2, while ARIMA modelling was conducted using the forecast package [7].

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**ANALYSIS**

**TABLE I - Descriptive Statistics of Motor Vehicle Registrations in Guyana (2000–2025)**

| Variable | Mean | Median | Min | Max |
|---|---|---|---|---|
| Private_Cars | 5103.27 | 3769 | 1232 | 16059 |
| Hire_Cars | 931.08 | 751 | 281 | 2538 |
| Lorries | 1276.23 | 1024 | 0 | 4482 |
| Buses | 740.73 | 614 | 321 | 1696 |
| Station_Wagons | 83.81 | 4 | 0 | 802 |
| Vans | 797.5 | 683 | 30 | 2220 |
| Tractors | 323.85 | 298.5 | 0 | 670 |
| Trailers | 269.15 | 254.5 | 0 | 579 |
| Motorcycles | 3839.88 | 3138 | 1095 | 10988 |
| Other | 1556.77 | 1401.5 | 246 | 4540 |
| Total | 14922.27 | 12260 | 4192 | 43511 |

The descriptive statistics and graphical trends collectively indicate a strong and sustained expansion, as well as a clear structural concentration, in motor vehicle registrations in Guyana over the 2000–2025 period. The total registration series shows a consistent long-term upward trajectory, increasing from relatively low levels in the early 2000s to substantially higher values in the 2020s, with the highest recorded level reaching 43,511 vehicles. The line graph confirms this overall growth pattern, despite intermittent fluctuations across selected years, and demonstrates a more pronounced upward shift in the later period. This trend suggests sustained motorization driven by economic development, improved access to imported vehicles, and rising demand for personal and commercial mobility, with a noticeable acceleration after the mid-2010s and a further intensification in the post-pandemic period.

Private cars dominate the vehicle structure throughout the study period, recording the highest mean (M = 5,103.27), median (3,769), and maximum (16,059). This clearly indicates that private vehicle ownership is the primary driver of motorization in Guyana. The wide range between the minimum (1,232) and maximum values reflects substantial temporal variation, consistent with shifts in income levels, credit availability, and import patterns. Motorcycles represent the second most significant category (M = 3,839.88), with a very high maximum value (10,988), highlighting their role as a more affordable and accessible mode of transport. Their sustained growth suggests increasing reliance on two-wheel transport, particularly among lower- and middle-income groups, and possibly partial substitution away from higher-cost private cars.

Lorries, vans, and hire cars form a middle tier of vehicle types, with moderate mean values (lorries: M = 1,276.23; vans: M = 797.5; hire cars: M = 931.08). These categories display relatively stable but responsive patterns over time, closely aligned with commercial activity, freight transport, and passenger service demand. Their lower volatility compared to private cars indicates that these vehicle types are more strongly influenced by economic activity cycles rather than individual household consumption behaviour.

At the lower end of the distribution, buses, tractors, and trailers exhibit comparatively low mean values (buses: M = 740.73; tractors: M = 323.85; trailers: M = 269.15). These figures reflect their specialised functional roles in public transport, agriculture, and industrial logistics. Although their averages remain low, occasional peaks in these categories suggest episodic surges in demand, likely linked to infrastructure development projects, agricultural expansion, or targeted transport investments.

Station wagons show a highly skewed distribution, with a very low median (4) compared to the mean (83.81) and a maximum of 802. This indicates that most years recorded minimal registrations, with occasional sharp spikes that distort the average, possibly due to classification changes or short-lived market preferences. Similarly, the “Other” category records a relatively high mean (M = 1,556.77), suggesting heterogeneous vehicle types grouped under a broad classification, leading to variability in recorded values over time.

Overall, total motor vehicle registrations (M = 14,922.27; median = 12,260; max = 43,511) demonstrate a clear and sustained increase across the study period. The widening gap between early and later years highlights accelerated motorization, particularly from the mid-2010s onward. The graphical evidence reinforces this structural upward shift, showing that Guyana’s transport system

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has undergone significant expansion driven by economic growth, increasing affordability of vehicles, and rising mobility demand across both private and commercial sectors.

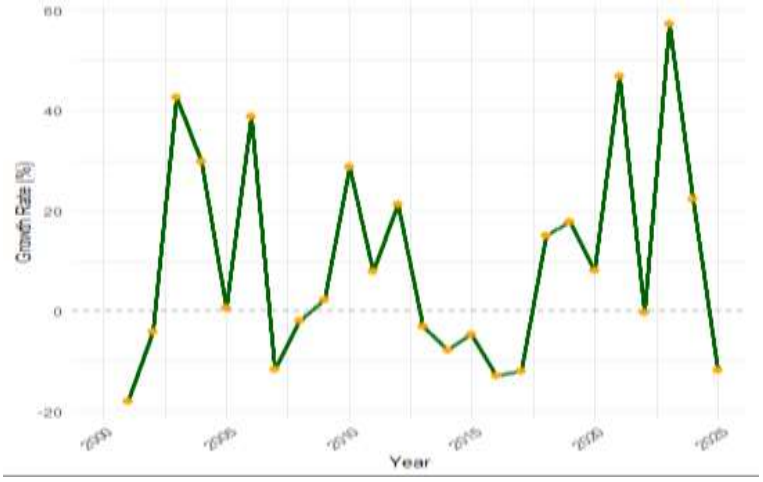


**Figure 1 – Annual Growth Rate of Total Vehicle Registrations (2000-2025)**

The annual growth rate of motor vehicle registrations in Guyana between 2000 and 2025 shows a highly unstable pattern, with strong fluctuations rather than steady progression. Over the period, growth moves between notable declines (about –10% to –15%) and sharp increases reaching roughly 50–60% in peak years, suggesting that vehicle registration trends are closely linked to shifts in economic conditions, import supply, and consumer demand. In the early 2000s, growth was particularly irregular, reflecting a developing motor vehicle market still adjusting to demand and availability, while the mid-2000s to early 2010s continued this cyclical behaviour with alternating periods of expansion and contraction, likely influenced by changes in affordability and import dynamics. From 2015 to 2019, fluctuations became more pronounced, although the overall direction remained mildly upward, indicating increasing demand despite ongoing economic or policy-related constraints. After 2020, the series shows a dramatic surge in growth, peaking around 2023–2024, which is consistent with post-pandemic recovery effects, stronger purchasing power, and increased vehicle imports, before dropping sharply in 2025, possibly signaling market correction or emerging economic tightening. Overall, the data suggest a long-term upward trajectory in motorisation, but one that is consistently disrupted by short-term volatility, creating important challenges for infrastructure planning and transport policy due to alternating periods of rapid expansion and sudden slowdown.

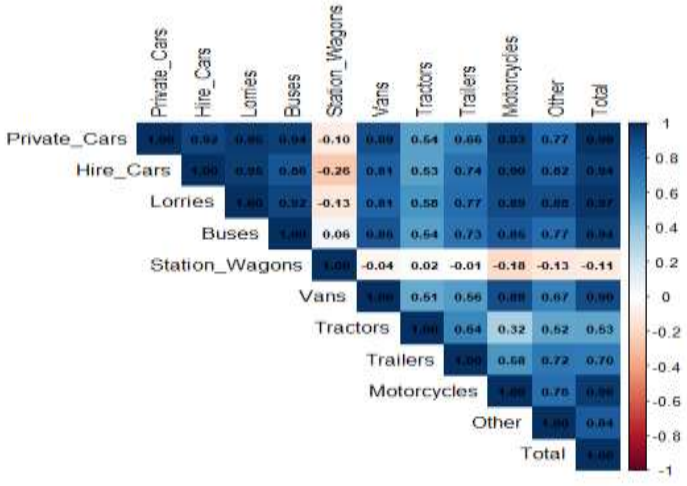


**Figure 2 – Correlation Heatmap**

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The correlation heatmap shows strong positive relationships among most categories of motor vehicles registered in Guyana, indicating that increases in one vehicle type generally occur alongside increases in others. In particular, private cars display some of the highest correlations with hire cars, vans, and lorries, reflecting closely aligned movements among these categories over the study period. Motorcycles also demonstrate moderate positive correlations with several categories, indicating that their growth tends to follow similar patterns to other vehicle types, though with slightly less intensity. Overall, the correlation structure is consistently positive across the dataset, showing that vehicle categories tend to move together rather than in opposing directions.

The forecasted vehicle registration trends for 2026–2030 indicate a sustained increase in motor vehicle ownership across all vehicle categories in Guyana, although the pace of growth differs considerably between categories.

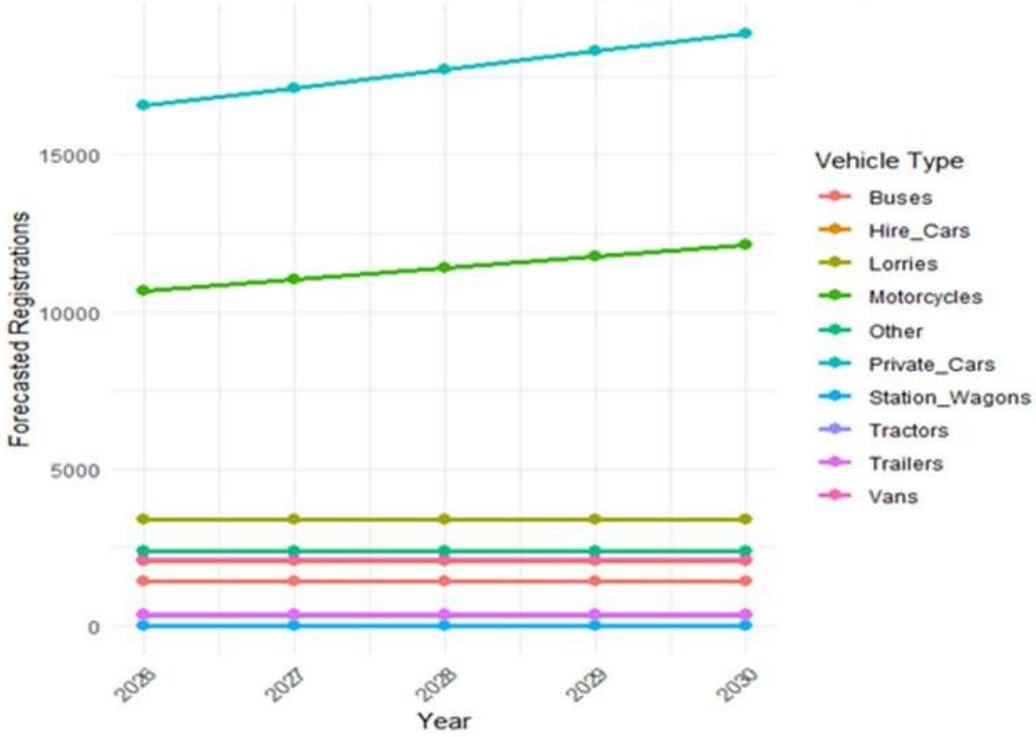


**Figure 3 – Forecasted Vehicle Registration Trends by Type (2026-203)**

Private vehicles remain the dominant category throughout the forecast period and exhibit the strongest absolute increase, rising from approximately 27,500 registrations in 2026 to over 31,000 by 2030. This substantial growth reflects increasing household vehicle ownership and highlights the growing importance of private transportation within the national mobility structure. Motorcycles also demonstrate a steady upward trend, increasing from roughly 11,500 to nearly 13,000 registrations over the same period, suggesting continued demand for relatively affordable and fuel-efficient transportation options. In contrast, buses, hire cars, vans, trucks, station wagons, tractors, and trailers display slower but stable increases, indicating moderate expansion in commercial and specialised transport activities without major structural shifts in these categories.

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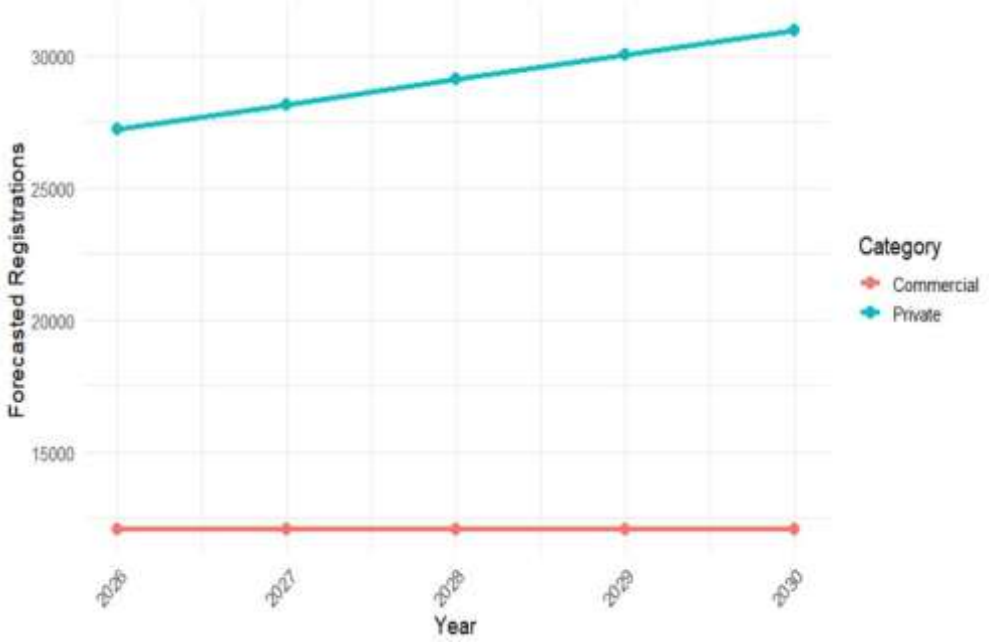


**Figure 4 – Forecasted Private vs Commercial Vehicle Growth (2026-2030).**

The comparison between private and commercial vehicle forecasts further shows that future growth in Guyana's vehicle fleet is expected to be driven primarily by private vehicle ownership rather than commercial transport expansion. While private vehicle registrations rise steadily throughout the forecast horizon, commercial vehicle registrations remain relatively stable at approximately 12,000 registrations with only marginal growth over time. At the aggregate level, total vehicle registrations are forecasted to increase consistently from approximately 39,666 vehicles in 2026 to about 44,948 vehicles by 2030, reflecting a stable upward trajectory in overall motorisation. Although the forecast intervals widen over time due to increasing uncertainty in longer-term projections, the central forecast path remains smooth and consistent. These projected trends suggest increasing pressure on road infrastructure, traffic management systems, and urban mobility networks, particularly as private vehicles and motorcycles continue to account for the largest share of future vehicle growth.

**TABLE II – Vehicle Density by Vehicle Type in Guyana (Forecast Period 2026–2030)**

| Vehicle Type | Total Vehicles | Vehicles per km | Vehicles per 1000 People |
|---|---|---|---|
| Buses | 7,115 | 1.78 | 8.89 |
| Hire Cars | 10,380 | 2.6 | 13 |
| Lorries | 17,030 | 4.26 | 21.3 |
| Motorcycles | 56,987 | 14.3 | 71.2 |
| Other | 11,810 | 2.96 | 14.8 |
| Private Cars | 88,561 | 22.2 | 111 |
| Station Wagons | 0 | 0 | 0 |
| Tractors | 1,620 | 0.41 | 2.02 |
| Trailers | 1,860 | 0.47 | 2.32 |
| Vans | 10,460 | 2.62 | 13.1 |

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The vehicle density analysis for Guyana, based on a national road network of 3,995 km and a population of approximately 800,000 persons, shows a highly concentrated transport structure dominated by private cars and motorcycles. Private cars account for the highest level of vehicle concentration with 88,561 units, corresponding to 22.2 vehicles per kilometre of roadway and 111 vehicles per 1,000 people, highlighting their dominant role in national mobility and road usage. Motorcycles follow as the second-largest category with 56,987 units, representing 14.3 vehicles per kilometre and 71.2 per 1,000 people, reflecting their importance as a widely used and affordable transport mode. Other categories such as lorries (17,030), buses (7,115), hire cars (10,380), vans (10,460), and other vehicles (11,810) contribute moderate levels of density ranging from 1.78 to 4.26 vehicles per kilometre, while tractors (1,620) and trailers (1,860) show minimal density and station wagons record zero values across all indicators, indicating no presence in the dataset.

To forecast future motor vehicle registrations in Guyana, an ARIMA(0,1,0) model with drift was employed. The model produces deterministic point forecasts based on the estimated drift component.

$$\boldsymbol{Total_t} = 38346 + 1320(\mathrm{t} - 2025) \quad ; \quad \boldsymbol{t = 2026, 2027, 2028, \ldots}$$

where:

- $Total_t$ represents the projected total number of vehicle registrations in year t.
- 38346 is the observed total registrations in 2025,
- 1,320 is the annual drift term estimated from the historical ARIMA model, representing the average yearly increase in registrations.

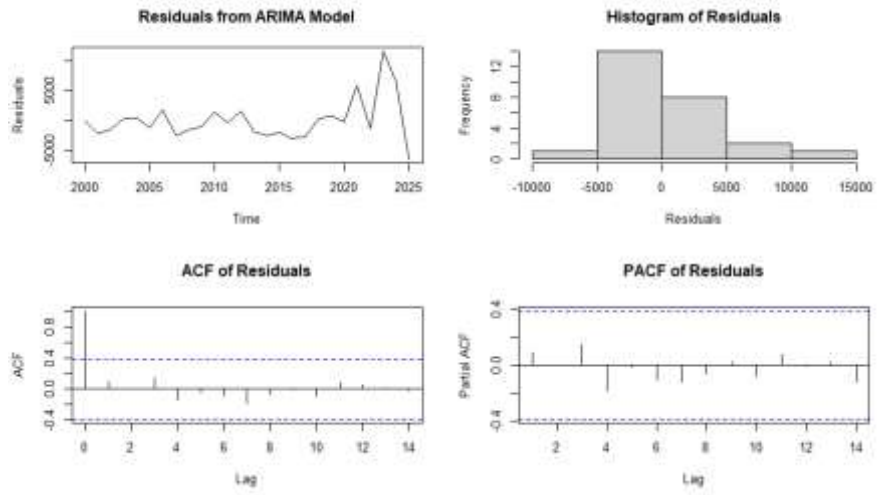


**Figure 5 – Diagnostic Evaluation of the ARIMA (0, 1, 0) Model with drift for Motor Vehicle Registration Forecasting in Guyana (2000-2025)**

The estimated ARIMA(0,1,0) model with drift indicates that motor vehicle registrations in Guyana follow a stochastic upward trend characterised by a persistent deterministic growth component. The estimated drift parameter of approximately 1,320 suggests that registrations are expected to increase by an average of about 1,320 vehicles annually over the forecast horizon, reflecting continued growth in motorisation associated with economic and demographic expansion. The model represents a random walk with drift, implying that short-run fluctuations are largely unpredictable while long-run growth is driven by the positive drift component. Forecasts generated from the model project a steady increase in registrations from approximately 39,666 vehicles in 2026 to 44,948 vehicles by 2030, with widening confidence intervals reflecting increasing uncertainty over longer forecast horizons. Despite this uncertainty, the forecast path remains stable and structurally consistent, supporting its usefulness for medium-term transport planning and policy analysis.

Diagnostic evaluation confirms that the ARIMA(0,1,0) with drift model is statistically adequate and appropriately specified. The Ljung–Box test produced a non-significant result ($\chi^2 = 3.84$, df = 10, p = 0.954), indicating no significant residual autocorrelation and suggesting that the residuals behave as white noise. This finding is reinforced by the low first-lag autocorrelation coefficient

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(ACF1 = 0.090), which indicates negligible serial dependence remaining in the residuals. Visual inspection of the residual plots further supports model adequacy, showing random dispersion around zero without systematic trends or cyclical patterns. Forecast accuracy measures also indicate acceptable predictive performance, with MAE = 2373.08, RMSE = 3491.09, MAPE = 15.91%, and MASE = 0.991, suggesting that the model performs slightly better than a naïve benchmark forecast. Overall, the model's parsimonious structure, satisfactory residual behaviour, and reasonable forecast accuracy justify its use as a reliable framework for forecasting motor vehicle registration trends in Guyana.

## DISCUSSION

The findings indicate a long-term upward trajectory in motor vehicle registrations in Guyana over the 2000–2025 period, although this growth is characterised by notable volatility and a late-period adjustment. Total registrations increased from relatively low levels in the early 2000s to a peak of 43,511 vehicles in 2024, followed by a decline to 38,346 in 2025, reflecting both sustained motorisation and short-term fluctuations in demand. Overall, the trend shows accelerated growth from the mid-2010s onward and a pronounced expansion after 2020, consistent with increased vehicle imports, rising incomes, and post-pandemic recovery effects, before a downward correction in the final year [8].

Private cars consistently dominate the vehicle fleet and represent the primary driver of motorisation throughout the study period, followed by motorcycles, which exhibit strong and sustained growth due to affordability and accessibility. Commercial and service-related vehicles, including lorries, vans, hire cars, buses, tractors, and trailers, display more moderate and stable growth patterns, reflecting their stronger linkage to economic activity and transport services rather than household consumption. Overall, the vehicle structure reveals a concentrated but gradually diversifying transport system [9].

Correlation analysis shows strong positive relationships among most vehicle categories, indicating that growth in one category is generally associated with growth in others. This suggests a broad-based expansion of motorisation across both private and commercial transport sectors, rather than isolated or category-specific growth dynamics.

Forecasting results using an ARIMA(0,1,0) model with drift indicate that motor vehicle registrations are expected to resume a steady upward trajectory over the 2026–2030 period. Total registrations are projected to increase from approximately 39,666 in 2026 to 44,948 in 2030, with private vehicles remaining the dominant category throughout the forecast horizon, followed by motorcycles. Commercial vehicle categories are projected to grow at a slower but stable rate, indicating continuity rather than structural transformation in this segment.

Vehicle density analysis further highlights increasing pressure on the transport system. Private cars and motorcycles account for the highest concentrations, with 111 and 71.2 vehicles per 1,000 people, respectively, significantly exceeding all other categories. This indicates a highly concentrated mobility structure and growing demand pressure on road infrastructure, particularly in urban and high-traffic corridors [10].

### *A. Implications for Infrastructure and Transport Planning*

The observed long-term growth in motor vehicle registrations in Guyana, coupled with forecasted increases through 2030, has significant implications for national infrastructure systems, particularly road network capacity, parking provision, traffic management, and broader transport policy. The sustained upward trajectory in private vehicle ownership indicates increasing pressure on existing road infrastructure, especially within urban and peri-urban corridors where traffic density is already highest. Given that private cars and motorcycles dominate both current and projected vehicle fleets, road usage is expected to intensify disproportionately within these categories, increasing the likelihood of congestion, reduced travel speeds, and accelerated road surface deterioration if capacity expansion does not keep pace with demand [11].

Parking infrastructure is also likely to come under increasing strain, particularly in commercial centres, administrative zones, and rapidly expanding urban areas where vehicle concentration is highest [12]. The continued rise in private vehicle ownership suggests that demand for both on-street and off-street parking will expand faster than the current supply, potentially resulting in inefficient land use, informal parking practices, and increased competition for limited urban space. This underscores the importance of integrating parking management strategies within broader land-use and urban development planning frameworks [13].

In terms of traffic management, the observed volatility in historical growth rates indicates that transport demand in Guyana is not only increasing but also subject to periodic surges. This creates challenges for system responsiveness, particularly at key intersections and major transport corridors where capacity constraints may be exceeded during peak growth phases. As vehicle

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density per kilometre continues to rise, the effectiveness of existing traffic control systems may decline without improvements in signal coordination, intersection design, enforcement mechanisms, and the adoption of more adaptive traffic management technologies.

From a policy perspective, the forecasted persistence of motorisation suggests that transport planning must adopt a more forward-looking and capacity-responsive approach [14]. The dominance of private vehicles highlights a structural reliance on individual mobility, which may place long-term strain on urban infrastructure if unaddressed. In this context, strengthening public transportation systems emerges as a critical complementary strategy. Expanding the availability, reliability, and affordability of public transport services may help moderate the growth of private vehicle dependence by offering a viable alternative for daily commuting [15]. However, such outcomes are contingent on service quality, network coverage, accessibility, and user confidence, and therefore require sustained investment and institutional strengthening rather than assuming automatic behavioural substitution.

Additionally, the continued growth in motorcycles and commercial vehicles indicates a diversifying transport demand structure, necessitating differentiated policy responses tailored to varying mobility needs, safety considerations, and infrastructure requirements across vehicle types [16].

Overall, the findings indicate that Guyana's transport system is entering a phase of sustained demand pressure, where infrastructure development, traffic regulation, and integrated transport policy will need to be closely aligned with long-term vehicle growth trends to maintain efficiency, mobility, and system resilience.

## CONCLUSION

This study examined motor vehicle registration dynamics in Guyana over the period 2000–2025, focusing on historical growth patterns, future projections, and the implications for transport infrastructure and policy planning.

The analysis shows a sustained long-term increase in motor vehicle registrations, accompanied by considerable annual fluctuations. Growth has been particularly strong from the mid-2010s onward, reflecting a structural shift in motorisation driven by rising mobility demand and increased access to vehicles. This upward trajectory reached a peak in 2024, followed by a decline in 2025, indicating short-term volatility within an otherwise expanding motorisation trend. Across the vehicle fleet, private cars consistently dominate overall registrations, followed by motorcycles, while commercial and specialised vehicle categories display more moderate and stable growth patterns.

Forecasting using an ARIMA (0,1,0) model with drift indicates that vehicle registrations are expected to resume a steady upward trajectory over the medium term, with total ownership rising consistently through 2030. The projections suggest that private vehicles will remain the principal contributor to growth, with motorcycles also maintaining a significant upward trajectory.

The findings further indicate important implications for transport infrastructure and planning. Continued growth in vehicle ownership is likely to place increasing pressure on road network capacity, parking systems, and traffic management efficiency. These patterns highlight the need for long-term planning approaches that align infrastructure development with sustained increases in motorisation.

Overall, the results demonstrate that motor vehicle growth in Guyana is structurally persistent but characterised by short-term fluctuations, underscoring the importance of proactive transport planning to support future mobility demand.

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