**Affordable Residences in Canada: A Provincial-level Analysis**

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**Objective**

This project will study the affordability landscape for Canadian citizens. The current rate of consumer product inflation in combination with surging house prices has made certain parts of Canada unfeasible to settle in. This project will analyze the cost of purchasing a residence in various provinces in order to determine which locations can still be considered reasonably affordable.

**Data Sources Accessed**

Data has been collected from various online resources for relevant metrics from each province to assist with the investigation:

**Median Incomes** – This data provides details on the median incomes of various demographics within each of province of Canada

https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1110019001

**Housing Affordability Index** – This data describes the proportion of income an individual who is an average earner must allocate towards mortgages and housing taxes for an average price home

https://www.bankofcanada.ca/rates/indicators/capacity-and-inflation-pressures/real-estate-market-definitions/

**Mortgage Rates** – This data lists the historical mortgage rates as set by the Bank of Canada

https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3410014501&cubeTimeFrame.startMonth=08&cubeTimeFrame.startYear=2010&cubeTimeFrame.endMonth=12&cubeTimeFrame.endYear=2022&referencePeriods=20100801%2C20221201

**Consumer Price** **Index** – The consumer price index tracks the prices of every day household items including groceries and toiletries and evaluates them against the average income in the area in which the data is collected

<https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1810000402>

**Relevant Business Questions**

This project will answer questions such as:

* Which is the most affordable province to be employed, purchase a home and live in?
* Which is the least affordable province to be employed, purchase a home and live in?
* Which province would likely provide the highest pay for a remote position?
* Which province would likely provide the lowest pay for a remote position?
* Which province would be most affordable to work remotely in?
* Which province would be least affordable to work remotely in?

As a side note, reliable data could not be sourced for the Northwest Territories, Nunavut, or the Yukon territory so they will be excluded from the analysis.

**Solution Strategy**

The average house prices of various residence types will be compared against the median yearly income for each respective province. The dataset will also be used to forecasted using ARIMA models to observe predicted trends that may suggest upcoming changes in the affordability landscape. The data will be displayed on an interactive Power BI dashboard that will be used to communicate trends and insights, focusing on the number of yearly salaries required to pay off a residence in full, and changes in the housing market and average income over time.

**Solution Alternative**

Using python to produce visualizations was an alternative to using Power BI that was considered. Sample plots generated with python that might have been used are posted below.

Chart

Description automatically generated Chart

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Chart, bar chart

Description automatically generated Chart, bar chart, histogram

Description automatically generated

**Actions and processes required to support implementation of alternative**

In order to efficiently implement the alternative, further data processing is required to edit the date datapoints so that they only contain the year. This preprocessing is currently implemented through PowerBI’s tool, power query. Additionally, more dataframes would need to be created in order to properly manage relationships between columns in the current dataframes. This would allow for more nuanced visualizations to be created. Unfortunately, swapping to this alternative would remove the ability to drill down into individual values and eliminate user interactivity which are features we are currently enjoying in Power BI.

**Gap Analysis**

This SWOT analysis compares the chosen method of using Power BI to visualize the housing data with the alternative, using Python to visualize the housing data. Strengths, weaknesses, opportunities, and threats are listed for each tool to determine which option will provide the most tangible benefits. After conducting the SWOT analysis, I’ve determined that using Power BI over Python is preferential due to the value provided by gaining experience with the tool.

Diagram

Description automatically generatedDiagram

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**Methods to reach the target goal applied to overcome gaps**

Continuous self-learning of the PowerBI software has been applied to ensure a high-quality final product was produced. Any extra knowledge gained will be useful in future professional endeavours with the software.

**Stakeholder Analysis**

**Projected Stakeholders**

1. **Homebuyers**: Homebuyers are the primary stakeholders in this project as they are the ones who will benefit from the findings. The insights provided will help them make informed decisions as to which province is most affordable when purchasing a home.
2. **Real estate agents**: Real estate agents are also important stakeholders in this project as they are the ones who help homebuyers find and purchase homes. They may use the findings to help their clients make informed decisions about where to buy a home and to adjust their marketing and sales strategies accordingly.
3. **Financial institutions**: Financial institutions such as banks, credit unions, and mortgage lenders are also important stakeholders in this project as they provide financing for home purchases. They may use the findings to adjust their lending policies and rates based on the affordability of residences in different provinces.
4. **Government agencies**: Government agencies, such as the Canada Mortgage and Housing Corporation (CMHC), are also important stakeholders in this project as they have a mandate to promote affordable housing and support the housing market. They may use the findings to develop policies and programs that address affordability issues in different provinces.
5. **Real estate developers**: Real estate developers are stakeholders in this project as they profit from building and selling homes. They may use the findings to identify areas where there is high demand for affordable homes and adjust their development plans accordingly.

**Stakeholder Importance Table**

|  |  |
| --- | --- |
| **Stakeholder** | **Importance** |
| **Homebuyers** | **High** |
| **Real Estate Agents** | **High** |
| **Financial Institutions** | **Medium** |
| **Government Agencies** | **Medium** |
| **Real Estate Developers** | **Low** |

**Importance Justification**

**Homebuyers and real estate agents are the most important stakeholders** as they are directly involved in the purchase and sale of homes and stand to benefit the most from the findings of the project.

**Financial institutions and government agencies are also important stakeholders**, but to a lesser extent, as they play a supporting role in the housing market and can use the findings to adjust their policies and practices.

**Data Privacy and Integrity Considerations**

1. **Data Governance**: Establishing a comprehensive data governance program can help ensure that data is properly managed and protected. This includes policies, processes, and procedures for data collection, storage, use, and sharing, as well as mechanisms for enforcing compliance with relevant laws and regulations. The data initially collected in this project is publicly available. Modified data frames used in this project are only accessible by the internal analyst team and those who have access to the raw dashboard file.
2. **Data Anonymization**: Anonymizing data helps protect the privacy of individuals by removing or replacing identifiable information, such as names or addresses, from datasets. This can be done through various techniques, such as hashing or encryption, and can help prevent unauthorized access to sensitive information. The data that was initially collected had already been aggregated and did not contain any personal data. In this case it was not possible to implement data anonymization.
3. **Secure Data Storage**: Ensuring that data is stored securely is essential for protecting the integrity and privacy of data. This includes using encryption and other security measures to protect data both at rest and in transit, as well as implementing access controls and monitoring systems to prevent unauthorized access. Due to the public availability of the data used in this project, no extreme measures were taken to ensure that the data was completely secure. All the data was stored on the internal team’s hardware which was password protected and stored at a private address.

**Project Findings and Recommendations**

The goal of this project was to identify which provinces offer the most affordable residences based on local wages.

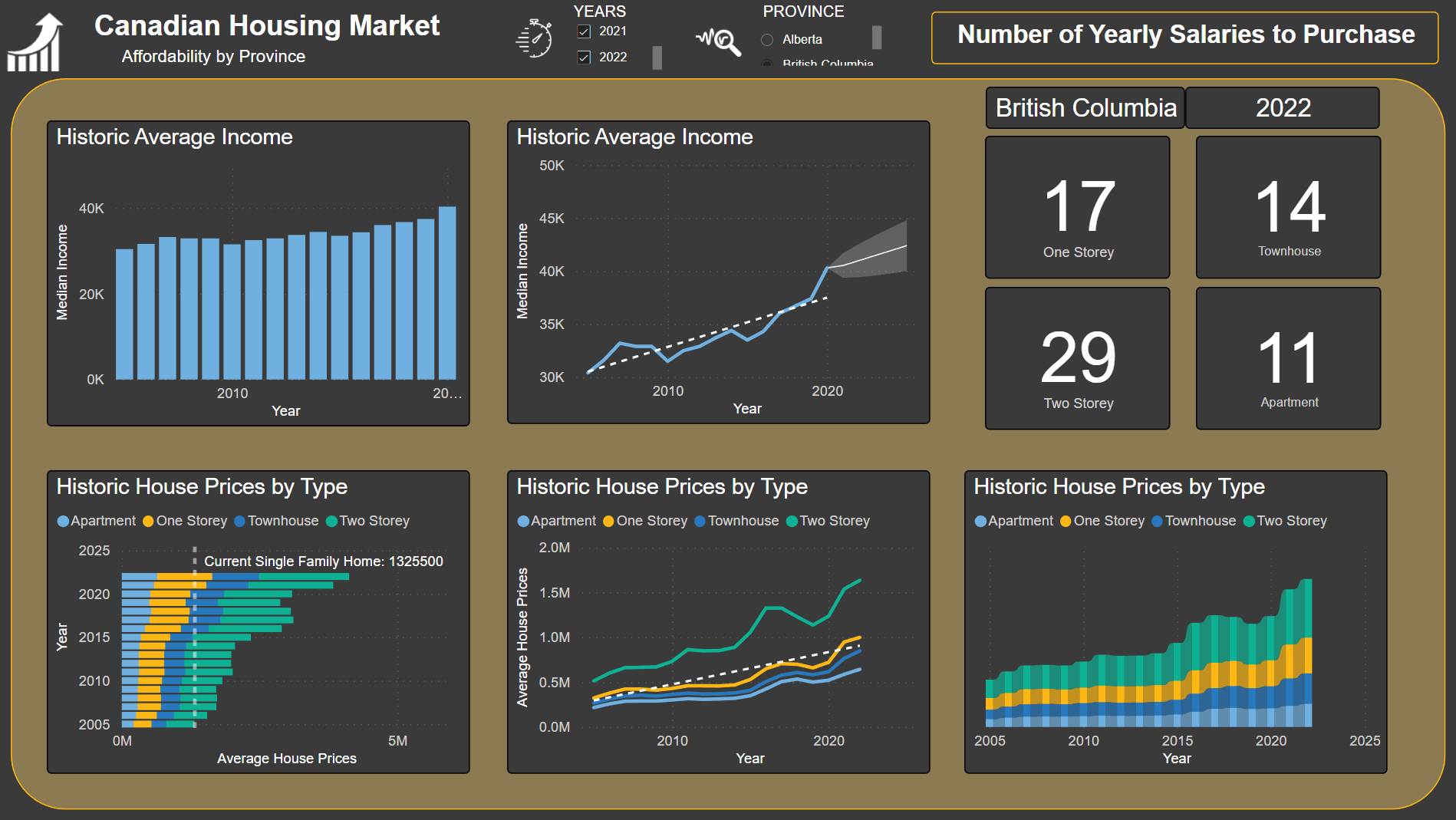
New Brunswick was determined to be the most affordable province to purchase a residence in, requiring only four median local yearly salaries to purchase a townhouse or five to purchase an apartment, one storey, or two storey home. New Brunswick also boasted the cheapest single-family homes coming in at an average of $281,900. This was followed closely by Newfoundland and Labrador who had an average single family home price of $282,400. However, due to the comparably lower local median yearly salary, Newfoundland’s affordability falls more in line with the remainder of the maritime provinces which were PEI who had an average single family home price of $362,800, and Nova Scotia who had an average single family home price of $376,100. In these provinces seven to eight local yearly salaries were required to pay off a single-family home which is over fifty percent greater than the number of yearly salaries required to purchase a single-family home in New Brunswick.

The prairie provinces fit into a medium affordability bracket requiring anywhere from seven to nine local yearly salaries to purchase a single-family home. Saskatchewan and Manitoba led the way with single family home prices averaging $342,100 and $358,700 respectively. On the opposite end, Alberta single family home prices averaged $521,100 and required as many as eleven local median yearly salaries to purchase a two-storey home. Remarkably Quebec’s affordability was nearly equal to Alberta’s which was unexpected.

Ontario and British Columbia boast the least affordable housing conditions in the country. Single family homes in Ontario cost on average $998,200 in 2022 requiring twelve years of local median yearly salary to purchase a one storey and seventeen years of salary to purchase a two-storey home. British Columbia’s affordability levels were even more shocking boasting an average single family home price of $1,325,500 equating to seventeen local median yearly salaries for a one storey or twenty-nine local median yearly salaries for a two-storey home.

In summary, the Maritimes are the most affordable provinces to purchase a home in, followed by the prairie provinces and Quebec, and then by Ontario and British Columbia. It would take approximately six times longer to pay off a two-storey home purchased in British Columbia compared to New Brunswick based on local salaries. In the case of a homebuyer working remotely, the most efficient location to purchase a single-family home is New Brunswick or Newfoundland and Labrador. It should be noted that the Canadian housing market has seen a surge in prices in the last several years so the affordability rankings may be subject to change in the near future.

**Dashboard Samples**



Graphical user interface

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Graphical user interface

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