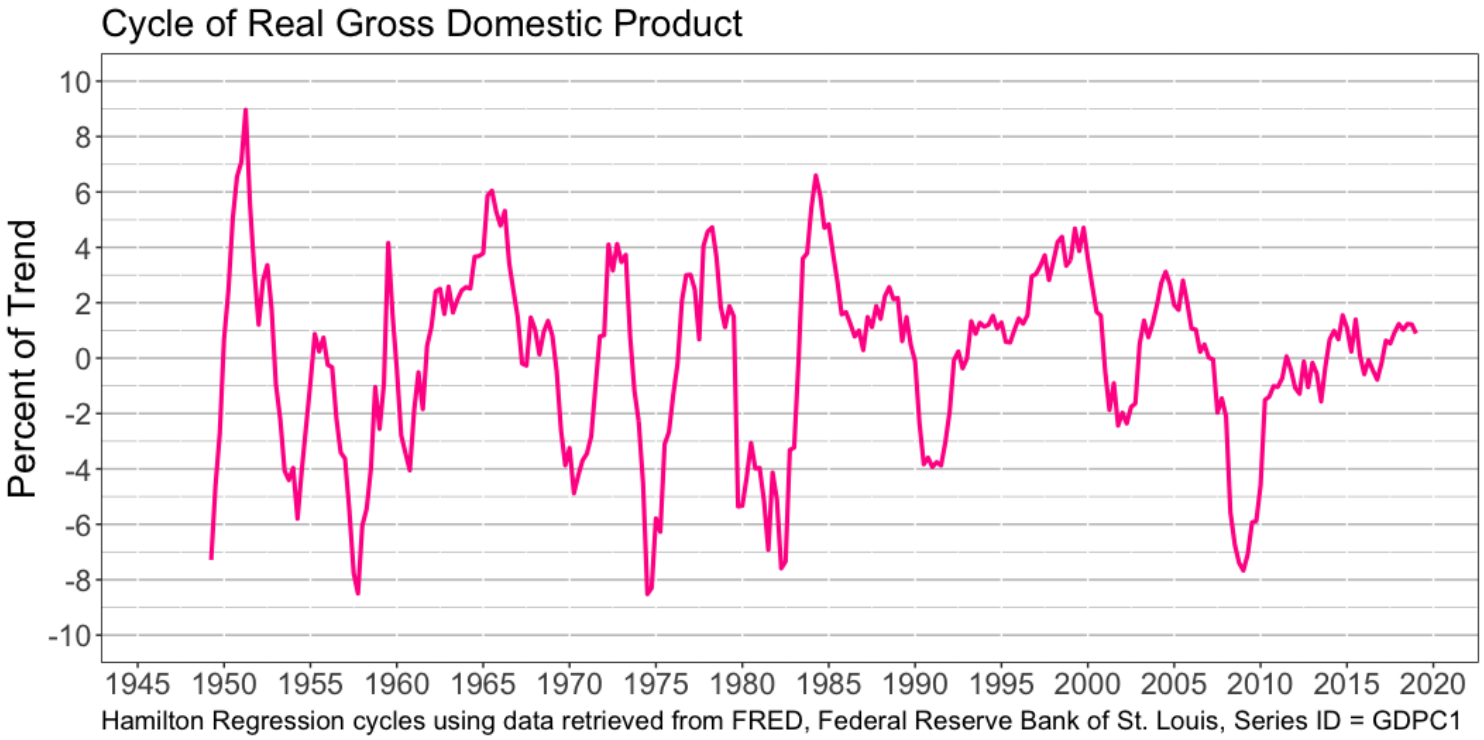
Business Cycles Data Book

Q

Our Reference Series RGDP

(Real Gross Domestic Product)



RGDP (Real Gross Domestic Product)

The total dollar value of all goods and services produced over a specific time period, often referred to as the size of the economy. The "Real" in RGDP means that it has been adjusted for inflation.

Observations & Notes

1) A Hamilton Regression is used due to its minimally obtrusive nature of extracting trend and cycle information from a time series.

2) Some data is missing from the "tails" due to the Hamilton regression being lagged (using data) 4 years back in order to provide a smoother estimates of RGDP across different points in time.

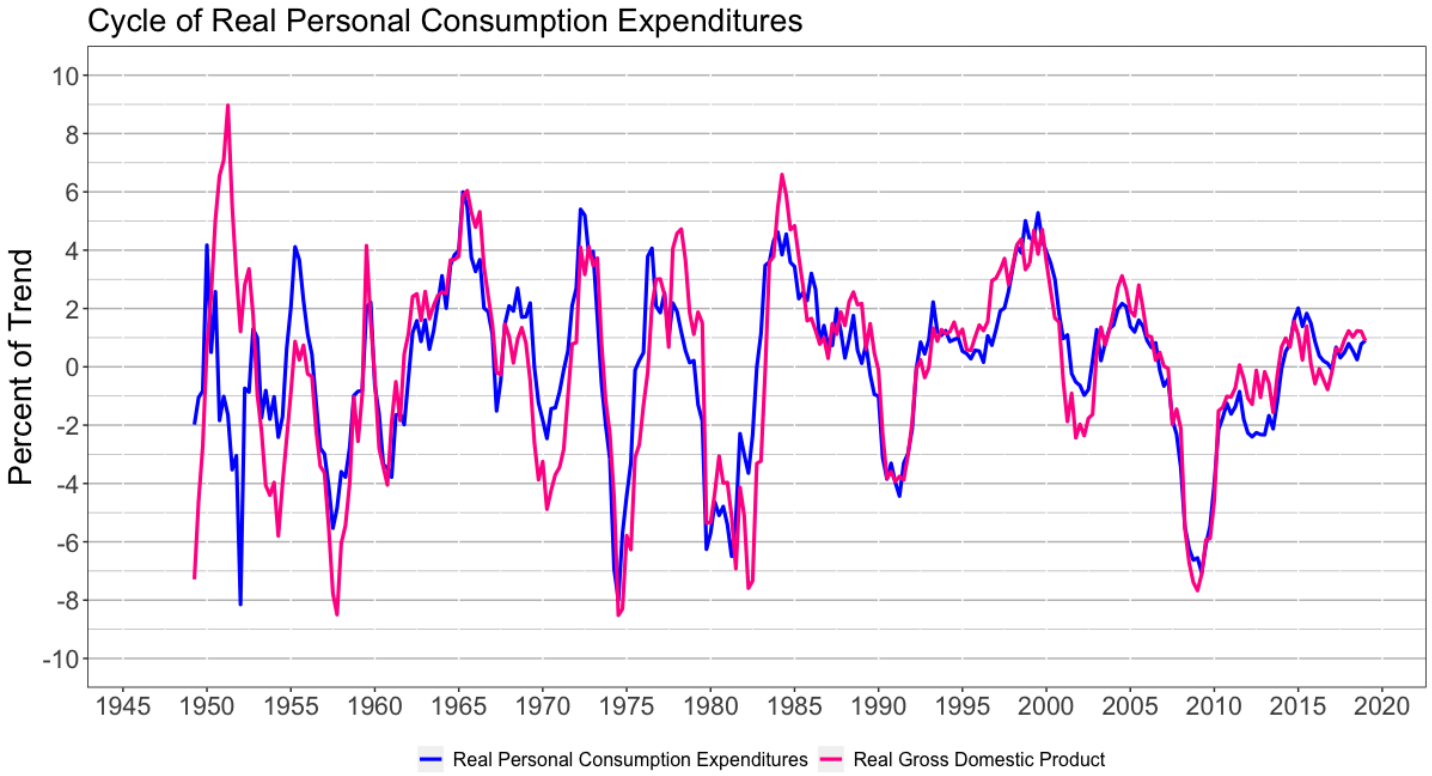
Cycles of GDPC1 1947-2019

Peaks	Troughs	T=>P	P=>T
(Q4) 1951	(Q4) 1954	none	12
(Q2) 1956	(Q2) 1958	6	8
(Q1) 1960	(Q2) 1961	7	5
(Q1) 1966	(Q4) 1970	19	19
(Q2) 1973	(Q2) 1975	10	8
(Q4) 1978	(Q1) 1983	14	17
(Q4) 1984	(Q1) 1992	7	29
(Q2) 2000	(Q4) 2002	33	10
(Q1) 2006	(Q3) 2009	13	14

Hamilton Regression Cycle Data from FRED. Expansion & Contraction time is **measured in quarters**. Data retrieved from Federal Reserve Bank of St. Louis, **Series ID = GDPC1**

National Income and Product Accounts

(Real Personal Consumption Expenditures)



Hamilton Regression Cycles (H = 8 , P = 4) using data retrieved from FRED, Federal Reserve Bank of St. Louis, Series IDs = PCECC96 and GDPC1

Observations & Notes

1) Consumption leads RGDP both for peaks and troughs.

2) Consumption and RGDP appears to be procyclical, despite there being a slightly countercyclical relationship that can be seen when attention is focused on the graph from the late 1940's to the mid 1950's, however it appears to "correct" itself after 1953. Procyclical relationships have the implication that the two variables are positively correlated.

Cyclical Comparision of Consumption to RGDP

Peaks			Troughs		
Consumption	RGDP	Lead/Lag	Consumption	RGDP	Lead/Lag
(Q3) 1950	(Q4) 1951	+5	(Q3) 1952	(Q4) 1954	+9
(Q4) 1955	(Q2) 1956	+2	(Q1) 1958	(Q2) 1958	+1
(Q2) 1960	(Q1) 1960	-1	(Q3) 1961	(Q2) 1961	+1
(Q1) 1966	(Q1) 1966	0	(Q4) 1970	(Q4) 1970	0
(Q1) 1973	(Q2) 1973	-1	(Q1) 1975	(Q2) 1975	-1
(Q1) 1977	(Q4) 1978	+7	(Q4) 1981	(Q1) 1983	+5
(Q1) 1985	(Q4) 1984	-1	(Q4) 1991	(Q1) 1992	+1
(Q1) 2000	(Q2) 2000	+1	none	(Q4) 2002	-
none	(Q1) 2006	-	(Q4) 2009	(Q3) 2009	-1
Average Lead/Lag		1.5			1.875

Leads and Lags measured in quarters (+ = lead) (- = lag)

Data is collected from the Federal Reserve Bank of St. Louis, Series ID's = GDPC1 & PCECC96

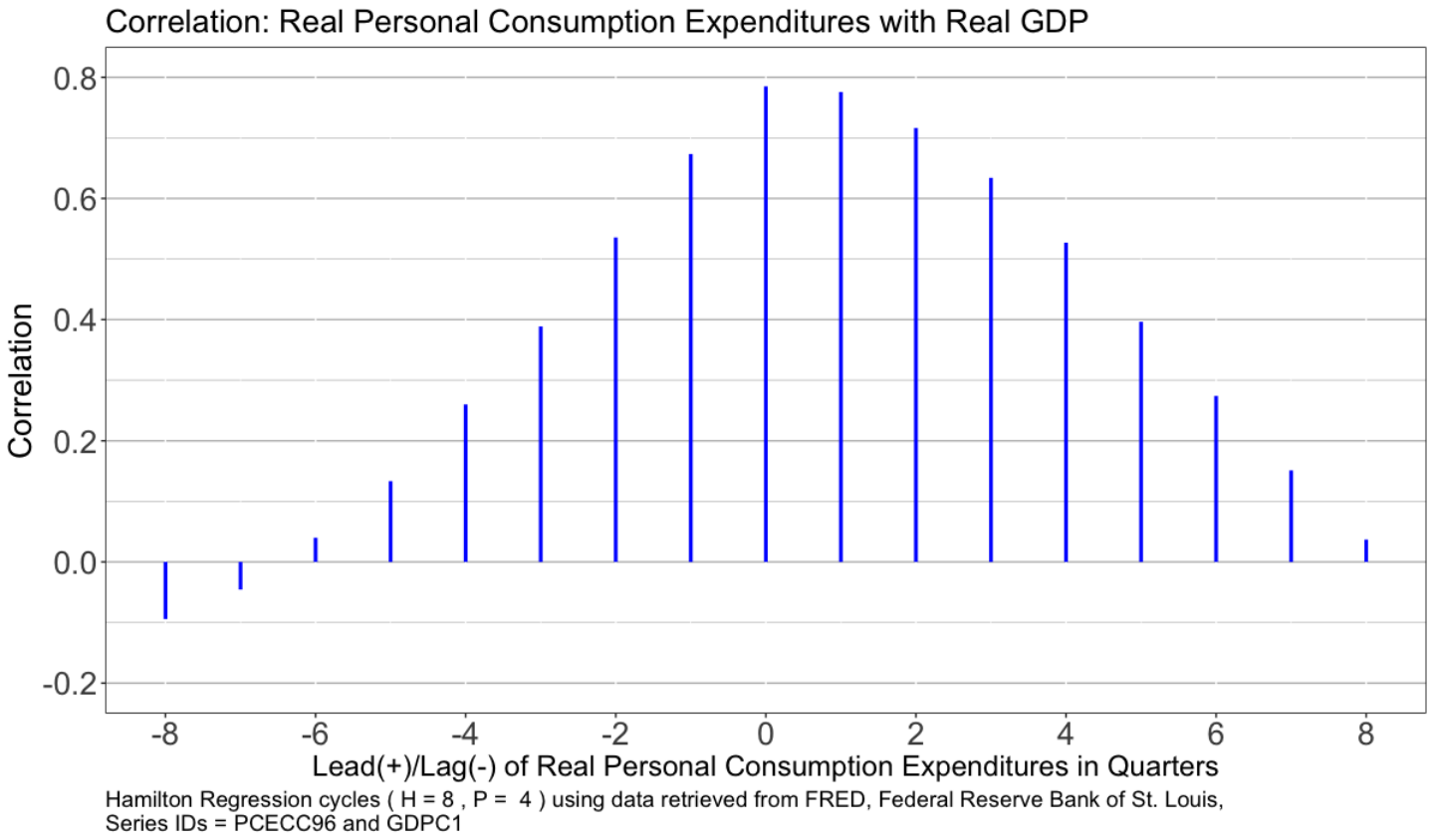
Definition:

Personal consumption expenditures is a measure of national consumer spending. It tells you how much money people spend on goods and services.

Personal consumption drives almost 70% of economic output. It is measured by gross domestic product. Personal consumption is an important economic indicator. It's the main workhorse that drives economic growth, making it a key component of GDP.

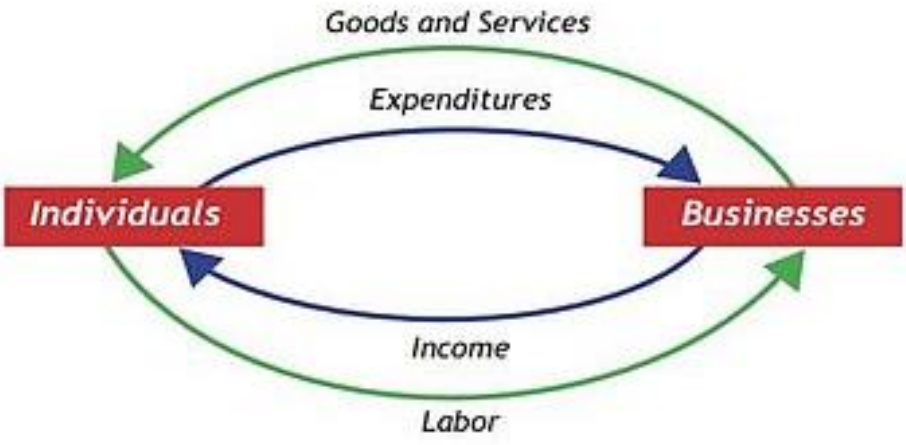
National Income and Product Accounts

(Real Personal Consumption Expenditures)



Observations From The Correlation Plot

As seen above, there is a strong positive correlation between consumption and real gross domestic product. A positive correlation implies a procyclical relationship between the two variables. This is consistent with our observations of procyclical behavior during a visual inspection of Real Personal Consumption superimposed on the reference series.

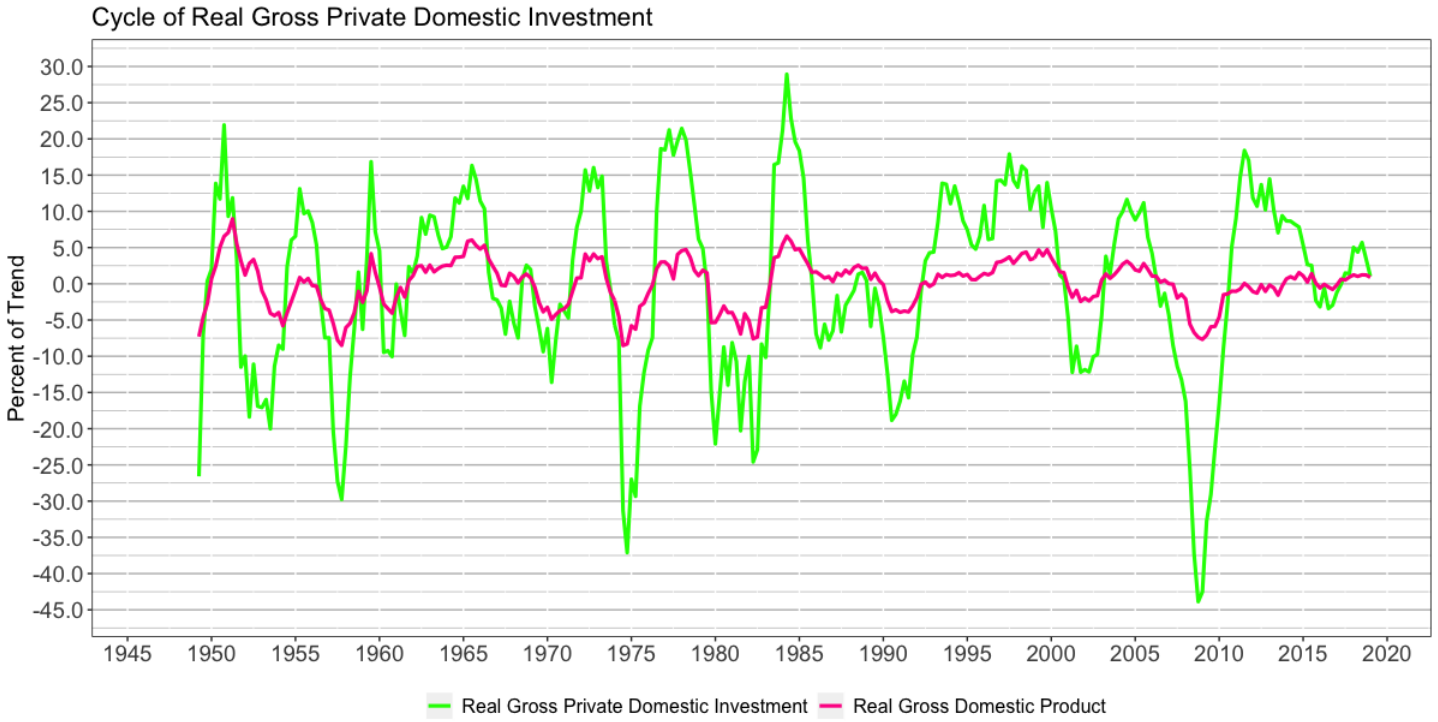


Conclusion

Real Gross Domestic Product & Real Personal Consumption Expenditures are procyclical, have a high degree of correlation, and RGDP appears to lag behind consumption. This is conducive with economic theory, and makes sense that changes in consumption would occur after changes in economic activity. The specific theory that is conducive to this belief is the simplified model of macroeconomic activity known as the circular flow model.

National Income and Product Accounts

(Real Gross Private Domestic Investment)



Hamilton Regression cycles (H = 8 , P = 4) using data retrieved from FRED, Federal Reserve Bank of St. Louis, Series IDs = GPDIC1 and GDPC1

Observations

Real Gross Private Investment appears to slightly lead RGDP, as well as showing signs of a procyclical relationship due to peaks in both the reference series as well as Investment appear to happen at the same time. (Taking its slight lead into account.)

Implications

The procyclical relationship between Investment and the reference series implies a positive correlation between the two variables over time.

Cyclical Comparision of Investment to RGDP

Peaks			Troughs		
Investment	**RGDP**	**Lead/Lag**	**Investment**	**RGDP**	**Lead/Lag**
(Q2) 1951	(Q4) 1951	+2	(Q1) 1954	(Q4) 1954	+3
(Q4) 1955	(Q2) 1956	+2	(Q2) 1958	(Q2) 1958	0
(Q1) 1960	(Q1) 1960	0	(Q2) 1961	(Q2) 1961	0
(Q1) 1966	(Q1) 1966	0	(Q4) 1970	(Q4) 1970	0
(Q2) 1973	(Q2) 1973	0	(Q2) 1975	(Q2) 1975	0
(Q3) 1978	(Q4) 1978	+1	(Q4) 1982	(Q1) 1983	+1
(Q4) 1984	(Q4) 1984	0	(Q2) 1991	(Q1) 1992	+2
(Q1) 1998	(Q2) 2000	+9	(Q4) 2002	(Q4) 2002	0
(Q1) 2005	(Q1) 2006	+4	(Q2) 2009	(Q3) 2009	+1
(Q2) 2012	-	-	-	-	-
Average Lead/Lag		+2			+0.78

Leads and Lags measured in quarters (+ = lead) (- =lag)

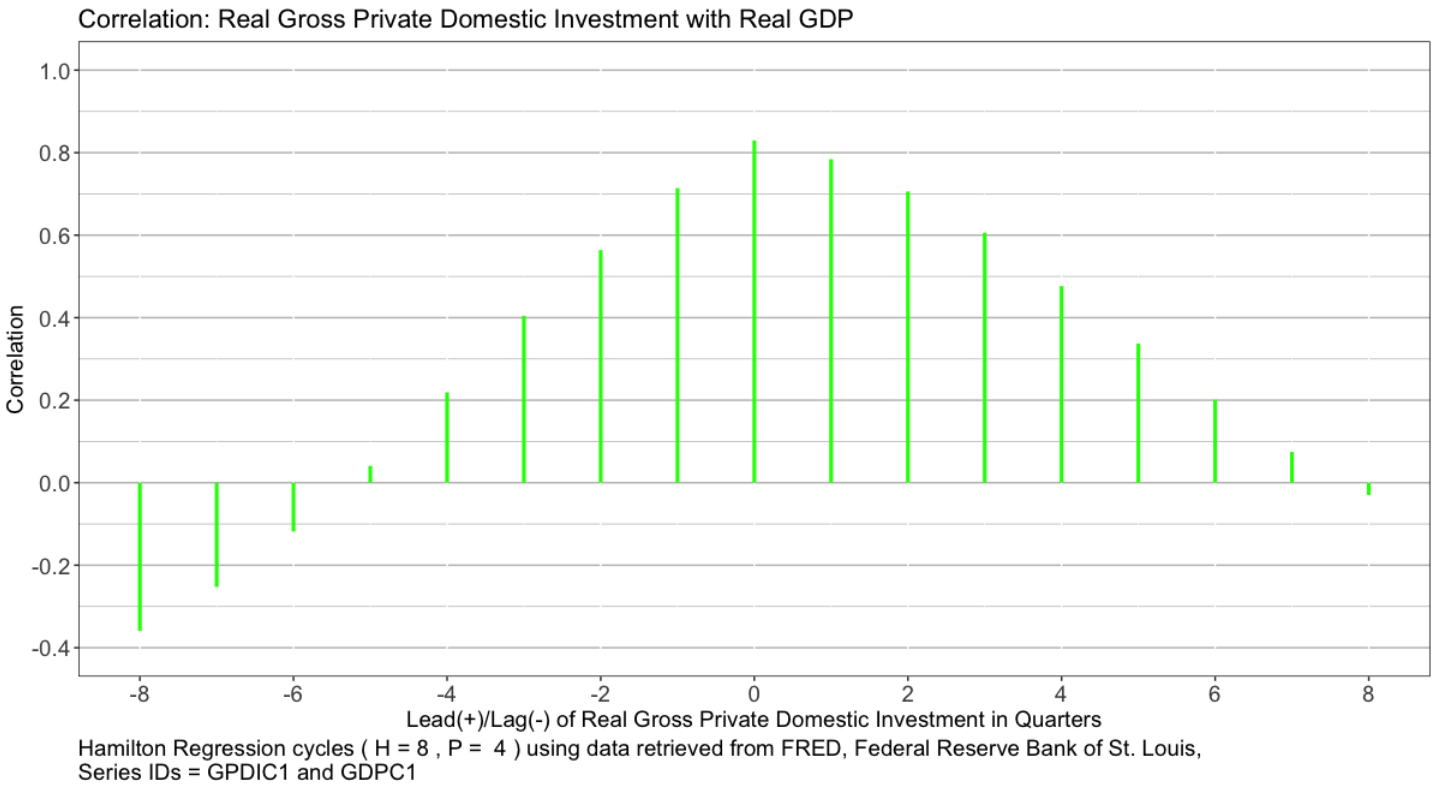
Data is collected from the Federal Reserve Bank of St. Louis, Series ID's = GPDIC1 & GDPC1

Gross private domestic investment

The measure of physical investment used in computing GDP in the measurement of nations' economic activity. This is an important component of GDP because it provides an indicator of the future productive capacity of the economy. It includes replacement purchases plus net additions to capital assets plus investments in inventories.

National Income and Product Accounts

(Real Gross Private Domestic Investment)



Observations & Implications

According to the correlation plot, there appears to be a strong positive correlation between Real Gross Private Domestic Investment with Real Gross Domestic Product, which implies that the two variables are procyclical. Procyclical variables have positive correlations, so our observations between these two series are theoretically sound.

Theory

It makes logical sense that Investment will lead Real Gross Domestic Product. In order for businesses or individuals to fund their ventures, they first need capital in order to take their first steps. Labor is also very important, however our focus is on capital being invested, specifically capital in terms of dollars.

Gross private domestic investment includes 3 types of investment:

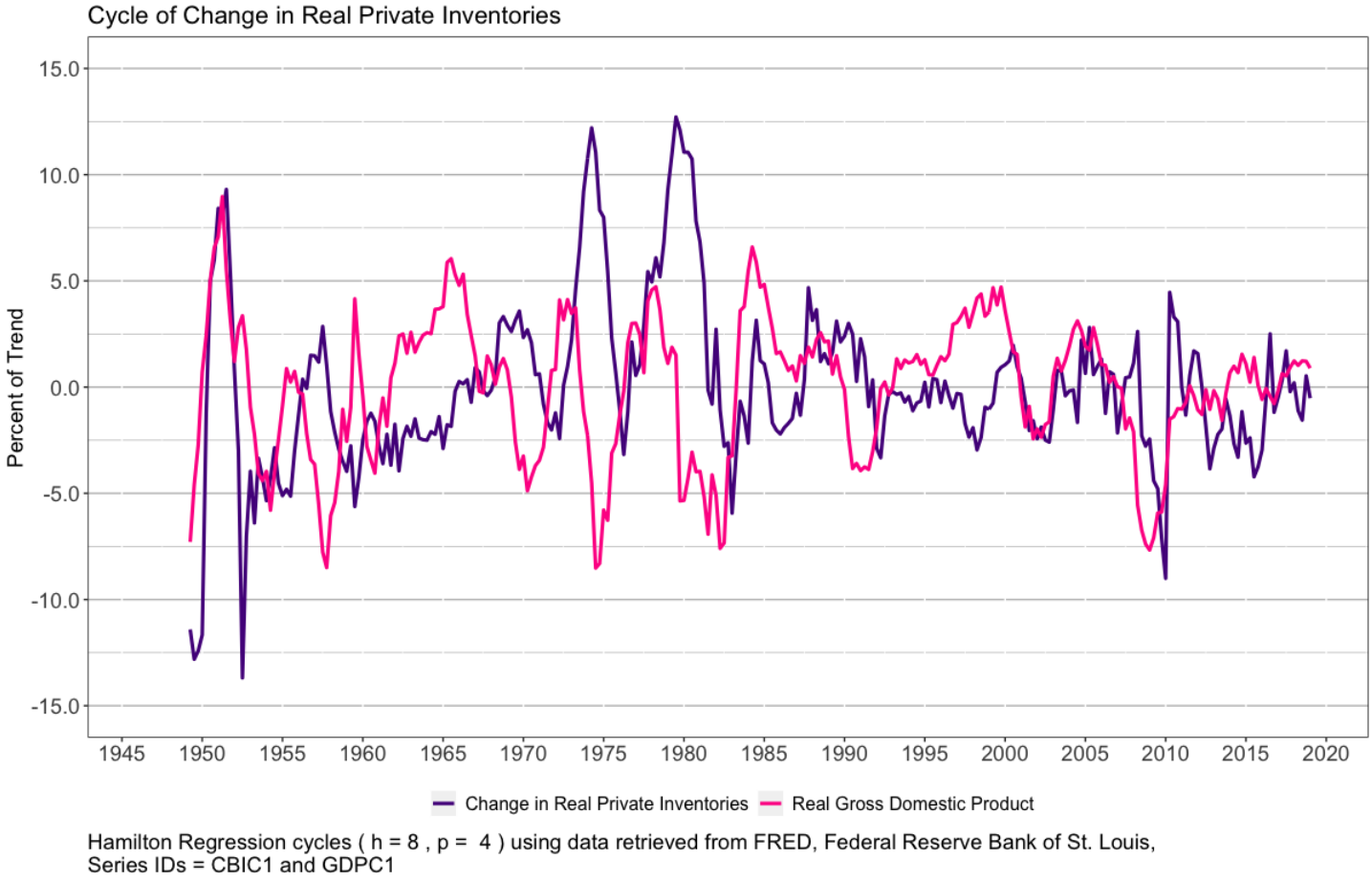
1) Non-residential investment: Expenditures by firms on capital such as tools, machinery, and factories.

2) Residential Investment: Expenditures on residential structures and residential equipment that is owned by landlords and rented to tenants.

3) Change in inventories (or stocks): The change of firm inventories in a given period.

National Income and Product Accounts

(Change in Real Private Inventories CBIC1)



Hamilton Regression cycles (h = 8 , p = 4) using data retrieved from FRED, Federal Reserve Bank of St. Louis, Series IDs = CBIC1 and GDPC1

Definition:
The increase or decrease in the stocks of final goods, intermediate goods, raw materials, and other inputs that businesses keep on hand to use in production.

Cyclical Comparision of Change in Real Private Inventories to RGDP

Peaks			Troughs		
Inventories	RGDP	Lead/Lag	Inventories	RGDP	Lead/Lag
(Q1) 1952	(Q4) 1951	-1	(Q1) 1953	(Q4) 1954	+7
(Q1) 1958	(Q2) 1956	-7	(Q1) 1960	(Q2) 1958	-7
(Q2) 1970	(Q1) 1960	-5	(Q4) 1972	(Q2) 1961	-46
(Q4) 1974	(Q1) 1966	-35	(Q4) 1976	(Q4) 1970	-24
(Q1) 1980	(Q2) 1973	-28	(Q3) 1983	(Q2) 1975	-33
(Q1) 1985	(Q4) 1978	-26	(Q3) 1986	(Q1) 1983	-14
(Q2) 1988	(Q4) 1984	-15	(Q4) 1992	(Q1) 1992	-3
(Q1) 2001	(Q2) 2000	-3	(Q2) 2003	(Q4) 2002	-2
(Q4) 2008	(Q1) 2006	-11	(Q3) 2010	(Q3) 2009	-4
(Q2) 2011	-	-	(Q1) 2016	-	-
Average Lead/Lag		-14.55			-14

Leads and Lags measured in quarters (+ = lead) (- =lag)

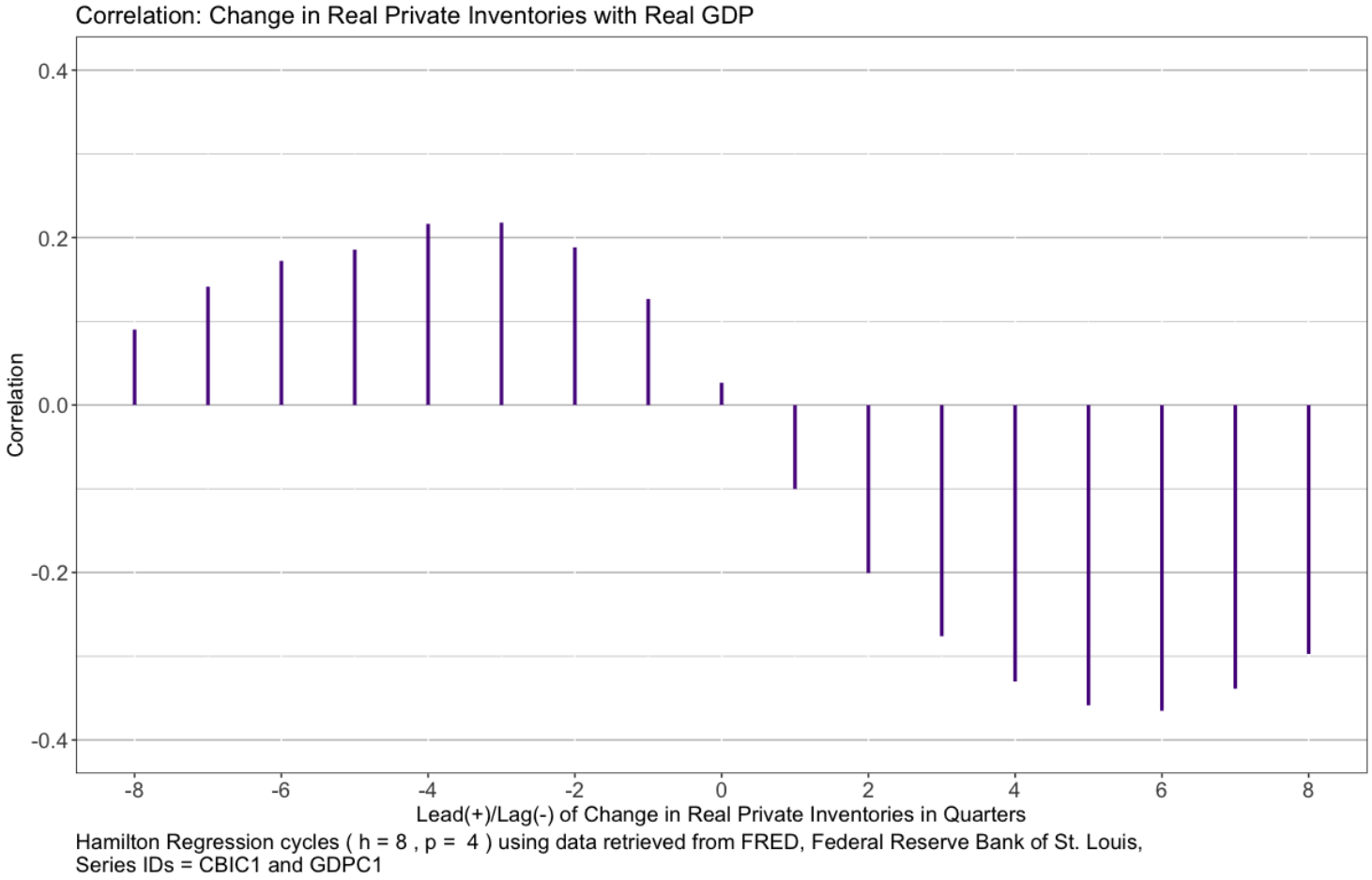
Data is collected from the Federal Reserve Bank of St. Louis, Series ID's = CBIC1 & GDPC1

The Change in Real Private Inventories at a first glance appears to be **coincident in the beginning** of the series. But as time progresses, Changes in Real Private Inventories **appears to be procyclical** with Real Gross Domestic Product in the middle of the series, however the two begin to show an **ever-increasing countercyclical relationship as time goes on**. The increasing countercyclical relationship implies negative correlation between the two variables.

Another thing to take note of is how the lag increases, then ends up decreasing closer to the end of the time series.

National Income and Product Accounts

(Change in Real Private Inventories CBIC1)



Observations & Implications

According to the correlation plot, there appears to be a positive correlation in beginning. This implies a procyclical relationship (which can be seen when comparing the two series). However, an ever-increasing negative correlation that is seen at the end implies a countercyclical relationship between the two series. The positive correlation in the beginning of the series is weak, wheras the negative correlation appears to have twice the "strength".

Theory

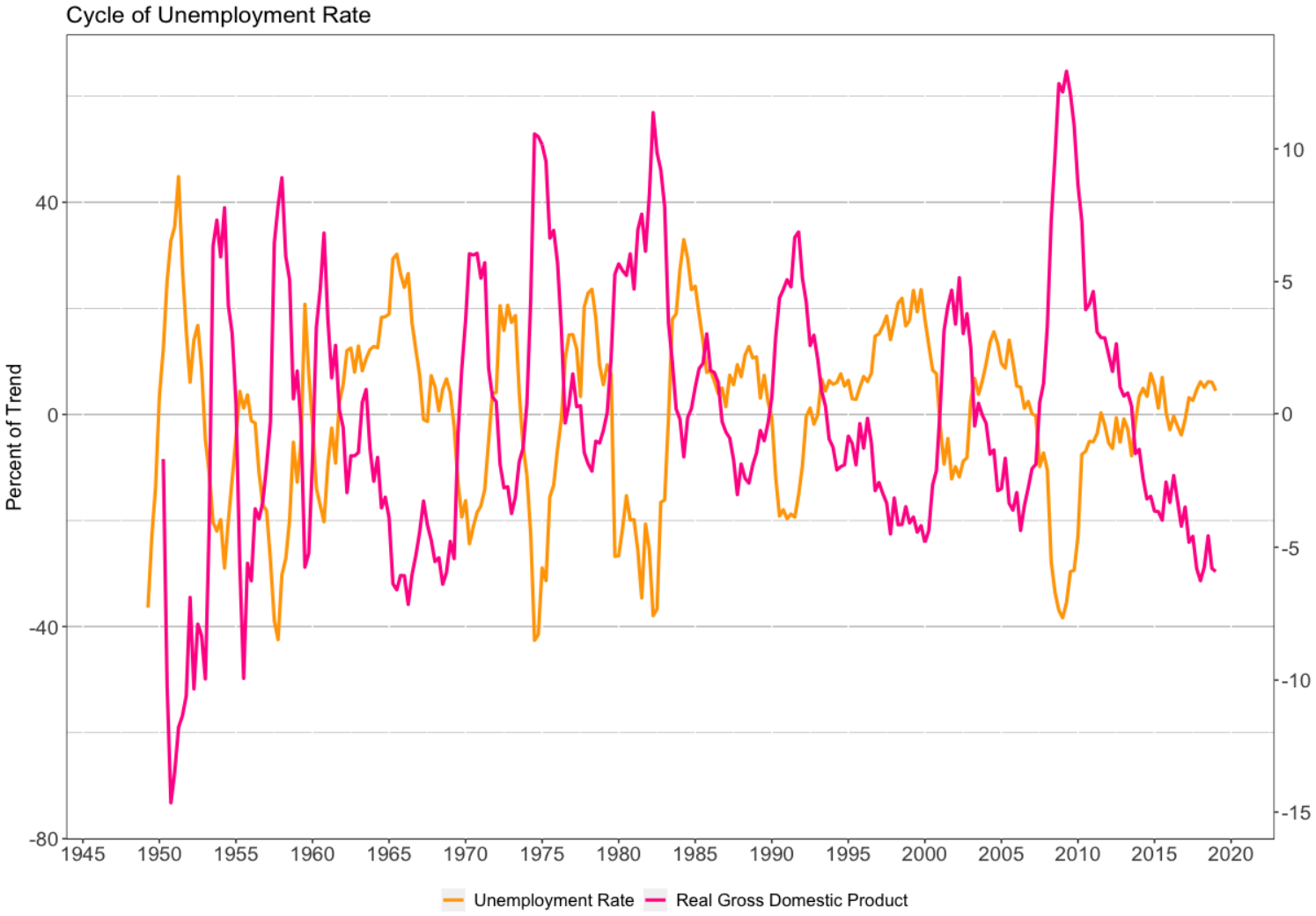
It makes sense that inventories will "stack"(increase) as RGDP decreases, and that it lags behind RGDP due to modern macroeconomic theory.

Key Information

Changes in inventories reflects the business sectors' stocks of finished products, intermediate goods, raw materials, and other inputs that businesses keep on hand to use in production. Inventories also include final goods that have been produced but remain unsold.

Employment

(Civilian Unemployment Rate UNRATE)



Hamilton Regression cycles (h = 8 , p = 4) using data retrieved from FRED, Federal Reserve Bank of St. Louis, Series IDs = UNRATE and GDPC1

Definition

The number of **unemployed** people **divided by** the **total size of the labor force**, expressed as a percentage. People who are jobless, looking for jobs, and available for work are considered unemployed. The labor force is defined as people who are either employed or unemployed.

Cyclical Comparision of Civilian Unemployment Rate to RGDP

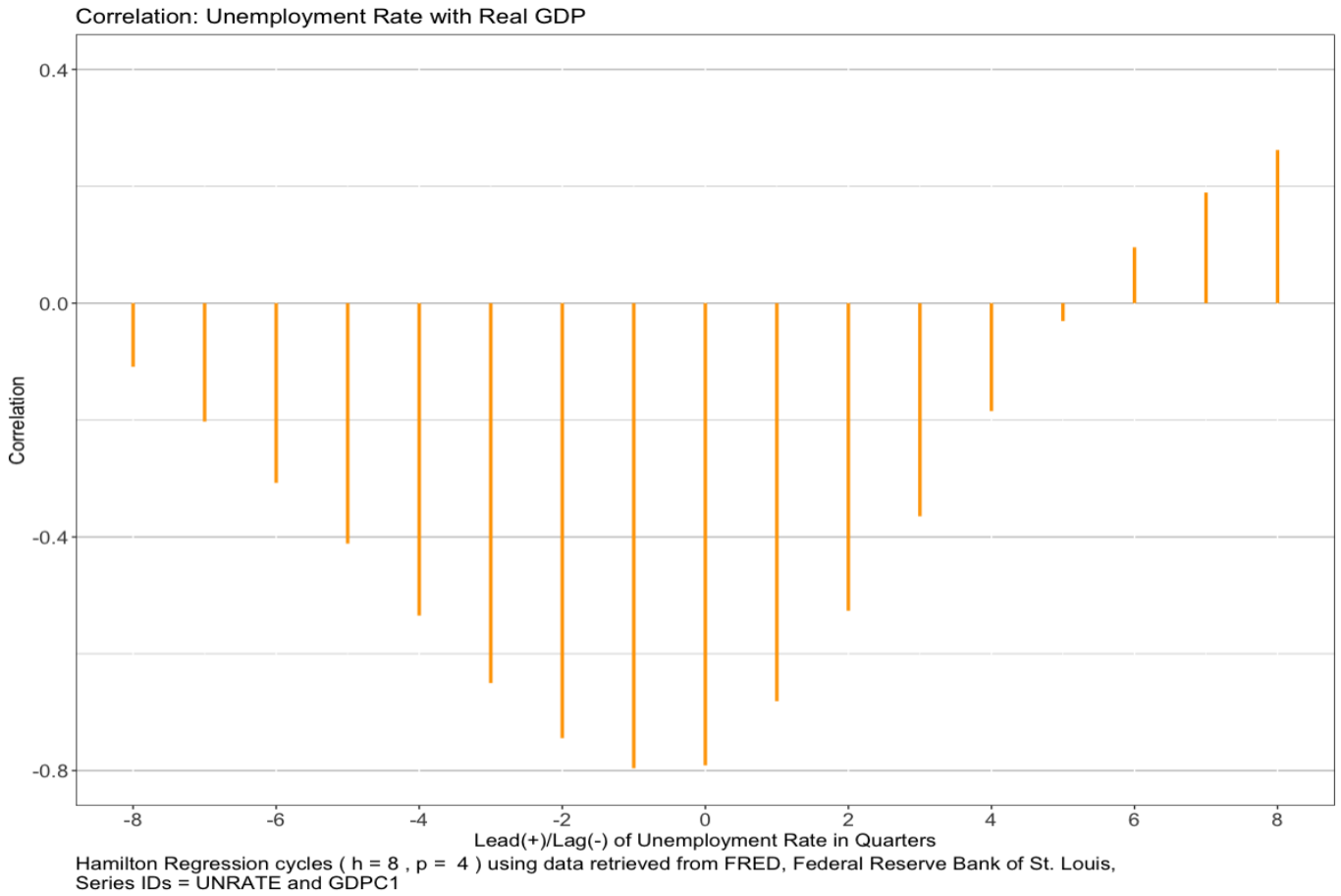
Peaks			Troughs		
Unemployment	**RGDP**	**Lead/Lag**	**Unemployment**	**RGDP**	**Lead/Lag**
-	(Q4) 1951	-	(Q2) 1951	(Q4) 1954	+10
(Q4) 1954	(Q2) 1956	+6	(Q1) 1956	(Q2) 1958	+9
(Q3) 1958	(Q1) 1960	+6	(Q2) 1960	(Q2) 1961	+4
(Q2) 1961	(Q1) 1966	+19	(Q4) 1966	(Q4) 1970	+16
(Q2) 1971	(Q2) 1973	+8	(Q3) 1973	(Q2) 1975	+7
(Q1) 1975	(Q4) 1978	+11	(Q4) 1978	(Q1) 1983	+17
(Q4) 1982	(Q4) 1984	+8	(Q4) 1988	(Q1) 1992	+13
(Q2) 1992	(Q2) 2000	+32	(Q3) 2000	(Q4) 2002	+7
(Q4) 2002	(Q1) 2006	+13	(Q4) 2006	(Q3) 2009	+11
(Q4) 2009	-	-	-	-	-
Average Lead/Lag		+12.88			+10.44

Leads and Lags measured in quarters (+ = lead) (- =lag)

Data is collected from the Federal Reserve Bank of St. Louis, Series ID's = UNRATE & GDPC1

Employment

(Civilian Unemployment Rate UNRATE)



Observations & Implications

According to the correlation plot, there is a very strong negative correlation between Civilian Unemployment rate and Real Gross Domestic Product.

A negative correlation implies a countercyclical relationship between the reference cycle (RGDP) and the Unemployment rate.

As seen on the peak/trough table, it is obvious that the unemployment rate leads real gross domestic product.

A low unemployment rate usually suggests strengthening economic growth. And conversely, a high unemployment rate usually suggests weakening economic conditions.

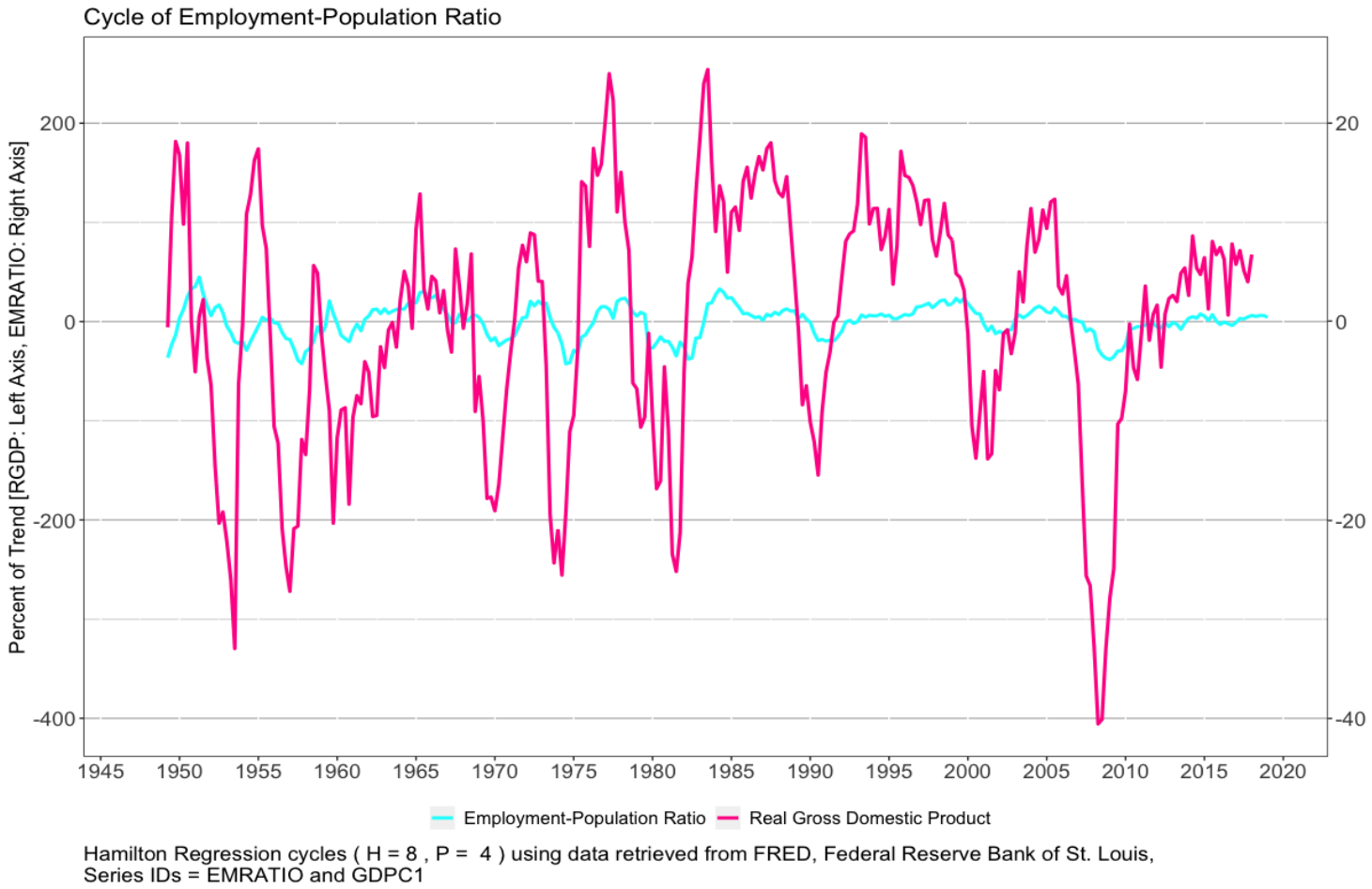
Historically, a trough in the unemployment rate also tends to be a predictor of a business recession.

Disclaimer, not to be confused with participation rate.

The participation rate and unemployment rate are economic metrics used to gauge the health of the U.S. job market. The key difference between the two indicators is the participation rate measures the percentage of Americans who are in the labor force, while the unemployment rate measures the percentage within the labor force that is currently without a job.

Employment

(Civilian Employment Population Ratio)



Hamilton Regression cycles (H = 8 , P = 4) using data retrieved from FRED, Federal Reserve Bank of St. Louis, Series IDs = EMRATIO and GDPC1

What Is the Employment-to-Population Ratio?

The employment-to-population ratio is a macroeconomic statistic that measures the civilian labor force currently employed to the total working age population of a region, municipality, or country. It is calculated by dividing the number of people employed by the total number of people of working age, and it is used as a metric of labor and unemployment.

Cyclical Comparision of Civilian Employment-Population Ratio to RGDP

Peaks			Troughs		
Emp/Pop	RGDP	Lead/Lag	Emp/Pop	RGDP	Lead/Lag
(Q1) 1951	(Q4) 1951	+3	(Q1) 1954	(Q4) 1954	+3
(Q3) 1955	(Q2) 1956	+3	(Q3) 1957	(Q2) 1958	+3
(Q1) 1959	(Q1) 1960	+4	(Q2) 1961	(Q2) 1961	0
(Q4) 1965	(Q1) 1966	+1	(Q3) 1970	(Q4) 1970	+1
(Q1) 1973	(Q2) 1973	+1	(Q4) 1974	(Q2) 1975	+2
(Q4) 1977	(Q4) 1978	+4	(Q1) 1982	(Q1) 1983	+4
(Q1) 1984	(Q4) 1984	+3	(Q1) 1991	(Q1) 1992	+4
(Q1) 1994	(Q2) 2000	+26	(Q4) 2001	(Q4) 2002	+5
(Q1) 2006	(Q1) 2006	0	(Q4) 2008	(Q3) 2009	+3
	-	-	-	-	-
Average Lead/Lag		+5			+2.89

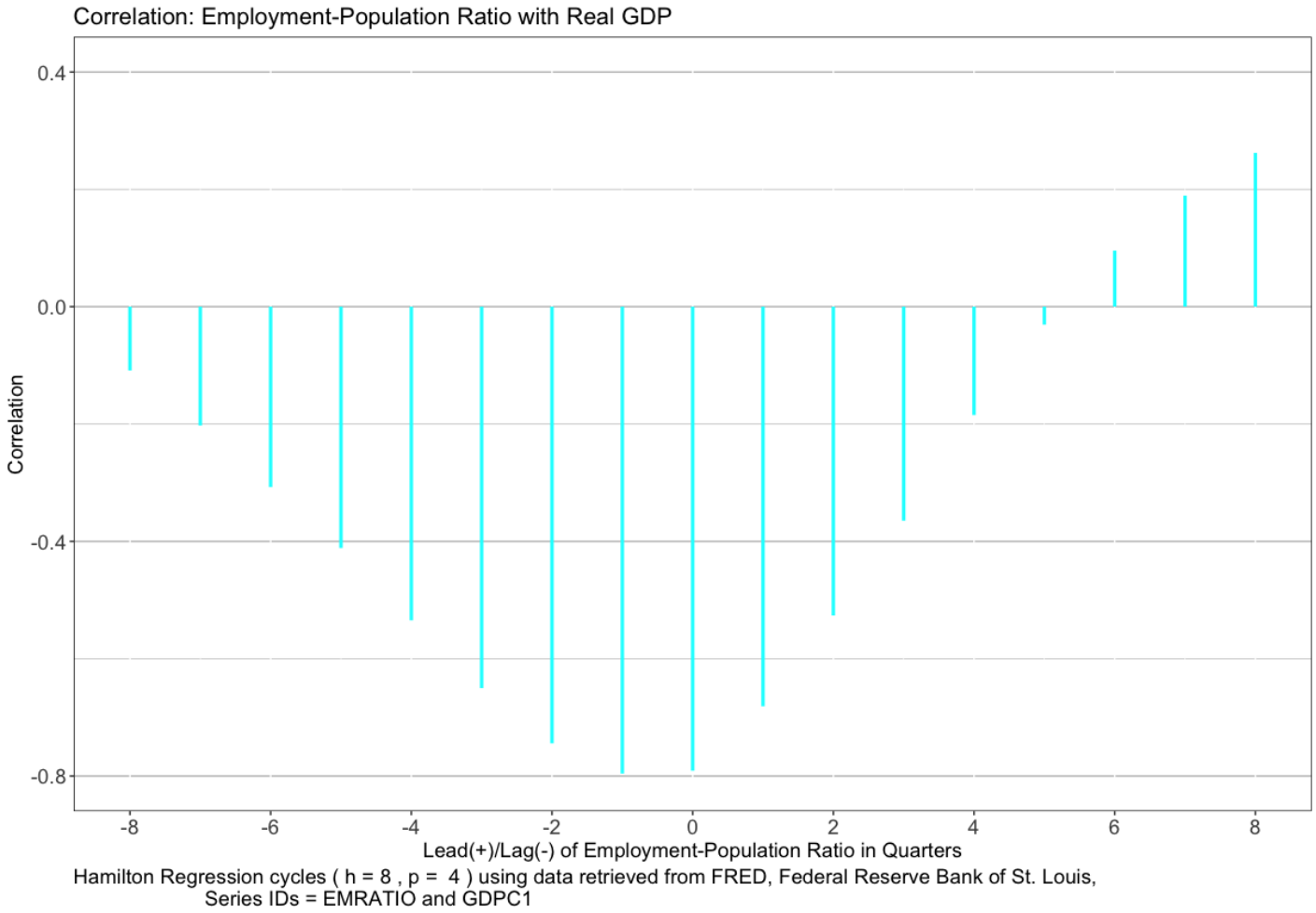
Leads and Lags measured in quarters (+ = lead) (- =lag)

Data is collected from the Federal Reserve Bank of St. Louis, Series ID's = EMRATIO & GDPC1

Understanding the Employment-to-Population Ratio Compared with other metrics: The employment-to-population ratio is not as affected by seasonal variations or short-term fluctuations in the labor market. It is often considered to be a more reliable indicator of job shrinkage or growth than the unemployment number in particular.

Employment

(Civilian Employment Population Ratio)



According to the correlation plot, there is a strong negative correlation between Employment-Population-Ratio and Real Gross Domestic Product.

A negative correlation implies a countercyclical relationship between the reference cycle (RGDP) and the Employment-Population Ratio.

As seen on the peak/trough table, it is obvious that employment-population ratio consistently leads real gross domestic product, and is increasing slightly over time.

This measure is similar to the labor force participation rate, which measures the total labor force, not just the part of the labor force already employed, divided by the total population.

$$\text{Employment-Population Ratio} = \frac{\text{Labor Force Employed}}{\text{Total Population}}$$

Key Facts

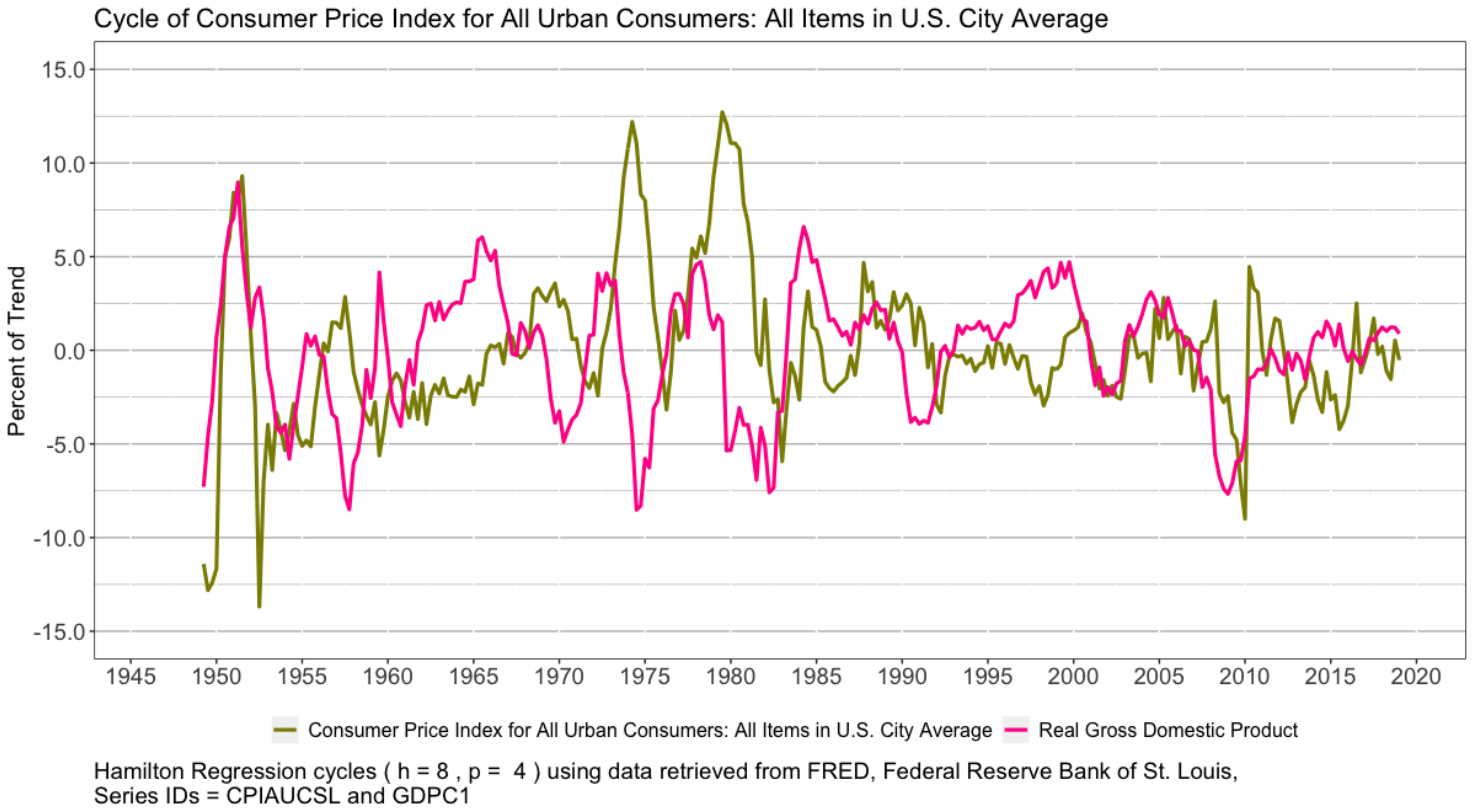
1) The civilian labor force includes employed and non-employed people and excludes military personnel, federal government employees, retirees, disabled persons, and some others.

2) Seasonal variations and short-term labor fluctuations do not affect the employment-to-population ratio.

3) Unlike the unemployment rate, the employment-to-population ratio includes unemployed people not looking for jobs.

Prices

(Consumer Price Index for All Urban Consumers: All Items CPIAUCSL)



Hamilton Regression cycles (h = 8 , p = 4) using data retrieved from FRED, Federal Reserve Bank of St. Louis, Series IDs = CPIAUCSL and GDPC1

The Consumer Price Index for All Urban Consumers

CPIAUCSL is a measure of the average monthly change in the price for goods and services paid by urban consumers between any two time periods. It can also represent the buying habits of urban consumers. This particular index includes roughly 88 percent of the total population, accounting for wage earners, clerical workers, technical workers, self-employed, short-term workers, unemployed, retirees, and those not in the labor force.

Cyclical Comparision of Consumer Price Index to RGDP

Peaks			Troughs		
CPI	RGDP	Lead/Lag	CPI	RGDP	Lead/Lag
(Q1) 1952	(Q4) 1951	-1	(Q1) 1953	(Q4) 1954	+8
(Q1) 1958	(Q2) 1956	-6	(Q1) 1960	(Q2) 1958	-7
(Q2) 1970	(Q1) 1960	-42	(Q4) 1972	(Q2) 1961	-42
(Q4) 1974	(Q1) 1966	-31	(Q4) 1976	(Q4) 1970	-24
(Q1) 1980	(Q2) 1973	-27	(Q3) 1983	(Q2) 1975	-31
(Q2) 1988	(Q4) 1978	-38	(Q4) 1992	(Q1) 1983	-33
(Q3) 1995	(Q4) 1984	-43	(Q4) 1998	(Q1) 1992	-25
(Q1) 2001	(Q2) 2000	-3	(Q2) 2003	(Q4) 2002	-2
(Q4) 2008	(Q1) 2006	-12	(Q1) 2016	(Q3) 2009	-34
	-	-	-	-	-
Average Lead/Lag		-22.56			-21.11

Leads and Lags measured in quarters (+ = lead) (- =lag)

Data is collected from the Federal Reserve Bank of St. Louis, Series ID's = CPIAUCSL & GDPC1

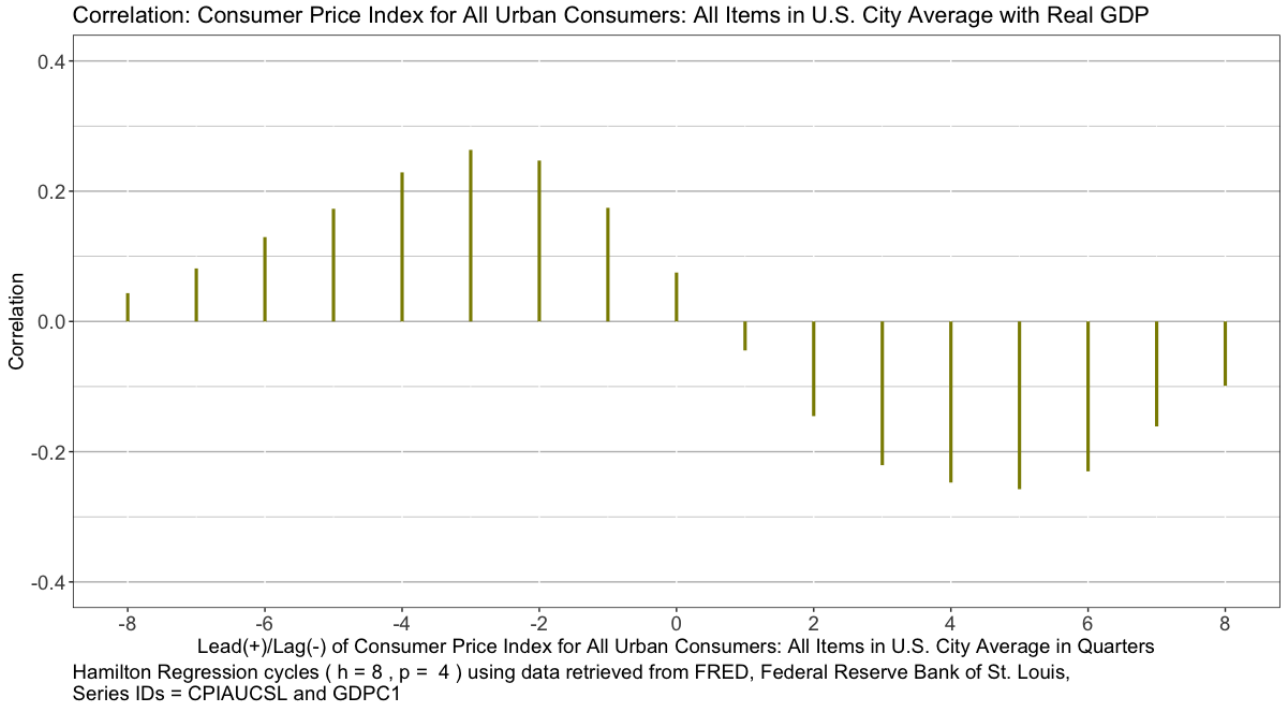
Key Information

The CPI can be used to recognize periods of inflation and deflation. Significant increases in the CPI within a short time frame might indicate a period of inflation, and significant decreases in CPI within a short time frame might indicate a period of deflation. However, because the CPI includes volatile food and oil prices, it might not be a reliable measure of inflationary and deflationary periods.

Prices

(Consumer Price Index for All Urban Consumers: All Items CPIAUCSL)

1947 - 1979

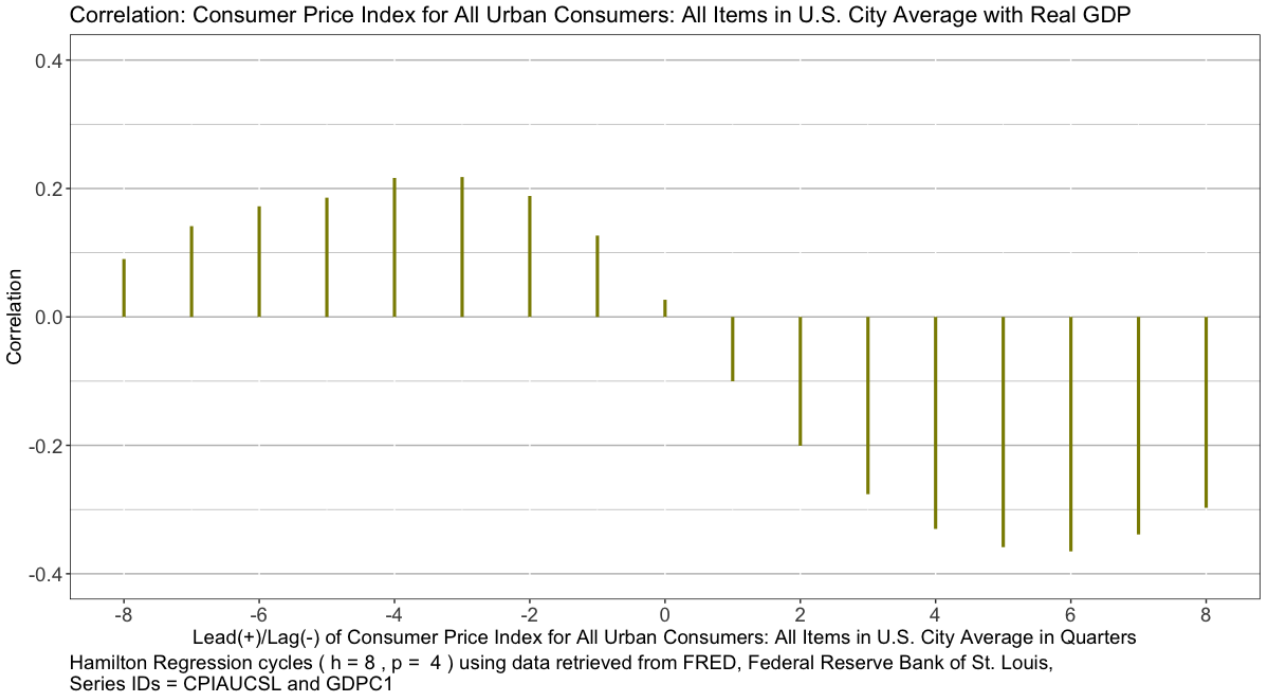


As seen in the peak/trough table, there is a significant lag between the Consumer Price Index and Real Gross Domestic Product. The Consumer Price Index consistently lags on average approximately 20 quarters behind Real Gross Domestic Product.

The correlation plots show a slightly positive correlation between both correlation plots (Plot 1 using years 1947-1979) & (Plot 2 using years 1979-2019). The positive correlation implies a procyclical relationship between the two variables.

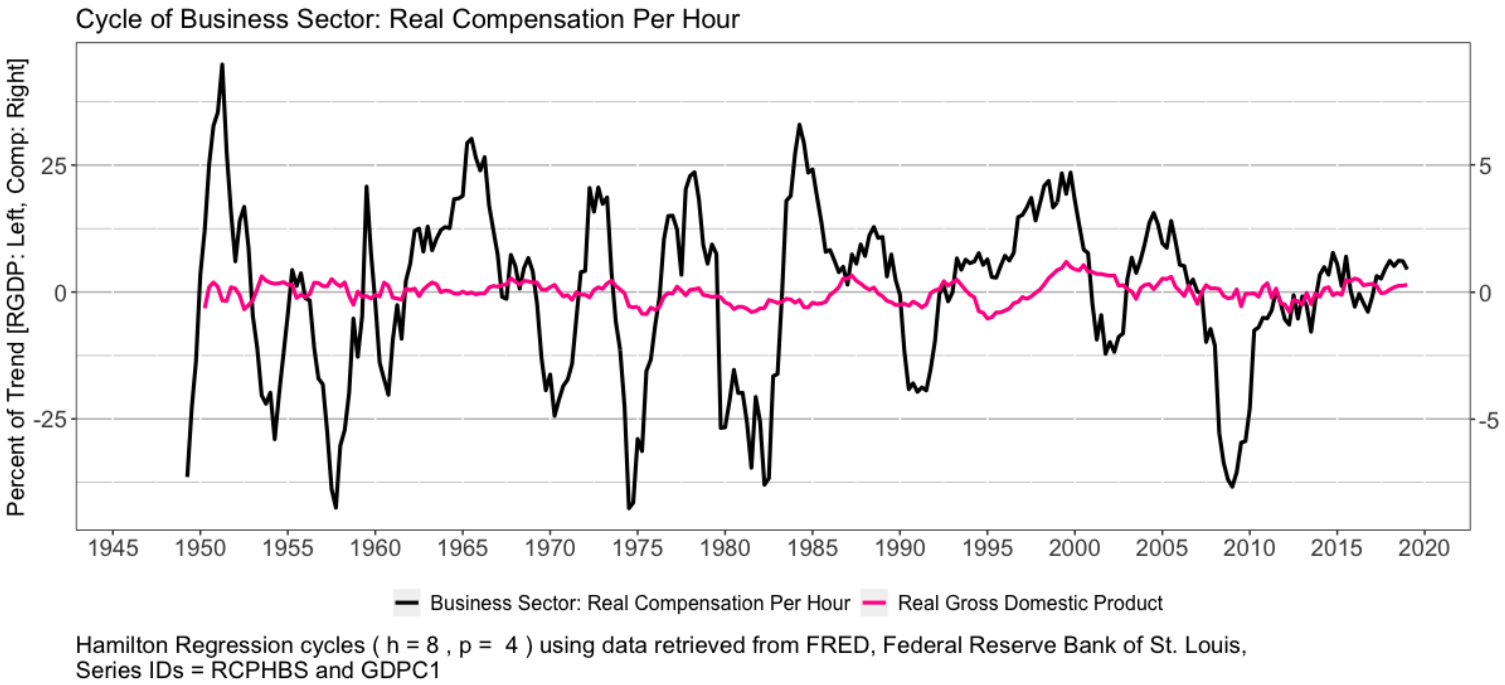
However, negative correlation appears to be stronger in later years. (As seen on the lower graph). Negative correlations imply a countercyclical relationship between the variables.

1979 - 2019



Wages

(Business Sector: Real Compensation Per Hour RCPHBS)



Hamilton Regression cycles (h = 8 , p = 4) using data retrieved from FRED, Federal Reserve Bank of St. Louis, Series IDs = RCPHBS and GDPC1

Definition

Indexes of compensation per hour for major sectors measure the compensation of employees and the self-employed divided by hours worked by all persons engaged in the sector. Real compensation per hour reflects the adjustment of hourly compensation for changes in consumer prices.

Cyclical Comparision of Real Compensation per hour to RGDP

Peaks			Troughs		
Compensation	**RGDP**	**Lead/Lag**	**Compensation**	**RGDP**	**Lead/Lag**
(Q2) 1951	(Q4) 1951	+2	(Q1) 1953	(Q4) 1954	+7
(Q1) 1958	(Q2) 1956	-7	(Q2) 1959	(Q2) 1958	-4
(Q2) 1968	(Q1) 1960	-30	(Q4) 1971	(Q2) 1961	-42
(Q1) 1974	(Q1) 1966	-32	(Q1) 1976	(Q4) 1970	-23
(Q1) 1979	(Q2) 1973	-23	(Q1) 1982	(Q2) 1975	-27
(Q4) 1987	(Q4) 1978	-36	(Q4) 1991	(Q1) 1983	-35
(Q4) 1993	(Q4) 1984	-36	(Q3) 1995	(Q1) 1992	-14
(Q2) 2000	(Q2) 2000	0	(Q1) 2004	(Q4) 2002	-5
(Q1) 2006	(Q1) 2006	0	(Q4) 2012	(Q3) 2009	-13
(Q3) 2016	-	-	-	-	-
Average Lead/Lag		-18			-17.33

Leads and Lags measured in quarters (+ = lead) (- =lag)

Data is collected from the Federal Reserve Bank of St. Louis, Series ID's = RCPHBS & GDPC1

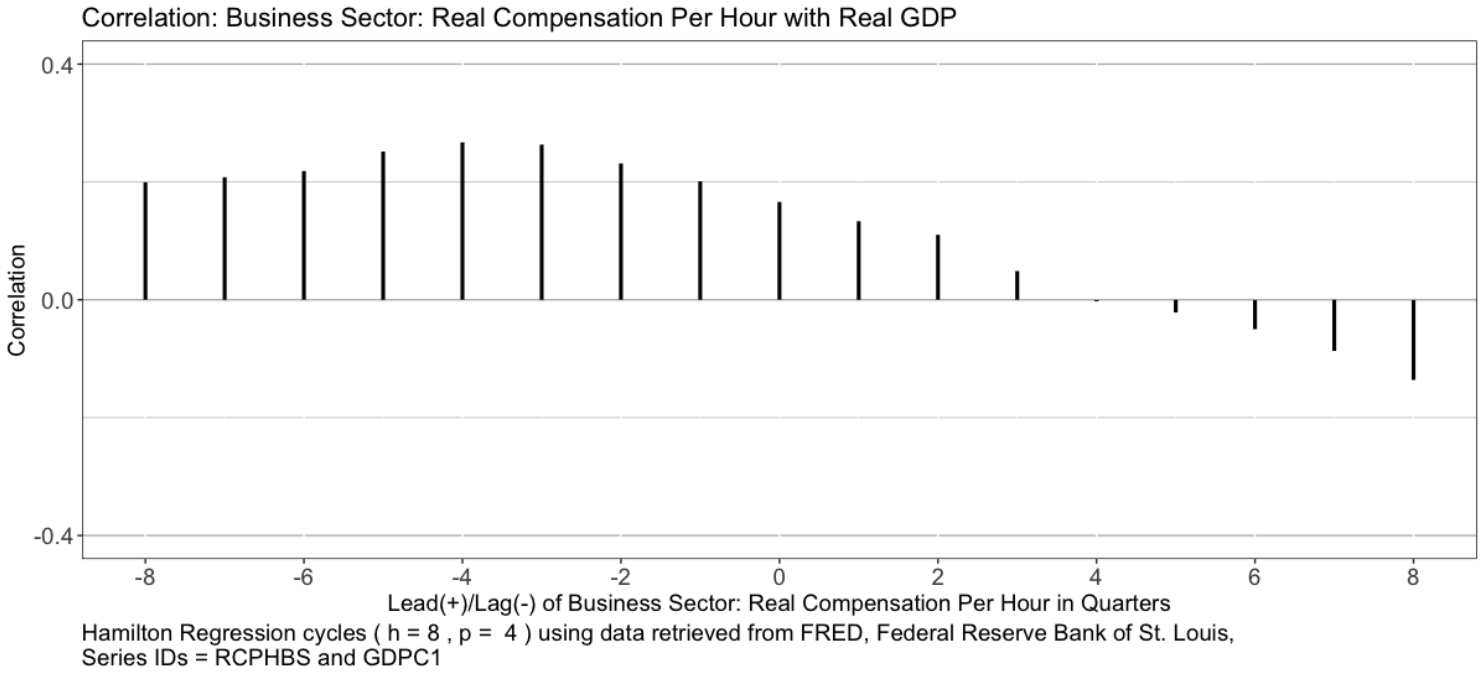
Observations & Implications

According to the peak/trough table above, Real Compensation per hour lags significantly behind Real Gross Domestic Product.

When visually comparing Real Compensation per hour and Real Gross Domestic Product, it may be difficult trying to identify whether the two variables are procyclical or not, but when lag is taken account of (mentally speaking), one can easily see that peaks for the reference series line up with peaks for the comparison series, and likewise for their troughs. However at the end it becomes more difficult to do so, and suspicions arise of a countercyclical relationship between RGDP and Compensation, which would imply a negative correlation.

Wages

(Business Sector: Real Compensation Per Hour RCPHBS)



Correlation Plot Analysis

According to the correlation plot, Real Constipation Per Hour has a positive correlation with Real Gross Domestic Product. A positive correlation implies a procyclical relationship between Real Gross Domestic Product and Real Compensation Per Hour.

Despite the correlation being a weak-positive one, it is still possible to identify a procyclical relationship without using the correlation plot, however another plausible explanation could be that the two cycles have an acyclical relationship, where there is no correlation, and that could be a valid argument too. However the correlation plot helps us draw more accurate conclusions.

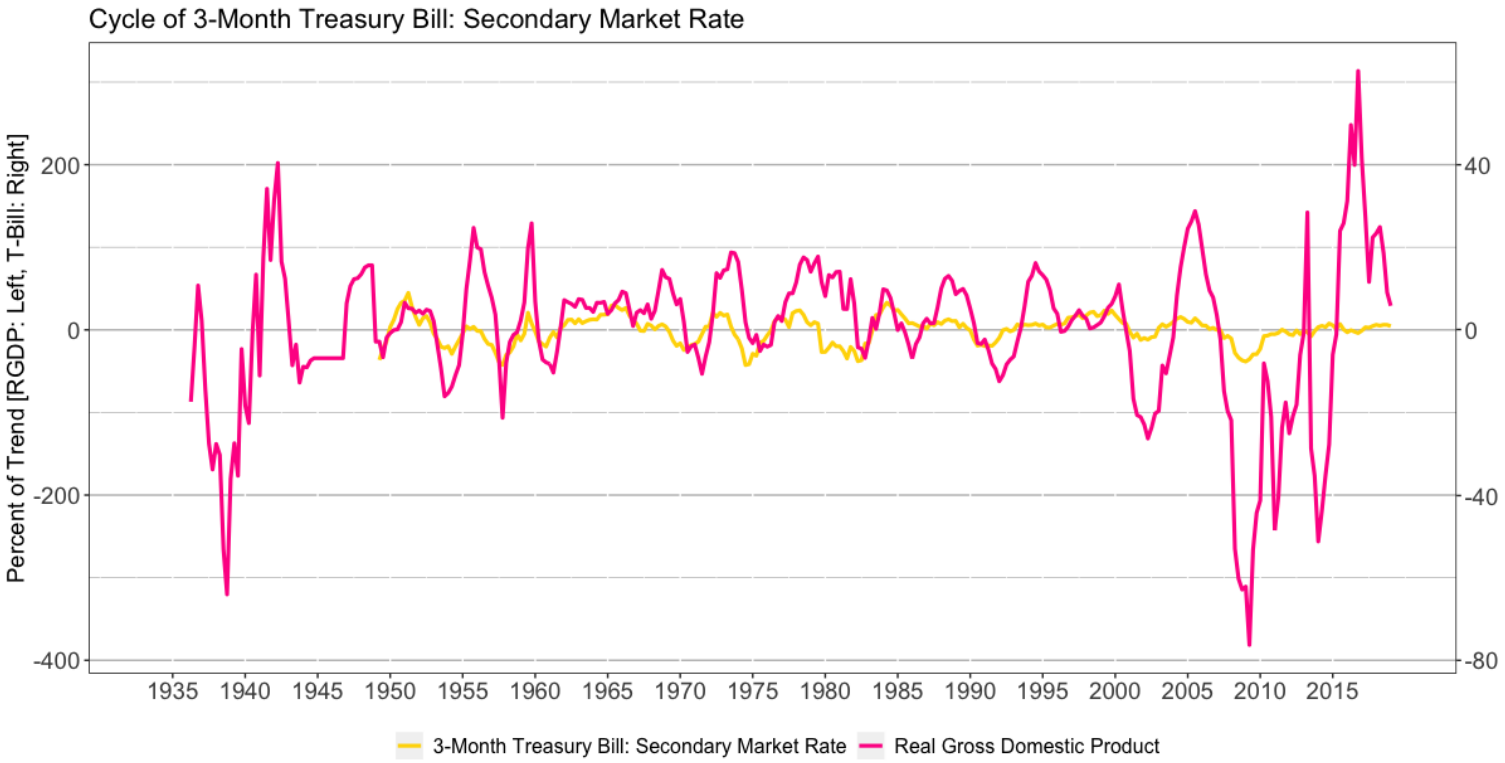
Real Compensation Per Hour not increasing at the same rate as productivity

As seen on the correlation above, Real Compensation per hour increases as RGDP increases, however as time progresses, it is not the case anymore. This is supported with modern economic theory.

According to the Bureau of Labor Statistics, Since 1973, hourly compensation of the vast majority of American workers has not risen in line with economy-wide productivity. In fact, hourly compensation has almost stopped rising *at all*. Net productivity grew 72.2 percent between 1973 and 2014. Yet inflation-adjusted hourly compensation of the median worker rose just 8.7 percent, or 0.20 percent annually, over this same period, with essentially all of the growth occurring between 1995 and 2002.

Interest Rates

(Nominal 3- Month Treasury Bill: Secondary Market Rate TB3MS)



Hamilton Regression cycles (h = 8 , p = 4) using data retrieved from FRED, Federal Reserve Bank of St. Louis, Series IDs = TB3MS and GDPC1

Cyclical Comparision of Secondary Market rate of 3-Month Treasury Bills to RGDP

Peaks			Troughs		
T-Bill	**RGDP**	**Lead/Lag**	**T-Bill**	**RGDP**	**Lead/Lag**
(Q4) 1942	(Q4) 1951	+36	(Q2) 1944	(Q4) 1954	+42
(Q2) 1949	(Q2) 1956	+28	(Q2) 1954	(Q2) 1958	+16
(Q2) 1960	(Q1) 1960	-1	(Q4) 1961	(Q2) 1961	-2
(Q2) 1969	(Q1) 1966	-11	(Q1) 1972	(Q4) 1970	-5
(Q2) 1974	(Q2) 1973	-4	(Q1) 1976	(Q2) 1975	-3
(Q1) 1980	(Q4) 1978	-5	(Q2) 1983	(Q1) 1983	-2
(Q3) 1984	(Q4) 1984	+1	(Q3) 1986	(Q1) 1992	+22
(Q1) 1989	(Q2) 2000	+45	(Q3) 1992	(Q4) 2002	+41
(Q1) 1995	(Q1) 2006	+44	(Q4) 2002	(Q3) 2009	+29
(Q1) 2006	-	-	(Q4) 2009	-	-
Average Lead/Lag		+14.78			+15.33

Leads and Lags measured in quarters (+ = lead) (- =lag)

Data is collected from the Federal Reserve Bank of St. Louis, Series ID's = TB3MS & GDPC1

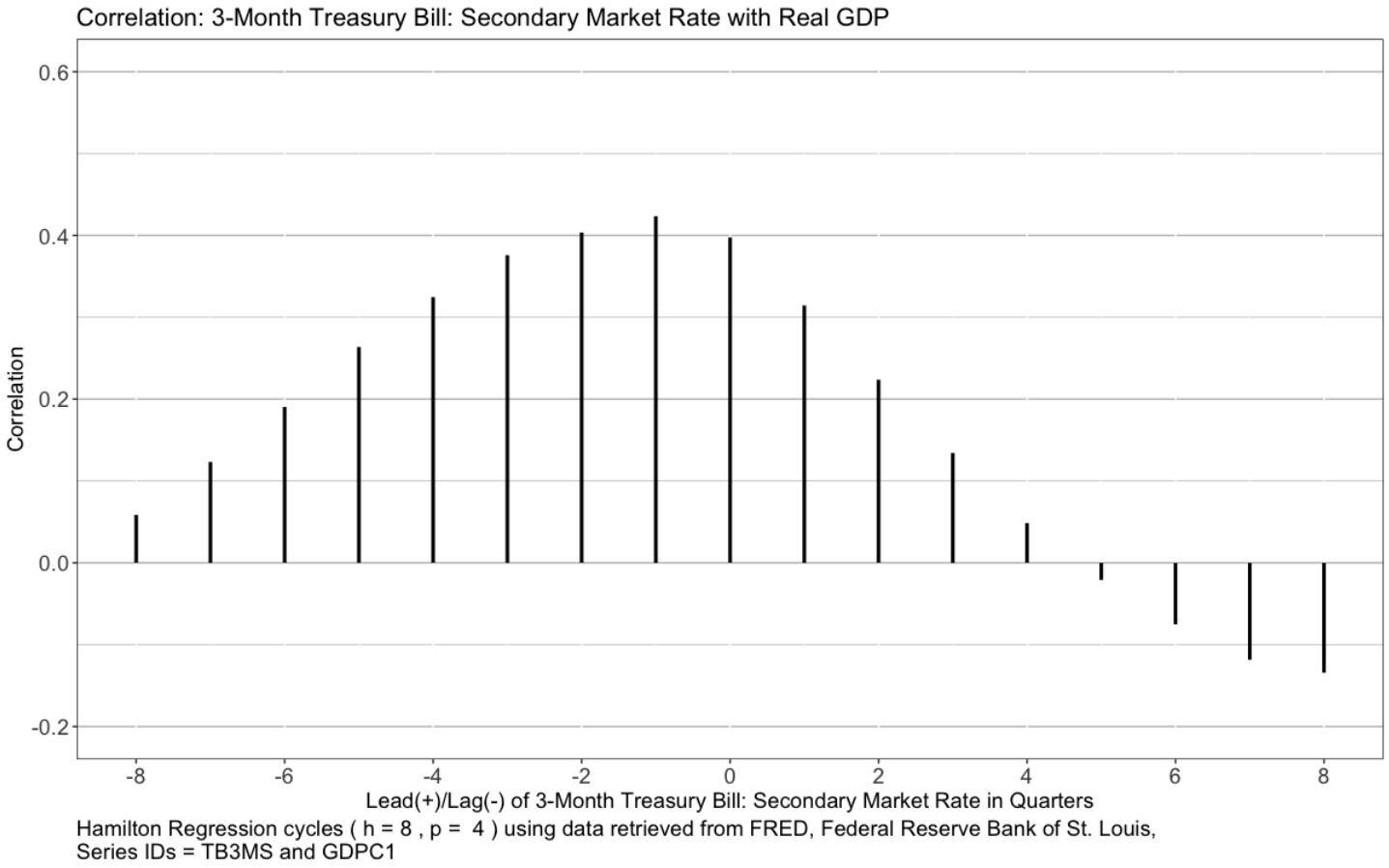
Definition

The 3 Month Treasury Bill Rate is the yield received for investing in a government issued treasury security that has a maturity of 3 months. The 3 month treasury yield is included on the shorter end of the yield curve and is important when looking at the overall US economy.

According to the peak/trough table, the Rate of Secondary Market 3-Month Treasury Bills overall leads Real Gross Domestic Product quite strongly. However upon closer inspection, Treasury Bill Rates leads RGDP in the beginning, for both peaks and troughs, then begins to lag for both peaks and troughs, then closer to the end Treasury Bill Rates begin to lead again, this time at what appears to be at an increasing rate than the earlier “leading” years.

Interest Rates

(Nominal 3- Month Treasury Bill: Secondary Market Rate TB3MS)



According to the correlation plot, there is a positive correlation between Nominal 3-Month Treasury Bill Secondary Market Rates and Real Gross Domestic Product. Positive correlations imply procyclical relationships between two variables.

It is hard to see a procyclical relationship when comparing the two series while one is superimposed upon another, but still possible. The correlation plot definitely helps to bridge the gap of uncertainty.

The final conclusion is that 3 Month Treasury Bill Secondary Market Rates lead, and have a procyclical relationship with Real Gross Domestic Product.

Key Facts

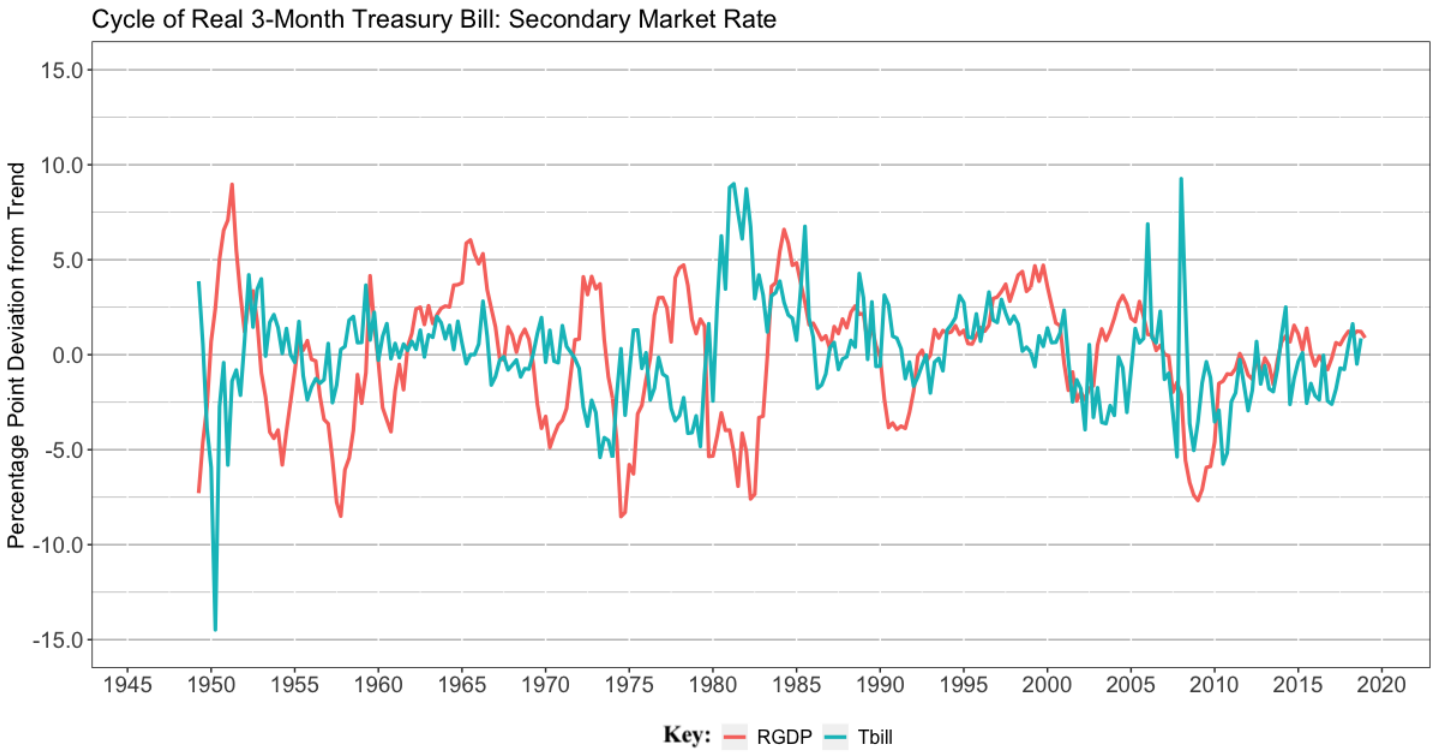
1) A Treasury Bill (T-Bill) is a short-term debt obligation backed by the U.S. Treasury Department with a maturity of one year or less.

2) Treasury bills are usually sold in denominations of $1,000 while some can reach a maximum denomination of $5 million.

3) The longer the maturity date, the higher the interest rate that the T-Bill will pay to the investor.

Interest Rates

(Real 3-Month Treasury Bill: Secondary Market Rate TB3MS, CPIAUCSL)



Hamilton Regression cycles using data retrieved from FRED, Federal Reserve Bank of St. Louis, Series ID = TB3MS and CPIAUCSL

Definition

The Real 3 Month Treasury Bill Rate is the yield received for investing in a government issued treasury security with a maturity of 3 months that has been adjusted for inflation by being divided by the consumer price index.

The 3 month treasury yield is included on the shorter end of the yield curve and is important when looking at the overall US economy.

Cyclical Comparision of Real Secondary Market rate of 3-Month Treasury Bills to RGDP

Peaks			Troughs		
Real T-Bill	**RGDP**	**Lead/Lag**	**Real T-Bill**	**RGDP**	**Lead/Lag**
-	(Q4) 1951	-	(Q4) 1950	(Q4) 1954	+4
(Q3) 1953	(Q2) 1956	+11	(Q4) 1957	(Q2) 1958	+2
(Q4) 1959	(Q1) 1960	+1	(Q4) 1961	(Q2) 1961	-4
(Q4) 1966	(Q1) 1966	-2	(Q2) 1967	(Q4) 1970	+14
(Q3) 1971	(Q2) 1973	+7	(Q3) 1974	(Q2) 1975	+3
(Q1) 1976	(Q4) 1978	+12	(Q4) 1979	(Q1) 1983	+13
(Q4) 1981	(Q4) 1984	+12	(Q4) 1986	(Q1) 1992	+21
(Q1) 1997	(Q2) 2000	+13	(Q3) 2004	(Q4) 2002	-7
(Q3) 2006	(Q1) 2006	-2	(Q2) 2008	(Q3) 2009	+5
(Q3) 2008	-	-	(Q2) 2009	-	-
Average Lead/Lag		+6.5			+5.67

Leads and Lags measured in quarters (+ = lead) (- =lag)

Data is collected from the Federal Reserve Bank of St. Louis, Series ID's = TB3MS, CPIAUCSL, GDPC1

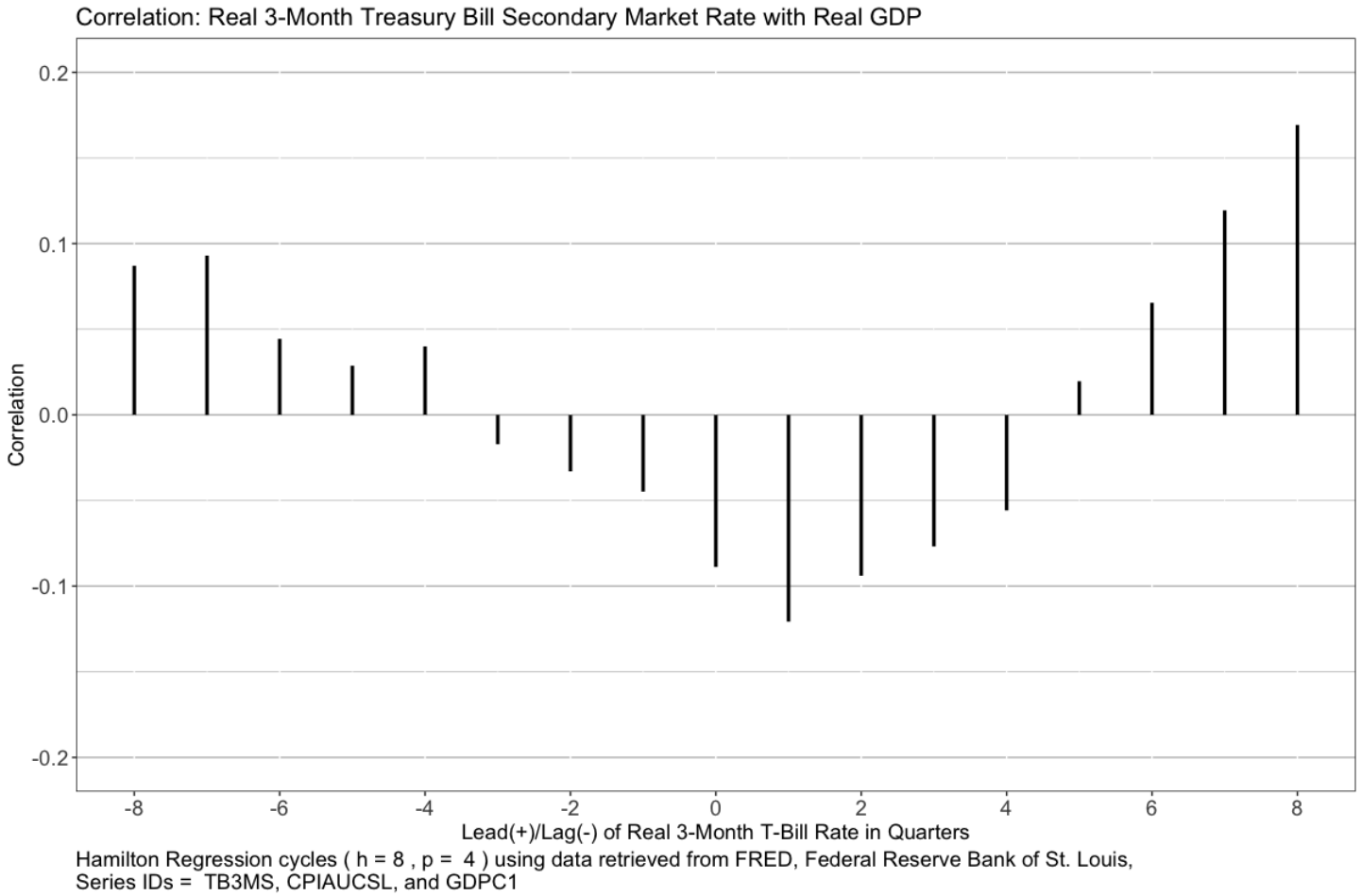
Observations & Implications

According to the peak/trough table, the Real 3 Month Treasury Bill Rate leads Real Gross Domestic Product, and also has a countercyclical relationship with Real Gross Domestic Product too.

The countercyclical relationship that Real 3 Month Treasury Bill Rate has with Real Gross Domestic Product implies a negative correlation.

Interest Rates

(Real 3-Month Treasury Bill: Secondary Market Rate TB3MS, CPIAUCSL)



In the beginning it appears that the Real 3 Month Treasury Bill Secondary Market Rate is positively correlated. This positive correlation implies that the two variables are procyclical. (As seen from 1950-1965)

In the middle of the two cycles, it appears that the Real 3 Month Treasury Bill Secondary Market Rate is negatively correlated. This negative correlation implies the two variables are countercyclical. (As seen from 1965-1990)

At the end the two variables appear to be positively correlated again, this positive correlation implies.. you guessed it, that the two variables are procyclical.

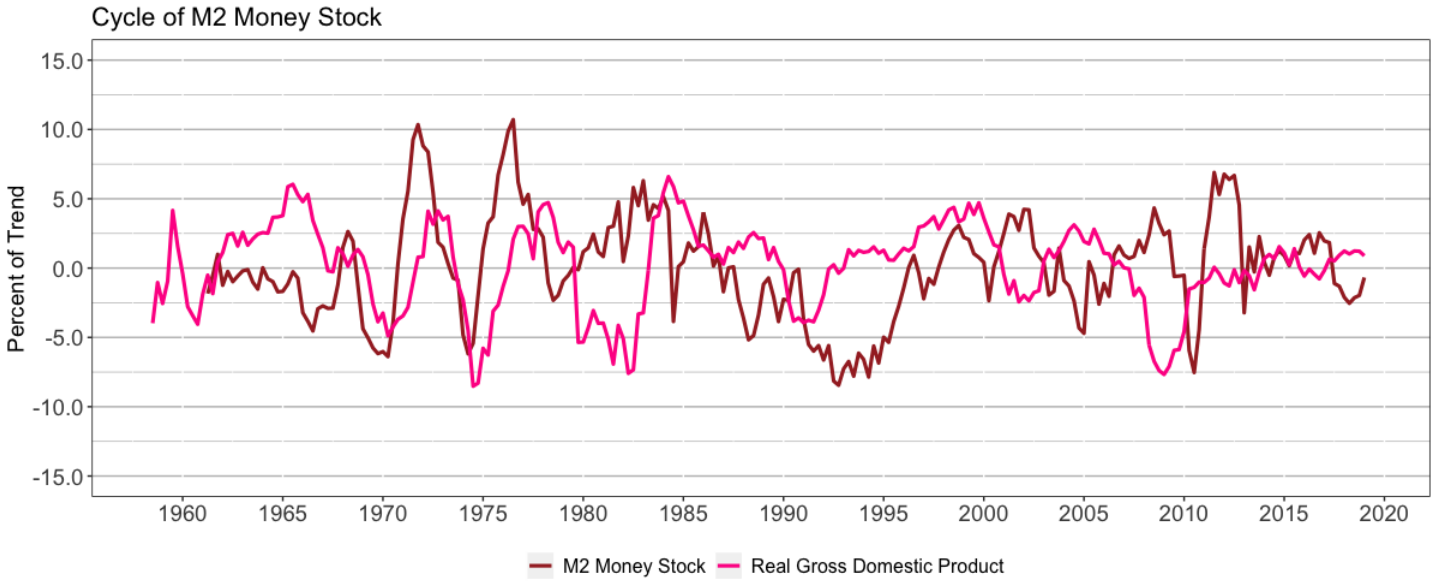
Notice the leads/lags on the Real Treasury Bill Rates is significantly smaller than the leads/lags for the Nominal Treasury Bill Rates.

Understanding Treasury Bills

The U.S. government issues T-bills to fund various public projects, such as the construction of schools and highways. When an investor purchases a T-Bill, the U.S. government is effectively writing an IOU to the investor. T-bills are considered a safe and conservative investment since the U.S. government backs them.

T-Bills are normally held until the maturity date. However, some holders may wish to cash out before maturity and realize the short-term interest gains by reselling the investment in the secondary market.

Money
(M2 Money Stock M2SL)



Hamilton Regression cycles (h = 8 , p = 4) using data retrieved from FRED, Federal Reserve Bank of St. Louis, Series IDs = M2SL and GDPC1

Cyclical Comparision of M2 Money Stock to RGDP

Peaks			Troughs		
M2	RGDP	Lead/Lag	M2	RGDP	Lead/Lag
(Q4) 1968	(Q4) 1951	-68	(Q4) 1970	(Q4) 1954	-64
(Q2) 1972	(Q2) 1956	-64	(Q4) 1974	(Q2) 1958	-62
(Q1) 1977	(Q1) 1960	-68	(Q1) 1979	(Q2) 1961	-73
(Q3) 1984	(Q1) 1966	-70	(Q1) 1985	(Q4) 1970	-63
(Q3) 1986	(Q2) 1973	-51	(Q4) 1988	(Q2) 1975	-36
(Q2) 1991	(Q4) 1978	-50	(Q3) 1992	(Q1) 1983	-36
(Q2) 1999	(Q4) 1984	-58	(Q4) 2000	(Q1) 1992	-35
(Q4) 2002	(Q2) 2000	-10	(Q3) 2005	(Q4) 2002	-11
(Q1) 2009	(Q1) 2006	-12	(Q1) 2011	(Q3) 2009	-6
(Q1) 2013	-	-	-	-	-
Average Lead/Lag		-50.11			-42.89

Leads and Lags measured in quarters (+ = lead) (- =lag)
Data is collected from the Federal Reserve Bank of St. Louis, Series ID's = M2SL, GDPC1

Key Facts

1) M2 is a measure of the money supply that includes cash, checking deposits, and easily convertible near money.

2) M2 is a broader measure of the money supply that M1, which just include cash and checking deposits.

3) M2 is a closely watched as an indicator of money supply and future inflation, and as a target of central bank monetary policy.

Observations & Implications

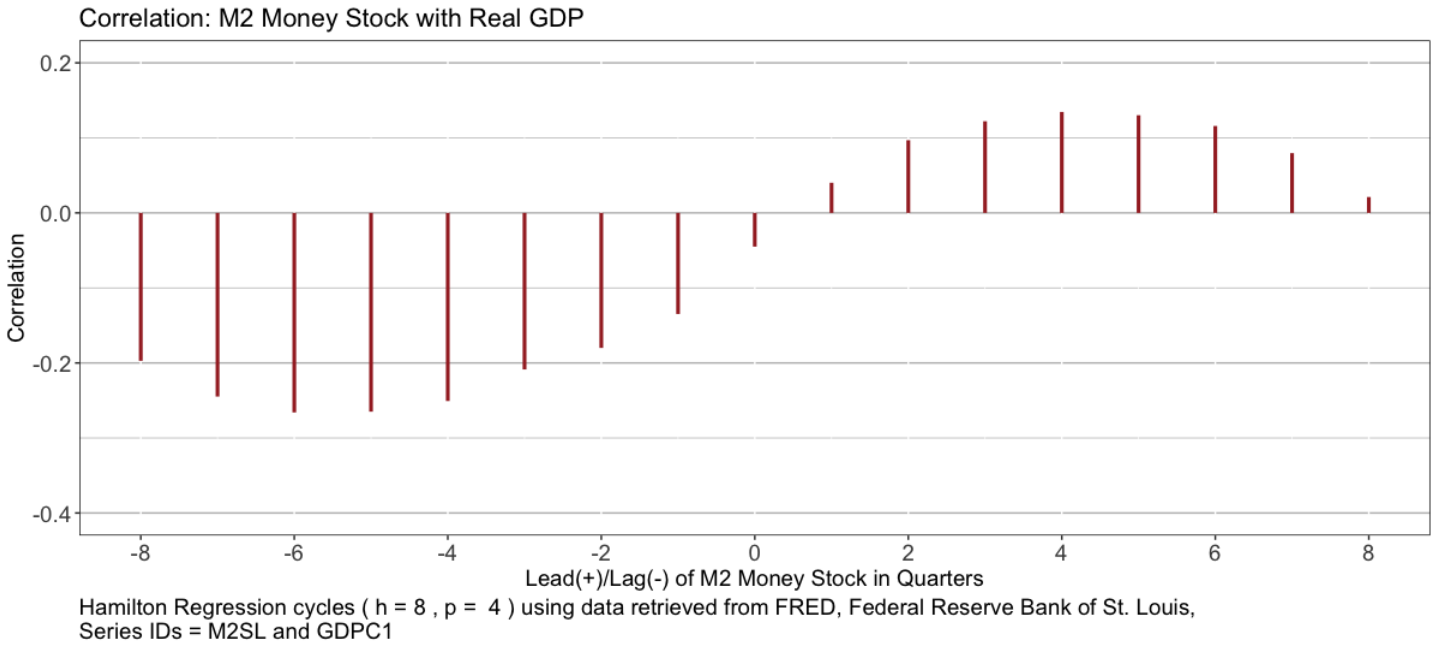
According to the peak/trough table the M2 Money stock appears to severely lag behind Real Gross Domestic Product for both peaks and troughs.

In the beginning, the two variables appear to be countercyclical, which would imply a negative correlation, then it looks like it tries to correct itself and manifests a more procyclical relationship. As we all know, procyclical relationships imply positive correlation.

Another interesting detail is that M2's lag appears to be decreasing slowly over time, and the lag actually decreases faster over time for troughs than peaks.

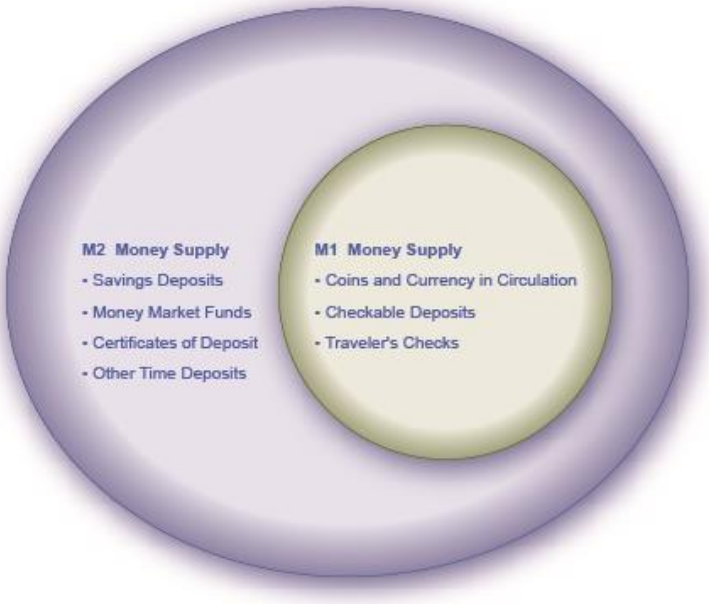
Money

(M2 Money Stock M2SL)



According to the correlation plot, M2 Money Stock has a slightly negative correlation in the beginning of the cycle (When compared to Real Gross Domestic Product), then closer to the end a slightly smaller, yet positive correlation can be spotted.

These observations imply a countercyclical relationship in the beginning of the series, then a procyclical relationship as time goes on. This is consistent with what is visually seen on the series and reference series on the previous page

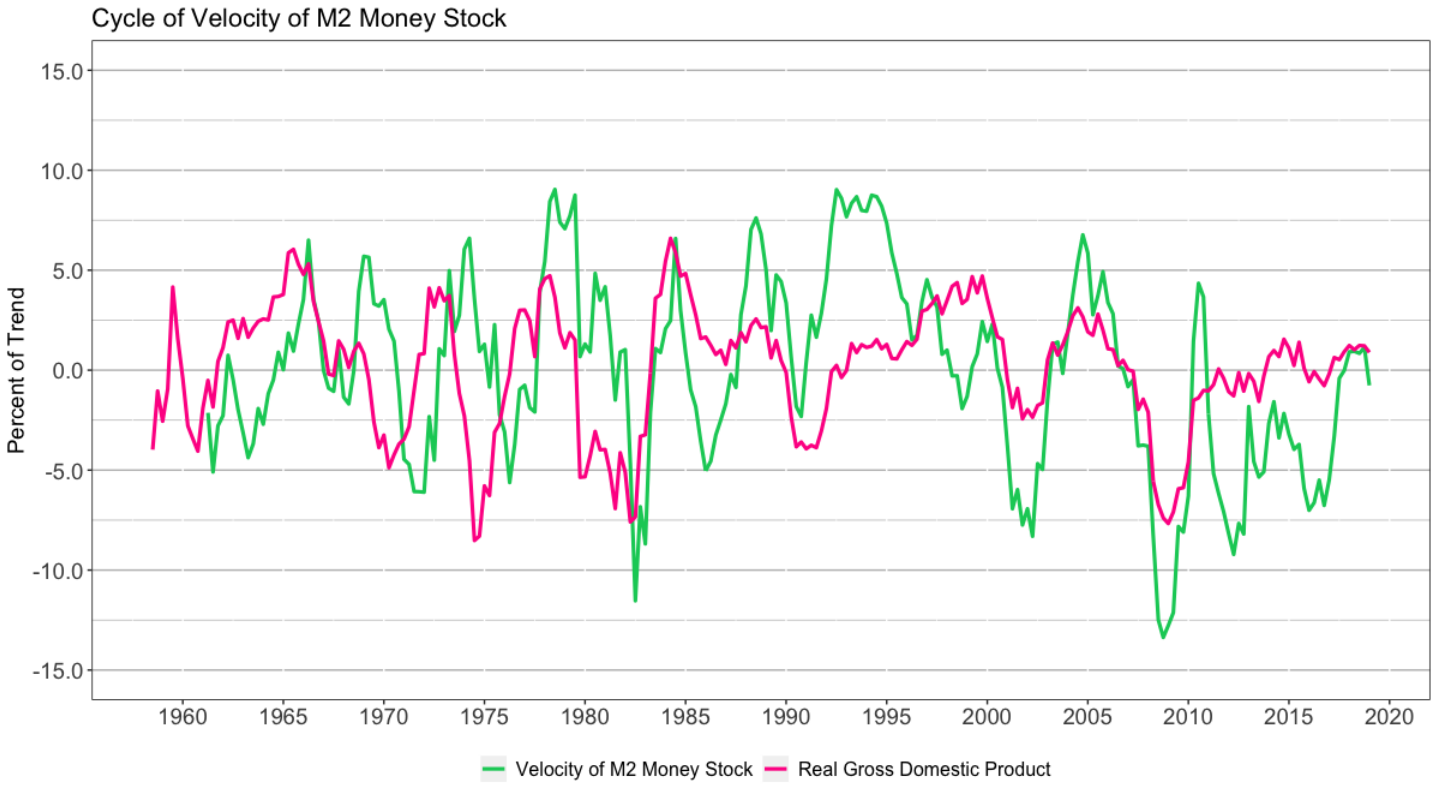


Key Facts

M2 includes a broader set of financial assets held principally by households. M2 consists of M1 plus: (1) savings deposits (which include money market deposit accounts, or MMDAs); (2) small-denomination time deposits (time deposits in amounts of less than $100,000); and (3) balances in retail money market mutual funds (MMMFs).

Seasonally adjusted M2 is computed by summing savings deposits, small-denomination time deposits, and retail MMMFs, each seasonally adjusted separately, and adding this result to seasonally adjusted M1.

Money



Hamilton Regression cycles (h = 8 , p = 4) using data retrieved from FRED, Federal Reserve Bank of St. Louis, Series IDs = M2V and GDPC1

Definition

The velocity of money is the frequency at which one unit of currency is used to purchase domestically-produced goods and services within a given time period. In other words, it is the number of times one dollar is spent to buy goods and services per unit of time. If the velocity of money is increasing, then more transactions are occurring between individuals in an economy.

Cyclical Comparision of Velocity of M2 Money Stock to RGDP

Peaks			Troughs		
M2 Velocity	RGDP	Lead/Lag	M2 Velocity	RGDP	Lead/Lag
(Q4) 1962	(Q4) 1951	-44	(Q4) 1963	(Q4) 1954	-32
(Q4) 1966	(Q2) 1956	-38	(Q4) 1968	(Q2) 1958	-38
(Q4) 1969	(Q1) 1960	-33	(Q3) 1972	(Q2) 1961	-41
(Q4) 1974	(Q1) 1966	-29	(Q4) 1976	(Q4) 1970	-24
(Q1) 1980	(Q2) 1973	-23	(Q1) 1983	(Q2) 1975	-27
(Q1) 1985	(Q4) 1978	-25	(Q3) 1986	(Q1) 1983	-8
(Q1) 1989	(Q4) 1984	-17	(Q2) 1991	(Q1) 1992	-5
(Q1) 1995	(Q2) 2000	+15	(Q4) 2002	(Q4) 2002	0
(Q2) 2005	(Q1) 2006	+3	(Q2) 2009	(Q3) 2009	+1
(Q1) 2011	-	-	-	-	-
Average Lead/Lag		-21.22			-19.33

Leads and Lags measured in quarters (+ = lead) (- =lag)

Data is collected from the Federal Reserve Bank of St. Louis, Series ID's = M2V, GDPC1

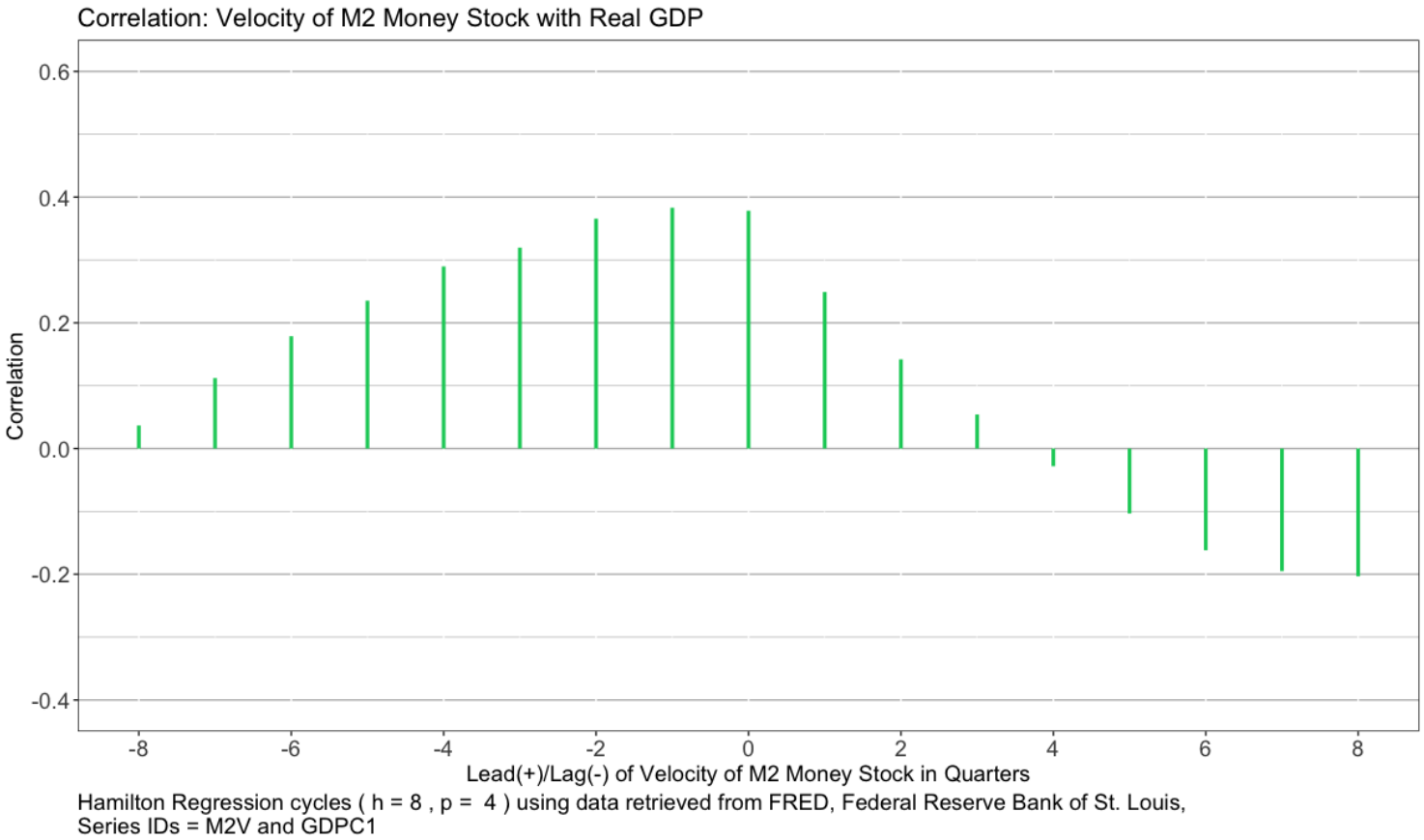
According to the peak/trough table, it appears that the Velocity of M2 Money stock strongly lags behind Real Gross Domestic Product for the most part, however over time the lag slowly, and consistently, decreases for both peaks and troughs.

Eventually for both peaks and troughs, Velocity of M2 Money stock begins to slightly lead the reference series.

Visually the Velocity of M2 Money stock appears to have a procyclical relationship with RGDP, this implies a positive correlation.

Money

(Velocity of M2 Money Stock M2V)



According to the correlation plot, there is a positive correlation in the beginning which implies a procyclical relationship between Velocity of M2 Money stock and Real Gross Domestic Product. Then as time goes on, a slight negative correlation begins to appear, but not enough to be significant.

One can deduct from the correlations alone that the series compared to the reference series starts off as procyclical, then begins to show countercyclical behaviors as time goes on.

The implication from this correlation plot is that the velocity of M2 Money Stock is (Procyclical)positively correlated with Gross Domestic Product, and a large lag that decreases over time.

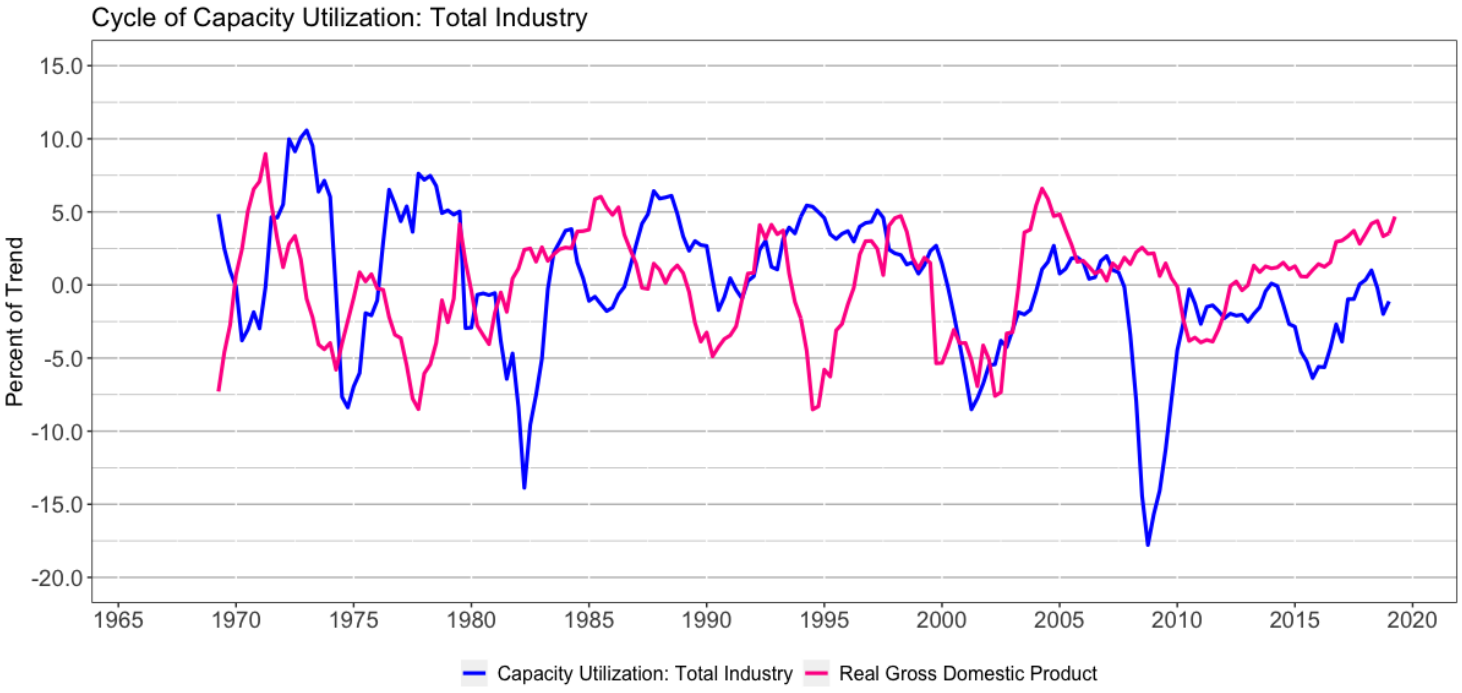
Key Insight about M2

The broader M2 component includes M1 in addition to saving deposits, certificates of deposit (less than $100,000), and money market deposits for individuals. Comparing the velocities of M1 and M2 provides some insight into how quickly the economy is spending and how quickly it is saving.

High money velocity is usually associated with a healthy, expanding economy. Low money velocity is usually associated with recessions and contractions.

Other

(Capacity Utilization: Total Industry TCU)



Hamilton Regression cycles (h = 8 , p = 4) using data retrieved from FRED, Federal Reserve Bank of St. Louis, Series IDs = TCU and GDPC1

Definition

Capacity Utilization: Total Industry (TCU) is the percentage of resources used by corporations and factories to produce goods in manufacturing, mining, and electric and gas utilities for all facilities located in the United States (excluding those in U.S. territories). We can also think of capacity utilization as how much capacity is being used from the total available capacity to produce demanded finished products.

Cyclical Comparision of Total Industry Capacity Utilization to RGDP

Peaks			Troughs		
TCU	RGDP	Lead/Lag	TCU	RGDP	Lead/Lag
(Q3) 1973	(Q4) 1951	-89	(Q2) 1975	(Q4) 1954	-82
(Q4) 1978	(Q2) 1956	-86	(Q4) 1982	(Q2) 1958	-94
(Q4) 1984	(Q1) 1960	-93	(Q4) 1986	(Q2) 1961	-98
(Q4) 1988	(Q1) 1966	-77	(Q2) 1991	(Q4) 1970	-82
(Q4) 1997	(Q2) 1973	-94	(Q4) 2001	(Q2) 1975	-102
(Q2) 2005	(Q4) 1978	-106	(Q2) 2009	(Q1) 1983	-99
(Q3) 2014	(Q4) 1984	-119	(Q2) 2016	(Q1) 1992	-91
(Q4) 2018	(Q2) 2000	-70	-	(Q4) 2002	-
-	(Q1) 2006	-	-	(Q3) 2009	-
-	-	-	-	-	-
Average Lead/Lag		-91.75			-92.57

Leads and Lags measured in quarters (+ = lead) (- =lag)

Data is collected from the Federal Reserve Bank of St. Louis, Series ID's = TCU, GDPC1

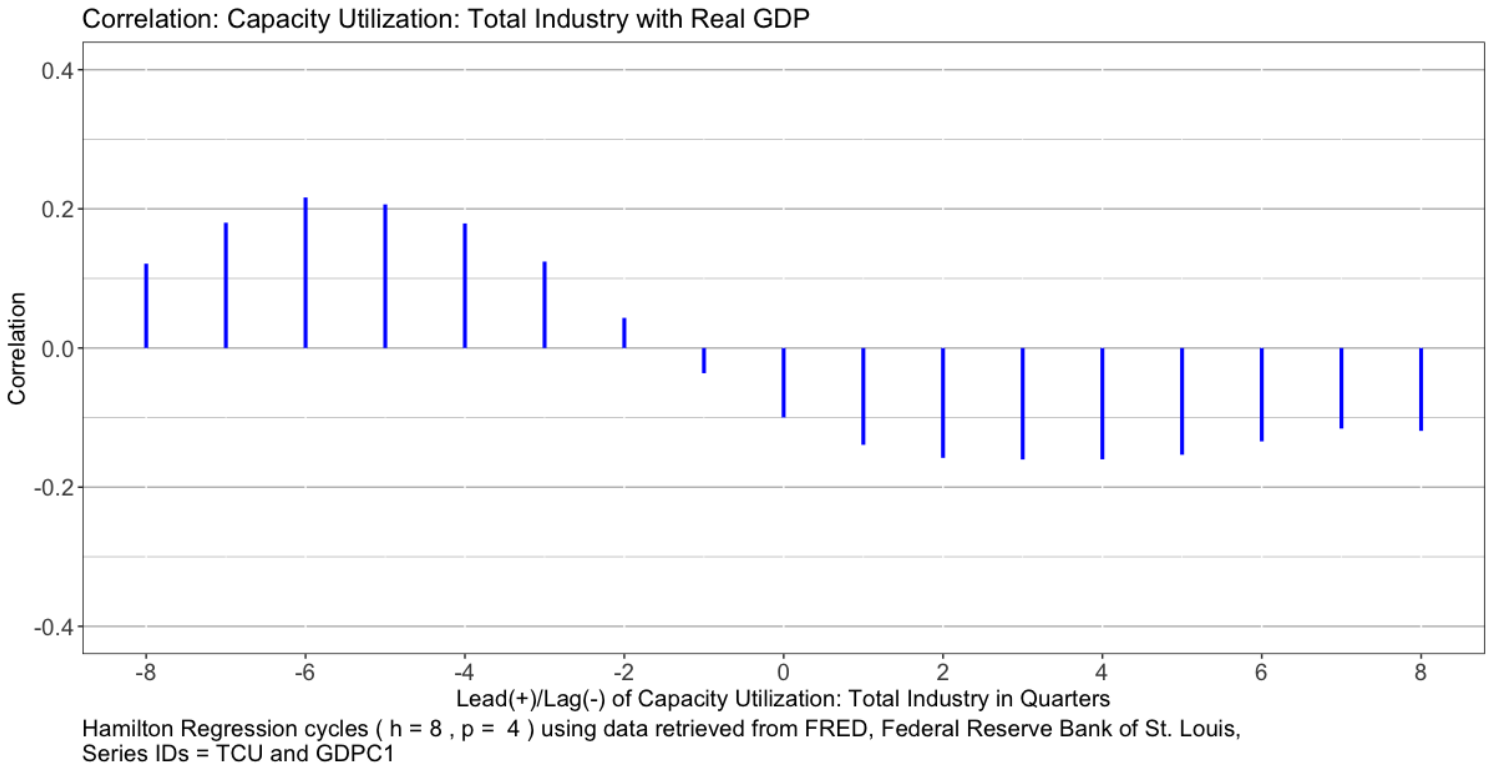
According to the peak/trough table, the Total Industry Capacity Utilization significantly lags behind Real Gross Domestic Product over time for both peaks and troughs. The average lag for both peaks and troughs is approximately -92 quarters.

When looking at TCU superimposed over the reference cycle, it appears that they have a procyclical relationship in the beginning (this implies a positive correlation).

Later on TCU appears to develop a counter cyclical relationship with RGDP (which implies a negative correlation closer to the end).

Other

(Capacity Utilization: Total Industry TCU)



Conclusion & Analysis

According to the correlation plot, there appears to be a slightly positive correlation between TCU and RGDP in the beginning, which implies a procyclical relationship between TCU and our reference series.

The end of the series looks more noisy and harder to discern a procyclical vs countercyclical relationship, so it will be noted as acyclical (no correlation) beyond the 1990's, despite there being a slight negative correlation later on according to the correlation plot.

In conclusion, Total Industry Capacity Utilization is procyclical and leads Real Gross Domestic Product.

Key Information

According to the Board of Governors of the Federal Reserve System, the capacity index tries to conceptualize the idea of sustainable maximum output, which is defined as the highest level of output a firm can sustain within the confines of its resources. The Board of Governors defines the seasonally adjusted capacity utilization rate as the output index divided by the capacity index. The capacity utilization rate can also implicitly describe how efficiently the factors of production (inputs in the production process) are being used. It sheds light on how much more firms can produce without additional costs. This rate also gives manufacturers some idea as to how much consumer demand they will be able to meet in the future.