The outdated status of the Fisher effect in the context of modern world economy

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Abstract: The paper focuses on the conditions of present-day economy which render the Fisher effect out of date. A multi-plot analysis was conducted to determine the reasons why, within the last 100 years, the Fisher effect ceased to be a universal theory in both time and space dimensions. Consequently, the author proposes to view the Fisher effect as a mere historical generalization. The paper enumerates a wide range of empirical studies, conducted by a number of academics, which show that the occurrence of the Fisher effect was limited, in both space and time, to only a few economies in the second half of the 20th century and the first decade of the 21st century – it did not appear in any other periods or economies. The results of these studies support the author's theoretical considerations. The present study constitutes a continuation of the methodological analysis conducted in the work titled *The Fisher effect – a law, a theory or a mere hypothesis?* published in the Research Papers of the Faculty of Economics of the Gorzow Wielkopolski State University of Applied Sciences (Sobkow 2015).

Keywords: Fisher effect, inflation, value of money in an inflationary environment, nominal interest rate, Darby effect.

1. INTRODUCTION

The theory of interest rates proposed by Fisher is not a trivial matter. Its author has been hailed by some of "the greatest economist that the United States has ever produced" (Schumpeter 1951, p. 223) and the theory itself has been used as a base for a number of other macroeconomic theories. Furthermore, the issue of the relationship between nominal and real interest rates under inflationary conditions is related to the current and strategic economic decisions made by both central banks and the various business entities operating in the economy. Examining the issue of choice of the best methodological framework for investigating the occurrence of the Fisher effect appears to still be vital and necessary as it does, ultimately, affect the financial effectiveness of corporations as well as the economy of the entire world.

Fisher published his theory of the correlation between real and nominal interest rates in the work *The Rate of Interest* published over 100 years ago, in 1907. In it, he asserted that a depreciation of the value of money by 1 percent will raise the interest rate by (approximately) the same amount (Fisher 1907, p. 327). This is the so-called 'a point-for-point effect', also known as the Fisher effect, which can be represented by the formula:

$$In=Ir+F$$

where:

In – nominal interest rate,

Ir – real interest rate,

F – expected inflation rate in the economy.

Fisher maintained his point of view in his next book *The Theory of Interest* (Fisher 1930). He postulated constancy of the real interest rate. Thus, he claimed that "nominal interest rates rise point-for-point with expected inflation, leaving the real rate unaffected" (Barsky 1987, p. 3).

The structure of the current article is as follows: Section 1 presents the methodological arguments proving the possibility of viewing the Fisher effect as a 'historical generalization'; Section 2 describes the changes which took place in the American economy over the past century. Whilst the Fisher effect worked properly at the beginning of the 20th century, there is a huge possibility that now, as a result of those changes, it is no longer effective; and finally, the Conclusion sets out the results of the analysis conducted for this study as well as potential new lines of inquiry in this area of research.

2. THE METHODOLOGICAL BASIS FOR CATEGORIZING THE FISHER EFFECT AS A HISTORICAL GENERALIZATION

Narrowing down a theory or a scientific law into a historical generalization requires mentioning two different reasons for putting forward this postulate, namely:

- methodical reasons which necessitate the moving of a theory or a scientific law from the universal level into a lower one, in this case the level of a historical generalization,
- socio-economic factors which formed the basis of the description of a given theory and which make it objectively impossible for a given theory to be universal.

Undoubtedly, from a methodological perspective, Fisher's 'point-for-point effect' is held as a scientific hypothesis. A hypothesis may generate more detailed predictions, for example, as to the stability of the real interest rate in the inflationary economy. If the Fisher hypothesis were to be an economic law, the outcomes of its expected application should not be limited both in terms of time and space. Thus, the law should remain effective at different times and in different places, namely in the 1930s and at the turn of the 20th/21st century, and not only in the US, but also in Poland, Japan, etc. Yet, as a result of the research carried out by numerous different groups of scientists and over a span of many years, the 'Fisher effect' underwent many effective falsifications. These falsifications have been conducted not only in a time, but also in a space di-

mension. There were times, in a certain economic area, when the hypothesis was applicable, and there were times when it was not. And there were places where the hypothesis was workable, and there were places where, at the same point in time, it was not. As such, the thesis relating to the stability of the real interest rate turned out to be false. Fisher's theory continued to be falsified on numerous occasions despite the fact that the research tools which might have caused errors in empirical studies were changed (Makin 1981; Mishkin 1984; Payne and Ewing 1997; Carneiro 2002; Miyagawa and Morita 2003). It was Cooray (2003) who conducted an extensive analysis of the research done on the effectiveness of the Fisher hypothesis in various places and over the last few decades. Concluding his study, he stated directly: "Despite the positive relationship observed between interest rates and inflation, the majority of empirical studies have not conformed to the hypothesis in its strictest form" (Cooray 2003, p. 145-6). Martins was even more rigorous and claimed that "a better understanding of interest rates and nominal prices empirical behavior requires the abandonment of Fisher (1930) theory of interest". Fisher's theory itself was described by himself as "an untouchable scientific axiom" (Martins 1994). Making reference to Popper's research methodology (Popper 2005), the Fisher effect should be rejected as a hypothesis which validity, in a universal sense, has been repeatedly denied. Thus, the methodological basis for questioning the universality of the Fisher effect is set on a firm foundation – the falsification conducted independently by various groups of researchers.

The methodological analysis conducted by the author of this article in the work titled *The Fisher effect – law, theory or just a hypothesis?* (Sobkow 2015) indicated that, as a result of the above, the Fisher effect might be considered as a so-called historical generalization. A historical generalization is a statement which, even if valid, is by no means universal as its validity is limited by time, and at times also by space. A historical generalization is, as such, only valid at a particular time in history and sometimes only in relation to a particular area (be it a country or a group of countries).

To exemplify, despite its name, the so-called Okun's law is a historical generalization. It was possible to observe that, in the United States until the year 1965, for every percentage point increase in the natural rate of unemployment, the country's GDP would decrease by roughly two to three percentage points (Okun 1966). Thus, Okun's law, which was derived from the abovementioned observation, is primarily

based on empirical studies rather than theoretical considerations. It allows to conclude that Okun's law may not be entirely predictive and, as a result of economic changes, may be perceived to be unstable across time. Undoubtedly, empirical studies confirm this assumption (Knotek 2007). It was already Prachowny who has estimated about three percentage points decrease in GDP for every one percentage point increase in the unemployment rate (Prachowny 1993). Other studies show that, whilst this index does, actually, stand at a mere 2% in the case of the US economy, it takes, at the same time, different values in other countries (Giorno, Richardson, Roseveare, Noord 1995). Thus, it would not be unusual, as in the case of Okun's law, to view Fisher's effect as a historical generalization.

3. THE DETECTION OF THE POSSIBLE CAUSES OF NARROWING DOWN THE FISHER EFFECT INTO A HISTORICAL GENERALIZATION

The search for the origins of the socio-economic conditions making it impossible for the Fisher effect to become a universal law should focus on detecting the specificity of the US economy at the turn of the 19th/20th century. These conditions differentiate the American economy from the past from the present one. It turns out that, at present, the American economy differs critically in many areas from the economy which constituted a basis for Fisher's theory on interest rate levels in inflationary conditions. It the primary issue, however, emphasis should be put on four issues, namely: the existence of income tax, the dollar/gold convertibility as well as the way a central bank operates.

3.1. Inflation rate

When Fisher formulated his 'law' at the turn of the 19th/20th century, the currency/gold convertibility, the so-called 'gold standard' was a prevailing principle in the world economy. At the same time, gold was also considered to be a material good. Not only was it used as a currency, but a lot of people tended to also hoard gold. What is more, it also had industrial applications: gold was used to produce luxury goods but it was also used as a material in technological production. Just like any other raw material, it was subject to the law of supply and demand. The changes in the supply of this particular material influenced its price (Barsky and De Long 1991, p.11). The rise of supply related either to the opening of new gold mines or the introduction of new advanced melting technologies, which resulted in a drop in the price of gold. This, in turn, led to a rise in the price of other goods in which prices were represented by the decreasing value of gold. The same was true the other way round. Thus, the drop in the supply of this raw material resulted in a rise in the price of gold. As a consequence, deflation appeared. However, these changes in gold supply (or demand) per year were not drastic. For this reason, the annual changes in prices fluctuated only by a few percentage points. In the last 20 years prior to 1907 (the year of the publication of Fisher's *The Rate of Interest*), the average level of price fluctuations (inflation or deflation) amounted to merely 1.18%. At the same time, the highest annual rate of inflation was 2.23% and deflation – 2.28% (21st Century: A Post Keynesian Perspective, 2015). The inflation rate was not even significantly influenced by the two major gold rushes in the US, namely the California and Klondike Gold Rush. The level of price fluctuations at that time was not more than a few percent annually. Therefore, investor's forecasts of inflation rates concentrated around this level. Moreover, it was also this level which they took into consideration when determining their investment risks. These were the conditions under which Fisher was conducting his considerations.

Fisher's effect is based on a wide range of assumptions related to the economy in which it functions. Curiously enough, some academic authors claim that there is no such thing as an economy in which the Fisher effect would prove to be valid (Marco 1994). Without going deeper into this issue, as it does not form the focus of this study, it is important to take note of one of the assumptions of the Fisher effect. The assumption refers to the fact that investors will expect the inflation premium to be exclusively limited to the inflation rate. For example, Fisher does not take into account the risk of changes in expectations of the level of the inflation premium depending on the alterations in the expected inflation rate. Neither the expected inflation rate nor the nature of inflation in terms of its potential changeability is taken into account in Fisher's formula. In other words, it does not matter in the formula whether inflation is expected to be amount to several or several hundred percentage points, and also whether it is stable or not. Modern economic thought acknowledges that a bonus expected by an investor investing in financial instruments with highly changeable rates of return will be higher than a bonus related to more financially stable investments. After all, Markowitz's modern portfolio theory is based exactly on this statement. However, the theory was formulated in the 1950s and 60s, which is many

decades after the publication of Fisher's fundamental works. What is more, some empirical studies carried out in recent years, may indicate that the level of inflation may have an influence on the validity of the Fisher effect (Phylaktis and Blake 1993).

The departure from the gold standard by the world economy after the Second World War led to a significant increase in interest rates. The average inflation rate in the American economy during 1968-1987 was as high as 6.4% and it was almost five times higher than in 1887-1906. In the Polish economy during the 1980-2000 period, the average annual level of increase in prices was as high as 69%. Conducting empirical studies aimed at establishing the connection between inflation rates, as well as the intensity of their changes and the effectiveness of the Fisher effect could allow to work out detailed limiting conditions. These would become the conditions limiting the effectiveness of the Fisher effect beyond which it would be nothing but a historical generalization.

3.2. Income tax

The Fisher effect may be considered as a determination of the condition under which money demand equates money supply under inflationary conditions. If we assume that Fisher was right, and that in an economy, regardless of the extent of changes in the rate of inflation, the rate of the real interest rate is stable, then, if the interrelation between the rate of inflation and the rate of interest would not match a point-for-point relation, the money market could become imbalanced. For example, if the rate of interest would not keep pace with the expected inflation rate, this would result in the flow of additional financial profit from creditors to debtors. This would increase the demand for money and, as a result, in accordance with the law of supply and demand, there would be an equilibrium in the money market at higher prices – exactly at the fulfillment of Fisher's 'point-for-point' condition.

The opinion that inflationary conditions make it possible for additional profits to flow from creditors to debtors is well established in the economic literature. However, the conditions in which this profit transfer would be feasible were limited to the situation characterized by a discrepancy between the expected and actual inflation rate (e.g. Alchian and Kessel 1959). Fisher shared this view. The situation mentioned above was, however, related to the conditions in which the actual inflation rate would equal its expected rate. Even if the Fisher effect does not hold, the abovementioned profit transfer would appear. In addition, while

in the second case the transfer was to result from the unpredictable occurrences (a discrepancy between the expected and actual inflation rate is, by nature, unpredictable), the first-case transfer was possible to predict. It would invariably appear in inflationary conditions. Unpredictability would only relate to the scale of the profit transfer.

After many falsifications of the effectiveness of the Fisher effect, many economists indicated that in both inflationary conditions and in a situation where an income tax was imposed on companies in order to maintain the real value of money whilst at the same time, while avoiding the disturbance of the balance of supply and demand, the nominal interest rate would have to increase by more than 'point-for-point'. A rise in the nominal interest rate should additionally allow for a tax shield generated from interest in order to avoid the transfer of profit from creditors to debtors (Darby 1975; Feldstein and Summers 1979). Otherwise, in inflationary conditions resulting a change in the level of interest charge at the rate indicated by the Fisher effect, a tax shield there would result in the transfer of a benefit from capital grantors to capital takers. The condition for the abovementioned situation to happen is the fact that interest rates should rise only by a level indicated by Fisher. With both higher levels of inflation and income tax rate, the tax shield effect could even exceed the level of the cost of money under non-inflationary conditions. Shaped in this way, the level of the cost of money would result in the lender incurring a financial loss every single time he was making a transaction. With reference to the Fisher effect, the Darby effect or Darby-Feldstein was formulated. It describes exactly this kind of relationship between nominal and real interest rates in inflationary conditions and the applicable income tax where the transfer, from money grantors to money takers, of the abovementioned financial profits related to a tax shield does not take place. The relation between the value of nominal and real interest rates would then be:

$$In=Ir+F/(1-T)$$

where:

T – income tax rate

Many studies conducted to prove this theory revealed the actual existence of evidence supporting the presence of the Darby effect (e.g. Peek, 1982). However, many of them also indicated time restrictions as well as varying intensity of the impact of the

tax factor on nominal interest rates. For instance, John A. Carlson, while examining the evidence verifying the Darby effect, found the proof for its influence on nominal interest rates in the United States in the 1960s. However, in the 1950s and the 1970s, this influence was considerably smaller (Carlson 1979). Even though, from a mathematical perspective, the Fisher effect is a special case of the Darby effect, perhaps it may be reasonable to view the Darby effect, just as Fisher effect, as a historical generalization. The question of theories accounting for the relation between nominal and real interest rates remains to be solved.

It turns out that when Fisher published his fundamental work titled *The Rate of Interest* (Fisher, 1907) income taxation did not exist in the US. It was only introduced in 1909 and it only became official law after passing the so-called Sixteenth Amendment of the United States Constitution in 1913. Moreover, at first, until the US joined the war in 1917, the tax rate amounted to merely 1-2% (IRS, 2015). Against the background of this low level of inflation and tax rates, the impact of a tax shield on the nominal interest rate suggested by Darby would amount, at that time, to only a fraction of a per mil. Its impact on the interest rates calculations, aimed at predicting future interest rates conditioned by the expected inflation rate, could still be omitted. As noted earlier in the last 20 years before 1907, the average yearly level of price fluctuations (inflation or deflation) was equal to merely 1.18%. At the same time, the highest annual rate of inflation was 2.23% and deflation 2.28% (21st Century: A Post Keynesian Perspective, 2015). The average tax shield impact would thus be:

$$Ts = f * It$$

where:

Ts – Tax shield

f – inflation rate

It– income tax rate

Ts= 1.18% * (1 ÷ 2%)

Ts = 0.012% ÷ 0.024%

The maximum impact of the tax shield would be:

$$Ts = (2.23 ÷ 2.28\%) * (1 ÷ 2\%)$$

$$Ts = 0.02\% ÷ 0.05\%$$

Even if the highest values of inflation and deflation are included in the calculations above, the money

transfer caused by the existing income tax would still amount to just a fraction of a per mil. Its impact on the interest rates calculations aimed at predicting future interest rates, conditioned by the expected inflation rate, could still be omitted.

The inexistence of an income tax imposed on companies would be a fully explicable reason for the absence of this factor in Fisher's formula when he presented his view on the interrelation between real and nominal interest rates in inflationary conditions at the beginning of the 20th century (Fisher 1907). He might have omitted this element until the publication of his fundamental work *The Theory of Interest* (Fisher 1930). This date, however, marks the time when significant tax and inflation transformations took place in the American economy. Both tax and inflation rates increased sharply. The change in Fisher's views might have already taken place in 1930 when he published *The Theory of Interest*. In the introduction to this book, Fisher pointed out to the significant changes in the world economy which took place since the date of publication, as well as other economists' critical opinions on *The Rate of Interest*. Ultimately, however, Fisher stood by his practically unchanged views ("My theory of interest has been altered scarcely at all") (Fisher I., 1930, p.10). Fisher's 'point-for-point effect' was not adapted to the changing conditions of the world economy.

3.3. Dollar/gold convertibility – the gold standard

Another factor that could limit the Fisher effect in terms of both time and space is the dollar/gold convertibility at the turn of the 19th/20th century. At that time, it was the currencies backed by the gold standard that dominated world financial markets. The American dollar was also convertible into gold on the basis of the Gold Standard Act passed on 14 March 1900 according to which 1 USD was backed by 1.67 g of pure gold. Both of Fisher's key publications, relating to the issue at hand, namely *The Rate of Interest* and *The Theory of Interest*, were published in 1907 and 1930 respectively, that is, before the American economy's departure from the 'gold standard'.

Nowadays, the dollar is no longer subject to the gold standard. It was replaced by fiat money. However, in the US, the transition from a gold-backed currency to a fiat currency was not just a single act but a process which started in 1933 and was completed in 1973. In 1933, the dollar's internal convertibility was suspended, and one year later the gold standard was

changed from $20.67 per ounce to $35 per ounce. In 1971, the government officially announced its intention to depart from the convertibility of the dollar. That ultimate step was finally taken in 1973. At the time, the exchange rate was already as high as $42 per ounce.

The hypothesis of the existence of a potential interrelation between the Fisher effect and the gold standard may be arrived at via indirect research. Most importantly, the relation between the price level in the economy and the interest rates which was noticed by Alfred Gibson and described by John Keynes as "Gibson's paradox" (Keynes 1930) has been directly linked to the "gold standard" period in the world economy. Together with the slow downfall of the "gold standard" Gibson's paradox also lost its power until its complete disappearance in the 1980s. The attempt aimed at explaining Gibson's paradox was taken by reference to the Fisher effect. This endeavor was made by Fisher himself as well as by other economists on the basis of his work. Gibson's paradox was supposed to be a deferred Fisher effect (Fisher, 1930). This explanation was generally criticized on the basis of different research outcomes (Friedman and Schwartz 1982) or the acknowledgement that Gibson's paradox is related more to the fluctuations of real interest rates than nominal interest rates (Shiller and Siegel 1977; Barsky and Summers 1988). However, in the opinion of the author of this article, the relation between Gibson's paradox and the Fisher effect is a matter which remains open for debate.

The next significant fact that could indirectly point to the relationship between the Fisher effect and the "gold standard" would be the fact that Darby, later followed by other academics, proposed the existence of the Darby effect following the abolition of the dollar/gold convertibility. The years following 1973 saw the publication of the most important works by Darby, Feldstein and Summers who postulated the incorporation of the income tax into Fisher's equation. As noted above, these works were published after 1973, that is, only after the convertibility of the dollar to gold was abolished. Thus, the publication of these research papers of a fundamentally methodological character took place in the 1970s, even though the rates of income tax payable by corporations as well as natural persons (which are crucial for the Darby effect), already reached a two-digit level in the US since the Second World War (IRS 2015).

3.4. The functioning of a central bank

Finally, the creation of a central bank in the United States might have substantially influenced the relationship between interest rates and inflation forecasts. The Federal Reserve System (Fed), which is a counterpart of the European Central Bank, was established in the US in 1913 (Econlib 2015). Thus, the creation of the Fed took place only after the publication of *The Rate of Interest* which established a basis for Fisher's equation. Subsequent changes, which were aimed at strengthening the Fed's power, were introduced in the years 1931-35, again that is a couple of years after the publication of *The Theory of Interest* (Fisher 1930). The influence central banks exert on interest rates is unquestionable and results, among others, from the fundamental duties imposed on these institutions. By way of an example, in Poland those duties as well as the rights related to them are laid down in the Banking Act of 29 August 1997 (Dz.U. 1997 Nr 140 poz. 938). Art. 3.1 of this Act states that "the basic objective of the NBP [the central bank of the Republic of Poland]" shall be "the maintenance of price stability and, at the same time, the support of the Government's economic policy".

The role of the influence a central bank has on the price levels may therefore contradict investors' expectations in terms of inflation rate, change these expectations or it even lead to the effective change in the result of these expectations (Gibson 1970).

4. CONCLUSION

The changes in economic circumstances of the US economy after 1930 could have an impact on the nominal and real interest rates as well as the relation between them. The postulated "point-for-point" relationship under inflationary conditions might have changed. Many theoretical, as well as subsequent empirical studies, confirmed the fact that the Fisher effect might have lost its validity or could only function under limited conditions of time and space. Some academics have directly stated that Fisher's "point-for-point" effect could be only applicable in income tax–free economies (Weidmann 1997). As a consequence of the publication of numerous research results denying the universal character of the Fisher effect, the author of this article believes that in today's global economy, it should be viewed just as a historical generalization and that its effectiveness should be limited to not later than the time until the first half of the 20th century. Since that time, the changes in economic conditions gave rise to such factors as inflation rate, the intensity of changes in inflationary processes, income taxation as well as the abolition of the gold standard. All those factors may influence the nominal and real

interest rates in inflationary conditions which were not taken into account in Fisher's theoretical considerations. As a result of these changes, the postulated 'effect' has lost its universal character. Thus, its use in decision-making processes at the corporate level may not be economically effective at present.

Undertaking empirical research aimed at determining the relation between inflation rates, the intensity of their changes and the degree of the effectiveness of the Fisher effect could lead to the pinpointing of detailed limiting conditions. They would become the conditions limiting the functioning of this 'law' beyond which it would be nothing but a historical generalization.

A final methodical commentary should be made at this point. Even if it would not be possible to detect all the causes which limit the Fisher effect to a given historical period, the empirical evidence of this limitation, derived from empirical studies aimed at the falsification of Fisher's effect, should be sufficient evidence to warrant the statement.

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