Grocery/Retail Store Inventory

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*Abstract*— This project develops a database system to analyze the relationship between farm prices, retail prices, and income levels across major U.S. cities. Using datasets on produce prices and income per capita, the system provides tools to track price markups from farm to retail, enabling the identification of pricing trends and economic disparities in food access. Implemented using MySQL Workbench, the project integrates historical price data with regional income statistics to explore how price markups vary by city and over time. The goal is to provide insights that inform pricing fairness, food policy, and economic planning.

# Introduction

In today's fast-paced retail environment, efficient inventory management is crucial for business success. Many stores struggle with tracking stock levels, preventing overstocking or stockouts, and ensuring smooth operations. The purpose of this project is to develop a robust database system for managing inventory in a retail store, offering a centralized platform for monitoring and controlling product stock. The primary problem this project seeks to address is the lack of real-time, accurate inventory tracking, which leads to operational inefficiencies and potential revenue loss. By implementing a well-organized and automated database system, the project aims to streamline inventory processes, reduce human error, and enhance decision-making. The specific goals include designing a user-friendly interface for managing products, implementing real-time stock updates, and generating insightful reports to improve store performance and customer satisfaction

# Literature REview

## Farm and Retail Food Prices

This paper analyses the relationship between monthly observations on farm level and retail level prices of three meats, seven fresh vegetables, five fresh fruits, eggs and cereals over the 1970's. A priori reasoning and results of Sim's causality tests suggest that in most cases changes in farm prices cause changes in retail prices rather than the reverse or a simultaneous relationship. Markup price relationships are estimated. Most of the variation of retail prices is explained by the current farm price, lagged farm prices, a wage variable, and last period's retail price of a substitute product.

## Farm Input, Farm Output and Retail Food Prices: A Cointegration Analysis

This paper investigates the adjustment mechanism between farm input prices, farm output prices and food retail prices in Canada. Johansen's maximum likelihood approach is used in addition to the Engle-Granger approach to test for cointegration. Contrary to the common assumption that farm output prices are more flexible than farm input prices, it is found that farm output prices, though cointegrated, are weakly exogenous in the sense that they do not respond in a systematic manner to disequilibrium in farm input prices and retail food prices. Evidence is found to support “cost push” and “demand pull” theories but, since food retail prices carry a heavier weight in the cointegration relations, it can be concluded that shocks manifesting themselves (first) at the retail level do not persist as long.

## An Exploration of the Relationship Between Income and Eating Behavior

This paper explores the relationship between income and eating behavior. To do this they examine choice in two food categories: milk and soft drinks. These categories have varieties differing in health qualities but either no differences in cost or lower cost for the healthier types. By examining food choices when there are no measurable cost differences but clear health differences, they were are able to isolate the association between income and healthy eating behavior. They find a negative association between income and dietary intake of higher-calorie types of milk and soft drinks. Their estimates are consistent across the five sets of the National Health and Nutrition Examination Survey and the Continuing Survey of Food Intakes by Individuals data that they study. For 2005 they estimate that an income increase of $10,000 is linked to a reduction in 377 calories from milk and 2,555 calories from soft drinks per year. Their results suggest that the cost of food may not be the only reason why low income people have less healthy diets.

## Determining the impact of food price and income changes on body weight

They developed a theoretical model to identify conditions under which price and income changes are most likely to change weight. Although it is intuitive that raising the price of high-calorie food will decrease consumption of such goods; it is not clear that such an outcome will actually reduce weight. Their empirical analysis demonstrates a case where a tax on food away from home, a food intake category blamed for much of the rise in obesity, could lead to an increase in body weight; a finding which emphasizes the need to employ economic modeling when developing public policy to reduce obesity.

# Methodology

In this project, MySQL workbench was the main tool used to create this database as well as the analysis. For the data used in the database, a free to use data base from a website named Kaggle was used. This dataset included the farm price and retail price of 23 unique products in 4 major cities such as ATL, LA, Chicago, and NYC. This dataset also contained those prices from 2001-2023.

Another source used was statsamerica.org where I found a free dataset for the income per capita for roughly the past 2 decades in a variety of places. Through this dataset I filtered out only the income per capita that relate to the retail prices in the first dataset I had, so ATL, LA, Chicago, and NYC.

Below is the script used to create the database:

DROP DATABASE project;

-- CREATE DATABASE

CREATE DATABASE IF NOT EXISTS project;

USE project;

CREATE TABLE IF NOT EXISTS produce

(

product\_id INT NOT NULL PRIMARY KEY AUTO\_INCREMENT,

product\_name VARCHAR(25) NOT NULL

);

INSERT INTO produce (product\_id, product\_name)

VALUES

(1, 'Asparagus'),

(2, 'Avocados'),

(6, 'Carrot'),

(7, 'Cauliflower'),

(8, 'Celery'),

(13, 'Nectarines'),

(14, 'Oranges')

;

CREATE TABLE IF NOT EXISTS produce\_prices

(

product\_id INT NOT NULL,

product\_name VARCHAR(25) NOT NULL,

date DATE NOT NULL,

farm\_price DECIMAL(10,2) NOT NULL,

atl\_retail DECIMAL(10,2) NOT NULL,

la\_retail DECIMAL(10,2) NOT NULL,

nyc\_retail DECIMAL(10,2) NOT NULL,

chicago\_retail DECIMAL(10,2) NOT NULL,

retail\_markup DECIMAL(10,4),

FOREIGN KEY (product\_id) REFERENCES produce(product\_id)

);

CREATE TABLE IF NOT EXISTS cities

(

city\_id INT NOT NULL PRIMARY KEY AUTO\_INCREMENT,

state VARCHAR(5) NOT NULL,

city VARCHAR(25) NOT NULL

);

INSERT INTO cities (state, city)

VALUES

('IL', 'Chicago'),

('NY', 'New York City'),

('CA', 'Los Angeles'),

('GA', 'Atlanta');

CREATE TABLE income

(

city\_id INT NOT NULL,

state VARCHAR(15) NOT NULL,

city VARCHAR(25) NOT NULL,

year INT NOT NULL,

income\_percapita INT NOT NULL,

PRIMARY KEY (city\_id, year),

FOREIGN KEY (city\_id) REFERENCES cities(city\_id)

);

I will also provide a few simple query’s I used to analyze the dataset

To find the average retail markup for each product:

SELECT

p.product\_name,

ROUND(AVG(pp.retail\_markup), 4) AS avg\_markup

FROM

produce\_prices pp

JOIN

produce p ON pp.product\_id = p.product\_id

GROUP BY

p.product\_name;

Compare farm price vs. retail price in NYC(or any of the cities) for a specific product:

SELECT

date,

farm\_price,

nyc\_retail,

(nyc\_retail - farm\_price) AS price\_diff

FROM

produce\_prices

WHERE

product\_name = 'Avocados'

ORDER BY

date;

Get the highest marked up product in a city(change city name accordingly):

SELECT

product\_name,

MAX(atl\_retail - farm\_price) AS max\_markup

FROM

produce\_prices

GROUP BY

product\_name

ORDER BY

max\_markup DESC

# Conclusion

Based on the analysis done to the dataset, I found that generally in the early 2000s and around 2012 the average markup from farm to retail in all cities was the highest its ever been. It sat at a staggering 200-300% increase. In the later 2010’s did prices ever get to lower markups around 10-30% which sounds more reasonable. In relation to the income, generally speaking the income only grew over time the farm price grew as well. Based on these numbers alone, if you weren’t caught up with our current inflation, these numbers and statistics of growing prices as income grows just shows how much more money was worth back then.

##### References

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