

# Issues Regarding the Inclusion of the Real Interest Rate with other factors in Phillips Curve Analysis

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## Abstract

This paper summarizes the arguments and counterarguments within the scientific discussion on the issue regarding the Inclusion of the Real Interest Rate with other factors in Phillips Curve Analysis. The main purpose of the article is to cause economists to consider the inclusion of the real interest rate in Phillips Curve analysis. Earlier economists have examined the Phillips Curve, including Irving Fisher (1926). Later Phillips (1958, 1961) made enough of impression to give the Phillips Curve its appellation (1958, 1961). Further work has been done by Freidman, Phelps Lucas, Rapping and others. Shifts from the Short Run Phillips Curve (SRPC) to the Long Run Phillips Curve (LRPC) have been explained primarily through workers not realizing their real wage has decreased until some time has passed. Also, this shifting from the SRPC to the LRPC is due to producers thinking that demand for their products has had a real, sustained increase, producers finally realize that is not true. This article agrees with those factors being present but also posits the idea of changes in the real interest rate affecting the shift from the SRPC to the LRPC. This brief article summarizes the conclusions of five econometric papers that suggest that the real interest rate should be included in Phillips Curve Analysis. The research empirically confirms and theoretically proves that the five articles with econometric evidence suggest that the real interest rate be included in Phillips Curve Analysis. Though Austrian economists consider capital in their theories, Austrian economists do not use Phillips Curve analysis but instead employ Hayekian Triangles. The results of the research shows that inflation and unemployment have a stable and inverse relationship. These results can be useful for economic analysts, government, financial experts, policymakers.

**Keywords:** Phillips Curve, real interest rate, real wage rate, business cycles, macroeconomic theory.

**JEL Classification:** E12, E24, E 40.

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## Introduction

The purpose of this article is to create more interest in the overall conclusion of some prior articles, in regard to Phillips Curve analysis that includes the real rate of interest. This article summarizes the main points of some research concerning the inclusion of the real interest rate in Phillips Curve analysis.

A Phillips Curve is a graph of the theoretical trade-offs between the inflation rate and unemployment rate.

### 1. Literature Review

Examining the trade-off between inflation and unemployment, has been present for many years and early references can be found in Fisher (1926), and Phillips (1958, 1961). New Keynesian models include the idea that unanticipated policies have more effects on the economy than anticipated ones (Mankiw, 2006; Gordon, 2009). New Keynesian models state that unanticipated policies can still have a lesser effect on the economy than anticipated ones. New Classical economists believe that only unanticipated policies have any effect on the economy (Lucas, 1972; Barro, 1976. 1984; Sargent, 1979). Both New Keynesian and Monetarist models are Marshallian, whereas New Classical models are Walrasian. A key difference is that Walrasian models are

not supportive of breaking up time periods by short and long terms and this point cannot be ignored. (Hoover, 1984).

Temporary increases in aggregate demand may affect the behavior of economics agents, such as producers who hire more labor but have to lay some of it off, once the aggregate demand is not sustained. The SRPC exists because labor agents do not immediately realize that there has been a decrease in their real wage, since they do not automatically realize inflation has increased. Comparing the wages to unemployment benefit may also have an effect. If inflation is correctly anticipated, the government can no longer use inflation to disguise real economic variables. Wage earners over time, incorporate inflation expectations into their behavior. Increasing levels of inflation would be necessary to create sufficient money illusion, which brings the real wages down, leading the economy to temporarily operate on the SRPC (Phelps, 1967, 1968; Friedman, 1968, 1969, 1970, 1976, 1977; Laidler, 1981). Shifts between the LRPC and SRPCs have also been discussed by New Classical economists, such as Lucas, (1972, 1973) Lucas and Sargent, (1981); and New Keynesian economists Mankiw (2006) and Gordon (2009).

## 2. Graphic Analysis

Mankiw (2006) describes the Phillips Curve and the Short-Run Aggregate Supply Curve (SRAC). The SRAC may provide a valid description of the supply side of the economy, until all input prices increase proportionately to the same level, as the output prices. Using labor inputs in a complementary way with capital, we include real wages and real interest rates in the model. Specifically, we use the Phillips Curve in Figure 1 to develop our model and assume that the economy is initially operating at point A on SRPC<sub>0</sub>. Then the difference between  $\pi_2$  and  $\pi_1$  creates a money illusion, which leads the economy from point A to point B. When economic agents realize that they failed to accurately anticipate the inflation rate, the agents would make an adjustment. Hence the economy moves to point C on the LRPC. Both temporary misconceptions regarding employees' knowledge of the real wage and entrepreneurs' and managers' knowledge of the real interest rate. In Figure 2, the is cost curves and isoquants show the in Figure 2, the effect of a change in the real interest rate of the capital and labor inputs used by a firm and its output. If the firm is initially operating at point A, the tangent point between the highest isoquant and highest is cost curves in the diagram, this is based upon a set of input costs. If the scenario is where the real wage is constant and real interest rate increases, then the isocost line would shift inward leading the firm to operate at point B, which produces a lower level of output. As Landskoner et al (1989) point out, variable interest rates are often present for commercial loans. If the entrepreneur had not predicted that the real interest rate was going to increase and the real interest rate in fact does, the production output could be lessened. *Overall, economies may use labor and capital in complementary ways, though this varies per industry and per firm.*

## 3. Empirical Analysis

Six prior articles have been considered in analyzing the relationship between the real rate of interest and the Phillips Curve. Five of these include econometric analysis done in Gentle et al (2005, 2008, 2013) and Chen et al (2010, 2011). The one that does not include econometrics, compares mainstream economics Phillips Curve analysis to Austrian economics Hayekian Triangles. A variety of models are used within the five econometric models. The results in these five articles suggest that the real interest rate should be used in Phillips Curve analysis. Some of the methods used, in no particular order, include: determining means, medians and standard deviations of variables, t-tests, non-nested tests (F test); Johansen's cointegration test; Augmented Dicky-Fuller test for unit root, Phillips Peron unit root test, Engle-Granger test for co-integration, estimated likelihood ratio test for omitted variable; test for indications of misspecification if the real interest rate variable is left out; Wald test for redundant variable and estimated F statistics which indicate misspecification if the real interest rate is omitted; Pearson Correlation test; Spearman correlation test, chi-squared statistics, and other methods. This brief article summarizes the conclusions of five econometric articles that suggest that the real interest rate should be included in Phillips Curve Analysis.

## Summary and Conclusion

In the literature, shifts from the Short Run Phillips Curve (SRPC) to the Long Run Phillips Curve (LRPC) have been explained primarily through workers not realizing their real wage has decreased until some time has passed. Also shifts between the SRPC and the LRPC is further due to producers thinking that demand for their products has had a real, sustained increase; however, producers finally realize that is not true. This article agrees with those factors being present but also posits the idea of changes in the real interest rate affecting the shift from the SRPC to the LRPC. In Gentle (1984), the theory of using real interest rates as part of Phillips Curve analysis is first discussed by him. As discussed, econometric results suggest that Phillips Curve analysis include the real interest rate as a factor. Though Austrian economists have written on capital theory, they do not employ the Phillips Curves described in this article. That is clearly noted in Gentle and Thornton (2014).

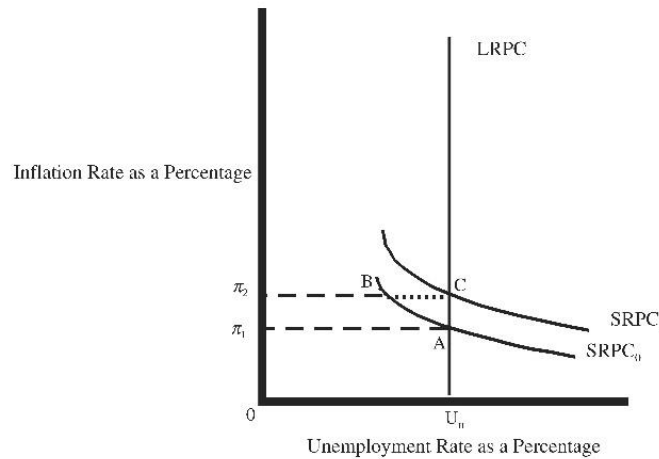


Figure 1. Phillips Curves

Source: (Gentle, et al 2005, 2008, 2013; Chen et al 2010, 2011).

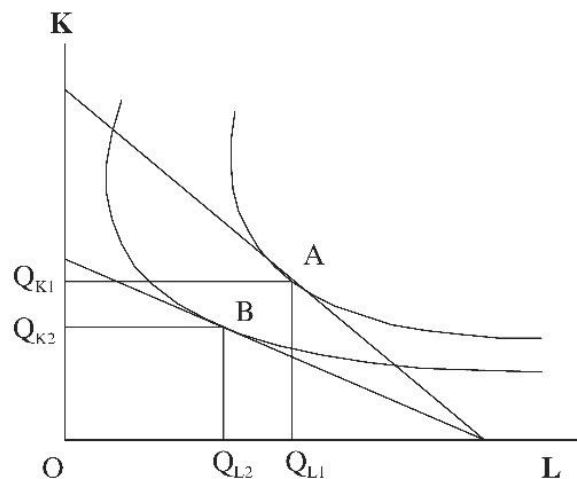


Figure 2. Effects if real interest rate changes on capital (K) and labor (L)

Source: (Gentle, et al 2005, 2008, 2013; Chen et al 2010, 2011).

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