

Calculation of Inflation from Salaries Instead of Consumer Products: A Logical Exercise

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Abstract—Inflation can be calculated from either the prices of consumer products or from salaries. This paper presents a logical exercise that shows it is easier to calculate inflation from salaries than from consumer products. While the prices of consumer products may change due to technological advancement, such as automation, which must be corrected for, salaries do not. If technological advancements are not accounted for within calculations based on consumer product prices, inflation can be confused with real wage changes, since both inflation and real wage changes affect the prices of consumer products. The method employed in this paper is a logical exercise. Logical arguments are presented that suggest the existence of many different feasible ways by which inflation can be determined. Then a short mathematical exercise will be presented which shows that one of these methods –using salaries – contains the fewest number of unknown parameters, and hence, is the preferred method, since the risk of mistakes is lower. From the results, it can be concluded that salaries, rather than consumer products, should be used to calculate inflation.

Keywords—Inflation, logic, math, real wages.

I. INTRODUCTION

INFLATION is often calculated from consumer products and consists of a price comparison of a given product across two years. This way of calculating inflation normally involves comparing the average change in the prices of a list of products between two points in time.

Inflation is the change in the value of money. When money becomes less valuable it is called inflation, and when it becomes more valuable it is called deflation. In the case of inflation, everyone earns more money but, at the same time, everything cost more. For example, if everything costs 2% more and everyone earns 2% more than at the start of a given period, then the inflation rate for that period is 2%. So, inflation is when the value that can be bought for a given amount of money decreases but the numerical number on the bill/account has not changed.

Since inflation is when both salaries and the prices of consumer products increase, it is possible to calculate inflation from either; which measure to use is a matter of choice. To choose the more difficult method offers no advantage, since the goal is simply to acquire the appropriate numerical values (a number three in terms of salary is the same as a number three in terms of prices, if neither contains errors). To use a method that is more difficult or that gives a less accurate value is not desirable.

The opposite of inflation is real wage change. It is when the

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salaries and prices of consumer products do not increase equally. If salaries increase more than the prices of consumer products, this is called a real wage increase, since people can afford more with their salaries. If the prices of consumer products increase more than salaries, this is called a real wage decrease, since people can afford less with their salaries.

In real life, changes of real wages and inflation occur at the same time, and both influence the prices of consumer products and salaries. Therefore, if one wants to calculate one effect, it is important that it is not contaminated by the other. If these effects are mixed up, the wrong values will be calculated. One must thus be careful to avoid such confusion. If the effect being measured is contaminated, one might think that inflation is occurring when in fact there is a change in real wages, or vice versa. Furthermore, if political or economic decisions are made with respect to changes in real wages or inflation, it is important that each is accurately calculated and distinguished. Otherwise, incorrect decisions can be made. In a worst case scenario, due to incorrect calculation, attempts to keep either inflation or real wages constant can fail, leading to inappropriate decisions or policies that in fact undermine the intended outcome. For example, a policymaker might intend to keep inflation at a constant rate of 1%. Yet due to contamination in their measurement approach, they incorrectly believe inflation to be at 2%, leading them to take wholly inappropriate action that reduces inflation below 1%. Another example could be if a policymaker wants to increase real wages but confuses this measure for inflation – they therefore enact policies to maximize inflation rather than real wages, leading to high inflation which in turn leads to a decrease in real wages. The bottom line is the importance of distinguishing inflation and real wage changes.

It would be far easier if inflation and real wage changes did not co-occur – if inflation was to happen first and then real wage changes subsequently, during different parts of the year. Unfortunately, this is not the case, and therefore, a means of separating the two is preferred. One can define both measures – inflation and real wage changes – in different ways. One way is to tie inflation to money, since inflation is the rate of change of the value of money, and to tie real wage changes to something non-monetary, since real wages are not how much money people have but rather how much people can buy with their salaries.

II. CALCULATING INFLATION FROM CONSUMER PRODUCTS

The main reason why it is hard to calculate inflation from consumer products is the change in price due to technological advancement. The change in product prices must first be

corrected for changes in automation and similar technical achievements. Inflation is therefore given by:

$$I = C * T_p \quad (1)$$

where I is the inflation, C is the change in prices of the consumer products and T_p is the effect of technological advancements on products (both goods and services).

The reason why this effect must be included in the calculation of inflation is that this effect changes the price of some or all products but does not constitute inflation. For example, if one company discovers a new means of making a computer that is twice as efficient for the same price, this is not 50% deflation but rather a technological advancement. The same applies to a company making shoes that discovers a way of making its shoes for half the cost – it is not 50% deflation. Deflation would be if these firms decreased their costs by lowering the workers' salaries. If the cost reduction is otherwise achieved, e.g., by automation, it is not deflation but rather real wages increase. (Getting more products for the same amount of work is not deflation, it is real wages increase.)

III. CALCULATING INFLATION FROM SALARIES

The main reason why it is easy to calculate inflation from salaries is that it is uncommon for salaries to be affected by technological advancement. The equation for calculating inflation from salaries is:

$$I = C * T_s \quad (2)$$

where I is the inflation, C is the change in salaries and T_s is the effect of technological advancements on salaries.

T is almost always 1, because there are no technological advancements in salaries. Salaries are measured as price per hour or price per month – these units do not often change and hence T is almost always 1. (The only way to get a T different from 1 is by some technological advancement to get more than 3600 seconds per hour or more than 24 hours per day. No such machine exists today, and it will not exist in the near future either.)

IV. COMPARING THE TWO DIFFERENT METHODS

In (1) there is one unknown parameter for calculating inflation, while in (2) there is no unknown parameter. Simple logic tells us that (2) is to be preferred. (Here, it is assumed that changes in prices of consumer products and salaries are equally hard to find.)

V. LOGICAL ARGUMENT

The logical background for this thesis will be presented here. A few different ideas underlie this thesis, the first and most important being the idea that inflation does not have to be the change of the prices of consumer products. The second idea is that, to calculate the correct value of inflation, one must have a well-defined measure, such as real wages, to ensure

contamination is avoided.

Inflation is a way to describe the change in the value of a certain amount of money. Some people like to think of this as the change in how many consumer products one can buy with a certain amount of money, but this is not the only way to look at it. It is just as valid to say that inflation is the change in how many working hours one can buy for a certain amount of money. This view tends to take an employer rather than a consumer perspective, but both views are equally valid. Money flows in a cycle in our economy – people have money that they use to buy consumer products from companies, who in turn spend some of that money on paying the salaries of its employees, who then again spend their money on consumption of goods and services. There is no difference, in terms of measuring inflation, if one decides to calculate this flow at the first or the second step. (In this cycle of money, the government can be considered a company as it too pays out salaries to and is paid by citizens.)

With an increase in salaries, people will have more money than before. Their experience of the value of that money will then decrease, since they earn more. This is how inflation works. Old savings will also feel less valuable, since they can be re-earned more quickly than before. People will also be willing to spend more money than before to purchase the same things. For instance, if one person doubles their income, all previous savings will feel only half as valuable, and the prices of products will seem low, even if they have not also doubled. Thus, if this happens to the entire population instead of just one person it is called inflation, even though the prices of all products might not have changed. The reason why some product prices might not have changed even though all salaries have is due to streamlining – all products that cannot be streamlined must double in price if salaries double in price. This is the major difference between goods and services – goods can easily be streamlined, while only some parts of the cost of services (i.e., the non-labour costs) can be streamlined, and hence, reduced in price as compared to salaries.

As shown above, one of the approaches to measuring inflation is more difficult than the other. To switch our approach is, of course, the only sensible thing to do to get a more accurate measure of inflation. Inflation is a very important property of the economy, so it is vital to get the most accurate value possible. (For example, the Swedish national bank aims to keep inflation at 2%, so it is important to get the right value [1].)

If one defines inflation as the change in salaries, the most accurate way to find real wages would not change. The best way to describe real wages is not as how many consumer products one can buy for one's salary. A better way to define it, regardless of how one measures inflation, is as how many hours one needs to work to afford a certain product. For example, how many hours must a construction worker work to be able to buy one kilo of meat, or how many hours must a nurse work to buy one pair of jeans. These values are absolute and will not be affected by inflation or the choice of currency, and so, they are good measures of real wages. With this definition, real wages are clearly separated from inflation as

calculated from salaries, and so, the risk of misinterpreting a change in real wages as a change in inflation decreases.

VI. TIME IS NOT MONEY, BUT MONEY IS TIME

The quotation “time is not money, but money is time” (“Tid är inte pengar utan pengar är tid” in Swedish as it is mentioned in [3]) is the background for this thesis. It simply explains that money does not buy a product directly, but rather, it buys someone else’s time. Every time someone buys a product they are in fact buying someone’s working time to produce that product. This lesson can explain why automation and mass production have improved real wages over time. That less work is required for the same number of products means higher real wages, since real wages should be measured as the working hours required to afford a certain product. The steps are, first, automation leads to an increase in productivity, which then leads to a decrease in production cost per unit. Next, decreased production costs lead to a decrease in market price, leading to an increase in real wages since people can afford more products. (This might not happen if free market conditions do not prevail or if a government interferes in the market). This adage can be as important to know as the axiom of “supply and demand”, which is known to rule the price of products. “Supply and demand” dictates the price consumers are willing to pay for a certain product, yet the point that “time is not money, but money is time” sets the boundary conditions on the price. If the demand decreases such that the price decreases below the boundary condition set by “time is not money, but money is time” no one will want to work to produce that product and these companies will go bankrupt until the supply drops to a level at which “supply and demand” again puts the price above the lower boundary condition. The other boundary condition is when the demand is so high that the price rises to a level at which people can spend their own time producing the product, and thereby, again decreasing the demand to a stable level.

One typical scenario based on the quotation “time is not money, but money is time” is when some services are so expensive that no one purchases them. This is often the case when the workload is so big that the price becomes so high that no one wants to buy the product and therefore an entire market disappears, e.g., house cleaning under conditions in which the price to clean a house is so expensive that almost no one buys it. According to strict “supply and demand”, the price should decrease until people start to buy the service, but it does not. The reason can be found in the knowledge that “time is not money, but money is time”, which says that all services have a boundary condition that sets the limit to the price of the product, regardless of what product it is. This leads to the conclusion that the product will not exist on the market if the price set by “supply and demand” is outside the range of the boundary condition set by “time is not money, but money is time”.

The quotation “time is not money, but money is time” explains why low and stable inflation is good and why healthy inflation is measured from salaries. In an economy based on this point, money is mainly a means of purchasing someone

else’s time. The lesson also implies that the backbone of the economy is the flow of money from people consuming products and companies paying salaries. In this kind of economy, money slowly loses its value both for people and for companies. Money will slowly lose its value for people if they continuously get higher and higher salaries, since people can earn more with increasing ease. If someone earns more money every year, their old savings will be decreasingly valuable to them. For example, with a salary increase of 2%, 102 dollars will feel like 100; so, if a worker saved 100 one year, next year it will not feel as valuable, since it was as easy to save 102 now as it was to save 100 previously. This will push people to use their money quickly, as new money will be easier to earn. If people use rather than save their money, the cycle of the flow of money will not be interrupted, as money flows from companies through salaries to individuals and then back to the companies through consumption. Money will also slowly lose its value for companies if their employees’ salaries continually increase, since the cost of having employees thus rises. If it costs an increasing amount to hire an employee, the employer’s old money will secure a decreasing number of working hours. For example, with a salary increase of 2% the company must pay 102 dollars for a day’s work if they paid 100 the year before. This will push companies to spend their money on hiring people this year instead of the next, since today’s money will get fewer working days next year. This will ensure the cycle of the flow of money is not interrupted, keeping companies hiring employees and employees consuming their salaries.

The big question left to answer, then, is why high inflation is not good, since inflation keeps the cycle of the flow of money from interrupting. One might think that higher inflation will push people to consume and companies to hire even faster, and it will. With very high inflation, both companies and individuals will try to spend their money as quickly as possible, which will certainly maintain the cycle of the flow of money. Yet very high inflation has some drawbacks. The most obvious in respect of the quotation “time is not money, but money is time” is that not all money should or can be spent on the same day as it is earned. With very high inflation, neither people nor companies can save money for future consumption, because their money will be worth much less later. Thus, saving money for a future investment is very expensive, since much more money will be required in the future than the cost of the investment today. For instance, if annual inflation is 20%, the value of old savings will diminish very quickly, and to save to purchase something in two years’ time will require that someone save 144 dollars for an investment that today only costs 100 dollars, since the value of the 44 dollars will disappear through inflation over the two years. This renders large investments very expensive, and hence, very few actors in economies with very high inflation save for large future investments. This in turn harms the economy since investments are necessary for streamlining and technological advancements to happen, which are then necessary to achieve real wage increases; otherwise, all salary increases will merely reflect inflation and not improvements in the economy.

VII. OLD KNOWLEDGE

This thesis should be old knowledge. In 1968, Milton Friedman [2] published a paper about “the natural rate of unemployment”. This well-known fact tells us that a too-low rate of unemployment will lead to an increase in salaries which will then increase inflation. This shows that salaries are a driving force of inflation.

As shown at the beginning of this paper, increasing salaries, however, are not just a driving force of inflation, as they can be seen as inflation itself. Thus, it is not so strange that an increase in salaries increases inflation, since it is inflation. Salaries and prices are just two sides of the same coin. Salaries are the side of the employer’s perspective and prices are the consumption perspective.

In Sweden, there is a concept called “the aim” (“märket” in Swedish) [4]. The aim is a goal set by a negotiation between companies and unions, whereby they set an aim for the increase of all salaries. This is done once a year and all companies agree to try to increase the salaries of their employees by the amount of the aim. For example, if the aim is 2.1%, all employees should get a salary increase of 2.1%, on average. This will lead to inflation of 2.1%, as described above. With this aim, a country can have a lower unemployment rate than the natural rate of unemployment without an increase in inflation, as long as the aim is a low number and, of course, as long as all salary negotiations generally respect the aim. The good thing about an aim is that everyone knows what inflation will be, and thus, everyone knows the probable increase in salaries and hiring costs. This offers predictability which is often good for the economy. Yet there is one great weakness of this system, as everyone naturally wants to get a little bit more than the aim so that they become a winner rather than a loser under the system. The winners are those who get more than the aim, since their income will increase more than the average, and therefore, secure themselves higher real wages as compared to those who only get an increase of the aim precisely. This might lead to some people getting more than the aim and some less, which might make the losers want more. If the losers then get more, perhaps as a result of strikes or other actions, then everyone gets more than the aim. This leads to two consequences: first, inflation may exceed the aim, possibly reaching very high levels according to “the natural rate of unemployment” and, second, the reliability of the aim system will fall. The system is therefore back at square one, where the natural rate of unemployment rules the rate of unemployment. Therefore, it is important to honour the agreed aim if people want the system to work. The problem is, as always, the humans – everyone agrees that the system is best for the whole, but then everyone wants a little bit more for themselves.

VIII. SUMMARY

There are many different ways of measuring and defining inflation, and the method of choice is up to every individual, but the preferred method should be the one that is easiest to use, with the fewest potential errors and unknowns. One

method that is used today by some organizations (e.g., the Swedish national bank [5]) calculates and compares the prices of consumer products over time. This method can work, but, as shown in this thesis, it has one flaw – if the prices of consumer products are used, one must correct for technological advancement; otherwise, the change in price might not reflect inflation but rather the rate of streamlining. This factor is very hard to calculate, partially because it is different for each product each year.

This paper proposes that the preferred method for calculating inflation is not the prices of consumer products but rather salaries. The main reason is because salaries do not contain any hidden unknown parameters due to technological advancements, since employees’ time is a fixed value (there is no machine that could provide us with more than 24 hours per day or 3600 seconds per hour). So, the bottom line is that the prices of consumer products contain one unknown parameter while salaries contain no unknown parameters, and hence, the latter is better to use for calculating the value of inflation with low uncertainty.

IX. CONCLUSION

This paper shows that there are many different means of calculating inflation and that one should choose the easiest method. The paper also shows that one way to measure inflation contains fewer unknown parameters and should therefore be chosen. From the arguments presented, it is recommended that calculations to measure inflation use salaries instead of using consumer products. With this way of measuring inflation, the risk of contamination with real wage changes is less likely. A more accurate measure of inflation will help to ensure more informed and accurate decisions are made by those who need to know the inflation rate and make good predictions and policies based on it.

X. FUTURE

A follow-up study to confirm this thesis would be desirable. Such a study might be necessary to prove that this concept is indeed valid for our economy. It might be possible to have an economy for which salaries are not the best method for measuring inflation, and the only way to truly know is through empirical research.

The follow-up study should be performed to confirm that salaries are a better measure of inflation. The goal for such a study must be to find whether the predictions of this theory are correct. It would also be useful if this study were to confirm that the prices of consumer products are a bad measure of inflation. If such a study were to confirm this thesis, it would truly support a change in the method of measuring inflation.

One study that should be performed would be to measure price changes over time for some selection of products, both goods and services. This study could be performed today by looking at old data (new prices are not necessary but could of course be used), then looking at the change of the prices of these products and comparing it with inflation. This thesis predicts that such a study would show that products that were

not streamlined before measuring would track inflation, while products that were streamlined would not. A typical product that would not be streamlined is one that primarily involves labour, e.g., services such as home cleaning. A typical product that would be streamlined is a new technological gadget, e.g., a product that can be bought at a typical electronics store.

If this study is performed and it confirms this thesis, the results will show that it is safe to adopt the salaries-based measure of inflation in place of calculations based on consumer product prices. If the study does not confirm this thesis, then a new logical exercise will be necessary to explain why this is not the case in our economy.

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