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Abstract

The objective of this dissertation is to determine the effect of expected demand on aggregate employment in the United States (U.S.) for the period 1948 Q1 to 2023 Q3. The relationship is studied using both qualitative and quantitative analysis.

My work is primarily based on expectations theory and on Keynesian economic theory, carefully considering the work of Lucas, Muth, and Sargent on expectations theory; and the work of Keynes on unemployment and effective demand. My model results indicate that economic expectations have a significant effect on aggregate employment.

The Research Problem is "What are the determinants of changes in aggregate employment in the United States of America (U.S.)?" This is an important research topic because significant increases in unemployment can have profound effects on an entire society, not just on its unemployed workers. When unemployment increases significantly, public health declines, crime increases, suicides increase, and public revenues decrease. Government is then placed in the unenviable position of facing increased demand for public services at the very time that public revenue is declining.

The Research Hypothesis is "Firms increase and decrease employment in response to changes in expected demand." Two proxies for expected demand are used in the dissertation: nonresidential fixed investment, and personal consumption expenditures.

The literature review was used to identify specific variables that some labor economists believe have a significant impact on employment. The literature review identifies two major research gaps in the study of aggregate employment in the U.S. These gaps are a shortage of papers on the effect of expected demand on aggregate employment; and that papers on expected demand and aggregate employment have not been updated to account for the economic effects of Covid-19, which began in the autumn of 2019.

The author addresses these research gaps by submitting a dissertation on expected demand and aggregate employment; and by including data for the period 1948 Q1 to 2023 Q3, thereby accounting for the economic effect of the Covid-19 pandemic.

As a result of the Covid lockdowns, civilian employment declined by twenty-two million jobs from February 2020 to April 2020. The U.S. government then spent approximately $5 trillion dollars to provide relief to businesses, individuals, and local government. As a result of the relief programs, total employment rose from 130.4 million in April 2020 to 156.9 million in December 2023.

The relief programs increased disposable income thereby increasing personal consumption. In so doing, government changed expectations as measured by personal consumption expenditures and nonresidential fixed investment. The increase in personal consumption raised business expectations and resulted in increases in nonresidential fixed investment, which increased employment.

The empirical results confirm my hypothesis. A total of sixteen models are presented in this dissertation. Every one of these models indicate that the two expected demand proxies have a significant effect on employment at below the 0.05 level.

The short-run models used included OLS, WLS, and ARCH-family models. A Fractionally Integrated GARCH (FIGARCH) model was used to estimate the long-run effects. The FIGARCH model estimated that the two expected demand proxies accounted for over 41% of the average change in employment over the course of this study.

About the Author

The author is the President (2004-2024) of Coast Economic Consulting and has been working as an economist since 1998. He has been a forecaster for the National Association for Business Economics' (NABE) Outlook Forecast since 2008. To the extent that citations are not provided for statements contained in this dissertation, those statements are the opinion of the author and are based on the author's education and experience.

A list of the author's published papers and working papers is provided below in a bibliographic format.

Published Papers

Reid L. (2023) A Study of Macroeconomic Variables that Affected Employment in the United States from 1948-2021. *Central European Review of Economics and Finance* 44:3:125-152. https://doi: 10.24136/ceref.2023.017, 70 points.

Reid L. (2023) A Study of Expected Demand and Aggregate Employment in the United States from 1948-2021. *Athens Journal of Social Sciences* 10:3:217-240. https://doi: 10.30958/ajss_v10i3.

Reid L. (2021) The Economic Effect of the COVID-19 Lockdown in the United States: Was the Cure Worse than the Disease? *Athens Journal of Health and Medical Sciences*, 9:1-21. https://doi.org/10.30958/ajhms.9-3-4.

Reid L. (2019) Why Insurgent Campaigns Rarely Win the Democratic Presidential Primary in the United States. *Athens Journal of Social Sciences* 6:2:139-153. https://doi.org/10.30958/ajss.6-2-4.

Reid L. (2018) Has the Brexit Vote Affected the United Kingdom's Largest Trading Partners? *Athens Journal of Social Sciences* 5:3:291-312. https://doi.org/10.30958/ajss.5-3-4.

Reid L. (2017) Did the Euro Harm the Greek Economy? Special Topics in Economics and Management, 2017, ISBN: 978-960-598-103-7, pp. 99-109. Athens Institute for Education and Research, Athens, Greece. Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2655923.

Reid L. (2016) The Political Segregation of the United States. Athens Journal of Social Sciences, April 2016, 3:2:85-98. https://doi.org/10.30958/ajss.3-2-1.

Working Papers

Reid L. (2019) The Effect of American and European Sanctions on Russia. Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3439207. https://doi.org/10.2139/ssrn.3439207.

Reid L. (2016) Has A High Value Added Tax Harmed the European Economy? Available at https://papers.ssrn.com/sol3/papers.cfm? abstract_id= 2822998. https://doi.org/10.2139/ssrn.2822998.

Reid L. (2012) Is the Discounted Cash Flow (DCF) Model a Biased Estimator of Stock Returns? (with Ron Knecht) Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2656393. https://doi.org/10.2139/ssrn.2656393

Reid L. (2012) Why Did the American Recovery and Reinvestment Act (ARRA) Fail, or Did It? Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id= 2655957. https://doi.org/10.2139/ssrn.2655957.

Reid L. (2011) Contemporary Evidence from California: Who Gains When Evidentiary Hearings Are Held? Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2656526. https://doi.org/10.2139/ssrn.2656526

Reid L. (2010) Did the American Recovery and Reinvestment Act Fund an Optimal Mix of Tax Reductions and Direct Government Spending? Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2656465. https://doi.org/10.2139/ssrn.2656465.

Reid L. (2002) Is the CAPM a Biased Estimator of Market Risk? Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2656519. https://doi.org/10.2139/ssrn.2656519

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However, I am solely responsible for the contents of this dissertation.

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INTRODUCTION AND HYPOTHESIS[1]

The objective of this dissertation is to determine the effect of expected demand on aggregate employment in the United States (U.S.) for the period 1948 Q1 to 2023 Q3. The relationship is studied using both qualitative and quantitative analysis (regression analysis). A theoretical model is provided in Chapter 2 and a historical overview of employment theories and expectations theory are provided in the Literature Review.

Regression analysis was used to estimate the values of the coefficients. The following types of regression analysis are used in this dissertation: Ordinary Least Squares (OLS), Weighted Least Squares (WLS), Auto Regressive Conditional Heteroskedasticity (ARCH), and Vector Auto Regression (VAR).

The research problem is: "What are the determinants of changes in aggregate employment in the United States of America (U.S.)?" This is an important research topic because significant increases in unemployment can have a profound effect on an entire society, not just on its unemployed workers. When unemployment increases significantly, public health declines, crime increases, suicides increase, and public revenues decrease. The government is then placed in the unenviable position of facing increased demand for public services at the very time that public revenue is declining.

During a large economic decline, governments can become unstable, and unsavory individuals can rise to positions of power. For example, Adolf Hitler rose to power in Germany in 1933 during the depths of the Great Depression.

My Research Hypothesis is "Firms increase and decrease employment in response to changes in expected demand." The dissertation confirms the hypothesis and finds that firms are risk averse and thus are overly pessimistic during both high growth and recessionary periods (See Chapter 4, Table 16).

I first became interested in the relationship between expectations and employment in 1996 in a graduate macroeconomics class at the University of California at Santa Cruz. In that class, I studied the work of Lucas, Muth, and Sargent on how expectations affected inflation.

Over the past twenty-eight years, I have explored whether expectations could have an affect on other macroeconomic variables such as employment and on other branches of economics and finance.[2] When I worked for the California Public Utilities Commission (1998-2005), I made presentations on the relationship between expectations and utility regulation.

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[1] This dissertation is written in American English and the Bibliography conforms to the Harvard Reference Style.

[2] In the Suggestions for Future Research section of the Conclusion, I mention that research on expectations should become part of other economic fields as well.

The dissertation focuses on aggregate employment rather than on the unemployment rate because of the problem of labor-force dropouts affecting the calculation of the unemployment rate. The U.S. unemployment rate is calculated by dividing the number of unemployed by the number of labor-force participants. An individual is not considered to be a member of the labor force unless they are either employed, or unemployed and actively seeking employment.

When the U.S. economy starts to improve, the size of the labor force will increase as more individuals start looking for work. The reverse is true when economic conditions deteriorate. For these reasons, the official U.S. unemployment rate might increase when economic conditions improve and decrease when the economy declines.

For example, the U.S. civilian labor force declined from 164.6 million in December 2019 to 160.2 million in January 2021. (Federal Reserve Bank of St. Louis 2021) The unemployment rate rose from 3.6% to 6.3% during the same period. Table 1 below gives the monthly change in the U.S. labor force and the monthly change in the unemployment rate from January 2020 to January 2021.

Table 1: Monthly Change in the U.S. Labor Force and the U.S. Unemployment Rate

Month	Change in the Size of the U.S. Labor Force (Thousands)	Change in the U.S. Unemployment Rate (%)
January 2020	–124	–0.1
February 2020	–7	0.0
March 2020	–1,727	0.9
April 2020	–6,243	10.4
May 2020	1,722	–1.5
June 2020	1,597	–2.2
July 2020	288	–0.9
August 2020	733	–1.8
September 2020	–740	–0.6
October 2020	640	–0.9
November 2020	–182	–0.2
December 2020	31	0.0
January 2021	–406	–0.4
Average	**–340**	**0.2**

Source: Federal Reserve Bank of St. Louis (2023), calculations by author.

One might expect that the change in the size of the labor force would be negatively correlated with the change in the unemployment rate. On average, the data confirms this expectation. The correlation coefficient between the nominal values of the two series is –0.96. Table 1 shows that the labor force declined by an average of 340,000 and the unemployment rate rose by an average of 0.2%. However, this negative correlation was not true in every month. The change in the labor force was positively correlated with the change in the unemployment rate in January 2020, September 2020, November 2020, and January 2021.

The purpose of this literature review is to provide a historical overview of literature on employment, and to identify variables that some labor economists believe to have an effect on aggregate employment. The typical literature on employment focuses on a small number of variables which the researcher believes are statistically or theoretically significant. Thus, Okun A. (1962) focused on the relationship between employment and Gross National Product (GNP), Keynes J. (1936) on effective demand, and neoclassical economists on perfect competition.

Based on the literature review, the following variables were used in the paper's initial regression analysis using nominal values: total nonfarm civilian employment, the consumer price index, government expenditures, international trade (imports plus exports), yield of the 10-year U.S. treasury bond, the manufacturing employment percentage, M3 money stock, current tax revenues, the federal minimum wage, nonresidential fixed investment, and personal consumption expenditures. Data was taken from the Federal Reserve Bank of St. Louis (FRED), the U.S. Bureau of Labor Statistics (BLS), and the U.S. Bureau of Economic Analysis (BEA).

All of the papers on expectations and employment reviewed for this dissertation agree that expected demand is positively correlated with total employment. In other words, employment tends to increase in a current or future period if expected demand increases in period t.

Despite this agreement, much is unknown about the relationship between expected demand and employment. Economists do not know how expected demand interacts with other macroeconomic variables such as taxes, government spending, money supply, international trade, and other variables.

The literature review identifies two major research gaps concerning studies of aggregate employment in the U.S.: a shortage of papers on the effect of expected demand on aggregate employment; and papers that account for the economic effect of the Covid-19 pandemic, which began in 2019. The author addresses these research gaps by submitting a dissertation on expected demand and aggregate employment and by using data for the period 1948 Q1 to 2023 Q3; thereby accounting for the economic effect of the Covid-19 pandemic.

The remainder of this dissertation is structured in the following way:

> Chapter 1 discusses expectations theory, explains how expectations affect aggregate demand, and explains how public policies shape expectations.
>
> Chapter 2 provides a theoretical model, describes the variables used in the empirical analysis, and discusses some of the variables that were omitted due to a lack of observations.
>
> Chapter 3 discusses different types of empirical analysis and the advantages and disadvantages of each type of analysis.

Chapter 4 provides the modeling methodology and modeling results discussed in Chapter 3. Section A provides a descriptive analysis of U.S. employment. Section B provides a description of the input and output variables, and Section C provides and interprets the model results.

Chapter 5 discusses how expectations have changed over time as measured by public opinion polls, discusses policy implications, and makes public policy recommendations.

LITERATURE REVIEW

The purpose of this literature review is to provide a historical overview of literature on employment, and to identify variables that some economists believe to have an effect on aggregate employment. The typical literature on employment focuses on a small number of variables that the researcher believes are statistically or theoretically significant. For example, Okun focuses on the relationship between employment and GNP, Keynes on effective demand, and neoclassical economists on perfect competition.

The literature review explored the four subjects listed below. These subject areas were chosen because, taken together, they help explain much of the effect of the suggested variables on aggregate employment during the period of the study. The four subjects are historical economic theory, expectations theory, growth models, and labor economics.

A. Historical Economic Theory

The classical theory of employment was developed by Ricardo, D. (1817), Say, J.B. (1834), Mill J.S. (1848); Smith A. (1776), and Pigou, A. (1933). Their theories postulate that if market forces are allowed to operate in an economic system, they will eliminate overproduction and make the economy produce output at the level of full employment. Say is famous for the development of Say's Law, which states that the production of a product creates demand for a different product.

Other theories about employment include the neoclassical theory of employment (Vercherand J. 2014), and Keynesian theory as described in "The General Theory of Employment, Interest, and Money." (Keynes J. 1936). Keynes eschewed classical theory and argued that: (p. 34)

> It may well be that classical theory is how we would like our economy to behave. But to assume that it actually does so is to assume our difficulties away.

Economic theory should not be taken as providing a definitive answer to an economic problem. Instead, researchers should view theory as guidance for the development of new research and applications. I note that the theories mentioned above were first published from 91 to 248 years ago.

The economic system of the United States has changed significantly since those theories were first published. These economic changes have included the abolition of slavery, new technologies, democratization, urbanization, increased regulation, and legislative changes.

That an economic theory is inconsistent with current economic data does not mean that the theory is no longer relevant. It does suggest that more research is needed, and that the theory should be updated. For example, neoclassical economics is essentially an update of classical economics. Neoclassical economics integrates the cost-of-production theory from classical economics with the concept of utility maximization and marginalism.

Neoclassical economists argue that employment policy should attempt to achieve greater labor market flexibility and wage flexibility so that perfect competition can be achieved. According to neoclassical economists, perfect competition will lead to the solution of the problem of unemployment. (See Bentolia S. and Saint-Paul G. 1992; and Emerson M. 1988)

Mark Blaug has argued that "The endogenous variables manipulated in neoclassical models were frequently incapable of being observed, even in principle, and most of the theorems that emerged from the analysis likewise failed to be empirically meaningful." (Blaug M. 1985, p. 700)

B. Expectations Theory

1. Background

The theory of rational expectations was first proposed by John Muth of Indiana University in 1961. Muth used the term to describe the many economic situations in which the outcome depends partly upon the economic expectations of individuals. (Sargent T. 1987)

Muth J. (1961) argued that all available information capable of maximizing the accuracy of price forecasts is almost instantaneously incorporated into current decisions by speculators, whose forecasts and expectations are rational in this sense. This is similar to the strong form of the Efficient Market Hypothesis in Finance. (Bodie Z. et al., 1996, p. 341)

Muth's original work was popularized by Robert Lucas in the 1970s. Lucas incorporated the idea of rational expectations into a dynamic general equilibrium model. (Lucas R. 1972) Lucas argued that expected inflation influences price setting behavior, and expected inflation becomes actual inflation.

This dissertation hypothesizes that employment is affected by a similar process: that expected demand affects the behavior of employers regarding increases or decreases in employment. The hypothesis implies that if employers expect that demand for their products and services will increase in a future period, they will increase employment to ensure that they retain their existing customers. If employers expect that demand for their products and services will decline in a future period; they may lay off workers in order to maximize profits or reduce expected losses. Chapter 1 shows that the cost of acquiring new customers is prohibitively expensive and may result in declining profits.

The literature has identified three general types of expectations: rational, naive, and extrapolative. The naive or Cobweb model is based on intuition. The Cobweb model has been used in an analysis of the economic behavior of farmers. It assumes that farmers will base planting decisions on current prices. If prices are low when farmers plant, they will reduce supply. If prices are high, they will increase supply. See Kaldor N. (1934) and Pashigian B. (2008).

Extrapolative expectations are formed by analyzing historical data and the growth rate of economic variables. Fuster et al. (2010) have documented a large amount of empirical research on extrapolative expectations. For example, Ball L. (2000) developed a model that explains the persistence of inflation in two monetary regimes. Tortorice D. (2010) looks at unemployment expectations in the Michigan Survey of households and finds that consumers are too optimistic at the beginning of recessions and too pessimistic at the end of recessions.

2. Bias and Rationality

Behavioral scientists Tversky and Kahneman have found that availability bias may have an effect on the formation of expectations. They found that the intuition of economic agents has an effect on their expectations. (Tversky A. and Kahneman D. 1973 and 1974)

Expectations are also subject to priming, framing, and anchoring effects. (See Kahneman D. 2011) Rational expectations are model-consistent expectations in that agents are assumed to understand the model and on average take the model's predictions as valid. (See Snowdon B. et al. 1994) The predictions of future values of economically relevant variables from the model are assumed to be the same as that of the decision-makers in the model. The issue of which expectations are rational has been widely debated by economists. There is a tendency for some macroeconomic modelers to attribute model error to irrational expectations, or more commonly by using the Keynesian term "animal spirits."

Eugene Fama has explained that psychological concepts like Keynesian "animal spirits" are vague and potentially untestable. (Fama E. 1998)

Fuster et al. (2010, p. 1)) have argued that:

> If a sample of macroeconomists were forced to write down a formal model of animal spirits, most wouldn't know where to start and the rest would produce models that had little in common. In contrast, the rational actor model appears conceptually elegant, disciplined, and parsimonious.

Richard Curtin makes a strong case that irrational expectations do not exist. I quote Curtin directly because he makes an important point relative to expectations and decision-making. Curtin argued that: (Curtin R. 2022, Section 1.11)[3]

> The elimination of passion from reason has long been held as a critical element of rational decisions. The separation of reason from passion is not only unwarranted, it is impossible. The insistence of the separation is usually motivated by examples where the influence of emotions caused disastrous outcomes for a household or firm. There is no denying these extreme miscalculations are present, and many believe even common.
>
> Incorrect choices due to emotional influences are often grouped with losses from decisions which were **rational** at the time they were made but nonetheless caused disastrous losses.

Additionally, Curtin proposed a natural expectations model that is a weighted average of an intuitive model and a rational expectations model. The accuracy of this model is dependent upon the weights chosen.

Blaug argues that the rational expectations approach inevitably leads to the anti-Keynesian conclusion that governments can influence nominal variables like the inflation rate but are not able to influence real variables such as output and employment. (Blaug M. 1985, p. 686).

There have been many instances in which government policies had an effect on output and employment. These instances include, but are not limited to, the New Deal programs of U.S. president Franklin D. Roosevelt in the 1930s and the stimulus programs of U.S. President Bill Clinton in the 1990s. These programs are discussed in Chapter 1.

In the 1950s, researchers first used the University of Michigan's Consumer Sentiment Index as a predictor of consumption. The analyses used microeconomic data to determine the relationship between the Sentiment Index and consumption expenditures of individual households. Richard Curtin has explained that "James Tobin (1959) interpreted the evidence as a clear rejection of the predictive power of consumers' economic expectations." (Curtin R. 2022, p. 3)

Many economists agreed with Tobin's argument that the prediction failures among some individuals could not be sensibly aggregated into positive results at the macroeconomic level. However, Tobin's analysis was strongly affected by the shortage of observations of macroeconomic data such as personal consumption expenditures.

[3] I refer to a section number instead of a page number because the paper's pages are not numbered.

C. Growth Models

Although the dissertation addresses the relationship between expected demand and employment, it is also useful to review the predictions of economic growth models. Okun's Law is a linear model which states that a 2% increase in GNP corresponds to a 1% decline in the rate of cyclical unemployment; a 0.5% increase in labor force participation; a 0.5% increase in hours worked per employee; and a 1% increase in output per hours worked. (Okun A. 1962)

In the U.S., nominal Gross National Product (GNP) and total non-farm employment are highly correlated (0.92) for the period 1948 Q1 to 2023 Q3. The dissertation found that the relationship between GNP and non-farm employment was similar to the relationships predicted by Okun's Law. The dissertation estimated that the coefficient of a 1% change in GNP with respect to the percent change in employment was 0.50, which means that a 1% increase in nominal GNP should result in a 0.50% increase in total non-farm employment. The regression output and the regression statistics are given in Table A-1 of Appendix A.

Christopoulos et al. (2019) found that Okun's threshold variable was endogenous and suggested a non-linear model. Guisinger et al. (2018) found that higher levels of education, a lower rate of unionization, and a higher percentage of non-manufacturing employment are important determinants of the differences in Okun's coefficient across U.S. states.

Nebot C. et al. (2019, p. 203) found that "differences between Okun coefficients below and above the threshold are consistent with the firm's 'risk aversion hypothesis,' according to which unemployment responds more strongly during recessions than during expansions."

Furceri D., Jalles J., and Loungan P. (2020) used a sample of eighty-five advanced and developing economies between 1978 and 2014 and found that the relationship between GNP and the unemployment rate was negative, as predicted by Okun. They also found that deregulation in labor markets, deregulation in product markets, and recessions have strengthened the response of unemployment to changes in GNP. For the United States, they found that the Okun coefficient was 0.48, which is comparable to the coefficient of 0.50 predicted by Okun in 1962.

Robert Solow's model explains changes in economic growth as a function of capital, labor, and technical progress. The savings rate is determined exogenously. Using his model, Solow (1957) calculated that about four-fifths of the growth in U.S. output per worker was attributable to technical progress. One of the major flaws of the Solow model in the light of the present dissertation is that fluctuations in employment are ignored.

D. Labor Economics

Labor markets function through the interaction of workers and employers. Labor economics looks at the suppliers of labor services (workers) and the demanders of labor services (employers), and attempts to understand the resulting patterns of employment, wages, and income. These patterns exist because each individual and employer in the market is presumed to make rational choices based on the information that they know regarding wages, the desire to provide labor, and the desire for leisure.

David Romer has explained that "Firms' demand for labor is determined by their desire to meet the demand for their goods. . . . The term effective labor demand is used to describe a situation, such as this, where the quantity of labor demanded depends on the amount of goods that firms are able to sell." (Romer D. 2019, p. 248) A discussion of the effect of productivity on aggregate employment is provided in Chapter 2.

Romer does not account for the marginal product of labor, or for the time lag between hiring workers, training workers, producing a product, and selling that product. This dissertation notes that the amount of goods that firms are able to sell in a future period is unknown.

Graham and Anwar (2019) noted that labor markets are normally geographically bounded and found that the rise of the Internet has brought about a "planetary labor market" in some sectors. (Graham M. and Anwar M. 2019).

The Organization for Economic Co-Operation and Development (OECD) publishes an annual index of employment protection for temporary contracts for each of its member countries. The United States has the lowest level of employment protection of all of the OECD countries. (OECD 2021, p. 6). A discussion of the effect of employment protection on employment is provided in Chapter 2.

Oliver D. (2022) developed two partial equilibrium models to analyze the effect of foreign worker quotas and labor subsidies on employment. The author found that quotas increased domestic sector employment and that labor subsidies increase overall employment

Labor economists have suggested nine additional subject areas that may explain changes in aggregate employment. These subject areas are discussed below in order of their importance to my research.

1. Expected Demand

Much of the early work on expectations and expected demand focused on the assumption that the expectations of workers and employers were often incorrect and had large forecast errors. Some economists have argued that generalized forecast errors are impossible because incorrect expectations are resolved through the interaction between agents.

Boianovsky M. (2017, p. 4) has found that Pigou A. (1927) "rejected the argument that generalised errors of forecast are impossible in the sense that widespread wrong expectations about the movement of a variable are necessarily fulfilled through interaction between agents."

Lavington F. (1922) argued that estimates of future demand are initially formed through a cumulative "contagion of confidence." When businesses realize that their actual profit is lower than anticipated, they develop a pessimistic forecast of future demand. In a simple two-period model, this means that the initial forecast is overly optimistic, and the second forecast is overly pessimistic.

Lavington does not explain what happens in future periods or whether businesses improve their forecasts over time. It is unrealistic to assume that businesses do not analyze their forecasts and attempt to improve their forecasts over the long run.

Pigou A. (1927) assumed that short-run shifts in the (discounted) demand for labor are primarily caused by changes in expected return. Variations in profit expectations are set off by impulses that may be of "real," "psychological," or "monetary" kinds, which lead to the "mutual generation of errors of optimism and pessimism." (Boianovsky M. 2020)

Pigou's real demand for labor function assumed a two-sector economy with a wage-goods and a non-wage-goods sector. He also assumed that employment in the wage-goods sector is determined by the effect of a given real wage on the amount of consumption goods. (Boianovsky M. 2020) Thus, Pigou's labor demand function is stable, and does not account for fluctuations in employment. (See Cottrell A. 1994 and Keynes J. 1936, pp. 278-279).

Cottrell and Keynes have incorrectly analyzed Pigou's real demand for labor function. The function will vary over time due to the fact that the real wage will vary. As the real wage changes, consumption, GDP, and employment will vary.

Single-period forecast errors are irrelevant because the source of these errors (e.g., model deficiencies) will be corrected in a future period. A business will notice that their model contains forecast errors. The business will modify their model and produce more accurate forecasts in the future. This process continues as errors are identified and the accuracy of the model is improved over time.

Tuinstra and Wagener (2007) have analyzed the evolutionary competition between two different estimation procedures. They found that bounded fluctuations in macroeconomic variables may emerge even in the presence of learning behavior.

A number of researchers have written papers that either assumed or found that agents exhibit learning behavior. These papers include Marcet A. and Nicolini J. (2003), Branch W. and Evans G. (2006), Berardi M. (2007), Tuinstra J. and Wagener F. (2007), and Assenza T. and Berardi M. (2009).

Keynes published the General Theory of Employment, Interest, and Money (General Theory) in 1936. In 1937, John Hicks developed the IS-LM model (investment savings-liquidity preference money supply) based on the General Theory. (Hicks J. 1937) The model was extended by Alvin Hansen in a paper published in 1953. (Hansen A. 1953).

Many reviews of the General Theory were published in the late 1930s. Kalecki M. (1936)[4], Hicks J. (1937), Harrod R. (1937), Meade J. (1937), Lange O. (1938), and most other reviewers excluded any discussion of expectations in their review articles of the General Theory, and did not acknowledge the limited role of expectations in the General Theory.

Michael Brady has pointed out that Champernowne D. (1936) was the only reviewer of the General Theory at the time who believed that expectations was one of the major features of the General Theory. Champernowne integrated expectations into the Keynesian equations (Brady M. 2017) and provided an expectations-adjusted version of Keynesian theory. More recently, Roncaglia T. (2006) argued that decision-making under conditions of uncertainty is a central element in Keynes' theoretical work.

Kregel J. (1976) and Bateman B. (1996, chapters 4 and 5) have argued that regardless of how agents react to unrealized expectations, the economy moves immediately to the point of effective demand. They believed that the point of effective demand may be less than full employment for a given "state of the news."

Prior to the publication of the General Theory, many economists believed that unemployment was a short-run disequilibrium phenomenon caused by incorrect business expectations. Boianovsky has explained that "Keynes preferred model, for demonstrating the role of effective demand in the determination of unemployment in equilibrium, assumed away disappointments and shifts in expectations." (Boianovsky M. 2020, p. 4)

Shackle G. (1939) argued that employers are risk averse and preferred to wait until the future was more certain before increasing investment in plant and therefore in employment. For example, an employer might want three years rather than one year of increased profits before increasing both investment and employment.[5]

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[4] Translated into English in Targetti F. and Kinda-Hass B. (1982).

[5] Risk-aversion is addressed in Chapter 4 of this dissertation.

Shackle (p. 447) hypothesized that "If, by general agreement, every entrepreneur made a public promise to lay out half as much again on improving his equipment during the next year as he did during the past year, it is possible that each would find his cash receipts sufficiently increased to make the fulfilment of this promise possible." Thus, Shackle is suggesting that there are consequences to not increasing investment when necessary.

Unfortunately, Shackle does not incorporate these suggested consequences into his theory. Instead, he assumes that the only risk faced by entrepreneurs is that they will increase investment prematurely. He does not address the possibility that their profits will be unnecessarily low because businesses failed to make necessary investments.

Topel R. (1982) and Rosanna R. (1985) conducted econometric analyses of the effect of expected demand on employment and hours. Topel used forecasts of shipments and Rossana used forecasts of orders as independent variables in their econometric analyses. Their regressions estimated that expected demand had a positive effect both on employment and on the average number of hours worked per employee.

Kraft K. (1989) studied the role of current or expected production during an economic boom on hours and employment. He developed a theory of employment during economic booms and empirically tested the theory using data from fifteen West German industries. None of the West German industries studied were in industries with fully flexible hours (such as the hospitality industry).

Kraft found that an increase in production will have a strong impact on employment but will have little effect on hours per worker. Kraft's paper does not account for labor supply or wages. Kraft's work is limited to the effect of current or expected production and orders on employment.

Dovern et al. (2020) used a panel of 4,700 German companies from 2018-2019. They analyzed the role of expected GDP growth in the firms' investment and employment decisions. They found that a 1% increase in expected GDP growth led to only a 0.01% increase in employment.

Diaz R. (2021) analyzed the work of Lanzilotta B. (2015). Lanzilotta collected data from 1973-2012 and analyzed the effect of business expectations in Uruguay. According to Diaz, the long-term effect of business expectations on changes in investment and employment is 0.73% and 0.12% respectively.

2. Interest Rates

Interest rates are the premium that must be offered to induce people to hold their wealth in some form other than hoarded (non-invested) money. Keynes believed that the rate of interest is the factor that adjusts at the margin the demand for hoards to the supply of hoards. (Keynes J. 1937, p. 215)

Keynes has explained that "if the interest taken in conjunction with opinions about their prospective yield raise the prices of capital-assets, the volume of current investment (meaning by this the value of the output of newly produced capital assets) will be increased; while if, on the other hand, these influences reduce the prices of capital-assets, the volume of current investment will be diminished." (Keynes J. 1937, pp. 217-218) Thus, interest rates affect investment, and changes in investment affect aggregate employment.

Kalecki M. (1936) criticized Keynes' theory of interest rates when he wrote that "First, it does not say anything about the sphere of investment decisions of the entrepreneur, who makes his calculations in 'disequilibrium' on the basis of existing market prices of investment goods." (Targetti F. and Kinda-Hass B. 1982, p. 251)

Champernowne D. (1936) theorized that if aggregate income is known, the amount of savings and the rate of interest are determined by the intersection of the demand curve of saving and the supply curve of saving. He also theorized that a decline in consumption would cause the rate of interest to fall, the savings rate will fall, employment will decrease, prices will decline, and real wages will increase. This theory is often called the Champernowne theory of employment. Champernowne has argued that in some hypothetical situations, Keynesian analysis is similar to the classical analysis of employment. (Champernowne D. 1936, p. 215)

Woodford M. (2022) recommended that in the case of a recession, policy makers should rely on targeted lump sum transfers rather than reducing the interest rate. He argued that the optimal economic outcome can be achieved only via fiscal policy, not via monetary policy.

Carl Walsh (2005) incorporated nominal price stickiness, habit persistence, and policy inertia into a model designed to study the dynamic impact of nominal interest rate shocks. He found that "labor market rigidities introduced by the process of matching job seekers with job vacancies . . . reduce the inflation impact of a nominal interest rate shock."(Walsh C. 2005, p. 848)

3. Inflation

Phillips A. (1958) fitted an empirical curve to a statistical scatter diagram of British time series data for annual percentage rates of change of money wages and unemployment as a proportion of the labor force over the years 1861-1957. The resulting curve showed an inverse relationship between unemployment and inflation.

Prior to the 1970s, the Phillips curve was a stable estimator of the relationship between inflation and unemployment. Beginning in 1970, both inflation and unemployment began to be positively correlated. The consumer price index (CPI) rose from 5.9% in 1969 Q4 to a high of 12.1% in 1974 Q4. Over the same period, U.S. civilian unemployment rate rose from 3.5% to 7.2%.

Blaug's (1985) explanation of this anomaly is that there is not one stable Phillips curve, but a series of Phillips curves. This is the problem in assuming that changes in one variable can be fully explained by changes in another variable. If that were true, then the two variables would be perfectly correlated, either positively or negatively (i.e., +1 or –1).

I used monthly data from January 1948 to December 2023 and estimated that the first difference of the two variables (unemployment and inflation) had a correlation coefficient of only –0.22. In part, this explains why the Phillips curve is not a stable or accurate estimator of inflation.

Several modifications to the Phillips curve have been suggested. Friedman M. (1968) argued that there is a natural rate of unemployment, and that monetary policy cannot keep unemployment below this level indefinitely. Romer D. (2019, p. 259) has suggested an Adaptive Expectations Phillips Curve (AEPC). The AEPC model makes four key assumptions. These assumptions are:

1. Neither wages nor prices are completely unresponsive to the current state of the economy.
2. Higher output is associated with higher wages and prices.
3. Supply shocks may occur.
4. Adjustment to past and expected future inflation is more complicated than the relationship assumed by the Phillips curve.

The hybrid Phillips Curve (Romer D. 2019) assumes that there is a link between past and future inflation in addition to the effect of expectations. The New Keynesian Phillips Curve (Roberts J. 1995) states that inflation depends on a core or expected inflation term and on output. Thus, inflation is a function of output and core or expected inflation.[6]

Ravenna F. and Walsh C. (2008) used a general equilibrium model to compare the New Keynesian Phillips Curve to a Phillips Curve based on labor market frictions using U.S. data. They found that a search-friction Phillips curve can potentially reconcile the New Keynesian model with the data.

[6] Core inflation is the aggregate inflation rate of all factors except food and energy.

Nosratabadi J. (2021) found that expected inflation affected both the observed and expected level of wages and employment in the Iranian province of Hamedan. He used the value of fixed-rate loans demanded by the firms over the period 2004-2011 as a proxy for expected inflation. Nosratabadi's work implies that firms will increase debt if they expect inflation to increase and will decrease debt if they expect inflation to decline.

4. The Minimum Wage Level

The effect on employment of increasing the minimum wage is a controversial subject. Alan Manning has pointed out that "A central concern in the [employment] estimates . . . is whether one has controlled appropriately for economic conditions affecting employment other than the minimum wage. Failure to do so effectively will lead to bias if the minimum wage is correlated with the omitted economic conditions." (Manning A. 2021, p. 12)

Using a New Keynesian model, Gali J. (2013) found that wage flexibility (e.g., no minimum wage) does not always improve social welfare. Gali criticized the classical theory of employment for implicitly assuming that firms view themselves as facing no demand constraints.

Meer J. and West J. (2016) found a negative employment effect using long lags in aggregate employment data. Neumark D. et al. (2014) found a negative employment effect using a synthetic control effect. Meer, West, and Neumark used a typical synthetic control effect by comparing data between different counties in the same U.S. state.

Bailey M. et al. (2022) studied the large rise in the minimum wage due to the 1966 amendment to the Fair Labor Standards Act. They found that the amendment increased wages and reduced aggregate employment. Giuliano L. (2013) and Hirsch B. et al. (2015) used payroll data and found that increases in the minimum wage resulted in wage effects but did not result in significant decreases in aggregate employment.

Finally, Manning recently reviewed some of the literature on the economic effect of changes to the minimum wage. Manning concluded that: "A balanced view of the evidence makes it clear that existing evidence of a negative employment effect is not robust to reasonable variation in specification, even when the wage effect is robust. . . . one has to acknowledge that the impact of the minimum wage on employment is theoretically ambiguous." (Manning A. 2021)

5. Distortionary Taxation

Distortionary taxes are taxes that affect the prices of items in a market. Several authors have published papers concerning the effect of distortionary taxation on employment. See Greenwood J. and Huffman G. (1991), Baxter M. and King R. (1993), and McGrattan E. (1994).

"Harberger triangles" refers to the deadweight loss occurring in the trade of a good or service due to the market power of buyers, of sellers, or because of government intervention. The size of a deadweight loss is proportional to the size of the Harberger triangles. Greenwood and Huffman used 1948-1985 U.S. annual data and found that the Harberger triangles were associated with distortionary taxation. Major weaknesses of their analysis are (1) it did not account for the effect of the costs and benefits of government spending programs; (2) it measured government spending, not taxation; and (3) it incorrectly assumed that all government spending is funded by federal income taxes.

Baxter and King found that "output falls in response to higher government purchases when these are financed by general income taxes." (Baxter M. and King R., 1993, p. 333) McGrattan studied the effects of distortionary tax policies using a dynamic recursive stochastic equilibrium model. She estimated that the welfare costs of taxation were eighty-eight cents per dollar for capital taxes, and thirteen cents per dollar for labor taxes.

There are a number of flaws in Baxter and King's paper. Most U.S. government purchases are not funded solely by any particular type of tax.[7] Instead, U.S. government purchases are funded by a combination of fees, taxes, and debt.

6. Economic Shocks

There have been a large number of papers concerning the effect of economic shocks on the labor market. Mortensen and Pissarides found that an aggregate shock induces negative correlations between job creation and job destruction, whereas a dispersion shock induces positive correlations. The job destruction process has been shown to have more volatile dynamics than does the job creation process. (Mortensen D. and Pissarides C. 1994) Their work implies that firms are risk averse.

Blanchard and Wolfers (2000) reviewed economic shocks in Europe since the 1960s and analyzed the relationship between economic shocks and institutions. They found that "the results so far suggest that an account of the evolution of unemployment based on the interaction of shocks and institutions can do a good job of fitting the evolution of European unemployment, both over time and across countries." (Blanchard O. and Wolfers J. 2000, p. C32.)

Evi Pappa studied the effect of fiscal shocks on employment and on the real wage using U.S. federal government and state government data. Pappa used Real Business Cycle (RBC) and New Keynesian models to evaluate the data. She found that aggregate increases in government employment raise both the real wage and total employment.

[7] BalancedPolitics.org has identified 100 taxes and fees collected by federal, state, and local governments. (Messerli J. 2011)

Pappa has acknowledged that “Our theoretical framework is too limited . . . since it allows for perfect labor mobility between private and public sectors, assumes that the government acts competitively in labor markets, and does not allow for equilibrium unemployment.” (Pappa E. 2009, p. 241)

Mian A. and Sufi A. (2014) studied the decline in U.S. employment from 2007-2009. They found that the decline in aggregate demand (consumption) was driven by shocks to household balance sheets. They estimated that 65% of the employment losses were caused by the decline in aggregate demand during this period.

Hane-Weijman E., Eriksson R., and Henning M. (2018) studied the job prospects of laid-off workers in Sweden from 1990-2005. They found that workers were more likely to be re-employed if they lived in a region where there were industries similar to the industry of their former employer. Workers found it more difficult to find employment if they lived in regions with high percentages of unrelated industries or high unemployment rates.

Huckfeldt C. (2022) studied the causes of earnings losses during recessions. He found that earnings losses are concentrated among workers who switch occupations after job displacement, and that the magnitude of these losses increases during recessions. Huckfeldt developed an unemployment model where hiring is more selective during recessions, and thus both unemployed workers and new labor market entrants must search for employment in lower paying jobs.

Stuart B. (2022) studied the long-run effects of the U.S. recession of 1980-1982 on people who were children, adolescents, and young adults when the recession began. These individuals suffered a long-term loss of both human capital and earned income. He found that the recession reduced the number of college graduates by 1.3–2.8 million and reduced earned income by $66–$139 billion per year.

Baqaee and Farhi used four observations to study the effect of Covid on GDP from February 2020 to May 2020. They argued that “policies that boost demand, like lowering interest rates or increasing government spending, exacerbate problems of inadequate supply, leading to shortages.” (Baqaee D. and Farhi E. 2022, pp. 1397-1398)

Caldara D. and Matteo I. (2022) used the text from 25 million news articles to construct a Geopolitical Risk Index (GPR) and found that higher firm-level geopolitical risk is associated with lower firm-level investment.

7. International Trade and Employment

Nickell S. (1984) studied manufacturing employment in the United Kingdom (U.K.) for the period 1958-1974. Nickell hypothesized that manufacturing employment is a function of industrial output, investment in plant and machinery, earnings, effective price of capital goods, output prices, real share prices, and M3 money supply.

Nickell's work suffered from a lack of computing power, which limited the scope of his study. His study was also impacted by the substantial increase in energy prices in 1973 and 1974, when spot crude oil prices rose by over 200%. Crude oil prices were $3.56/barrel in December 1972 and rose to $11.16/barrel in December 1974. (Federal Reserve Bank of St. Louis 2022)

Enrique Mendoza studied the relationship between terms of trade shocks and business cycles using a dynamic stochastic model of a small open economy for the G-7 countries and twenty-three developing economies. He found that terms-of-trade disturbances accounted for approximately one-half of the observed variability of GDP and real exchange rates. (Mendoza E. 1995)

There is substantial disagreement among economists about the effect of trade on manufacturing employment. Papers by Yang L. (2021) and Pierce and Schott (2016) are indicative of this disagreement. Yang L. (2021) used an instrumental variable approach and found that U.S. exports to different markets created more than 1.6 million manufacturing jobs between 1991 and 2007. Pierce J. and Schott P. (2016) found that the sharp drop in US manufacturing employment after 2000 was strongly affected by a change in U.S. trade policy that eliminated tariff increases on some Chinese imports.

Acharya estimated the impact of imports on Canada's level of employment, skill structure, and wages by level of education for the period 1992-2007 for 88 industries. Acharya found that "The effect on employment of import intensity is small, about 6,000 persons annually." (Acharya R. 2017)

Davis C. and Hashimoto K. (2022) constructed a two-country model of international trade. They found that when a larger country reduces unemployment benefits, its domestic unemployment rate falls, industry concentration rises, productivity growth increases; and unemployment increases in the smaller country. They found that when the smaller country reduces unemployment benefits, its unemployment rate falls, industry concentration declines, and productivity growth is slowed.

Their results confirm the standard model of the labor market in that increased productivity increases employment. (See Van Biesebroeck J. 2015) The differences of the impact of the same policy action on a larger country and on a smaller country indicate that the policy actions of larger countries (such as the U.S.) may have a significant effect on the rest of the world.

An adequate multi-period model might yield different results, as explained in the following example. In period one, the large country cuts unemployment benefits and increases exports to the smaller country, thereby decreasing GDP in the smaller country. In period two, unemployment increases in the larger country due to a decline in exports to the smaller country.

8. Labor Productivity

Pétursson T. and Sløk T. (2001) estimated employment and wages in Denmark from 1975 to 1995 by developing a theoretical general equilibrium model based on wage bargaining between trade unions and firms. The model is based on a comparison of the marginal productivity of labor and the real wage.

Their theoretical model was tested using a cointegrated Vector Auto Regression (VAR) model. According to the authors, the empirical results failed to reject the theoretical model and produced good out-of-sample forecasts.

Johannes Van Biesebroeck published a survey of the literature concerning wages and productivity. He repeats the textbook theory of employment and argues that "A firm will add employees to its workforce until the additional value produced by the last worker hired equals the going wage rate." (Van Biesebroeck J. 2015, p. 11)

Ceteris paribus, an increase in productivity will increase both wages and aggregate employment as measured by the national accounts. Thus, a shift in workers from the agricultural sector to other sectors will increase both wages and total employment. (Van Biesebroeck J. 2015) His view is consistent with the standard model of the labor market regarding productivity, employment, and wages.

Brynjolfsson E. and McAfee A. (2011) argued that information technology (IT) will increase labor productivity and will result in the replacement of workers in IT- intensive manufacturing industries. Their view is contrary to the traditional view of labor productivity expressed by Van Biesebroeck that increases in labor productivity result in higher wages and increased employment.

Acemoglu D. et al. (2014) found that labor productivity gains have not existed since the end of the 1990s. The authors stated that "It is difficult to square these output declines with the notion that computerization and IT embodied in new equipment are driving a productivity revolution, at least in US manufacturing." (Acemoglu D. et al. 2014, p. 399)

McCullough E. (2017) studied labor productivity in three sectors (agriculture, service, and manufacturing) in four sub-Saharan countries (Ethiopia, Malawi, Tanzania, and Uganda). She used macroeconomic data and found that labor productivity is 40% greater in sectors other than agriculture.

Two general equilibrium models are discussed below: the Diamond, Mortensen, and Pissarides (DMP) model and the dynamic stochastic general equilibrium model (DSGE). The DMP model is a model of the job creation and job destruction process with non-cooperative wage behaviour (Mortensen P. and Pissarides C. 1994). The DSGE model is a real business cycle model "in which the level of employment is determined using a search framework for the labor market." (Andolfatto D. 1996, p. 112)

Kudoh N. and Miyamoto H. (2023) compared the DMP model (without income effects) and the dynamic stochastic general equilibrium model (DSGE) model (with income effects). See Merz M. (1995) and Andolfatto D. (1996). Both the DMP and DSGE models attempt to account for search frictions and general equilibrium effects.

Kudoh and Miyamoto found that general equilibrium effects had only a small impact on employment in the DMP model. General equilibrium effects in the DSGE model had a much stronger impact on employment via changes in the value of leisure and the marginal hourly wage rate. The differences in impact are primarily due to the fact that the DSGE model accounted for variable work hours.

9. Insider/Outsider Models

Romer argues that there are two groups of potential workers (insiders and outsiders) in a unionized firm. The insiders are workers who have some connection with the firm during the bargaining process and whose interests are accounted for in the contract. The outsiders are workers who have no initial connection with the firm but who may be hired after a union contract has been signed. (Romer 2019, p. 547)

Gottfries N. (1992) and Oswald A. (1993) argue that due to normal employment growth and turnover, the insiders are usually fully employed, and the only hiring decision concerns how many outsiders to hire. Blanchard O. and Summers L. (1986) found that the insiders are reluctant to allow the hiring of large numbers of outsiders at a lower wage, because they realize that such a policy would result in the outsiders controlling the bargaining process.

Blanchard O. and Summers L. (1986, pp. 35-36) found that employment follows a random walk. They make two significant assumptions that are critical to their findings: (1) expected changes in labor demand have no effect on the level of employment; and (2) newly hired workers do not immediately become insiders.

Insider/outsider models constitute an argument against trade unions or other forms of labor market segmentation that create groups of different status. The models imply that the existence of trade unions results in suboptimal employment because trade unions tend to restrict the number of outsiders hired by a unionized firm.

E. Measuring Employment and Unemployment

There are two general methods used by different countries to report employment data: survey results and recorded data. The U.S. Bureau of Labor Statistics (BLS) conducts a monthly survey (Current Employment Statistics) of business establishments in the U.S.

In 2023 Q3, the BLS estimated that 3.8% of the labor force was unemployed out of a labor force of 167.9 million. They estimated that total civilian employment was 157.3 million and that 6.3 million people were unemployed. A complete list of variables and how to access them is provided in Table 14.

The BLS has explained that: (United States Bureau of Labor Statistics 2021)

> The Current Employment Statistics (CES) survey is based on a sample of 651,000 business establishments nationwide. The survey produces monthly estimates of employment, hours, and earnings for the Nation, States, and major metropolitan areas.

Because the BLS uses survey data, it does not consider administrative data such as the number of people who receive unemployment benefits. (Carey P. 2021) The BLS use of survey data may cause the results to be biased, although the amount of bias is probably small due to the large number of observations in their study.

Unemployment is a symptom of labor market distress, which is discussed in Chapter 2. Escudero et al. (2019) analyzed labor market programs in Latin America and the Caribbean, and argued that their “more comprehensive view of the policy impacts resonates better with the characteristics of labour markets in the region, where traditional labour market indicators (e.g., unemployment) do not necessarily reflect the level of labour market distress.” (Escudero et al., p. 3)

Komlos J. (2020) argues that the BLS underestimates the number of people who are effectively unemployed because the BLS fails to account for the number of workers whose hours are reduced during an economic downturn. He assumed that part-time workers who would like to work full time are 72.7% employed and 27.3% unemployed. Using his assumptions, Komlos found that the real unemployment rate in May 2020 was 24.4%. In contrast, the BLS reported that the unemployment rate in May 2020 was 13.3%.

F. The Variables Suggested by the Economic Literature

The literature review helped me to identify the following variables that some economists believe influence aggregate employment. The thirteen variables suggested by the economic literature are:

1. Minimum Wage Level
2. Nominal Gross National Product (GNP)
3. Interest Rates
4. Inflation
5. Taxation
6. Education Level
7. Manufacturing Employment
8. Unionization
9. Personal Consumption Expenditures
10. M3 Money Stock
11. Marginal Labor Productivity
12. Proxies for fiscal policy shocks
13. International Trade (Imports plus Exports)

A discussion of these variables is provided in Chapter 2.

CHAPTER 1
EXPECTATIONS AND EFFECTIVE DEMAND

This chapter is divided into two sections. Section A discusses expectations theory and explains how it can be applied to the analysis of the labor market. Section B explains how effective demand affects employment and how expectations affect the components of aggregate demand.

I separate the discussion of expectations theory from a discussion of expected demand because theories of expected demand predated the development of expectations theory by at least 50 years.

A. Theories of expectations in economics and expected demand

Snowdon B. et. al (1994) defined rational expectations as model-consistent expectations in which agents are assumed to understand the model and on average take the model's predictions as valid. The model's predictions of future values of economically relevant variables are assumed to be the same as that of the decision makers in the model.

I agree with this definition of rational expectations. If an expectation is acted upon (e.g., by increasing or decreasing investment), it does not matter if the expectation is classified as rational or irrational. The action caused by the expectation will affect other macroeconomic variables. Thus, the classification of an expectation is not relevant to this dissertation.

The issue of which expectations are rational has been widely debated by economists. There is a tendency for macroeconomic modelers to attribute stochastic error or model error to irrational expectations, or, more commonly, by invoking the Keynesian term "animal spirits." Eugene Fama has argued that psychological concepts such as Keynes' "animal spirits" are vague and potentially untestable.

Keynes published the General Theory of Employment, Interest, and Money (General Theory) in 1936. In 1937, John Hicks developed the IS-LM model (investment savings-liquidity preference money supply) based on the General Theory (Hicks J. 1937). Alvin Hansen later extended his model. (Hansen A. 1953).

Keynes use of the term "animal spirits" in the General Theory is often misunderstood. Keynes did not equate animal spirits with irrational expectations as claimed by many educators, economists, and financial theorists. Keynes mentioned the term "animal spirits" three times in the General Theory. Keynes defined animal spirits as "a spontaneous urge to action rather than inaction, and not as the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities." (Keynes J. 1936, p. 161)

Keynes recognized the economic benefits of animal spirits when he wrote that "Thus if the animal spirits are dimmed and the spontaneous optimism falters, leaving us to depend on nothing but a mathematical expectation, enterprise will fade and die . . . (Keynes J. 1936, p. 162)

Many reviews of the General Theory were published in the late 1930s. These reviews included the work of Kalecki M. (1936), Champernowne D. (1936), Hicks J. (1937), Harrod R. (1937), Meade J. (1937), Lange O. (1938), and other reviewers. All of the reviewers except Champernowne excluded any discussion of expectations in their review articles of the General Theory and did not acknowledge the role of expectations in the General Theory.

Although Keynes discusses expectations, his theory was based not on expectations, but on results. Bradley Bateman pointed out that Keynes believed there is no scientific basis for forming an expectation of the future. (Bateman B. 1996) Nevertheless, Keynes wrote that "Effective results of production and sales influence occupation [employment] to the extent that they are the reason for the change in subsequent expectations." (Keynes J. 1936, p. 51).

Keynes believed that expectations would have their full effect on employment over the long term, not the short term. Keynes stated that "the level of employment at any time depends, in a sense, not merely on the existing state of expectation but on the states of expectation which have existed over a certain past period."(Keynes J. 1936, p. 50)

Much of the theory of rational expectations was first proposed by John Muth of Indiana University in 1961. He used the term to describe the many economic situations in which the outcome depends partly on what economic agents expect to happen.

Muth found that all available information capable of maximizing the accuracy of price forecasts is almost instantaneously incorporated into current decisions by speculators, whose forecasts and expectations are rational in this sense. Muth's finding is similar to the strong form of the Efficient Market Hypothesis (EMH) in Finance.

EMH was first proposed in 1900 by French mathematician Louis Bachelier in his PhD thesis "The Theory of Speculation". Bachelier's work was effectively based on the random walk model of Jules Regnault (Jovanovic F. 2012).

In 1970, Eugene Fama published a review of EMH and the evidence supporting the hypothesis. The paper extended the theory and defined three forms of financial market efficiency: weak, semi-strong and strong. (Fama E. 1970)

The weak form asserts that market prices reflect all publicly available information that can be derived from past market prices. All three forms of the EMH assume that new information is instantly incorporated into the market price of a good or economic variable and that there is no residual effect from news on a given day. For example, positive or negative news will have no effect on the market price the following day.

Muth's original work was popularized by Robert Lucas in the 1970s. Lucas incorporated the idea of rational expectations into a dynamic general equilibrium model. Lucas argued that expected inflation influences price-setting behavior, and therefore, expected inflation has a significant effect on inflation in a future period.

This dissertation hypothesizes that employment is affected by a similar process: that expected demand affects the behavior of employers regarding increases or decreases in employment. If employers expect that demand for their products and services will increase in a future period, they will increase employment to ensure that they retain their existing customers. Conversely, if employers expect that demand for their products and services will decline in a future period; they may lay off workers in order to maximize profits or reduce expected losses.

1. Extrapolative Expectations and Bias

Extrapolative expectations are formed by analyzing historical data and the growth rate of economic variables. Fuster et al. (2010) have documented a host of empirical research on extrapolative expectations. For example, Ball L. (2000) developed a model which explains the persistence of inflation in two separate monetary regimes.

Behavioral scientists Tversky and Kahneman (Tversky D. and Kahneman D. 1974) have found that availability bias may have an effect on the formation of expectations. They found that the intuitions of economic agents have an effect on their expectations. Daniel Kahneman (Kahneman D. 2011) has pointed out that expectations are also subject to priming, framing, and anchoring effects.

Sheldon R. and Wigmore I. (2023) have explained that availability bias is the tendency to rely on easily available information when evaluating situations or making decisions. Because of this bias, people believe that readily available information is more representative of fact than other information. For example, a business might rely on the reported change in real GDP to make investment decisions rather than on a complete range of public and private information.

Priming is the theory that exposure to one stimulus may influence a response to a subsequent stimulus, without conscious guidance or intention. The framing effect is a cognitive bias where people decide on options based on whether the options are presented with positive or negative connotations. (Plous S. 1993)

Kassiani Nikolopoulou has explained that "Anchoring bias describes people's tendency to rely too heavily on the first piece of information they receive on a topic. Regardless of the accuracy of that information, people use it as a reference point, or anchor, to make subsequent judgments." (Nikolopoulou K. 2023) The theory of anchoring bias is in direct conflict with the Efficient Market Hypothesis (discussed above) which argues that financial decisions are based on the most current information, not the oldest information.

Incorrect expectations are commonly classified as irrational expectations. Just because a decision (based on expectations) is incorrect does not mean that the decision was a product of irrational expectations. Quite often, decisions are both rational and incorrect.

For example, many stock market investors took long positions in the market in 2022 and suffered losses of approximately 9% on average. The Dow Jones Industrial Average (DJIA) declined by 8.78% in 2022. (Yahoo Finance 2022, calculation by author)

Investors might have used extrapolative expectations and based their decision on the fact that the DJIA had an average annual return of 7.09% over the period 1929 to 2022. In this instance, their decision was both rational and incorrect. Their decision was based on historical data, and over the long term their decision might have yielded positive returns.

In discussing rational expectations theory, Blaug (1985, p. 687) has explained that "everyone mistakenly perceives an unanticipated rise in prices as a rise in the relative price of what they sell, whether goods or services, and therefore supplies more; since on average everyone is making the same mistake, aggregate output rises; subsequently, everyone learns of their mistake, at which point aggregate output falls back to its previous level."

Thus, single-period forecast errors are irrelevant because the sources of these errors (e.g., model deficiencies) will be corrected in a future period. For example, a restaurant owner may be using an average of the last three years' demand to forecast future demand. If the owner's model underestimates future demand because it does not account for those holidays when the number of customers increases, the restaurant owner modifies the model and attempts to produce more accurate forecasts in the future. This process continues as other errors are identified and the accuracy of the model is improved over time.

2. Can government influence output and employment?

Mark Blaug has argued that the rational expectations approach inevitably leads to the anti-Keynesian conclusion that governments can influence nominal variables such as the inflation rate but are not able to influence real variables such as output and employment. (Blaug M. 1985, p. 686).

There have been many instances in which government policies have had an effect on output and employment. These include, but are not limited to, the New Deal programs of U.S. president Franklin Roosevelt in the 1930s and the stimulus programs of U.S. President Bill Clinton in the 1990s. These two stimulus programs are discussed below.

Herbert Hoover served as president of the U.S. from March 1929 to March 1933. The Great Depression occurred at the start of his term in October 1929. The Depression worsened during his term in office, as almost seven million people (a decline of 40.7%) lost their jobs by the end of 1932. Prior to the start of the Great Depression in 1929, 20.953 million were employed. By the end of 1932, only 13.574 million were employed. (Givens M., 1933)

At the time of the beginning of Givens' study in 1929, there were approximately 32 million non-agricultural employees. If we assume that the numbers given above are representative of non-agricultural employees, there were 32 million non-agricultural employees in 1929 and 20.753 million in 1932, a loss of over eleven million jobs.

Spurred by demands for action by John Maynard Keynes and other leading economists, the U.S. Congress passed a series of New Deal programs beginning in 1933. As a result, non-farm employment rose to 29.923 million by the end of 1938, an increase of approximately 9.2 million jobs.

GDP fell from $104.6 billion in 1929 to $57.5 billion in 1932, a decline of over 45%. As a result of the fiscal and monetary stimulus programs of the New Deal, GDP increased to $93 billion by the end of 1938, an increase of 61.74%. (Statista 2022)

The second major set of stimulus programs occurred during the administration of U.S. president Bill Clinton. Clinton took office in January 1993 in the middle of an economic recession in which the unemployment rate had risen to 7.4%. In March 1993, Clinton proposed a $16.3 billion stimulus program and five-year budget blueprint that was passed by Congress. (Eaton W. 1993)

The Clinton stimulus programs and budget blueprint was a combination of spending cuts, tax increases, the elimination of protectionist tariffs, and the creation of new programs from 1993-1996. Major stimulus bills signed into law by President Clinton included the Omnibus Budget Reconciliation Act of 1993 (OBRA), The North American Free Trade Agreement (NAFTA) in 1994, the Taxpayer Relief Act of 1997 (TRA), and the Small Business Job Protection Act of 1996 (SBJPA).

The OBRA raised gasoline taxes by 4.3 cents/gallon, increased social security taxes for 25% of the higher income recipients, decreased taxes for low-income families by expanding the earned income tax credit, and increased the marginal tax rate from 36% to 39.6% for high-income individuals. (Sabo M. 1993)

NAFTA eliminated some protectionist tariffs and increased U.S. exports, thereby increasing the number of American non-manufacturing jobs. U.S. exports to Canada and Mexico rose from $337 billion in 1993 to $1.2 trillion in 2011. (Politi J. 2013)

The TRA reduced the short-term capital gains tax from 28% to 20% and the long-term capital gains tax from 15% to 10%. The Act also provided a tax exemption on the sale of a house of up to $250,000 for single individuals and $500,000 for married people. Additional tax credits were given to individuals with educational savings and retirement funds.

The tax reduction stimuli constitute a conservative form of Keynesian economic theory. The goal of Keynesian policies in a situation where effective demand is inadequate to provide full employment is for government to build more public works projects and to create demand by putting more money into the economy. Tax reduction stimuli seek to increase disposable income by cutting taxes.

By the end of 1998, the unemployment rate was 4.4%, over 15 million jobs had been created, and nominal GDP had risen by 32.51%. By the time Clinton left office in 2000, the unemployment rate had fallen to 3.9%, an additional 5.2 million jobs had been created, and nominal GDP had risen by an additional 11.24%. (Federal Reserve Board of St. Louis 2022, calculations by author)

3. Why do Profit Maximizing Firms Hire Additional Workers?

Why do profit maximizing firms hire additional workers? If firms are risk-averse, why don't firm managers develop a profitable enterprise and then expand or contract their labor force via attrition? This type of hiring strategy is often used by firms in the hospitality industry, such as hotels and restaurants. In the case of the hospitality industry, profits are maximized by increasing and decreasing employee hours along with changes in expected demand.

The vast majority of firms will hire additional workers when they expect demand to increase and reduce their workforce when they expect demand to decline. Failure to add employees when necessary often results in losing customers, and thereby losing the remaining customer lifetime value of the lost customers.

Firms consider the following two factors when making decisions concerning the size of their workforce: customer acquisition cost (CAC) and customer lifetime value (CLV). Customer lifetime value is a business metric used to determine the amount of money a customer will spend on a company's products or services over time. Customer acquisition cost is the cost of acquiring a new customer.

CAC is calculated using the simple formula CAC = total marketing cost for acquiring new customer / number of customers acquired. According to industry sources, the average CAC can be as high as $2,000 per customer (Bailyn E. 2022). The CAC is often underestimated because it does not account for expenses such as travel expenses, or post-acquisition costs such as increased customer service costs or additional accounting costs.

CLV can be calculated as CLV = the cost of acquiring and serving that customer. The average CLV for different industries ranges from $90,000 to $1.13 million. (Tessitore S. 2022) Thus, it is clear that the CAC costs and the loss of CLV provide a strong incentive for firms to add workers when expected demand increases.

4. The History of Expected Demand Theories

Much of the early work on expectations and expected demand focused on the fact that the expectations of workers and employers were often incorrect and had large forecast errors. Some economists have argued that forecast errors are impossible because incorrect expectations are resolved through the interaction between economic agents.

Lavington F. (1922) argued that estimates of future demand are initially formed through a cumulative “contagion of confidence.” When businesses realize that their actual profit is lower than anticipated, they develop a pessimistic forecast of future demand. In a simple two-period model, this means that the initial forecast is overly optimistic, and the second forecast is overly pessimistic.

Lavington does not explain what happens in future periods or whether businesses improve their forecasts over time. It is unrealistic to assume that firms do not analyze their forecasts and do not improve their forecasts over the long run.

Arthur Pigou (Pigou A. 1927) assumed that short-run shifts in the discounted demand for labor are primarily caused by changes in expected return. Variations in profit expectations are caused by real, psychological, or monetary factors. According to Pigou, this led to the generation of alternating errors of optimism and pessimism.

Pigou developed a real demand for labor function that assumed a two-sector economy composed of a wage-goods and a non-wage-goods sector. He also assumed that employment in the wage-goods sector is determined by the effect of the real wage on consumption.

As explained above, single-period forecast errors are irrelevant because the source of these errors (e.g., model deficiencies) will be corrected in a future period. A business will notice that their model contains forecast errors. The business will modify their model and attempt to produce more accurate forecasts in the future. This process continues as errors are identified and the accuracy of the model is improved over time.

A number of researchers have written papers which either assumed or found that economic agents exhibit learning behavior.[8] In his 1939 paper, G. Shackle argued that employers are risk averse and prefer to wait until the future is more certain before increasing investment in plant and therefore employment. For example, an employer might want three years rather than one year of increased profits before increasing investment and employment.[9]

B. How does Effective Demand Affect Employment?

John Maynard Keynes believed that employment depends upon effective demand. He defined "effective demand" as the point of equilibrium where aggregate demand equals aggregate supply. Effective demand results in output that creates income and employment.

The simplest form of Keynes aggregate supply theory is given by the equation $Z = \phi(N)$, where Z is the aggregate supply price given N employees, ϕ is the golden ratio (1.618), and N is the number of employees. The aggregate demand formula is $D = f(N)$. He argued that if $D > Z$, entrepreneurs will have an incentive to hire additional workers. (Keynes J. 1936, p. 25)

Profits are maximized at the intersection of the supply curve and the demand curve. Effective demand is the value of D at this intersection, given some constraints such as Investment.

Hartwig J. (2007, pp. 725-726) has explained that:

> In case of deficient demand, a quantity reaction of output closes the gap. That is why demand determines supply. . . . It is well known that the Principle of Effective Demand is about quantity reactions of output that equate saving and investment.

The key elements of Keynes' theory as described in the General Theory are:

1. When employment increases, aggregate real income increases.
2. An increase in aggregate real income increases consumption.
3. There must be an amount of current investment sufficient to account for the difference between total output and consumption. If there is inadequate investment, entrepreneurs will not have an incentive to increase employment to its optimal level, which is defined as the intersection of the supply curve and the demand curve.

---

[8] These papers include Marcet A. and Nicolini J. (2003), Branch W. and Evans G. (2006), Berardi M. (2007), Tuinstra J. and Wagener F. (2007), and Assenza T. and Berardi M. (2009).

[9] Risk aversion is discussed in Chapters 3 and 4 of the dissertation.

1. The impact of expectations on the components of GDP

Aggregate demand is the total demand for all goods and services produced in an economy. Dean E. et. al (2015,) have explained that "aggregate demand is the sum of four components: consumption expenditure, investment expenditure, government spending, and spending on net exports (exports minus imports)." Since these four components constitute the textbook GDP formula, this is equivalent to stating that aggregate demand is equal to GDP.

The Bureau of Labor Statistics (BLS) and the Bureau of Economic Analysis (BEA) are the original source of most of the data used in this dissertation. The BLS uses a complex method to estimate GDP. (See Bureau of Labor Statistics 2022 for more information). In part, this method was developed to prevent double counting, e.g., to prevent counting dollars spent by government as both government spending and private consumption.

For example, assume that government pays a construction company to build a road. The construction company buys materials and hires additional workers. Analysts should not count the full values of both the public expenditure and the private investment and private consumption. Otherwise, the same dollars would be counted more than once.

If the textbook GDP definition was used for the year 2022, and the left-hand side of the equation (GDP) is estimated separately, GDP is $26,137 billion. In the right-hand side of the equation, consumption is $17,736 billion, investment is $4,408 billion, government spending is $9,169 billion, and net exports are –$867 billion. The sum of these components is $30.446 trillion compared to the estimated GDP of $26.137 trillion, a difference of $4.309 trillion or approximately 16.49%.

An excellent proxy for GDP is the equation:

> GDP = personal consumption expenditures + private fixed investment (private residential fixed investment + private nonresidential fixed investment) + government consumption and investment + net exports.

In this case, the right-hand side of the GDP equation is $17,736 billion + $4,408 billion + $4,575 billion + –$867 billion = $25.852 trillion, a difference of $285 billion or approximately 1.09%.[10] I attribute this relatively small difference to measurement error.

[10] The United States Bureau of Economic Analysis has stated that "[Government] Consumption expenditures and gross investment are the measures of government spending included in calculations of gross domestic product, or GDP." (Bureau of Economic Analysis 2023a)

The correlation between the expected demand variables and the components of GDP are given in Table 2 below.

Table 2: Correlation Between the first difference of the Expected Demand proxies and the first difference of the components of GDP for the period 1948 Q1 to 2023 Q3

Expected Demand Proxy	**Aggregate Demand Component**	**Correlation**
Nonresidential Fixed Investment (NFI)	Personal Consumption Expenditures	0.50
	Total Private Investment[11]	0.91
	Government Consumption and Investment	0.18
	Net Exports	–0.33
Personal Consumption Expenditures (PCE)	Personal Consumption Expenditures[12]	1.00
	Total Private Investment	0.50
	Government Consumption and Investment	0.42
	Net Exports	–0.26

Source: Author

It is likely that there is a one-way Granger causality between PCE and NFI. In other words, changes to PCE are a significant cause of changes to NFI, but NFI does not have a significant effect on PCE in short-run. This causality will be discussed in more detail in Chapters 3 and 4.

[11] Total Private Investment is the sum of private residential fixed investment and private non-residential fixed investment.

[12] Since personal consumption expenditures is both an expected demand proxy and a component of GDP, the correlation is 1.00.

Policymakers should treat changes in NFI as a signal that both aggregate demand and aggregate employment may increase, and this increase may result in increases in the cost of goods and services. PCE is experienced by businesses on a daily basis and is the primary cause for changes in expectations. If a business believes that demand for their company's goods and services is increasing, they will increase investment. The increase in investment will in turn cause increases in employment.

Net exports only have a small effect on the U.S. economy as measured by GDP. In 2022, U.S. GDP was 26.137 trillion dollars and net exports were –857 billion dollars. Thus, the absolute value of net exports accounted for only 3.28% of the U.S. economy.[13] The last time that net exports were positive occurred over 40 years ago in 1980 Q3 when the U.S. economy was in a recession.

2. The role of public policy in shaping expectations

There are significant public-policy implications associated with my research. In a recessionary environment, the goal of government should be to change consumer and business expectations and thereby increase aggregate employment. If government is able to effectively manage consumer expectations, recessions will be shorter and less severe.

There are two major political parties in the United States: the Democratic Party and the Republican Party. The Democrats tend to support liberal Keynesian policies, and the Republicans tend to support conservative neoclassical policies.

Government affects expectations via news releases, the issuance of reports, and public statements by politicians. Unfortunately, the party in power will usually present an optimistic view of the economy and the minority party will present a pessimistic view. Thus, one political party will positively affect expectations and the other party will negatively affect expectations. The minority party apparently does not consider that they are making the economy worse. If the economy declines, the minority party will find it more difficult to govern effectively once they become the majority party.

[13] For the period 1948 Q1 to 2021 Q4, the first difference of net exports had a correlation coefficient of -0.29 with the first difference of GDP.

This "push-pull" effect is caused by the dysfunctional system of American governance, which in turn is caused by the political segregation of the United States. Reid L. (2016, p. 97) concluded that:

> I recommend that political dysfunction be reduced by eliminating Senatorial holds, by eliminating super majority voting rules, and by allowing minority leaders to bring up to ten bills per session to a floor vote in the House and Senate. Finally, using the example of the California State Legislature, I recommended various rule changes that might reduce political dysfunction at the U.S. federal level.

Barack Obama was sworn in as president of the United States on January 20, 2009. On February 13, 2009, the U.S. Congress passed the American Recovery and Reinvestment Act (ARRA). The bill was signed into law by President Obama on February 17, 2009. ARRA was passed in response to widespread fears that the U.S. was in danger of slipping into a 1930s-style economic depression. The primary objectives of ARRA were to save existing jobs and to create new jobs quickly. The Act included direct spending on infrastructure, education, health, and energy; federal tax incentives; and expansion of unemployment benefits and other social welfare provisions.

The rationale for ARRA was derived from Keynesian macroeconomic theory, which argues that during recessions, government should offset the decrease in private spending with an increase in public spending in order to save jobs and to stop further economic deterioration. Despite its provision of substantial funds, ARRA did not have a substantial impact on economic expectations in the U.S. for over a year.

Right Direction/Wrong Direction (RD/WD) polls are often taken as a measure of forward-looking expectations. The last RD/WD poll conducted by Associated Press-Ipsos before the passage of ARRA found that 25% of respondents felt that the United States was headed in the right direction. This fell to an average of 17% for the remainder of 2009. Expectations started to improve in January 2010 as 26% of respondents (NBC News Wall Street Journal Poll) felt that the U.S. was moving in the right direction. (RealClear Politics 2021)

Recoveries are muted and inflation is exacerbated when neither political party will accept obvious economic facts because their acceptance might lead to defeat at the polls. During Democrat Barack Obama's tenure as president, the unemployment rate fell from 7.8% to 4.7% from 2009 to 2016 and over eleven million jobs were created. The Republicans ignored the increase in employment and alleged that the decline in the unemployment rate was due to labor force dropouts.

When Republican Donald Trump was U.S. president (2017-2021), the unemployment rate fell from 4.7% in January 2017 to 3.2% in February 2020 and over seven million jobs were created. The Democrats incorrectly claimed that Trump just inherited a good economy from Obama and that the unemployment rate counted people who worked two jobs as two employees.

According to the Congressional Budget Office, ARRA would cost $787 billion over the 2009-2019 period. The Act included direct spending on infrastructure, education, health, and energy; federal tax incentives; expansion of unemployment benefits and other social-welfare provisions. Reid provides a breakdown of spending by project type in Table 6 of his 2010 paper. (Reid L. 2010, p. 15)

Reid pointed out that: (Reid L. 2010, p.16, footnote omitted)

> Major policy objectives of the Obama administration included environmental improvement, incentivizing renewable energy development, and increased support for education. Thus, we find that ARRA provided significant funding for environmental projects, renewables, and education. Many of the projects were funded because they were consistent with policy objectives, not because they were economically efficient.

Summary

Section A explains theories of expectations in economics. It addresses the work of John Maynard Keynes and explains why Keynes' work is based on short-term results, not expectations. It explains Keynes view of "animal spirits" which he defined as "a spontaneous urge to action rather than inaction, and not as the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities." (Keynes J. 1936, p. 161) Keynes considered animal spirits as an essential element of economic growth.

Section A also discusses three major stimulus programs that affected expectations and which in turn effected employment. These were the New Deal from 1933-1938, the Clinton stimulus from 1993 to 2000, and the Obama stimulus from 2009-2016. All three were effective in increasing employment over the long term as predicted by Keynes. In the short term, the Obama stimulus had almost no effect for two years, whereas the Clinton and FDR stimuli had an immediate effect.

Section B explains the relationship between effective demand and aggregate employment in the United States. It also provides an analysis of the impact of expectations on the components of GDP and discusses the role of public policy in shaping expectations. I found that the two expectations proxies are highly correlated with total private investment.

In the discussion of Public Policy (Section B.2), the cause of the dysfunctional system of American government is explained. The public policy recommendations attempt to at least partially mitigate the effect of this dysfunction.

These policy recommendations include eliminating Senatorial holds, eliminating super majority voting rules, and allowing minority leaders to bring up to ten bills per session to an immediate floor vote in the House and Senate. Finally, using the example of the California State Legislature, I recommended various rule changes that might reduce political dysfunction if they were adopted at the U.S. federal level.

CHAPTER 2
EMPLOYMENT AND ITS DETERMINANTS

This chapter is based on a paper that I wrote in 2023 entitled "A Study of Macroeconomic Variables that Affected Employment in the United States from 1948-2021. The paper was published in the Central European Review of Economics and Finance. (See Reid L. 2023)

This chapter is divided into three sections. Section A provides a theoretical model of employment. Section B discusses the variables that are included in the model results presented in Chapter 4, and Section C discusses variables which were omitted due to a lack of quarterly observations.

A. Theory of Employment

Businesses experience consumption (PCE) on a daily basis and incorporate either the level of consumption or the change in consumption from a previous period into their mathematical models. Typically, these model results indicate the level of demand in some future period and how much they should invest as measured by nonresidential fixed investment (NFI). In turn, increases in NFI will result in the hiring of additional workers.

For example, a business might purchase additional equipment, expand existing offices, or open new offices. If a firm had a risk factor of 1.00, they would simply adopt the model results and increase NFI accordingly. However, because firms are risk averse (Shackle G. 1939), a firm will effectively multiply its' risk factor by the level of expected demand indicated by its model. This process may occur either qualitatively or quantitatively.

A simple theoretical model of the relationship between expected demand and employment is provided below in Equation 1. The simple form of the relationship between expected demand and the level of aggregate employment in a future period can be expressed algebraically as:

$$E_{t+n} = E_t + \kappa(\beta D_t) \qquad \text{Eq. 1}$$

where:

E_t is aggregate employment at time *t*

E_{t+n} is aggregate employment at time *t* + *n*, where *n* is the number of quarters between the analysis (time *t*) and the hiring or laying off workers. For an individual firm, the value of *n* is a function of the type of industry, marginal productivity of new workers, the amount of training time required, competitive considerations, and other factors.

κ is a risk factor whose value ranges from 0 to 1.

D_t is the level of expected demand for a company's goods and services at time *t*. Expected demand is composed of two variables: personal consumption expenditures and nonresidential fixed investment.

β is the estimated coefficient of expected demand.

B. Included Variables

The following variables were taken from the literature review and were included in the initial OLS model results provided in Chapter 4: personal consumption, government spending, inflation, international trade, the minimum wage rate, money supply, the manufacturing employment percentage, nonresidential fixed investment, taxation, and the yield of the 10-year U.S. treasury bond.

1. Consumption

There are two variables which can be used to measure domestic consumption: personal consumption expenditures (PCE) and personal consumption expenditures less food and energy consumption (PCELFE). Proponents of the use of PCELFE argue that food and energy consumption is more volatile and that the use of PCE may present a biased picture of domestic consumption.

Over the monthly period 1959:1 to 2023:12, PCE had a mean of $5.59 trillion, a standard deviation of $5.04 trillion, and a volatility of (90.21%).[14] PCELFE had a mean of $4.83 trillion, a standard deviation of $4.46 trillion, and a volatility of 92.30%.[15] I use PCE in my models because it includes food and energy consumption and because there is only a minor difference between the volatility of the two series. The summary results of these two series are given in Figure 1 and in Figure 2 below.

[14] Volatility is calculated by dividing the standard deviation of the series by the mean of the series.

[15] Monthly data is used PCELFE is only available monthly starting in January 1959.

Figure 1: Histogram and Summary Statistics of the PCE Variable

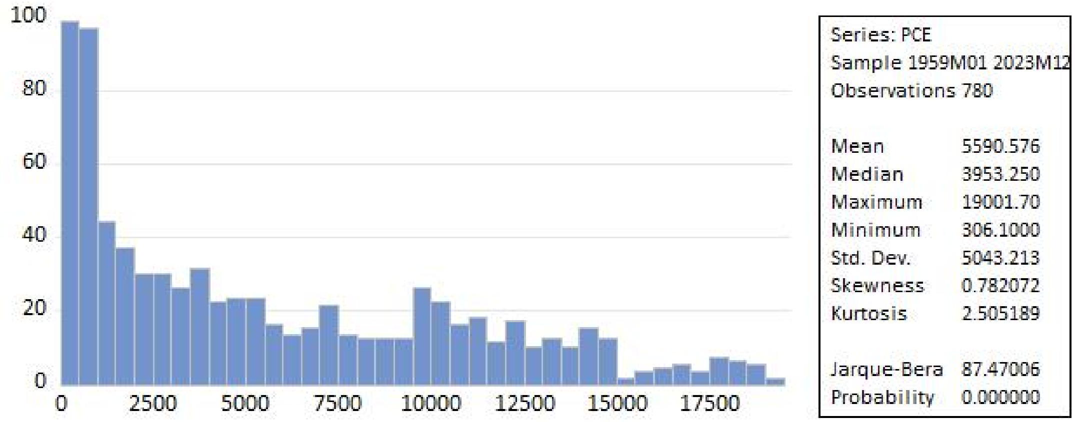
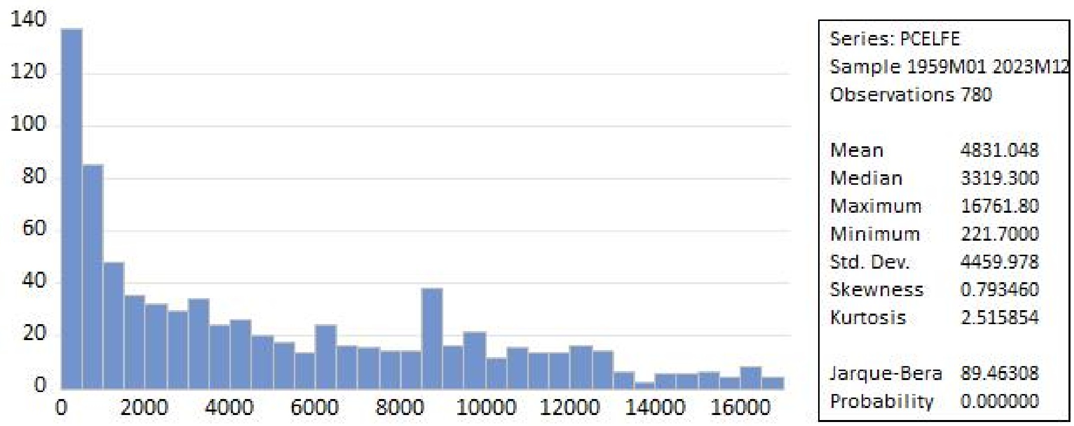


Figure 2: Histogram and Summary Statistics of the (PCELFE) variable



2. Government Spending

A review of economic theory indicates that an increase in government spending might have three major effects on employment. First, it increases employment by putting more money into the economy. Second, it crowds out private investment and third it increases inflation which in turn decreases employment.

There are three variables that measure U.S. government spending: federal government current expenditures (FCE), government total expenditures (GTE), and federal government consumption and gross investment (GCI). As explained in Chapter 1, government consumption and investment are used in the calculation of both gross national product and gross domestic product. An explanation of the differences in the three variables is given in Table 3 below.

Table 3: Government Spending Variables

Variable	Includes	Data Starts
Federal Current Expenditures (FCE)	Federal government consumption expenditures, plus spending on social benefits and other transfer payments, interest payments, and subsidies to businesses.	1947 Q1
Government Total Expenditures (GTE)	All expenditures of the federal, state, and local governments.	1948 Q1
Government Consumption and Gross Investment (GCI)	All government expenditures used to produce and provide services to the public. These include national defense, education, and highway construction.	1947 Q1

Source: U.S. Bureau of Economic Analysis (2023)

I have used government total expenditures in my models because the series provides a more complete picture of total government spending than does government consumption and gross investment. The model results are provided in Chapter 4.

3. Gross National Product (GNP)

GNP is used instead of GDP because GNP was the variable suggested by Okun A. (1962) in his model of the U.S. economy. I do not use real GNP or real GDP because the real value of a series is simply the nominal value of a series adjusted for inflation. Since inflation (as measured by CPI) is one of the modeling variables, the use of real GDP or real GNP would mean that inflation is counted twice, once in the CPI variable and once in the real GNP or the real GDP variable.

GNP is a measure of a domestic economy and GDP is a measure of an international economy. The only difference between GNP and GDP is that GDP includes net exports (exports minus imports). Measured over the period 1948 Q1 to 2023 Q3, the first difference of GDP and the first difference of GNP are highly correlated with a correlation coefficient of over 0.99.

4. International Trade

The dissertation uses imports plus exports as a proxy for the value of international trade instead of net exports (exports minus imports). This method is used by many practitioners such as First Trust Data Watch. Economists at First Trust have recently stated that "We like to focus on the total volume of trade, imports plus exports, as it represents the extent of business and consumer interactions across the US border." (Wesbury B. and Stein R. 2023)

In nominal terms, U.S. net exports have been negative since 1980. The value of net exports as a percentage of GDP is a small part of the U.S. economy and has been declining since 2005 (see Figure 3 below). The absolute value of net exports as a percentage of GDP has ranged over time, from 2.7% in 1948 to 3.8% in 2023 Q4 with a low of 0.0% in 1950, a high of 6.0% in 2005, and a mean of 1.8%.[16]

Figure 3: The value of Net Exports as a percent of GDP (1947-2023)

I ran two regressions with the first difference of GDP as the dependent variable in order to show the full effect of international trade on GDP. Both regressions had a single independent variable, the first difference of net exports and the first difference of total trade (imports plus exports). A moving average term (MA1) was used to control the effect of serial correlation. A summary of the two regressions is provided in Table 4 below and the full regression output is given in Tables A-2 and A-3 of Appendix A.

[16] Source: U.S. Bureau of Economic Analysis 2023, calculations by author.

Table 4: Comparison of International Trade Regression Results

Item	Net Exports Model	Total Trade Model
Independent Variable Coefficient	–1.6103	1.4235
P-value	0.0000	0.0000
Constant term coefficient	86.3506	58.5757
P-value	0.0000	0.0000
Durbin-Watson statistic	1.8286	1.8210
R-squared	0.0654	0.6896
F-statistic p-value	0.0000	0.0000

Source: Regression output by author

As shown in Table 4, the total trade model captures over 68% of the variance of the first difference of GDP compared to less than 7% in the net exports model. In 2023 Q3, the first difference of GDP was approximately $547 billion and the first difference in net exports was minus $27 billion or approximately 5% of the first difference of GDP. The net export model indicates that the net exports coefficient was –1.61 or approximately $43.2 billion.

In 2023 Q3, the first difference of total trade was $111 billion or approximately 20% of the first difference of GDP. The total trade model indicates that trade (imports plus exports) increased GDP by approximately $157.6 billion compared to $43.2 billion for the net exports model.

5. Investment

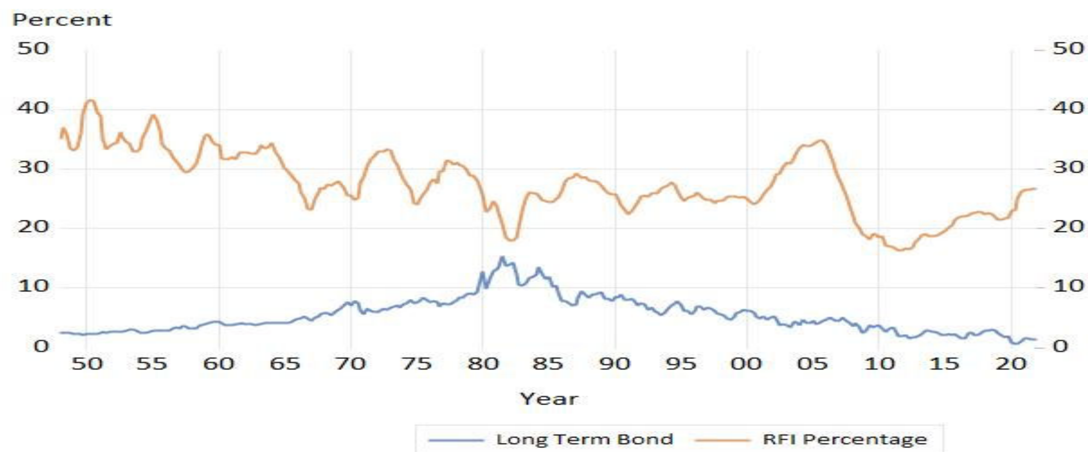
As discussed in Chapter 1, total private investment can be estimated as the sum of two variables: private residential fixed investment and private nonresidential fixed investment. Private residential fixed investment (RFI) consists of purchases of private residential structures and residential equipment that is owned by landlords and rented to tenants. Private nonresidential fixed investment (NFI) consists of purchases of nonresidential structures, equipment, and software. (Bureau of Economic Analysis 2023b)[17]

[17] As shown in Chapter 4, NFI is one of the proxies for expected demand.

In 2023 Q3, total private investment (NFI+RFI) was approximately $4.81 trillion and nominal GDP was $27.61 trillion. Thus, total private investment constituted 17.42% of nominal GDP. For the period 1948 Q1 to 2023 Q3, the nominal values of RFI and NFI had a correlation of approximately 0.95.[18] The first difference of these two series has a correlation of only 0.35. This implies that quarterly changes in these two series tend to move in opposite directions. This was true in 110 out of 303 quarters in the study.

NFI's share of total investment has grown from 58.59% in 1950 to 77.51% in 2023, although NFI has declined from a high of 83.70% in 2011. RFI is primarily housing investment and housing investment is sensitive to changes in interest rates as shown in Figure 4. If RFI rises more than NFI in a given period, then NFI's share of total investment will decline.

Figure 4: The long-term bond yield and the RFI percentage (1948-2023)



6. The U.S. Federal Minimum Wage

The effect of the federal minimum wage variable is difficult to estimate in a first difference model because of a lack of variance in the series and the small number of minimum wage workers. The United States Bureau of Labor Statistics (BLS) has reported that 181,000 workers earned the minimum wage in 2021 and 910,000 workers earned less than the minimum wage compared to a total of 149.2 million employed workers. Thus, minimum wage workers account for less than 0.8% of all workers in the United States. (Bureau of Labor Statistics 2022b)

[18] The nominal values of NFI and RFI are stationary series. Thus, using only the nominal values to estimate correlation may yield a biased estimate of the correlation between the two series.

The U.S. last increased the federal minimum wage in 2009. Thus, the first difference of the minimum wage series is zero in many quarters. Out of 303 quarters in the study, the first difference in the minimum wage variable was zero in 279 quarters.

The United States established a federal minimum wage of $.25/hour when President Franklin Roosevelt signed the Fair Labor Standards Act (FLSA) in 1938. The federal minimum wage has increased from $0.25/hour in 1938 to $7.25/hour today for eligible employees. Employees under age 20 may be paid a sub minimum wage of $4.25/hour if their employment does not displace other workers.

The FLSA was only applicable to employees engaged in interstate commerce or in the production of goods for interstate commerce. The FLSA has been amended several times since 1938 and coverage has been expanded.

In 1961, coverage was extended to employees in large retail and service enterprises, local transit, construction, and gasoline service station employees. The 1966 amendments extended coverage to state and local government employees of hospitals, nursing homes, and schools; and to laundries, dry cleaners, large hotels, motels, restaurants, and farms. Subsequent amendments extended coverage to uncovered federal, state, and local government employees, certain workers in retail and service trades, and to domestic workers in private households. Table 5 provides a history of changes to the federal minimum wage in the United States.

Table 5: History of Changes to the U.S. Federal Minimum wage

Effective Date	Hourly Rate ($)	Hourly Rate Increase (%)	Inflation Rate Increase (%)
October 24, 1938	$0.25		NA
October 24, 1939	$0.30	20.00%	NA
October 24, 1945	$0.40	33.33%	NA
January 25, 1950	$0.75	87.50%	9.91%
March 1, 1956	$1.00	33.33%	11.38%
September 3, 1961	$1.15	15.00%	11.47%
September 3, 1963	$1.25	8.70%	2.71%
February 1, 1967	$1.40	12.50%	6.99%
February 1, 1968	$1.60	14.29%	3.65%
May 1, 1974	$2.00	25.00%	45.76%
January 1, 1975	$2.10	5.00%	7.90%
January 1, 1976	$2.30	9.52%	7.13%
January 1, 1978	$2.65	15.22%	12.05%
January 1, 1979	$2.90	9.43%	8.99%
January 1, 1980	$3.10	6.90%	13.25%
January 1, 1981	$3.35	8.06%	12.35%
April 1, 1990	$3.80	13.43%	50.23%
April 1, 1991	$4.25	11.84%	4.82%
October 1, 1996	$4.75	11.76%	16.99%
September 1, 1997	$5.15	8.42%	1.97%
July 24, 2007	$5.85	13.59%	28.88%
July 24, 2008	$6.55	11.97%	4.94%
July 24, 2009	$7.25	10.69%	–1.22%
December 31, 2023	$7.25	0.00%	30.77%

Sources: United States Bureau of Labor Statistics and the Federal Reserve Board of St. Louis, calculations by author.[19]

[19] The consumer price index for urban consumers was used as a proxy for the inflation rate. Inflation data was not available until January 1947.

As shown in Table 5, increases to the minimum wage (in percent) exceeded the inflation rate in most periods prior to the last increase in the minimum wage in 2009. Since 2009, inflation has increased by 30.77% with no increase to the minimum wage. Thus, the real minimum wage in 2009 dollars is only $5.54/hour.

As a result, the current U.S. minimum wage is not high enough to allow workers to maintain an adequate standard of living.[20] However, it is higher than the minimum wage in 20 of the 27 countries in the European Union. (Eurostat 2023). Only seven European Union countries have a minimum wage higher than the U.S. minimum wage. These countries are Belgium, France, Germany, Ireland, Luxembourg, the Netherlands, and Spain.

7. Money Supply

Money supply (also referred to as money stock) is the total of all the currency and liquid assets in a country's economy on a particular date. In their undergraduate textbook, Hall and Taylor present a short-run growth model in which the growth in the price level is equal to the growth of money supply. (Hall R. and Taylor J. 1993, p. 136) Of course, the operations of the money market are far more complex than the short-run model presented by Hall and Taylor. Table 6 below provides a description of the different ways that money supply is measured and the available data for each measurement method.

[20] A minimum wage worker will earn $15,080 annually if they work 2,080 hours per year (40 hours per week multiplied by 52 weeks). The federal poverty level for a single person is $14,580 per year in the lower 48 states, $16,770 in Hawaii and $18,210 in Alaska. (Reed E. 2023)

Table 6: Types of Money Supply and the availability of data on each variable

Type	Includes	Data Availability	Correlation with M3
M0	Notes and coins in circulation	None[21]	NA
MB	M0 plus note and coins in bank vaults and Federal Reserve Bank credit[22]	None	NA
M1	M0 plus travelers checks of non-bank issuers (e.g., American Express), demand deposits, checkable deposits, and savings deposits.	1959:Q1 to 2023:Q3	0.74
M2	M1 plus time deposits of less than $100,000 and individual money market deposit accounts[23]	1959:Q1 to 2017:Q1	0.99
M3	M2 plus large time deposits, institutional money market funds, short-term repurchases, and other larger liquid assets	1948:Q1 to 2023:Q3	1.00
MZM	M1 plus all money market funds	1980:Q4 to 2021:Q1	0.84

Source: Federal Reserve Bank of St. Louis (2023)

The correlations given in Table 6 are the first difference of the variables for the period 1980 Q4 to 2017 Q1. This time period was chosen because this was the only time period in which data was available for all of the variables. All of the measures of money supply are highly correlated with M3 and have correlation coefficients ranging from 0.74 to 0.99.

The econometric models in this dissertation use M3 to measure money supply because it is the broadest measure of money supply and because M3 data is available for the entire length of the study (1948 Q1 to 2023 Q3).

[21] M0 (monetary base) is not published by the BLS, although it is included in other measures of money supply.

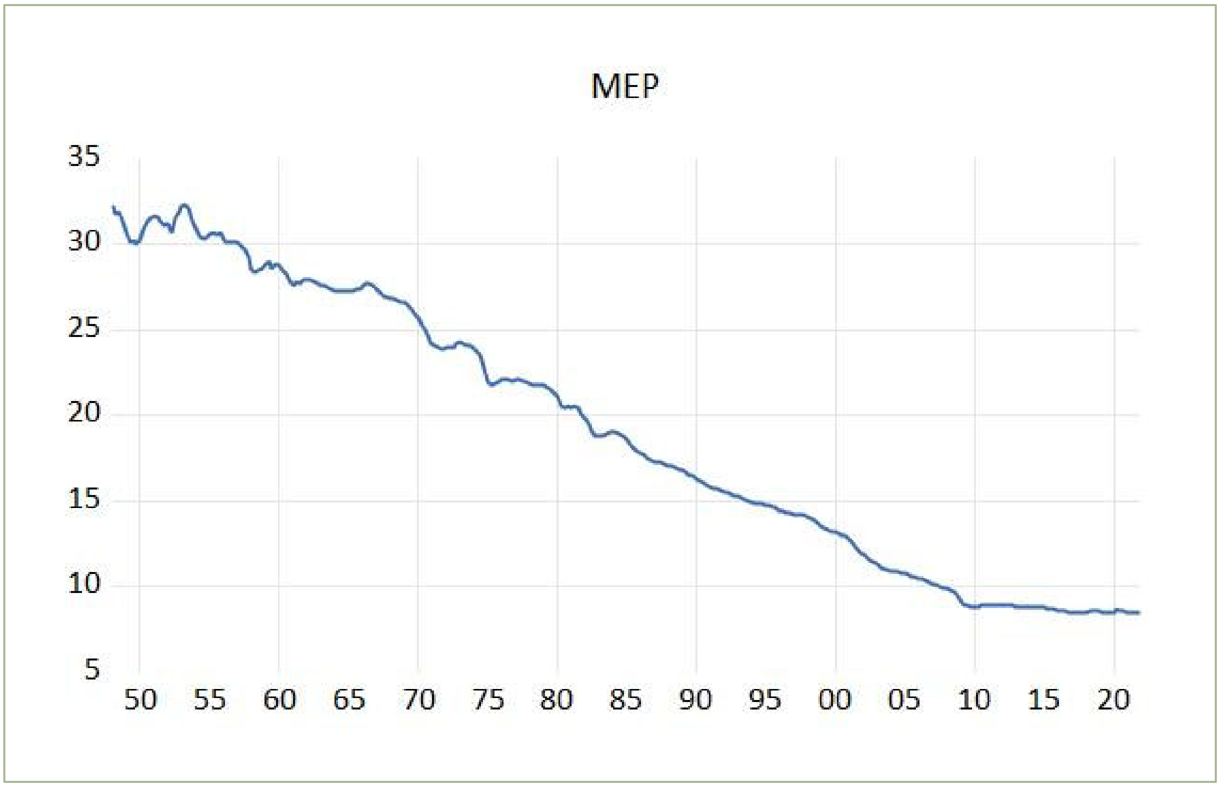
[22] MB is the most liquid measure of money supply.

[23] M2 is a key economic indicator used to forecast inflation.

8. Non-Manufacturing Employment

The percentage of employees employed in manufacturing (MEP) has fallen from 32.15% in 1948 to 8.23% in 2023. The non-manufacturing employment percentage is 1 – MEP. As shown in Figure 5, the MEP has been relatively stable since 2011, falling only sixty-six basis points, from 8.89% to 8.23%.

Figure 5: The percentage of workers employed in manufacturing (1948-2023)

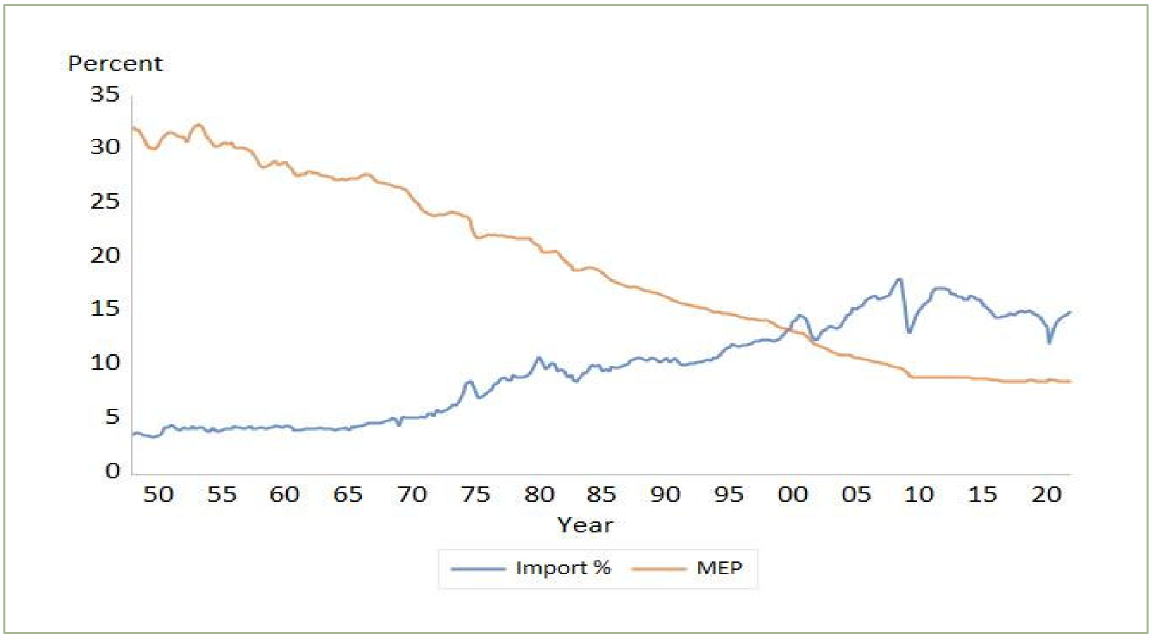


The MEP declined significantly in every decade until 2010 when it stabilized at under 9%. Both the MEP and the number of manufacturing employees have fallen over the length of this study. By the end of 1978, there were 19.334 million manufacturing employees. By 2023, there were only 12.954 million, a loss of almost seven million manufacturing jobs.

The decline in both the MEP and manufacturing employment has been affected by technological change, innovation, and productivity as manufacturers needed fewer workers to produce the same level of output. (See Gruss B. and Natova N. 2018) However, the primary cause of the decline in MEP has been the change in U.S. trade policy since 1948. At that time, the U.S. was almost a closed economy as measured by the import percentage (Imports/GNP).

The GNP import percentage rose from 3.6% in 1948 to 17.1% in 2011 and then fell to 14.9% in 2023. The decline in imports as a percentage of GNP has been a major contributor to the stabilization of MEP since 2011.[24] Figure 6 provides a comparison of the percentage of imports with the MEP. It shows that as the percentage of imports rose, the MEP fell.

Figure 6: The import percentage and the MEP (1948-2023)

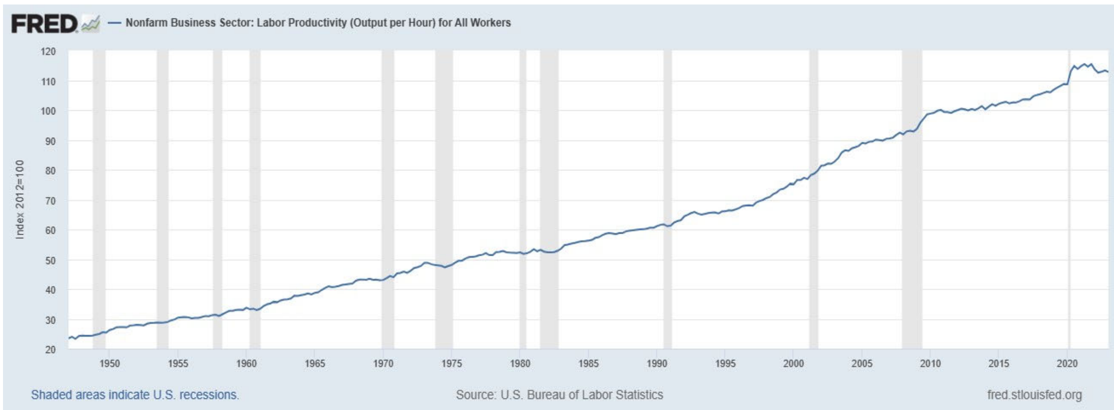


[24] The MEP fell only 47 basis points during this decade from 8.88% in 2011 to 8.41% in 2021.

9. Labor Productivity

Labor productivity is nominal GDP divided by total hours worked. Figure 7 provides a graph of a seasonally adjusted index (2012=100) of labor productivity from 1948 to 2023.

Figure 7: Labor Productivity Index (1948-2023)



Kenton W. (2023) has explained that “Labor productivity growth comes from increases in the amount of capital available to each worker (capital deepening), the education and experience of the workforce (labor composition), and improvements in technology (multi-factor productivity growth).”

Kenton argues that “Investment in an economy is equal to the level of savings because investment has to be financed from savings. . . . It is only when monetary policy is tightened, and rates rise that the economy encourages saving and ultimately future investment.” Unfortunately, the data does not support Kenton’s arguments.

In 2023 Q3, gross savings was approximately $5.6 trillion compared to total private investment of approximately $4.8 trillion, a difference of over 16%. For the period 1948 Q1 to 2023 Q3, gross savings averaged approximately $1.5 trillion compared to an average of $1.2 trillion in private investment, a difference of 25%.

As measured by the long-term bond yield, interest rates rose from 1948 Q1 (2.44%) to 1981 Q 3 (15.32%) and then fell to 0.68% in 2020 Q3. The savings rate (Gross Savings/GNP) rose from 16.27% in 1948 to 23.27% in 1981 and then rose to 30.67% by 2020. The savings rate increased by 700 basis points when interest rates were increasing and rose by 740 basis points when interest rates were declining. The correlation between the savings rate and interest rates is only .001875 which indicates that changes in interest rates have almost no effect on savings.[25]

10. Taxation

The U.S. Internal Revenue Service is the federal agency responsible for administering the U.S. tax code. The current U.S. federal individual marginal tax rate ranges from 10% to 37% depending upon an individual's adjusted gross income. The top marginal tax rate was over 90% in the 1950s.[26] However, the effective tax rate was only 16.9%. (Greenberg S. 2017)

This dissertation uses government total receipts (GTR) as a proxy for taxation because GTR provides a more accurate picture of the tax burden faced by individuals and businesses. In 2022, federal income taxes were $1.7 trillion (York E. 2023) and total government tax receipts were approximately $3.2 trillion. Thus, income taxes constituted approximately 53% of total federal government tax receipts.

Messerli J. (2011) has identified over 100 different taxes. In his article, Messerli quotes Robert Brault's joke that the "U.S. Internal Revenue Service: [is] an agency modeled after the revenue raising concepts of the 19th century economist, Jesse James".[27] --Robert Brault

The marginal tax rate provides an incomplete picture of the amount of taxes paid by Americans and thus provides an incomplete picture of the amount of disposable income. Disposable income can be saved, used to consume goods and services, or invested. Therefore, models that rely on the marginal tax rate will yield biased estimates of other macroeconomic variables such as GDP, consumption, or investment.

The effective tax rate is total taxes paid divided by total income. The effective tax rate is much lower than the marginal tax rate due to the number of deductions, exemptions, and credits that can be claimed by both individual and corporate taxpayers. For example, all individual taxpayers who file a joint return receive a standard deduction of at least $25,000 ($30,500 for people over 65).

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[25] Unless otherwise stated, the first difference of a series is used to estimate correlations throughout this dissertation.

[26] Many economics papers have used the marginal tax rate as a proxy for taxation.

[27] Jesse James was a famous 19th century outlaw from the state of Missouri.

Other deductions and credits for individual taxpayers who do not itemize deductions include contributions to an individual retirement account, exempt interest, exemptions related to social security benefits and pensions, qualified business income deductions, child care credit, education deductions and credits, educator expenses, health savings account deduction, health insurance deduction, self-employment tax deduction, student loan interest deduction, alimony deduction, foreign tax credit, and the residential energy credit.

Taxpayers who itemize deductions do not receive the standard deduction. However, they can claim deductions for medical and dental expenses, state and local taxes, home mortgage interest, investment interest paid, charitable contributions, casualty and theft losses, and job-related expenses such as uniforms and union dues.

Small businesses can claim deductions for all reasonable expenses incurred, automobile expenses,[28] depreciation and amortization, and expenses incurred for business use of their home.

C. Omitted Variables

Data for some variables is not available quarterly. These variables are the level of education, unionization, employment protection, and regulation. I provide modeling results for three of these variables listed below for informational purposes. Table 7 below provides information about these four variables.

[28] In some cases, automobile expenses have not been incurred. The IRS allows taxpayers to deduct either actual costs or take the standard mileage deduction of 62.5 cents per mile, which is an IRS estimate of the cost of operating an automobile. If a taxpayer deducts the standard mileage rate, they are deducting an estimate of costs which have not been incurred.

Table 7: The Omitted Variables

Variable	Data Availability	Frequency	Source	Number of Observations
Level of Education	1964-2022	Annual	United States Census Bureau (2023)	59
Unionization, Percentage of all employees	1983-2022	Annual	USA Facts (2022)	40
Employment Protection	1998-2019	Annual	OECD (2023)	22
Regulation	1998-2013	Every five years	OECD (2023)	4

Source: Author

In econometrics, observation bias is the level of bias resulting from too few observations. Cotes R. (1722) found that the use of different observations is the best estimate of the true value of a series and that errors decrease with aggregation. Cotes implies that too few observations will cause estimates to be biased. My modeling practice is to control observation bias by ensuring that regressions contain a minimum of ten observations per independent variable. Additionally, first difference models are used to ensure that all of the variables are stationary. The number of observations for each variable are given in Table 7 above.

I am unable to model the effect of regulation on aggregate employment because there are only five observations. Employment Protection was not modeled because it is a non-stationary series as measured by the Augmented Dickey-Fuller (ADF) test. I have estimated the effect of the first difference of education and the first difference of unionization on the first difference of aggregate employment in two separate regressions (see Section C.5 below).

1. Education

As mentioned in the literature review, Guisinger et al. (2018) found that higher levels of education, a lower rate of unionization, and a higher percentage of non-manufacturing employment are important determinants of the differences in Okun's coefficient across U.S. states.

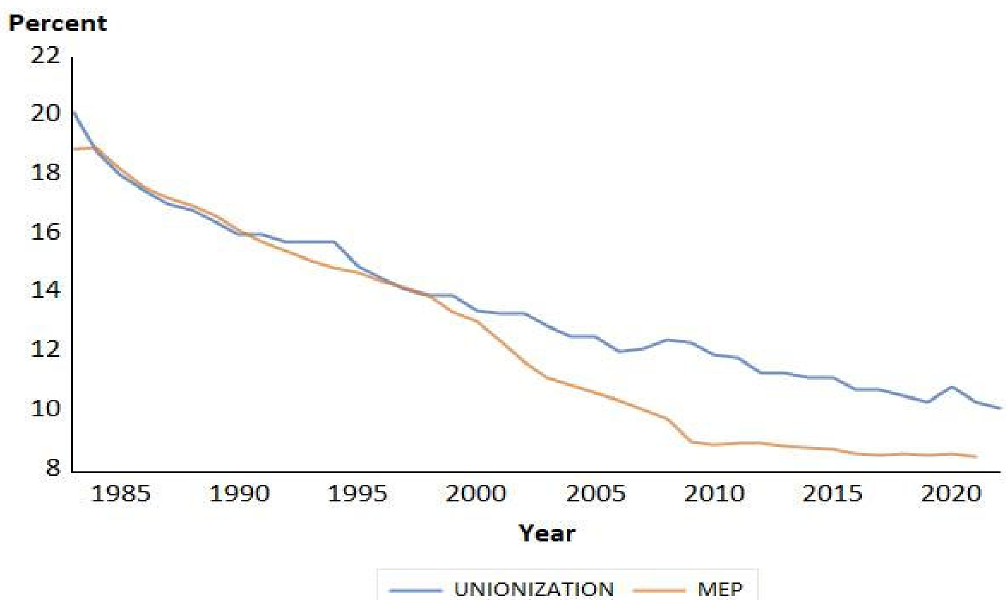
Individuals with more education have a lower unemployment rate and a higher median income. In 2021, individuals with a bachelor's degree or higher had an unemployment rate of 2.1% and a median annual income of $84,497. At that time, the civilian unemployment rate for all workers was 3.9% and the median annual income was $70,384. (Federal Reserve Bank of St. Louis 2023)

2. Unionization

The level of unionization is the percentage of employees who belong to trade unions. The unionization percentage has fallen from 20.1% in 1983 to 10.1% in 2022. Union membership rates vary greatly in public sector and private sector organizations. The unionization rate in the public sector is 33.1% compared to 6.0% in the private sector. Union members had median weekly earnings of $1,216 versus $1,029 for non-union members, a difference of approximately 18%. (Bureau of Labor Statistics 2023)

The manufacturing employment percentage and the unionization percentage have a correlation coefficient of 0.98. As shown in Figure 8, declines in the unionization percentage tend to coincide with declines in the MEP.

Figure 8: Unionization and the MEP (1983-2022)



This correlation and graphical results are consistent with the regression results in the regression equation UP =$\alpha + \beta_1 M$, where UP is the unionization percentage, alpha is the constant term, M is the MEP, and β_1 is the estimated coefficient of MEP. The regression results indicate that a 1% change in the MEP will result in a 0.73% change in the unionization percentage.

The regression uses a moving average term (MA1) to control serial correlation, has an R-squared of 0.977, and a Durbin Watson statistic of 1.54. Complete regression statistics are given in Table A-4 of Appendix A.

3. Employment Protection

The Organization for Economic Cooperation and Development (OECD) has published an annual index of employment protection in seventy-one countries from 1998-2019. The index is based on the level of regulation on dismissals and on the use of temporary contracts. Each country is rated on a scale from zero to six, where zero is no regulation and six is the highest level of regulation. The index is based solely on employment protection legislation. It does not account for administrative rulings or policy, the level of enforcement, or the political views of the leader of a country.

In 2019, the United States had a score of 2.12 compared to an average score of 2.80 in all countries in the index and an average score of 2.79 for OECD countries. (OECD 2021) The United States had the eighth lowest level of employment protection of countries rated by the OECD. There have been very few changes in the index for individual countries since 1998; the index values have changed in only ten out of seventy-one countries. In each of these countries, the index value changed only once in twenty-one years.

It could be argued that a low level of regulation is a benefit in terms of employment because businesses are more likely to hire workers if it is easy to lay workers off. On balance, the data concerning the relationship between employment protection and the unemployment rate does not support this view.

As measured by GDP, the U.S. economy is the largest economy in the world, and it has a strong effect on almost every country in the world. The strength of the U.S. economy has caused unemployment rates to decline throughout the world since 2020.[29]

The United States currently has an unemployment rate of 3.6% compared to 6.5% in the Euro area. It has the 17th lowest unemployment rate out of forty-two countries listed in a recent issue of the Economist. (The Economist 2023) Of the sixteen countries with lower unemployment rates than the U.S., only one (South Korea) has a lower employment protection score than the United States.

[29] The U.S. unemployment rate has declined from 14.7% in April 2020 to 3.6% in December 2023.

There is some evidence to suggest that there is a positive correlation between employment protection and unemployment rates in some European countries. Of the fourteen European countries listed by the Economist, seven had higher employment protection scores and a higher unemployment rate than the United States.

4. Regulation

Vannoni M. and Morelli M. (2021) have identified many of the benefits and costs of regulation. These benefits and costs are discussed below.

Public choice theory argues that regulation hinders economic growth by creating excessive burdens for economic actors (Niskanen W. 1971). Regulation can disincentivize firms to upscale, enter a market, innovate, and invest in skill formation. (Fonseca et al. 2001, Nicoletti G. and Scarpetta S. 2003, Ciccone A. and Papaioannou E. 2007, Braunerhjelm P. and Eklund J. 2014).

The introduction of detailed property rights and the establishment of a rule of law can safeguard consumers, incentivize investors, and encourage companies to create innovative technologies (Dam K. 2007). Di Vita G. (2017) argued that a certain amount of regulation is needed for the economy to grow because it reduces uncertainty. (Slemrod J. 2005, Graetz M. 2007)

Unfortunately, many of the papers on regulation seem to reflect the ideological beliefs of the authors. I was unable to find a suitable model of the economic effect of regulation for the following reasons: shortage of observations (OECD 2023), untestable models, and poor proxy use (Dawson J. and Seater J. 2013). Additionally, many papers addressed benefits without addressing costs or addressed costs without addressing benefits.

Dawson J. and Seater J. (2013) used the number of pages in the United States Code of Federal Regulations as a proxy for the level and growth in regulations. They fail to address state and local regulations, the quality of the regulations, the economic benefits of regulation, or regulatory capture theory. (See Dal Bó E. 2006)

Some of Dawson and Seater's estimates are not realistic. For example, they estimate that "Had regulation remained at its 1949 level, current GDP would have been about $53.9 trillion, an increase of $38.8 trillion." (Dawson J. and Seater J. 2013, p. 22)

5. The Omitted Variable Models

I performed an econometric regression for the Education and Unionization variables.[30] Table 8 provides a summary of the model results. The full regression results are given in Tables A-5 and A-6. The stationarity tests for education, unionization, and employment protection are given in Tables A-29 — A-31.

Table 8: Summary of the Regression results of Education and Unionization on the first difference of Employment[31]

Item	Education Model	Unionization Model
Estimated Coefficient	–257.41 (0.48)	155.68 (0.36)
Constant Term	4682.79 (0.28)	–471.61 (0.84)
R-squared	0.01	0.020
Durbin-Watson statistic	1.67	1.73
Prob. of F statistic	0.48	0.36
ADF test probability	0.00	0.00

Source: Regression output provided by author.

As shown in Table 8, neither education nor unionization has a significant effect on changes in aggregate employment. Since the econometric results do not reject the null hypothesis, I assume that the true coefficient is zero for both variables. These results make intuitive sense because neither variable has a significant effect on either expected demand or realized demand.

It is possible that the results would have been different if monthly or quarterly data had been available for these variables. The employment protection variable could have been modeled if the index had included the effects of administrative rulings, administrative policy, the level of enforcement, or the political views of the leader of a country.[32]

30 The Regulation variable was not testable due to a shortage of observations and the Employment Protection (EP) variable was non-stationary. Additionally, the first difference of the EP variable has a near singular matrix.

31 The p-values are given in parenthesis.

32 The OECD is discontinuing the employment protection index after 2023.

Summary

This chapter provided a theoretical model of employment and an analysis of the included and omitted variables that were taken from the literature review and used in the initial OLS regressions given in Chapter 4. The omitted variables are Education, Employment Protection, and Regulation. Those variables were omitted because of a lack of observations. Additionally, Employment Protection was not included because it is a non-stationary series as measured by the Augmented Dickey-Fuller (ADF) test.

My analysis of the included variables indicates that:

- There is only a minor difference between the volatility of personal consumption expenditures and the volatility of personal consumption expenditures minus food and energy.
- In nominal terms, U.S. net exports have been negative since 1980. The value of net exports as a percentage of GDP is a small part of the U.S. economy and has been declining since 2005. The absolute value of net exports as a percentage of GDP has ranged over time, from 2.7% in 1948 to 3.8% in 2021 Q4 with a low of 0.0% in 1950, a high of 6.0% in 2005, and a mean of 1.8%.
- Nonresidential Fixed Investment (NFI's) share of total investment has grown from 58.34% in 1950 to 73.33% in 2023, although NFI has declined from a high of 83.70% in 2011.
- Minimum wage workers account for less than 0.8% of all workers in the United States. (Bureau of Labor Statistics 2022b) The current U.S. minimum wage is not high enough to allow workers to maintain an adequate standard of living. However, it is higher than the minimum wage in 20 of the 27 countries in the European Union.
- The percentage of manufacturing employees (MEP) has fallen from 32.15% in 1948 to 8.41% in 2023. The MEP has been relatively stable since 2011, falling only forty-eight basis points, from 8.89% to 8.41%. The primary cause of the decline in MEP has been the change in U.S. trade policy since 1948. At that time, the U.S. was almost a closed economy as measured by the import percentage (Imports/GNP).

- As measured by the 10-year bond yield, interest rates rose from 1948 Q1 (2.44%) to 1981 Q 3 (15.32%) and then fell to 0.68% in 2020 Q3. The savings rate (Gross Savings/GNP) rose from 16.27% in 1948 to 23.27% in 1981 and then rose to 30.67% by 2020. The savings rate increased by 700 basis points when interest rates were increasing and rose by 740 basis points when interest rates were declining. The correlation between the savings rate and interest rates is only .001875 which indicates that changes in interest rates have almost no effect on savings.

- This dissertation uses government total current receipts (GTR) as a proxy for taxation because GTR provides a more accurate picture of the tax burden faced by individuals and businesses. In 2023, federal income taxes were $1.7 trillion (York E. 2023) and total government tax receipts were approximately $3.2 trillion. Thus, income taxes constituted approximately 53% of total federal government tax receipts.

CHAPTER 3
THE MODELING METHODOLOGY AND THE EMPIRICAL MODELS

Introduction

This chapter provides a discussion of empirical models and their strengths and weaknesses. Section A describes the modeling methodology. Section B describes Least Squares models. Section C describes Auto Regressive and Moving Average models. Section D describes Autoregressive Conditional Heteroskedasticity (ARCH) models. Section E describes Vector Auto Regression (VAR) and Vector Error Correction (VEC) models.[33]

There are two general purposes in performing econometric analysis. (1) to forecast the dependent variable; or (2) to attempt to determine the true value of the estimated coefficients. I am only interested in the value of the estimated coefficients in this dissertation.

Econometric Views version 13 (Eviews 13) was used to run all the econometric models used in this dissertation. The author relies on the information provided in the EViews Version 13 Users Guide throughout this dissertation. By convention, the following symbols are used in this chapter except where noted:

α is the constant term.

ε is the error term.

β_n is the estimated coefficient.

σ^2 is variance.

Σ is the summation sign of the form sum from n to k.

A variable with an overscore or bar (*e.g.*, $\overline{X}$) indicates the mean of the variable. Thus, X bar is the mean of X.

Δ is the percent change in the value of a variable. For example, $\Delta X_t = (X_t - X_{t-1})/X_{t-1}$.

33 Vector Auto Regression (VAR) models should not be confused with Value-at-risk models (VaR). VaR models are used to estimate risk while VAR models seek to estimate the interactivity between different variables.

The type of regression (e.g., OLS, VAR, etc.) that should be used in time-series analysis depends on what the modeler hopes to accomplish. A list of goals and recommended regression types is given in Table 9 below.[34]

Table 9: Econometric Goals and Recommended Solutions

Goal	Regression Type
Unbiased estimates	OLS
Account for heteroskedasticity	OLS with either a Huber-White or Newey-West covariance matrix. ARCH model family.
High R-squared	ARMA or ARIMA model.
Account for interactivity between variables	VAR model
Fix serial correlation problem.	OLS, ARCH models, or VAR
Stationarity of variables.	First difference model.
High volatility observations should have more weight than low volatility observations.	Weighted least squares with either standard deviation or variance as the weight.
Low volatility observations should have more weight than high volatility observations.	Weighted least squares with either the inverse of standard deviation or the inverse of variance as the weight.
Measure the effect of different time periods.	Use a dummy variable where one is the time period of interest, otherwise zero.
Forecast the variance of the dependent variable	ARCH models.
Forecast long-run variance of the dependent variable.	FIGARCH or FIEGARCH models.
Model non-stationary series that cannot be transformed into stationary series by other methods.	Vector Error Correction (VEC) models

[34] The information contained in Table 9 is based on my education and experience. The list addresses some common econometric problems.

Goal	Regression Type
Perform Bayesian analysis.	VAR or VEC models.
Conditional variance	ARCH, VAR, and VEC models.
Determine the true value of all the coefficients.	All models except ARMA models.
Use both endogenous and exogenous variables in a single regression.	Two-stage least squares or VAR models.

Source: Author

A. The Modeling Methodology

The following methodology was used to estimate the effect of the variables listed in Chapter 2:

1. Use the literature review to identify variables that some economists believe have an affect on aggregate employment.
2. Collect quarterly data for the period 1948:Q1 to 2023:Q3 for the variables identified in step 1.
3. Regress the nominal value of the independent variables on the nominal value of aggregate employment using OLS. The model will account for serial correlation by using autoregressive and moving average terms when necessary.
4. Perform stationarity tests on each variable using the Augmented Dickey-Fuller (ADF) test.
5. Experiment with different functional forms such as a first difference model, a delta model, a log model, and a dlog model.
6. Choose the best functional form for future regressions.[35]
7. Repeat step 4.
8. Choose the best OLS model based on R-squared, the F-statistic, the Durbin-Watson statistic, and whether the sign of the estimated coefficients is consistent with economic theory.
9. Eliminate variables that have p-values of more than 0.05 in the initial OLS model from future regressions.

[35] A dlog model uses the first difference of the log values of the variables.

10. Run weighted least squares, vector auto regression, and autoregressive conditional heteroskedasticity (ARCH) family models using the final set of variables determined in step 9.
11. Compare the ARCH family models with the results from the OLS and VAR models.
12. Estimate the correlation between the final set of variables.
13. Run Granger causality tests for the final set of variables.
14. Run a variance decomposition test for the final set of variables.
15. Estimate the impulse response between different variables using a vector auto regression (VAR) model.

B. Least Squares Models

1. OLS

LeGendre A. (1805) first published a mathematical description of least squares, of which OLS is now the most popular type. Least squares is the basic econometric model and is the only unbiased model. All other econometric models discussed in this chapter are variants of least squares and employ the underlying mathematics of least squares.

In Econometrics, a biased model is a model in which the sum of the errors does not equal zero. The error for a single observation is the difference between the estimated value of the dependent variable and the actual value of the dependent variable. OLS is the only unbiased model when a constant term (α) is included in the regression equation. Other models (e.g., ARCH models) seek to trade a small amount of bias for more robust results.

There are six classical assumptions of Ordinary Least Squares (OLS). These assumptions are (1) the regression model is linear; (2) the error term has a mean of zero; (3) all independent variables are uncorrelated with the error term; (4) observations of the error term are uncorrelated with each other; (5) the error term has a constant variance (no heteroskedasticity) and is normally distributed; and (6) no independent variable is a perfect linear function of other explanatory variables. (Reid L. 2022) The OLS models given in Chapter 4 are consistent with all the classical assumptions except the assumption of normality.[36]

[36] Hall R. et al. (1995, p. 34) has explained that the assumption of normally distributed errors is not usually valid for macroeconomic data.

a. Calculation of OLS

In a regression equation with one dependent variable and a constant term, an OLS equation is of the form Y = α + βX, where Y is the dependent variable, α is the constant term, and β is the estimated coefficient of X.[37] The estimates of β and α (Studenmund A. 1992, p. 39) are determined by the equations: alpha = Y bar - beta X bar E4

$$\beta = \frac{\sum_{i=1}^{n}\left[\left(X_i - \overline{X}\right)\left(Y_i - \overline{Y}\right)\right]}{\sum_{i=1}^{n}\left(X_i - \overline{X}\right)^2} \quad \text{Eq. 2}$$

$$\alpha = \overline{Y} - \beta\overline{X} \quad \text{Eq. 3}$$

In a regression equation with two independent variables and a constant term, an OLS equation is of the form $Y = \alpha + \beta_1 X_1 + \beta_2 X_2$, where Y is the dependent variable, α is the constant term, β_1 is the estimated coefficient of X_1, and β_2 is the estimated coefficient of X_2. The estimates of β_1, β_2, and α are determined by the equations: (Brannick M. 2023)

$$\beta_1 = [(\Sigma X_2^2)(\Sigma X_1 Y) - (\Sigma X_1 X_2)\ )(\Sigma X_2 Y)]\ /\ [(\Sigma(X_1^2)(\Sigma X_2^2) - (\Sigma X_1 X_2)^2] \quad \text{Eq. 4}$$

$$\beta_2 = [(\Sigma X_1^2)(\Sigma X_2^2) - (\Sigma X_1 X_2)\ )(\Sigma X_1 Y)]\ /\ [(\Sigma(X_1^2)(\Sigma X_2^2) - (\Sigma X_1 X_2)^2] \quad \text{Eq. 5}$$

where Σ is the sum from 1 to n.

$$\alpha = Y_M - \beta 1 X_M - \beta_2 X_{2M} \quad \text{Eq. 6}$$

where X_M is the mean of X and Y_M is the mean of Y.

Two conclusions can be drawn from Equations 2-6. First, the value of the constant term (α) is equal to any deviations between the estimated value of Y and the mean of Y and the OLS regression is unbiased. Second, the estimates of β_1 and β_2 exhibit two-way Granger causality in that the value of β_1 is affected by the value of β_2 and the value of β_2 is affected by the value of β_1.

b. Endogeneity

Endogeneity is a situation in which an independent variable is correlated with the error term. Serial correlation occurs when the error term is correlated with the error term. The econometric literature indicates that one of the major weakness of OLS is its endogeneity problem.

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[37] An OLS equation can also be expressed in the non-linear form $Y = \alpha + X^\beta$.

The dissertation overcomes the endogeneity problem in my dataset by ensuring that the variables are stationary, addressing the serial correlation problem as measured by the Durbin-Watson statistic, and using a first difference model. The level of serial correlation can be reduced by using a first difference model and/or using an autoregressive or moving average term in a regression. Once serial correlation has been appropriately reduced (DW statistic of 1.50-2.00), endogeneity is no longer a problem in the regressions.

Maddala G. (1992) has explained that "It is often asserted that the source of serial correlation is that some variables that should have been included in the equation are omitted and that these omitted variables are themselves autocorrelated." If a first difference model is used and the omitted variables are unknown, a researcher can include autoregressive and/or moving average terms in the regression equation to reduce or eliminate the serial correlation problem.

As shown in Table 10, once the serial correlation problems have been solved, endogeneity is no longer a problem in my dataset. I do not claim that this is true for all time series datasets. In order to prove that addressing serial correlation problems solves endogeneity problems, a researcher would have to use simulation techniques and conduct a major econometric study relative to this question. This type of study is beyond the scope of this dissertation.

Table 10 below provides the correlation between each explanatory variable and the error term for the first difference of each of the variables used in the models given in Chapter 4. These variables are the consumer price index, government expenditures, government tax receipts, money supply, nonresidential fixed investment, personal consumption expenditures, tax revenues, and trade (imports plus exports).

Table 10: Correlation (r) between the first difference of the explanatory variables and the error term

Variable	Correlation Coefficient	p-Value
Consumer price index	–5.16E-16	0.9999
Government expenditures	4.62E-17	0..9999
Percentage of manufacturing employees	–1.20E-16	0.9999
M3 money supply	–1.99E-16	0.9999
Nonresidential fixed investment	–1.15E-16	0.9999
Personal consumption expenditures	–1.23E-16	0.9999
Taxes	6.73E–17	0.9999
Trade	–2.35E-16	0.9999

Source: Author

The null hypothesis for each of the correlation tests is r =0. The -value for the correlation tests indicates that the null hypothesis is not rejected. Therefore, the statistical correlation between each explanatory variable and the error term is assumed to be zero.

c. Other OLS Problems

There are two more serious problems that cannot be resolved by OLS. First, OLS does not accurately account for the interactivity between different variables. For example, personal consumption expenditures affect the consumer price index, and the consumer price index affects personal consumption. This interactivity is known as two-way Granger causality (see Chapter 4).

The second problem is multi-collinearity between the independent variables. We would like for each independent variable to be uncorrelated with other independent variables and highly correlated with the dependent variable. Instead, a macroeconomic data series is often correlated with other macroeconomic data series. A high degree of correlation between independent variables is a significant problem that cannot be resolved by OLS estimation.

Greene W. (1993, p. 267) has pointed out that:[38]

> When the regressors are highly correlated, we often observe the following problems:
>
> 1. Small changes in the data can produce wide swings in the parameter estimates.
>
> 2. Coefficients may have very high standard errors and low significance levels in spite of the fact that they are jointly highly significant.
>
> 3. Coefficients will have the wrong sign or an implausible magnitude.

2. Model Settings

EViews 13 offers a variety of settings that can be adjusted for each model, or a user can simply use the defaults. Changing the default settings can improve model performance and forecasting. However, optimal performance is dependent on the type of regression and the properties of the independent variables. There are no theoretically correct values for the settings and the optimal values can only be determined through modeling experience and the type of modeling work.[39]

For example, sometimes a Huber-White covariance matrix works best at reducing heteroskedasticity and sometimes a Newey-West covariance matrix produces better results. There are also tradeoffs that must be made. ARMA terms cannot be used in conjunction with Huber-White or Newey-West covariance matrices, so the user must decide which is more important: reducing serial correlation or accounting for heteroskedasticity. The OLS model settings are provided in Table 11 below.

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[38] I refer to Greene's 1993 book throughout this dissertation instead of his later books because Greene (1993) provided a critique of different econometric methods from a purist perspective. The critiques were not included in Greene's later books.

[39] I provide this information so that other researchers can duplicate my modeling results.

Table 11: Least Squares Model Settings

Setting	OLS	ARMA Terms
Covariance Matrix	Huber-White	
Degrees of freedom adjustment	Yes	Yes
Weights	None	
Information Matrix	OPG	OPG
Estimation Method		Maximum Likelihood
Optimization Method		OPG - BHHH
Algorithm		Marquardt
Maximum number of iterations		500
Convergence tolerance		0.0001
Backcast MA terms	No	No
Starting coefficient values		Automatic

Source: Author

C. Auto Regressive and Moving Average Models

An auto regressive model (AR*n*) and a moving average model (MA*n*) are composed solely of a constant term, AR terms, and MA terms. It is possible to include auto regressive and moving average terms in an OLS model (see above) and thereby transform the OLS model into an OLS model with auto regressive and/or moving average terms.

AR and MA models are often grouped together to form an ARMA model. Sometimes an integrating term is added to form an ARIMA model. An AR(n) term is simply the n-period lag of the dependent variable Y. The moving average term uses the lag of the error term to estimate the coefficient of MA(n).

Since an AR model is based on the lagged values of the dependent variable, the values of all relevant independent variables will be contained within the AR(n) term or terms (e.g., AR(1) AR(2), AR(3) . . .) If an autoregressive term is part of a regression equation of the form $Y = \alpha + \beta_1 A + \beta_2 X$, where α is the constant term, A is the AR term and X is an independent variable, the values of the independent variable will be estimated twice, once by β_1 and once by β_2.

Another problem with AR models is that they tend to produce ever higher R-squared values as more AR terms are added to the model. Normally, R-squared (along with the F statistic) is used as a measure of the quality of a model. This is not possible in an ARMA model when multiple AR terms are used.

As mentioned in Table 9, AR models are often able to provide the best estimates of the value of the dependent variable Y. In my dissertation, I am only interested in the estimated coefficients of the independent variables and not in the ability to produce in-sample forecasts of the dependent variable.

For the reasons given above, the models specified in Chapter 4 only use AR(1) and MA(1) terms to reduce the level of serial correlation as measured by the DW statistic. AR and MA terms are not included in the models if they are not needed for this purpose.

D. Auto Regressive Conditional Heteroskedasticity (ARCH) Models

ARCH models are nonlinear estimators that were originally developed to analyze financial data. I use some of these models to analyze macroeconomic data because there are many similarities between financial time series and macroeconomic time series. Both types of time series exhibit non-normality, skewness, kurtosis, and multi-collinearity between independent variables. Additionally, both types of time series are formed by weakly efficient markets as defined by the Efficient Market Hypothesis (see Chapter 1).

Greene W. (1993, p. 439) has shown that OLS is the most efficient linear estimator, but ARCH models are the most efficient estimators. Despite the many advantages of OLS, I rely on OLS results less than on ARCH results because OLS assumes that the residuals are normally distributed. ARCH models[40] only assume that the conditional residuals are normally distributed.

[40] The term "ARCH models" refers to models that use an ARCH process or some variant of an ARCH process (GARCH, EGARCH, IGARCH, TARCH, etc.) and not only to the original model first published by Engle in 1982.

An OLS model assumes that the variance of the error term is constant. ARCH models assume that the variance of the error term is the result of a process. ARCH models were specifically designed to address financial modeling problems and to provide more consistent estimates than those provided by OLS (Engle R. 1995).

ARCH models estimate a mean equation and a variance equation. The mean equation is given in the form $Y = \alpha + X' + \varepsilon$, where Y is the dependent variable, α is the constant term, X' is a vector of independent variables, and ε is the error term. The variance equation is written as $\sigma^2 = \alpha + \beta_1(\varepsilon_{t-1})^2 + \beta_2(\sigma^2)_{t-1}$, where α is the constant term, β_1 is the estimated coefficient of the square of the one-period lag of the error term, and β_2 is the estimated coefficient of the one-period lag of the variance.

ARCH models require three different specifications: one for the conditional mean equation, one for the conditional variance, and one for the conditional error distribution (e.g., Gaussian). ARCH models are written in the form A(x,y), where A is the type of ARCH model (e.g., GARCH, EGARCH etc.), *x* is the first order autoregressive term, and *y* is the first order moving average term. In the case of a simple ARCH model, the specification is ARCH(0,1). For a simple GARCH model, the specification is GARCH(1,1).

ARCH models have been used in both time-series and cross-sectional work and have been shown to provide superior out-of-sample forecasts to OLS estimates. The first ARCH model was published in 1982 (Engle R. 1982); and the first extension (GARCH 1,1) to an ARCH model was developed in 1986 (Bollerslev T. 1986).

Both financial data and macroeconomic data are often characterized by non-normal distributions and multi-collinearity of the independent variables. Traditional econometric models assume a constant one-period forecast variance. In contrast, ARCH models use stochastic processes that have nonconstant variances conditional on the past. For these processes, the recent past gives information about the one-period forecast variance. (Engle R. 1982)

The assumption of normally distributed errors is not usually valid for macroeconomic data. Since the ARCH model assumes only that the conditional disturbances are normally distributed, the unconditional returns tend to exhibit both skewness and kurtosis. Even if the assumption of conditional normality is invalid, the estimator can still be expected to give satisfactory results and results are consistent with quasi-maximum likelihood. (Hall R. et al. 1995, p. 34)

ARCH models consist of a mean equation and a variance equation, in contrast to OLS, which only consists of a mean equation. ARCH models assume that:

1. Markets are weakly efficient.
2. Market participants use all available past information to forecast the conditional variance (future variance) of a series.
3. The forecast variance is conditional because it is dependent upon past information.
4. The conditional variance tends to have a significant effect on changes in a series and on out-of-sample forecasts.

1. ARCH Model Types

Many different variance processes have been suggested since the initial publication of the first ARCH model. Different authors have argued that the variance in a specific financial series can be best described as:

- An ARCH model (Engle R. 1982) in which the previous period's news about volatility affects volatility in the current period.
- An ARCH(q) model in which the squared residual from a previous period effects volatility in the current period (Engle and Kraft, 1983). The ARCH(q) model is only relevant if $q > 1$. If $q = 1$, the ARCH(q) model would be a simple ARCH model.
- A GARCH(1,1) model (Bollerslev T. 1986) in which the current period's variance is a function of an ARCH term and the previous period's forecast variance (GARCH term).
- An ARCH-M model (Engle R., Lilien D., and Robins R. 1987) in which the current period's variance is a function of an ARCH term and one or more exogenous variables.
- A TARCH model (Zakoian J. 1990) which assumes that returns are symmetric and that lagged market increases have a different affect on volatility than do lagged market decreases.
- A Component model (Engle R. and Gonzalez-Rivera G. 1991) in which the mean of the variance reverts to a specified level instead of the mean of the series. A component model can be used in combination with other ARCH models, although it is most frequently used in conjunction with a TARCH model.

- An Asymmetric model (Engle R. and Ng V. 1993) which assumes that a market decline in a previous period has a greater effect than a market increase of the same magnitude. The assumptions of the Asymmetric model are consistent with the economic literature. (See Shackle G. 1939; Mortensen D. and Pissarides C. 1994; and Nebot C. et al. 2019)
- A Power ARCH model (Ding et al. 1993) which allows the power parameter of the standard deviation to be estimated rather than imposed by the user.
- An EGARCH model (Nelson D. 1996) which assumes that current volatility is negatively correlated with lagged returns. Nelson first presented the EGARCH model at the American Statistical Association conference in 1989.
- A fractionally integrated GARCH model, FIGARCH, that captures long-run properties of the variance and is used to forecast long-run variance. (Baillie R., Bollerslev T., and Mikkelsen H. 1996)
- A fractionally integrated exponential model, FIEGARCH, that combines the properties of the EGARCH and FIGARCH models. (Bollerslev and Mikkelson 1996)

2. ARCH Model Equations

This section provides the variance equations for some types of ARCH models. As mentioned previously, ARCH models are specified in the form A(*x,y*), where A is the type of ARCH model, *x* is the first order autoregressive term, and *y* is the first order moving average term. The conditional variance equations are given below.

a. Basic ARCH Model, GARCH(0,1)

$$\sigma^2 = \alpha + \beta_1 \varepsilon_{t-1}^2 + \beta_2 \sigma_{t-1}^2 \qquad \text{Eq. 7}$$

where α is the constant term, β_1 is the estimated coefficient of the error term in the previous period, and β_2 is the estimated coefficient of the variance in the previous period.

b. GARCH Model, GARCH(1,1)

$$\sigma^2 = \alpha + \beta_1 \varepsilon_{t-1}^2 + \beta_2 \sigma_{t-1}^2 \qquad \text{Eq. 8}$$

where α is the constant term, β_1 is the estimated coefficient of the error term from the previous period, and β_2 is the estimated coefficient of the variance in the previous period.

c. TARCH Model

$$\sigma^2 = \varpi + \sum_{j=1}^{q} \beta_j \sigma_{t-j}^2 + \sum_{i=1}^{p} \alpha_i \varepsilon_{t-1}^2 + \sum_{k=1}^{r} \lambda_k \varepsilon_{t-k}^2 I_{t-k} \qquad \text{Eq. 9}$$

where I_t is the threshold term. I_t equals 1 if $\varepsilon_t < 0$, otherwise $I_t = 0$.

In this model, good news occurs when the lagged residual is positive and bad news occurs when the lagged residual is negative. Good news has an impact of α_i and bad news has an impact of $\alpha_i + \gamma_i$. If $\gamma_i > 0$, bad news increases volatility and there is a leverage effect for the *ith* order.[41] If γ_i does not equal 0, the news impact is asymmetric.

The major problem with the TARCH model is its' reliance on the unproven assumption that the sign of the lagged residual is a determinant of good news or bad news. The sign of the lagged residual could also be caused by omitted variables, model error, or stochastic variation. The model makes no attempt to separate news quality (good or bad) from the effect of stochastic error, irrelevant variables, or omitted variables. For this reason, the TARCH model is not included in the model results provided in Chapter 4.

d. Exponential GARCH (EGARCH) Model

The EGARCH model was based on the observation of financial traders that high volatility days tend to follow low volatility days and vice versa. This phenomenon can also be observed in some macroeconomic data. The changes in personal consumption expenditures in the first four months of 2021 are a good example of this phenomenon.

Personal consumption expenditures rose by 2.48% in January, fell by 0.60% in February, rose by 5.23% in March, and then rose by 0.60% in April. These changes were driven by fundamental factors such as direct payments to individuals, business subsidies, rent freezes, increased unemployment benefits, a substantial increase in the number of telecommuters, and widespread distribution of the Covid-19 vaccine.

The EGARCH model is based on a type of technical analysis which does not directly account for these fundamental factors when estimating the conditional variance. However, fundamental factors can be included in the mean equation. These fundamental factors will affect the error term of the mean equation which will in turn affect the EGARCH estimate of the conditional variance.

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41 The concept of financial leverage is not relevant to the analysis of most macroeconomic data.

The EGARCH(1,1) conditional variance equation is:

$$\log\left(\sigma_t^2\right) = \varpi + \sum_{j=1}^{q} \beta_j \log\left(\sigma_{t-j}^2\right) + \sum_{i=1}^{p} \alpha_i \left(\left| \frac{\varepsilon_{t-i}}{\alpha_{t-i}} \right| - E \right) + \sum_{k=1}^{r} \lambda \frac{\varepsilon_{t-k}}{\sigma_{t-k}} \qquad \text{Eq. 10}$$

e. Power ARCH (PARCH) Model

In the PARCH model, the power parameter δ of the standard deviation can be estimated rather than imposed, and the optional γ parameters are added to capture asymmetry of up to order *r* as shown in the conditional variance equation below.

$$\sigma_t^\delta = \varpi + \sum_{j=1}^{q} \beta_j \sigma_{t-j}^\delta + \sum_{i=1}^{p} \alpha_i \left(| \varepsilon_{t-i} | - \gamma_i \varepsilon_{t-i} \right)^\delta \qquad \text{Eq. 11}$$

f. Component Model, ARCH(1,1)

The component model allows mean reversion to a varying level m_t. The component model is composed of two equations, a transitory equation, and a permanent equation. The transitory equation is:

$$\sigma_t^2 - m_t = \alpha(\varepsilon_{t-1}^2 - m_{t-1}) + \beta(\sigma_{t-1}^2 - m_{t-1}) \qquad \text{Eq. 12}$$

The permanent equation is:

$$m_t = \omega + \rho(m_{t-1} - \omega) + \phi(\varepsilon_{t-1}^2 - \sigma_{t-1}^2) \qquad \text{Eq. 13}$$

Equation 12 describes the transitory component, $\sigma_t^2 - m_t$, which converges to zero with powers of $(\alpha + \beta)$. Equation 13 describes the long run component m_t, which converges to ω with powers of ρ. The value of ρ is typically between 0.99 and 1 so that ρ slowly approaches ω.

g. Fractionally Integrated GARCH Model, FIGARCH(1,1)

The FIGARCH model is designed to capture the long-run dependence properties of the variance. The variance equation is:

$$\sigma_t^2 = \omega + (1 - \beta(L) - \phi(L)\pi(L))\varepsilon_{t-1}^2 - \sigma_{t-1}^2 + \beta(L)\, \sigma_{t-1}^2 \qquad \text{Eq. 14}$$

where L is the lag operator and $\pi(L)$ is the infinite lag operator.

$$\pi(L) = 1 + \pi^*(L) \qquad \text{Eq. 15}$$

In practice, the infinite lag is truncated to a finite number.

h. Fractionally Integrated Exponential GARCH Model, FIEGARCH(1,1)

The FIEGARCH model combines the EGARCH model and the FIGARCH model. The FIEGARCH(1,1) adds a long-run polynomial term to the EGARCH(1,1) model. The FIEGARCH(1,1) variance equation is:

$$\log(\sigma_t^2) = \omega + \frac{\alpha(L)}{\beta(L)} g(z_{t-1}) + \sum_{k=1}^{\infty} \pi_k g(z_{t-1-k}) - \alpha g(z_{t-2}) - \alpha \sum_{k=1}^{\infty} \pi_k g(z_{t-2-k})$$

$$+ \beta(\log \sigma_{t-1}^2) \qquad \text{Eq. 16}$$

where $z_t = \varepsilon_t / \sigma_t$

The long-run polynomial term is given by the equation:

$$\log(\sigma_t^2) = \omega + \frac{\alpha(L)}{\beta(L)} \pi(L) g(z_{t-1}) \qquad \text{Eq. 17}$$

E. Vector Auto Regression (VAR) and Vector Error Correction (VEC) Models

The Vector Autoregression (VAR) model was first introduced by Sims C. (1980) in his critique of the existing macroeconomic models prior to 1980. Two general types of Vector models discussed in this section: Vector Auto Regression (VAR) models and Vector Error Correction (VEC) models. VAR and VEC models are discussed in Sections C.1 and C.2, respectively.

The major difference between VAR/VEC models and OLS is that VAR/VEC models attempt to capture the interactivity between different variables via the impulse response and variance decomposition functions. For example, consumption affects investment and investment affects consumption because an increase in investment increases income and income tends to increase consumption. This interactivity is referred to as two-way Granger causality, where variable X affects variable Y and variable Y affects variable X.

In contrast, OLS models freeze the dependent variable and estimate the effect of an independent variables on the dependent variable. This technique leads to estimation errors because of the effect of two-way Granger causality. The effect of two-way Granger causality operates in real-time and not just in the time period (e.g., quarterly) of the available data.

1. VAR Models

Both VAR and VEC models use the values of exogenous variables and the lags of endogenous variables to estimate the values of all the endogenous variables. The regression results given in Chapter 4 use the Online Education Technology Company's (2023) suggestion of four lags of each endogenous variable. VAR and VEC models may either be restricted or unrestricted. In a restricted model, the user may place linear restrictions on one or more coefficient estimates.

Greene W. (1993) is one of the leading critics of VAR models. He has described the VAR as simply an overfit of some simultaneous equation model. When discussing causality tests in VAR models, he argues that the VAR is an article of faith, there is no theory behind the formulation, and that causality tests are based on a model that may have missing variables or missing lagged effects. (Greene W. 1993, p. 553)

The major advantages of VAR and VEC models are:

- VAR and VEC models have the capability to measure the interactivity between different independent variables.
- Serial correlation is not a concern due to the number of lags in the system.
- Restricted VAR and VEC models allow the user to impose linear constraints on coefficient estimates of the independent variables.
- VAR and VEC models have the ability to determine the effect of an impulse response on the system.

The major disadvantages of VAR and VEC models are:

- "Since VARs frequently require estimation of a large number of parameters, a common problem is that estimates, forecasts, and impulse responses are imprecise." (EViews Users Guide, p. 957)
- Due to the number of lags, many of the coefficient estimates of the lags are not significant and have a p-value of greater than 0.05.
- Typically, only the lags of a single independent variable will have a significant effect on that variable as measured by the p-values.

- Coefficient estimates often rotate between positive and negative values for individual lags. For example, the estimated coefficient of X_{t-1} is positive, and the estimated coefficient of X_{t-2} is negative, etc.[42]

EViews has explained that: (EViews 13 Users Guide 2022, p. 865)

> As an example, suppose that industrial production (IP) and money supply (M) are jointly determined by a VAR with two lags and let a constant be the only exogenous variable. Then the VAR may be written as:

$$IP_t = a_{11}IP_{t-1} + a_{12}M_{t-1} + b_{11}IP_{t-2} + b_{12}M_{t-2} + c_1 + e_{1t} \qquad \text{Eq. 18}$$

where a_{ij}, b_{ij}, and c_i are the parameters to be estimated.

$$M_t = a_{21}IP_{t-1} + a_{22}M_{t-1} + b_{21}IP_{t-2} + b_{22}M_{t-2} + c_2 + e_{2t} \qquad \text{Eq. 19}$$

Each VAR equation will then be estimated separately by OLS. Thus, a VAR reduced-form model is simply an OLS model with lags.

2. VEC Models

Maddala G. and Kim I. (1998) have explained that Error Correction Models (ECMs) was first introduced by Sargan (1964) and popularized by Davidson et al. (1978). Although ECMs predate the development of the VAR model in 1980, they currently form the basis of the Vector Error Correction Models (VECM).

The Vector Error Correction model (VECM) is a re-parameterization of the VAR process that is specifically designed to deal with non-stationary variables and to analyze both the long-run and short-run dynamics driving the underlying variables. As shown in Chapter 4, the first difference of all the variables used in my regressions are stationary. VEC models are often used to analyze the effect of co-integration (see Section D).

A VAR process of order p is given by the equation:

$$y_t = A_1 y_{t-1} + \ldots + A_p y_{t-p} + u_t \qquad \text{Eq. 20}$$

Where y_t is a K-vector of endogenous variables, $A_1 \ldots A_K$ are K x K matrices of coefficients, and u_t is the residual vector, which is distributed with mean zero and variance matrix Σ.

[42] EViews has recommended that users not rely on the values of the estimated coefficients obtained from a VAR or VECM model.

A VECM then subtracts y_{t-1} from both sides of Equation 20 and changes the remaining elements from the right-hand side as differences. Thus, a VECM changes the functional form of the variables which means that the coefficient estimates will be different than in the VAR model on which the VECM is based. The VECM incorrectly implies that employment in period *t-1* has no effect on employment in period *t*.

Summary

This chapter provides a discussion of empirical models and their strengths and weaknesses. The models analyzed include OLS, ARCH, and VAR. For each type of model, I provide an equation describing how the results are calculated. The polynomial is used by the FIGARCH model to forecast the long-run effects. A more detailed discussion of long-run effects is given in Chapter 4.

Endogeneity is a situation in which an independent variable is correlated with the error term. Serial correlation occurs when the error term is correlated with lags of the error term. The econometric literature indicates that one of the major weaknesses of OLS is its endogeneity problem.

The dissertation overcomes the endogeneity problem in OLS by ensuring that the variables are stationary, addressing the serial correlation problem as measured by the Durbin-Watson statistic, and by using a first difference model. Once these steps are taken, the correlation between an independent variable and the error term is zero in my first difference model.

There are two additional problems that cannot be resolved by OLS. First, OLS does not accurately account for the interactivity between different variables. For example, personal consumption expenditures affect the consumer price index, and the consumer price index affects personal consumption. This interactivity is known as two-way Granger causality (see Chapter 4).

The second problem is multi-collinearity between the independent variables. We would like for each independent variable to be uncorrelated with other independent variables and highly correlated with the dependent variable. Instead, a macroeconomic data series is often highly correlated (over 0.80) with other macroeconomic data series. A high degree of correlation between independent variables is a significant problem that cannot be resolved by OLS estimation.

This chapter explains that ARCH models are nonlinear estimators that were originally developed to analyze financial data. I will use some of these models to analyze macroeconomic data because there are many similarities between financial time series and macroeconomic time series. Both types of time series exhibit non-normality, skewness, kurtosis, and multi-collinearity between independent variables. Additionally, both types of time series are formed by weakly efficient markets as defined by the Efficient Market Hypothesis (EMH). The EMH is discussed in Chapter 1.

Both VAR and VEC models use the values of exogenous variables and the lags of endogenous variables to estimate the values of all the endogenous variables. In a restricted VAR model, the user may place linear restrictions on one or more coefficient estimates. This chapter provides a list of the advantages and disadvantages of VAR models.

William Greene is one of the leading critics of VAR models. He has described the VAR as simply an overfit of a simultaneous equation model. When discussing causality tests in VAR models, he argues that the VAR is an article of faith, there is no theory behind the formulation, and that causality tests are based on a model that may have missing variables or missing lagged effects. (Greene W. 1993, p. 553)

Most VAR models provide unreliable coefficient estimates. However, VAR models have proven to be a valuable tool in analyzing variance decomposition, and in calculating the impulse response between different variables.

CHAPTER 4
MODELING METHODOLOGY
AND EMPIRICAL RESULTS

This chapter provides the modeling methodology and modeling results discussed in Chapter 3. Section A provides a descriptive analysis of U.S. employment. Section B provides a description of the input and output variables. Section C provides and interprets the model results.

A. Descriptive Analysis of U.S. Employment

Table 12 below provides the annualized employment growth rate for different economic sectors during the period 1948 Q1 to 2023 Q3. The two largest growth sectors were Professional and Business Services (PBS), and Private Education and Health Services (PEHS). Manufacturing employment was the only sector with a negative growth rate. Finally, there has not been a large increase in the growth of government employment relative to private sector employment. There has been only a twenty-four basis-point difference between the growth rate of private-sector employment and the growth rate of public-sector employment.

Over the period of this study (1948-2023), the economy has slowly changed from a manufacturing-based economy to an information-based economy, as indicated by the decline in growth rate of manufacturing employment and by the substantial increase in the growth rate of professional and business services.

The U.S. Census Bureau defines the “baby boom generation” as comprised of those individuals born between 1946 and 1964. (Bump P. 2014) In 2020, Pew Research found that 33.7% (71.2 million) of U.S. adults were members of the baby boom generation. (Fry R. 2020)

The large increase in health-service employment has been driven by the aging of the baby boom generation who, as they aged, needed more medical services, which led to increased employment in the health-services sector.

Table 12: Annualized Employment Growth by Sector (1948-2023)

Sector	1948 (mm)	2023 (mm)	Annual Growth Rate
Total Civilian Employment	44.683	149.742	1.67%
Public Sector	5.888	22.967	1.88%
Private Sector	38.795	126.775	1.64%
Professional and Business Services (PBS)	2.914	29.069	3.20%
Private Education and Health Services (PEHS)	2.096	23.892	3.39%
Retail Trade	4.552	15.365	1.68%
Wholesale Trade	2.236	6.100	1.38%
Leisure and Hospitality	2.743	15.258	2.51%
Manufacturing Employment	14.086	12.584	–0.15%
Financial Activities	1.754	8.935	2.26%
Construction	2.306	7.594	1.65%

Source: U.S. Bureau of Labor Statistics (2021a), calculations by author.

It is extremely difficult to forecast future employment because future events are often unpredictable and can have a dramatic effect on employment. This was particularly true during the Covid period (2020-2023). Civilian employment fell from 152.4 million in February 2020 to 130.4 million in April 2020, for a loss of twenty-two million jobs or over 14% of the labor force.

On March 11, 2020, the World Health Organization declared Covid-19 a global pandemic. The first lockdown in the United States occurred in the territory of Puerto Rico on March 15, 2020. Lockdowns were fully implemented in most U.S. states by April 7, 2020 (Reid L. 2021). On April 10, 2023, U.S. President Biden signed a resolution which ended the national U.S. Covid emergency.

It was not possible for analysts to predict the response of government to the loss of this many jobs in such a short period of time. The U.S. government spent approximately $5 trillion dollars to provide relief to businesses, individuals, and local government. (Parlapiano A. *et al.* 2022) As a result of the relief programs, employment rose from 130.4 million in April 2020 to 156.9 million in December 2023.

A good example of these forecasting problems is the 2020 forecast of the U.S. Bureau of Labor Statistics (BLS). Based on historical data, the BLS forecast an annual growth rate in employment of 0.7% from 2020 to 2030, or a total growth rate of 7.22% from 2020 to 2030. (Bureau of Labor Statistics 2021a)

As a percent of the civilian labor force, the BLS estimated that:[43]

- Manufacturing employment will fall from 7.9% in 2020 to 7.4% in 2030.
- Retail employment will fall from 9.7% in 2020 to 8.6% in 2030.
- Health care and social assistance employment will increase from 12.9% in 2020 to 14.0% in 2030.
- Government employment will fall from 14.3% in 2020 to 13.7% in 2030.
- Professional and business services employment will increase from 13.2% in 2020 to 13.5% in 2030.

Table 13 provides information on 2020 employment, 2023 employment, the BLS 2030 employment forecast, and the BLS 2023-2030 employment forecast.

Table 13: 2020-2030 BLS Employment Forecast

Item	2020 Emp. (mm)	2023 Emp. (mm)	2030 BLS Forecast (mm)	2023-2030 BLS Forecast (mm)
Total civilian employment	142.4	156.9	152.7	–4.2
Manufacturing employment	12.2 (8.6%)	13.0 (8.3%)	11.3 (7.4 %)	–1.7
Retail employment	15.1 (10.6%)	15.5 (9.9%)	13.1 (8.6%)	–2.4
Health care and social assistance employment	16.0 (11.2%)	17.1 (10.9%)	21.4 (14%)	4.3
Government employment	21.7 (15.2%)	22.9 (14.6%)	20.9 (13.7%)	–2.0
Professional and business services employment	20.7 (14.5%)	23.0 (14.7%)	20.6 (13.5%)	–2.4

Source: U.S. Bureau of Labor Statistics, calculations by author.

[43] These estimates assume that government policy will not change over the course of the forecast period.

As shown in Table 13, the BLS has significantly underestimated both the total job growth and the labor force percentages of the five sectors listed above. Total non-agricultural employment has risen from 142.475 million in December 2020 to 156.923 million in October 2023, an increase of 11.43%. In order for the BLS forecast to be accurate, employment would have to decline by 4.2 million jobs by 2030, a decrease of 2.68%.

U.S. employment has never declined by over 2.7% in any seven-year period since the Great Depression. During the Great Depression, employment declined by about two million jobs from 1930 to 1937, a decrease of 5.52%. (Statista 2023)

B. Input and Output Variables

Seasonally adjusted quarterly data was collected for all variables for the period 1948 Q1 to 2023 Q3. All data was obtained from the Federal Reserve Bank of St. Louis (2022) and from the Board of Governors of the Federal Reserve System (1976). The Literature Review was used to identify ten input variables. The output variable is Aggregate Employment. An additional proxy for expected demand (nonresidential fixed investment) was added to the list of input variables. Of the twelve input variables suggested by the literature, two (Education and Unionization) are only available annually, and were removed from the initial list of input variables.

The variables may be downloaded from the site https://fred.stlouisfed.org/series/[Data Series]. A list of the variables and the data series are given in Table 14 below.

Table 14: Variables and Data Series

Variable	Data Series	Description	Updated
Civilian Labor Force	CLF16OV	Thousands of persons.	March 12, 2024
CPI	CPIAUCSL	Consumer Price Index, all urban consumers.	Feb. 12, 2024
Emp	PAYEMS	Thousands of Nonfarm Civilian Employees.	Feb. 12, 2024
Exports	EXPGS	Exports of goods and service, Billions of dollars.	Feb. 12, 2024
FGE	FGEXPND	Federal Government: Current Expenditures, Billions of Dollars.	Feb. 12, 2024

Variable	Data Series	Description	Updated
Fiscal	Calculated	Total Government Current Expenditures, FGE plus LGE, Billions of Dollars	Feb. 13, 2024
FTR	W006RC1Q027SBEA	Federal Government Current Tax Receipts, Billions of Dollars	Feb. 12, 2024
GCI	GCE	Government Consumption Expenditures and Gross Investment, Billions of Dollars	Feb. 15, 2024
GDP	GDP	Gross Domestic Product, Billions of Dollars	Feb. 14, 2024
GNP	GNP	Gross National Product, Billions of Dollars	Feb. 12, 2024
Imports	IMPGS	Imports of Goods and Services, Billions of Dollars	Feb. 12, 2024
LGE	SLEXPND	State and Local Government Current Expenditures, Billions of Dollars	Feb. 13, 2024
LP	OPHNFB	Nonfarm Business Sector: Labor Productivity (Output per Hour) for All Workers.	Feb. 12, 2024
LTB	IRLTLT01USM156N	Yield of the U.S. Treasury 10-Year Bond in percent.	Feb. 13, 2024
LTR	W070RC1Q027SBEA	State and Local Government Current Tax Receipts, Billions of Dollars	Feb. 12, 2024
ME	MANEMP	All Employees, Manufacturing, Thousands of Persons.	Feb. 12, 2024
MEP	Calculated	Manufacturing employees as a percentage of total nonfarm civilian employees.	Feb. 12, 2024
MS	MABMM301USM189S	M3 Money Stock, Billions of Dollars. (November 2023)	Feb. 12, 2024

Variable	Data Series	Description	Updated
MW	FED-MINNFRWG	Federal Minimum Hourly Wage in dollars per hour for nonfarm civilian workers.	Feb. 12, 2024
NE	Calculated	Exports minus Imports, Billions of Dollars	Feb. 15, 2024
NFI	PNFI	Private Nonresidential Fixed Investment, Billions of Dollars.	Feb. 12, 2024
PCE	PCE	Personal Consumption Expenditures, Billions of Dollars	Feb. 12, 2024
PCELFE	DPCCRC1M027SBEA	Personal Consumption Expenditures Less Food and Energy, Billions of Dollars	Feb. 16, 2024
RFI	PRFI	Private Residential Fixed Investment, Billions of Dollars	Feb. 15, 2024
Taxes	Calculated	Total Government current tax receipts, FTR plus LTR, Billions of Dollars	Feb. 13, 2024
Total Private Investment	Calculated	Total Private Investment, NFI plus RFI, Billions of Dollars	Feb. 15, 2024
Trade	Calculated	Imports plus Exports, billions of dollars.	Feb. 13, 2024
Unemployment Level	UNEMPLOY	Thousands of persons.	Mar. 12, 2024
Unemployment Rate	UNRATE	Percent of the labor force that is unemployed.	Mar. 12, 2024

Source: Federal Reserve Bank of St. Louis

C. The Econometric Model Results

This section provides the regression results for the OLS, ARCH family, and VAR models. A first difference functional form was used for all of the final models. The estimated coefficients provide a conservative picture of the impact of the independent variables on the dependent variable because the dependent variable (employment) is based on all non-agricultural employees.

1. OLS Models

The initial OLS regression used nominal values and controlled serial correlation by using an autoregressive term (AR1) and a moving average term (MA1). The regression had an R-squared of 0.999, a Durbin-Watson (DW) statistic of 1.72, and an F-statistic p-value of 0.0000.

The regression equation is:

$$E = \alpha + \beta_1 C_t + \beta_2 CPI_t + \beta_3 F_t + \beta_4 IT_t + \beta_5 L_t + \beta_6 MEP_t + \beta_7 MS_t + \beta_8 MW_t + \beta_9 N_t + \beta_{10} T_t + \beta_{11} A + \beta_{12} M + \varepsilon$$

where:

α is the constant term.

β_1-β_{12} are the estimated coefficients at time *t*.

C_t is Personal Consumption Expenditures at time *t*.

CPI_t is the Consumer Price Index at time *t*.

E_t is Aggregate Employment at time *t*.

F_t is Government Expenditures at time *t*.

IT_t is International Trade at time *t*.

L_t is the yield of the long-term (10 year) U.S. Treasury Bond at time *t*.

MEP_t is the percent of nonfarm civilian employees who work in Manufacturing at time *t*.

MS_t is M3 Money Stock at time *t*.

MW_t is the federal minimum wage at time *t*.

N_t is Nonresidential Fixed Investment at time *t*.

T_t is Government Tax Receipts at time *t*.

A is the autoregressive term AR(1).

M is the moving average term MA(1)

ε is the error term.

A summary of the model results is given in Table 15 below, and the full output is given in Table A-7 of Appendix A.

Table 15: Summary of Regression Results for the Initial OLS Model using nominal values

Variable	Estimated Coefficient	Probability
Constant	65,569.02	0.5344
CPI	31.07	0.2042
Fiscal	–0.73	0.0000
LTB	5.90	0.9336
MEP	521.46	0.152
MS	–1.66	0.0000
MW	0.92	0.9979
NFI	11.90	0.0000
PCE	0.57	0.0010
Taxes	2.58	0.0000
Trade	1.74	0.0000
AR(1)	1.00	0.0000
MA(1)	0.35	0.0000

Source: Author

In the dissertation's initial regression (using nominal values), several econometric problems were evident. These problems included:

1. Use of an incorrect functional form
2. Serial correlation
3. Outliers
4. Non-stationarity of the variables

a. Functional Form

The term functional form refers to the algebraic form of a relationship between a dependent variable and regressors. Different variables may use a different functional form, although that is a practice that this dissertation only uses in its analysis of event shocks.

In order to attempt to solve the problems listed above, four additional OLS models were run: a first difference model, a Delta model (single period percent change), a log model, and a first difference model using log values (Dlog model). The GNP variable was removed from the regression results because personal consumption expenditures (PCE) and nonresidential fixed investment (NFI) are contained within the GNP variable.

b. Serial Correlation

The Durbin-Watson (DW) statistic was used to measure serial correlation. A DW statistic less than 1.50 indicates positive serial correlation, and a DW statistic greater than 2.00 indicates negative serial correlation. The dissertation accounted for serial correlation by using AR and MA terms when necessary.

c. Outliers

The dissertation defines an outlier as an observation that is greater than two standard deviations from the mean of the series. Traditionally, some statisticians have eliminated outliers from the data set. This was a controversial practice that does not work well when dealing with time series data. Outliers in an economic series are often caused by either recessions or by high growth periods following a recession. The elimination of outliers is equivalent to stating that recessions do not exist and will never exist in the future. For that reason, the author did not eliminate any observations from the data set.

Over the period 1948 Q1 to 2023 Q3, the quarterly percentage change in GNP (growth rate) has ranged from –9.54% to 8.73%. The mean of the GNP series is 1.55% and the standard deviation is 1.35%. High growth periods are defined as periods where the growth rate is greater than two standard deviations above the mean (4.25%), and low growth periods are defined as periods where the growth rate is less than two standard deviations below the mean (–1.15%). The quarters that meet these standards are given in Table 16 below.

Table 16: High-Growth and Low-Growth Quarters

Quarter	GNP Growth Rate (%)	Employment Growth Rate (%)	Modified Okun Coefficient
1950 Q3	6.19%	3.01%	0.49
1951 Q1	4.97%	2.16%	0.43
1978 Q2	5.64%	1.74%	0.31
1980 Q4	4.26%	0.81%	0.19
2020 Q3	8.73%	2.89%	0.33
1949 Q1	–1.92%	–1.76%	0.92
1953 Q4	–1.32%	–1.32%	1.00
2008 Q4	–2.47%	–1.40%	0.57
2020 Q2	–9.54%	–8.84%	0.93

Source: Author

As mentioned previously, the coefficient of a 1% change in GNP with respect to the percent change in non-farm civilian employment for the period 1948 Q1 to 2023 Q3 is 0.50, which implies that a 1% increase in nominal GNP should result in a 0.50% increase in total non-farm civilian employment. This is similar to the relationship predicted by Okun A. (1962).

Table 16 shows that the calculated coefficient was lower in all the high-growth quarters than predicted by Okun and was higher in all the low-growth quarters than predicted by Okun. This implies that firms are risk averse and are more likely to reduce employment in times of negative economic growth than they are to increase employment in high-growth periods.

As a matter of public policy, this result indicates that government should be extremely concerned with preventing recessions, because employment losses are immediate during recessions, and employment often recovers slowly after a recession ends.

For example, total non-farm employment did not recover from the Covid-related decline in employment until June 2022. Total non-farm employment fell from 152.371 million in February 2020 to 130.43 million in April 2020. Total non-farm employment did not recover until June 2022, when it rose to 152.412 million, a gain of only 41,000 jobs since February 2020.

d. Stationarity

The use of non-stationary data in a time-series analysis is not consistent with the classical assumptions of OLS. and may result in biased coefficient estimates and an incorrect interpretation of those estimates.

Because of the fact that all of the nominal variables are non-stationary, I ran a preliminary first difference model (see Table A-8). Only two of the coefficient estimates (LTB and MW) had a p-value greater than 0.05. Therefore, the LTB and MW variables were dropped from the remainder of the regressions.

The initial and final OLS regressions satisfy both the classical assumptions and the assumption of stationary variables. The ADF test was run for the independent and dependent variables, and both the first difference and Dlog values of all the variables were found to be stationary.

2. OLS Equally Weighted Model Results

The equally weighted OLS model results are summarized in Tables 17-18, and the full model output is given in Tables A-9 — A-12 of Appendix A.

Table 17: OLS Model Statistics

Model	R-Squared	F Statistic Prob.	DW Statistic
First Difference	0.799	0.0000	1.56
Delta	0.701	0.0000	1.81
Log	0.999	0.0000	1.51
Dlog	0.681	0.0000	1.79

Source: Author

Although the log model has the highest R^2 value, the results are suspect because they imply that there is almost no stochastic error. A summary of the model results is provided in Table 18 below.[44] The full regression output is provided in Tables A-9 — A-12, and the stationarity tests are given in Tables A-32 — A-41.

[44] The first difference of the employment series is a stationary series with an ADF probability of 0.0000.

Table 18: Estimated Coefficients and Stationary Test Results for the OLS Models

Variable	First Difference Model	Delta Model	Log Model	Dlog Model	ADF Test Prob.*
Constant	466.52 (0.0000)	0.003 (0.0000)	9.45 (0.0000)	0.004 (0.0000)	NA
CPI	–42.58 (0.1414)	–0.012 (0.7511)	–0.28 (0.0000)	–0.017 (0.6782)	0.0004
Fiscal	–1.03 (0.0000)	–0.090 (0.0000)	–0.11 (0.0000)	–0.091 (0.0000)	0.0000
MEP	1320.63 (0.0000)	0.256 (0.0000)	0.25 (0.0000)	0.222 (0.0000)	0.0000
MS	–2.09 (0.0000)	–0.089 (0.0006)	–0.04 (0.0001)	–0.107 (0.0001)	0.0098
NFI	8.22 (0.0000)	0.064 (0.0000)	0.02 (0.1696)	0.069 (0.0000)	0.0000
PCE	0.84 (0.0179)	0.140 (0.0000)	0.50 (0.0000)	0.130 (0.0000)	0.0000
Taxes	3.29 (0.0000)	0.052 (0.0000)	0.06 (0.0013)	0.055 (0.0000)	0.0000
Trade	0.73 (0.1115)	0.030 (0.0004)	0.06 (0.0000)	0.036 (0.0001)	0.0000

Source: Author

* The ADF tests were run using a constant term and evaluated using MacKinnon (1996) one-sided p-values.

I note that the Taxes variable has a positive coefficient, and the Fiscal variable has a negative coefficient. This is caused by the fact that the Taxes variable is positively correlated (r = 0.52) with employment and the Fiscal variable is negatively correlated (r = –0.68) with employment. This should not be interpreted to mean that increasing taxes will increase employment.

In 2023 Q3 government spending was $10.2 trillion and government tax receipts were $5.2 trillion. Thus, we can safely assume that all government tax receipts will be spent. In order to determine employment effect of government spending, the combined effect of taxes and spending must be analyzed.

With the exception of the CPI variable, all four models listed in Table 18 provide consistent results of the estimated coefficients. In three of the four models, the estimated coefficient of the CPI variable had a p-value of greater than 0.05. The p-values for the CPI variable ranged from a low of 0.0000 in the log model to a high of 0.7511 in the Delta model.

Based on a review of the four models, I have the most confidence in the first difference model. The OLS first difference model has an R-squared of 0.773, the residuals are not serially correlated, all of the estimated coefficients except the CPI and trade variables are significant, and none of the estimated coefficients have an atheoretical sign. The cross correlations of the explanatory variables are given in Table 19 below.

Table 19: Cross Correlation of the first difference of the explanatory variables

Variable	CPI	Fiscal	MEP	MS	NFI	PCE	Taxes	Trade
CPI		–0.11	0.19	0.08	0.49	0.58	0.42	0.53
Fiscal			0.08	0.52	–0.41	0.12	–0.34	–0.59
MEP				0.12	0.12	0.07	0.09	0.02
MS					–0.21	0.24	0.08	–0.29
NFI						0.50	0.58	0.74
PCE							0.45	0.44
Taxes								0.69
Trade								

Source: Author

The estimates of correlation indicate that none of the variables are highly correlated with any other variable. The dissertation defines a pair of variables as highly correlated if the absolute value of the correlation coefficient is 0.80 or greater. As shown in Table 19, the correlation estimates range from –0.59 (Fiscal and Trade) to 0.74 (NFI and Trade).

3. Weighted Least Squares

In order to address the problem of outliers discussed above, Weighted Least Squares (WLS) was run using the first difference functional form and the weight set to the inverse of the standard deviation. The regression has an R-squared of 0.799 and a DW statistic of 1.56. Two of the variables (CPI and Trade) were not significant at or below the 0.05 level, but both of the estimated coefficients have the correct sign. I attribute the lack of significance to the CPI variable to the presence of the money supply variable in the regression.

A summary of the WLS results is given in Table 20 below, and the full regression output is provided in Table A-14 of Appendix A.

Table 20: The WLS Model Results

Variable	Coefficient	Probability	Mean of Series	Jobs Impact
Constant	466.52	0.0000	NA	
CPI	–42.58	0.1414	0.9397	0
Fiscal	–1.02	0.0000	33.5979	34,270
MEP	1320.63	0.0000	–0.08	–105,650
MS	–2.09	0.0000	67.9619	–142,040
NFI	8.22	0.0000	12.2595	100,773
PCE	0.84	0.0179	61.6594	51,794
Taxes	3.29	0.0000	17.0071	55,953
Trade	0.73	0.1115	26.5636	0

Source: Author

The jobs impact results show that on average the expected demand proxies (NFI and PCE) account for 152,567 jobs, or over 45% of the average quarterly increase in employment.

4. Auto Regressive Conditional Heteroskedasticity Models

As discussed in Chapter 3, Auto Regressive Conditional Heteroskedasticity (ARCH) models estimate a mean equation and a variance equation. The mean equation is given in the form $Y = \alpha + X' + \varepsilon$, where Y is the dependent variable, α is the constant term, X' is a vector of independent variables, and ε is the error term.

The variance equation is written as $\sigma^2 = \alpha + \beta_1(\varepsilon_{t-1})^2 + \beta_2(\sigma^2)_{t-1}$, where β_1 is the estimated coefficient of the square of the one-period lag of the error term, and β_2 is the estimated coefficient of the one-period lag of the variance.

Table 21 provides the model statistics for five of the ARCH family of models, and Table 22 provides a summary of the model results for these models. The p-values are given in parentheses in Table 22. The full regression output is given in Tables A-15—A-19 of Appendix A.

The Akaike info criterion (AIC) is a measure of the quality of a regression.[45] The lower the AIC, the higher the quality. AIC is defined by the equation:

$$AIC = -2(l/T) + 2(k/T) \quad \text{Eq. 21}$$

where k is the number of parameters, l is the value of the log likelihood function, and T is the number of observations.

Table 21: ARCH Model Statistics

Model	**R-Squared**	**AIC**	**DW Statistic**
ARCH	0.783	14.74	1.71
GARCH	0.765	14.57	1.77
EGARCH	0.752	14.56	1.70
PARCH	0.782	14.54	1.73
FIGARCH	0.765	14.76	1.78

Source: Author

[45] Other measures of regression quality include the log-likelihood function, R-squared, and the p-value of the F-statistic.

Table 22: ARCH Family Model Results (p-values in parentheses)

Model	CPI	Fiscal	MEP	MS	NFI	PCE	Taxes	Trade
ARCH	41.10 (0.0000)	–1.36 (0.0000)	1332.99 (0.0000)	–2.01 (0.0000)	10.44 (0.0000)	1.08 (0.0085)	2.33 (0.0016)	–0.64 (0.2645)
GARCH	-6.18 (0.7732)	–1.74 (0.0000)	1529.19 (0.0000)	–1.54 (0.0000)	5.33 (0.0000)	0.86 (0.0000)	2.16 (0.0000)	0.23 (0.5594)
EGARCH	–14.64 (0.4145)	–1.76 (0.0000)	1580.97 (0.0000)	–1.41 (0.0000)	5.69 (0.0000)	0.78 (0.0000)	2.52 (0.0000)	0.65 (0.0798)
PARCH	3.68 (0.8501)	–1.51 (0.0000)	1497.23 (0.0000)	–1.67 (0.0000)	6.28 (0.0000)	0.67 (0.0000)	2.53 (0.0000)	0.47 (0.2833)
Average of the short-run models	5.99	–1.59	1485.10	–1.66	6.94	0.85	2.39	0.18
FIGARCH	–40.20 (0.1174)	–1.84 (0.0000)	1320.62 (0.0000)	–1.28 (0.0000)	6.78 (0.0000)	1.13 (0.0000)	2.08 (0.0015)	0.32 (0.4652)

Source: Author

As shown in Table 22, the first difference of the CPI did not have a significant effect on the first difference of employment in four of the five models. Additionally, the CPI coefficient has an atheoretical sign in two out of the five models. I attribute this result to the fact that much of the effect of the CPI is captured by the money supply variable.

The FIGARCH model is a long-run model, and the other four models are short-run models. The long-run results shown in Table 22 indicate that the employment impact of nonresidential fixed investment will decrease over time and the impact of personal consumption expenditures will increase over time.

5. The Jobs Impact

Employment has grown by an average of 370,808 jobs over the period 1948 Q1 to 2023 Q3. The impact on employment of personal consumption expenditures and nonresidential fixed investment is calculated by multiplying the estimated coefficient by the mean of the series. The jobs impact of these two variables is given in Table 23 below.

Table 23: The Jobs Impact of NFI and PCE for each model

Item	OLS	ARCH	GARCH	EGARCH	PARCH	FIGARCH
NFI Coefficient	8.22	10.44	5.33	5.69	6.28	6.78
NFI Mean ($ billion)	12.26	12.26	12.26	12.26	12.26	12.26
PCE Coefficient	0.84	1.08	0.86	0.78	0.67	1.13
PCE Mean ($ billion)	61.66	61.66	61.66	61.66	61.66	61.66
NFI Jobs Impact	100,077	127,994	65,346	76.993	60,932	83,123
PCE Jobs Impact	51,794	66,593	53,028	41,312	42,545	69,676
Total Jobs Impact	151,871	194,587	118,374	117,854	103,477	152,799

Source: Author

The impact of the average of the five short-term model results indicates that nonresidential fixed investment accounts for an average of 70,885 jobs per quarter, and that personal consumption expenditures accounts for an average of 51,054 jobs per quarter. Thus, the expected demand proxies account for over 121,000 jobs per quarter in the short-term models.

The impact of the long-term model results indicates that nonresidential fixed investment will account for an average of 83,123 jobs per quarter, and that personal consumption expenditures will account for an average of 69,676 jobs per quarter. Thus, the expected-demand proxies account for over 152,000 jobs per quarter over the long-term.

6. Vector Auto Regression Model

As discussed in Chapter 3, the reduced form Vector Auto Regression (VAR) model does an inadequate job of separating the coefficient values in a multi-variable equation. The separation of coefficient values is extremely important in the evaluation of macroeconomic data because the macroeconomic variables tend to be highly correlated with one another. Nevertheless, the standard VAR model is a useful tool in analyzing variance decomposition and in estimating impulse responses.

a. Standard VAR Model Results

Eight variables were used in the OLS, WLS, and ARCH models discussed above. However, the use of eight variables creates too large a VAR system given the number of observations. Therefore, I have reduced the system to just four first-differenced variables. These variables are employment, nonresidential fixed investment, personal consumption expenditures, and government spending.

The VAR Model results are given in Table A-20 of Appendix A using first differenced variables, four lags of each variable, and a total of 298 observations. Overall, the coefficient estimates are suspect due to the wrong sign of many of the lags of the variables. As a result, I do not rely on these estimates in my final evaluation of employment given in Table 23 above. With respect to employment, the VAR model has an R-squared of 0.736 and an adjusted R-squared of 0.721. Thus, the regression is able to account for over 73% of the variance of the first difference of employment.

b. Variance Decomposition

EViews has explained that "Variance decomposition separates the variation in an endogenous variable into the component shocks to the VAR. Thus, the variance decomposition provides information about the relative importance of each innovation in affecting the variables in the VAR." (EViews 13 Users Guide, p. 894)

Variance decomposition analysis was run for each of the four variables for ten periods. In each period, the strongest effect on the variance of a given variable is the variance of the variable itself. Table 24 provides the average percent of total variance for each variable over the ten periods of the study. The full output is provided in Table A-21 of Appendix A.

Table 24: Average of the Variance Decomposition Results

Decomposed Variable	Emp (%)	Fiscal (%)	NFI (%)	PCE (%)
EMP	21.83	18.32	12.74	47.11
Fiscal	1.89	39.12	2.91	56.08
NFI	2.04	9.40	67.29	21.28
PCE	0.62	25.34	14.48	59.56

Source: Author

The variance decomposition results should not be interpreted as measuring the effect of a specific independent variable on the dependent variable (EMP). The variance decomposition results are not adjusted for the variances or means of the individual series, nor do they consider the type of variable.

c. Impulse Response

EViews has explained that "A shock to the *ith* variable not only directly affects the *ith* variable but is also transmitted to all of the other endogenous variables through the dynamic (lag) structure of the VAR. An impulse response function traces the effect of a one-time shock to one of the innovations on current and future values of the endogenous variables." (EViews 13 Users Guide, p. 885)

In his critique of impulse response analysis, Helmut Lütkepohl has pointed out that: (Lütkepohl H. 2005, p. 62)

> All effects of omitted variables are assumed to be in the innovations. If important variables are omitted from the system, this may lead to major distortions in the impulse responses and makes them worthless for structural interpretations. The system may still be useful for prediction, though.

The impulse response function has two additional weaknesses. First, the calculation of impulse responses measure the effect of changes to the system, not just shocks. In order to qualify as a shock, a change must be unexpected. Examples of shocks include the Arab oil boycotts of the 1970s; the terrorist attack on the eastern United States on September 11, 2001; and the financial crisis of 2008-2009. The impulse response function does not limit itself to the measurement of shocks and does not differentiate between expected and unexpected changes to the economic system.

Second, the impulse response function does not differentiate between positive and negative changes to the economic system. The literature indicates that firms are risk-averse and that the response to a negative change will be greater than the response to a positive change. (See Table 16 above; Shackle G. 1939; Mortensen D. and Pissarides C. 1994; and Nebot C. et al. 2019)

Impulse response estimates were run for ten periods. The results indicate that:

- There will be no increase in employment in period one.
- A $1 billion increase in personal consumption expenditures will increase employment by 9,033 jobs in period two.
- A $1 billion increase in nonresidential fixed investment will cause a loss of 3,612 jobs in period 2 and a gain of 14,080 jobs in period 3. However, the result in period 2 is not significant at the 0.05 level. These results imply that there is a two-quarter lag between investment and the hiring of new employees.

- A $1 billion increase in personal consumption expenditures will result in the creation of 9,033 jobs in period two.
- A $1 billion increase in government spending will result in the creation of 2,365 jobs in period 2.

The full impulse response output is given in Table A-22 of Appendix A. Graphs of the response of the first difference of employment to a $1 billion change in the first difference of government spending, nonresidential fixed investment, and personal consumption expenditures are given in Figures 9-11 below.

Figure 9: Response of Employment to Government Spending

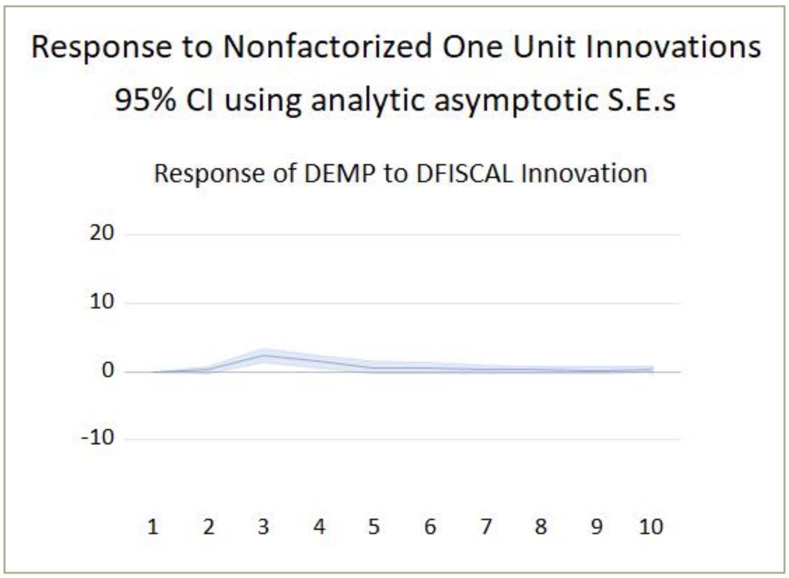


Figure 10: Response of Employment to Nonresidential Fixed Investment

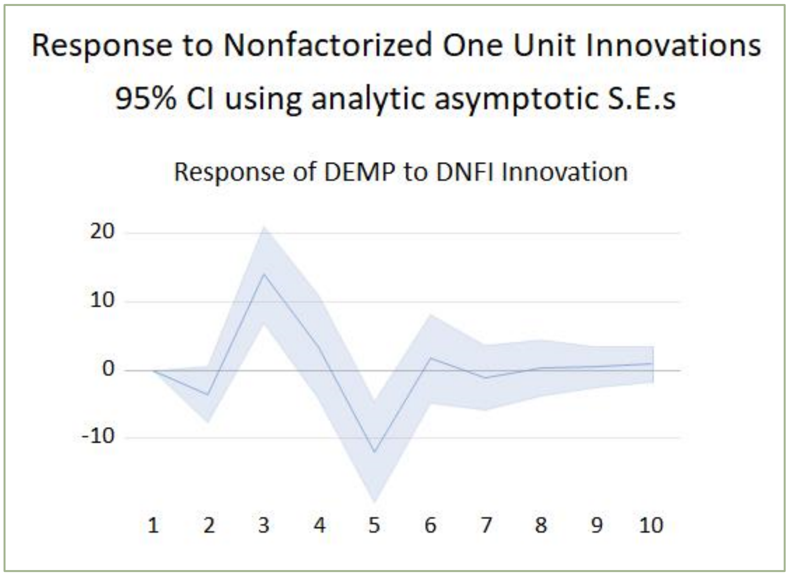
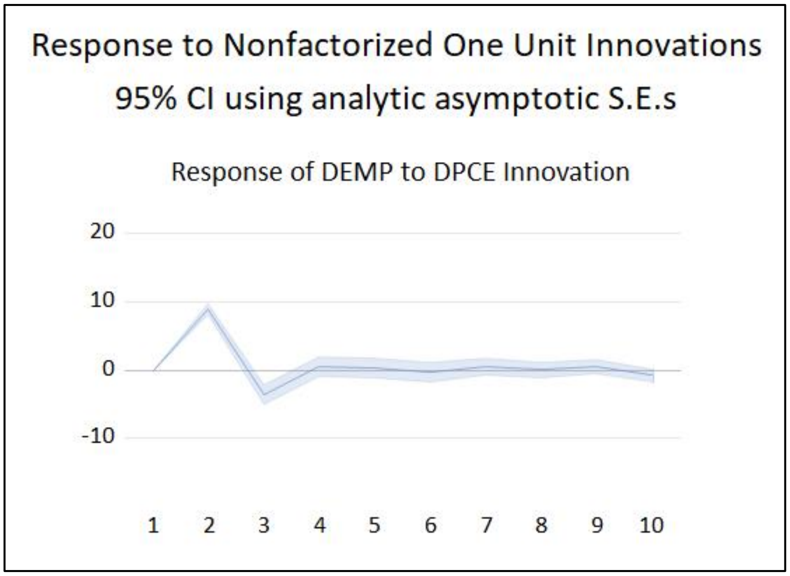


Figure 11: Response of Employment to Personal Consumption Expenditures



7. Co-Integration

The following discussion of co-integration relies heavily on the work of Maddala and Kim in Maddala G. and Kim I. (1998). Rao B. (2007) has explained that co-integration tests were developed to analyze non-stationary time series. A non-stationary time series is a process that has variances and means that vary over time. Since all the first-differenced variables used in the final regression results in Chapter 4 are stationary, cointegration is not relevant to my dissertation. For this reason, cointegration test results are provided for informational purposes only.

Maddala G. and Kim I. (1998, p. 488) have described cointegration as a "purely statistical concept". In other words, accounting for cointegration may or may not have an effect on the quality of the coefficient estimates.

Two general types of data-generating processes (DGPs) are mentioned in the literature: difference stationary processes (DSPs) and trend stationary processes (TSPs).[46] Integration tests are designed to estimate the number of cointegrating equations in a TSP, not in a DSP. Maddala and Kim have explained that "it is well known that the inference based on the model of the TSP class leads to spurious conclusions when the true DGP belongs to the DSP class." (Maddala G. and Kim I. 1998, p. 416)

The estimating model for a TSP is $y_t = \gamma_o + \gamma_1 t + \varepsilon_t$, where *t* is time and ε_t is a stationary ARMA process. Kim I. (1997) argues that the correct estimating model for a DSP should include y_{t-1} as a regressor. Thus, the DGP for a DSP should be estimated using the equation $y_t = \alpha_0 + y_{t-1} + \varepsilon_t$, where ε_t is a stationary ARMA process. If observations of the error term (ε_t) are not serially correlated, then the DGP is a random walk with drift α_0.

The Co-integration test results shown in Table 25 confirm Maddala and Kim's prediction concerning spurious conclusions. The Johansen Co-Integration Test (JCT) was used to estimate the number of co-integrated equations. As shown in Table 25, the Unrestricted Coefficient Rank Test found that there were seven cointegrated equations at or below the 5% level.

---

[46] The first differenced variables are members of the DSP class of variables. Thus, the variables constitute an autoregressive integrated moving average (ARIMA) process. (Maddala J. and Kim I. 1998, pp. 24-25)

Table 25: JCT results

Date: 02/24/24 Time: 14:45
Sample: 1948Q1 2023Q3
Included observations: 303
Lags interval (in first differences): 1 to 4
Endogenous variables: DCPI DEMP DFISCAL DMEP DMS DNFI DPCE DTAXES DTRADE
Deterministic assumptions: Case 3 (Johansen-Hendry-Juselius): Cointegrating relationship includes a constant. Short-run dynamics include a constant.

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.** Critical Value
None *	0.432918	640.4589	197.3709	0.0000
At most 1 *	0.352602	471.9854	159.5297	0.0000
At most 2 *	0.324803	342.8515	125.6154	0.0000
At most 3 *	0.246831	226.2046	95.75366	0.0000
At most 4 *	0.163131	142.0151	69.81889	0.0000
At most 5 *	0.152497	89.12292	47.85613	0.0000
At most 6 *	0.070524	39.98116	29.79707	0.0024
At most 7 *	0.057294	18.26031	15.49471	0.0187
At most 8	0.002478	0.736925	3.841465	0.3906

Trace test indicates 8 cointegrating equation(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

8. Granger Causality

It is important to realize that correlation does not prove causation. There are a number of spurious correlations in the economic literature. EViews has pointed out that "Interesting examples include a positive correlation between teachers' salaries and the consumption of alcohol and a superb positive correlation between the death rate in the UK and the proportion of marriages solemnized in the Church of England." (EViews Users Guide, p. 634)

Granger causality was first introduced by Clive Granger in his study of causal relations (Granger C. 1969). EViews has explained that "Granger causality measures precedence and information content but does not by itself indicate causality in the more common use of the term." (EViews Users Guide, p. 675)

Granger showed that causality could be either one-way (X causes Y) or two-way (X causes Y and Y causes X). This is usually expressed as X Granger causes Y (one-way) and X Granger causes Y and Y Granger causes X (two-way). Granger suggested that a feedback mechanism could be operating in real time as opposed to the time period in which data is available (e.g., quarterly).

Granger found that in an equation of the form $Y_t = \alpha + X_t$, the best linear predictor can be given by the equation:

$$P_t = (X \mid \overline{X}, \overline{Y}) \sum_{j=1}^{\infty} a_j X_{t-j} + \sum_{j=1}^{\infty} b_j Y_{t-j} \qquad \text{Eq. 22}$$

where the values of the a_j terms and the b_j terms are chosen to minimize $\sigma^2 (X \mid \overline{X}, \overline{Y})$ and the equations consist only of lagged values of X_t and Y_t.

Granger assumed that the a_j and b_j terms are not equal to zero. He cautioned modelers that omission of other relevant variables could result in spurious causality (Granger C., 1969, p. 429).

Granger causality tests require a lag length (*l*), which is the longest period over which one variable could reasonably predict another variable. The Granger causality test results are given in Table A-23 for the dependent variable employment (Y_t), and for the eight explanatory variables given in Table 22 using a lag length of four.

For each pair of the group of variables, the Granger causality test runs bivariate regressions of the form:

$$Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \ldots + \alpha_l Y_{t-l} + \beta_1 X_{t-1} + \ldots + \beta_l X_{-l} + \varepsilon_t \qquad \text{Eq. 23}$$

$$X_t = \alpha_0 + \alpha_1 X_{t-1} + \ldots + \alpha_l X_{t-l} + \beta_1 Y_{t-1} + \ldots + \beta_l Y_{-l} + \varepsilon_t \qquad \text{Eq. 24}$$

where X_t is an explanatory variable, Y_t is the dependent variable, α_0 is the constant term, α_n β_n are the estimated coefficients, and *l* is the lag length.

The Granger causality test reports F-statistics using Wald statistics for the joint hypothesis $\beta_1 = \beta_2 = \ldots = \beta_l = 0$ for each equation. The null hypotheses are that X does not Granger cause Y in the first regression (Equation 23) and that Y does not Granger cause X in the second regression (Equation 24).

The Granger causality tests indicate the existence of Granger causality for the variables listed in Table 26 below. A total of ninety-eight pairs of variables were evaluated. Thirteen variable pairs exhibited one-way Granger causality, and sixteen pairs of variables exhibited two-way Granger causality.

Granger causality is typically stated in the form "X Granger causes/does not cause Granger Y." The first variable listed in Table 26 is Granger X and the second variable listed is Granger Y. For example, in a test of causality between the first difference of the consumer price index and the first difference of employment, the null hypothesis of no causality is rejected at below the 0.05 level. This result is equivalent to stating that the first difference of the consumer price index affects the first difference of employment. The full regression results are provided in Table A-23 of Appendix A.

Table 26: Granger Causality test results of the first difference of the variables

Variables	F-Statistic	Prob.
Consumer price index and employment	4.2625	0.0149
Consumer price index and government tax receipts	9.1579	.0001
Consumer price index and international trade	17.3822	7E-08
Consumer price index and nonresidential fixed investment	13.4765	3E-06*
Employment and government tax receipts	7.6887	.0006
Employment and international trade	28.3237	6E-12
Employment and money supply	11.0539	2E-05*
Employment and nonresidential fixed investment	18.1850	4E-08*
Employment and personal consumption expenditures	31.6573	4E-13
Government expenditures and the consumer price index	5.2285	.0059
Government expenditures and employment	13.0329	4E-06*
Government expenditures and international trade	33.7649	6E-14*
Government expenditures and money supply	17.9947	4E-08*
Government expenditures and nonresidential fixed investment	32.8933	1E-13
Government expenditures and personal consumption expenditures	22.9712	5E-10*
Government tax receipts and international trade	6.5483	0.0016

Variables	F-Statistic	Prob.
Government tax receipts and money supply	3.1905	0.0426*
Government tax receipts and nonresidential fixed investment	5.7020	.0037
Manufacturing employment percentage and employment	2.8802	0.0230
Money supply and the consumer price index	14.1795	1E-06*
Money supply and international trade	28.1158	7E-12*
Money supply and nonresidential fixed investment	23.5600	3E-10
Money supply and personal consumption expenditures	48.5960	6E-19*
Nonresidential fixed investment and employment	5.1451	0.0061*
Nonresidential fixed investment and personal consumption expenditures	5.5363	0.0044*
Personal consumption expenditures and the consumer price index	23.0461	5E-10
Personal consumption expenditures and government tax receipts	64.0786	8E-24*
Personal consumption expenditures and international trade	172.9650	2E-50*
Personal consumption expenditures and money supply	20.4907	5E-09*

Source: Author
* Two-way Granger causality

9. Political and Economic Shocks

There have been a number of political and economic shocks that may have affected aggregate employment. The impulse response function analysis (see above) analyzed the response for ten periods. For modeling purposes, the effect of the shock began in the quarter in which the shock occurred and ended nine periods later.

This dissertation focuses on four specific shocks: the Arab oil embargo in 1973, the election of Ronald Reagan as president in 1980, the 2008 financial crisis, and the terrorist attack on the United States in 2001. These four events are discussed below.

In the last week of October 1973, the Organization of Arab Petroleum Exporting Countries (OAPEC) announced that it would discontinue selling oil to the United States and to other nations that had supported Israel during the October 6-25, 1973 Yom Kippur War. (Smith C. 2006, p. 329) As a result of this and other embargoes, oil prices increased from $4.31 barrel in 1973 to $38.00 barrel in 1981. This led to high gasoline prices, double-digit inflation, and a double-digit unemployment rate in the United States. The shock began in 1973 Q4 and ended in 1976 Q1.

Ronald Reagan became president of the United States on January 20, 1981, and served until January 20, 1989. During his first term in office, Reagan instituted policies of economic deregulation, taxed social security income, cut other taxes, cut federal spending, and discouraged public-sector labor unions. As a result of these policies, the unemployment rate rose from 7.5% in January 1981 to 10.8% in December 1982. The shock began in 1980 Q4 and ended in 1983 Q1.

On September 11, 2001 (“9/11”), the terrorist group al-Qaeda hijacked four commercial airplanes and crashed the planes loaded with fuel into targets in the United States. The hijackers crashed two planes into the Twin Towers of the World Trade Center in New York City, and one plane into the Pentagon in Arlington County, Virginia. The fourth plane crashed in Pennsylvania during a passenger revolt. (National Commission on Terrorist Attacks Upon the United States 2004) As a result of the 9/11 attacks, the unemployment rate rose from 4.9% in August 2001 to 6.3% in June 2003. The shock began in 2001 Q3 and ended in 2003 Q4.

The 2008 financial crisis began with the collapse of the Lehman Brothers global financial services firm on September 15, 2008. (De Pauli L. and Hill J. 2022) The unemployment rate rose from 6.1% in September 2008 to a high of 10.0% in October 2009. The shock began in 2008 Q3 and ended in 2010 Q4.

The employment effect of the four shocks is estimated in four separate regressions using an OLS first-difference model and a dummy-variable technique. The regression equation is:

$$E = \alpha + \beta_1 C_t + \beta_2 CPI_t + \beta_3 G_t + \beta_4 IT_t + \beta_5 MEP_t + \beta_6 MS_t + \beta_7 NFI_t + \beta_8 S + \beta_9 T_t + \varepsilon$$

where:

α is the constant term.

C_t is Personal Consumption Expenditures at time t.

CPI_t is the Consumer Price Index at time t.

E_t is Aggregate Employment at time t.

G_t is Government Expenditures at time t.

IT_t is International Trade at time t.

MEP_t is the Manufacturing Employment Percentage at time t.

MS_t is M3 Money Stock at time t.

NFI_t is Nonresidential Fixed Investment at time t.

S is a dummy variable where the value is equal to one during the shock and zero otherwise at time t.

T_t is government tax receipts at time t.

β_1-β_9 are the estimated coefficients.

ε is the error term.

A summary of the effect of each of the four shocks on employment is given in Table 27 below, and the full regression output is given in Tables A-24—A-27 of Appendix A.

Table 27: The effect of political and economic shocks on employment

Shock	Estimated Coefficient	Probability	Total Job Loss[47] (mm)
1973 Arab oil embargo	2.73	0.9851	0.00
1980 Election of Ronald Reagan	–298.54	0.0406	2.99
2001 Terrorist attack (9/11)	–172.77	0.2456	0.00
2008 financial crisis	–549.77	0.0002	5.50

Source: Author

As shown in Table 27, two of the four shocks (the 1980 election of Ronald Reagan and the 2008 financial crisis) had a significant effect on employment. These shocks resulted in the loss of over eight million jobs.

[47] Total job losses are calculated by multiplying the estimated coefficient by the number of quarters (10) in the event period.

Summary

The dissertation hypothesized that firms increase and decrease employment in response to changes in expected demand. The empirical results confirm this hypothesis. The results of sixteen models are provided in this chapter. Every one of these models indicate that the two expected-demand proxies (personal consumption expenditures and nonresidential fixed investment) have a significant effect on employment at below the 0.05 level.

An average of the short-run model results estimated that changes in the expected demand proxies accounted for an average of 121,000 jobs per quarter. The long-run model results indicate that the expected-demand proxies will account for over 152,000 jobs per quarter or over 41% of the average quarterly increase in employment over the period of this study.

CHAPTER 5
POLICY IMPLICATIONS
AND RECOMMENDATIONS

In the first four chapters, the dissertation has shown that changes in expectations have a significant effect on changes in aggregate employment. Changes in personal consumption expenditures and nonresidential fixed investment are a result of changes in economic expectations. This chapter consists of three sections. Section A looks at how expectations have changed over time as measured by public-opinion polls. Section B discusses policy implications, and Section C makes public policy recommendations.

A. How Expectations have changed over time

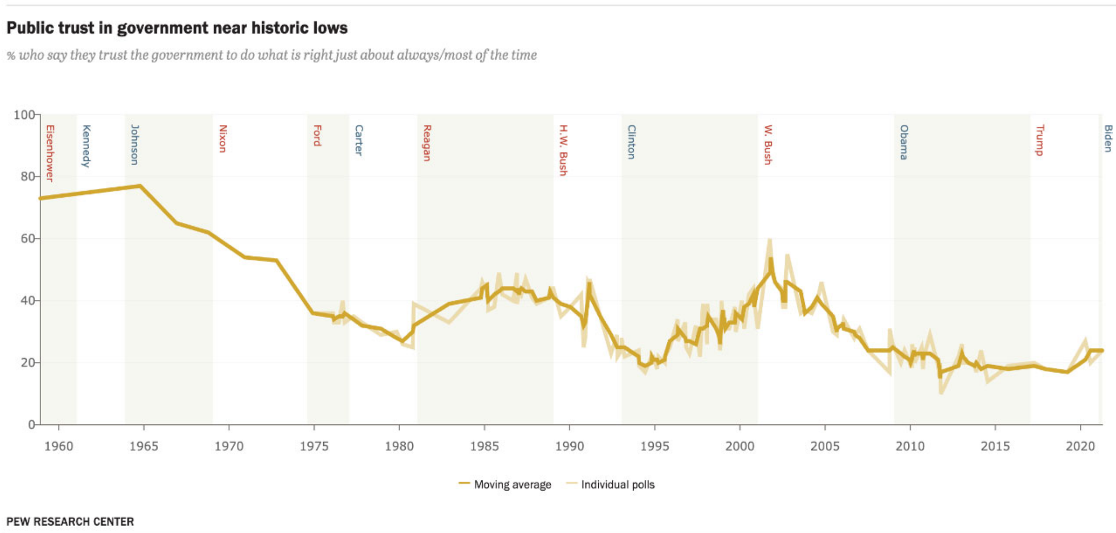
This section reviews two types of polling data: trust in government, and consumer confidence. The poll results provide a picture of how expectations have changed over time.

1. Trust in Government

Government can increase economic expectations in two ways. It can affect expectations by positive messaging, or by passing legislation designed to increase economic expectations. Positive messaging is unlikely to be successful in the U.S. because of a loss of trust in government.

Pew Research has conducted a trust-in-government survey in the U.S. since 1958. Survey Respondents were asked whether they agreed with the statement "I trust in the federal government to do what is right just about always or most of the time." The sum of these two responses ("always" and "most of the time") indicate the level of public trust in government. Figure 12 gives the survey results over the period 1958-2023.

Figure 12: Trust in Government (1958-2023)



As shown in Figure 12, trust in government has declined from 77% in 1964 to 16% in 2023. Pew Research has explained that: (Pew Research 2023)

> When the National Election Study began asking about trust in government in 1958, about three-quarters of Americans trusted the federal government to do the right thing almost always or most of the time. Trust in government began eroding during the 1960s, amid the escalation of the Vietnam War, and the decline continued in the 1970s with the Watergate scandal and worsening economic struggles.
>
> Confidence in government recovered in the mid-1980s before falling again in the mid-1990s. But as the economy grew in the late 1990s, so too did confidence in government. Public trust reached a three-decade high shortly after the 9/11 terrorist attacks but declined quickly thereafter. Since 2007, the shares saying they can trust the government always or most of the time have not surpassed 30%.

Confidence in the federal government is driven by a highly partisan political atmosphere in which respondents have more confidence in government when the president is a member of their party. Thus, we find that 25% of Democrats and 8% of Republicans have confidence in government when Democrat Joe Biden is president. In 2020, 12% of Democrats and 28% of Republicans had confidence in government when Republican Donald Trump was president.

The lack of confidence in government is not limited to the bureaucracy of the federal government. It also affects political leaders. An average of recent polls indicated that all of the major political leaders had favorability ratings of less than 40% in an average of recent polls.[48] The favorability ratings of the political leaders are given in Table 28 below. The favorability rating indicates the percentage of respondents who have a favorable impression of various political leaders.

Table 28: Favorability ratings of U.S. political leaders

Leader	Position	Rating
Joe Biden	President of the United States (2021-2024)	39.2%
Donald Trump	President of the United States (2017-2021)	39.9%
Kamala Harris	Vice-President of the United States (2021-2024)	35.7%
Mike Johnson	Republican speaker of the U.S. House of Representatives	23.0%
Hakeem Jeffries	Democratic minority leader of the U.S. House of Representatives	28.7%
Chuck Schumer	Democratic majority leader of the U.S. Senate	32.0%
Mitch McConnell	Republican minority leader of the U.S. Senate	20.7%

Source: RealClear Politics (2023)

2. Political Dysfunction

This section on political dysfunction relies heavily on my 2016 paper entitled "The Political Segregation of the United States." (Reid L. 2016) The lack of confidence in the federal government and in its political leaders is in great part caused by the dysfunctional American political system. The dysfunctional political system is in great part caused by the political segregation of the United States. Political segregation, or sorting, is a process by which voters segregate themselves into communities of like-minded individuals. As a result, conservatives tend to move to conservative areas and liberals tend to move to liberal areas.

[48] Source: RealClear Politics (2023).

There are two major political parties in the United States, the Democratic Party, and the Republican Party. The modern Democratic Party was formed in 1828 and the modern Republican Party was formed in 1856. No other party has won the presidency since the Whigs won in 1848.

A number of papers have dealt with the effect of party polarization on governance in the United States. Bowling and Pickerill (2013) found that party polarization at the state and federal level has hindered the adoption of numerous policies. When parties are polarized, elected officials become highly ideological, thus affecting the political agenda of decision makers (Pickerill and Bowling 2014). Since the mid-1970s, Democrats and Republicans in Congress have moved away from the ideological center and have engaged in party-line voting (Poole 2012).

Population migration has led to a situation in which congressional district residents have become more politically extreme, and congressional districts are often dominated by a single political party. The legislators who are elected from these congressional districts have also become more extreme. If a member of Congress is concerned about a primary election in which there might be opposition from the member's own party, the member will cast votes that maximize political support from that party.

Political dysfunction has caused eighteen U.S. government shutdowns since 1976 (Matthews 2013). The shutdowns occurred either because Congress could not agree on a budget, or because the President did not agree with the budget passed by Congress.

A number of solutions have been proposed to reduce party polarization. The most noteworthy proposal, campaign finance reform, was analyzed by Thomas E. Mann and Anthony Carrado, who found that campaign finance reform, is a weak tool for depolarizing American political parties (Mann and Carrado 2014).

In 2016, I used the U.S. state of California as an example of how political dysfunction can be successfully reduced. I recommended that political dysfunction could be successfully reduced by eliminating senatorial holds[49], by eliminating super-majority voting rules[50], and by allowing minority leaders to bring up to ten bills per session to a floor vote in the House and in the Senate. Finally, using the example of the California State Legislature, I recommended various rule changes that might reduce political dysfunction at the U.S. federal level. (Reid L. 2016)

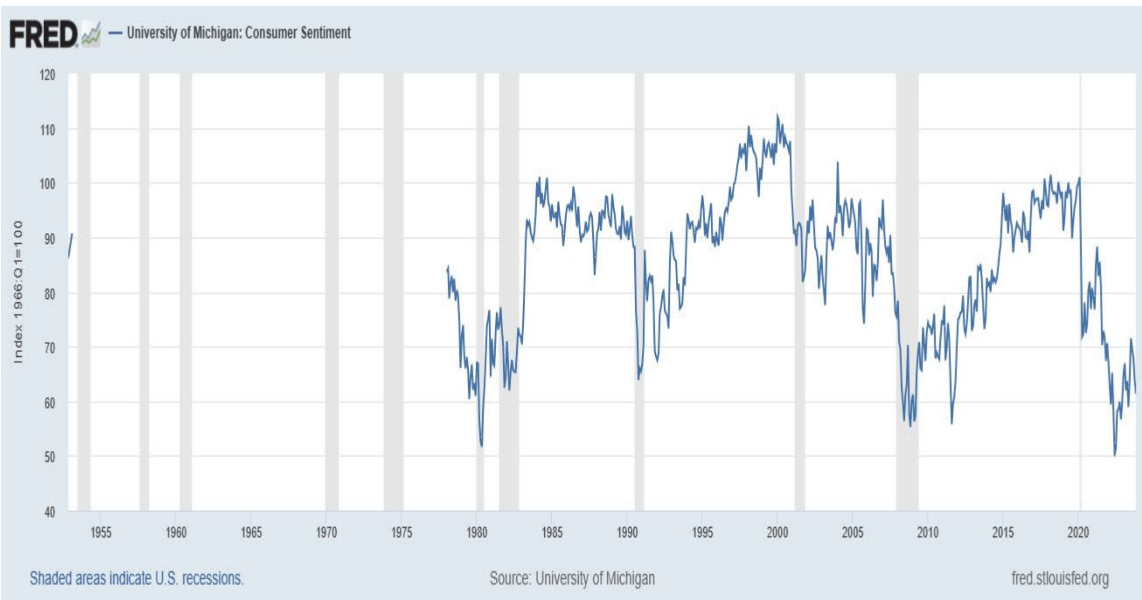
[49] The rules of the U.S. Senate allow any Senator to prevent a vote on a nominee or procedural motion. This is referred to as a Senatorial hold.

[50] The U.S. Senate Rules require that all bills receive a three-fifths super majority before debate can be abbreviated and the bill voted can be voted on. This approval process is referred to as a super majority voting rule.

3. Consumer Confidence

The University of Michigan has conducted a continuous monthly consumer sentiment survey since January 1978. The resulting index is a measure of consumer confidence in the economy. However, there are some methodological problems with the survey. The data is not seasonally adjusted, and the survey measures consumer sentiment for a given month and is not forward looking. However, the index provides a snapshot of consumer confidence in the economy over time. Figure 13 provides a graph of the consumer sentiment index from 1978 to 2023.

Figure 13: The University of Michigan Consumer Sentiment Index (1966 Q1=100)



Source: Surveys of Consumers, University of Michigan: Consumer Sentiment © [UMCSENT], retrieved from FRED, Federal Reserve Bank of St. Louis. (Accessed on December 24, 2023)

The Consumer Sentiment Index (CSI) is an adequate measure of consumer expectations and a good predictor of the direction of changes to total employment in some (but not all) periods. As shown in Figure 13, there were four periods in which there were substantial changes to the CSI. These periods were September 1980 to February 1984, April 1990 to November 1990, November 1990 to January 2000, and April 2021 to June 2022.

From September 1980 to February 1984, the CSI rose from 73.7 to 97.4 and employment increased by almost three million jobs. From April 1990 to November 1990, the CSI fell from 93.9 to 66.0 and employment declined by 68,000 jobs. From November 1990 to January 2000, the CSI rose from 66.0 to 112.0 and employment rose by 21.8 million jobs. From April 2021 to June 2022, the CSI fell from 88.3 to 51.5 but employment increased by 7.6 million jobs.

The effect of the CSI on employment was estimated using an OLS first difference model. The model results indicate that the CSI does not have a significant effect on employment at the 0.05 level. The regression statistics are given in Table 29 below, and the full regression output is given in Table A-28 of Appendix A.

Table 29: The effect of the CSI on Employment Model

Item	Value	p-value
R-Squared	0.015	NA
F Statistic	2.77	0.10
Durbin-Watson Statistic	1.86	NA
Constant term	392.66	0.0000
Consumer sentiment index	23.61	0.0982

Source: Author

B. Policy Implications

In Section C, I make recommendations for legislative and budgetary action by the U.S. federal government. For practical reasons, recommendations must be limited to the federal government. It would be unwieldly to attempt to analyze the budgetary and legislative processes of every state, town, school board, and special district in the United States.

The long-term model results indicate that employment can be maximized by reducing the rate of inflation, decreasing government spending, decreasing the money supply, and by increasing expectations as measured by nonresidential fixed investment and personal consumption expenditures.

The U.S. Federal Reserve Board can reduce the rate of inflation by raising interest rates. Government spending can be reduced by legislative and or budgetary action by the President. For example, the legislature is required to pass a budget each year which limits the amount of money that can be spent by the executive branch of government for the next fiscal year. The budget becomes final once the budget is signed into law by the President.

If the President believe that the budget is too high, the President could veto the budget bill passed by Congress. No president has ever vetoed a budget passed by Congress. Any disagreements between the executive and legislative branches of government are usually resolved before a budget is passed.

1. Government Spending and Employment

Government expenditures includes spending by all levels of government, not just the U.S. federal government. In 2023 Q3, total annualized government expenditures were over $10.01 trillion. During the same period, federal government annualized expenditures were $6.403 trillion, or about 64% of total government expenditures. (Federal Reserve Bank of St. Louis 2024)

Total government expenditures are composed of two variables: federal government expenditures and state and local government expenditures. From 2021 Q1 to 2022 Q1, federal expenditures fell from $8.17 trillion to $5.93 trillion, a reduction of $2.24 trillion. State and local government expenditures rose from $3.24 trillion to $3.48 trillion, an increase of $240 billion.

There is a significant body of theory concerning the effect of government expenditures. This is referred to as "crowding out" theory and "crowding in" theory. Neoclassical economists argue that increases in government spending reduces investment capital in the private sector since the amount of capital is finite. They also argue that public investment is less efficient than private investment in terms of job creation. Keynesian economists argue that government spending creates jobs because it increases private investment. As discussed above, the static model results seem to confirm "crowding in" theory.

For example, let's suppose that government wants a road to be built or more lanes to be added to an existing road. The construction firm will purchase materials and hire workers in order to meet their contractual obligations with government. Once the road is built, government might hire consultants to help them integrate the new road into the government's existing infrastructure system (e.g., timing of traffic signals, assignment of police officers, etc.) or they might increase the number of government employees to perform the necessary integration work.

Government spending also increases personal consumption expenditures which increases nonresidential fixed investment, which increases employment. A good example of this relationship is direct government subsidies to individuals and businesses during the Covid-19 pandemic. In the recent Covid recession that began in the spring of 2020, government expenditures rose by 37.4% between 2020 Q1 and 2021 Q2.

There was apparently a one quarter lag between government expenditures and the effect on personal consumption expenditures and employment. Thus, the relevant period in terms of the effect of government expenditures on employment becomes 2020 Q2 to 2021 Q3. During this period, personal consumption expenditures rose from $14 trillion to $16.4 trillion and employment rose from 137.7 million to 147.8 million, an increase of 10.1 million jobs.

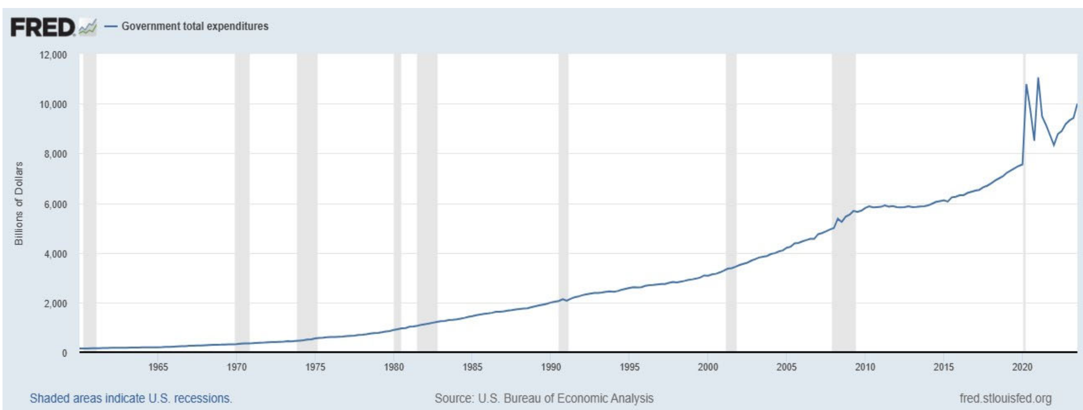
As discussed below, the empirical evidence on the total effect of government spending on employment is mixed.

A FIGARCH(1,1) model was used to estimate the long-run effects of the independent variables on changes to employment. The model results are summarized in Table 22 of Chapter 4. The static model results indicate that the combined effect of taxes and government expenditures have a positive effect on employment.

The long-run model results indicate that a $1 billion increase in taxes will increase employment by 2,081 jobs and that a $1 billion increase in government spending will decrease employment by 1,837 jobs. Taken together, a $1 billion increase in taxes will increase employment by 244 jobs.

The model results also indicate that if government seeks to increase employment, it should seek to decrease expenditures and decrease money supply. The federal government has direct control only over federal expenditures. Figure 14 gives the growth of government expenditures from 1960 to 2023.

Figure 14: The growth of government expenditures (1960-2023)



As shown in Figure 14, there was a substantial reduction in government expenditures in 2021-2022. Annualized government expenditures fell from $11.41 trillion in 2021 Q1 to $9.41 trillion in 2022 Q1, a reduction of $2.00 trillion. During the same period, nonfarm civilian employment rose from 144.27 million to 151.37 million, an increase of over seven million jobs.

2. Proposed Legislative Changes

Senator Bernie Sanders ran for president in the Democratic party primary of 2015-2016 against former Secretary of State Hillary Clinton. Sanders' campaign was based on four major issues: increasing the minimum wage to $15 per hour, Medicare for All (MFA), the elimination of student debt, and opposition to the proposed Trans Pacific Partnership (TPP) trade agreement.

Increasing the minimum wage would have only a small effect on employment because very few people are paid the federal minimum wage. As discussed in Chapter 2, minimum-wage workers account for less than 0.8% of all workers in the United States.

The TPP was never passed due to the opposition of democratic Senator Bernie Sanders and Republican nominee Donald Trump in 2015-2016.[51] The treaty was never submitted to the U.S. Senate for a vote. On January 20, 2017, President Trump signed an executive order withdrawing the U.S. from the TPP agreement. (Popken B. 2017)

Medicare for All, the Public Option, and the elimination of student debt are discussed below.

a. Medicare for All

Unlike most health-care systems in Europe, the U.S. health-care system is a mix of public and private systems in which different programs are designed to target the needs of different segments of society. Medicare covers individuals over age sixty-five and some disabled persons. Medicaid covers low-income individuals and families. The Childrens Health Insurance Program covers children from low-income families. Private health insurance typically covers people who are under age sixty-five.

Other private health insurance (e.g., Medicare Advantage) covers some of the difference between what Medicare pays and the cost of medical services. Long-term care is covered by private long-term care insurance. Hospice care is covered by private hospice care insurance. Dental costs are covered by private dental insurance. MFA would replace most of these public and private programs with a single-payer system managed by the Department of Health and Human Services.

Medicare For All was first introduced by Representative (Rep.) John Conyers in 2003 in the 108th session of Congress. Since that time, an MFA bill has been introduced in every session of Congress. None of these bills have ever been voted on by the committee to which they were assigned. Thus, the bills are referred to as having "died in committee." The most recent MFA bills were introduced by Rep. Jaypal and by Sen. Sanders on May 17, 2023.

The Sanders bill (S. 1655) would replace most of the current health insurance system with publicly funded national health care insurance, administered by the U.S. Department of Health and Human Services (HHS). The requirements of the bill would be implemented over a four-year period.

[51] Donald Trump was president of the United States from January 2017 to January 2021.

The Congressional Research Service has explained that: (Congressional Research Service 2023)

> The bill prohibits cost-sharing (e.g., deductibles, coinsurance, and copayments) and other charges for covered services, with the exception of prescription drugs. Additionally, private health insurers and employers may only offer coverage that is supplemental to, and not duplicative of, benefits provided under the [MFA] program.
>
> Health insurance exchanges and specified federal health programs terminate upon program implementation. However, the program does not affect coverage provided through the Department of Veterans Affairs, TRICARE, or the Indian Health Service. Additionally, state Medicaid programs must cover certain institutional long-term care services.
>
> The bill also establishes a series of implementing provisions relating to (1) health care provider participation; (2) HHS administration; and (3) payments and costs, including the requirement that HHS negotiate prices for prescription drugs and establish a formulary.

Several studies have been published since 2005 that have attempted to analyze the effects of MFA. Hogg W. et. al (2005) has explained that other analysts have estimated a long-term savings of 40% of all national health expenditures. In 2008, Physicians for a National Health Program estimated immediate savings at $350 billion per year. (Physicians for a National Health Program 2008)

In 2003, a study found that U.S. health care administration costs accounted for 30.1% of U.S. health care expenses, compared to 16.7% in Canada which has a national health insurance program.[52] (Woolhandler et al. 2003)

In 2018, the Mercatus Center released a study of Bernie Sanders' 2017 MFA bill. The study found that the bill would increase federal spending by $32.6 trillion over a ten-year period, and that the savings on administrative and other costs could save $2.05 trillion. (Blahous C. 2018) The study did not account for benefits such as increased consumption, increased employment, increased tax revenues, and decreases in the number of unnecessary deaths.

The most recent study found that MFA would save 13% in national healthcare expenditures (approximately $450 billion annually) and save more than 68,500 lives every year. (Galvani A. et al. 2020)

[52] The Canadian national health insurance program does not cover prescription drugs.

This dissertation provides a preliminary analysis of three health-care reform proposals. These health-care reforms are the Sanders bill, the Public Option, and a cap on the premium increases of private health insurance companies.

1. The Sanders Bill

There are several major problems with the Sanders bill in terms of its effect on employment. In 2022, The U.S. had 333.29 million persons. Of these, 76.11 million were minors (under eighteen years old), and 257.18 million were adults. (Statista 2022b) In December 2023, there were 65.64 million Medicare recipients compared to 63.96 million in December 2021, a growth rate of 1.30% per annum. (Centers for Medicare and Medicaid Services 2021) As of June 2021, there were 76.30 million Medicaid recipients. Using an annual growth rate of 1.30%, I estimate that there were 78.30 million Medicaid recipients in 2023. Thus, 143.94 million persons are enrolled in Medicare or Medicaid, and 113.24 million adults would need to be incorporated into the Medicare system.

The largest number of persons ever incorporated into Medicaid occurred between February 2020 and June 2021, when 12.51 million persons were added, or 9.38 million per year (13.29%). If we assume that Medicare could accommodate a similar growth rate, it could add an additional 8.72 million enrollees per year for a total of over eighteen million new recipients. Thus, it would take a minimum of seven years to fully implement the Sanders MFA bill.

Other problems include:

1. Approximately 400,000 persons are currently employed by private health insurance firms. (Congressional Budget Office 2022) In their analysis of indicative M4A proposals, the CBO assumed that all of these individuals would be unemployed in the event that a M4A bill was signed and implemented.

2. The cost of closing down programs such as CHIPs, ACA programs, and Medicaid is uncertain and is beyond the scope of this preliminary analysis.

3. Hospitals lose approximately 9.9% treating Medicare and Medicaid patients. They are able to recover those losses because private health insurance programs pay an average of 40% more than does Medicare and Medicaid. (Galvani A. et al. 2020)

4. The potential bankruptcy of hospitals is a risk factor unless the federal government directly subsidizes hospitals for losses incurred in treating MFA patients.

2. Assumptions

The following assumptions were made in my analysis of the effect of the MFA proposal on employment:

1. Annual population growth is 0.5%.

2. Private health insurance employment will decline as revenues decline.

3. For every dollar that disposable income is increased due to a reduction in health insurance premiums, personal consumption expenditures will increase by 57 cents.[53]

4. A FIGARCH(1,1) model is used to forecast the change in employment after changes are made to the government spending and personal consumption expenditures variables.

5. The incremental cost of MFA will be paid by the Medicare tax. The Medicare tax rate is currently 2.90%, and the annualized national income in 2023 Q4 was $22.5 trillion. Thus, I assume that Medicare costs will be equal to $22.5 trillion * .029 = $652.5 billion.

6. Medicare costs will be equal to approximately 20% of federal spending. (See Cubanski J. and Neuman T. 2023)

Two options were considered regarding Medicare for All. Option 1 is the bill introduced by Sen. Sanders and Option 2 is the Public Option. Under the Public Option, all residents could have the same health coverage that is currently provided to Medicare recipients, and new enrollees would still be required to pay for the cost of Medicare insurance.

b. The Public Option

Some of the cost advantages of the Public Option are that dental coverage and long-term care coverage will not be provided. A major disadvantage of this approach is that disposable income will decline when compared to the Sanders bill due to the continued payment of premiums by recipients.

[53] The marginal propensity to consume is calculated by dividing the first difference of personal consumption expenditures by the first difference of gross national product.

There is a major political advantage in the Public Option. Under the Sanders bill, most of the existing health insurance companies will be prevented from selling health insurance. This will mean that health insurance companies would be more likely to vigorously oppose the Sanders bill. It will also affect political contributions to the Democratic Party if the Democratic Party supports MFA. In 2020, insurance industry political action committees gave approximately $13.5 million to Republican candidates and $11.5 million to Democratic candidates. (Simpson A. 2020)

Some may argue that there are legal problems with the federal government banning private insurance companies from selling health insurance policies. However, it is likely that the U.S. Supreme Court would find this prohibition to be lawful. In Wickard v. Filburn 1941, the Supreme Court relied on Section 8 of Article 1 of the U.S. constitution and confirmed that the U.S. government has the constitutional power to regulate interstate commerce. (United States Supreme Court 1941)

Section 8 of Article 1 of the U.S. Constitution states that: (Congress.gov 2024)

> The Congress shall have Power To lay and collect Taxes, Duties, Imposts and Excises, to pay the Debts and provide for the common Defence and general Welfare of the United States; but all Duties, Imposts and Excises shall be uniform throughout the United States;
>
> . . .
>
> [The U.S. government has the power] To make all Laws which shall be necessary and proper for carrying into Execution the foregoing Powers, and all other Powers vested by this Constitution in the Government of the United States, or in any Department or Officer thereof.

Health insurance companies will be less likely to oppose the Public Option than MFA because they could still sell supplementary insurance policies to provide coverage for medical procedures and medical costs not covered by Medicare under the public option. Thus, the Public Option is more likely to be passed by Congress. A comparison of the effect of both health insurance proposals is given in Table 30 below.

Table 30: The annual economic effect of two health care proposals on employment if the options are implemented over a seven-year period

Item	The Sanders Bill	The Public Option
a. National Income	22.5 trillion dollars	22.5 trillion dollars
b. Medicare Tax Rate	2.90%	2.90%
c. Medicare and Medicaid costs	2.00 trillion dollars	2.00 trillion dollars
d. Incremental Medicare premiums paid by government	1.46 trillion dollars	Zero dollars
e. Total Medicare and Medicaid costs (c+d) paid by government	3.46 trillion dollars	2.00 trillion dollars
f. Number of recipients	143.94 million	143.94 million
g. Cost per recipient (e/f)	$24,030.85	$13,894.68
h. Annual incremental recipients	18.1 million	18.1 million
i. Incremental cost per year (h*i)	434.96 billion dollars	251.49 billion dollars
j. Private health insurance premiums paid per year	157.14 billion dollars	157.14 billion dollars
k. Marginal propensity to consume	0.57	0.57
l. Increase in personal consumption expenditures (j*k)	89.57 billion dollars	89.57 billion dollars
m. Jobs effect (taken from FIGARCH model forecast)	Gain of 210,850 jobs annually.	Gain of 164,982 jobs annually.

Source: Author

As shown in Table 30, the Sanders MFA bill would result in an increase of 210,850 jobs annually, or 1,475,950 jobs over the seven-year implementation period. Due to a lack of data availability, the following costs and benefits are not included in this analysis.

These costs and benefits include the following:

- Dental premiums paid
- Cost of dental coverage
- Effect on jobs due to the elimination of co-pays
- Long term care premiums paid
- Costs of long-term care coverage
- Reductions in the cost of prescription drugs and hospital services
- Effect on jobs due to the reduction of administrative costs
- Effect on jobs due to 70,000 lives saved. I value this benefit at $7.5 million per life or $535 billion annually.
- Administrative cost of eliminating certain federal programs, such as Medicaid, CHIPS, and Affordable Care Act programs.
- The value of transportable health insurance so that health insurance is not based on a single employer.
- Cost savings associated with shifting patients from hospital emergency services to medical care by general practitioners.

c. Insurance Premium Price Caps

Another possible solution to the problem of high health care costs is the institution of a price cap system whereby the annual increase in insurance premiums is limited to the annual inflation rate as measured by the consumer price index.

Open enrollment for Medicare, ACA programs, and private health care insurance typically begins on November 1 and lasts until January 15 of the following year. (HealthCare.gov 2024) Insurance providers typically set health insurance premiums based on their increase in costs for the previous year. In the discussion below, I use the annual change in the CPI as a proxy for health insurance costs.

Net health care premiums rose from $1.01 trillion in 2020 to $1.10 trillion in 2023, an increase of 8.58%. During the same period, the CPI rose from 261.564 to 280.126, an increase of 7.10%. If private health care premiums had been capped at the inflation rate, consumers would have saved approximately $15 billion.

According to industry sources, the problem will become more severe in 2024. Debbie Ashford, the North America chief actuary for Health Solutions at Aon, estimates that health care premiums will increase by 8.5% for 2024. (Luhby T. 2023) For the period 2022 Q3 to 2023 Q3, the CPI rose from 296.539 to 307.481, an increase of only 3.69%.

A cap on premium increases would increase economic expectations, increase disposable income, increase personal consumption expenditures, and increase employment. However, the cap could result in a reduction in the supply of health insurance to older individuals.

It is likely that health insurance companies would respond to a price cap by engaging in either price discrimination or marketing discrimination in an effort to attract younger, healthier customers and to discourage older customers. This type of price or marketing discrimination could lead to a decline in the number of insured persons.

d. Student Debt Forgiveness

In 2023, total federal student debt was more than $1.7 trillion, or over 8% of GDP. Student debt relief was an issue in the 2016 and 2020 presidential elections and contributed to Sen. Bernie Sanders' strong showing in the 2016 and 2020 democratic primaries.

In August 2022, President Biden announced that he would use executive action to forgive $10,000 in student loans for single borrowers earning less than $125,000 per year, and $250,000 per year for married couples. The Biden plan offered an additional $10,000 in debt forgiveness for Pell Grant recipients.[54] (Nova A. 2022)

In 2022 (Biden v. Nebraska et al.) multiple states filed suit against the federal government asking that the U.S. Supreme Court rule that Biden's debt forgiveness plan was not lawful. On June 30, 2023, the Supreme Court ruled that the Biden administration did not have the authority to waive student debt without congressional approval. (U.S. Supreme Court 2023)

Although the Biden debt forgiveness plan would have dramatically increased disposable income and therefore increased employment, full student debt forgiveness is not possible at this time.

[54] Pell grants are typically awarded to undergraduate students from low-income families.

C. Recommendations

Section B considered the implementation of three health care reform proposals. The three health-care policy proposals are MFA, the Public Option, and annual caps on health insurance costs. I found that either the MFA or the Public Option would have a positive effect on employment. However, the MFA may be politically infeasible.

An MFA bill has been introduced in every session of Congress since 2003. None of these bills have ever been voted on by the committee to which they were assigned. As discussed above, the Public Option is more likely to be passed by Congress. Although MFA will create more jobs, I recommend that congress attempt to pass the Public Option since it is more likely to become law.

Summary

This chapter presented polling data showing that trust in government has declined from 77% in 1964 to 16% in 2023 and argued that the lack of confidence in the federal government and in its political leaders is in great part caused by a dysfunctional American political system. Polling data also shows that economic sentiment has declined dramatically since 2020.

Four policy options for increasing employment are discussed: capping annual increases to health insurance premiums, Medicare for All (MFA), the Public Option, and student debt forgiveness. Complete student debt forgiveness is prohibited by a decision of the United States Supreme Court. A FIGARCH(1,1) model was used to evaluate the remaining three options. The model results indicate that MFA would result in the creation of 210,850 jobs annually and the Public Option would create 164,982 jobs annually. I recommended that Congress attempt to pass the Public Option.

CONCLUSION

The objective of this dissertation is to determine the effect of expected demand on aggregate employment in the United States for the period 1948 Q1 to 2023 Q3. The relationship is studied using both qualitative and quantitative analysis. Chapter 5 discusses potential application of the findings, with examples related to the effect of legislation, expenditures, and employment in the national health-care sector.

The Research Gap

All of the literature on expectations and employment reviewed for this dissertation agree that expected demand is positively correlated with total employment. In other words, employment tends to increase in a current or future period if expected demand increases in period *t*.

Despite this agreement, much is unknown about the relationship between expected demand and employment. Economists do not know how expected demand interacts with other macroeconomic variables such as taxes, government spending, money supply, international trade, and other variables. The most recent paper on expectations and aggregate employment that I am aware of was written in 2017 by Mauro Boianovsky (Boianovsky M. 2020). Thus, there are no papers on expectations and aggregate demand that account for the economic effect of Covid-19, which began in the fall of 2019.

The literature review identifies two major research gaps concerning studies of aggregate employment in the U.S.: a shortage of papers on the effect of expected demand on aggregate employment, and papers on aggregate employment have not been updated to account for the economic effects of Covid-19, which began in 2019. The author addresses these research gaps by submitting a dissertation on expected demand and aggregate employment and by using data for the period 1948 Q1 to 2023 Q3; thereby accounting for the economic effect of the Covid-19 pandemic and the economic recovery from the pandemic.

The Research Hypothesis

The research hypothesis is "Firms increase and decrease employment in response to changes in expected demand." The empirical results confirm the hypothesis and find that firms are risk averse and thus are overly pessimistic during both high growth and recessionary periods (See Chapter 4, Table 16).

A total of sixteen econometric models are presented in this dissertation. Every one of these models indicate that the two expected-demand proxies (personal consumption expenditures and nonresidential fixed investment) have a significant effect on employment at below the 0.05 level.

An average of the short-run model results indicates that changes in expected demand accounted for approximately 33% of the average change in quarterly employment. The long-run ARCH model (FIGARCH) estimated that the expected demand proxies will account for over 152,000 jobs per quarter, or over 41% of the average quarterly increase in employment over the period of this study.

Policy Implications

The long-term model results indicate that employment can be maximized by reducing the rate of inflation, decreasing government spending, decreasing the manufacturing employment percentage (MEP), decreasing the money supply, and by increasing expectations as measured by nonresidential fixed investment and personal consumption expenditures.

The Federal Reserve Board can reduce the rate of inflation by raising interest rates. Government spending can be reduced by legislative and or budgetary action. Government has no direct control over the MEP, but it could refrain from subsidizing manufacturing.

The model results indicate that:

- A reduction in the money supply will increase employment. However, government cannot reduce the money supply without decreasing disposable income by increasing taxes or by increasing interest rates.

- An increase in nonresidential fixed investment will increase inflation and increase employment.

- An increase in personal consumption expenditures will increase employment and increase inflation. Thus, an increase in PCE will increase employment, but an increase in inflation will decrease employment.

Limitations of Research

Like all empirical research, the accuracy of the empirical results is dependent on the availability of data and the models chosen to estimate the values of the coefficients. In this research, I used OLS models, a WLS model, and ARCH models for this purpose. Additionally, a VAR model was used to perform variance decomposition, estimate impulse response functions, perform co-integration tests, and estimate Granger causality.

Of course, other models could have been used as well. These omitted models include simulation techniques, Autoregressive Distribute Lag models (ARDL), two stage least squares, n-stage least squares, generalized method of moments, generalized linear models, etc. I used the models that I had the most experience running, and which have produced the most realistic results in my previous econometric work. If some of the other models had been used, the coefficient values and p-values would have probably been different.

Suggestions for Future Research

My dissertation is based on the merger of expectations theory and Keynesian theory. During this process, I carefully considered the work of Lucas, Muth, and Sargent on expectations theory and the work of Keynes on unemployment and effective demand. My model results indicate that economic expectations have a significant effect on aggregate employment.

If employers expect that demand for their products and services will increase in a future period, they will increase employment to ensure that they retain their existing customers. Conversely, if employers expect that demand for their products and services will decline in a future period; they may lay off workers in order to maximize profits or reduce expected losses.

Economic expectations have an effect on other fields of economics as well. These fields include but are not limited to labor economics, energy economics, resource economics, health economics, regulatory economics, behavioral economics, finance, and investment economics. I encourage other researchers to explore the effect of expectations in other economic subject areas.

Subject areas that could be explored in future papers include the effect of expectations on wages, hours, marginal labor productivity, the market price of oil and natural gas, renewable energy, utility cost-of-capital, medical costs, economic price discrimination, the economic value of the firm, property values, public policy, and the market price of stocks and bonds.

Bibliography

Acemoglu D., Autor D., Dorn D., Hanson G., and Price B. (2014) Return of the Solow Paradox? IT, Productivity, and Employment in US Manufacturing. *American Economic Review: Papers & Proceedings* 104:5:394–399. http://dx.doi.org/10.1257/aer.104.5.394

Acharya R. (2017) Impact of Trade on Canada's Employment, Skill and Wage Structure. *The World Economy 2017*. https://doi.org/10.1111/twec.12360.

Algan Y., Guriev S., Papaioannou E., and Passari E. (2017) The European Trust Crisis and the Rise of Populism. *Brookings Papers on Economic Activity* Fall 2017 309:400. https://doi.org/10.2139/ssrn.3128274.

Andolfatto D. (1996) Business cycles and labor-market search. *American Economic Review* 86:112-132. Available at https://www.jstor.org/stable/2118258. [Accessed December 5, 2022]

Assenza T. and Berardi M. (2009) Learning in a credit economy. *Journal of Economic Dynamics & Control* 33:1159–1169. https://doi.org/10.1016/j.jedc.2008.12.004.

Associated Press (2023) Biden ends COVID national emergency after Congress acts, April 11, 2023. Available at https://www.npr.org/2023/04/11/ 1169191865/biden-ends-covid-national-emergency. [Accessed February 1, 2024]

Bailey M., DiNardo J., and Stuart B. (2022) The Economic Impact of a High National Minimum Wage: Evidence from the 1966 Fair Labor Standards Act. Journal of Labor Economics 39:2 329-367, https://doi.org/10.1086/712554.

Baillie R., Bollerslev T., and Mikkelsen H. Fractionally Integrated Generalized Autoregressive Conditional Heteroskedasticity. *Journal of Econometrics* 73:1:5-59.

Bailyn E. (2022) Average Customer Acquisition Cost (CAC) By Industry: B2B Edition. FirstPageSage. Available at https://firstpagesage.com/seo-blog/seo-roi/average-customer-acquisition-cost-cac-by-industry-b2b-edition-fc/. [Accessed December 26, 2022]

Ball L. (2000) Near-Rationality and Inflation in Two Monetary Regimes. NBER Working Paper 7988. https://doi.org/10.3386/w7988.

Bateman, B. (1996). Keynes's uncertain revolution. Ann Arbor: University of Michigan Press. ISBN 0-472-10708-9.

Baxter M. and King R. (1993) Fiscal Policy in General Equilibrium. *American Economic Review* 83:315 334.

Bell B. (2015) Do Recessions Increase Crime? World Economic Forum. Available at https://www.weforum.org/agenda/2015/03/do-recessions-increase-crime/ [Accessed February 9, 2021]

Bentolila, S, and Saint-Paul G. (1992) The Macroeconomic Impact of Flexible Labor Contracts with an application to Spain. *European Economic Review* 36:1013-1053. https://doi.org/10.1016/0014-2921(92)90043-V.

Berardi M. (2007) Heterogeneity and misspecifications in learning. *Journal of Economic Dynamics and Control* 31:10:3203-3227. https://doi.org/10.1016/j.jedc.2006.11.002

Bettoni L. and Santos M. (2022) Public sector employment and aggregate fluctuations. *Journal of Macroeconomics* 72:103418. https://doi.org/10.1016/j.jmacro.2022.103418

Blahous C. (2018) The Costs of a National Single-Payer Healthcare System. Mercatus Center working paper. Social Science Research Network

Blanchard O. and Summers L. (1986) Hysteresis and the European Unemployment Problem. *NBER Macroeconomics Annual* 1: 15-78.

Blanchard O. and Wolfers J. (2000). The Role of Shocks and Institutions in the Rise of European Unemployment: The Aggregate Evidence. *The Economic Journal* 110:462:C1-C33, Conference Papers. https://doi.org/10.1111/1468-0297.00518.

Blaug M. (1985) Economic Theory in Retrospect, 4th edition. Cambridge: Cambridge University Press. ISBN 052131644.

Bodie Z., Kane A., and Marcus J. (1996) Investments, 3rd edition. New York: Richard D. Irwin. ISBN 0-256-14638-1.

Boianovsky M. (2020). Between Pigou and Keynes: Champernowne on Employment and Expectations. In Expectations, pp. 69-85. Springer Studies in the History of Economic Thought. Springer, Cham. https://doi.org/10.1007/978-3-030-41357-6_4.

Boianovsky, M. (2005). Introduction. In Business cycle theory, selected texts 1860-1939, vol. VII – Saving, investment and expectations, ed. By M. Boianovsky. London: Pickering & Chatto.

Bollerslev T. (1986) Generalized Autoregressive Conditional Heteroscedasticity. *Journal of Econometrics* 31:3:307:327. https://doi.org/10.1016/0304-4076(86)90063-1.

Bollerslev T. and Mikkelsen H. Modeling and Pricing Long- Memory in Stock Market Volatility. Journal of Econometrics 73:151-184. https://doi.org/10.1016/0304-4076(95)01736-4

Bowling C. and Pickerill J (2013) Fragmented federalism: The state of American federalism 2012-13. *The Journal of Federalism* 43:3: 315-346.

Bowling C. and Pickerill J (2013) Fragmented federalism: The state of American federalism 2012-13. *The Journal of Federalism* 43:3: 315-346. https://doi.org/10.1093/publius/pjt022.

Brady, M. (2017) How J.M. Keynes presented the technical analysis of his IS and LM curves in the General Theory in 1936: why D.G. Champernowne got it right in 1936 and Hicks (and Harrod, Meade, Lange) got a big part wrong in 1937 and 1938. https://doi.org/10.2139/ssrn.2956744.

Branch W. and Evans, G. (2006) Intrinsic heterogeneity in expectation formation. Journal of Economic Theory 127:1:264-295. https://doi.org/10.1016/j.jet.2004.11.005.

Brannick M. (2023) Regression with Two Independent Variables. University of South Florida. Available at https://faculty.cas.usf.edu/mbrannick/regression/Part3/ Reg2.html. [Accessed November 20, 2023]

Braunerhjelm P. and Eklund J. (2014) Taxes, tax administrative burdens and new firm formation. *Kyklos* 67(1):1–11. https://doi.org/10.1111/kykl.12040.

Brynjolfsson E. and McAfee A. (2011) Race Against the Machine. Lexington, MA: Digital Frontier Press.

Bump P. (2021) Here Is When Each Generation Begins and Ends, According to Facts. The Atlantic, March 15, 2014. Available at https://www.theatlantic.com/national/archive/2014/03/here-is-when-each-generation-begins-and-ends-according-to-facts/359589/. [Accessed December 15, 2023]

Bureau of Economic Analysis (2023a). Available at https://www.bea.gov/resources/learning-center/what-to-know-government#:~: text=Consumption%20expenditures%20and%20gross%20investment%20are%20the%20measures,other%20transfers%2C%20interest%20payments%2C%20and%20subsidies%20to%20businesses. [Accessed June 6, 2023]

Bureau of Economic Analysis (2023b) Available at https://www.bea.gov/help/glossary. [Accessed June 20, 2023]

Bureau of Labor Statistics (2023). Union Members Summary news release. January 19, 2023. Available at https://www.bls.gov/news.release/ union2.nr0.htm. [Accessed July 27, 2023]

Bureau of Labor Statistics (2022a). Handbook of Methods. Available at https://www.bls.gov/opub/hom/emp/calculation.htm. [Accessed April 24, 2023]

Bureau of Labor Statistics (2022b). Characteristics of minimum wage workers, 2021. April 2022, Report 1098. Available at https://www.bls.gov/opub/reports/minimum-wage/2021/pdf/home.pdf. [Accessed July 1, 2023]

Bureau of Labor Statistics (2021a). Employment by Major Industry Sector. Available at https://www.bls.gov/emp/tables/employment-by-major-industry-sector.htm. [Accessed December 16, 2022]

Bureau of Labor Statistics (2021b). Frequently Asked Questions (FAQs). Available at https://www.bls.gov/respondents/ces/faqs.htm#1. [Accessed August 13, 2021]

Carey P. (2021) Measuring Employment: Interpreting the Monthly Jobs Data. National Association for Business Economics, Economic Measurement Seminar. August 9, 2021.

Centers for Medicare and Medicaid Services (2021) CMS Releases Latest Enrollment Figures for Medicare, Medicaid, and Children's Health Insurance Program (CHIP). Available at https://www.cms.gov/newsroom/news-alert/cms-releases-latest-enrollment-figures-medicare-medicaid-and-childrens-health-insurance-program-chip. [Accessed January 14, 2024]

Champernowne, D. (1936) Unemployment, Basic and Monetary: The Classical Analysis and the Keynesian. *Review of Economic Studies* 3: 201-216.

Christopoulos D, McAdam P., and Tzavalis E. (2019). Exploring Okun's law asymmetry: an endogenous threshold LSTR approach. European Central Bank. https://doi.org/10.2139/ssrn.3515399.

Ciccone A. and Papaioannou E. (2007) Red tape and delayed entry. *Journal of the European Economic Association* 5(2-3):444–458. https://doi.org/10.1162/jeea.2007.5.2-3.444

Congress.gov (2024) Constitution Annotated. Available at https://constitution.congress.gov/browse/article-1/section-8/. [Accessed January 18, 2024]

Congressional Budget Office (2022) Working Paper 2022-02. Available at http://go.usa.gov/xUzd7. [Accessed January 14, 2024]

Cotes R. with Robert Smith, ed. (1722) *Harmonia mensurarum.* Cambridge, England. chapter: Logometria, p. 28.

Commission on Terrorist Attacks upon the United States (2004) Staff Report on August 26, 2004. Available at https://www.archives.gov/files/research/9-11/staff-report-sept2005.pdf. [Accessed December 17, 2023]

Congressional Research Service (2023) Summary: S.1655 — 118th Congress (2023-2024). Available at https://www.congress.gov/bill/118th-congress/senate-bill/1655. [Accessed January 14, 2024]

Cottrell A. (1994) Keynes's appendix to chapter 19: a readers' guide. *History of Political Economy* 26: 681-95. https://doi.org/10.1215/00182702-26-4-681.

Cubanski J. and Neuman T. (2023) What to Know about Medicare Spending and Financing. Available at https://www.kff.org/medicare/issue-brief/what-to-know-about-medicare-spending-and-financing/. [Accessed January 15, 2024]

Curtin R. (2022) A New Theory of Expectations. *Journal of Business Cycle Research* 2022. https://doi.org/10.1007/s41549-022-00074-w.

Dal Bó E. (2006). Regulatory capture: A review. *Oxford Review of Economic Policy*. 22(2): 203–225. doi:10.1093/oxrep/grj013

Dam K. (2007) The Law-Growth Nexus: The Rule of Law and Economic Development. Brookings Institution Press.

Davidson J., Hendry D., Srba F., and Yeo S. (1978) Econometric modeling of the Aggregate Time-Series Relationship Between Consumer's Expenditure and Income in the United Kingdom. *Economic Journal* 88:661-692. https://doi.org/10.2307/2231972.

Davis C. and Hashimoto K. (2022) Productivity growth, industry location patterns and labor market frictions. *Regional Science and Urban Economics* 97:103817. https://doi.org/10.1016/j.regsciurbeco.2022.103817.

Dean E., Elardo J., Green M. Wilson B., and Berger S. (2020) Principles of Economics: Scarcity and Social Provisioning (2nd ed.). Houston: Rice University.

De Paoli L. and Hill J. (2022) The Last of Lehman Brothers. Bloomberg Businessweek, May 23, 2022. Available at https://www.bloomberg.com/features/2022-lehman-brothers-collapse-plan-repay-after-bankruptcy/. [Accessed December 17, 2023]

Diamond P. (1982) Aggregate demand management in search equilibrium. *Journal of Political Economy* 90:881-894. https://doi.org/10.1086/261099.

Diaz R. (2021) Expectations and Employment. Available at https://repositorio.unicolmayoredu.co/bitstream/handle/unicolmayor/3472/AS006Entrega%20definitiva%20monograf%c3%ada.pdf?sequence=1&isAllowed=y. [Accessed November 3, 2022]

Ding C., Granger C., and Engle R. (1993) A long memory property of stock market returns and a new model. *Journal of Empirical Finance* 1:83-106. https://doi.org/10.1016/0927-5398(93)90006-D.

Di Vita. G (2017) Institutional quality and the growth rates of the Italian regions: The costs of regulatory complexity. *Papers in Regional Science* 97:4: 1057-1081. https://doi.org/10.1111/pirs.12290.

Dovern, J., Muller, L., and Wohlrabe K. (2020). How do firms form expectations of aggregate growth? New evidence from a large-scale business survey. CESIFO. https://doi.org/10.2139/ssrn.356486.

Eaton W. (1993) House Approves Clinton's Budget, Stimulus Package: Economy: Democrats hand the President a double victory, passing his deficit-cutting plan and his $16.3-billion spending program to spur recovery. Los Angeles Times, March 19, 1993. Available at https://www.latimes.com/archives/la-xpm-1993-03-19-mn-12835-story.html. [Accessed December 20, 2022]

Economist (2023) Economic and Financial Indicators. The Economist Magazine, July 22, 2023, p. 70.

Emerson M. (1988) Regulation or Deregulation of the Labor Market. *European Economic Review* 32:775-817. https://doi.org/10.1016/0014-2921(88)90047-5.

Engle R. (1982) Autoregressive Conditional Heteroskedasticity with Estimates of the Variance of U.K. Inflation. *Econometrica* 50:4:987-1008. https://doi.org/10.2307/1912773

Engle R. and Gonzalez-Rivera G. (1991) Semiparametric ARCH Models. *Journal of Business and Economic Statistics* 9:4:345:359. https://doi.org/10.1080/07350015.1991.10509863.

Engle R. and Kraft D. Multiperiod Forecast Error Variances of Inflation Estimated from ARCH Models, in A. Zellner (ed.), Applied Time Series Analysis of Economic Data, (Washington, D.C.: 1983), pp. 293-302.

Engle R., Lilien D., and Robins R. Estimating the Time Varying Risk Premia in the Term Structure: the ARCH-M Model. *Econometrica* 55:2:391-407. https://doi.org/10.2307/1913242.

Engle R. and Ng V. (1993) Measuring and Testing the Impact of News on Volatility. *Journal of Finance* 48:5:1749-1778. https://doi.org/10.1111/j.1540-6261.1993.tb05127.x.

Escudero V., Kluve J., López-Mourelo E., and Pignatti, C. (2019). Active Labour Market Programmes in Latin America and the Caribbean: Evidence from a Meta Analysis. *The Journal of Development Studies* 55:12:2644-2661. https://doi.org/10.1080/00220388.2018.1546843

Eurostat (2023) Minimum Wages. Available at https://ec.europa.eu/eurostat/databrowser/ view/tps00155/default/table?lang=en. [Accessed June 25, 2023]

EViews 13 Users Guide (2022) Users Guide II, Chapter 23. S&P Global Inc.

Fama E. (1998) Market Efficiency, Long-Term Returns, and Behavioral Finance. *Journal of Financial Economics*, 49:3:283–306. https://doi.org/10.1016/S0304-405X(98)00026-9.

Fama E. (1970) Efficient Capital Markets: A Review of Theory and Empirical Work. *Journal of Finance* 25:2:383-417. https://doi.org/10.2307/2325486.

Federal Reserve Bank of St. Louis (2024) Available at https://fred.stlouisfed.org. [Accessed January 8, 2024]

Federal Reserve Bank of St. Louis (2021) Available at https://fred.stlouisfed.org. [Accessed February 7, 2021]

Fonseca R., Lopez-Garcia P., and Pissarides C. (2001) Entrepreneurship, start-up costs and employment. *European Economic Review* 45(4):692–705. https://doi.org/10.1016/S0014-2921(01)00131-3

Friedman M. (1968) The Role of Monetary Policy. *American Economic Review* 58:1:1-17. Available at https://www.jstor.org/stable/1831652. [Accessed October 21, 2022]

Fry R. (2020) Millennials overtake Baby Boomers as America's largest generation. Pew ResearchCenter, April 28, 2020. Available at https://www.pewresearch.org/short-reads/2020/04/28/millennials-overtake-baby-boomers-as-americas-largest-generation/.[Accessed December 15, 2023]

Furceri D., Jalles J., and Loungan P. (2020) On the Determinants of the Okun's Law: New Evidence from Time-Varying Estimates. *Comparative Economic Studies* 62:661–700. https://doi.org/10.1057/s41294-019-00111-1.

Fuster A., Laibson D., and Mendel B. (2010) Natural Expectations and Macroeconomic Fluctuations. *Journal of Economic Perspectives* 24:4:67-84. https://doi.org/10.1257/jep.24.4.67.

Gali J. (2013) Notes for a New Guide to Keynes (I): Wages, Aggregate Demand, and Employment. *Journal of the European Economic Association* 11:973-1003. https://doi.org/10.1111/jeea.12032.

Galvani A., Parpia A., Foster E., Singer B., and Fitzpatrick M. (2020) Improving the Prognosis of Healthcare in the United States. *Lancet* 395:524–533. https://doi:10.1016/ S0140-6736(19)33019-3.

Givens M. (1933) Employment During the Depression. *National Bureau of Economic Research* Bulletin 47.

Gottfries N. (1992). Insiders, Outsiders, and Nominal Wage Contracts. *Journal of Political Economy* 100:252-270. https://doi.org/10.1086/261817.

Graetz M. (2007) Tax reform unravelling. *The Journal of Economic Perspectives* 21(1):69–90. https://doi.org/10.1257/jep.21.1.69

Graham M. and Anwar M. (2019). The global gig economy: Towards a planetary labour market? *First Monday* 24:4. https://doi.org/10.5210/fm.v24i4.9913.

Granger C. (1969). Investigating Causal Relations by Econometric Models and Cross-Spectral Methods. *Econometrica* 37:424–438. https://doi.org/10.2307/1912791.

Greenberg S. (2017) Taxes on the Rich Were Not That Much Higher in the 1950s. Tax Foundation. Available at https://taxfoundation.org/taxes-on-the-rich-1950s-not-high/. [Accessed July 24, 2023]

Greene W. (1993) Econometric Analysis. Englewood, NJ: Prentice Hall Inc.

Greenwood J. and Huffman G. (1991) Tax Analysis in a Real-Business-Cycle Model: On Measuring Harberger Triangles and Okun Gaps. *Journal of Monetary Economics* 27:167 190. https://doi.org/10.1016/0304-3932(91)90040-U.

Gruss B. and Natova N. (2018) The Decline in Manufacturing Jobs: Not Necessarily a Cause for Concern. International Monetary Fund. Available at https://www.imf.org/en/Blogs/Articles/2018/04/09/the-decline-in-manufacturing-jobs-not-necessarily-a-cause-for-concern. [Accessed July 15, 2023]

Giuliano L. (2013 Minimum Wage Effects on Employment, Substitution, and the Teenage Labor Supply: Evidence from Personnel Data. Journal of Labor Economics 31:1:155–194. https://doi.org/10.1086/666921

Guisinger A., Hernandez-Murillo R., Owyang M., and Sinclair T. (2018). A state-level analysis of Okun's law. *Regional Science and Urban Economics* 68:239-248. https://doi.org/10.1016/j.regsciurbeco.2017.11.005.

Hall R. and Taylor J. (1993) Macro Economics. New York: W.W. Norton and Company, 4th edition, ISBN 0-393-96307-1, HB172.5-H35.

Hall, R., Lilien D., Sueyoshi G., Engle R., Johnston J., and Ellsworth S (1995) EViews Users Guide, (Quantitative Micro Software: 1995).

Hane-Weijman E., Eriksson R., and Henning M. (2018) Returning to work: regional determinants of re-employment after major redundancies. *Regional Studies* 52:6:768-780. https://doi.org/10.1080/00343404.2017.1395006.

Hansen, A. (1953). A Guide to Keynes. New York: McGraw Hill. ISBN 9780070260467.

Harrod R. (1937) Mr. Keynes and Traditional Theory. *Econometrica* 5: 74- 86. *Econometrica* 5: 74- 86. https://doi.org/10.2307/1905402.

Hartwig J. (2007) Keynes vs. the Post Keynesians on the Principle of Effective Demand. *The European Journal of the History of Economic Thought*. 14:4:725-739. https://doi:10.1080/09672560701695554.

Hawton K. and Haw C. (2013) Economic recession and Suicide. Available at https://www.weforum.org/agenda/2015/03/do-recessions-increase-crime/. [Accessed February 9, 2021]

HealthCare.gov (2024) Open Enrollment Period. Available at https://www.healthcare.gov/glossary/open-enrollment-period/ #:~:text= The%20yearly%20period%20%28November%201%20%E2%80%93%20January%2015%29,coverage%2C%20or%20based%20on%20your%20estimated%20 household%20income. [Accessed January 17, 2024]

Hicks, J. (1937). Mr. Keynes and the 'Classics': A Suggested Interpretation. *Econometrica*. 5: 147–159. https://doi.org:10.2307/1907242. JSTOR 1907242.

Hirsch B., Kaufman B., and Zelenska T. (2015) Minimum Wage Channels of Adjustment. Industrial Relations 54:2:199–239. https://doi.org/10.1111/ irel.12091.

Huckfeldt C. Understanding the Scarring Effect of Recessions. *American Economic Review* 112:4: 1273–1310. https://doi.org/10.1257/aer.20160449.

Johansen S. (1995). Likelihood-based Inference in Cointegrated Vector Autoregressive Models. Oxford: Oxford University Press. https://doi.org/10.1093/0198774508.001.0001.

Jovanovic F. (2012) Bachelier: Not the forgotten forerunner he has been depicted as. An analysis of the dissemination of Louis Bachelier's work in economics. *The European Journal of the History of Economic Thought* 19:3:431-451. https://doi:10.1080/09672567.2010.540343.

Kahneman, D. (2011). Thinking, fast and slow. New York: Farrar, Straus and Giroux.

Kaldor N. (1934) A Classificatory Note on the Determination of Equilibrium. *Review of Economic Studies* 1:122-136. https://doi.org/10.2307/2967618.

Kalecki M. (1936) Some remarks on Keynes theory. *Economista* 3. Translated to english in Targetti F. and Kinda-Hass B. (1982).

Kenton W. (2023) What Is Productivity and How to Measure It Explained. Investopedia. Available at https://www.investopedia.com/terms/p/productivity.asp. [Accessed July 18, 2023]

Keynes J. (1937). The General Theory of Employment. *The Quarterly Journal of Economics* 51:2. https://doi.org/10.2307/1882087.

Keynes J. (1936) The General Theory of Employment, Interest, and Money. London: Palgrave MacMillan.

Kim I. (1997) Detecting the Number of Structural Breaks. *Economics Letters* 57:145-148. https://doi.org/10.1016/S0165-1765(97)00229-2.

Kolb E. (1988) The Weimar Republic, p. 105. New York: Routledge.

Komlos J. (2020) The Actual U.S. Unemployment Rate Was 24.4% in May 2020. CESifo Working Papers, June 2020. https://doi.org/10.2139/ssrn.3635178.

Kraft K. (1989) Expectations and the adjustment of hours and employment. *Applied Economics* 21:487-495. https://doi.org/10.1080/758519715.

Kregel J. 1976 Economic Methodology in the Face of Uncertainty: The Modelling Methods of Keynes and the Post-Keynesians. *The Economic Journal* 86:209-225. https://doi.org/10.2307/2230743.

Kudoh N. and Miyamoto H. (2023) Do general equilibrium effects matter for labor market dynamics? *Economic Modelling* 119:106128. https://doi.org/10.1016/j.econmod.2022.106108.

Lange O. (1938) The rate of interest and the optimum propensity to consume. *Economica* 5: 12-32. https://doi.org/10.2307/2548833.

Lanzilotta B. (2015) Business expectations: consequences for growth in Uruguay. *Cuadernos de Economía*, 34:65:423-442. https://doi.org/10.15446/cuad.econ.v34n65.45932.

Lavington F. (1922) The Trade Cycle. London: P.S. King & Son.

Legendre A. (1805), Nouvelles méthodes pour la détermination des orbites des comètes [New Methods for the Determination of the Orbits of Comets] (in French), Paris: F. Didot. Available at hdl:2027/nyp.33433069112559. [Accessed July 30, 2021]

Lucas R. (1972) Expectations and the Neutrality of Money. *Journal of Economic Theory*. 4:103-124. https://doi.org/10.1016/0022-0531(72)90142-1.

Luhby T. (2023) Health care costs at work set to rise steeply in 2024. CNN Digital, October 31, 2023. Available at https://www.cnn.com/2023/10/31/politics/health-care-costs-job/index.html. [Accessed January 17, 2024]

Lütkepohl H. (2005). New Introduction to Multiple Time Series Analysis. Springer Science & Business Media. https://doi.org/10.1007/978-3-540-27752-1.

Maddala G. (1992) Introduction to Econometrics. Englewood Cliffs, New Jersey: Prentice-Hall. ISBN 0-02-374545-2.

Maddala G. and Kim I. (1998) Unit Roots, Cointegration, and Structural Change. Cambridge: New York. ISBN 978-0-521-58257-5 (hardback) and ISBN 978-0-521-58782-2 (paperback). https://doi.org/10.1017/CBO9780511751974.

Mann C. (2021) International Data Comparisons: Using Macro-National Statistics and Micro-Firm Surveys. National Association for Business Economics, Economic Measurement Seminar. August 9, 2021.

Manning A. (2021) The Elusive Employment Effect of the Minimum Wage. *Journal of Economic Perspectives* 35:3-26. https://doi.org/10.1257/jep.35.1.3.

Marcet A. and Nicolini J. Recurrent Hyperinflations and Learning. *The American Economic Review* 93:1476-1498. https://doi.org/10.1257/000282803322655400.

Matthews D. (2013, September 25) Here is every previous government shutdown, why they happened and how they ended. The Washington Post. Available at http://wapost/1lJhaBc. [Accessed March 31, 2016]

McCullough E. (2017) Labor productivity and employment gaps in Sub-Saharan Africa. *Food Policy* 67:133-152. https://doi.org/10.1016/j.foodpol.2016.09.013.

McGrattan E, (1994) The Macroeconomic Effects of Distortionary Taxation. *Journal of Monetary Economics* 33:573-601. https://doi.org/10.1016/0304-3932(94)90044-2.

Meade J. (1937) A Simplified Model of Mr. Keynes's System. *Review of Economic Studies* 4:98-107. https://doi.org/10.2307/2967607.

Meer J. and West J. (2016) Effects of the Minimum Wage on Employment Dynamics. Journal of Human Resources 51:500–522. https://doi.org/10.3368/ jhr.51.2.0414-6298R1.

Mendoza E. (1995). The Terms of Trade, the Real Exchange Rate, and Economic Fluctuations. *International Economic Review* 36:1:101-137. https://doi.org/10.2307/2527429.

Merz M. (1995) Search in the labor market and the real business cycle. *Journal of Monetary Economics* 36:269-300. https://doi.org/10.1016/0304-3932(95)01216-8.

Messerli J. (2011). List of 100 Taxes and Fees You Pay to the Government. BalancedPolitics.Org. Available at https://www.balancedpolitics.org/editorials/100_taxes_you_pay.htm. [Accessed on October 2, 2022]

Mian A. and Sufi A. (2014) What explains the 2007-2009 drop in Employment?. *Econometrica* 82:6:2197-2223. https://doi.org/10.3982/ECTA10451.

Mill J. (1848) The Principles of Political Economy: with some of their applications to social philosophy. (1st ed.), London: John W. Parker.

Mortensen D. and Pissarides C. (1994) Job creation and job destruction in the theory of unemployment. *Review of Economic Studies* 61:397-415. https://doi.org/10.2307/2297896.

Muth J. (1961) Rational Expectations and the Theory of Price Movements. *Econometrica* 29:315-335. https://doi.org/10.2307/1909635.

Nebot C., Beyaert A., and García-Solanes J. (2019). New insights into the nonlinearity of Okun's law. *Economic Modelling* 82:202-210. https://doi.org/10.1016/j.econmod.2019.01.005.

Nelson, D. “Modeling Stock Market Volatility Changes”, Proceedings of the ASA, (1989), pp. 93-98.

Nelson D. (1996) Modelling stock market volatility changes. In Modelling Stock Market Volatility (pp. 3–15). Academic Press. https://doi.org/10.1016/B978-012598275-7.50002-8.

Neumark D., Salas J., and Wascher W. (2014) Revisiting the Minimum Wage-Employment Debate: Throwing Out The Baby With The Bathwater? *ILR Review* 67:608:648. https://doi.org/10.1177/00197939140670S307.

Nickell S, (1984). An Investigation of the Determinants of Manufacturing Employment in the United Kingdom. *The Review of Economic Studies* 51:4:529-557. https://doi.org/10.2307/2297778.

Nicoletti G. and Scarpetta S. (2003) Regulation, productivity and growth: OECD evidence. *Economic Policy* 18(36):9–72. https://doi.org/10.1111/1468-0327.00102.

Nikolopoulou K. (2023) What Is Anchoring Bias? | Definition & Examples. Scribd. Available at https://www.scribbr.com/research-bias/anchoring-bias/. {Accessed March 9, 2023]

Niskanen W. (1971), Bureaucracy and representative government, Abingdon, UK: Routledge.

Nosratabadi, J. (2021). Do firms' inflation expectations matter in their employment and wages? Causal evidence. https://doi.org/10.2139/ssrn.3575169.

Nova A. (2022) Biden cancels $10,000 in federal student loan debt for most borrowers. CNBC, August 24, 2022. Available at https://www.cnbc.com/2022/08/24/biden-expected-to-cancel-10000-in-federal-student-loan-debt-for-most-borrowers.html. [Accessed January 18, 2024]

OECD (2023) OECD (2023) Employment Protection Legislation: Strictness of employment protection legislation: collective dismissals. OECD Employment and Labour Market Statistics (database), https://doi.org/10.1787/data-00316-en. [Accessed July 27, 2023].

OECD (2021) The New OECD Employment Protection Legislation Indicators for Temporary Contracts. Available at https://www.oecd.org/els/emp/OECD-EPLIndicators-TemporaryContracts.pdf. [Accessed December 9, 2022]

Okun A. (1962) Potential GNP, its Measurement and Significance. Cowles Foundation, Yale University.

Olivier D. (2022) Nationalization of the private sector labor force, quotas, matching and public jobs, an illustration with Saudi Arabia. *Quarterly Review of Economics and Finance* 86:98-117. https://doi.org/10.1016/j.qref.2022.06.004.

Online Education Technology Company (2023) Structural Vector Autoregressive Models. Available at https://courses.edx.org/assets/courseware/v1/c202f38f73d40c750fee01d7c109006c/asset-v1:IMFx+MFx+3T2021a+type@asset+block/MF_M5_Pt1_VAR_slides.pdf. [Accessed August 20, 2023]

Oswald A. (1993) Efficient Contracts Are on the Labour Demand Curve: Theory and Facts. *Labour Economics* 1:85-113. https://doi.org/10.1016/0927-5371(93)90007-5.

Pappa E. (2009) The Effects of Fiscal Shocks on Employment and the Real Wage. *International Economic Review* 50:217-244.

Parlapiano A., Solomon D., Ngo M., and Cowley S. (2022) Where $5 Trillion in Pandemic Stimulus Money Went. New York Times, March 11, 2022. Available at https://nyti.ms/367ApRu. [Accessed November 17, 2023]

Pashigian, B. (2008) Cobweb Theorem. The New Palgrave Dictionary of Economics, 2nd edition. https://doi.org/10.1057/978-1-349-95121-5_600-1.

Pétursson T. and Sløk T. (2001) Wage formation and employment in a cointegrated VAR model. *Econometrics Journal* 4:191-209. https://doi.org/10.1111/1368-423X.00062.

Pew Research (2023) Public Trust in Government: 1958-2023. Pew Research Center, September 19, 2023. Available at https://www.pewresearch.org/politics/2023/09/19/public-trust-in-government-1958-2023. [Accessed December 24, 2023}

Phillips A. (1958) The Relation between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom 1861–1957. *Economica* 25:283-299. https://doi.org/10.2307/2550759.

Physicians for a National Health Program (2008) Single Payer System Cost? Available at https://web.archive.org/web/20101206190254/http://www.pnhp.org/facts/single_payer_system_cost.php?page=all. [Accessed January 12, 2024]

Pickerill J. and Bowling C. (2014) Polarized Parties, Politics, and Policies: Fragmented Federalism in 2013-2014. *The Journal of Federalism* 44:3:369-398. https://doi.org/10.1093/publius/pju026

Pierce J. and Schott P. (2016) The Surprisingly Swift Decline of US Manufacturing Employment. *American Economic Review* 106:7:1632-1662. https://doi.org/10.1257/aer.20131578.

Pigou A. (1933) The Theory of Unemployment. London: MacMillan and Company.

Pigou A. (1927) Industrial Fluctuations. London: Macmillan and Company.

Pissarides C. (2000) Equilibrium Unemployment Theory. Cambridge, MA: The MIT Press.

Plous S. (1993). The psychology of judgment and decision making. McGraw-Hill. ISBN 978-0-07-050477-6.

Politi J. (2013) Contentious Nafta pact continues to generate a sparky debate. Financial Times, December 2, 2013. Available at https://www.ft.com/content/b7230156-4c51-11e3-923d-00144feabdc0. [Accessed March 14, 2023]

Poole K. (2012) Graphic picture of a polarized congress. *UGA Research* 41:1:32-33.

Popken B. (2017) Why Trump Killed TPP — And Why It Matters To You. NBC News, January 23, 2017. Available at https://www.nbcnews.com/business/economy/why-trump-killed-tpp-why-it-matters-you-n710781. [Accessed December 26, 2023]

QMS (2021) EViews 12 Users' Guide. Available at http://www.EViews.com/help/helpintro. html#page/content%2FVAR-Vector_Error_Correction_(VEC)_Models.html. [Accessed on February 5, 2021]

Rao B. (2007) Cointegration for the Applied Economist. Palgrave Macmillan. ISBN 101403966148 and ISBN13978-1403966145

Ravenna, F. and Walsh C. (2008). Vacancies, unemployment, and the Phillips curve. *European Economic Review*, 52:8:1494–1521. https://doi.org/10.1016/j.euroecorev.2008.06.006

RealClear Politics (2023) Favorability Ratings: Political Leaders. Available at https://www.realclearpolitics.com/epolls/other/other/FavorabilityRatingsPoliticalLeaders.html. [Accessed December 24, 2023]

RealClear Politics (2021) Direction of Country. Available at https://www.realclearpolitics.com/epolls/other/direction_of_country-902.html. [Accessed November 5, 2021]

Reed E. (2023) What Is the 2023 Federal Poverty Level (FPL)? Smart Asset. Available at https://smartasset.com/financial-advisor/federal-poverty-level-2020.

Reid L. (2023) A Study of Macroeconomic Variables that effected Employment in the United States from 1948-2021. *Central European Review of Economics and Finance,* 44:3:125-152. https://doi: 10.24136/ceref.2023.017.

Reid L. (2022) A Study of Expected Demand and Aggregate Employment in the United States from 1948-2021. *Athens Journal of Social Sciences*, 10:1-24. https://doi.org/10.2139/ssrn.4122593.

Reid L. (2021) The Economic Effect of the COVID-19 Lockdown in the United States: Was the Cure Worse than the Disease? Athens Journal of Health and Medical Sciences 9: 1-21. https://doi.org/10.30958/ajhms.X-Y-Z.

Reid L. (2016) The Political Segregation of the United States. *Athens Journal of Social Sciences* 3:2:85-98. https://doi.org/10.30958/ajss.3-2-1.

Reid L. (2012) Why did the American Recovery And Reinvestment Act (ARRA) Fail—Or Did It?. Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2655957. https://doi.org/10.2139/ssrn.2655957.

Reid L. (2010) Did the American Recovery and Reinvestment Act Fund an Optimal Mix of Tax Reductions and Direct Government Spending. Fourth International Conference on Social Science Research. https://doi.org/10.2139/ssrn.2656465.

Ricardo D. (1817) The Principles of Political Economy and Taxation. (1st ed.), London: John Murray, ISBN 9783487409290.

Roberts J. (1995) New Keynesian Economics and the Phillips Curve. *Journal of Money, Credit, and Banking* 27:975-984. https://doi.org/10.2307/2077783.

Romer D. (2019) Advanced Macroeconomics, 5th Ed., 15. New York: McGraw-Hill.

Roncaglia T. (2006) The Richness of Ideas: A History of Economic Thought. University presses of Zaragoza, Spain. Cited in Diaz R. (2021).

Rossana R. (1985) Buffer stocks and labor demand: further evidence. *Review of Economics and Statistics* 67:16-26. https://doi.org/10.2307/1928430.

Sabo M. (1993) H.R.2264 - Omnibus Budget Reconciliation Act of 1993. Available at https://www.congress.gov/bill/103rd-congress/house-bill/2264. [Accessed March 14, 2023]

Sargan J. (1964) Wages and Prices in the United Kingdom: A Study in Econometric Methodology, in P.E. Hart, G. Mills, Basic concepts and J.K. Whitaker (eds.), Econometric Analysis for National Economic Planning. London: Butterworth. Reprinted in D.F. Hendry and K.F. Wallis (eds.), Econometrics and Quantitative Economics. Oxford: Basil Blackwell, 1984.

Sargent T. (1987) Rational Expectations and Inflation. New York: Harper and Row. https://doi.org/10.1057/978-1-349-95121-5_1684-1.

Say, J. (1834) A Treatise on Political Economy. Philadelphia: Grigg and Elliott.

Shackle G. (1939) Expectations and Employment. *The Economic Journal* 49:195:442-452. https://doi.org/10.2307/2224801.

Sheldon R. and Wigmore I. (2023) Availability Bias. Whatis.com. Available at https://www.techtarget.com/whatis/definition/availability-bias. [Accessed March 9, 2023]

Simpson A. (2020) How Much Insurance Groups Have Given to Trump, Biden and House, Senate Candidates. Insurance Journal, October 29, 2020. Available at https://www.insurancejournal.com/news/national/2020/10/29/588600.htm. [Accessed January 16, 2024]

Sims C. (1980) Macroeconomics and Reality. *Econometrica* 48:1:1-48. https://doi.org/10.2307/1912017.

Slemrod J. (2005) The etiology of tax complexity: Evidence from us state income tax systems. *Public Finance Review* 33(3):279–299. https://doi.org.10.1177. 1091142105275003.

Smith A. (1776) An Inquiry into the Nature and Causes of the Wealth of Nations. London: W. Strahan.

Smith C. (2006), Palestine and the Arab–Israeli Conflict, New York: Bedford/St. Martin's. ISBN: 9780312437367, ISBN10: 0312437366.

Snowdon B., Vane H., and Wynarczyk P. (1994). A modern guide to macroeconomics. (pp. 236–279). Cambridge: Edward Elgar Publishing Limited.

Solow R. (1957) Technical change and the aggregate production function. *Review of Economics and Statistics* 39:312-320. https://doi.org/10.2307/1926047.

Statista (2023) Nonagricultural employment in the United States from 1900 to 1943. Available at https://www.statista.com/statistics/1241616/non-agricultural-employment-united-states-historical/[Accessed November 14, 2023]

Statista (2022a) Annual Gross Domestic Product and real GDP in the United States from 1929 to 2020. Available at https://www.statista.com/statistics/1031678/gdp-and-real-gdp-united-states-1930-2019/ [Accessed December 18, 2022]

Statista (2022b) Resident population of the United States by sex and age as of July 1, 2022. Available at https://www.statista.com/statistics/241488/population-of-the-us-by-sex-and-age. [Accessed January 14, 2024]

Stuart B. (2022) The Long-Run Effects of Recessions on Education and Income. *Applied Economics* 14:42-74. https://doi.org/10.1257/app.20180055.

Studenmund A. (1992) Using Econometrics. Harper Collins: 1992.

Svetlana P. (2014) DMP Model. *Bankarstvo* 43:3:128-137. https://doi.org/10.5937/bankarstvo1403128P.

Targetti F. and Kinda-Hass B. (1982) Kalecki's Review of Keynes' General Theory. *Australian Economic Papers* 21:39:244-260. https://doi.org/10.1111/j.1467-8454.1982.tb00387.x.

Tessitore S. (2022) Average Customer Lifetime Value by Industry (2022). CustomerGuage. Available at https://customergauge.com/blog/average-customer-lifetime-value-by-industry. [Accessed December 22, 2022]

Tobin J. (1959) On the Predictive value of consumer intentions and attitudes. *The Review of Economics and Statistics* 41:1:1-11. https://doi.org/10.2307/1925452.

Topel R. (1982) Inventories, layoffs, and the short-run demand for labor. *American Economic Review* 72:769-787. Available at https://www.jstor.org/stable/1810016. [Accessed November 1, 2022]

Tortorice D. (2010) Unemployment Expectations and the Business Cycle. Social Science Research Network. https://doi.org/10.2139/ssrn.175508.

Tuinstra J. and Wagener F. (2007) On learning equilibria. *Economic Theory* 30: 493–513. https://doi.org/10.1007/s00199-005-0059-1.

Tversky A. and Kahneman D. (1974) Judgment under Uncertainty: Heuristics and Biases. *Science* 185:4157:1124-1131.

Tversky A. and Kahneman D. (1973) Availability: A Heuristic for Judging Frequency and Probabilities. *Cognitive Psychology* 5:2:207-232. https://doi.org/10.1016/0010-0285(73)90033-9.

United States Census Bureau (2023) CPS Historical Time Series Tables, Table A-1. Available at https://www.census.gov/data/tables/time-series/demo educational-attainment/cps-historical-time-series.html. [Accessed July 25, 2023]

United States Supreme Court (2023) Biden, President of the United States, et al. v. Nebraska et al., 600 US.477. Available at https://www.supremecourt.gov/opinions/22pdf/22-506_nmip.pdf. [Accessed January 18, 2024]

United States Supreme Court (1941) Wickard v. Filburn. Available at https://www.oyez.org/cases/1940-1955/317us111. [Accessed January 19, 2024]

USA Facts (2022) In 2020, the number of unionized workers dropped, while the share of union members increased. Available at https://usafacts.org/articles/labor-union-membership/. [Accessed July 26, 2023]

Van Biesebroeck J. (2015) How tight is the link between wages and productivity? A survey of the literature. International Labour Office, Geneva, Switzerland. Available at https://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---travail/documents/publication/wcms_410267.pdf. [Accessed November 22, 2022]

Vannoni M. and Morelli M. (2021) Regulation and economic growth: A ‘contingent’ relationship. VoxEu. Available at https://cepr.org/voxeu/columns/regulation-and-economic-growth-contingent-relationship. [Accessed July 28, 2023]

Vercherand J. (2014) The Neoclassical Model of the Labor Market. London: Palgrave MacMillan. https://doi.org/10.1057/9781137373618_3.

Walsh, C. (2005). Labor market search, sticky prices, and interest rate policies. *Review of Economic Dynamics*, 8:4:829–849. https://doi.org/10.1016/j.red.2005.03.004

Wesbury B. and Stein R. (2023). April International Trade. First Trust Data Watch, June 7, 2023. Available at https://www.ftportfolios.com/Commentary/EconomicResearch/2023/6/7/the-trade-deficit-in-goods-and-services-came-in-at-74.6-billion-in-april. [Accessed June 14, 2023]

Woodford M. (2022). Effective Demand Failures and the Limits of Monetary Stabilization Policy. *American Economic Review* 112:5:1475.1521. https://doi.org/10.1257/aer.20201529.

Woolhandler S., Campbell T., and Himmelstein D. (2003) Costs of Health Care Administration in the United States and Canada. *New England Journal of Medicine* 349:368-375. https://doi.org/10.1056/NEJMsa022033.

Worldometer (2023) COVID-19 Coronavirus Pandemic. Available at https://www.worldometers.info/coronavirus/#countries. [Accessed December 25, 2023]

Yahoo Finance (2022) Dow Jones Industrial Average (^DJI). Available at https://finance.yahoo.com/quote/%5EDJI/history?p=%5EDJI. [Accessed December 31, 2022]

Yang L. (2021) Job creation and job destruction: The effect of trade shocks on U.S. manufacturing employment. *World Economy* 44:10:2908-2948. https://doi.org/10.1111/twec.13111.

York E. (2023) Summary of the Latest Federal Income Tax Data, 2023 Update. Tax Foundation. Available at https://taxfoundation.org/publications/latest-federal-income-tax-data/. [Accessed July 24, 2023]

Zakoian J. (1990) Threshold Heteroskedastic Model. L'Institut national de la statistique et des études économiques. Paris, France.

Zhou S. (1995). The Response of Real Exchange Rates to Various Economic Shocks. *Southern Economic Journal* 61:936-954. https://doi.org/10.2307/1060733.

Appendix A
REGRESSION OUTPUT and STATIONARY TESTS

Table A-1: The Effect of GNP on Non-Farm Employment in the United States

Dependent Variable: @PCH(EMP)
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 02/14/24 Time: 08:09
Sample: 1948Q2 2023Q3
Included observations: 302
Convergence achieved after 5 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.003625	0.000468	-7.743580	0.0000
@PCH(GNP)	0.501995	0.011249	44.62593	0.0000
MA(1)	0.236519	0.065350	3.619242	0.0003
SIGMASQ	2.54E-05	1.36E-06	18.68682	0.0000

R-squared	0.652513	Mean dependent var	0.004200
Adjusted R-squared	0.649015	S.D. dependent var	0.008567
S.E. of regression	0.005075	Akaike info criterion	-7.715539
Sum squared resid	0.007676	Schwarz criterion	-7.666394
Log likelihood	1169.046	Hannan-Quinn criter.	-7.695876
F-statistic	186.5288	Durbin-Watson stat	1.899291
Prob(F-statistic)	0.000000		

Inverted MA Roots	-.24

Table A-2: The effect of Total Trade (Imports plus Exports) on GDP in the United States

Dependent Variable: DGDP
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 02/16/24 Time: 23:36
Sample: 1948Q2 2023Q3
Included observations: 302
Convergence achieved after 119 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	58.57565	10.89333	5.377203	0.0000
DTRADE	1.423482	0.013094	108.7087	0.0000
MA(1)	0.365224	0.022878	15.96394	0.0000
SIGMASQ	10795.04	448.8923	24.04817	0.0000

R-squared	0.689571	Mean dependent var	90.54432
Adjusted R-squared	0.686446	S.D. dependent var	186.7890
S.E. of regression	104.5941	Akaike info criterion	12.15168
Sum squared resid	3260101.	Schwarz criterion	12.20083
Log likelihood	-1830.904	Hannan-Quinn criter.	12.17135
F-statistic	220.6542	Durbin-Watson stat	1.821039
Prob(F-statistic)	0.000000		
Inverted MA Roots	-.37		

Table A-3: The effect of Net Exports on GDP in the United States

Dependent Variable: DGDP
Method: Least Squares
Date: 02/16/24 Time: 23:29
Sample (adjusted): 1948Q2 2023Q3
Included observations: 302 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	86.35059	10.44877	8.264189	0.0000
DNE	-1.610261	0.351546	-4.580514	0.0000

R-squared	0.065366	Mean dependent var	90.54432
Adjusted R-squared	0.062250	S.D. dependent var	186.7890
S.E. of regression	180.8818	Akaike info criterion	13.24016
Sum squared resid	9815466.	Schwarz criterion	13.26474
Log likelihood	-1997.265	Hannan-Quinn criter.	13.25000
F-statistic	20.98111	Durbin-Watson stat	1.828614
Prob(F-statistic)	0.000007		

Table A-4: The Unionization percentage and the MEP

Dependent Variable: UNION
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 03/13/24 Time: 14:21
Sample: 1983 2022
Included observations: 40
Convergence achieved after 39 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.509429	0.365393	12.34131	0.0000
MEP	0.738277	0.026808	27.53939	0.0000
MA(1)	0.682080	0.175070	3.896044	0.0004
SIGMASQ	0.158485	0.042414	3.736585	0.0006

R-squared	0.976500	Mean dependent var	13.59000
Adjusted R-squared	0.974541	S.D. dependent var	2.629985
S.E. of regression	0.419636	Akaike info criterion	1.211429
Sum squared resid	6.339396	Schwarz criterion	1.380317
Log likelihood	-20.22858	Hannan-Quinn criter.	1.272494
F-statistic	498.6278	Durbin-Watson stat	1.543215
Prob(F-statistic)	0.000000		

Inverted MA Roots	-.68

Table A-5: The effect of Education on the first difference of Aggregate Employment

Dependent Variable: D(EMP)
Method: Least Squares
Date: 07/29/23 Time: 18:39
Sample (adjusted): 1965 2022
Included observations: 58 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4682.794	4288.552	1.091929	0.2795
EDU	-257.4100	361.7514	-0.711566	0.4797

R-squared	0.008961	Mean dependent var	1639.897
Adjusted R-squared	-0.008737	S.D. dependent var	2452.584
S.E. of regression	2463.275	Akaike info criterion	18.49025
Sum squared resid	3.40E+08	Schwarz criterion	18.56129
Log likelihood	-534.2171	Hannan-Quinn criter.	18.51792
F-statistic	0.506327	Durbin-Watson stat	1.670393
Prob(F-statistic)	0.479687		

Table A-6: The effect of the Unionization Percentage on the first difference of Aggregate Employment

Dependent Variable: D(EMP)
Method: Least Squares
Date: 07/29/23 Time: 18:44
Sample: 1983 2022
Included observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-471.6127	2314.819	-0.203736	0.8396
UNION	155.6816	167.3053	0.930524	0.3580

R-squared	0.022279	Mean dependent var	1644.100
Adjusted R-squared	-0.003451	S.D. dependent var	2743.136
S.E. of regression	2747.865	Akaike info criterion	18.72374
Sum squared resid	2.87E+08	Schwarz criterion	18.80819
Log likelihood	-372.4749	Hannan-Quinn criter.	18.75427
F-statistic	0.865874	Durbin-Watson stat	1.733566
Prob(F-statistic)	0.357974		

Table A-7: OLS model results using nominal values

Dependent Variable: EMP
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 02/17/24 Time: 18:41
Sample: 1948Q1 2023Q3
Included observations: 303
Convergence achieved after 51 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	65569.02	105148.0	0.623588	0.5334
CPI	31.07182	24.41882	1.272454	0.2042
FISCAL	-0.729150	0.082376	-8.851519	0.0000
LTB	5.897333	70.69605	0.083418	0.9336
MEP	52145.99	21346.58	2.442826	0.0152
MS	-1.657632	0.185598	-8.931294	0.0000
MW	0.917793	342.2376	0.002682	0.9979
NFI	11.90410	1.616923	7.362194	0.0000
PCE	0.573635	0.173193	3.312114	0.0010
TAXES	2.576696	0.524894	4.908979	0.0000
TRADE	1.739323	0.386627	4.498705	0.0000
AR(1)	0.999838	0.001950	512.7909	0.0000
MA(1)	0.351826	0.045987	7.650579	0.0000
SIGMASQ	257559.6	17897.27	14.39100	0.0000

R-squared	0.999789	Mean dependent var	98099.04
Adjusted R-squared	0.999779	S.D. dependent var	34962.63
S.E. of regression	519.6504	Akaike info criterion	15.41824
Sum squared resid	78040546	Schwarz criterion	15.58983
Log likelihood	-2321.863	Hannan-Quinn criter.	15.48688
F-statistic	105137.5	Durbin-Watson stat	1.704382
Prob(F-statistic)	0.000000		

Inverted AR Roots	1.00
Inverted MA Roots	-.35

Table A-8: The Preliminary OLS First Difference Model

Dependent Variable: DEMP
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 02/21/24 Time: 19:59
Sample: 1948Q2 2023Q3
Included observations: 302
Convergence achieved after 15 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	483.1399	51.43828	9.392614	0.0000
DCPI	-58.10621	24.49224	-2.372434	0.0183
DFISCAL	-0.849436	0.075554	-11.24281	0.0000
DLTB	29.47128	62.78121	0.469428	0.6391
DMEP	118690.1	19939.03	5.952654	0.0000
DMS	-2.128388	0.135908	-15.66048	0.0000
DMW	-409.6600	241.1489	-1.698784	0.0904
DNFI	7.905881	1.256550	6.291735	0.0000
DPCE	0.598420	0.160964	3.717717	0.0002
DTAXES	2.655735	0.457653	5.802945	0.0000
DTRADE	1.740349	0.359304	4.843670	0.0000
MA(1)	0.191703	0.067189	2.853211	0.0046
SIGMASQ	184024.9	11392.97	16.15250	0.0000

R-squared	0.809445	Mean dependent var	370.8079
Adjusted R-squared	0.801533	S.D. dependent var	984.3483
S.E. of regression	438.5234	Akaike info criterion	15.04692
Sum squared resid	55575511	Schwarz criterion	15.20664
Log likelihood	-2259.085	Hannan-Quinn criter.	15.11083
F-statistic	102.3022	Durbin-Watson stat	1.854166
Prob(F-statistic)	0.000000		

Inverted MA Roots	-.19

Table A-9: The OLS First Difference Model

Dependent Variable: DEMP
Method: Least Squares
Date: 02/23/24 Time: 20:55
Sample (adjusted): 1948Q2 2023Q3
Included observations: 302 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	466.5202	37.67650	12.38226	0.0000
DCPI	-42.57524	28.87197	-1.474622	0.1414
DFISCAL	-1.022966	0.130475	-7.840327	0.0000
DMEP	132063.2	14886.17	8.871542	0.0000
DMS	-2.088428	0.210534	-9.919661	0.0000
DNFI	8.221826	1.358948	6.050140	0.0000
DPCE	0.838290	0.352152	2.380481	0.0179
DTAXES	3.294618	0.680146	4.843986	0.0000
DTRADE	0.731256	0.458106	1.596261	0.1115

R-squared	0.799080	Mean dependent var	370.8079
Adjusted R-squared	0.793594	S.D. dependent var	984.3483
S.E. of regression	447.2082	Akaike info criterion	15.07327
Sum squared resid	58598594	Schwarz criterion	15.18385
Log likelihood	-2267.064	Hannan-Quinn criter.	15.11752
F-statistic	145.6615	Durbin-Watson stat	1.557803
Prob(F-statistic)	0.000000		

Table A-10: The OLS Delta Model

Dependent Variable: P_EMP
Method: Least Squares
Date: 02/23/24 Time: 20:58
Sample (adjusted): 1948Q2 2023Q3
Included observations: 302 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.003749	0.000643	5.830288	0.0000
P_CPI	-0.012300	0.038743	-0.317480	0.7511
P_FISCAL	-0.089647	0.008512	-10.53219	0.0000
P_MEP	0.256130	0.042844	5.978170	0.0000
P_MS	-0.088518	0.025446	-3.478610	0.0006
P_NFI	0.063852	0.014770	4.322972	0.0000
P_PCE	0.139831	0.029445	4.748816	0.0000
P_TAXES	0.051602	0.012411	4.157771	0.0000
P_TRADE	0.029709	0.008336	3.564072	0.0004

R-squared	0.701252	Mean dependent var	0.004200
Adjusted R-squared	0.693095	S.D. dependent var	0.008567
S.E. of regression	0.004746	Akaike info criterion	-7.833743
Sum squared resid	0.006599	Schwarz criterion	-7.723168
Log likelihood	1191.895	Hannan-Quinn criter.	-7.789501
F-statistic	85.96999	Durbin-Watson stat	1.813254
Prob(F-statistic)	0.000000		

Table A-11: The OLS Log Model

Dependent Variable: L_EMP
Method: Least Squares
Date: 02/23/24 Time: 21:00
Sample: 1948Q1 2023Q3
Included observations: 303

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.445383	0.048851	193.3512	0.0000
L_CPI	-0.279754	0.017734	-15.77471	0.0000
L_FISCAL	-0.109659	0.014084	-7.785959	0.0000
L_MEP	0.248205	0.020293	12.23113	0.0000
L_MS	-0.039375	0.010242	-3.844436	0.0001
L_NFI	0.024139	0.017531	1.376874	0.1696
L_PCE	0.496234	0.035602	13.93851	0.0000
L_TAXES	0.061371	0.018894	3.248152	0.0013
L_TRADE	0.061437	0.011396	5.391081	0.0000

R-squared	0.998265	Mean dependent var	11.42207
Adjusted R-squared	0.998218	S.D. dependent var	0.391833
S.E. of regression	0.016541	Akaike info criterion	-5.336738
Sum squared resid	0.080436	Schwarz criterion	-5.226429
Log likelihood	817.5158	Hannan-Quinn criter.	-5.292607
F-statistic	21147.51	Durbin-Watson stat	0.151303
Prob(F-statistic)	0.000000		

Table A-12: The OLS Dlog Model

Dependent Variable: DL_EMP
Method: Least Squares
Date: 02/23/24 Time: 21:02
Sample (adjusted): 1948Q2 2023Q3
Included observations: 302 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.003833	0.000678	5.653699	0.0000
DL_CPI	-0.017112	0.041196	-0.415389	0.6782
DL_FISCAL	-0.091002	0.009712	-9.369736	0.0000
DL_MEP	0.222151	0.044275	5.017532	0.0000
DL_MS	-0.107018	0.026993	-3.964611	0.0001
DL_NFI	0.069494	0.015620	4.449141	0.0000
DL_PCE	0.130022	0.031030	4.190211	0.0000
DL_TAXES	0.054674	0.013242	4.128868	0.0000
DL_TRADE	0.035588	0.008935	3.982966	0.0001

R-squared	0.681289	Mean dependent var	0.004154
Adjusted R-squared	0.672587	S.D. dependent var	0.008695
S.E. of regression	0.004976	Akaike info criterion	-7.739221
Sum squared resid	0.007253	Schwarz criterion	-7.628646
Log likelihood	1177.622	Hannan-Quinn criter.	-7.694979
F-statistic	78.29102	Durbin-Watson stat	1.788824
Prob(F-statistic)	0.000000		

Table A-13: The Final OLS Model

Dependent Variable: DEMP
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 02/18/24 Time: 14:26
Sample: 1948Q2 2023Q3
Included observations: 302
Convergence achieved after 21 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	366.9299	50.49193	7.267100	0.0000
DCPI	-69.99561	24.99929	-2.799904	0.0055
DFISCAL	-0.660697	0.075750	-8.722061	0.0000
DMS	-2.093320	0.154865	-13.51702	0.0000
DNFI	9.347516	1.272433	7.346174	0.0000
DPCE	0.413390	0.177432	2.329851	0.0205
DTAXES	2.632688	0.487213	5.403569	0.0000
DTRADE	2.152949	0.352479	6.108017	0.0000
MA(1)	0.320404	0.051224	6.254978	0.0000
SIGMASQ	219477.2	14509.20	15.12676	0.0000

R-squared	0.772735	Mean dependent var	370.8079
Adjusted R-squared	0.765730	S.D. dependent var	984.3483
S.E. of regression	476.4384	Akaike info criterion	15.20346
Sum squared resid	66282111	Schwarz criterion	15.32633
Log likelihood	-2285.723	Hannan-Quinn criter.	15.25262
F-statistic	110.3161	Durbin-Watson stat	1.789897
Prob(F-statistic)	0.000000		

Inverted MA Roots	-.32

Table A-14: The WLS Model

Dependent Variable: DEMP
Method: Least Squares
Date: 02/23/24 Time: 22:47
Sample (adjusted): 1948Q2 2023Q3
Included observations: 302 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	466.5202	37.67650	12.38226	0.0000
DCPI	-42.57524	28.87197	-1.474622	0.1414
DFISCAL	-1.022966	0.130475	-7.840327	0.0000
DMEP	1320.632	148.8617	8.871542	0.0000
DMS	-2.088428	0.210534	-9.919661	0.0000
DNFI	8.221826	1.358948	6.050140	0.0000
DPCE	0.838290	0.352152	2.380481	0.0179
DTAXES	3.294618	0.680146	4.843986	0.0000
DTRADE	0.731256	0.458106	1.596261	0.1115

R-squared	0.799080	Mean dependent var	370.8079
Adjusted R-squared	0.793594	S.D. dependent var	984.3483
S.E. of regression	447.2082	Akaike info criterion	15.07327
Sum squared resid	58598594	Schwarz criterion	15.18385
Log likelihood	-2267.064	Hannan-Quinn criter.	15.11752
F-statistic	145.6615	Durbin-Watson stat	1.557803
Prob(F-statistic)	0.000000		

Table A-15: The ARCH Model

Dependent Variable: DEMP
Method: ML ARCH - Normal distribution (Marquardt / EViews legacy)
Date: 02/24/24 Time: 03:03
Sample (adjusted): 1948Q2 2023Q3
Included observations: 302 after adjustments
Convergence achieved after 108 iterations
Presample variance: backcast (parameter = 0.7)
GARCH = C(10) + C(11)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	415.6656	28.28068	14.69786	0.0000
DCPI	41.09606	0.146096	281.2950	0.0000
DFISCAL	-1.357556	0.218160	-6.222741	0.0000
DMEP	133299.3	9972.795	13.36630	0.0000
DMS	-2.008835	0.306614	-6.551670	0.0000
DNFI	10.44155	1.674603	6.235237	0.0000
DPCE	1.078896	0.409829	2.632549	0.0085
DTAXES	2.327569	0.739026	3.149510	0.0016
DTRADE	-0.643334	0.576505	-1.115921	0.2645
		Variance Equation		
C	-3653.531	1567.340	-2.331040	0.0198
GARCH(-1)	1.035369	0.014298	72.41397	0.0000

R-squared	0.782834	Mean dependent var	370.8079
Adjusted R-squared	0.776904	S.D. dependent var	984.3483
S.E. of regression	464.9374	Akaike info criterion	14.73915
Sum squared resid	63336866	Schwarz criterion	14.87430
Log likelihood	-2214.612	Hannan-Quinn criter.	14.79322
Durbin-Watson stat	1.714536		

Table A-16: The GARCH Model

Dependent Variable: DEMP
Method: ML - ARCH
Date: 02/23/24 Time: 23:54
Sample (adjusted): 1948Q2 2023Q3
Included observations: 302 after adjustments
Convergence achieved after 34 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
GARCH = C(11) + C(12)*RESID(-1)^2 + C(13)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
@SQRT(GARCH)	-0.086323	0.177977	-0.485024	0.6277
C	540.1247	54.89007	9.840118	0.0000
DCPI	-6.181099	21.44441	-0.288238	0.7732
DFISCAL	-1.739008	0.126156	-13.78457	0.0000
DMEP	152918.8	8320.096	18.37946	0.0000
DMS	-1.543349	0.195791	-7.882648	0.0000
DNFI	5.329610	1.187581	4.487789	0.0000
DPCE	0.862093	0.136839	6.300075	0.0000
DTAXES	2.161340	0.489689	4.413697	0.0000
DTRADE	0.225898	0.386999	0.583716	0.5594
		Variance Equation		
C	24838.64	8721.015	2.848137	0.0044
RESID(-1)^2	0.537011	0.109778	4.891806	0.0000
GARCH(-1)	0.363453	0.094011	3.866050	0.0001

R-squared	0.765462	Mean dependent var	370.8079
Adjusted R-squared	0.758234	S.D. dependent var	984.3483
S.E. of regression	484.0017	Akaike info criterion	14.56840
Sum squared resid	68403220	Schwarz criterion	14.72812
Log likelihood	-2186.829	Hannan-Quinn criter.	14.63231
Durbin-Watson stat	1.773019		

Table A-17: The EGARCH Model

Dependent Variable: DEMP
Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)
Date: 02/23/24 Time: 23:54
Sample (adjusted): 1948Q2 2023Q3
Included observations: 302 after adjustments
Convergence achieved after 81 iterations
Coefficient covariance computed using outer product of gradients
Presample variance: backcast (parameter = 0.7)
LOG(GARCH) = C(11) + C(12)*ABS(RESID(-1)/@SQRT(GARCH(-1))) + C(13)*LOG(GARCH(-1))

Variable	Coefficient	Std. Error	z-Statistic	Prob.
@SQRT(GARCH)	-0.409118	0.135597	-3.017157	0.0026
C	674.7074	41.30953	16.33297	0.0000
DCPI	-14.63891	17.93898	-0.816039	0.4145
DFISCAL	-1.764960	0.171553	-10.28815	0.0000
DMEP	158096.7	9444.868	16.73890	0.0000
DMS	-1.413528	0.232650	-6.075774	0.0000
DNFI	5.688883	1.242168	4.579801	0.0000
DPCE	0.784233	0.131668	5.956138	0.0000
DTAXES	2.523729	0.474139	5.322765	0.0000
DTRADE	0.647138	0.369379	1.751961	0.0798
Variance Equation				
C(11)	0.913251	0.563324	1.621183	0.1050
C(12)	0.842614	0.107088	7.868438	0.0000
C(13)	0.864253	0.048693	17.74889	0.0000

R-squared	0.752093	Mean dependent var	370.8079
Adjusted R-squared	0.744452	S.D. dependent var	984.3483
S.E. of regression	497.6051	Akaike info criterion	14.55714
Sum squared resid	72302371	Schwarz criterion	14.71686
Log likelihood	-2185.128	Hannan-Quinn criter.	14.62104
Durbin-Watson stat	1.695509		

Table A-18: The PARCH Model

Dependent Variable: DEMP
Method: ML ARCH - Normal distribution (Marquardt / EViews legacy)
Date: 02/23/24 Time: 23:55
Sample (adjusted): 1948Q2 2023Q3
Included observations: 302 after adjustments
Convergence achieved after 61 iterations
Presample variance: backcast (parameter = 0.7)
@SQRT(GARCH)^C(14) = C(11) + C(12)*ABS(RESID(-1))^C(14) + C(13)
*@SQRT(GARCH(-1))^C(14)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
LOG(GARCH)	-80.45889	21.38286	-3.762775	0.0002
C	1408.515	225.0650	6.258260	0.0000
DCPI	3.675913	19.45147	0.188979	0.8501
DFISCAL	-1.508154	0.156766	-9.620392	0.0000
DMEP	149723.2	7930.933	18.87838	0.0000
DMS	-1.671526	0.197661	-8.456520	0.0000
DNFI	6.281470	1.218820	5.153732	0.0000
DPCE	0.673112	0.133401	5.045772	0.0000
DTAXES	2.529932	0.378302	6.687598	0.0000
DTRADE	0.472943	0.440766	1.073003	0.2833
		Variance Equation		
C(11)	118477.2	578540.8	0.204786	0.8377
C(12)	0.568190	0.126721	4.483802	0.0000
C(13)	0.529503	0.084898	6.236906	0.0000
C(14)	2.676414	0.906168	2.953551	0.0031

R-squared	0.781657	Mean dependent var	370.8079
Adjusted R-squared	0.774927	S.D. dependent var	984.3483
S.E. of regression	466.9933	Akaike info criterion	14.53718
Sum squared resid	63680174	Schwarz criterion	14.70919
Log likelihood	-2181.115	Hannan-Quinn criter.	14.60601
Durbin-Watson stat	1.727195		

Table A-19: The FIGARCH Model

Dependent Variable: DEMP
Method: ML ARCH - Normal distribution (Marquardt / EViews legacy)
Date: 02/23/24 Time: 23:52
Sample (adjusted): 1948Q2 2023Q3
Included observations: 302 after adjustments
Convergence achieved after 20 iterations
Presample variance: backcast (parameter = 0.7)
GARCH = C(11) + C(12)*RESID(-1)^2 + C(13)*RESID(-1)^2*(RESID(-1)<0)
+ C(14)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
GARCH	-2.22E-06	0.000101	-0.022003	0.9824
C	441.3674	33.63979	13.12040	0.0000
DCPI	-40.19610	25.67289	-1.565702	0.1174
DFISCAL	-1.837295	0.164548	-11.16569	0.0000
DMEP	132061.6	11409.10	11.57511	0.0000
DMS	-1.280487	0.276629	-4.628890	0.0000
DNFI	6.777991	1.291579	5.247834	0.0000
DPCE	1.129621	0.219925	5.136404	0.0000
DTAXES	2.081169	0.654045	3.181994	0.0015
DTRADE	0.319313	0.437263	0.730253	0.4652
		Variance Equation		
C(11)	126097.1	10140.23	12.43532	0.0000
RESID(-1)^2	-0.520246	0.044075	-11.80361	0.0000
GARCH(-1)	-0.510071	5.56E-11	-9.18E+09	0.0000
D	0.996374	0.123633	8.059116	0.0000

R-squared	0.765411	Mean dependent var	370.8079
Adjusted R-squared	0.758180	S.D. dependent var	984.3483
S.E. of regression	484.0551	Akaike info criterion	14.76072
Sum squared resid	68418320	Schwarz criterion	14.93272
Log likelihood	-2214.868	Hannan-Quinn criter.	14.82954
Durbin-Watson stat	1.780838		

Table A-20: VAR Model Results

Vector Autoregression Estimates
Date: 02/19/24 Time: 20:35
Sample (adjusted): 1949Q2 2023Q3
Included observations: 298 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	DFISCAL	DNFI	DPCE	DEMP
DFISCAL(-1)	0.444785	0.029641	0.256495	0.239167
	(0.08613)	(0.00920)	(0.04392)	(0.29610)
	[5.16398]	[3.22093]	[5.84060]	[0.80773]
DFISCAL(-2)	-0.184957	-0.012263	0.036822	-0.040679
	(0.07380)	(0.00788)	(0.03763)	(0.25370)
	[-2.50620]	[-1.55529]	[0.97858]	[-0.16034]
DFISCAL(-3)	0.082131	0.018127	0.124648	0.545679
	(0.06157)	(0.00658)	(0.03139)	(0.21167)
	[1.33390]	[2.75550]	[3.97053]	[2.57801]
DFISCAL(-4)	0.276414	-0.011137	0.069583	-0.921424
	(0.05375)	(0.00574)	(0.02740)	(0.18478)
	[5.14263]	[-1.93939]	[2.53908]	[-4.98671]
DNFI(-1)	1.800501	0.566611	1.208981	-3.611944
	(0.61798)	(0.06603)	(0.31508)	(2.12444)
	[2.91353]	[8.58165]	[3.83700]	[-1.70019]
DNFI(-2)	-0.441855	-0.055216	-0.134158	6.118290
	(0.72329)	(0.07728)	(0.36878)	(2.48646)
	[-0.61090]	[-0.71451]	[-0.36379]	[2.46064]
DNFI(-3)	-0.395066	-0.118756	-1.864547	-3.233677
	(0.72888)	(0.07787)	(0.37163)	(2.50567)
	[-0.54202]	[-1.52496]	[-5.01724]	[-1.29054]
DNFI(-4)	0.357094	0.021085	0.567651	-0.996587
	(0.59582)	(0.06366)	(0.30379)	(2.04825)
	[0.59933]	[0.33122]	[1.86859]	[-0.48655]
DPCE(-1)	-2.622637	0.178580	0.000224	9.032949
	(0.12827)	(0.01370)	(0.06540)	(0.44094)
	[-20.4469]	[13.0311]	[0.00342]	[20.4856]
DPCE(-2)	1.573621	-0.117625	0.237494	-5.685357
	(0.20338)	(0.02173)	(0.10370)	(0.69917)
	[7.73729]	[-5.41311]	[2.29027]	[-8.13160]
DPCE(-3)	0.371929	0.004108	0.315150	-2.550613
	(0.22723)	(0.02428)	(0.11585)	(0.78114)
	[1.63683]	[0.16921]	[2.72023]	[-3.26526]
DPCE(-4)	0.105352	0.054038	0.246361	0.829985
	(0.21589)	(0.02307)	(0.11008)	(0.74218)
	[0.48798]	[2.34272]	[2.23811]	[1.11831]
DEMP(-1)	0.075428	0.004504	0.011938	0.371959
	(0.02593)	(0.00277)	(0.01322)	(0.08914)
	[2.90885]	[1.62562]	[0.90293]	[4.17270]

DEMP(-2)	-0.061168	0.001909	-0.013488	0.407261
	(0.02289)	(0.00245)	(0.01167)	(0.07871)
	[-2.67171]	[0.78063]	[-1.15550]	[5.17451]
DEMP(-3)	-0.108022	-0.003703	-0.016686	-0.058084
	(0.02092)	(0.00224)	(0.01067)	(0.07193)
	[-5.16250]	[-1.65651]	[-1.56406]	[-0.80749]
DEMP(-4)	0.051007	0.005716	0.017243	0.031355
	(0.02108)	(0.00225)	(0.01075)	(0.07248)
	[2.41923]	[2.53730]	[1.60400]	[0.43260]
C	49.73836	-3.956116	0.793658	16.96988
	(14.8666)	(1.58837)	(7.57994)	(51.1071)
	[3.34565]	[-2.49067]	[0.10471]	[0.33205]
R-squared	0.766392	0.737037	0.539649	0.736088
Adj. R-squared	0.753090	0.722064	0.513437	0.721061
Sum sq. resids	6473333.	73894.14	1682818.	76501259
S.E. equation	151.7787	16.21630	77.38653	521.7724
F-statistic	57.61675	49.22444	20.58771	48.98421
Log likelihood	-1910.774	-1244.325	-1710.038	-2278.747
Akaike AIC	12.93808	8.465266	11.59086	15.40770
Schwarz SC	13.14899	8.676174	11.80177	15.61860
Mean dependent	34.02116	12.42289	62.46533	377.2718
S.D. dependent	305.4510	30.75951	110.9419	987.9301

Determinant resid covariance (dof adj.)	3.34E+15
Determinant resid covariance	2.64E+15
Log likelihood	-6982.470
Akaike information criterion	47.31859
Schwarz criterion	48.16223
Number of coefficients	68

Table A-21: Variance Decomposition Results

Variance Decomposition of DFISCAL:

Period	S.E.	DFISCAL	DNFI	DPCE	DEMP
1	151.7787	100.0000	0.000000	0.000000	0.000000
		(0.00000)	(0.00000)	(0.00000)	(0.00000)
2	240.1973	40.01884	2.143506	56.72347	1.114179
		(3.67632)	(1.95418)	(4.07880)	(0.83748)
3	266.6247	37.49290	1.759087	59.76142	0.986601
		(3.83163)	(1.66471)	(4.08136)	(0.81495)
4	275.5318	36.85427	1.657908	58.72973	2.758098
		(3.99511)	(1.60612)	(4.20111)	(1.39126)
5	306.9499	30.08774	3.021271	64.66856	2.222438
		(3.79986)	(1.70592)	(3.77288)	(1.14260)
6	311.0873	29.52619	3.364527	64.89839	2.210895
		(3.90839)	(1.83145)	(3.89645)	(1.22440)
7	312.7382	29.47285	3.773072	64.55596	2.198117
		(3.92846)	(2.06699)	(3.95765)	(1.20859)
8	315.0172	29.29578	4.463495	63.84325	2.397473
		(4.00431)	(2.22234)	(4.03744)	(1.27755)
9	315.3026	29.26306	4.456929	63.77833	2.501687
		(4.01223)	(2.22875)	(4.09411)	(1.31510)
10	315.8261	29.23333	4.450390	63.81207	2.504213
		(4.04775)	(2.22642)	(4.12373)	(1.31888)

Variance Decomposition of DNFI:

Period	S.E.	DFISCAL	DNFI	DPCE	DEMP
1	16.21630	4.474395	95.52560	0.000000	0.000000
		(2.24908)	(2.24908)	(0.00000)	(0.00000)
2	25.61841	2.888971	70.35392	26.40792	0.349191
		(1.19851)	(4.18037)	(3.98317)	(0.46383)
3	27.47278	4.240453	69.72706	24.07711	1.955378
		(1.79543)	(4.09497)	(3.46502)	(1.61190)
4	28.18413	6.571125	67.84203	23.30348	2.283366
		(2.94835)	(4.53717)	(3.68300)	(2.07574)
5	28.85273	8.806484	65.11703	23.48186	2.594624
		(3.60634)	(4.96771)	(3.90972)	(2.38207)
6	29.19798	10.46543	63.88519	22.98886	2.660514
		(4.20942)	(5.27656)	(3.85904)	(2.51841)
7	29.73560	11.47564	62.10742	23.74611	2.670828
		(4.73689)	(5.60550)	(4.04489)	(2.63233)
8	30.13425	12.96566	60.86425	23.48489	2.685203
		(5.33340)	(5.99658)	(4.10726)	(2.70644)
9	30.58497	15.32201	59.26675	22.80458	2.606656
		(5.95222)	(6.27800)	(3.99672)	(2.71106)
10	30.86847	16.77972	58.18926	22.47149	2.559541
		(6.46389)	(6.45825)	(3.97535)	(2.73372)

Variance Decomposition of DPCE:

Period	S.E.	DFISCAL	DNFI	DPCE	DEMP
1	77.38653	1.676597	12.94695	85.37645	0.000000
		(1.32883)	(3.82255)	(3.78040)	(0.00000)
2	85.76101	13.91297	16.33601	69.53210	0.218921
		(3.37517)	(3.98922)	(4.26054)	(0.60561)
3	89.28455	17.14344	17.60651	64.69664	0.553409
		(3.99507)	(4.04101)	(4.44729)	(0.94963)
4	98.02930	24.33434	15.93754	59.26430	0.463823
		(3.95870)	(3.47036)	(3.93620)	(0.85742)
5	103.6501	28.67443	14.47411	56.35661	0.494843
		(4.56578)	(3.22601)	(4.04586)	(0.82221)
6	105.4390	30.73065	14.08600	54.57360	0.609756
		(5.02986)	(3.20519)	(4.19619)	(0.91133)
7	107.0731	31.87803	13.66126	53.78254	0.678174
		(5.25206)	(3.18040)	(4.36288)	(1.02260)
8	109.3961	33.74041	13.53981	51.75789	0.961899
		(5.60377)	(3.29856)	(4.52839)	(1.19965)
9	110.9885	35.29156	13.17401	50.46725	1.067180
		(5.90963)	(3.24830)	(4.74063)	(1.33352)
10	111.7960	36.05664	13.02734	49.77789	1.138127
		(6.12239)	(3.24316)	(4.90014)	(1.45237)

Variance Decomposition of DEMP:

Period	S.E.	DFISCAL	DNFI	DPCE	DEMP
1	521.7724	50.05015	5.613158	2.834744	41.50195
		(4.27185)	(1.99094)	(1.12758)	(3.87960)
2	897.8137	16.90467	9.056967	58.08194	15.95642
		(2.57580)	(3.56094)	(4.01242)	(1.90343)
3	968.0350	14.65514	12.23273	54.21037	18.90176
		(2.30920)	(3.84319)	(4.08828)	(3.05501)
4	990.3376	14.75982	13.09303	52.31162	19.83553
		(2.33061)	(4.01568)	(4.13680)	(3.34814)
5	1007.996	14.27433	14.59335	50.77479	20.35754
		(2.27289)	(3.88230)	(4.07539)	(3.53473)
6	1009.732	14.43882	14.60034	50.63841	20.32243
		(2.40526)	(3.87933)	(4.10435)	(3.60720)
7	1011.520	14.49260	14.55099	50.63901	20.31740
		(2.44262)	(3.85407)	(4.07756)	(3.64717)
8	1012.839	14.46328	14.56295	50.52494	20.44883
		(2.45006)	(3.90307)	(4.11080)	(3.71109)
9	1014.883	14.56416	14.55858	50.50997	20.36729
		(2.55505)	(3.92562)	(4.14905)	(3.71529)
10	1016.558	14.59700	14.51076	50.56961	20.32262
		(2.61908)	(3.90153)	(4.20294)	(3.74831)

Cholesky One S.D. (d.f. adjusted) Innovations
Cholesky ordering: DFISCAL DNFI DPCE DEMP
Standard errors: Monte Carlo (100 repetitions) standard deviations in parentheses

Table A-22: Impulse Response Results

Response of DFISCAL: Period	DFISCAL	DNFI	DPCE	DEMP
1	1.000000	0.000000	0.000000	0.000000
	(0.00000)	(0.00000)	(0.00000)	(0.00000)
2	0.444785	1.800501	-2.622637	0.075428
	(0.08613)	(0.61798)	(0.12827)	(0.02593)
3	-0.588407	-2.063992	1.409391	-0.022762
	(0.12724)	(0.97464)	(0.19877)	(0.03821)
4	-0.088690	-0.320443	0.777676	-0.111016
	(0.12283)	(1.08199)	(0.21540)	(0.03659)
5	0.370770	5.659213	-1.787008	-0.000699
	(0.10652)	(1.07152)	(0.21999)	(0.03324)
6	-0.143968	-2.454286	0.581041	0.020102
	(0.11202)	(1.04049)	(0.23614)	(0.03442)
7	-0.184038	-1.709661	0.267106	-0.009536
	(0.08285)	(0.81190)	(0.22462)	(0.02088)
8	0.056367	2.330801	-0.150338	-0.045047
	(0.08142)	(0.76071)	(0.21385)	(0.01991)
9	0.052890	-0.077381	-0.137139	0.030905
	(0.07570)	(0.62685)	(0.21267)	(0.01788)
10	-0.057833	-0.619909	0.206617	0.009770
	(0.05962)	(0.49796)	(0.19580)	(0.01129)

Response of DNFI: Period	DFISCAL	DNFI	DPCE	DEMP
1	0.000000	1.000000	0.000000	0.000000
	(0.00000)	(0.00000)	(0.00000)	(0.00000)
2	0.029641	0.566611	0.178580	0.004504
	(0.00920)	(0.06603)	(0.01370)	(0.00277)
3	0.064597	0.518833	-0.053455	0.010504
	(0.01413)	(0.10348)	(0.02099)	(0.00425)
4	0.045000	0.148177	0.019019	0.005469
	(0.01427)	(0.10954)	(0.02099)	(0.00418)
5	0.036173	-0.222978	0.038239	0.005535
	(0.01399)	(0.10666)	(0.01995)	(0.00402)
6	0.034888	0.065850	0.006121	0.003094
	(0.01255)	(0.10089)	(0.01943)	(0.00390)
7	0.027422	0.026088	0.048756	0.002875
	(0.01010)	(0.08205)	(0.01667)	(0.00334)
8	0.032791	0.059306	0.022184	0.002607
	(0.00976)	(0.06925)	(0.01448)	(0.00289)
9	0.035496	0.088926	-0.003480	-2.99E-05
	(0.00916)	(0.05697)	(0.01373)	(0.00249)
10	0.028299	0.005509	-0.012765	0.000214
	(0.00850)	(0.05344)	(0.01274)	(0.00241)

Response of DPCE:

Period	DFISCAL	DNFI	DPCE	DEMP
1	0.000000	0.000000	1.000000	0.000000
	(0.00000)	(0.00000)	(0.00000)	(0.00000)
2	0.256495	1.208981	0.000224	0.011938
	(0.04392)	(0.31508)	(0.06540)	(0.01322)
3	0.189654	0.969835	-0.111467	0.015746
	(0.04240)	(0.34629)	(0.06916)	(0.01269)
4	0.150182	-1.272272	0.326761	-0.002009
	(0.04306)	(0.35743)	(0.06858)	(0.01265)
5	0.179810	0.209493	-0.254429	-0.008720
	(0.04433)	(0.34996)	(0.07254)	(0.01330)
6	0.093085	0.186238	0.063566	-0.011378
	(0.04087)	(0.32914)	(0.07141)	(0.01209)
7	0.063929	-0.220965	0.150561	-0.009390
	(0.03778)	(0.29004)	(0.06516)	(0.01156)
8	0.103924	0.697257	-0.051848	-0.018185
	(0.03660)	(0.26976)	(0.06240)	(0.01051)
9	0.096490	0.283763	-0.051800	-0.012028
	(0.03377)	(0.24127)	(0.06096)	(0.00966)
10	0.059675	-0.038187	-0.018086	-0.009771
	(0.03143)	(0.22002)	(0.05049)	(0.00930)

Response of DEMP:

Period	DFISCAL	DNFI	DPCE	DEMP
1	0.000000	0.000000	0.000000	1.000000
	(0.00000)	(0.00000)	(0.00000)	(0.00000)
2	0.239167	-3.611944	9.032949	0.371959
	(0.29610)	(2.12444)	(0.44094)	(0.08914)
3	2.364503	14.07951	-3.595716	0.655220
	(0.49001)	(3.63737)	(0.74200)	(0.14730)
4	1.566663	3.445118	0.511995	0.392583
	(0.47201)	(3.89263)	(0.76194)	(0.13917)
5	0.616772	-12.06443	0.340461	0.329986
	(0.44517)	(3.79953)	(0.74534)	(0.13092)
6	0.504755	1.690744	-0.344520	0.056074
	(0.39792)	(3.34241)	(0.72295)	(0.12433)
7	0.344652	-1.190420	0.503764	0.077751
	(0.29140)	(2.41826)	(0.63128)	(0.09463)
8	0.259799	0.365816	0.029405	0.129351
	(0.26678)	(2.07059)	(0.55643)	(0.08050)
9	0.215358	0.456074	0.626254	-0.008350
	(0.23345)	(1.55403)	(0.52611)	(0.06198)
10	0.368222	0.864867	-0.731322	0.045242
	(0.19188)	(1.26827)	(0.46935)	(0.04974)

Nonfactorized One Unit Innovations
Standard errors: Analytic standard deviations in parentheses

Table A-23: Granger Causality Test of the first difference of the variables

Pairwise Granger Causality Tests
Date: 02/24/24 Time: 15:09
Sample: 1948Q1 2023Q3
Lags: 4

Null Hypothesis:	Obs	F-Statistic	Prob.
DEMP does not Granger Cause DCPI	298	2.25838	0.0630
DCPI does not Granger Cause DEMP		2.14600	0.0752
DFISCAL does not Granger Cause DCPI	298	6.26237	8.E-05
DCPI does not Granger Cause DFISCAL		1.22900	0.2986
DMEP does not Granger Cause DCPI	298	0.51313	0.7261
DCPI does not Granger Cause DMEP		0.32574	0.8606
DMS does not Granger Cause DCPI	298	10.6272	5.E-08
DCPI does not Granger Cause DMS		3.07663	0.0167
DNFI does not Granger Cause DCPI	298	0.15858	0.9590
DCPI does not Granger Cause DNFI		6.84058	3.E-05
DPCE does not Granger Cause DCPI	298	14.3902	1.E-10
DCPI does not Granger Cause DPCE		0.89396	0.4679
DTAXES does not Granger Cause DCPI	298	2.80416	0.0261
DCPI does not Granger Cause DTAXES		8.90781	9.E-07
DTRADE does not Granger Cause DCPI	298	0.72678	0.5743
DCPI does not Granger Cause DTRADE		10.9292	3.E-08
DFISCAL does not Granger Cause DEMP	298	15.0869	3.E-11
DEMP does not Granger Cause DFISCAL		5.53116	0.0003
DMEP does not Granger Cause DEMP	298	2.88020	0.0230
DEMP does not Granger Cause DMEP		1.75073	0.1389
DMS does not Granger Cause DEMP	298	2.49413	0.0432
DEMP does not Granger Cause DMS		5.69246	0.0002
DNFI does not Granger Cause DEMP	298	5.06834	0.0006
DEMP does not Granger Cause DNFI		10.0672	1.E-07
DPCE does not Granger Cause DEMP	298	155.410	9.E-71
DEMP does not Granger Cause DPCE		12.8344	1.E-09
DTAXES does not Granger Cause DEMP	298	2.09886	0.0810
DEMP does not Granger Cause DTAXES		4.58373	0.0013
DTRADE does not Granger Cause DEMP	298	1.17717	0.3210
DEMP does not Granger Cause DTRADE		14.0226	2.E-10
DMEP does not Granger Cause DFISCAL	298	0.12473	0.9735
DFISCAL does not Granger Cause DMEP		0.68078	0.6058
DMS does not Granger Cause DFISCAL	298	5.79345	0.0002
DFISCAL does not Granger Cause DMS		10.7025	4.E-08
Null Hypothesis:	Obs	F-Statistic	Prob.

DNFI does not Granger Cause DFISCAL	298	2.93898	0.0209
DFISCAL does not Granger Cause DNFI		24.4095	2.E-17
DPCE does not Granger Cause DFISCAL	298	116.315	6.E-59
DFISCAL does not Granger Cause DPCE		21.8714	9.E-16
DTAXES does not Granger Cause DFISCAL	298	3.61152	0.0068
DFISCAL does not Granger Cause DTAXES		17.9064	4.E-13
DTRADE does not Granger Cause DFISCAL	298	7.06807	2.E-05
DFISCAL does not Granger Cause DTRADE		34.9927	8.E-24
DMS does not Granger Cause DMEP	298	0.82149	0.5123
DMEP does not Granger Cause DMS		0.07860	0.9888
DNFI does not Granger Cause DMEP	298	1.41952	0.2275
DMEP does not Granger Cause DNFI		1.26068	0.2856
DPCE does not Granger Cause DMEP	298	1.34010	0.2551
DMEP does not Granger Cause DPCE		0.31443	0.8682
DTAXES does not Granger Cause DMEP	298	1.00779	0.4037
DMEP does not Granger Cause DTAXES		0.74131	0.5645
DTRADE does not Granger Cause DMEP	298	1.01233	0.4013
DMEP does not Granger Cause DTRADE		0.61068	0.6553
DNFI does not Granger Cause DMS	298	1.15692	0.3301
DMS does not Granger Cause DNFI		11.6546	9.E-09
DPCE does not Granger Cause DMS	298	85.3870	9.E-48
DMS does not Granger Cause DPCE		23.1582	1.E-16
DTAXES does not Granger Cause DMS	298	0.92118	0.4519
DMS does not Granger Cause DTAXES		19.1750	5.E-14
DTRADE does not Granger Cause DMS	298	0.88405	0.4738
DMS does not Granger Cause DTRADE		14.4138	1.E-10
DPCE does not Granger Cause DNFI	298	94.1047	4.E-51
DNFI does not Granger Cause DPCE		13.3918	5.E-10
DTAXES does not Granger Cause DNFI	298	4.69441	0.0011
DNFI does not Granger Cause DTAXES		1.84683	0.1199
DTRADE does not Granger Cause DNFI	298	1.31700	0.2637
DNFI does not Granger Cause DTRADE		2.34201	0.0551
DTAXES does not Granger Cause DPCE	298	4.96948	0.0007
DPCE does not Granger Cause DTAXES		29.9180	8.E-21
DTRADE does not Granger Cause DPCE	298	10.8328	3.E-08
DPCE does not Granger Cause DTRADE		123.128	3.E-61
DTRADE does not Granger Cause DTAXES	298	5.92208	0.0001
DTAXES does not Granger Cause DTRADE		4.01181	0.0035

Table A-24: The effect of the 1973 Arab Oil Embargo on Employment

Dependent Variable: DEMP
Method: Least Squares
Date: 02/24/24 Time: 15:22
Sample (adjusted): 1948Q2 2023Q3
Included observations: 302 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	466.4512	37.92076	12.30068	0.0000
DCPI	-42.61716	29.00815	-1.469144	0.1429
DFISCAL	-1.023013	0.130722	-7.825854	0.0000
DMEP	1320.935	149.9896	8.806841	0.0000
DMS	-2.088238	0.211139	-9.890364	0.0000
DNFI	8.222787	1.362242	6.036215	0.0000
DPCE	0.838642	0.353255	2.374043	0.0182
DTAXES	3.294365	0.681443	4.834397	0.0000
DTRADE	0.731317	0.458901	1.593628	0.1121
EMBARGO	2.729701	146.0117	0.018695	0.9851

R-squared	0.799080	Mean dependent var	370.8079
Adjusted R-squared	0.792888	S.D. dependent var	984.3483
S.E. of regression	447.9731	Akaike info criterion	15.07990
Sum squared resid	58598524	Schwarz criterion	15.20276
Log likelihood	-2267.064	Hannan-Quinn criter.	15.12905
F-statistic	129.0352	Durbin-Watson stat	1.557810
Prob(F-statistic)	0.000000		

Table A-25: The effect of the 1980 election of Ronald Reagan on Employment

Dependent Variable: DEMP
Method: Least Squares
Date: 02/24/24 Time: 15:25
Sample (adjusted): 1948Q2 2023Q3
Included observations: 302 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	471.4146	37.54614	12.55561	0.0000
DCPI	-34.41702	28.98698	-1.187327	0.2361
DFISCAL	-1.026739	0.129775	-7.911686	0.0000
DMEP	1296.427	148.5154	8.729244	0.0000
DMS	-2.105808	0.209554	-10.04898	0.0000
DNFI	8.159907	1.351858	6.036070	0.0000
DPCE	0.810616	0.350486	2.312834	0.0214
DTAXES	3.321101	0.676552	4.908863	0.0000
DTRADE	0.675148	0.456419	1.479230	0.1402
REAGAN	-298.5421	145.1806	-2.056350	0.0406

R-squared	0.801948	Mean dependent var	370.8079
Adjusted R-squared	0.795844	S.D. dependent var	984.3483
S.E. of regression	444.7645	Akaike info criterion	15.06552
Sum squared resid	57762117	Schwarz criterion	15.18838
Log likelihood	-2264.893	Hannan-Quinn criter.	15.11468
F-statistic	131.3734	Durbin-Watson stat	1.588597
Prob(F-statistic)	0.000000		

Table A-26: The effect of the 2001 Terrorist Attack on Employment

Dependent Variable: DEMP
Method: Least Squares
Date: 02/24/24 Time: 15:27
Sample (adjusted): 1948Q2 2023Q3
Included observations: 302 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	472.9598	38.05836	12.42722	0.0000
DCPI	-44.41831	28.89800	-1.537072	0.1254
DFISCAL	-1.029244	0.130508	-7.886456	0.0000
DMEP	1312.297	148.9443	8.810655	0.0000
DMS	-2.075121	0.210718	-9.847866	0.0000
DNFI	7.966657	1.375722	5.790893	0.0000
DPCE	0.888437	0.354569	2.505685	0.0128
DTAXES	3.181034	0.686710	4.632281	0.0000
DTRADE	0.803434	0.462013	1.738986	0.0831
TERROR	-172.7668	148.4883	-1.163505	0.2456

R-squared	0.800007	Mean dependent var	370.8079
Adjusted R-squared	0.793843	S.D. dependent var	984.3483
S.E. of regression	446.9385	Akaike info criterion	15.07527
Sum squared resid	58328179	Schwarz criterion	15.19813
Log likelihood	-2266.366	Hannan-Quinn criter.	15.12443
F-statistic	129.7836	Durbin-Watson stat	1.557686
Prob(F-statistic)	0.000000		

Table A-27: The effect of the 2008 Financial Crisis on Employment

Dependent Variable: DEMP
Method: Least Squares
Date: 02/24/24 Time: 15:29
Sample (adjusted): 1948Q2 2023Q3
Included observations: 302 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	497.7814	37.81547	13.16343	0.0000
DCPI	-49.87246	28.32459	-1.760748	0.0793
DFISCAL	-1.047391	0.127863	-8.191498	0.0000
DMEP	1335.930	145.7480	9.166023	0.0000
DMS	-2.027576	0.206695	-9.809527	0.0000
DNFI	7.043208	1.367064	5.152070	0.0000
DPCE	0.925223	0.345437	2.678411	0.0078
DTAXES	2.970057	0.671326	4.424164	0.0000
DTRADE	1.010627	0.454567	2.223275	0.0270
CRISIS	-549.7688	147.4855	-3.727613	0.0002

R-squared	0.808207	Mean dependent var	370.8079
Adjusted R-squared	0.802295	S.D. dependent var	984.3483
S.E. of regression	437.6806	Akaike info criterion	15.03341
Sum squared resid	55936789	Schwarz criterion	15.15627
Log likelihood	-2260.045	Hannan-Quinn criter.	15.08257
F-statistic	136.7191	Durbin-Watson stat	1.630804
Prob(F-statistic)	0.000000		

Table A-28: The Consumer Sentiment Index model results

Dependent Variable: DEMP
Method: Least Squares
Date: 03/09/24 Time: 14:29
Sample: 1978Q2 2023Q3
Included observations: 182

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	392.6612	89.06930	4.408491	0.0000
DCSI	23.60959	14.19555	1.663168	0.0980

R-squared	0.015135	Mean dependent var	391.2473
Adjusted R-squared	0.009663	S.D. dependent var	1207.404
S.E. of regression	1201.556	Akaike info criterion	17.03155
Sum squared resid	2.60E+08	Schwarz criterion	17.06676
Log likelihood	-1547.871	Hannan-Quinn criter.	17.04582
F-statistic	2.766128	Durbin-Watson stat	1.864415
Prob(F-statistic)	0.098019		

UNIT ROOT TESTS
(Augmented Dickey-Fuller)

Table A-29: The Unionization Percentage Variable

Null Hypothesis: UNION has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.752125	0.0000
Test critical values:	1% level	-3.605593	
	5% level	-2.936942	
	10% level	-2.606857	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(UNION)
Method: Least Squares
Date: 07/29/23 Time: 16:05
Sample: 1983 2022
Included observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UNION(-1)	-0.657106	0.114237	-5.752125	0.0000
C	9.016658	1.570010	5.743057	0.0000

R-squared	0.465443	Mean dependent var	0.252500
Adjusted R-squared	0.451376	S.D. dependent var	3.234112
S.E. of regression	2.395479	Akaike info criterion	4.633751
Sum squared resid	218.0562	Schwarz criterion	4.718195
Log likelihood	-90.67501	Hannan-Quinn criter.	4.664283
F-statistic	33.08694	Durbin-Watson stat	0.324711
Prob(F-statistic)	0.000001		

Table A-30: The Education Variable

Null Hypothesis: EDU has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.986651	0.0000
Test critical values:	1% level	-3.548208	
	5% level	-2.912631	
	10% level	-2.594027	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EDU)
Method: Least Squares
Date: 07/29/23 Time: 16:44
Sample (adjusted): 1965 2022
Included observations: 58 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EDU(-1)	-0.028124	0.003129	-8.986651	0.0000
C	0.384399	0.036939	10.40625	0.0000

R-squared	0.590523	Mean dependent var	0.053448
Adjusted R-squared	0.583211	S.D. dependent var	0.033953
S.E. of regression	0.021920	Akaike info criterion	-4.768974
Sum squared resid	0.026907	Schwarz criterion	-4.697925
Log likelihood	140.3003	Hannan-Quinn criter.	-4.741299
F-statistic	80.75989	Durbin-Watson stat	1.665347
Prob(F-statistic)	0.000000		

Table A-31: The Employment Protection Variable

Null Hypothesis: EP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.318153	0.1743
Test critical values:	1% level	-3.724070	
	5% level	-2.986225	
	10% level	-2.632604	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EP)
Method: Least Squares
Date: 07/29/23 Time: 17:11
Sample: 1998 2022
Included observations: 25

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EP(-1)	-0.378788	0.163401	-2.318153	0.0297
C	0.706667	0.324961	2.174620	0.0402

R-squared	0.189394	Mean dependent var	0.000000
Adjusted R-squared	0.154150	S.D. dependent var	0.611991
S.E. of regression	0.562849	Akaike info criterion	1.765008
Sum squared resid	7.286376	Schwarz criterion	1.862518
Log likelihood	-20.06259	Hannan-Quinn criter.	1.792053
F-statistic	5.373832	Durbin-Watson stat	1.092892
Prob(F-statistic)	0.029686		

Table A-32: The Consumer Price Index Variable

Null Hypothesis: DCPI has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.052038	0.0000
Test critical values:	1% level	-3.452066	
	5% level	-2.870996	
	10% level	-2.571880	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DCPI)
Method: Least Squares
Date: 04/04/24 Time: 13:08
Sample (adjusted): 1949Q1 2023Q3
Included observations: 299 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DCPI(-1)	-0.316099	0.062569	-5.052038	0.0000
D(DCPI(-1))	-0.371802	0.066638	-5.579393	0.0000
D(DCPI(-2))	-0.225699	0.057093	-3.953199	0.0001
C	0.311929	0.082450	3.783260	0.0002

R-squared	0.337344	Mean dependent var	0.012023
Adjusted R-squared	0.330605	S.D. dependent var	1.236998
S.E. of regression	1.012070	Akaike info criterion	2.875159
Sum squared resid	302.1640	Schwarz criterion	2.924664
Log likelihood	-425.8363	Hannan-Quinn criter.	2.894973
F-statistic	50.05933	Durbin-Watson stat	2.018097
Prob(F-statistic)	0.000000		

Table A-33: The Government Expenditures variable

Null Hypothesis: DFISCAL has a unit root
Exogenous: Constant
Lag Length: 10 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.145531	0.0010
Test critical values:	1% level	-3.452674	
	5% level	-2.871263	
	10% level	-2.572023	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DFISCAL)
Method: Least Squares
Date: 04/04/24 Time: 12:52
Sample (adjusted): 1951Q1 2023Q3
Included observations: 291 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DFISCAL(-1)	-1.219879	0.294263	-4.145531	0.0000
D(DFISCAL(-1))	-0.131938	0.281407	-0.468851	0.6395
D(DFISCAL(-2))	-0.571751	0.263468	-2.170097	0.0308
D(DFISCAL(-3))	-0.234412	0.241038	-0.972509	0.3316
D(DFISCAL(-4))	-0.114827	0.220594	-0.520535	0.6031
D(DFISCAL(-5))	0.096377	0.205889	0.468103	0.6401
D(DFISCAL(-6))	-0.216348	0.198284	-1.091105	0.2762
D(DFISCAL(-7))	-0.421487	0.183972	-2.291036	0.0227
D(DFISCAL(-8))	-0.668820	0.163984	-4.078568	0.0001
D(DFISCAL(-9))	-0.498819	0.117490	-4.245643	0.0000
D(DFISCAL(-10))	-0.307088	0.075791	-4.051752	0.0001
C	41.70080	17.60924	2.368121	0.0186

R-squared	0.759461	Mean dependent var	0.280155
Adjusted R-squared	0.749977	S.D. dependent var	490.7776
S.E. of regression	245.4000	Akaike info criterion	13.88402
Sum squared resid	16801708	Schwarz criterion	14.03550
Log likelihood	-2008.125	Hannan-Quinn criter.	13.94470
F-statistic	80.08125	Durbin-Watson stat	2.009104
Prob(F-statistic)	0.000000		

Table A-34: The Long-Term Bond Variable

Null Hypothesis: DLTB has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-18.04089	0.0000
Test critical values:	1% level	-3.451920	
	5% level	-2.870931	
	10% level	-2.571845	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DLTB)
Method: Least Squares
Date: 04/04/24 Time: 13:11
Sample (adjusted): 1948Q3 2023Q3
Included observations: 301 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLTB(-1)	-1.044558	0.057899	-18.04089	0.0000
C	0.006739	0.031595	0.213287	0.8312

R-squared	0.521197	Mean dependent var	0.002193
Adjusted R-squared	0.519595	S.D. dependent var	0.790830
S.E. of regression	0.548134	Akaike info criterion	1.642029
Sum squared resid	89.83487	Schwarz criterion	1.666661
Log likelihood	-245.1254	Hannan-Quinn criter.	1.651886
F-statistic	325.4736	Durbin-Watson stat	2.001633
Prob(F-statistic)	0.000000		

Table A-35: The Manufacturing Employment Percentage Variable

Null Hypothesis: DMEP has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.96572	0.0000
Test critical values:	1% level	-3.452141	
	5% level	-2.871029	
	10% level	-2.571897	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DMEP)
Method: Least Squares
Date: 04/04/24 Time: 13:13
Sample (adjusted): 1949Q2 2023Q3
Included observations: 298 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DMEP(-1)	-0.745649	0.067998	-10.96572	0.0000
D(DMEP(-1))	0.165098	0.064713	2.551226	0.0112
D(DMEP(-2))	0.318836	0.060733	5.249836	0.0000
D(DMEP(-3))	0.276982	0.053608	5.166778	0.0000
C	-0.056127	0.009877	-5.682528	0.0000

R-squared	0.349369	Mean dependent var	0.001857
Adjusted R-squared	0.340486	S.D. dependent var	0.176667
S.E. of regression	0.143472	Akaike info criterion	-1.028711
Sum squared resid	6.031213	Schwarz criterion	-0.966680
Log likelihood	158.2780	Hannan-Quinn criter.	-1.003881
F-statistic	39.33297	Durbin-Watson stat	2.061064
Prob(F-statistic)	0.000000		

Table A-36: The Money Supply Variable

Null Hypothesis: DMS has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.543940	0.0002
Test critical values:	1% level	-3.452066	
	5% level	-2.870996	
	10% level	-2.571880	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DMS)
Method: Least Squares
Date: 04/04/24 Time: 14:24
Sample (adjusted): 1949Q1 2023Q3
Included observations: 299 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DMS(-1)	-0.240152	0.052851	-4.543940	0.0000
D(DMS(-1))	-0.340471	0.063855	-5.331943	0.0000
D(DMS(-2))	-0.200990	0.058543	-3.433185	0.0007
C	15.88983	8.129408	1.954611	0.0516

R-squared	0.269689	Mean dependent var	-0.327090
Adjusted R-squared	0.262262	S.D. dependent var	145.9114
S.E. of regression	125.3258	Akaike info criterion	12.51300
Sum squared resid	4633431.	Schwarz criterion	12.56250
Log likelihood	-1866.693	Hannan-Quinn criter.	12.53281
F-statistic	36.31241	Durbin-Watson stat	2.018993
Prob(F-statistic)	0.000000		

Table A-37: The Minimum Wage Variable

Null Hypothesis: DMW has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.483744	0.0000
Test critical values:	1% level	-3.452141	
	5% level	-2.871029	
	10% level	-2.571897	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DMW)
Method: Least Squares
Date: 04/04/24 Time: 14:26
Sample (adjusted): 1949Q2 2023Q3
Included observations: 298 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DMW(-1)	-0.613179	0.111818	-5.483744	0.0000
D(DMW(-1))	-0.452618	0.096164	-4.706701	0.0000
D(DMW(-2))	-0.484144	0.076401	-6.336846	0.0000
D(DMW(-3))	-0.437303	0.052538	-8.323483	0.0000
C	0.014095	0.005774	2.441262	0.0152

R-squared	0.618982	Mean dependent var	0.000000
Adjusted R-squared	0.613780	S.D. dependent var	0.143607
S.E. of regression	0.089247	Akaike info criterion	-1.978188
Sum squared resid	2.333738	Schwarz criterion	-1.916157
Log likelihood	299.7501	Hannan-Quinn criter.	-1.953358
F-statistic	118.9979	Durbin-Watson stat	2.001667
Prob(F-statistic)	0.000000		

Table A-38: The Nonresidential Fixed Investment Variable

Null Hypothesis: DNFI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.282236	0.0000
Test critical values:	1% level	-3.451920	
	5% level	-2.870931	
	10% level	-2.571845	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DNFI)
Method: Least Squares
Date: 04/04/24 Time: 14:28
Sample (adjusted): 1948Q3 2023Q3
Included observations: 301 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DNFI(-1)	-0.447274	0.048186	-9.282236	0.0000
C	5.541631	1.587103	3.491665	0.0006

R-squared	0.223699	Mean dependent var	0.071977
Adjusted R-squared	0.221103	S.D. dependent var	28.96942
S.E. of regression	25.56701	Akaike info criterion	9.327105
Sum squared resid	195447.9	Schwarz criterion	9.351737
Log likelihood	-1401.729	Hannan-Quinn criter.	9.336962
F-statistic	86.15990	Durbin-Watson stat	2.112417
Prob(F-statistic)	0.000000		

Table A-39: The PCE Variable

Null Hypothesis: DPCE has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.873428	0.0025
Test critical values:	1% level	-3.452215	
	5% level	-2.871061	
	10% level	-2.571915	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DPCE)
Method: Least Squares
Date: 04/04/24 Time: 14:29
Sample (adjusted): 1949Q3 2023Q3
Included observations: 297 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DPCE(-1)	-0.284323	0.073403	-3.873428	0.0001
D(DPCE(-1))	-0.374981	0.077362	-4.847075	0.0000
D(DPCE(-2))	-0.357466	0.077987	-4.583643	0.0000
D(DPCE(-3))	-0.025451	0.070096	-0.363088	0.7168
D(DPCE(-4))	-0.251543	0.057859	-4.347493	0.0000
C	19.44033	6.963004	2.791946	0.0056

R-squared	0.445270	Mean dependent var	1.025202
Adjusted R-squared	0.435738	S.D. dependent var	123.6807
S.E. of regression	92.90564	Akaike info criterion	11.92104
Sum squared resid	2511754.	Schwarz criterion	11.99566
Log likelihood	-1764.275	Hannan-Quinn criter.	11.95091
F-statistic	46.71584	Durbin-Watson stat	2.033256
Prob(F-statistic)	0.000000		

Table A-40: The Taxes Variable

Null Hypothesis: DTAXES has a unit root
Exogenous: Constant
Lag Length: 6 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.164866	0.0000
Test critical values:	1% level	-3.452366	
	5% level	-2.871128	
	10% level	-2.571950	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DTAXES)
Method: Least Squares
Date: 04/04/24 Time: 14:33
Sample (adjusted): 1950Q1 2023Q3
Included observations: 295 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DTAXES(-1)	-0.689908	0.096290	-7.164866	0.0000
D(DTAXES(-1))	-0.051313	0.094780	-0.541392	0.5887
D(DTAXES(-2))	0.127003	0.090847	1.397987	0.1632
D(DTAXES(-3))	0.245658	0.087178	2.817905	0.0052
D(DTAXES(-4))	0.122061	0.085206	1.432534	0.1531
D(DTAXES(-5))	0.221034	0.079496	2.780443	0.0058
D(DTAXES(-6))	0.313053	0.065488	4.780344	0.0000
C	11.83666	3.528955	3.354155	0.0009

R-squared	0.422026	Mean dependent var	0.253217
Adjusted R-squared	0.407929	S.D. dependent var	68.79568
S.E. of regression	52.93561	Akaike info criterion	10.80277
Sum squared resid	804225.3	Schwarz criterion	10.90276
Log likelihood	-1585.409	Hannan-Quinn criter.	10.84281
F-statistic	29.93748	Durbin-Watson stat	1.979236
Prob(F-statistic)	0.000000		

Table A-41: The Trade Variable

Null Hypothesis: DTRADE has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-13.52891	0.0000
Test critical values:	1% level	-3.451920	
	5% level	-2.870931	
	10% level	-2.571845	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DTRADE)
Method: Least Squares
Date: 04/04/24 Time: 14:38
Sample (adjusted): 1948Q3 2023Q3
Included observations: 301 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DTRADE(-1)	-0.760265	0.056196	-13.52891	0.0000
C	17.30398	6.828017	2.534262	0.0118

R-squared	0.379708	Mean dependent var	0.373379
Adjusted R-squared	0.377634	S.D. dependent var	147.6166
S.E. of regression	116.4550	Akaike info criterion	12.35951
Sum squared resid	4054969.	Schwarz criterion	12.38414
Log likelihood	-1858.106	Hannan-Quinn criter.	12.36937
F-statistic	183.0313	Durbin-Watson stat	1.990771
Prob(F-statistic)	0.000000		