How can the Phillips curve be used for today's policy?

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Abstract

Simple observation seems to suggest a downward shift of the Phillips curve to low levels of inflation for countries such as the US, Germany, France and Japan. A cloud of inflation-unemployment data points can be read as a family of short run negatively sloped Phillips curves intersecting a vertical long run Phillips curve. How can the evidence on these families of Phillips curves be used for policy? How can it be used to induce higher inflation in today's low inflation context? (JEL: E31, E40,E52,E58, E62, E63)

Introduction

Why is inflation low in the Euro area? Is it because interest rates cannot be lowered further? Or is it because interest rates are too low? Can these two questions both make sense? Can inflation be low because interest rates are not low enough, as it can be low because interest rates are too low?

It is indeed a feature of monetary economics that apparently contradictory effects coexist. The key to finding answers to the questions above is to distinguish short run effects from long run ones that tend to work in opposite directions. While in the short run inflation may be raised by lowering nominal interest rates, in the long run high inflation can only be supported by high rates. In the short run, lower policy rates may induce both higher inflation, and lower unemployment. This is consistent with a negative empirical relationship between inflation and unemployment, the Phillips curve. Instead in the long run, lower rates do not seem to have first order effects on growth, and, instead of raising inflation, they lower it, one-to-one. This article is about this distinction, of the short run and long run effects of monetary policy, in an attempt at answering the questions of why inflation is low in the Euro area and what policy should do about it. In particular, we want to discuss ways in which the evidence on the Phillips curve can be used to achieve higher inflation.[1]

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1.   While we would expect money to be neutral in the long run, money may also be neutral in the short run, meaning that the long run effects could happen fast, even instantaneously. When

Central bankers are confident that the way to keep inflation at target is to have nominal rates be lower than average when inflation threatens to deviate down from target, and to have nominal rates above average when inflation deviates upwards. Monetary models are not inconsistent with this view, provided average interest rates move positively, one-to-one with the target.

Short run deviations from average rates may keep inflation at target. These days nominal interest rates are much below average, since average nominal rates that are consistent with a target of 2% should be between 2 and 4%, and they are zero. So is this a way to induce inflation to go back to target? The key to answer this is in the time frame of the deviation from average. Policy rates have not been below average for the last one, two or even three years. They have been below average for the last eight years, and they are expected, and announced, to stay low for a few more years. This can hardly be seen as a short run deviation from average. It looks a lot more like a lower average. And lower average nominal rates mean lower average inflation rates, in the models and in the data.

Money in the long and short run

In his Nobel Lecture in 1996, Robert Lucas goes back to the data on the quantity theory of money and the Phillips curve to make the case for the neutrality of money in the long run and the absence of it in the short run. Lucas also goes back to David Hume' essays "Of Interest" and "Of Money" published in 1752. Two of the wonderful quotes from those essays are:

> It is indeed evident that money is nothing but the representation of labour and commodities, and serves only as a method of rating or estimating them. Where coin is in greater plenty, as a greater quantity of it is required to represent the same quantity of goods, it can have no effect, either good or bad ... any more than it would make an alteration on a merchant's books, if, instead of the Arabian method of notation, which requires few characters, he should make use of the Roman, which requires a great many. [Of Money, p. 32]

and

> There is always an interval before matters be adjusted to their new situation, and this interval is as pernicious to industry when gold and silver are diminishing as it is advantageous when these metals are encreasing. The workman has not the same employment from the manufacturer and merchant- chant, though he pays

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the euro was introduced, money supply in Portugal was reduced 200 times (in units of money understood as the escudo and the euro), all prices were reduced also by 200 times, and there were no real effects. The neutral effects of money, which are a characteristic of the long run, happened instantaneously. What the long run and the policy of replacing escudos with euros have in common is that both in the long run and for simple policies like a change in monetary units, the policies are well anticipated and understood.

> the same price for everything in the market. The farmer cannot dispose of his corn and cattle, though he must pay the same rent to his landlord. The poverty, and beggary, and sloth which must ensue are easily foreseen. [p. 40]

Lucas relates these two apparently contradictory statements to the quantity theory evidence on the long run effects of money and to the evidence on short run effects from Phillips curves.

The central predictions of the quantity theory are that, in the long run, there is a one-to-one relationship between average growth rate of the money supply and average inflation and that there is no relation between the average growth rate of money and real output. We will add to this the long run evidence between nominal interest rates and inflation.

Figure 1 taken from McCandless and Weber (1995) plots 30 year (1960-1990) average annual growth rates of money against annual inflation rates (first panel) and average real output growth rates (second panel), for a total of 110 countries. For inflation and money growth, the dots lie roughly on a $45°$ line, meaning that countries with higher average growth rate of money have higher inflation by the same magnitude.[2] Similarly countries with higher nominal interest rates also have higher inflation, also one-to-one as documented in Figure 2 (first panel), taken from Teles and Valle e Azevedo (2016). For real output growth and money growth, there seems to be no relationship between the variables.

For the short run, the evidence on the effects of monetary policy is mixed. Lucas (1996), using plots of annual inflation against unemployment rates for the United States in the period between 1950 and 1994 (from Stockman, A.C. (1996)) shows that at first sight the variables are unrelated. Then, he gives it its best chance by drawing in the cloud of points a family of short run Phillips curves that would be shifting up (Figure 3). The idea is that the downward sloping Phillips curve is evidence of short run effects of monetary policy. The curves would be shifting up as those short run effects would be exploited to reduce unemployment.[3] Higher surprise inflation would reduce unemployment in the short run, but it would eventually raise inflation expectations shifting the Phillips curve upwards. Higher, and higher surprise inflation would then be necessary to reduce unemployment further, and further, inducing further shifts of the Phillips curve. The use of the short run non-neutrality of money to systematically reduce unemployment would lead to shifts to higher short run Phillips curves, leading in the long run to higher inflation. In this sense one might be able to distinguish in the cloud of points a vertical long run Phillips curve and a family of short run Phillips

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2. The evidence for countries with moderate to low inflation is much less striking. Teles *et al.* (2016) provide explanations for this that are still consistent with the quantity theory, long run neutrality of money. This is the content of Box 1.

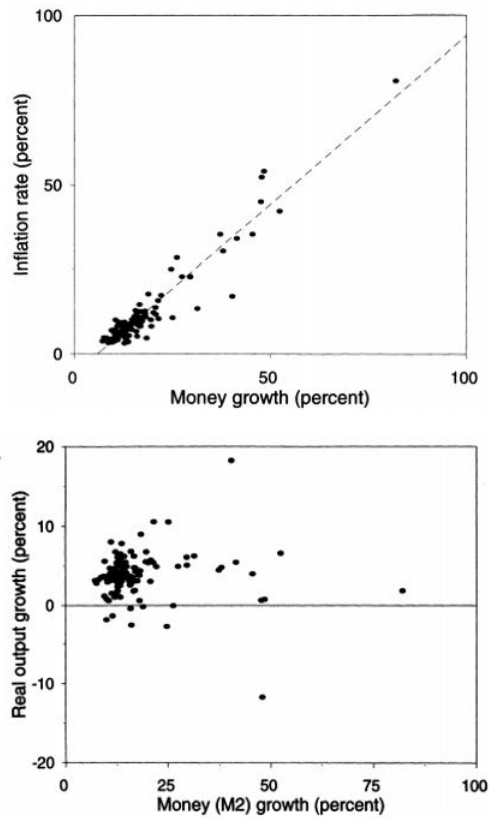3. See Sargent, T. J. (2001) for a formal analysis of this argument.

FIGURE 1: Long run money, prices and output

Source: McCandless and Weber (1995).

curves crossing it at points that over time are moving upwards towards higher inflation for some natural rate of unemployment.[4]

Extending the sample period to the more recent periods, and using the same approach where the short run Phillips curve is given its best chance[5], shows the reverse picture of shifting Phillips curves downwards (Figure 4). Not only the short run Phillips curves that appear out of the cloud of points seem to move downwards but the last three years could possibly suggest a new even lower curve.

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4. The estimation of short run Phillips curves is difficult because of endogenous policy. See Fitzgerald and Nicolini (2014) for an econometric estimation of Phillips curves using regional data for the US.

5. The data breaks are hand picked to carefully try to make it work.
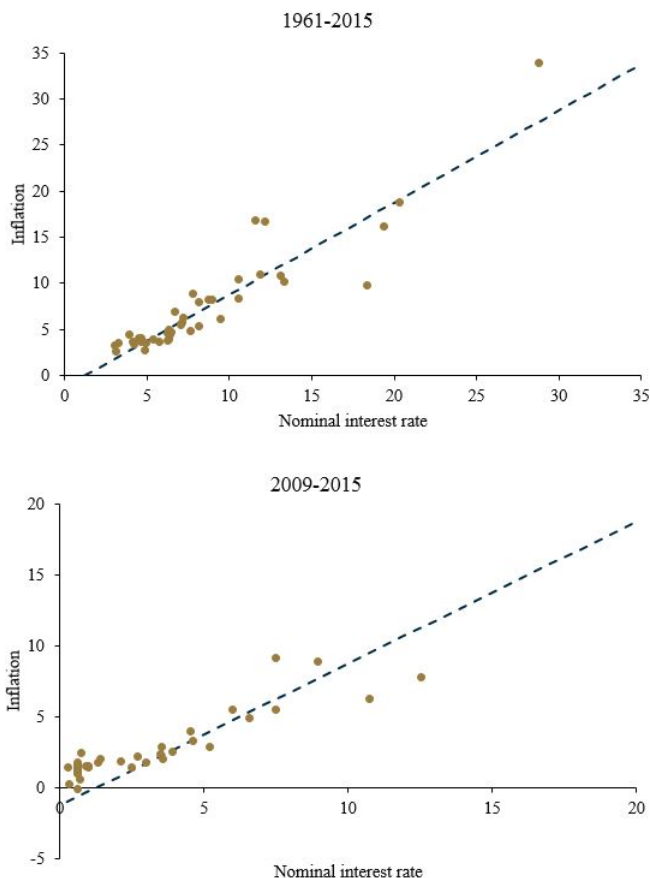
FIGURE 2: Nominal interest rates and inflation

Source: Teles and Valle e Azevedo (2016).

The story behind the movements along the short-run Phillips curve together with possible shifts of those Phillips curves, relies on a mechanism of expectations formation that adjusts to the economic context. Depending on the economic context those shifts of the short-run Phillips curves can happen at a very fast pace. Movements along the long run vertical Phillips curve can be almost instantaneous.

The picture is strikingly similar for other countries. For Germany the high inflation curves are lower than for the US but other than that they look alike (Figure 5). For Germany the last three years suggest a short run vertical Phillips curve, associated with a precipitate decline in inflation. For France there is clearly also a shift to the right towards more unemployment (Figure 6). What could explain that shift to the right? Stronger unemployment protection
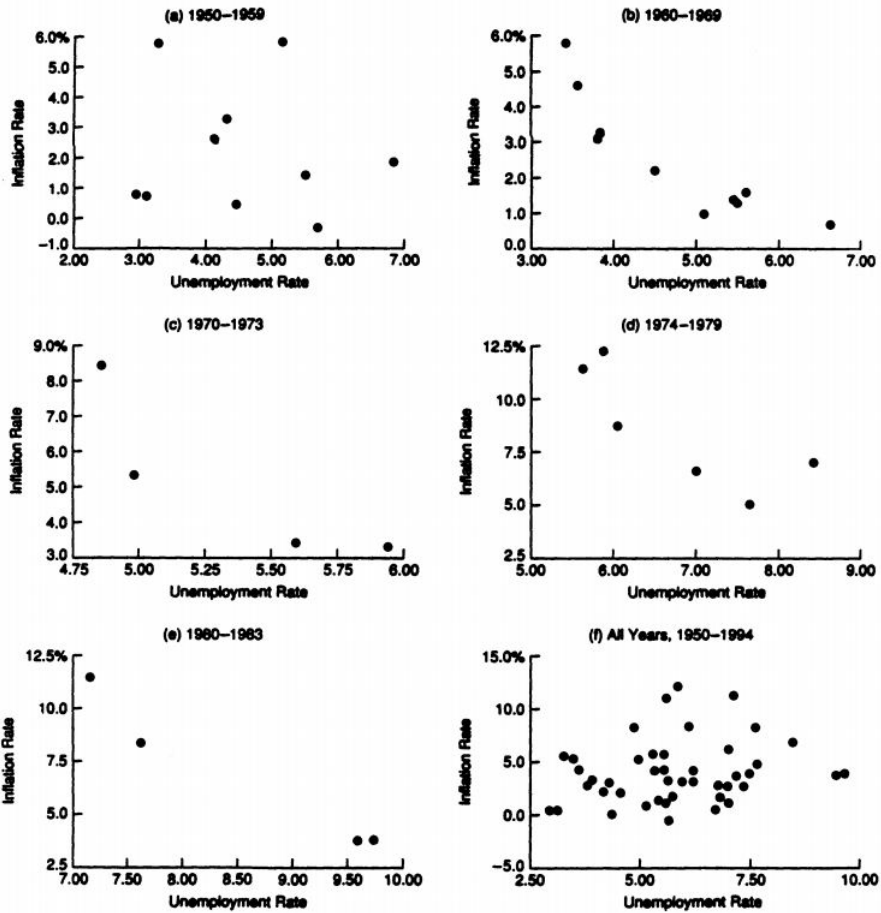
FIGURE 3: Lucas Phillips curves for the United States

Source: Lucas(1996).

and more effective minimum wages must be part of the explanation. Still the same shift downwards is clear.

Again, the picture for Japan is similar (Figure 7). Even if for Japan the whole curve looks like a Phillips curve, a more careful reading can still identify a family of curves, with similar shifts to the ones in France, where the curves seem to shift to the right and downwards, with resulting higher natural unemployment and lower inflation expectations.
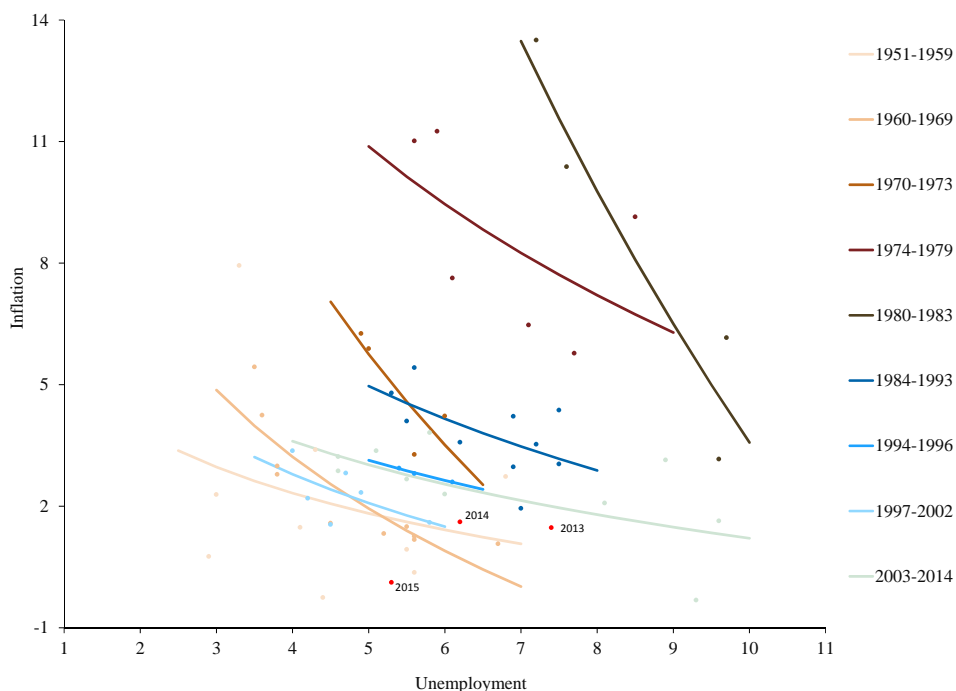
FIGURE 4: Phillips curves for the United States

Source: Bureau of Labour Statistics and own calculations.

Can the Phillips curve be used for policy?

The data on inflation and unemployment can be read as a family of downward sloping short run Phillips curves crossing a vertical long run curve. This reading is consistent with the apparently contradictory statements of David Hume. It is also the contribution of Friedman and Phelps that gave Phelps the Nobel Prize in 2006. Its formalization with rational expectations is one of the main contributions of Robert Lucas that also justified his Nobel prize. The reading is also consistent with all macro models with sticky prices or wages that are written today.

Even if there are certainly short run effects of monetary policy, and nominal frictions matter in the short run also in response to nonmonetary shocks, those effects are averaged out in the long run. In that sense, in the long run inflation is strictly a monetary phenomenon moving one-to-one with the growth rate of the money supply and with the nominal interest rate. In the long run the Phillips curve is vertical. There is some natural rate of unemployment because people take time to find jobs and firms take time to
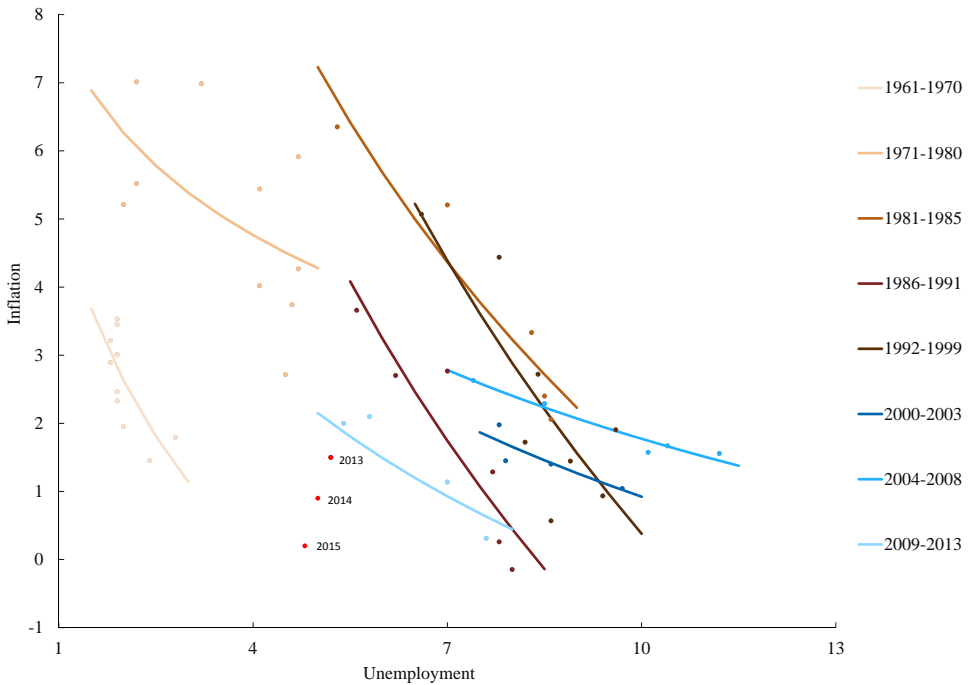
FIGURE 5: Phillips curves for Germany

Source: AMECO database and own calculations.

fill vacancies. That natural rate of unemployment is consistent with many possible levels of inflation. Inflation could be very low or very high, and only monetary policy would determine the level.

A simple quantity equation and the Fisher equation can be useful to formalize this. Because money must be used for transactions, some monetary aggregate, M, times velocity, v, equals the price level, P, times real output, Y:

$$Mv = PY$$

In growth rates, with stable velocity, this means that

$$\pi \approx \mu - \gamma,$$

where π is the inflation rate, μ is the growth rate of the money supply and γ is the long run real output growth rate. The Fisher equation will have the return on a nominal bond, i, be equal to the return on a real bond, r, plus expected inflation, π^e. This is an arbitrage condition between a nominal and a real bond, formally written as
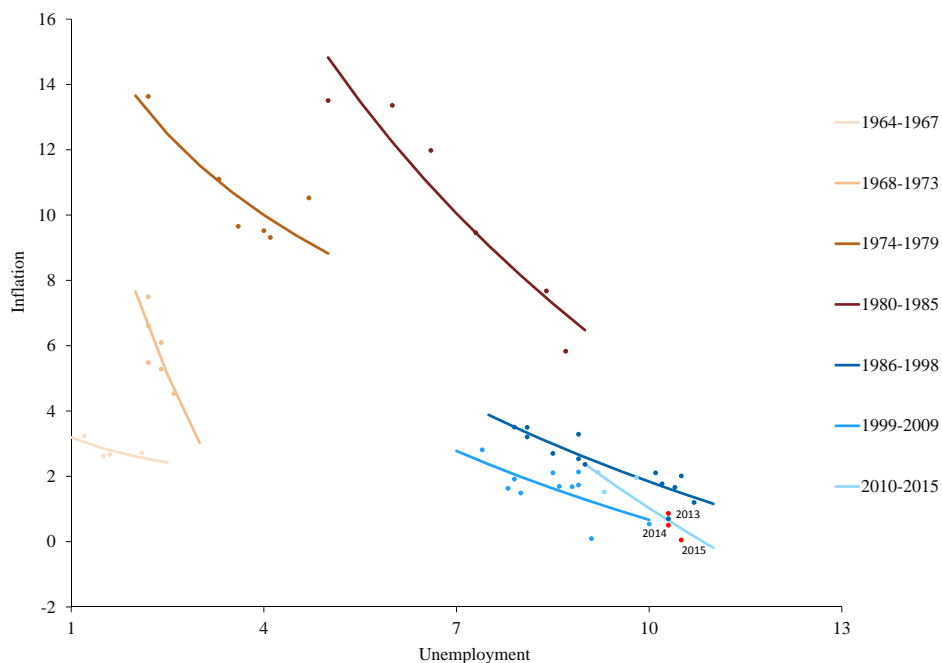
$$i = r + \pi^e$$

FIGURE 6: Phillips curves for France

Source: AMECO database and own calculations.

The simplest possible way to model the interaction between nominal and real variables will have the long run real growth rate, γ, and the real rate of interest, r, be invariant to monetary policy. A higher growth rate of money translates into higher inflation. A higher nominal interest rate also translates into higher inflation. Because the nominal interest rate cannot be very much below zero (otherwise only cash, that pays zero return, would be held), inflation is bounded below. But it is not bounded above.

This very simple model fits beautifully the long term data in Figures 1 and 2. A higher nominal interest rate translates into higher inflation, and growth rate of money, one-to-one.

The long run behavior of money and prices could be described by a more complete model without uncertainty and with fully flexible prices and wages. We now want to think of a world with aggregate uncertainty but without information frictions, with flexible prices and wages. In that world, the natural rate of unemployment would move over time, but monetary policy would not have short run effects. Inflation could be higher or lower, but that would have no bearing on real variables (other than through the
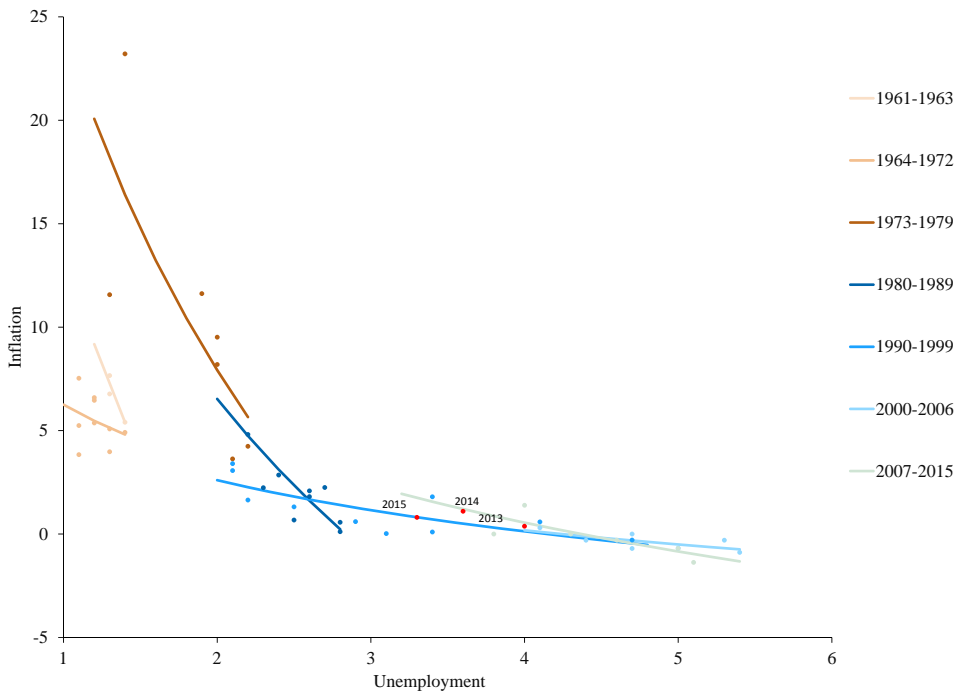
FIGURE 7: Phillips curves for Japan

Source: AMECO database and own calculations.

distortions imposed by volatile nominal interest rates). Notice that the raw data on inflation and unemployment is not inconsistent with this view. The natural rate of unemployment could be moving around in response to real shocks, and inflation could be moving around in response to both real and monetary shocks.

In particular the data could draw an horizontal Phillips curve even if prices are fully flexible. This is particularly relevant since more recent Phillips curves have very low slopes, very close to zero. The reason for an horizontal Phillips curve with flexible prices would be inflation targeting. If in a world with flexible prices monetary policy is successful in keeping inflation at a constant target, then we should see exactly an horizontal Phillips curve. Unemployment would be moving up and down, but inflation would be stable at target. As it turns out in such an environment, because it is a stable nominal environment, we have reasons to think that even if prices are sticky that price stickiness is irrelevant.

The long run Phillips curve in this context would average out the movements in unemployment and would be a vertical line at that average unemployment rate, for different targets for inflation.

Nominal rigidities and the use of the Phillips curve for policy

Now we want to give a chance to the Phillips curve as evidence for short run effects of monetary policy. One clear way to understand what these short run effects are, as well as the long run neutrality, is to read Lucas (1988) lecture "What economists do" given at a graduation ceremony at Chicago back in the 80's.[6] Basically, we are going to use Kennywood Park, the amusement park in Lucas lecture, as the model of short run effects of money.

In Kennywood Park a surprise appreciation of the currency internal to the park (or a decrease in the money supply) has negative real effects. Output goes below potential, and unemployment goes above its natural rate. But the experiment has no effect on inflation. One way there can be both a positive effect on unemployment and a negative one on inflation is by assuming that the model has two parks, one in which the appreciation takes everyone by surprise and the other where the appreciation is well anticipated. In the first park the effects would be negative on output, and positive on unemployment. In the second park the effects would be negative on prices. The joint effects would both raise unemployment and lower prices. Unemployment rises above the natural rate (and output falls below potential) and inflation falls below some reference level associated with expected or average inflation.[7] Similarly a surprise depreciation would have moved inflation above the reference level and unemployment below the natural rate, along a Phillips curve.

In what sense would there be a vertical long run Phillips curve? If every week there was a depreciation of the currency in the park, then this would just translate into higher inflation. Everyone would anticipate and understand the policies and there would be no real effects. How fast would the short run effects disappear and only the long run neutrality appear? It would probably not take long, probably not longer than a year, for both operators and patrons to realize that prices and exchange rates were moving over time in neutral ways.

We now go back to the Phillips curve data. Suppose, then, that the downward sloping Phillips curves are due to short run non-neutrality of

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6.   This is reproduced in Box 2.

7.   If inflation is expected to be around 2%, then inflation would move below or above 2%. The reference level can be the target for inflation, but it doesn't necessarily have to be. It may be the case that expectations deviate from target, temporarily or possibly even permanently, if policy is unable to achieve the target.

money, of the type in Kennywood Park. Should policy exploit the non neutrality?[8] Lucas partially answers this question, but we can add to that answer with insights from the more recent literature on stabilization policy.

The idea of the Phillips curve is that there is some level of the natural rate of unemployment corresponding to potential output, but that the economy may be above or below potential, with more or less inflation. Potential output is the level of economic activity that would arise if the economy was not subject to nominal rigidities, such as sticky prices or wages. Shocks to technology or preferences, or in financial markets, can move potential output but they can also create gaps which are the deviations of equilibrium output from potential output. Those gaps manifest themselves not only as deviations of output from potential but also as deviations of inflation from target. When output is below potential, inflation is below target, as suggested by the downward sloping short run Phillips curve.

Monetary policy can act on those deviations of output from potential, and inflation from target. Monetary policy induces movements along the Phillips curve, stimulating the economy and thus inducing inflation. This can be achieved through policy on the money supply or on nominal interest rates. The economy can be stimulated by raising the money supply or by cutting interest rates. Why the movements in these two instruments are opposites is a much harder question to answer. We would need a more complex model than Kennywood Park in order to give a convincing answer. Since this is something no central banker has doubts about, we will just assume it here.

Other shocks, other than monetary, may also cause movements along the Phillips curve, in particular when potential output also changes, inducing also a shift of the curve to the right or left. The role of monetary policy in this context ought to be to bring the economy back to potential whenever because of other shocks, the economy is either above or below potential. In so doing, inflation is also brought back to target.

The nonneutrality of money in the short run is responsible for the gaps, but it is also the reason why monetary policy is effective in dealing with them. The more severe is the nonneutrality, the wider are the gaps created, but also the more effective policy is. As it turns out, the same policy can be used in more or less rigid environments, to deal with wider or narrower gaps, because the effectiveness of policy is exactly right to deal with those different gaps (see Adão. *et al.* (2004)). The policy that can fully deal with the gaps is a policy of full inflation targeting.

Inflation targeting can keep output at potential, or unemployment at its natural rate. Given that if inflation is stable and at target, the agents would be in a stable nominal environment, there would be no reason for nominal

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8. One straightforward way to exploit the short run Phillips curve for policy is to use measures of slack to forecast inflation. This turns out not to be very useful as discussed in Box 3.

rigidities to be relevant. In that environment there would be still movements in the natural rate of unemployment, but there would be no deviations from it. The Phillips curve would be horizontal with inflation at target. Unemployment would be moving with shocks, but it would correspond to movements in the natural rate, not to deviations from it.

The efficient way to induce the movements along the curve in reaction to shocks is to use monetary policy. Fiscal policy can also be used, but conventional fiscal policy adds costs because it also changes the potential output in ways that are not desirable. If by using the money supply or the interest rate it is possible to bring the economy back to potential why building airports or roads for that purpose? Roads should be repaired when needed, not when the economy is below potential. Distributive policies should be used for distribution, not as standard macro stabilization policy.

One exception to the rule that monetary policy should be used first is when monetary policy is deprived of instruments.[9] This happens when interest rates are so low that they cannot be lowered further. As it turns out when that is the case, money supply policy also looses its effectiveness. When the nominal interest rate is very low, close to zero, the opportunity cost of money is also very low. People may just as well hold money, so that increasing the supply of money has no effects. In particular, banks may hold very high reserves at zero cost, or close to zero. Figure 8 is evidence of this.

Monetary policy can play a role in stabilizing the economy in response to shocks. This does not mean that economic fluctuations should be eliminated. It just means that the fluctuations would be the desirable ones (not the patologies that Lucas talks about in his lecture). It means that, when productivity is high, production is able to rise fully, and when productivity is low, production is able to go down fully. It may very well be the case, with this way of looking at stabilization policy, that instead of reducing economic fluctuations, policy would be increasing them.

Now, should monetary policy try to induce systematic movements along the Phillips curve in order to reduce unemployment? The model of Kennywood Park, again, helps to understand that the answer is no. Monetary policy is not very effective when used systematically. Systematic policy feeds into expectations and instead of lowering unemployment (and raising inflation) along the Phillips curve, only inflation rises. The Phillips curve shifts up and the movement is along the long run vertical Phillips curve. But there is another, more important reason not use policy to systematically increase output above potential. It is that potential output may very well be the optimal level of output, even if associated with unemployment.

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9. There is fiscal policy that can mimic monetary policy and that can be used even at the zero bound (Correia *et al.* (2013))). It is not simple policy because in principle many taxes would have to be used. In a monetary union that is not fiscally integrated, a lot of explaining and coordinating, and experimenting would have to take place.
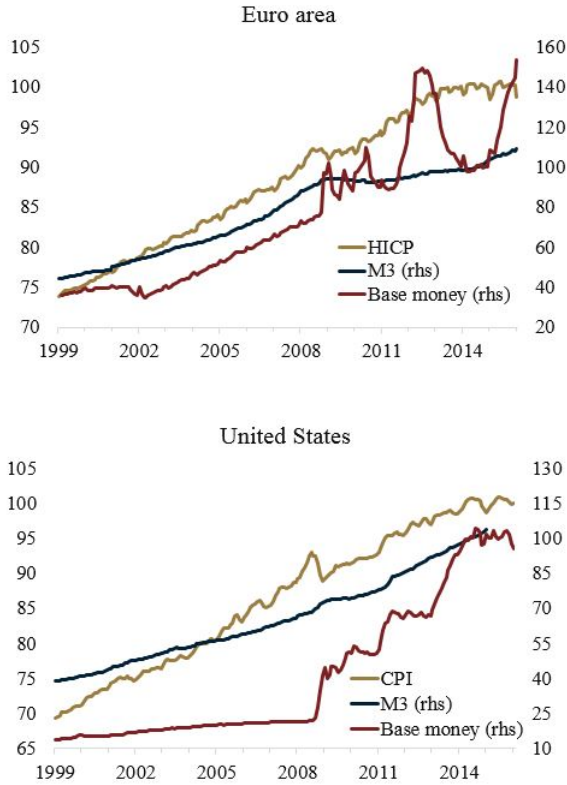
Euro area

United States

Figure 8: Money and inflation

Source: Bureau of Labour Statistics, ECB, Eurostat, Federal Reserve Economic Data and own calculations.

Monetary policy can also act directly on inflation by shifting upwards or downwards the Phillips curve. A higher Phillips curve corresponds to one with higher reference (average, expected, or target) inflation. That can only be supported by higher average nominal interest rates and growth rates of the money supply.[10]

Inflation is currently very low in the Euro area. The natural question to ask after this discussion is whether the low inflation is because of a movement along a Phillips curve associated with output below potential, or whether it is because of a shift downwards of the curve associated with lower inflation

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10. Expectations may adapt in a way such that a shift along the curve may shift the curve. Agents that are unsure about the way policy is conducted, or are uncertain about the true model, may perceive temporary high inflation for higher average inflation, so that a movement along the curve may induce a shift of the curve.

expectations. If it is a movement along the curve there is not much monetary policy can do. If along the curve, the way to stimulate is to reduce rates, rates are already at zero and cannot be lowered further. If the answer is that the curve has shifted down, then there is a lot more that policy can do. A shift upwards of the Phillips curve with higher inflation can be supported by higher rates, and interest rates are not bounded above.

Concluding with one pressing policy question

Currently in the Euro area there is one pressing policy question that can be broken in two. The first question is whether the current low inflation is the result of a movement along a Phillips curve associated with slack in the use of economic resources. There is certainly considerable slack in the Euro area in the countries exposed to the sovereign debt crisis. If there was room to cut rates, should policy rates be cut down further in order to address that slack? Yes, most central bankers would agree. But the answer using a more complete model could very well be no. One problem with the countries exposed to the sovereign debt crisis is that savings, both public and private, were not high enough, and lower rates would reduce savings.

The slack in countries like Portugal is indeed very high. Now, is monetary policy in the context of the euro area the right way to address that slack? Countries with sovereign currencies that go through the type of external account adjustment that Portugal went through have their currency devalue up to the point where real wages in units of tradeables go down on impact by 50%. In that context what difference does European inflation of 2% make? If labor market restrictions, such as minimum wages, are adjusted to inflation to keep those restrictions active, whatever inflation could be produced, unemployment would not be reduced. In the end, the solution to the considerable slack in countries like Portugal is not a technical one, but a political one.

The second question is whether the low inflation is due to a shift down of the Phillips curve, because of persistently low nominal interest rates. The answer to this is likely to be yes. The reason is very simple. Nominal interest rates have been very low for the last eight years and they are expected to remain low for a long time. That looks a lot like the long run, when inflation and interest rates move in the same direction.

If indeed the answer to the second question is yes, how can inflation be brought back to target? One thing we have no doubts about is that eventually interest rates will have to be higher, if inflation is to return to target. What is not so clear is how fast policy rates should go up. That is why monetary policy making is such a great challenge today.

Box 1. Evidence for countries with moderate to low inflation

The relationship between average inflation and growth rate of money is not so overwhelming when attention is focused on countries with relatively low inflations. There, the picture looks more like a cloud than a straight line. Teles *et al.* (2016) show that the reason for it is that when inflation is relatively low other monetary factors play a role. They make the case that if the interest rate is larger at the beginning of the sample than at the end, one would expect that the real quantity of money would be larger at the end than at the beginning so that inflation would be lower than the growth rate of money supply in that sample period. Breaking the sample period into two they correct for this effect and see the points lining up beautifully on a 45º line, in the first sample. The 45º line seems to fade away in the second part of the sample, after the mid-eighties. They make the case that inflation targeting, by reducing the variability of inflation in the second part of the sample, explains why the points lie on an horizontal line rather than on a diagonal.

Box 2. What Economists Do

Robert E. Lucas, Jr. December 9, 1988

Economists have an image of practicality and worldliness not shared by physicists and poets. Some economists have earned this image. Others – myself and many of my colleagues here at Chicago– have not. I'm not sure whether you will take this as a confession or a boast, but we are basically story-tellers, creators of make-believe economic systems. Rather than try to explain what this story-telling activity is about and why I think it is a useful –even an essential– activity, I thought I would just tell you a story and let you make of it what you like.

My story has a point: I want to understand the connection between changes in the money supply and economic depressions. One way to demonstrate that I understand this connection –I think the only really convincing way– would be for me to engineer a depression in the United States by manipulating the U.S. money supply. I think I know how to do this, though I'm not absolutely sure, but a real virtue of the democratic system is that we do not look kindly on people who want to use our lives as a laboratory. So I will try to make my depression somewhere else.

The location I have in mind is an old-fashioned amusement park–roller coasters, fun house, hot dogs, the works. I am thinking of Kennywood Park in Pittsburgh, where I lived when my children were at the optimal age as amusement park companions - a beautiful, turn-of-the-century place on a bluff overlooking the Monongahela River. If you have not seen this particular park, substitute one with which you are familiar, as I want you to try to visualize how the experiment I am going to describe would actually work in practice.

Kennywood Park is a useful location for my purposes because it is an entirely independent monetary system. One cannot spend U.S. dollars inside the park. At the gate, visitors use U.S. dollars to purchase tickets and then enter the park and spend the tickets. Rides inside are priced at so many tickets per ride. Ride operators collect these tickets, and at the end of each day they are cashed in for dollars, like chips in a casino.

For obvious reasons, business in the park fluctuates: Sundays are big days, July 4 is even bigger. On most concessions –I imagine each ride in the park to be independently operated– there is some flexibility: an extra person can be called in to help take tickets or to speed people getting on and off the ride, on short-notice if the day is unexpectedly big or with advanced notice if it is predictable. If business is disappointingly slow, an operator will let some of his help leave early. So "GNP" in the park (total tickets spent) and employment (the number of man hours worked) will fluctuate from one day to the next due to fluctuations in demand. Do we want to call a slow day –a Monday or a Tuesday, say– a depression? Surely not. By an economic depression we mean something that ought not to happen, something pathological, not normal seasonal or daily ups and downs.

This, I imagine, is how the park works. (I say "imagine" because I am just making most of this up as I go along.) Technically, Kennywood Park is a fixed exchange rate system, since its central bank–the cashier's office at the gate– stands ready to exchange local currency –tickets– for foreign currency –US dollars– at a fixed rate.

In this economy, there is an obvious sense in which the number of tickets in circulation is economically irrelevant. Noone –customer or concessioner– really cares about the number of tickets per ride except insofar as these prices reflect U.S. dollars per ride. If the number of tickets per U.S. dollar were doubled from 10 to 20, and if the prices of all rides were doubled in terms of tickets–6 tickets per roller coaster ride instead of 3–and if everyone understood that these changes had occurred, it just would not make any important difference. Such a doubling of the money supply and of prices would amount to a 100 percent inflation in terms of local currency, but so what?

Yet I want to show you that changes in the quantity of money–in the number of tickets in circulation–have the capacity to induce depressions or booms in this economy (just as I think they do in reality). To do so, I want to imagine subjecting Kennywood Park to an entirely operational experiment. Think of renting the park from its owners for one Sunday, for suitable compensation, and taking over the functions of the cashier's office. Neither the operators of concessions nor the customers are to be informed of this. Then, with no advance warning to anyone inside the park, and no communication to them as to what is going on, the cashiers are instructed for this one day to give 8 tickets per dollar instead of 10. What will happen?

We can imagine a variety of reactions. Some customers, discouraged or angry, will turn around and go home. Others, coming to the park with a dollar budget fixed by Mom, will just buy 80 percent of the tickets they would have bought otherwise. Still others will shell out 20 percent more dollars and behave as they would have in the absence of this change in "exchange rates." I would have to know much more than I do about Kennywood Park patrons to judge how many would fall into each of these categories, but it is pretty clear that no-one will be induced to take more tickets than if the experiment had not taken place, many will buy fewer, and thus that the total number of tickets in circulation–the "money supply" of this amusement park economy–will take a drop below what it otherwise would have been on this Sunday.

Now how does all of this look from the point of view of the operator of a ride or the guy selling hot dogs? Again, there will be a variety of reactions. In general, most operators will notice that the park seems kind of empty, for a Sunday, and that customers don't seam to be spending like they usually do. More time is being spent on "freebies", the river view or a walk through the gardens. Many operators take this personally. Those who were worried that their ride was becoming passé get additional confirmation. Those who thought they were just starting to become popular, and had thoughts of adding some capacity, begin to wonder if they had perhaps become over-optimistic. On many concessions, the extra employees hired to deal with the expected Sunday crowd are sent home early. A gloomy, "depressed" mood settles in.

What I have done, in short, is to engineer a depression in the park. The reduction in the quantity of money has led to a reduction in real output and employment. And this depression is indeed a kind of pathology. Customers are arriving at the park, eager to spend and enjoy themselves; Concessioners are ready and waiting to serve them. By introducing a glitch into the park's monetary system, we have prevented (not physically, but just as effectively) buyers and sellers from getting together to consummate mutually advantageous trades.

That is the end of my story. Rather than offer you some of my opinions about the nature and causes of depressions in the United States, I simply made a depression and let you watch it unfold. I hope you found it convincing on its own terms–that what I said would happen in the park as the result of my manipulations would in fact happen. If so, then you will agree that by increasing the number of tickets per dollar we could as easily have engineered a boom in the park. But we could not, clearly, engineer a boom Sunday after Sunday by this method. Our experiment worked only because our manipulations caught everyone by surprise. We could have avoided the depression by leaving things alone, but we could not use monetary manipulation to engineer a permanently higher level of prosperity in the park. The clarity with which these affects can be seen is the key advantage of operating in simplified, fictional worlds.

The disadvantage, it must be conceded, is that we are not really interested in understanding and preventing depressions in hypothetical amusement parks. We are interested in our own, vastly more complicated society. To apply the knowledge we have gained about depressions in Kennywood Park, we must be willing to argue by analogy from what we know about one situation to what we would like to know about another, quite different situation. And, as we all know, the analogy that one person finds persuasive, his neighbor may well, find ridiculous.

Well, that is why honest people can disagree. I don't know what one can do about it, except keep trying to tell better and better stories, to provide the raw material for better and more instructive analogies. How else can we free ourselves from the limits of historical experience so as to discover ways in which our society can operate better than it has in the past? In any case, that is what economists do. We are storytellers, operating much of the time in worlds of make believe. We do not find that the realm of imagination and ideas is an alternative to, or a retreat from, practical reality. On the contrary, it is the only way we have found to think seriously about reality.

In a way, there is nothing more to this method than maintaining the conviction (which I know you have after four years at Chicago) that imagination and ideas matter. I hope you can do this in the years that follow. It is fun and interesting and, really, there is no practical alternative.

Box 3. The Phillips curve is not useful for forecasting inflation

A standard approach to monetary policy has the policy rate move with a forecast for inflation. Can the Phillips curve be used to improve upon that forecast for inflation? The answer is a surprising no. As is turns out, in forecasting inflation at shorter horizons, one or two year-ahead, the best forecast is current inflation. Measures of slack, that according to the Phillips curve are directly related to inflation, do not significantly improve the inflation forecast, and neither do other monetary or financial variables. One reference for these results is Atkeson and Ohanian (2001). This does not mean that the Phillips curve is not to be found in the data. It just means that measures of slack do not add information to current inflation in order to forecast future inflation.

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