Exploratory Analysis of Demand for Meat Proteins

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**Introduction**

The exploratory analysis will explore trends between the demand for different meat proteins throughout 2000 – 2019. The objective of the analysis is to look into the variations of proteins and how the demand has changed over time.

**Part One: Protein Demand and Prices**

*Figure 1*

Figure 1 indicates that demand for beef was generally the highest before the Great Recession with chicken right behind. Beef demand was at its highest during 2000 and in 2002. However, post-Great Recession, chicken demand has overtaken beef. Pork was at its highest during the year 2000 but has declined since. The summary statistics also suggest that the demand for fish has fallen up to the recession but has seen growing demand post-recession as seen in Table 1. These trends bring into question whether the Great Recession affected the demand for meat proteins and changed consumer choices.

Additionally, the prices for each protein product has increased over time except for canned salmon. The price of canned salmon decreased by the time the Great Recession occurred but has seen an increase afterward. The demand for chicken as well as its price sees a positive relationship where both demand and price has increased over the years, suggesting that chicken is a preferred protein. The beef and pork demand has an inverse relationship with their respective products, with sirloin steak and pork chops as their price has increased over time. Demand for fish and the price of canned salmon share a somewhat similar trend with both declining until the Great Recession, followed by rising demand and prices afterward.

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| --- | --- | --- | --- | --- |
| **Summary Statistics of protein demand (in kilograms) before the Great Recession (Q1 2000 – Q4 2007)** | | | | |
| **Statistic** | **Chicken** | **Beef** | **Pork** | **Fish** |
| **Mean** | 30.50 | 30.86 | 25.87 | 9.15 |
| **Median** | 30.69 | 30.69 | 25.62 | 9.22 |
| **Standard Deviation** | 0.44 | 0.69 | 1.96 | 0.58 |
| **Minimum** | 29.12 | 29.94 | 23.06 | 7.50 |
| **Maximum** | 30.99 | 32.40 | 28.94 | 9.81 |
| **Summary Statistics of protein demand (in kilograms) during the Great Recession (Q1 2008 – Q3 2009)** | | | | |
| **Mean** | 30.93 | 28.76 | 23.52 | 7.70 |
| **Median** | 30.95 | 28.65 | 23.65 | 7.78 |
| **Standard Deviation** | 0.12 | 0.59 | 0.36 | 0.27 |
| **Minimum** | 30.77 | 27.08 | 22.81 | 7.22 |
| **Maximum** | 31.12 | 29.75 | 23.89 | 8.05 |
| **Summary Statistics of protein demand (in kilograms) after the Great Recession (Q4 2009 – Q1 2019)** | | | | |
| **Mean** | 30.79 | 26.29 | 21.59 | 8.37 |
| **Median** | 31.42 | 25.73 | 21.67 | 8.37 |
| **Standard Deviation** | 1.76 | 1.11 | 0.64 | 0.42 |
| **Minimum** | 29.73 | 24.42 | 20.58 | 7.51 |
| **Maximum** | 35.06 | 27.98 | 23.23 | 9.14 |

*Table 1*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Summary Statistics of prices (per kilogram) before the Great Recession (Q1 2000 – Q4 2007)** | | | | |
| **Statistic** | **Chicken** | **Sirloin Steak** | **Pork Chops** | **Canned Salmon** |
| **Mean** | $ 5.05 | $ 14.24 | $ 9.58 | $ 3.56 |
| **Median** | $ 5.11 | $ 14.33 | $ 9.47 | $ 3.43 |
| **Standard Deviation** | $ 0.41 | $ 1.14 | $ 0.46 | $ 0.35 |
| **Minimum** | $ 4.34 | $ 11.16 | $ 8.25 | $ 3.20 |
| **Maximum** | $ 5.73 | $ 16.31 | $ 10.65 | $ 4.37 |
| **Summary Statistics of prices (per kilogram) before the Great Recession (Q1 2008 – Q3 2009)** | | | | |
| **Mean** | $6.18 | $15.62 | $9.93 | $3.30 |
| **Median** | $6.27 | $15.52 | $9.44 | $3.30 |
| **Standard Deviation** | $0.22 | $0.52 | $0.23 | $0.03 |
| **Minimum** | $5.85 | $14.94 | $9.09 | $3.27 |
| **Maximum** | $6.41 | $16.41 | $9.76 | $3.34 |
| **Summary Statistics of prices (per kilogram) after the Great Recession (Q4 2009 – Q1 2019)** | | | | |
| **Mean** | $7.13 | $19.93 | $11.45 | $4.07 |
| **Median** | $7.18 | $20.36 | $12.01 | $4.34 |
| **Standard Deviation** | $0.40 | $3.27 | $1.22 | $0.61 |
| **Minimum** | $6.33 | $15.16 | $9.18 | $3.04 |
| **Maximum** | $7.76 | $24.94 | $13.08 | $5.42 |

*Table 2*

**Part Two: Population and Wages**

*Figure 2*

|  |  |  |
| --- | --- | --- |
| **Slope Coefficients for Quarterly Wages** | | |
| Period | Q1 2000 - Q4 2009 | Q1 2010 – Q1 2019 |
| Coefficients | 0.368602 | 0.738104 |

*Table 3*

Quarterly wages from the years 2000 – 2009 is growing at a steadier, higher rate than 2010 – 2019 with a coefficient of 0.368602. This suggests that demand was higher for beef for a brief amount of time because consumers have more income to spend during the period 2000 – 2009. However, from 2010 – 2019, wages are growing at a lower rate compared to 2000 – 2009 with a coefficient of 0.738104. Income may be unable to keep up with the rising prices of steak during 2010 - 2019, contributing to the declining demand for beef. Additionally, chicken demand continues to rise despite the rising prices, perhaps due to a more affordable price. For pork, the demand for this protein is less than chicken and beef. The price of pork chops lies between chicken and sirloin steak, so pork could be a substitute in place of beef. Finally, for fish, demand dropped up until 2007, possibly because increasing incomes allow consumers to buy other desirable meat proteins to consume. After 2007, demand fish demand saw increases possibly because income was growing at a slower rate, and prices were lower compared to other meat proteins as seen with canned salmon.

*Figure 3*

|  |  |  |
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| **Slope Coefficients for Quarterly Wages** | | |
| Period | Q1 2002 - Q4 2009 | Q1 2015 – Q1 2019 |
| Coefficients | 884.42113 | 1234.0398 |

*Table 4*

By comparing the slope coefficient from Q1 2002 – Q4 2009 with the coefficient from period Q1 2015 – Q1 2019 in Table 3, we can see that during Q1 2015 – Q1 2019, the population was growing at a quicker rate. It suggests that with a faster rate of population growth, there will be more demand for meat as families may want to purchase more meat for the household. Additionally, their preferences for meat may depend on the amount of income a family has.

**Part Three: The data**

Previously I proposed using the *Median Income of Couple Families* as one of my datasets. However, it is now replaced with the *Quarterly Monthly Wages* dataset, as it is more suitable. Additionally, *Population Estimates, Quarterly* was added to conduct a more accurate analysis. The data uses protein demand from Agriculture Canada which was transformed from yearly data into quarterly data. Wages, prices, and population were obtained from Statistics Canada. Wages and prices were also transformed from monthly data into quarterly data as well to match the quarterly data of the population.

**References**

[**Agriculture Canada. https://www5.agr.gc.ca/eng/animal-industry/red-meat-and-livestock-market-information/protein-disappearance-and-demand-by-species/?id=1415860000022, accessed on November 28, 2020**](file:///C:\Users\Kevin\AppData\Roaming\Microsoft\Word\Agriculture%20Canada.%20https:\www5.agr.gc.ca\eng\animal-industry\red-meat-and-livestock-market-information\protein-disappearance-and-demand-by-species\%3fid=1415860000022,%20accessed%20on%20November%2028,%202020)

[**Statistics Canada. Table 14-10-0063-01 Employee wages by industry, monthly, unadjusted for seasonality DOI: https://doi.org/10.25318/1410006301-eng**](file:///C:\Users\Kevin\AppData\Roaming\Microsoft\Word\Statistics%20Canada.%20Table%2014-10-0063-01%20Employee%20wages%20by%20industry,%20monthly,%20unadjusted%20for%20seasonality%20DOI:%20https:\doi.org\10.25318\1410006301-eng)

[**Statistics Canada. Table 17-10-0009-01 Population estimates, quarterly  
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[**Statistics Canada. Table 18-10-0002-01 Monthly average retail prices for food and other selected products  
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