

A New Stock Index to Better Predict the United States' Real GDP

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ABSTRACT

The relationship between the United States' real GDP and the overall stock market has been acknowledged by researchers and investors alike. This research paper will document a newly created composite index that will try to more accurately predict the overall U.S. economy through the proxy of GDP than the current S&P 500 index. Success will be determined if the composite index representing the addition of a service sector component to the S&P 500 is more correlated to U.S. real GDP than the S&P 500 alone. The results suggest that the service sector is not quite adequately in the S&P 500. A stronger service component in the S&P 500 would allow the index to be more statistically correlated to U.S. real GDP during the period of 1995-2009. The model will allow decision-makers to produce better choices based on a more accurate understanding of current economic conditions.

INTRODUCTION

Many economists have tried to predict U.S. real GDP using economic variables such as industrial production, consumer price index, and money supplies changes. However, this paper will take a different approach to estimating U.S. GDP. It will not use economic indicators, but will instead use existing fund indices. The Morningstar Business Index and Morningstar Consumer Index, which represent the service sector in the economy, will be compounded to the S&P 500 to test whether it can more accurately track U.S. real GDP. The S&P 500 is recognized world-wide as the one of the best U.S. stock market indices and often represents the U.S. economy as a whole. However, there is evidence that shows that the S&P 500 could use more service exposure to better reflect the overall economy.

The Standard and Poor's S&P 500 index might not enough stocks from the services sector because portfolio managers and economists want a consistent, stable index that they can accurately compare past results to. The Standard and Poor's index committee may have not been adding enough service related firms into the S&P 500 in order to avoid excess stock turnover. A better index might be able to more accurately reflect how the U.S. economy is currently performing by adding a higher percentage of service-related firms to the S&P 500. Another problem with the S&P 500 index is that some companies do not closely follow the business cycle. Many stocks in the index follow the business cycle, but there are some that are not correlated to the business cycle. The services index that is being added to the S&P 500 should more accurately follow the business cycle, and therefore the economy.

To find out whether a services component is missing from the S&P 500, the research model includes four different indices. The first index contains only the S&P 500, the next includes a percentage of the Morningstar service indices returns added S&P 500 returns, the one after includes a higher percentage of the service indices added to the S&P 500, and the last index includes the highest percentage of the service indices added to the S&P 500. Regression analysis can find out which index can more accurately reflect the United States' economy (in terms of real GDP) than the benchmark S&P 500 from one period to the next. The measure of success is to statistically demonstrate that adding a services component to the S&P 500 will more accurately represent the U.S. economy over the past 15 years than the S&P 500 alone. This will show that the index can better reflect the business cycle and therefore the economy as a whole. The

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hypothesis for this test is that the index with a higher percentage of services will be a more accurate predictor of the U.S. economy than the S&P 500.

This paper is organized as follows. The next section includes the importance of the study, review of the literature as well as an explanation of the rationale behind the decisions made in the project. The following section includes the methodology used in creating the new stock indices and comparing it to real GDP. Subsequently, the testing of the research model and results will be recorded. An interpretation of the results takes place in the Discussion section. The final section includes a conclusion of the project and a discussion of other project ideas and areas of further research.

LITERATURE REVIEW

Importance of the Study

Understanding how the economy is currently performing as well as how the economy will perform in the future is a very relevant concern in everyone's life, from the average family to portfolio managers to top ranking government officials. It can affect anyone's decision, from when to buy a house, change jobs, or retire. In addition, decision-makers such as government officials or portfolio managers require the most up-to-date information about the U.S. economy in order to perform their duties properly. Therefore, the most accurate knowledge of how the U.S. economy is performing is very important. Each and every day, economists try to analyze the economy to understand how the U.S. is performing compared to the previous quarters as well as how its performance stacks up against other countries in the world. Decision-makers in the government can alter their policies to allow the U.S. economy to keep its constant growth or change if policy is failing. There are so many different indicators for how the economy is functioning because decision-makers need multiple sources to help them make the best choices. Many people rely on the S&P 500 to tell them what is going on in the economy. A more accurate index can help average Americans as well as important decision-makers produce the best choices. This study will attempt to be a more accurate representation of the U.S. economy than the S&P 500 to assist both the average American and decision-makers.

The stock market is expected to give an accurate representation of how the economy is performing because it gathers participants' expectations of where the economy is headed in the future. There is a strong level of credibility to these forecasts because people have often invested very large sums of money to back up these predictions. Not all economic agents need to have identical expectations. The weighted average of the overall forecast for the economic agents will provide the direction of the overall economy. A rational investor in the stock market would believe that rises in the level of GDP leads to firms performing positively as a whole or vice versa, that an overall increase in U.S. companies' performance will lead to an increase in GDP. However, expectations and reality can often be different. Average investors would be making massive amounts of money if stock markets showed exactly what was going on in the economy. That is why decision-makers continually need the latest information on how the economy is

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performing to make correct decisions for the future. Even economists have trouble forecasting the next period's GDP as this graph by Michael Panzner shows (Panzner):

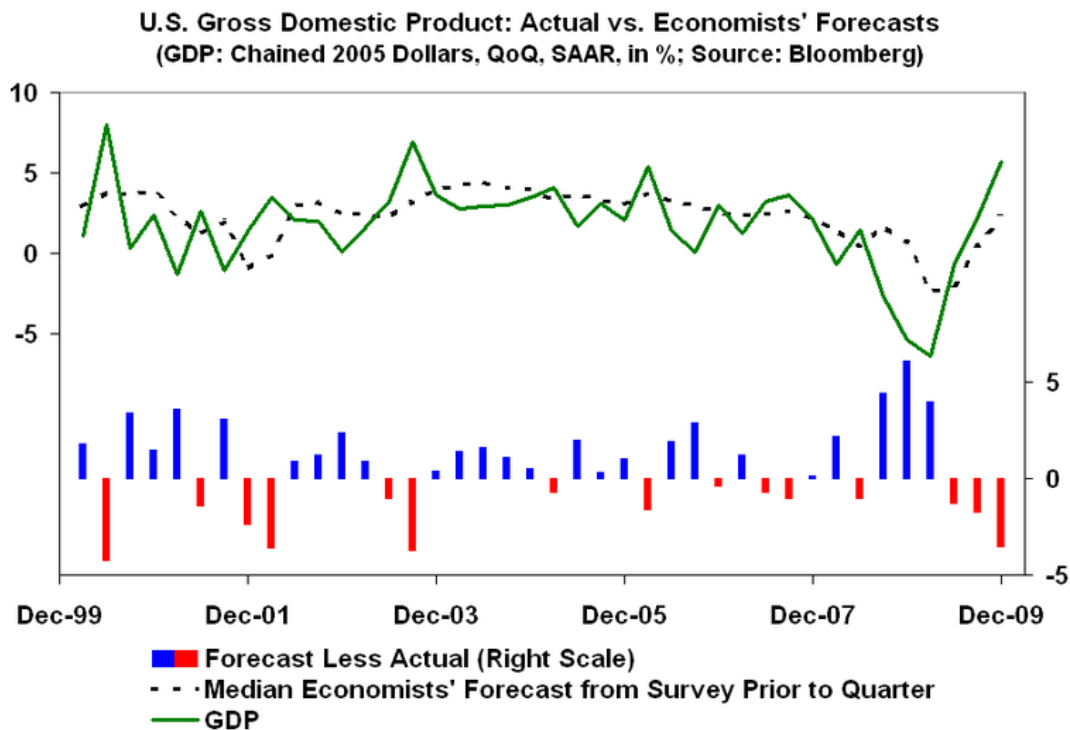


Figure 1: Actual GDP vs. Economists' Forecasts

Shift Towards Services

One of the fundamental problems with the S&P 500 representing the overall economy is the shift in the significance of services in the economy today compared to the past. The shift in the increasing importance of services in the overall economy has been well documented throughout the 20th century by such scholars as Kuznets (1957), Chancey (1979), Fuchs (1980), and Schettkat and Yocarini (2003). It is also clearly supported through economic data. This shift from a manufacturing economy to a service-oriented one will now be summarized. The transition really started after World War 1. The United States was an agricultural society before this time and it was not until the war started that the productive capabilities of the country were enhanced. The U.S. economy had to transform into a heavily industrialized country to meet the production needs of war time. The U.S. was the leader in productive capacity until globalization accelerated. The rise of cheap labor in other countries halted the ability of the U.S. to make products cheaper than other countries. In order for the U.S. to continue to grow, it had to

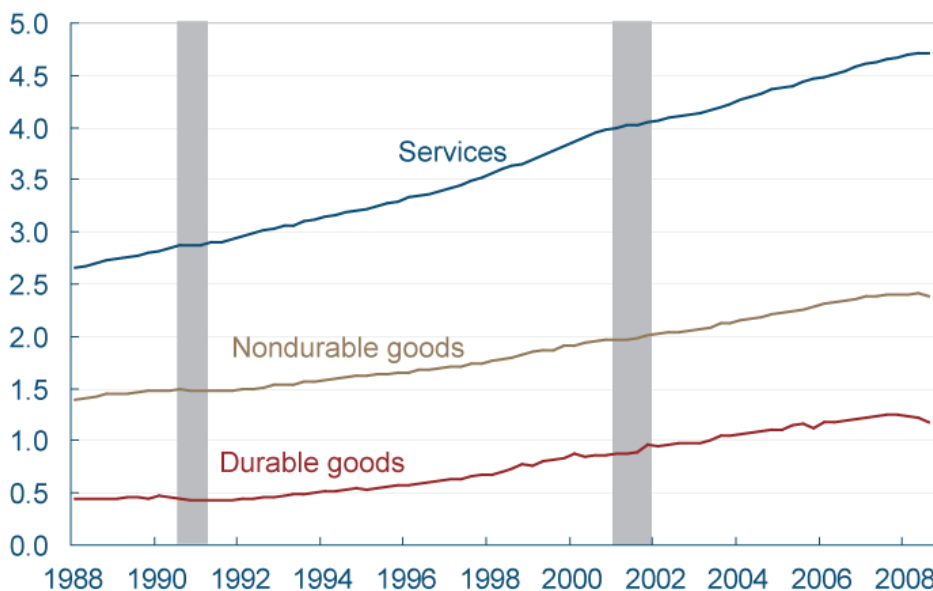
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specialize in services. These include financial services, transportation, business consulting, legal, and personal services. The U.S. economic system seems better geared towards services because of the increasing consequences of continually improving productivity in other countries (Fuchs, *Economic Growth*). Increasing productivity is vital in such a globalized world. The graph from the Bureau of Economic Analysis below shows the increasing significance of service related companies in the U.S. economy (2008). Excluding government spending, the services component of GDP (services from personal consumption expenditures and net exports from services) accounted for about 53.65% of real GDP in 1995 and has increased to approximately 61.36% of real GDP for 2009. This graph shows that the services component of U.S. real GDP has nearly doubled in just 22 years (BEA).

Consumption: Components

Trillions of 2000 dollars



Source: Bureau of Economic Analysis.

Figure 2- Breakdown of Components in GDP

The problem is that the stocks in the S&P 500 haven't been changing fast enough with the economy. As mentioned on their website, Standard and Poor's tries to maintain that the "stability of the population of companies within the S&P 500 Index is of primary consideration. Excess company turnover impacts the statistical validity of the Index as a gauge of Market

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performance” (S&P 500 United States). One of the reasons for the slow entry of new service-oriented firms into the S&P 500 is the desire not to have excessive turnover. Excessive turnover can lead to an unreliable index because bringing in new stocks into the index and removing stocks can lead to mathematical error in index calculations. Portfolio managers that use the S&P 500 index as their benchmark index want the index to be as stable as possible. This problem has hindered the S&P 500’s ability to adjust to the overall United States economy.

The importance of service-related companies in the U.S. economy cannot be stressed too much because the increasing U.S. dependence on the service sector for income is not likely to end anytime soon. The United States is sending more production overseas and out of America because of cheap labor abroad. Alexander Paris, Jr. from Barrington Research Associates writes that S&P 500 does not adequately address the importance of services in the overall economy. He addresses the increase in service-related activities due primarily to outsourcing as well as the increased importance of human capital for these changes (Paris). Due to this reasoning, he doesn’t benchmark the success of the indices that he manages to the S&P 500.

Why the S&P 500

The S&P 500 is often considered by most investors as the quintessential representation of the United States equity market. Standard and Poor’s considers this index to be the “500 leading companies in leading industries of the U.S. economy” (S&P 500 United States). Portfolio managers and investors also choose this index because of the abundance of historical data available. The index is maintained by its Index Committee to continually monitor, among other things, that it is a leading indicator of U.S. equities and ensure its liquidity in the marketplace. Its current adjusted market cap is approximately \$10.51 trillion with its top 10 holdings accounting for a very substantial 20.26%. Moreover, just 45 of the 500 companies represent over 50% of the entire S&P 500 index value. The index represents 10 different sectors: Utilities, Consumer Discretionary, Consumer Staples, Energy, Financials, Health Care, Industrials, Information Technology, Materials and Telecommunications.

The S&P 500 dates back to 1923, when Standard and Poor’s had 233 companies in the index. This index finally transitioned to its commonly recognized 500 company listing in 1957. There is a common misconception that the S&P 500 contains the 500 largest companies or most expensive stocks in the U.S., but this would contradict Standard & Poor’s index objectives and

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also would provide index liquidity issues. Both of these scenarios would conflict with the index's objectives because Standard and Poor's is looking for influential companies in each industry, not necessarily the 500 biggest companies. The index does mostly contain large-cap American stocks that are float-adjusted weighted. This indicates that the S&P 500 index is calculated by the market capitalization of the stocks (defined as number of shares outstanding multiplied by the share price) based on the number of shares available for public trading, called "float". Stocks with a higher float market capitalization have a greater impact on the index as a whole than stocks with smaller float market caps.

The S&P 500 index has averaged a yearly inflation-adjusted return of 6.76% from 1957 to 2008. On March 24, 2000, this index reached an all-time high of 1,552.87 during the day. However, this was at the time of the "dot-com bubble" and it subsequently lost about 50% of its worth in the following two years. All statistics and methodology were obtained from the S&P 500 portion of the Standard and Poor's Website (S&P 500 United States).

The S&P 500 is listed in the U.S. Department of Commerce's eleven leading economic indicators. This demonstrates the Department of Commerce's confidence in the S&P 500 to show where the economy is heading. In addition, Alan White concluded that S&P 500 is the strongest stock market index through his use of 20 axioms that best represent various "quality" indicators of a well-constructed index. These axioms included: monotonicity in current date prices, stock split invariance, merging of firms, and limiting dominant stocks among others (White 89-105). This approach looked at both the mathematical as well as the fundamental decisions that go into creating these indices. There were no assumptions about a shareholder's risk/return inclination, but rather a concentration on the measurement of the return performance for the stocks in the portfolio (White 86). The S&P 500 was compared to other indexes such as the DJIA and other Value Line indexes to test which was the best (White 112). There are a couple of reasons why the S&P 500 is superior to other indexes for this study.

The S&P 500 has a clear advantage over the Dow Jones Industrial Average (DJIA) because the DJIA simply has too few companies and has a much lower level of diversification. It is an infrequently revised listing of thirty stocks chosen by editors of the Wall Street Journal. This index can deviate significantly from representing actual breakdown of the economy as a whole because it only contains thirty stocks and never has utility or transportation companies. The

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DJIA is a price weighted index, meaning the companies with the highest priced stocks dominate the lower priced stocks. Therefore, a big swing in one or a few companies in this index can have a dramatic effect over the index as a whole. In addition, every stock in the DJIA is also in the S&P 500 (Taulbee 94).

One of the problems with the NASDAQ Index is that it contains too many companies from the Technology sector. This often leads to large swings in the index when the Technology sector is either performing very well or very poorly. In addition, the NASDAQ has smaller companies in the index. This will lead to increased riskiness of the index and often a less accurate representation of the overall economy.

There are many indexes that can be chosen as a proxy of the current U.S. economic situation. However, research for this project has shown that the S&P 500 is the best due to its world-wide recognition, broad diversity, superior company selection and its mission to pick the leading companies in the leading sectors of the U.S. economy. Its world-wide recognition is so important because many other countries in the world associate the performance of the S&P 500 with the performance of the United States.

Discussion of Economic Variables

There are various economic measures that the proposed stock index can be compared against. Many different definable and measurable economic gauges were researched including: Gross Domestic Product, Gross National Product (GNP), productivity, employment, public expenditures, personal income, consumer confidence, various price levels and Purchasing Managers Index (commonly known as PMI) just to name to name a few.

Other studies have tried to compare economic indicators to the S&P 500. Brian D. Fitzpatrick compared the total return of the S&P 500 from 1968 to 1987 to numerous macroeconomic variables, which included growth rates of corporate earnings, GNP, money supply, S&P 500 dividend yield, seasonally adjusted consumer price index, and the U.S. treasury composite. The only significant relationship that was found was the S&P 500 dividend yield with a 6-month time lag (Fitzpatrick 73). Real GDP was not used in this study, yet it is important that none of the other variables were statistically correlated to S&P 500 total returns.

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Gross National Product is the sum value of all goods and services produced by a country's citizens within a given time period. For example, if an American citizen lived and produced goods that were sold in France, then those goods would be accounted for in GNP. The fact that goods produced outside the United are included in this figure deviates from the project goal of solely finding a U.S. economic indicator. Now, a discussion of the exact definition of Gross Domestic Product will follow along with more rationale on why this figure more closely follows this project's goals.

Gross Domestic Product is the most common indicator of the United States' total economic production. Most economists look at GDP to determine how the United States has been growing compared to the rest of the world as well as to compare how the United States' economy has performed in the past. The Federal Reserve Bank of New York defines GDP as, "The total value of goods and services produced within the borders of the United States, regardless of who owns the assets or the nationality of the labor used in producing that output" (Economic Indicators). GDP statistics are released on a quarterly and yearly basis. A rational stock market investor would perceive an overall rise in the level of GDP to represent that companies as a whole are performing positively.

GDP is truly the best measure of economic activity because it accounts for all economic activity within a country. Almost all major industrialized countries use GDP as the key measure of their economic productivity. Therefore, the result is that Gross Domestic Product is the indicator that most closely reflects the project's goals.

Another reason why GDP is the best gauge for the project is that GDP is the best way to currently predict how the economy is doing. The reason behind creating GDP is for people to get an instant snapshot of how the economy as a whole is performing. Of course, the only problem with this statistic is that it comes out every three months. The economy is often changing very rapidly (just look at the period of September 2008- November 2008) and this can outdate the GDP statistic very quickly. However, it will be an excellent predictor of how the proposed index and the S&P 500 performed in the past.

There are also two types of GDP, nominal GDP and real GDP. Nominal GDP is the total value of goods and services produced in the United States at current prices. This means that inflation

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is taken into account every time that GDP statistics are released. Alternatively, real GDP is the total value of goods and services produced in the United States at *constant prices*. The problem with nominal GDP is that inflation makes comparing the production of different historical periods impossible because different periods have different levels of inflation. However, real GDP keeps prices stable, which allows for the comparison of total production of goods and services rather than the market value of the goods and services at the time GDP is released. This essentially allows year-to-year comparisons of GDP without the effects of price level changes. Therefore, real GDP will be used because it will allow for the proper comparison of historical periods.

Real GDP

GDP is very tedious and often confusing to calculate because of the detailed requirements of what exactly is included in GDP, but it is worthwhile to note what is included (and excluded) in GDP on a simpler level because of the use of a modified GDP statistic for the model which will be explained later. U.S. real GDP is calculated by adding Private Consumption (labeled “C”), Gross Investments (“I”), Government Spending (“G”) and Exports – Imports (“X”-“M”) together.

Private Consumption includes most private expenses of households and is generally the largest factor in real GDP, usually around 60%. Typical expenses include food, rent, clothing, medical expenses and virtually any service. It is important to be aware that the only way that buying something will impact GDP is if it is a *final* good. For example, buying a Picasso painting will not increase GDP, but paying for auctioneer fees would increase GDP.

Gross Investment is classified as most business investments that are projected to increase return through business activities. Some examples are factories, machinery, R&D, marketing, and employee training. The crucial detail is that the money invested must be put into a good or service. Therefore, an investment into a stock does not go directly to GDP during the transaction, but any processing fee does increase GDP because it is a service. Gross Investment is a very important statistic to look at because it can often forecast the future to a certain extent. This is because investment usually results in increased consumption at some point in the future. Gross investment usually accounts for about 20% of GDP (BEA).

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Government Spending is simply the total amount of money that the government uses to fund two distinct categories of purchases. The first is the government's purchase of goods and services for current use, or government consumption. The second is government investment, which is the purchase of goods or services intended to create future benefits. Examples include building infrastructure and paying for research. A common misconception is that government transfer payments are included in GDP. A transfer payment represents any transfer of payment that is not a purchase of a good or service, such as social security payments or welfare. Therefore, transfer payments are not included in GDP because they do not provide any direct purchase toward a good or service. Government spending accounted for between 32-37% of real GDP from 1995-2007 and then increased to approximately 45% in the period of 2008-2010 where (BEA).

Government spending usually signals Washington's decisions rather than market forces. Therefore, government spending will be excluded from U.S. real GDP for this study. The elimination of government spending from GDP is necessary because fluctuations in government spending can throw off exactly how the economy is performing. Excessive government spending can artificially boost real GDP and it can be countercyclical to the business cycle. For example, the massive amount of government spending in 2009 really propped up the GDP figure, but did not accurately show how poorly the economy was performing. Of course, there can be government spending that is consistent with the business cycle; although this can be difficult to predict. Therefore, removing the total value of government spending in U.S. real GDP will get to the heart of what the project is aiming at: how the U.S. economy is currently performing.

Net Exports is the final component of GDP and consists of gross exports minus gross imports. Imports must be subtracted from GDP because imports do not take into account the production of a nation when total consumption is determined. Exports are still included because the goods or services are still produced within the country and contribute to the overall production of a nation.

The Business Cycle and Its Impact On The Stock Index

This section will discuss different elements of the business cycle and their tremendous impact on the validity of the stock index. The business cycle refers to the fluctuations in the economic production of a country in a period ranging from a few months to several years. The business

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cycle has four distinct parts: contraction, (the slowdown in the rate of economic production), trough (the lowest part in the business cycle, where contraction turns into expansion), expansion (the period of time where economic activity strengthens) and finally the peak (the highest point of economic activity). Eventually the economy moves into back into contraction and the whole cycle repeats itself.

The business cycle is not regular or predictable, as every business cycle is different. The only common theme is that all business cycles follow this same pattern. The expectation in all nations is that there is a long-term growth trend in the production of an economy without the fluctuations being too severe. The most important objective for the index is for the stocks in the index to reflect all four of these periods as closely as possible. This will give the stock index the ability to reflect the overall economy at any point in time.

The problem with the S&P 500 as a proxy for the U.S. economy is that many of the stocks don't accurately follow the business cycle. Many stocks in industries such as utilities or food manufacturing won't increase in tune with a boom economy, but conversely won't decrease very much in a weakening economy because the demand for food is relatively stable. Another example of a stock that would not be included is one that increases quickly in a boom economy, but also decreases rapidly in a deteriorating economy. Many technology stocks would fall under this category. The S&P 500 index doesn't quite accurately follow the business cycle because its stock composition doesn't contain a representative mix of industrial and services firms found in the U.S. economy. The correlation between the business cycle and services is very high in many cases because the service sector truly drives the economy. The service sector is also directly associated with the business cycle because it closely follows the contractionary and expansionary phases of the business cycle, thus representing the economy very closely at all times. Thus, the service sector will give an accurate reflection of U.S. GDP.

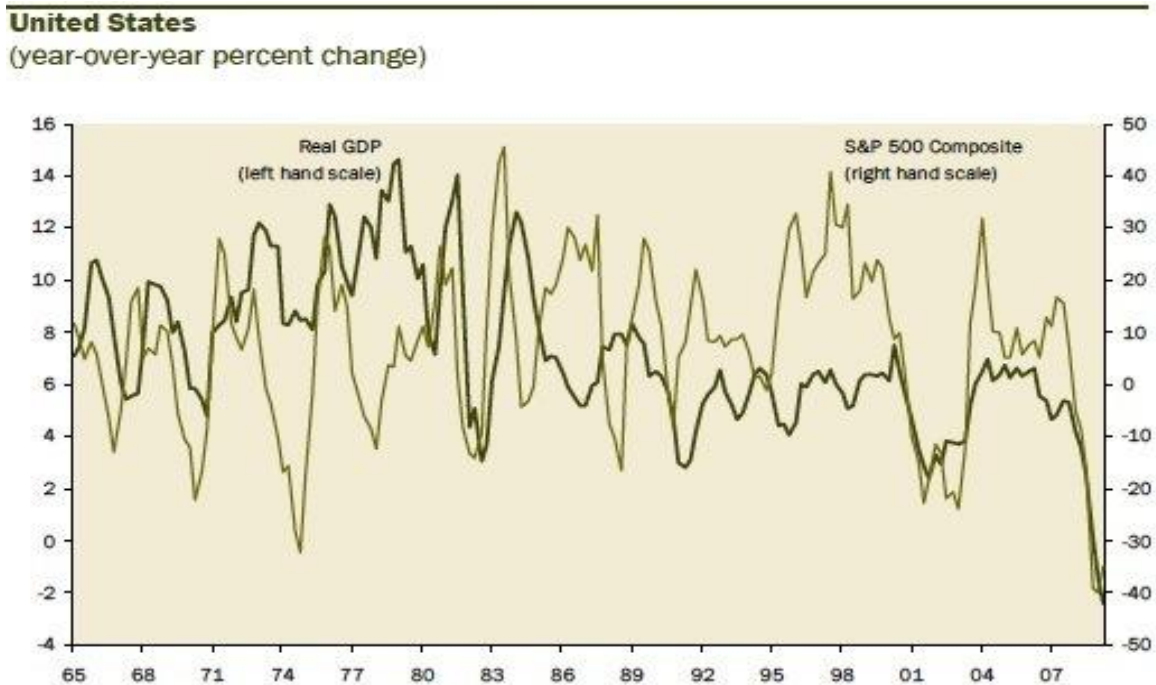
The majority of investors and studies would agree with Charles P. Jones. He wrote that there is a correlation between the business cycle and stock performance. His example was that in economic expansionary times, technology stocks would generally outperform "old economy stocks" such as Walmart and Coca Cola Corporation (Jones 440). Stocks in the S&P 500 many times do not follow the business cycle because so many stocks in it fall under the "old economy stocks" category remain relatively stable over time and don't have large decreases in recessions

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or large increases during an expansion. Adding a services component to the S&P 500 would reduce the percentage of “old economy stocks” in it and allow the new index to more closely follow the business cycle.

Another problem with the S&P 500 is that many of the companies act as either lagging indicators of the economy. A stock would be acting as a lagging indicator if it changes after the overall economy has progressed. In contrast, a stock would act as a leading indicator if it changes its level of value before the overall economy has moved. Generally speaking, the S&P 500 index acts as a leading indicator, however the S&P 500 can have difficulty predicting the U.S. economy based on the stock make-up at a particular time. For example, the S&P 500 won't be able to forecast the U.S. economy very accurately if its stock selection at a particular time has a heavily-weighted composition of companies that don't act as leading indicators to the economy. The service index will be able to provide better insight into the current state of the economy. This will make the new index a better predictor of current economic conditions than just the S&P 500 alone. This graph created by Rosenberg truly shows how inconsistent S&P 500 returns (added to Dividends) is from GDP growth (2009):



Source: Haver Analytics, Gluskin Sheff

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Figure 3- S&P 500 compared to U.S. real GDP

Alternatives to the S&P 500

Many investors and portfolio managers have either used existing indices or created new indices to track the progress of the economy. An example of a widely used existing index to benchmark against is the Wilshire 5000. It is a market capitalization weighted index with every publicly traded company headquartered in United States. It has some advantages over the S&P 500, including that the company listing is broader and contains a greater quantity of smaller companies. Some researchers believe is a more representative measure of the U.S. economy because it has every publically traded company in the U.S. However, the Wilshire 5000 is market cap weighted and it turns out that the fluctuations in index levels are highly correlated to the larger firms because the price swings of large market cap companies dominate the price swings of the smaller market cap companies. However, there have been times where the small market cap companies have led performance over the larger market cap ones and affected the index substantially. Another problem with the Wilshire 5000 is that the highly illiquid stocks found in the index can be very erratic and add ample volatility. Investors and portfolio managers will continue to use the Wilshire 5000 for benchmarking their indices as well as observing how the U.S. economy is performing due to its inclusion of small and mid cap companies.

Other studies have used their own indices to more accurately replicate the U.S. economy. Dillon, Folta and Safian (2002) created a new index called the Safian Index to try to smooth out the inconsistencies between the S&P 500 and U.S. GDP. Their goal was to find out how to more accurately reflect how the economy is performing so that they can benchmark their portfolio's success. First, they broke down stocks into these different categories: cyclical, consumer, growth, capital goods, technology, finance, and a catch-all category called "satellite". The only information that is given as to how exactly they split stocks into these different categories is that they classified companies according to factors that influence their earnings. Much of their information was not disclosed in order to keep their index unique.

They changed weightings of each of the aforementioned categories using GDP statistics to more accurately reflect the overall economy using their own subjective opinions on where the United States was in the business cycle. For example, faster growing sectors were given higher weighting when the economy was expanding. The result was that their index was able to more

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accurately follow GDP throughout the index's existence. However, they note that the process of creating assumptions built into the changing of weightings of each sector was too subjective and could lead to inaccuracies (Dillon, Folta, Safian).

The lesson that this study found is that the S&P 500 is too heavily influenced by big swings in a sector. The Safian index was able to more accurately reflect GDP than the S&P 500 because they were able to more accurately represent the actual economy than Standard and Poor's index was able to do. Their index was essentially able to more closely follow the business cycle than the S&P 500. Therefore, the compilation of indices will try to more accurately reflect U.S. GDP similar to this study by more closely following the business cycle through the service sector. This project will not follow the same procedure to break down the S&P 500 as Folta and Safian because of their warning of how subjective their process was. In order for a study to be replicable for other researchers, concrete and objective steps must be put in place. It still is important to now that the U.S. GDP can be more accurately predicted by breaking down the S&P 500 to find what exactly moves the U.S. economy. This study also excluded government spending from GDP, but did not reveal how they removed it. It was removed because, the study's goals was to understand what was going on solely in economy without any "artificial" spending from the U.S. government, the same objective found in this paper.

Taulbee (2001) performed a study that looked at different economic variables in relationship to the overall economy as well as different industries within the U.S. economy. Relevant to this study, he compared real GDP to the S&P 500 as well as used proxies for cyclical, defensive, and growth industries. His proxy for a cyclical industry is the Dow Jones Transportation Average (DJT), the proxy for the defensive industry is Dow Jones Utility Index, and proxy for the growth industry is the Pacific Exchange Technology Index. He concluded that real GDP is significantly related to the S&P 500 as well as the proxy for cyclical industrials, the DJT. Defensive and growth industries were not statistically associated with fluctuations in real GDP (Taulbee 99).

His use of existing indices was particularly insightful because he broke down the overall stock universe to try to more accurately represent real GDP. He showed that the stock indices which represented cyclical industries did a better job of reflecting U.S. real GDP. Applicable to this study, the service indices included in this study follow more of a cyclical pattern, rather than the defensive or growth industries. Therefore, the service sector should be more correlated to U.S.

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real GDP than the S&P 500 because the S&P 500 has a large quantity of defensive and growth stocks. Taulbee also found out that decision-makers are able to make superior choices by altering the S&P 500 to better reflect the overall economy.

To conclude the literature review section, the studies previously mentioned have effectively broken down the S&P 500 and are better able to replicate the U.S. economy than the S&P 500. These studies show that decisions-makers may be able to make better choices because of a more accurate representation of U.S. GDP. The best way to go about doing this is to find what exactly is driving the growth of the economy as well as how accurately the index is able to follow the business cycle. The research outlined in the literature review section shows that the service sector drives the growth of the economy and is able to effectively adhere to the business cycle. However, little work has been done focusing solely on adding the service component to an existing index. Adding this component should allow this newly-created index to bridge the discrepancy between the S&P 500 returns and U.S. real GDP shown in Figure 3. Therefore, a closer interpretation of economic activity should be available at all times by combining of the constantly fluctuating S&P 500 with the service indices.

METHODOLOGY

The main purpose of this study is to test whether the S&P 500 needs stronger service exposure to more accurately reflect the U.S. economy. Testing the hypothesis will be done with regression analysis. The regression model will analyze how closely the dependent variable, U.S. real GDP, is correlated to the independent variables' returns. Regression analysis is effectively able to analyze the impact of several independent variables on dependent variable. The hypothesis for the model is listed below:

H₁: A composite index consisting of the Morningstar Consumer Services, Morningstar Business Services Indices, and S&P 500 will be more statistically correlated to U.S. real GDP than just the S&P 500 from 1995-2009

This regression analysis equation will single out the composite index and test whether the increase of service exposure from the composite index is more correlated to U.S. real GDP than the S&P 500. The statistical output from Microsoft Excel will test to see if the composite index has more statistical correlation to U.S. real GDP from one period to the next. The full equation is represented below:

$$GDP_t = \alpha + \beta_1 * GDP_{t-1} + \beta_2 * Composite\ Index\ returns_{t-1} + \epsilon_t \quad (1)$$

The equation for the regression analysis includes α as the constant, β_n referring to each variable's coefficient, and ϵ representing the error term. The subscript "t" is used to represent the current period, while the subscript "t-1" indicates the prior period. The GDP statistic from the previous period was used to smooth out returns as well as test if the indices were able to increase or decrease in tune with real GDP. The composite index returns from the prior period were used to see if prior period's index returns could effectively predict GDP for the next period, the center of this project's goal.

U.S. real GDP is announced on a quarterly basis; therefore the returns of the S&P 500 and the Morningstar indices needed to be measured quarterly. The S&P 500 total returns were acquired from a Factset station, while both of the Morningstar Service Indices' data was obtained from a representative of the Morningstar Corporation. The test used total returns because they represent

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returns from the stocks in the index as well as dividend returns to better represent the complete returns from the indices.

Fifteen years of data were used in the experiment, from the first quarter of 1995 to the last quarter of 2009. This gave a total of 59 observations. This time period is used to reflect the period in the U.S. where the services component became increasingly important as well as reflect the most recent data. In addition, 59 observations will be able to statistically demonstrate the correlated of independent variables to the dependent variable. The percentage change from one period to the next for all the variables is shown in this equation:

$$Period_t \text{ returns} = \frac{Period_t \text{ returns} - Period_{t-1} \text{ returns}}{Period_{t-1} \text{ returns}} \quad (2)$$

The dependent variable for this test will be the U.S. real GDP. The quarterly returns from the period of 1995-2009 were obtained from Bureau of Economic Analysis (BEA) website. The stock indices will be tested against GDP to discover whether the addition of service indices to the S&P 500 will to more closely predict the next period's real GDP. As discussed in the GDP section in the literature review, government spending needed to be taken out of real GDP to more accurately reflect how the economy is truly performing. The removal of the government spending statistic was simply done by looking at the composition of GDP on the BEA. The BEA conveniently removed all government spending from GDP. The equation below shows exactly what was included in this modified real GDP statistic (notice the "G" representing government spending is absent):

$$Modified \text{ GDP} = C + I + (X - M)$$

Or

$$Modified \text{ GDP} = Private \text{ Consumption} + Gross \text{ Investment} + (Exports - Imports) \quad (3)$$

The independent variables in the regression model are the stock indices and U.S. real GDP, both from the prior period. The stock indices will be composed of either the S&P 500 alone or a composite index with different weightings of the S&P 500 and the two handpicked service indices. First, the service indices that were chosen will be discussed. To more closely represent the service component of the U.S. economy, the Morningstar Consumer Services Index Fund and

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the Morningstar Business Service Index Fund will be used. These indices have very stable management, index objectives, a steady history, and truly fit very well with the U.S. service sector. The index objectives of both indices are to accurately track components of the service sector in the United States.

Morningstar describes its Business Services Sector Index as tracking the performance of companies that include advertising, printing, business support, consultants, employment, engineering and construction, security service, waste management, distributors, and transportation. Much of this index deals with business-to-business services as well as services that attempt to expand a company's market share. This index is ideal for this study because many of the business services follow the business cycle very closely.

The Morningstar Consumer Services Sector Index tracks the performance of companies that include retail stores, personal services, homebuilders, home supply, travel and entertainment companies, and educational providers. Many of the companies in this index follow the business cycle closely because profits in these industries swing with how the consumer is currently buying. Consumer spending is a very substantial portion of GDP and therefore, should closely follow GDP.

Four indices were created that incorporated either only the S&P 500 or the addition of equally weighted Morningstar Service Indices as represented below. The following newly created indices are listed below:

	S&P 500	Morningstar Consumer Services Index Fund	Morningstar Business Services Index Fund
Stock Index #1	100%	0%	0%
Stock Index #2	75%	12.5%	12.5%
Stock Index #3	50%	25%	25%
Stock Index #4	25%	37.5%	37.5%

Table 1- Breakdown of Composite Indices

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Each of the composite indices listed in Table 1 will be included into regression equation found Formula 1 to create four different equations that will be individually tested.

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RESULTS

The results of the model are that the composite service indices are not dramatically more statistically correlated than the index containing only the S&P 500. This implies that the S&P 500 does already have significant exposure to the service sector. However, addition service sector exposure is able to more accurately reflect U.S. real GDP. The follow table displays results of the regression analysis:

Variable	Observations	Adjusted R²	P Value	T-Stat	Standard Error	Statistically Significant
Index 1	59	0.38998	0.00028	3.86731	0.00634	Yes
Index 2	59	0.39463	0.00024	3.91962	0.00632	Yes
Index 3	59	0.41469	0.00016	4.04110	0.00621	Yes
Index 4	59	0.38705	0.00028	3.87587	0.00636	Yes

Table 2 - Summary Regression Results

All the findings in this model are statistically significant as shown by the very low P-value, with over 99% confidence that the model's results are accurate. In addition, the adjusted R² shows that between 38.7% and 41.4% of the fluctuation in GDP is explained through the regression model's equations. Adjusted R² is characterized by only increasing if the new variable improves the regression analysis more than what would be anticipated by chance. There are a lot of variables that can influence GDP; therefore, the 38.7%-41.4% explanation of the variability in GDP in this model is a very substantial finding considering that it is able to explain a large percentage of GDP. U.S. GDP is impossible to predict perfectly, so this model by itself is able to represent a large part of it.

As Table 2 shows, the S&P 500 does require a larger service component to more accurate reflect real GDP. This statement is true up a certain point. All composite indices will be compared against Index 1, which only contained S&P 500 returns. The model concluded that an increasing percentage of Morningstar service indices brought about a higher correlation to U.S. real GDP until the final index. Index 2 was more correlated than Index 1, with Index 3 being the most correlated. The problem with Index 4 is that there was too high of a percentage of services included in the index, which lead to a decrease in the accuracy in the predictability of this index.

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It is very important to observe that all the results of the testing are statistically significant with a confidence range of at least 98.88%.

These next set of tables delve further into the data to look at exactly how the independent variables within the regression equation affected the overall index's ability to predict U.S. real GDP.

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Composite Index 1			
	Intercept	GDP(t-1)	Stock Index 1
Coefficient	0.00556	0.45932	0.02719
P-Value	0.00029	0.00015	0.01019
T-Stat	3.86731	4.06292	2.65922
Standard Error	0.00144	0.11305	0.01022
Statistically Significant	Yes	Yes	Yes

Composite Index 2			
	Intercept	GDP(t-1)	Stock Index 2
Coefficient	0.00563	0.44506	0.03176
P-Value	0.00024	0.00026	0.00803
T-Stat	3.91962	3.89527	2.74890
Standard Error	0.00144	0.11426	0.01155
Statistically Significant	Yes	Yes	Yes

Composite Index 3			
	Intercept	GDP(t-1)	Stock Index 3
Coefficient	0.00570	0.42170	0.04081
P-Value	0.00016	0.00047	0.00286
T-Stat	4.04110	3.71860	3.11999
Standard Error	0.00141	0.11340	0.01308
Statistically Significant	Yes	Yes	Yes

Composite Index 4			
	Intercept	GDP(t-1)	Stock Index 4
Coefficient	0.00560	0.44084	0.03615
P-Value	0.00028	0.00039	0.01184
T-Stat	3.87587	3.77278	2.60194
Standard Error	0.00145	0.11685	0.01389
Statistically Significant	Yes	Yes	Yes

Table 3 - Individual Indices' Regression Results

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To summarize the results in Table 3, the data shows that adding the Morningstar Service indices to the S&P 500 provides a relatively significant improvement for the prediction U.S. real GDP. However, the findings also show that the accuracy of the model decreases when too much of the service indices are included in the composite index.

The regression analysis shows that Index 1 is able to predict 39% of GDP. Within Index 1, GDP_{t-1} represents a large portion of the overall predictability from the regression formula at 45.9%. This was to be expected because most of the time GDP does not vary dramatically from one period to the next. The S&P 500 variable within Index 1 adds another 2.7% to the explanation of the overall index's prediction for GDP. This statistic may not seem very substantial, however just one additional variable was able to increase our understanding of GDP. The p-value and t-statistic reveals how statistically significant the results are. The p-value is .01 representing a 99% confidence level, while t-statistic for the S&P 500 shows that this variable is at a confidence level of 2.66 standard deviations. Generally speaking, any t-value greater than two or less than negative two is adequate, with higher t-values giving a higher confidence in the coefficient as a predictor.

Index 2 is able to more accurately predict GDP than the first index, as shown in the higher R^2 value of 39.4%. Adding a 25% Morningstar service component to the S&P 500 was able to increase the composite index's clarification for the prediction of GDP by roughly .4%. In addition, the t-statistic increased, which shows the model's increasing confidence to predict GDP through this variable. GDP_{t-1} decreased to predicting 44.5% of the next period's GDP as the composite index variable was able to predict more of the next period's GDP results.

Index 3's adjusted R^2 is the highest of all the other indices; therefore Index 3 is the most accurate predictor of GDP in this model. Index 3 is able to explain 41.5% of the predictability in GDP from 1995-2009, an increase of 2.5% over the S&P 500 only index. The composite index containing 50% Morningstar Services Indices and the 50% S&P 500 was able to add 4.01% to the overall explanation found in the Index 3. The overall confidence in this variable has increased as revealed in the p-value of .002 and t-value of 3.11 standard deviations.

The data from Index 4 shows that too much exposure to the Morningstar Service indices decreases ability for the index to explain GDP. This index is only able to predict 38.7% of U.S.

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real GDP. A composite index containing 75% of the Morningstar indices provided too much service exposure and a less accurate prediction of U.S real GDP. The P-value decreased to a 98.8% confidence level and the T-stat moved down to 2.6 standard deviations; thus showing the overall's index less significant predictive power.

DISCUSSION

The results show that the S&P 500 does have substantial exposure to the service sector in the U.S. economy. However, more service exposure needs to be included in the index for it to more closely mimic the U.S. economy. The model demonstrates that the addition of the Morningstar indices to the S&P 500 is more correlated to U.S. real GDP from 1995 to 2009, thus H_1 is accepted. The null hypothesis is rejected because of the high statistical significance of all variables in the regression model.

The S&P 500 needs a higher service component up to a certain threshold; otherwise its ability to imitate the U.S. economy is not as accurate as it could be. The exact amount of service exposure that should be included in the S&P 500 may be impossible to calculate, especially with the increasing relevance of the service sector in the U.S. economy being a moving target. However, one thing is certain from the results of this regression analysis: a more significant number of service firms need to be included in the S&P 500 index. This can be done by targeting companies to be included in the index that have a heavy reliance on services for their revenues. The influx of service oriented firms into the S&P 500 cannot be done too quickly because of the stability and reliability of the index may be in jeopardy. The transition to a more service oriented S&P 500 can be done over a few years without too much of a disruption to investor's confidence in the index or any problems with the index calculation. These service oriented firms should be put in the index relatively soon as the U.S. relies even more on the service sector.

It is interesting to note that while analyzing the GDP statistics, the data shows that there has been an increase in the services sector included in GDP over the last 15 years. For total real U.S. GDP, the percentage of consumer and business services has increased from 43.50% to 48.76% during the period of 1995 to 2009. Excluding government spending, this figure jumps from 53.65% to 61.36% during the same period. This data directly demonstrates the increasing importance of the service sector of the economy. The increase of the service sector has been consistently increasing throughout the past 15 years and its growth does not seem to be slowing down soon.

Decision-makers, from the average American to government officials, can benefit more by looking at Index 3 than the S&P 500. This will help them make better choices such as which financial decision is most appropriate given the situation for a citizen or company. A CEO might be able to make better decisions on where to direct their company based on the economy. It may

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seem unlikely that life-changing decisions should be made just by looking at this index, but this could be one important variable to look at when making future decisions that involve the well-being of the U.S. economy.

CONCLUSION

The purpose of this paper was to examine the development of the U.S. economy and see if the S&P 500 was able to reflect this evolution. The first step to do this was analyze the service sector which showed that the business cycle plays a very important role in determining if a stock index is able to reflect the economy during economic expansion as well as contraction. The S&P 500 is an important way to predict U.S. real GDP, but adding a composite index containing more services can predict U.S. real GDP more accurately. The S&P 500 needs to include more service firms before it falls farther behind in its ability to reflect the overall U.S. economy. One of the problems with this is that the S&P 500 contains larger firms, while many service firms are often smaller. Standard and Poor's will simply have to find stocks that have more service exposure than firms that are already in the index.

These findings act as a head start into looking into other ways that the S&P 500 can become a more representative measure of the U.S. economy. For example, more research should break down different periods of time and see if Standard and Poor's was able to accurately replicate the economy during different time periods. It is possible that the S&P 500 only recently started to deviate from the amount of service sector exposure that should be included in their index to reflect the economy. Also, it could be the case that government spending is not correlated at all to the economy, or maybe that government spending is highly correlated. This would find out if government spending should be included in the GDP statistic. The model would then be compared against this new GDP statistic. Other research can be done to include different variables in their models, such as including a difference service index in the composite index or compare the model against a different market index such as the Wilshire 5000.

In conclusion, this study found results that support the hypothesis. However, more research needs to be done to examine different ways of including a stronger service component to the S&P 500. In addition, the Standard and Poor's Index Committee should be continuously looking for companies that closely follow the business cycle so that they can remain a leading indicator of the U.S. economy. The U.S. economy is always evolving and the S&P 500 needs to reflect this in the future.

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