Data Analysis Report for The Leasing Market in Norway

By Jianling Li / December 2024

1. Introduction

The report analyzes the development of the leasing market in Norway from 2015 to 2023, with a particular focus on specific types of leasing equipment. The goal is to observe and explore potential connections between leasing investments, leasing behavor, and corresponding interest rate. By understanding these connections, this report aims to shed light on how interest rate trends influence leasing activities, offering insights into market dynamics over the given time period.

1.1 Leasing dataset

The leasing dataset utilized in this report was collected from FINFO (www.finfo.no/statistikk/). The report adopted the 'Andre utlån' dataset which covers different leasing equipments.

1.2 Leasing interest rate

The leasing interest rate data was sourced from Statistics Norway (SSB, https://www.ssb.no/statbank/), under the category 'Bank og finansmarked' (Banking and Finanical Markets) and its subcategory 'Renter på utlån, etter utlånstype og sektor' (Interest Rates on Loans, by Loan Type and Sector). The report assumes the investors typically secure leasing loan from local banks, and therefore the interest rates on new loans are particularly releant. These rates reflect the most recent lending conditions and are likely to influence leasing behaviors.

To align with the diverse categories of leasing equipment, the selection of leasing interest rates was carefully tailored based on the leasing sector. The categories include:

Ikke-finansielle foretak (Non-financial enterprises):

- Represents loans taken by businesses for operational purposes.
- Relevant for leasing categories such as industrial equipment, transport equipment, public transport, and building/real eastate.

Husholdninger (Households):

- Encompasses loans taken by private individuals.
- Applied to leasing categories like personal cars, office/computer equipment, as these are often financed through consumer loans.

Totalt (All sectors):

- Combine loans from both non-financial enterprises and households.
- Useful for analyzing general leasing trends in equipment categories that do not fit neatly into the other two classifications (e.g., 'Annet'. Other equipment).

All the leasing interest rates are collected with monthly data. To align with the yearly leasing dataset, the monthly leasing interest rates are converted to yearly mean value. For the missing data in colums, which was filled up with an average value computed from 2015 to 2023. This is to maintain the data intergrity. In addition, the leasing dataset and the leasing interest rates were merged in the same dataset for convenience of data exploring and analysis.

2. Exploratory analysis

In this section, the report adpoted different methods to explore the data. To identify and compare trends in leasing investments, the report normalize the data, which allows for comparing the relative changes of

categories over time, making it easier to observe how different categories behave proportionally. For explict observation of the development of different eqjuipment categories in the leasing investments over time, as well as trends in long term and short term, matplotlib was implemented for data visualization.

2.1 Analyze the development in leasing for various equipment categories over time

Figure 1 displays the development in leasing for various equipment categories over time. Leasing investment in 'Personbiler' consistently dominates other equipment ategories, with a clear upward trend from 2015 to 2022, before a slight decline in 2023. This suggests that the personal car leasing is the primary contributor to the overall leasing market in Norway.

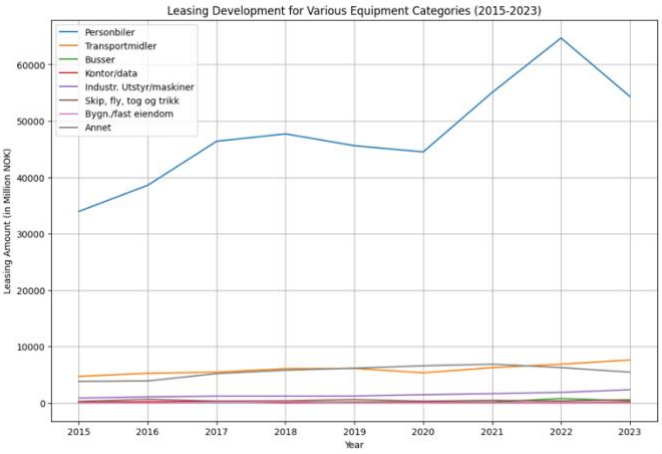

Figure 1

The investment in transport equipment and other equipment shows gradual growth. The trend indicates a growing demand for transport - equipment related and other equipment leasing, possibly reflceting increased commercial, industrial, or other activities.

The category of 'Bygn./fast eiendom' experienced a sharp increase in 2018, followed by fluctuations and stabilization. The peak could indicate a one-time surge in real estate-related leasing, possibly due to specific market or policy changes during that year.

Categories 'Busser', 'Transportmidler', 'Kontor/data', and 'Industr. Utstyr/maskiner' perform little variation over time, with minor increase or stability in investments. This could imply either a limited market demand or a saturation of leasing activities in these areas.

A noticeable decline in 'Personabiler' and slight stabilization or decline in other categories can be observed in 2023. This might be linked to macroeconomic conditions, such as inflation, changes in interest rate, or shifting market preferences.

2.2 Identify and visualize trends and seasonal variations

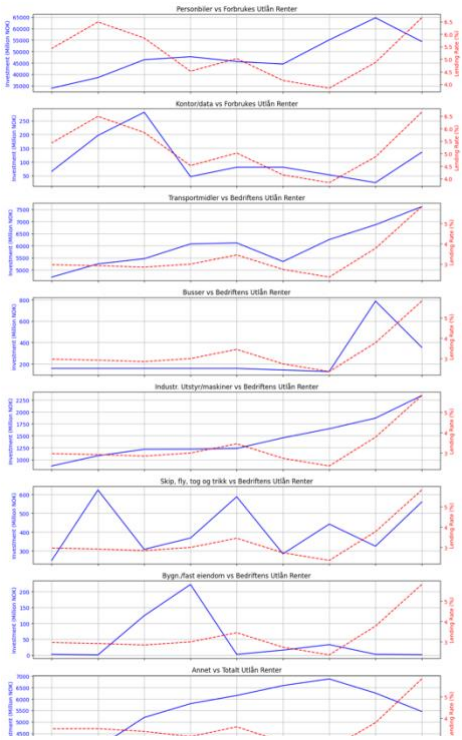

Figure 2

Figure 2 exhibits trends of different equipment categories over the years.

- **Consumer leasing sector:** There is a steady increase in investments of 'Personbiler' over the years, peaking in 2022 and followed by a slight decline in 2023. The decline in this leasing investment in 2023 may correlate with the sharp rise in consumer leasing interest rates. A fluctuating trend is observed for 'Kontor/data' equipment leasing, with a significant peak in 2018, followed by a steady decline. The sharp decline in leasing after 2018 could imply market saturation or reduced demand for the office equipment.
- **Corporate Leasing sector:** Steady growth is observed both in 'Transportmidler' and 'Industr. Utstyr/maskiner' equipments. A slightly different is that 'Transportmidler' equipment occured a noticeable increase from 2021 to 2023, while 'Industr. Utstyr/maskiner' remained stable increase in leasing investments over the years. The other leasing categories display various performances. Public transport like 'Busser' presented a mostly flat trend, with minor variations and a peak in 2022. Other heavy transports like 'Skip, fly, tog og trikk', volatile trends were observed, with spikes in 2018 and 2023. For 'Bygn./fast eiendom' equipment, a sharp increase in 2018, followed by fluctuations and stabilization in later years. The corporate leasing interest rates remain relatively stable, with a slight increase in 2023. The consistent and steady growth of 'Transportmidler' and 'Industr. Utstyr/maskiner' equipments suggest their stable demands in leasing market. 'Busser' shows also limited sensitiity to leasing interest rate change. However, for 'Skip, fly, tog og trikk' and 'Bygn./fast eiendom', volatility in leasing

investments may reflect the cyclical nature of these high-capital industries. Particular for 'Bygn./fast eiendom', the peak in 2018 might correlate with external market or policy shifts.

- **Other Leasing sector:** displayed a steady increase in leasing investment over the years. A consistent increase suggests gradual diversification in leasing activities.

Seasonal variations refer to patterns that repeat over a fixed time interval like quarters or months. The leasing equipments dataset lack of actual monthly or quarterly leasing data, which makes seasonal patterns remain undetectable if only yearly data is availabhle. Alternative, detrending the data removes long-term trends and highlights short-term fluctuations, which can display approximating seasonal variations. However, yearly leasing data fails to explicitly capture seasonal cycles since each data point aggregates a full year, reducing the accuracy of data detection and prediction.

2.3 Compare growth rates between different categories

Most categories exhibited consistent and small fluctuations in growth rates over time, indicating relative stability. (Refer to Figure 3)

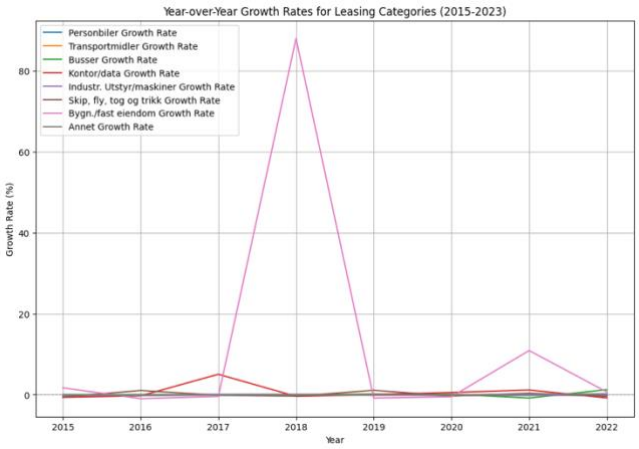

Figure 3

- **Notable Outlier: 'Bygn./fast eiendom'**

This category shows a significant spike in 2018 (over 80%) growth rates over time, which stands out dramatically compared to other categories. Such a sharp increase could reflect a temporary surge in leasing activity due to specific events, policy change or market demand.

- **Minor Growth Variability Categories**

Categories like 'Personbiler', 'Transportmidler', and 'Industr. Utstyr/maskiner' exhibit small, consistent changes, suggesting these are stable and mature segments of the leasing market.

- **Significant Growth Variablility in Specific market**

The category of 'Skip, fly, tog og trikk' shows visible fluctuations, though not as notable as 'Bygn./fast eiendom', reflecting possible cycles in the heavy transportation leasing market.

- **Minimal growth**

'Kontor/data' category appears to have minimal growth, suggesting it may not be as influenced by the same market dynamic as other categories.

2.4 Formulate at least three hypotheses based on observed patterns

Hypothesis 1: Dominance of "Personbiler" in Leasing Development

- From the "Leasing Development for Various Equipment Categories" plot, **'Personbiler' (Passenger Vehicles)** has a significantly larger investment volume compared to other categories. This suggests that passenger vehicles are the primary focus of leasing activities.

- **Hypothesis**: The high dominance of "Personbiler" is driven by its necessity for both private and commercial use in Norway, with steady consumer demand across urban and rural areas.

Hypothesis 2: Cyclical Investment in high-captical investments in "Bygn./fast eiendom" (real estate) and 'Skip, fly, tog og trikk' (heavy transport)

- From the trends plot, 'Bygn./fast eiendom' (Buildings and Real Estate) exhibits sharp growth in specific years (notably 2017-2018), followed by periods of stagnation or decline.

- **Hypothesis**: Investment in real estate and heavy transport leasing are heavily influenced by external factors like interest rates and macroeconomic policies, resulting in periodic growth spurts.

Hypothesis 3: Stable Investment in Industrial Equipment Categories

- The growth rate plot reveals consist and stable growth trends in industrial categories such as 'Transportmidler' and 'Industr. Utstyr/maskiner'. These categories show minimal impact by the change of corporate leasing interest rate compared to other categories.

- **Hypothesis**: the consist and stable demand of these industrial categories, as well as the minimal impact by leasing interest rate, suggest they are stable investment objects in the leasing market in Norway.

3. Correlation analysis

For correlation analysis, the report utilized linear regression model and statistical results to investigate the linear relationship between two specific features. While the correlation heatmap offers an overview with the correlation degree for all the features.

3.1 Investigate the correlation between interest rates and office/computer equipment leasing

Figure 4 reveals the correlation between the consumer leasing interest rates and office/computer equipment leasing. The blue dots represent the data point leasing amount and the corresponding leasing interest rate. The red regression line slopes upward, indicating a positive relationship between leasing interest rates and office/computer equipment leasing amount. The positive correlation suggest that higher consumer leasing interest rates are associated with increased leasing amount for office/computer equipment. This could reflect increased demand for such equipment even in higher interest rate environments.

In addition, there is a noticeable dispersion in the data points around the regression line. While some data points align closely with the trend, others deviate significantly, suggesting variability in the relationship. The pink shaded region represents the confidence interval for the regression line. It is relatively wide, indicating uncertainty about the precise strength of the relationship between the variables. The wide confidence interval suggests caution in using the regression model for precise predictions.

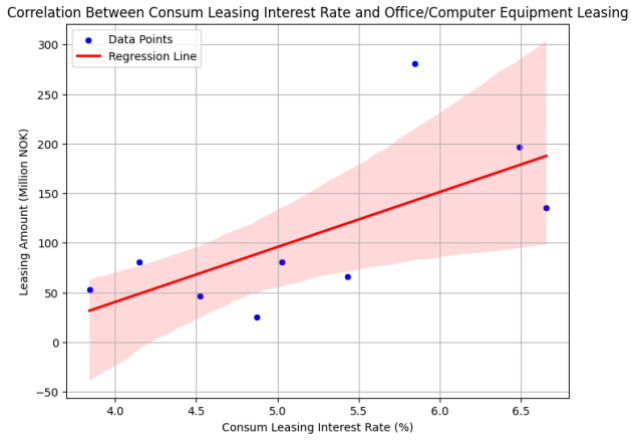

Figure 4

3.2 Perform statistical tests to validate the findings

Statistical Results:
Pearson Correlation Coefficient: 0.66
P-Value: 0.0539
Linear Regression Equation: y = 55.36x -180.97
R-Squared: 0.43

- Pearson correlation coefficient (0.66): is in the middle of 0 and 1, which indicates a moderate positive correlation exists between consumer leasing interest rates and leasing amounts for office/computer equipment. This suggests that as the interest rates increase, the leasing amount also tends to increase, though not perfectly.

- P-Value (0.0539): is slightly above the typical threshold of 0.05, this means the correlation is not statistically signifiant at the 5% level. However, it is close enough to suggest a potential relationship that warrants further exploration.
- Linear Regression Equation: slope 55.36 indicates that for every 1% increase in consumer leasing interest rates, leasing amount for office/computer equipment increases by NOK55.36 million on average. The intercept -180.97 suggests when the leasing interest rate is 0% (a hypothetical scenario), the leasing amount would be negative. This indicates that the model is best applied within the observed range of leasing interest rates.
- R-Squared Value (0.43): means that 43% of the variance in office/computer equipment leasing amount is explained by the variation in consumer leasing interest rates. This indicates a moderate level of explaination, leaving 57% of the ariantion unexplained by this factor.

3.3 Visualize the connections

The correlation heatmap (Figure 5) provides a visual summary of the relationships between the various variables in the dataset. Numbers in the heatmap, the more closer to 1, indicates the stronger correlations between two variables. As well as the color more closer to red, the stronger correlations of the two variables. On the contrary, less correlation. Key observations as below:

- Strong Positive Correlations.

The strongest correlation between ‘Personbiler’ and ‘Total investeringer’ (1.0) indicates personal cars account for a large share of total leasing investments. And a strong correlation between ‘Bedriftens Utlån Renter’ and ‘Totalt Utlån Renter’ (0.98), indicating that the corporate leasing interest rates follow changes in overall leasing interest rates.

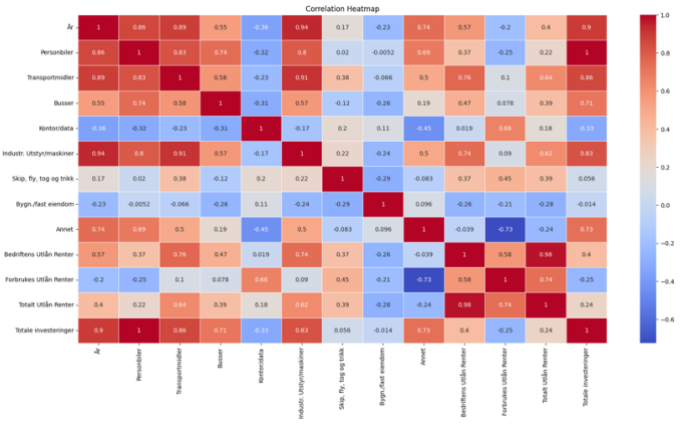

Figure 5

An other strong correlations are observed on ‘År’ vs. ‘Industr. Utstyr/maskiner’ (0.94), ‘År’ vs. ‘Tranportmidler’ (0.89), ‘År’ vs. ‘Personbiler’ (0.86). This suggests steady increase in these investments over the analyzed years. And a very strong correlation between ‘År’ and ‘Total Investeringer’ (0.90), indicating an overall upward trend in leasing investment market from 2015 to 2023 in Norway.

The heatmap reveals that ‘Transportmidler’ has very high correlation with ‘Personbiler’ (0.83), and with ‘Industr. Utstyr/maskiner’ (0.91). This suggests that investments in transport equipment often align with investment in both personal cars and industrial sectors.

- Medium Positive Correlations.

The category of ‘Bedriftens Utlån Renter’ displays medium - high correlation with ‘Transportmidler’ (0.76) and with ‘Industr. Utstyr/maskiner’ (0.74). This implies that industrial and transport equipment – related investments are senstive to corporate leasing interest rates. Medium correlation degree between ‘Forbrukes Utlån Renter’ and ‘Kontor/data’ (0.66), suggests that investments in office/computer equipment are influenced by consumer leasing interest rates.

- Weak Negative Correlations.

The category of ‘Bygn./fast eiendom’ is observed to have negative correlation with ‘År’ (-0.23) and weeker correlation with other categories.This suggests stagnant or declining investment in this category over time, and limited interdependence from other investments. As the trends observation in Section 2.2, this also reveals the cyclical nature of building/real easte sector from another aspect.