MACRO ECONOMICS II

Objective: To make the students to understand the macro economic concepts and their relevance to the economy.

Module I: New Classical macro economics

The new classical critique of micro foundations, micro foundations of macro economics – the new classical approach - Policy implications of new classical approach - Empirical evidence.

Module II: Stabilization policy - I

Lags in the effects of policy – role of expectations –uncertainty and economic policy – rules versus discretion – Phillips curve and the aggregate supply curve – expectations and short run Phillips curves – Friedman – Phelps argument – shifting short-run Phillips curve – trade off between inflation and employment – natural rate of unemployment.

Module III: Stabilization policy - II

Okun's law –budget deficit and inflation – mechanics of financing the budget – income policies –monetarists and Keynesian models – portfolio approach – crowding out – government budget constraint – Rational expectations and short run ineffectiveness of stabilization policy – Criticisms of the rational expectations hypothesis

Module IV: Equilibrium and disequilibrium analysis

Walrasian general equilibrium models – problem of consistency and invalid dichotomy – real balance effect – assessment of the significance of real balance effect – effective demand, notional demand and involuntary unemployment – price and quality flexibility – source of non instantaneous price adjustment – new Keynesianism and the theory of unemployment.

Module V: Macro economics in the open economy

Application of fiscal and monetary policies in an open economy – fiscal policy and monetary policy with fixed exchange rates and flexible exchange rates – global co-operation and coordination in macro economic policy – internal and external balances – monetary approach to the balance of payment

Micro-Foundation of Macroeconomics | Economics

The lack of clear connection between macroeconomics and microeconomics has long been a source of controversy and discontent among economists. K. J. Arrow (1967) called it a 'major scandal' that neo-classical price theory cannot account for such macroeconomic phenomenon as unemployment.

R. Lucas and T. Sargant (1979) argued that Keynesian Macroeconomics is 'fundamentally flowed' by its lack of firm micro foundation. Over the years, macroeconomic theorists and practitioners alike have complained of the schizophrenic nature of a discipline whose two major branches project radically different views of the world.

In recent years, the quest for micro foundations has been a mainspring of development in macroeconomic theory. So, the distinction between the two branches of economics is getting blurred. And considerable work in recent years has gone into investigating the 'microeconomic foundations of macroeconomics' and much current research in macroeconomics has a distinctly micro-flavour.

Still, the goal of macroeconomics seems to be to understand and predict the behaviour of aggregate economic variables—consumption, investment, employment, etc. — rather than understand a single economic unit or market in isolation. So, this difference in focus may serve as a distinguishing characteristic.

New macroeconomics—which has a strong micro-foundation—rides on two wheels:

(1) New classical economics and

(2) New Keynesian economics.

1. New Classical Approach:

The new classical approach assumes that rational agents are always optimising. In other words, it has rigorous micro foundations in the sense that it is based on analysis of utility-maximising behaviour of agents interacting in clearing markets.

A new branch of classical economics, called New Classical Macroeconomics, was developed by Robert Lucas, Thomas Sargant and Robert Barro. It emphasises the role of flexible wages and prices, but it adds a new feature—called rational expectations—to explain the effectiveness or ineffectiveness of policy measures.

Rational Expectations:

New classical economics relies on rational expectations hypothesis. According to this hypothesis, people make unbiased forecasts. In addition, economic agents such as households and investors use all available information in making consumption and investment decisions. The key assumption here is that because of rational expectations, the government cannot fool the people with systematic economic policies.

Real Business Cycles:

Business cycles are equilibrium economic phenomenon, driven largely by productivity stocks, caused by changes in technology. In the RBC approach, shocks to technology, investment or labour supply change the potential output of the economy.

According to the RBC theory, short-run economic fluctuations should be explained while assuming that prices are fully flexible, even in the short run. Almost all microeconomic analyses are based on the premise that prices adjust to clear markets. Advocates of RBC theory argue that macroeconomic analysis should be based on the same assumption. RBC theory has a strong micro foundation.

This bears evidence from the following:

i. Inter-Temporal Substitution of Labour:

RBC theory emphasises that the quantity of labour supplied at any given time depends on the incentives that workers get. A worker is inclined to work longer hours when he is well rewarded and is willing to work fewer hours when he is paid low wage. Sometimes, if the reward for working is sufficiently small, workers choose to forgo working altogether—at least for a short period of time. This willingness to reallocate hours of work over time is called the inter-temporal substitution of labour.

When real wage is perceived to be high relative to future real wage(s) workers try to work more hours today, and take more leisure later when the real wage falls again. Such a willingness to work more hours when the incentive to work is relatively high and fewer hours when the incentive to work is relatively low is called an inter-temporal substitution of labour and is a key feature of the RBC transmission mechanism and ensures that current period output rises.

As an example, consider a student who needs to (i) study, and (ii) earn money to save for the future. Studying seriously and earning money at the same time is difficult. So the choice is between either working in the summer and studying in winter or working in the winter and studying in summer.

If the student works in summer and gets paid at the end of summer, then at the end of winter he will have W_s (1 + r/2) rupees — the sum of his summer wage and the interest for half a year that he would earn by saving the money in a bank. If the student works in winter, then at the end of winter he will have W_w rupees.

The real relative wage between summer and winter is thus equal to

$$\frac{W_s(1+\frac{r}{2})}{W_w}$$

The higher this quantity, it is more likely that the student will choose summer rather the winter work. Thus the incentive to work hard how—accept lots of overtime, say—depends on three factors: the current wage, the expected future wage, and the real interest rate. Increases in the first and the third tend to lead people to postpone recreation and other non-work uses of time to the future.

Increases in the second tend to lead people to work less. If people are strongly desirous of shifting their hours of work from season to season or from year to year, then one would expect substantial fluctuations in employment.

RBC theory uses this concept to explain why employment and output fluctuate. Shocks to the economy that cause the interest rate to rise or the wage rate to be temporarily high cause workers to work for long periods; the increase in work effort varies employment and production. The converse is also true.

ii. Technology Shocks:

The RBC theory assumes that economy experiences fluctuations in technology and these fluctuations cause fluctuations in output and employment. When the available technology improves over time, the economy produces more output, and real wages rise.

Due to inter-temporal substitution of labour, the improved technology also creates more employment. This leads to further rise in output. The converse is also true. Output and employment fall during recessions because the available production technology deteriorates, lowering output and reducing incentive to work.

iii. Wage-Price Flexibility:

RBC theory assumes that wages and prices adjust quickly to clear markets. This means that the market imperfection or sticky wages and prices is not important for understanding economic fluctuations. It is felt that the assumption of flexible prices is superior methodology to the assumption of sticky prices, because it ties in macroeconomic theory more closely to microeconomic theory.

2. New Keynesian Economics:

Critics of RBI theory believe that short-run fluctuations in output and employment represent deviations from the natural levels of the variables. They feel that these deviations occur because wages and prices are slow to adjust to changing economic conditions.

This stickness makes the short-run aggregate surplus curve upward sloping rather than vertical. Consequently, fluctuation in the aggregate demand causes short-run fluctuations in capital and output. New Keynesian economics has attempted to explain price stick-ness by examining the microeconomics behind short-run price adjustment. By doing so, it attempts to put the conventional theories of short-run fluctuations on a much stronger foundation.

Small Menu Cost and Aggregate Demand Externalities:

One reason for price stick-ness or sluggish price adjustment is the existence of menu costs, or the costs of changing prices. Such costs lead firms to adjust prices at discrete time periods and not every now and then. No doubt menu costs are very small but they are not inconsequential. Even though such costs are small for the individual firm, they can have large effects on the economy as a whole.

A typical large manufacturing firm sells differentiated products and employs different types of labour. Changing prices and wages in response to every minor fluctuation in demand is a costly and time-consuming activity. Firms find it optimal to keep their price lists (menus) constant for long periods of time.

Since all manufacturing firms are operating in imperfectly competitive markets, they have some pricing discretion. Hence it may be optimal for firms to react to small changes in demand by holding prices constant and responding with changes in output and employment. If many firms behave in this way, output and employment will respond to changes in aggregate demand.

One reason for slow adjusting of prices in the short run is that there are externalities to price adjustment. A price cut by one firm benefits other firms in the economy. By lowering its price, a firm lowers the average price level, at least marginally and thereby raises real money balances.

The increase in real money balances expands aggregate demand (by shifting the LM curve to the right). The economic expansion in turn raises the demand for the products of all firms. This macroeconomic impact of one firm's price adjustment on the demand of all other firms' products is called aggregate demand externality.

Staggering of Wages and Prices:

Since all unions and firms do not set wages and prices at the same time, we find staggering of wage and price adjustment in the economy. Due to lack of synchronization of the activities of different unions and firms staggering occurs, i.e., individual wages and prices change frequently even though the overall level of wages and prices adjust slowly and gradually (or show sluggishness). The reason is that every firm prefers to wait and watch the actions of others. No firm wishes to take the lead, i.e., to be the first to announce a substantial price increase.

There is staggering in labour market, too. This affects wage determination. If, for instance, the money supply falls, aggregate demand will fall. This, in turn, requires a proportionate fall in the nominal wages to ensure full employment. If all wage rates fall, proportionally, each worker would willingly accept a lower nominal wage.

But each worker is reluctant to be the first to accept a wage cut because this means a temporary fall in his real wage. The staggered setting of individual wages makes the overall level of wages sticky.

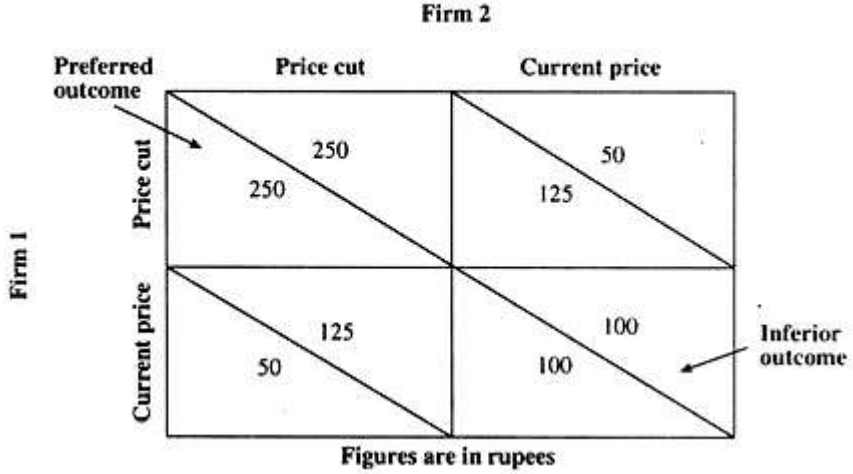
Recession as Coordination Failure:

Coordination failure occurs in the setting of wage and prices because those who set them must anticipate the actions of other wage and price setters. Trade unions negotiating wages are concerned about high wages and favourable terms and conditions other units will secure. Firms setting prices are watchful of the prices other firms will charge.

An Example:

A simple example will explain how a recession could arise from coordination failure. Suppose there are just two firms in an economy. After a fall in money supply, each firm has to decide whether to cut its price, if its objective is profit maximisation. Each firm's profit, however, depends not only on its own pricing decision but also on the decision by the other firm. The choice in terms of a simple duopoly game problem faced by each firm is shown in Table 1, which shows how the profits of the two firms depend on their actions.

Table 1 : A Pay-off Matrix of Pricing Game



If each firm changes its current price, real money balances remain low, a recession starts and each firm makes a profit of Rs 100. If both firms cut their prices, real money balances are high, a recession is avoided, and each firm makes a profit of Rs 250. No doubt, both firms prefer to avoid a recession. But none can do it by its own action. If one firm cuts its price, and the other doesn't, a recession starts. The firm making the price cut earns Rs 50 while the other earns Rs 125.

The situation described above is typical of duopoly. The lesson to be learned from the above example is that each firm's decision influences the set of outcomes available to the other firm. When one firm cuts its price, it improves the position of the other firm since money supply goes up. So the other firm can then act to avoid a recession. The favourable effect of one firm's price cut on the other firm's profit opportunities arises due to an aggregate demand externality.

Two opposite outcomes are possible in this economy. On the one hand, if each firm expects the other to cut its price, both will cut prices, resulting in the best possible outcome in which each earns Rs 250. On the other hand, if each firm expects its only rival to maintain its current price, both will maintain their prices, in which case each makes Rs 100. Each outcome is possible. So there is multiple equilibria problem.

The inferior outcome, in which each firm earns Rs 100, is an example of coordination failure. If the two firms could coordinate their pricing decision they would both cut their price and reach the preferred outcome. In the real world, in which there are a large number of firms, coordination is really

difficult. Thus the main message of this example is that prices can be sticky simple because people expect them to be sticky, although stickiness is not in the interest of anyone.

NK vs. RBC:

Economists in the New Keynesian (NK) tradition believe that wages and prices are sticky. Therefore, monetary and fiscal policies should be used to stabilise the economy. Price stickiness at the micro-level is a type of market imperfection, and it leaves open the possibility that government policies can raise social welfare.

By contrast, RBC theory suggests that the government's influence on the economy is limited and that even if the government could stabilise the economy, it should not try to do so. According to this theory, the ups and downs of the business cycle are the natural and efficient response of the economy to changing technological possibilities.

The standard RBC model does not include any type of market imperfection. It is essentially a model of equilibrium business cycle in the sense that the invisible hand of the market guides the economy in such a fashion that there is an optimal allocation of resources.

Efficiency Wages:

Another important recent development, fusing elements of both new classical and new Keynesian economics, is called efficiency Wage theory. This approach developed by Edmund Phelps and J. Stiglitz explains the rigidity of real wages and the existence of involuntary unemployment in terms of a firm's attempts to keep wages above the market-clearing level in order to increase labour productivity.

As firms raise their wages to increase productivity, job seekers may be willing to stand in line for these high-paying jobs, thereby producing involuntary wait unemployment. The startling feature of this theory is that involuntary unemployment is an equilibrium phenomenon and will not disappear over time. The new classical approach seeks to explain why there could be a labour market equilibrium in which there is an excess supply of labour at the going wage.

Microeconomics of Wage Behaviour:

R. G. Lipsey has provided a micro foundation of cyclical behaviour of wages. In his view, firms tend to absorb cyclical demand fluctuations by varying their outputs rather than their prices. The overall microeconomics of wage behaviour is thought to be as follows: when demand falls, oligopolistic firms reduce their outputs and their demands for labour, holding their markup approximately constant. The unemployment does not lead to a sharp fall in money wage rates. So firms' unit costs, and, hence, their prices, fall no faster than their productivity is rising.

There will also be some downward pressure on money wages (particularly in non-unionized sectors) and on prices in more competitive markets and the result will be a slow downward drift of the price level. When demand rises above the potential output, firms try to expand output by hiring more labour and labour shortages that develop cause wages to rise. As costs rise, firms pass these on in higher prices. This is a continuous process, which goes on as long as excess demand holds GDP above its potential level.

Micro Foundation of Inflation Theory:

If the proportion of price-setting systems in the economy increases, the SRAS curve becomes more elastic. This implies a shift of the AD curve to the right which will cause moderate rather than sharp inflation.

Micro Foundation of Investment and Consumption Functions:

There are two other micro foundations of macroeconomics. These are the consumption function and the investment function.

Consumption Function:

Since the time of Keynes, economists expressed their interest in knowing how individuals decide how much of their income to consume today and how much to save for the future. This is essentially a microeconomic question because it addresses the behaviour of individual decision-makers. Yet its answer has important macroeconomic consequences. In fact, household's consumption decisions affect the way the economy as a whole behaves both in the short run and in the long-run.

The consumption decision of households is essential in long-run analysis because of its role in economic growth. The Solow-model of economic growth shows that the saving rate is a key determinant of the steady-state capital stock and thus of the level of economic well- being.

The consumption decision of households is crucial for short-run analysis because of its role in determining aggregate demand. Consumption is the major component of aggregate desired expenditure. So fluctuations in consumption are a key element of booms and recessions. The IS-LM model shows that changes in consumer spending plans can be a source of shocks to the economy and the MPC is a determinant of the fiscal policy multipliers.

Fisher-Model:

While Keynes hypothesized that a person's current consumption depends largely on his current income, the Fisher model says, instead, that consumption is based on income the consumer expects over his entire lifetime.

A change in the rate of interest affects aggregate consumption expenditure. Two microeconomic concepts—income effect and substitution effect—are used to explain how a consumer reacts to a change in the rate of interest.

Modigliani-model:

For those consumers who would like to borrow but cannot, consumption depends on a person's lifetime income. F. Modigliani emphasised that income varies systematically over people's lives and that saving allows consumers to more income from those times in life when income is high to those times when it is low. This interpretation of the consumer behaviour forms the basis of the life cycle hypothesis.

Individual and Aggregate Consumption Functions:

According to LCH, an individual saves during his working years to maintain consumption after retirement. This saving motive has important implication for the consumption function. The main message of the LCH is that aggregate consumption, like that of an individual, depends on both wealth and income.

The most important prediction of the hypothesis is that saving rises over a person's lifetime. If a person enters the job market with no wealth, he will accumulate wealth during his working years and then run down his wealth during his retirement years.

M. Friedeman's PIH is based on the assumption that forward-looking consumers have their consumption decisions not only on their current income, but also on the income they expect to receive in the future. Thus PIH highlights that consumption depends on people's expectations.

The rational expectations hypothesis states that people use all available information to make optimal forecasts about the future. If the PIH is correct and if consumers have rational expectations, then changes in consumption over time should be unpredictable.

In other words, changes in consumption reflect 'surprises' about lifetime income. If consumers are using optimally all available information then they should be surprised only by events that were entirely unpredictable. Therefore, changes in their consumption should be unpredictable as well.

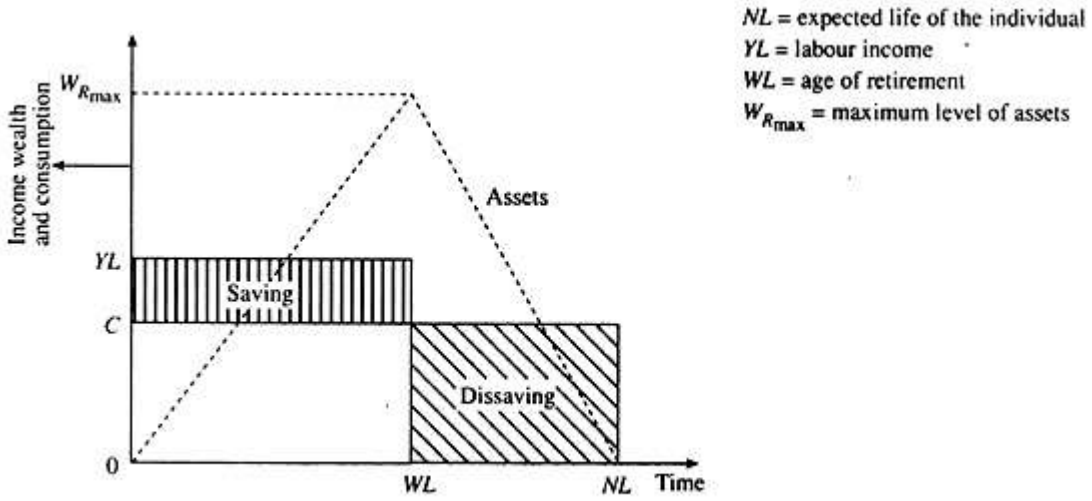


Fig. 1: Total Income, Consumption, and Wealth in the LCH

Rational Expectations Model:

The rational expectations approach to consumption has implications for the analysis of economic policies. If consumers go by the permanent income hypothesis (PIH) and have rational expectations as well, then also unexpected policy changes influence consumption. These policy changes become effective when they change expectations.

This means that if consumers have rational expectations, policymakers influence the economy not only through their actions but also through the public's expectations of their actions. Since it is not possible to observe expectations directly, it is difficult to know how and when changes in fiscal policy alter aggregate demand.

Investment Function:

By adding the investment functions of individual profit-maximising firms we arrive at the aggregate investment function. Thus there is micro foundation of aggregate investment function. And aggregate investment is the second important component of aggregate desired expenditure.

Investment fluctuations lead to short-term income fluctuations or business cycles. Investment is affected by two main factors, viz., the expected rate of return on new investment (the marginal efficiency of capital) and the rate of interest. Any change in expected rate of return on new investment will lead to change in the volume of investment and cause national income to rise or fall.

The Demand for Money:

The Baumol-Tobin model explains the amount of money held outside of banks. But we can interpret the model more broadly. Let's suppose a person who holds a portfolio of monetary assets (currency and demand deposits) and non-monetary assets (stocks and bonds).

Monetary assets can be used for transactions but they offer a low rate of return. Let i be the difference in return between monetary and non-monetary assets and let F be the cost of transferring nonmonetary assets into monetary assets, such as brokerage fee. The decision about how often to pay the brokerage fee is quite similar to the decision about how often to make a trip to the bank.

Therefore, the Baumol Tobin model describes a person's demand for monetary assets. By showing that money demand depends positively on expenditure (K), and negatively on the interest rate (i), the model provides a microeconomic rationale for the Keynesian money demand function:

$(M/P)_d = f(Y,i)$

Conclusion:

It is interesting to speculate on whether or not the quest for a micro foundation of macroeconomics will continue to play an important role in the future development of macroeconomics. The disunity between micro and macro that has motivated so many contributors is shrinking rapidly on the frontiers of research.

It is also questionable whether the microeconomic principles of equilibrium and rationality that have been applied so fruitfully in the development of macroeconomics can be of more service. By themselves they are no more than organising devices; they yield no meaningful empirical propositions in the absence of a great money supporting hypotheses.

Stabilisation

The term can also refer to measures taken to resolve a specific economic crisis, for instance, an exchange-rate crisis or stock market crash, in order to prevent the economy developing recession or inflation.

The package is usually initiated either by a government or central bank, or by either or both of these institutions acting in concert with international institutions such as the International Monetary Fund (IMF) or the World Bank. Depending on the goals to be achieved, it involves some combination of restrictive fiscal measures (to reduce government borrowing) and monetary tightening (to support the currency).

Recent examples of such packages include Argentina's re-scheduling of its international obligations (where central banks and leading international banks re-scheduled Argentina's debt so as to allow it to avoid total default), and IMF interventions in South East Asia (at the end of the 1990s) when several Asian economies encountered financial turbulence. This type of stabilization can be painful, in the short term, for the economy concerned because of lower output and higher unemployment. Unlike a business-cycle stabilization policy, these changes will often be pro-cyclical, reinforcing existing trends. While this is clearly undesirable, the policies are designed to be a platform for successful long-run growth and reform.

It has been argued that, rather than imposing such policies after a crisis, the international financial system architecture needs to be reformed to avoid some of the risks (e.g., hot money flows and/or hedge fund activity) that some people hold to destabilize economies and financial markets, and lead to the need for stabilization policies and, e.g., IMF interventions. Proposed measures include for example a global Tobin tax on currency trades across borders

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Rational Expectations Theory

What Is Rational Expectations Theory?

The rational expectations theory is a concept and modeling technique that is used widely in macro economics. The theory posits that individuals base their decisions on three primary factors: their human rationality, the information available to them, and their past experiences. It suggests that people's current expectations of the economy are, themselves, able to influence what the future state of the economy will become. This precept contrasts with the idea that government policy influences financial and economic decisions.

Economists often use the doctrine of rational expectations to explain anticipated inflation rates. For example, if past inflation rates were higher than expected, then people might consider this, along with other indicators, to mean that future inflation also might exceed expectations. The rational expectations theory is the dominant assumption model used in business cycles and finance as a cornerstone of the efficient market hypothesis (EMH) .

Understanding Rational Expectations Theory

Using the idea of "expectations" in economic theory is not new. In the 1930s, the famous British economist, John Maynard Keynes assigned people's expectations about the future—which he called "waves of optimism and pessimism"—a central role in determining the business cycle. However, the actual theory of rational expectations was proposed by John F. Muth in his seminal paper, "Rational Expectations and the Theory of Price Movements," published in 1961 in the journal, *Econometrica*. Muth used the term to describe numerous scenarios in which an outcome depends partly on what people *expect* will happen. The theory did not catch on until the 1970s with Robert E.Lucas. Jr. and the neoclassical revolution in economics.

The Relationship Between Inflation and Unemployment

The Phillips Curve

The Phillips curve shows the inverse relationship between inflation and unemployment: as unemployment decreases, inflation increases.

Learning Objectives

Review the historical evidence regarding the theory of the Phillips curve

Key Takeaways

Key Points

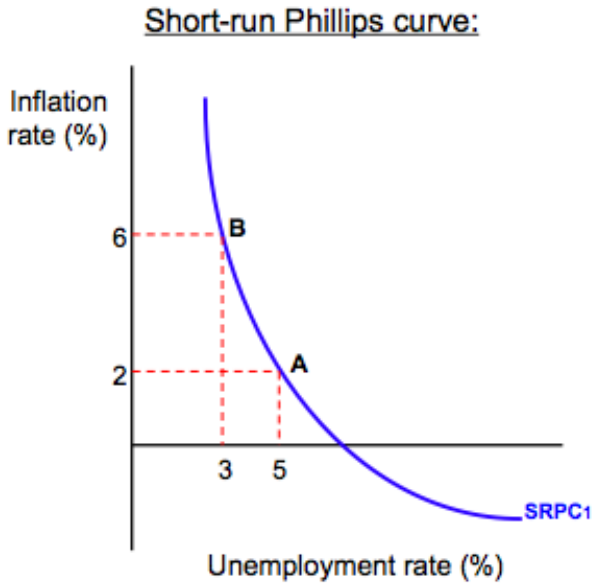
- The relationship between inflation rates and unemployment rates is inverse. Graphically, this means the short-run Phillips curve is L-shaped.
- A.W. Phillips published his observations about the inverse correlation between wage changes and unemployment in Great Britain in 1958. This relationship was found to hold true for other industrial countries, as well.
- From 1861 until the late 1960's, the Phillips curve predicted rates of inflation and rates of unemployment. However, from the 1970's and 1980's onward, rates of inflation and unemployment differed from the Phillips curve's prediction. The relationship between the two variables became unstable.

Key Terms

- **Phillips curve**: A graph that shows the inverse relationship between the rate of unemployment and the rate of inflation in an economy.
- **stagflation**: Inflation accompanied by stagnant growth, unemployment, or recession.

The Phillips curve relates the rate of inflation with the rate of unemployment. The Phillips curve argues that unemployment and inflation are inversely related: as levels of unemployment decrease, inflation

increases. The relationship, however, is not linear. Graphically, the short-run Phillips curve traces an L-shape when the unemployment rate is on the x-axis and the inflation rate is on the y-axis.

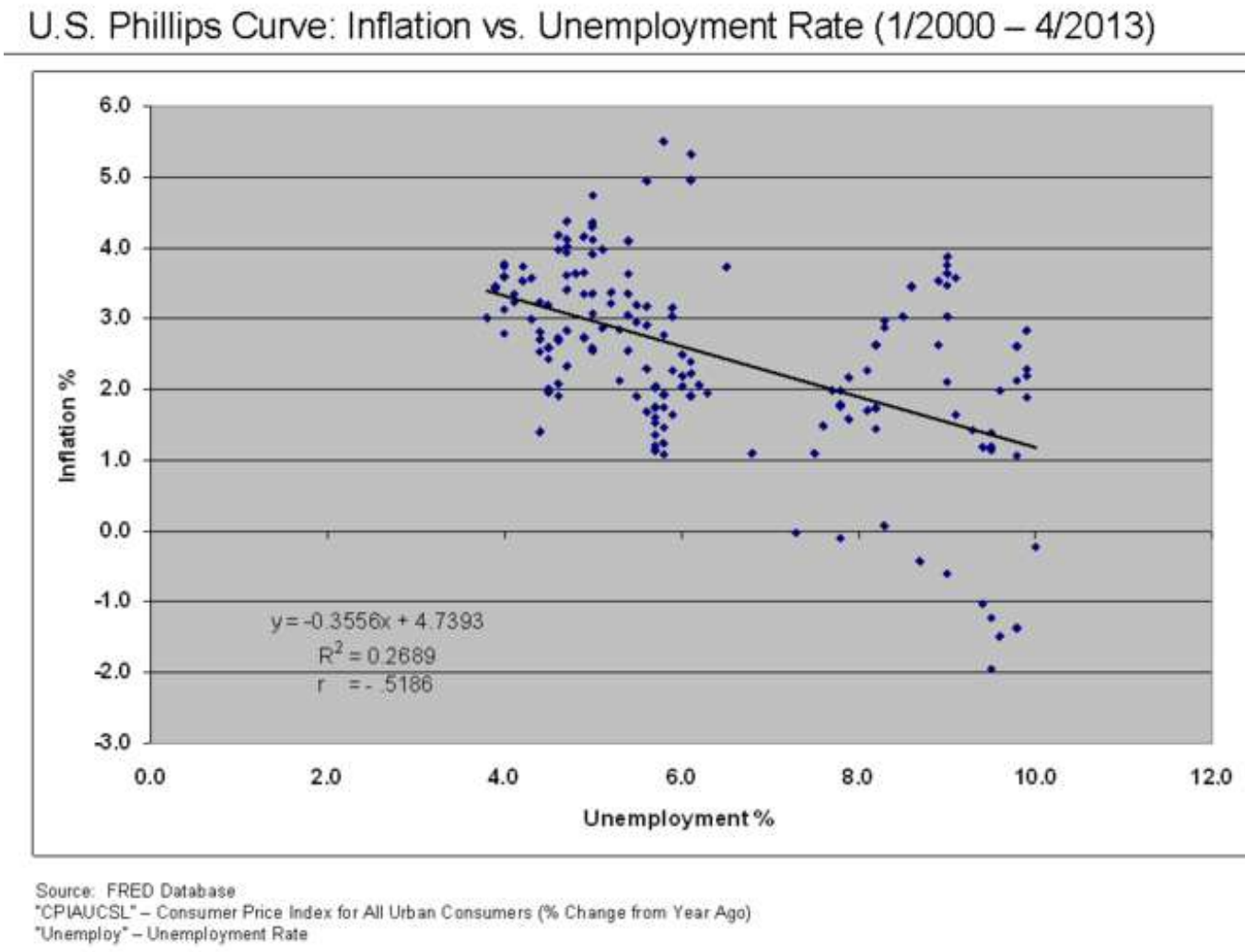


Theoretical Phillips Curve: The Phillips curve shows the inverse trade-off between inflation and unemployment. As one increases, the other must decrease. In this image, an economy can either experience 3% unemployment at the cost of 6% of inflation, or increase unemployment to 5% to bring down the inflation levels to 2%.

History

The early idea for the Phillips curve was proposed in 1958 by economist A.W. Phillips. In his original paper, Phillips tracked wage changes and unemployment changes in Great Britain from 1861 to 1957, and found that there was a stable, inverse relationship between wages and unemployment. This correlation between wage changes and unemployment seemed to hold for Great Britain and for other industrial countries. In 1960, economists Paul Samuelson and Robert Solow expanded this work to reflect the relationship between inflation and unemployment. Because wages are the largest components of prices, inflation (rather than wage changes) could be inversely linked to unemployment.

The theory of the Phillips curve seemed stable and predictable. Data from the 1960's modeled the trade-off between unemployment and inflation fairly well. The Phillips curve offered potential economic policy outcomes: fiscal and monetary policy could be used to achieve full employment at the cost of higher price levels, or to lower inflation at the cost of lowered employment. However, when governments attempted to use the Phillips curve to control unemployment and inflation, the relationship fell apart. Data from the 1970's and onward did not follow the trend of the classic Phillips curve. For many years, both the rate of inflation and the rate of unemployment were higher than the Phillips curve would have predicted, a phenomenon known as "stagflation. " Ultimately, the Phillips curve was proved to be unstable, and therefore, not usable for policy purposes.



Source: FRED Database
"CPIAUCSL" – Consumer Price Index for All Urban Consumers (% Change from Year Ago)
"Unemploy" – Unemployment Rate

US Phillips Curve (2000 – 2013): The data points in this graph span every month from January 2000 until April 2013. They do not form the classic L-shape the short-run Phillips curve would predict. Although it was shown to be stable from the 1860's until the 1960's, the Phillips curve relationship became unstable – and unusable for policy-making – in the 1970's.

The Relationship Between the Phillips Curve and AD-AD

Changes in aggregate demand cause movements along the Phillips curve, all other variables held constant.

Learning Objectives

Relate aggregate demand to the Phillips curve

Key Points

- Aggregate demand and the Phillips curve share similar components. The rate of unemployment and rate of inflation found in the Phillips curve correspond to the real GDP and price level of aggregate demand.
- Changes in aggregate demand translate as movements along the Phillips curve.
- If there is an increase in aggregate demand, such as what is experienced during demand-pull inflation, there will be an upward movement along the Phillips curve. As aggregate demand

increases, real GDP and price level increase, which lowers the unemployment rate and increases inflation.

Key Terms

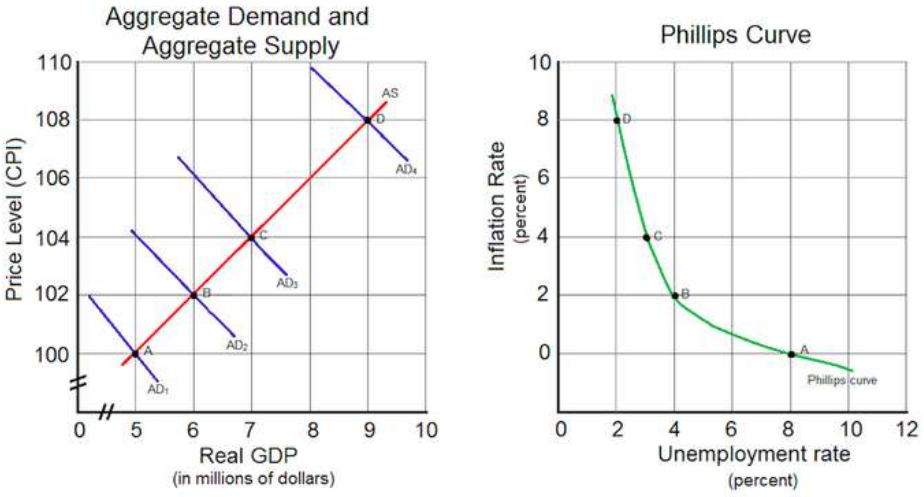
- **Phillips curve**: A graph that shows the inverse relationship between the rate of unemployment and the rate of inflation in an economy.
- **aggregate demand**: The total demand for final goods and services in the economy at a given time and price level.

The Phillips Curve Related to Aggregate Demand

The Phillips curve shows the inverse trade-off between rates of inflation and rates of unemployment. If unemployment is high, inflation will be low; if unemployment is low, inflation will be high.

The Phillips curve and aggregate demand share similar components. The Phillips curve is the relationship between inflation, which affects the price level aspect of aggregate demand, and unemployment, which is dependent on the real output portion of aggregate demand. Consequently, it is not far-fetched to say that the Phillips curve and aggregate demand are actually closely related.

To see the connection more clearly, consider the example illustrated by. Let's assume that aggregate supply, AS, is stationary, and that aggregate demand starts with the curve, AD_1. There is an initial equilibrium price level and real GDP output at point A. Now, imagine there are increases in aggregate demand, causing the curve to shift right to curves AD_2 through AD4. As aggregate demand increases, unemployment decreases as more workers are hired, real GDP output increases, and the price level increases; this situation describes a demand-pull inflation scenario.



Phillips Curve and Aggregate Demand: As aggregate demand increases from AD1 to AD4, the price level and real GDP increases. This translates to corresponding movements along the Phillips curve as inflation increases and unemployment decreases.

As more workers are hired, unemployment decreases. Moreover, the price level increases, leading to increases in inflation. These two factors are captured as equivalent movements along the Phillips curve from points A to D. At the initial equilibrium point A in the aggregate demand and supply graph, there is a corresponding inflation rate and unemployment rate represented by point A in the Phillips curve graph. For every new equilibrium point (points B, C, and D) in the aggregate graph, there is a corresponding point in the Phillips curve. This illustrates an important point: changes in aggregate demand cause movements along the Phillips curve.

The Long-Run Phillips Curve

The long-run Phillips curve is a vertical line at the natural rate of unemployment, so inflation and unemployment are unrelated in the long run.

Learning Objectives

Examine the NAIRU and its relationship to the long term Phillips curve

Key Points

- The natural rate of unemployment is the hypothetical level of unemployment the economy would experience if aggregate production were in the long-run state.
- The natural rate hypothesis, or the non-accelerating inflation rate of unemployment (NAIRU) theory, predicts that inflation is stable only when unemployment is equal to the natural rate of unemployment. If unemployment is below (above) its natural rate, inflation will accelerate (decelerate).
- Expansionary efforts to decrease unemployment below the natural rate of unemployment will result in inflation. This changes the inflation expectations of workers, who will adjust their nominal wages to meet these expectations in the future. This leads to shifts in the short-run Phillips curve.
- The natural rate hypothesis was used to give reasons for stagflation, a phenomenon that the classic Phillips curve could not explain.

Key Terms

- **Natural Rate of Unemployment**: The hypothetical unemployment rate consistent with aggregate production being at the long-run level.
- **non-accelerating inflation rate of unemployment**: (NAIRU); theory that describes how the short-run Phillips curve shifts in the long run as expectations change.

The Phillips curve shows the trade-off between inflation and unemployment, but how accurate is this relationship in the long run? According to economists, there can be no trade-off between inflation and unemployment in the long run. Decreases in unemployment can lead to increases in inflation, but only in the short run. In the long run, inflation and unemployment are unrelated. Graphically, this means the Phillips curve is vertical at the natural rate of unemployment, or the hypothetical unemployment rate if aggregate production is in the long-run level. Attempts to change unemployment rates only serve to move the economy up and down this vertical line.

Natural Rate Hypothesis

The natural rate of unemployment theory, also known as the non-accelerating inflation rate of unemployment (NAIRU) theory, was developed by economists Milton Friedman and Edmund Phelps. According to NAIRU theory, expansionary economic policies will create only temporary decreases in unemployment as the economy will adjust to the natural rate. Moreover, when unemployment is below the natural rate, inflation will accelerate. When unemployment is above the natural rate, inflation will decelerate. When the unemployment rate is equal to the natural rate, inflation is stable, or non-accelerating.

An Example

To get a better sense of the long-run Phillips curve, consider the example shown in. Assume the economy starts at point A and has an initial rate of unemployment and inflation rate. If the government decides to pursue expansionary economic policies, inflation will increase as aggregate demand shifts to the right. This is shown as a movement along the short-run Phillips curve, to point B, which is an unstable equilibrium. As aggregate demand increases, more workers will be hired by firms in order to produce more output to meet rising demand, and unemployment will decrease. However, due to the higher inflation, workers' expectations of future inflation changes, which shifts the short-run Phillips curve to the right, from unstable equilibrium point B to the stable equilibrium point C. At point C, the

rate of unemployment has increased back to its natural rate, but inflation remains higher than its initial level.

NAIRU and Phillips Curve: Although the economy starts with an initially low level of inflation at point A, attempts to decrease the unemployment rate are futile and only increase inflation to point C. The unemployment rate cannot fall below the natural rate of unemployment, or NAIRU, without increasing inflation in the long run.

The reason the short-run Phillips curve shifts is due to the changes in inflation expectations. Workers, who are assumed to be completely rational and informed, will recognize their nominal wages have not kept pace with inflation increases (the movement from A to B), so their real wages have been decreased. As such, in the future, they will renegotiate their nominal wages to reflect the higher expected inflation rate, in order to keep their real wages the same. As nominal wages increase, production costs for the supplier increase, which diminishes profits. As profits decline, suppliers will decrease output and employ fewer workers (the movement from B to C). Consequently, an attempt to decrease unemployment at the cost of higher inflation in the short run led to higher inflation and no change in unemployment in the long run.

The NAIRU theory was used to explain the stagflation phenomenon of the 1970's, when the classic Phillips curve could not. According to the theory, the simultaneously high rates of unemployment and inflation could be explained because workers changed their inflation expectations, shifting the short-run Phillips curve, and increasing the prevailing rate of inflation in the economy. At the same time, unemployment rates were not affected, leading to high inflation and high unemployment.

The Short-Run Phillips Curve

The short-run Phillips curve depicts the inverse trade-off between inflation and unemployment.

Learning Objectives

Interpret the short-run Phillips curve

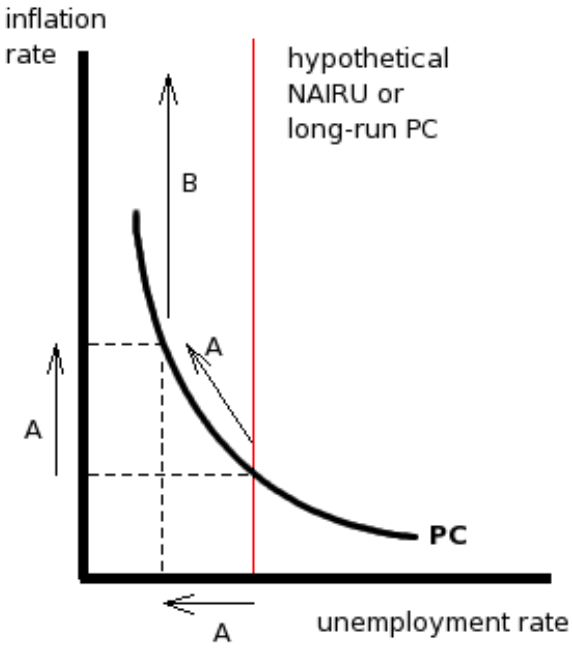
Key Points

- The long-run Phillips curve is a vertical line at the natural rate of unemployment, but the short-run Phillips curve is roughly L-shaped.
- The inverse relationship shown by the short-run Phillips curve only exists in the short-run; there is no trade-off between inflation and unemployment in the long run.
- Economic events of the 1970's disproved the idea of a permanently stable trade-off between unemployment and inflation.

Key Terms

- **Phillips curve**: A graph that shows the inverse relationship between the rate of unemployment and the rate of inflation in an economy.

The Phillips curve depicts the relationship between inflation and unemployment rates. The long-run Phillips curve is a vertical line that illustrates that there is no permanent trade-off between inflation and unemployment in the long run. However, the short-run Phillips curve is roughly L-shaped to reflect the initial inverse relationship between the two variables. As unemployment rates increase, inflation decreases; as unemployment rates decrease, inflation increases.



Short-Run Phillips Curve: The short-run Phillips curve shows that in the short-term there is a tradeoff between inflation and unemployment. Contrast it with the long-run Phillips curve (in red), which shows that over the long term, unemployment rate stays more or less steady regardless of inflation rate.

Consider the example shown in. When the unemployment rate is 2%, the corresponding inflation rate is 10%. As unemployment decreases to 1%, the inflation rate increases to 15%. On the other hand, when unemployment increases to 6%, the inflation rate drops to 2%.

Historical application

During the 1960's, the Phillips curve rose to prominence because it seemed to accurately depict real-world macroeconomics. However, the stagflation of the 1970's shattered any illusions that the Phillips curve was a stable and predictable policy tool. Nowadays, modern economists reject the idea of a stable Phillips curve, but they agree that there is a trade-off between inflation and unemployment in the short-run. Given a stationary aggregate supply curve, increases in aggregate demand create increases in real output. As output increases, unemployment decreases. With more people employed in the workforce, spending within the economy increases, and demand-pull inflation occurs, raising price levels.

Therefore, the short-run Phillips curve illustrates a real, inverse correlation between inflation and unemployment, but this relationship can *only exist in the short run*. The idea of a stable trade-off between inflation and unemployment in the long run has been disproved by economic history.

Relationship Between Expectations and Inflation

There are two theories of expectations (adaptive or rational) that predict how people will react to inflation.

Learning Objectives

Distinguish adaptive expectations from rational expectations

Key Points

- Nominal quantities are simply stated values. Real quantities are nominal ones that have been adjusted for inflation.
- Adaptive expectations theory says that people use past information as the best predictor of future events. If inflation was higher than normal in the past, people will expect it to be higher than anticipated in the future.
- Rational expectations theory says that people use all available information, past and current, to predict future events. If inflation was higher than normal in the past, people will take that into consideration, along with current economic indicators, to anticipate its future performance.
- According to adaptive expectations, attempts to reduce unemployment will result in temporary adjustments along the short-run Phillips curve, but will revert to the natural rate of unemployment. According to rational expectations, attempts to reduce unemployment will only result in higher inflation.

Key Terms

- **adaptive expectations theory**: A hypothesized process by which people form their expectations about what will happen in the future based on what has happened in the past.
- **rational expectations theory**: A hypothesized process by which people form their expectations about what will happen in the future based on all relevant information.

The short-run Phillips curve is said to shift because of workers' future inflation expectations. Yet, how are those expectations formed? There are two theories that explain how individuals predict future events.

Real versus Nominal Quantities

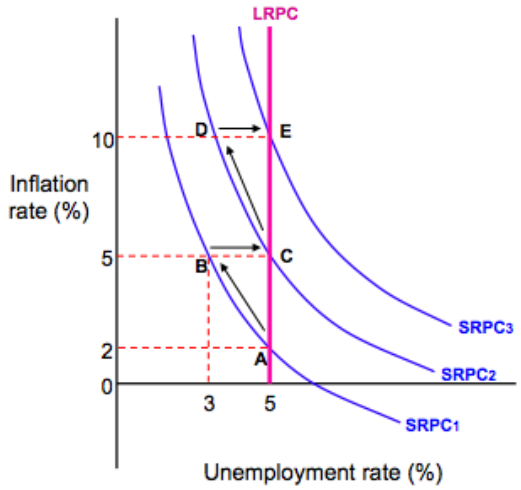
To fully appreciate theories of expectations, it is helpful to review the difference between real and nominal concepts. Anything that is nominal is a stated aspect. In contrast, anything that is real has been adjusted for inflation. To make the distinction clearer, consider this example. Suppose you are opening a savings account at a bank that promises a 5% interest rate. This is the nominal, or stated, interest rate. However, suppose inflation is at 3%. The real interest rate would only be 2% (the nominal 5% minus 3% to adjust for inflation).

The difference between real and nominal extends beyond interest rates. In an earlier atom, the difference between real GDP and nominal GDP was discussed. The distinction also applies to wages, income, and exchange rates, among other values.

Adaptive Expectations

The theory of adaptive expectations states that individuals will form future expectations based on past events. For example, if inflation was lower than expected in the past, individuals will change their expectations and anticipate future inflation to be lower than expected.

To connect this to the Phillips curve, consider. Assume the economy starts at point A at the natural rate of unemployment with an initial inflation rate of 2%, which has been constant for the past few years. Accordingly, because of the adaptive expectations theory, workers will expect the 2% inflation rate to continue, so they will incorporate this expected increase into future labor bargaining agreements. This way, their nominal wages will keep up with inflation, and their real wages will stay the same.



Expectations and the Phillips Curve: According to adaptive expectations theory, policies designed to lower unemployment will move the economy from point A through point B, a transition period when unemployment is temporarily lowered at the cost of higher inflation. However, eventually, the economy will move back to the natural rate of unemployment at point C, which produces a net effect of only increasing the inflation rate.According to rational expectations theory, policies designed to lower unemployment will move the economy directly from point A to point C. The transition at point B does not exist as workers are able to anticipate increased inflation and adjust their wage demands accordingly.

Now assume that the government wants to lower the unemployment rate. To do so, it engages in expansionary economic activities and increases aggregate demand. As aggregate demand increases, inflation increases. Because of the higher inflation, the real wages workers receive have decreased. For example, assume each worker receives $100, plus the 2% inflation adjustment. Each worker will make $102 in nominal wages, but $100 in real wages. Now, if the inflation level has risen to 6%. Workers will make $102 in nominal wages, but this is only $96.23 in real wages.

Although the workers' real purchasing power declines, employers are now able to hire labor for a cheaper real cost. Consequently, employers hire more workers to produce more output, lowering the unemployment rate and increasing real GDP. On, the economy moves from point A to point B.

However, workers eventually realize that inflation has grown faster than expected, their nominal wages have not kept pace, and their real wages have been diminished. They demand a 4% increase in wages to increase their real purchasing power to previous levels, which raises labor costs for employers. As labor costs increase, profits decrease, and some workers are let go, increasing the unemployment rate. Graphically, the economy moves from point B to point C.

This example highlights how the theory of adaptive expectations predicts that there are no long-run trade-offs between unemployment and inflation. In the short run, it is possible to lower unemployment at the cost of higher inflation, but, eventually, worker expectations will catch up, and the economy will correct itself to the natural rate of unemployment with higher inflation.

Rational Expectations

The theory of rational expectations states that individuals will form future expectations based on all available information, with the result that future predictions will be very close to the market equilibrium. For example, assume that inflation was lower than expected in the past. Individuals will take this past information and current information, such as the current inflation rate and current economic policies, to predict future inflation rates.

As an example of how this applies to the Phillips curve, consider again. Assume the economy starts at point A, with an initial inflation rate of 2% and the natural rate of unemployment. However, under rational expectations theory, workers are intelligent and fully aware of past and present economic variables and change their expectations accordingly. They will be able to anticipate increases in aggregate demand and the accompanying increases in inflation. As such, they will raise their nominal wage demands to match the forecasted inflation, and they will not have an adjustment period when their real wages are lower than their nominal wages. Graphically, they will move seamlessly from point A to point C, without transitioning to point B.

In essence, rational expectations theory predicts that attempts to change the unemployment rate will be automatically undermined by rational workers. They can act rationally to protect their interests, which cancels out the intended economic policy effects. Efforts to lower unemployment only raise inflation.

Shifting the Phillips Curve with a Supply Shock

Aggregate supply shocks, such as increases in the costs of resources, can cause the Phillips curve to shift.

Learning Objectives

Give examples of aggregate supply shock that shift the Phillips curve

Key Points

- In the 1970's soaring oil prices increased resource costs for suppliers, which decreased aggregate supply. The resulting cost-push inflation situation led to high unemployment and high inflation (stagflation), which shifted the Phillips curve upwards and to the right.
- Stagflation is a situation where economic growth is slow (reducing employment levels) but inflation is high.
- The Phillips curve was thought to represent a fixed and stable trade-off between unemployment and inflation, but the supply shocks of the 1970's caused the Phillips curve to shift. This ruined its reputation as a predictable relationship.

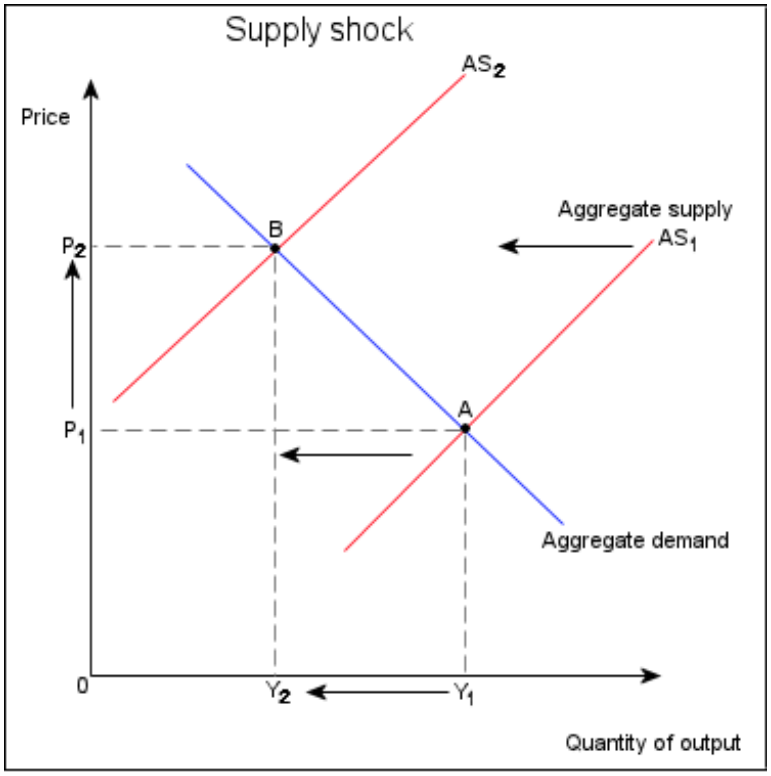
Key Terms

- **stagflation**: Inflation accompanied by stagnant growth, unemployment, or recession.
- **supply shock**: An event that suddenly changes the price of a commodity or service. It may be caused by a sudden increase or decrease in the supply of a particular good.

The Phillips curve shows the relationship between inflation and unemployment. In the short-run, inflation and unemployment are inversely related; as one quantity increases, the other decreases. In the long-run, there is no trade-off. In the 1960's, economists believed that the short-run Phillips curve was stable. By the 1970's, economic events dashed the idea of a predictable Phillips curve. What could have happened in the 1970's to ruin an entire theory? Stagflation caused by a aggregate supply shock.

Stagflation and Aggregate Supply Shocks

Stagflation is a combination of the words "stagnant" and "inflation," which are the characteristics of an economy experiencing stagflation: stagnating economic growth and high unemployment with simultaneously high inflation. The stagflation of the 1970's was caused by a series of aggregate supply shocks. In this case, huge increases in oil prices by the Organization of Petroleum Exporting Countries (OPEC) created a severe negative supply shock. The increased oil prices represented greatly increased resource prices for other goods, which decreased aggregate supply and shifted the curve to the left. As aggregate supply decreased, real GDP output decreased, which increased unemployment, and price level increased; in other words, the shift in aggregate supply created cost-push inflation.



Aggregate Supply Shock: In this example of a negative supply shock, aggregate supply decreases and shifts to the left. The resulting decrease in output and increase in inflation can cause the situation known as stagflation.

Shifting the Phillips Curve

The aggregate supply shocks caused by the rising price of oil created simultaneously high unemployment and high inflation. At the time, the dominant school of economic thought believed inflation and unemployment to be mutually exclusive; it was not possible to have high levels of both within an economy. Consequently, the Phillips curve could not model this situation. For high levels of unemployment, there were now corresponding levels of inflation that were higher than the Phillips curve predicted; the Phillips curve had shifted upwards and to the right. Thus, the Phillips curve no longer represented a predictable trade-off between unemployment and inflation.

Disinflation

Disinflation is a decline in the rate of inflation, and can be caused by declines in the money supply or recessions in the business cycle.

Learning Objectives

Identify situations with disinflation

Key Takeaways

Key Points

- Disinflation is not the same as deflation, when inflation drops below zero.
- During periods of disinflation, the general price level is still increasing, but it is occurring slower than before.
- The short-run and long-run Phillips curve may be used to illustrate disinflation.

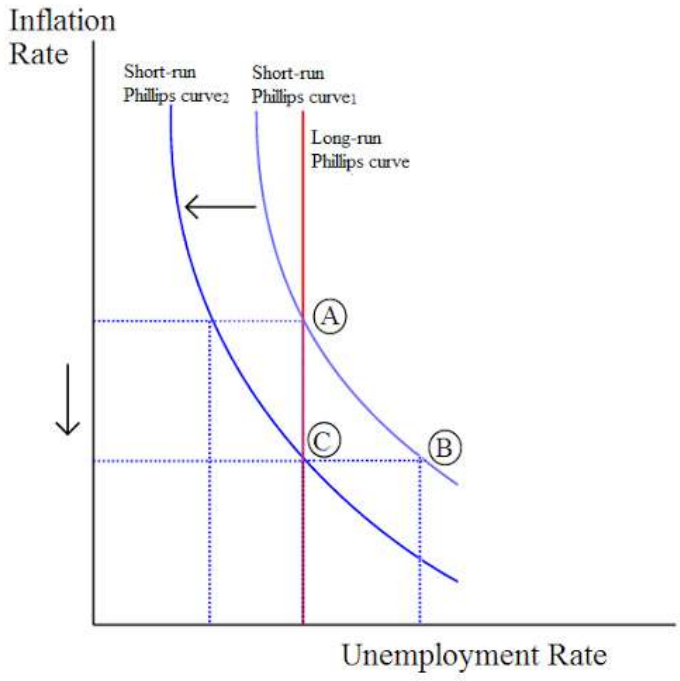
Key Terms

- **disinflation**: A decrease in the inflation rate.
- **inflation**: An increase in the general level of prices or in the cost of living.
- **deflation**: A decrease in the general price level, that is, in the nominal cost of goods and services.

Inflation is the persistent rise in the general price level of goods and services. Disinflation is a decline in the rate of inflation; it is a slowdown in the rise in price level. As an example, assume inflation in an economy grows from 2% to 6% in Year 1, for a growth rate of four percentage points. In Year 2, inflation grows from 6% to 8%, which is a growth rate of only two percentage points. The economy is experiencing disinflation because inflation did not increase as quickly in Year 2 as it did in Year 1, but the general price level is still rising. Disinflation is not to be confused with deflation, which is a decrease in the general price level.

Causes

Disinflation can be caused by decreases in the supply of money available in an economy. It can also be caused by contractions in the business cycle, otherwise known as recessions. The Phillips curve can illustrate this last point more closely. Consider an economy initially at point A on the long-run Phillips curve in. Suppose that during a recession, the rate that aggregate demand increases relative to increases in aggregate supply declines. This reduces price levels, which diminishes supplier profits. As profits decline, employers lay off employees, and unemployment rises, which moves the economy from point A to point B on the graph. Eventually, though, firms and workers adjust their inflation expectations, and firms experience profits once again. As profits increase, employment also increases, returning the unemployment rate to the natural rate as the economy moves from point B to point C. The expected rate of inflation has also decreased due to different inflation expectations, resulting in a shift of the short-run Phillips curve.



Disinflation: Disinflation can be illustrated as movements along the short-run and long-run Phillips curves.

Inflation vs. Deflation vs. Disinflation

To illustrate the differences between inflation, deflation, and disinflation, consider the following example. Assume the following annual price levels as compared to the prices in year 1:

- Year 1: 100% of Year 1 prices
- Year 2: 104% of Year 1 prices
- Year 3: 106% of Year 1 prices
- Year 4: 107% of Year 1 prices
- Year 5: 105% of Year 1 prices

As the economy moves through Year 1 to Year 4, there is a continued growth in the price level. This is an example of inflation; the price level is continually rising. However, between Year 2 and Year 4, the rise in price levels slows down. Between Year 2 and Year 3, the price level only increases by two percentage points, which is lower than the four percentage point increase between Years 1 and 2. The trend continues between Years 3 and 4, where there is only a one percentage point increase. This is an example of disinflation; the overall price level is rising, but it is doing so at a slower rate.

Between Years 4 and 5, the price level does not increase, but decreases by two percentage points. This is an example of deflation; the price rise of previous years has reversed itself.

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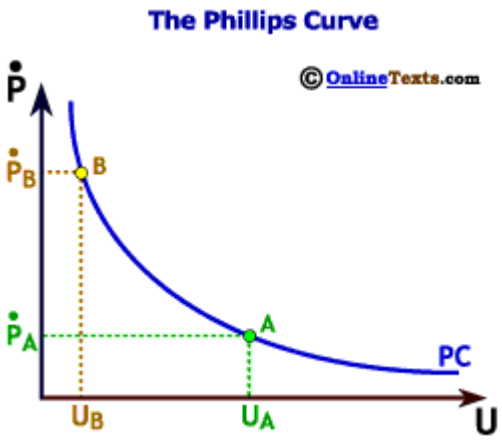
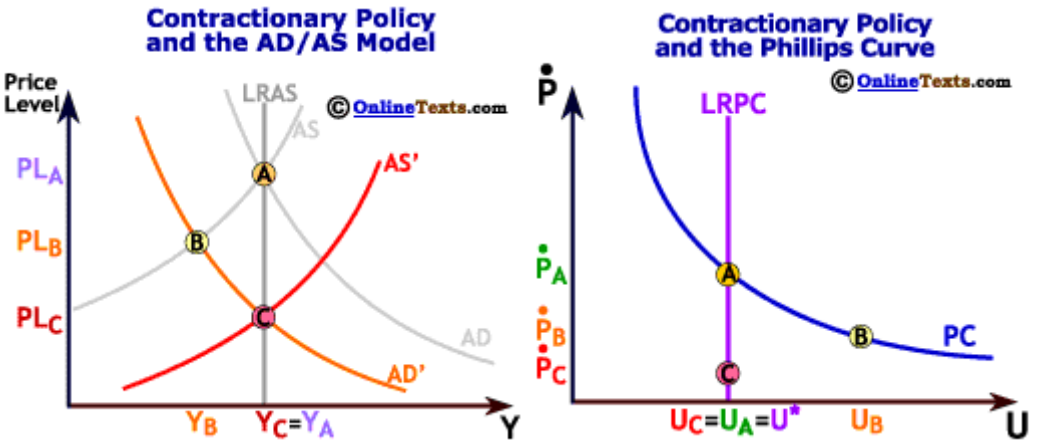
The Phillips Curve



The Phillips curve is a graph illustrating the relationship between inflation and the unemployment rate. The Phillips curve is a dynamic representation of the economy; it shows how quickly prices are rising through time for a given rate of unemployment. The relationship between inflation and unemployment depends upon the time frame. The short-run Phillips curve, illustrated in the figure titled **"The Phillips Curve"**, shows that the relationship between the inflation rate ($\dot{P}$) and unemployment is negative. When inflation rises, unemployment falls and vice versa.

This relationship helps to explain the adage "there is no good news in economics." When one side of the economy is doing well, the other side tends to do poorly. For example, if unemployment is low, inflation tends to be relatively high. Journalists often focus on the parts of the economy doing poorly. Because of the relationship represented in the Phillips curve, economists in the late 1950s and 1960s thought that all the Federal Reserve or government had to do was to pick the point on the short-run Phillips curve that they wanted the economy to be on. If they wanted to have less unemployment and operate, for example, at point B on the graph instead of point A, then they had to live with more inflation. This simplistic notion turned out to be false in the 1970s, forcing economists to rethink the whole notion of the Phillips curve.

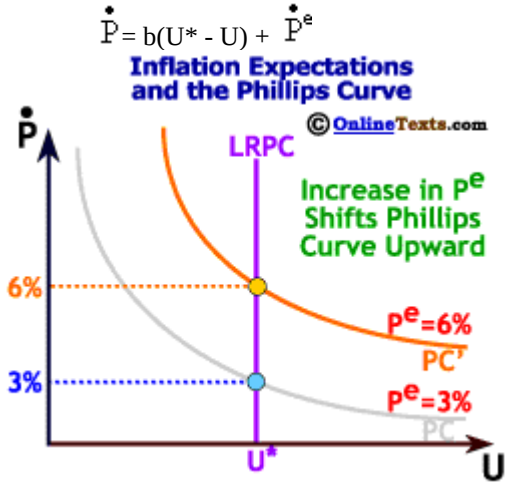


The Role of Expectations

The short-run tradeoff between inflation and unemployment is thought to work because people have an idea of what inflation expectations are going to be, and those expectations change slowly. When the Aggregate Demand curve shifts to the right, prices and output increase. This shift increases inflation and lowers unemployment. Firms respond to this situation by attempting to hire workers. Workers view the wage offered as "good" since they do not expect that prices will rise also.

But in the long-run, workers learn that inflation has risen and they are no longer happy with their wage, so they increase their inflation expectations. Workers demand larger increases in wages which forces firms to lay off some workers until the economy arrives back at the natural rate of unemployment.

We can express the Phillips curve as an equation in the following manner:



where $\dot{P}^e$ is the expected rate of inflation based upon inflation expectations, b is a constant greater than zero reflecting the inverse relationship between inflation and unemployment, U is the current unemployment rate, and U* is the natural rate of unemployment.

For example, suppose that $\dot{P}^e$=3%, b=0.5, U*=5% and U=4.0%. From these parameters, we know that

$\dot{P}$ = 0.5(5% - 4%) + 3%, or $\dot{P}$ = **3.5%**.

Note that in the long-run U* = U, so
$\dot{P}$ = (b x 0) + $\dot{P}^e$, therefore
$\dot{P}$ = $\dot{P}^e$.

If the economy's unemployment rate were at the natural rate of unemployment, the inflation rate would be 3% because $\dot{P}$ = 0.5(5% - 5%) + 3% = **3.0%**.

The long-run Phillips curve equation suggests that the inflation rate is entirely determined by inflation expectations. As the figure titled **"Inflation Expectations and the Phillips Curve"** illustrates, when inflation expectations rise, the Phillips curve shifts upward. In particular, when inflation expectations rise from 3 percent to 6 percent, the short-run Phillips curve shifts upward until the inflation rate is 6 percent when the economy is at the natural rate of unemployment.

Now we can understand the differences between the short-run and long-run Phillips curves. In the short run, an increase in Aggregate Demand does move the economy up to the left *along* the short-run Phillips curve. Output and inflation increase while unemployment decreases. Over the longer term, however, inflation expectations increase and workers no longer work the extra hours because they realize that real wages have not increased with the increase in prices. Output returns to the same level as before but inflation is higher because it is built into the system in terms of higher inflation expectations. The long run Phillips curve, therefore, is vertical.

Shifts in the AS Curve

When the Aggregate Supply curve shifts, we can get very different results in the Phillips curve. For example, let us take the case of an oil shock. As we see in the left-hand chart titled **"An Oil Shock and the AD/AS Model"**, an oil shock shifts the Aggregate Supply curve to the left and the result is *stagflation*--a rise in both inflation *and* unemployment. On the Phillips curve plotted in the right-hand chart titled **"Phillips Curve Response to an Oil Shock"**, the oil shock produces a movement to the northeast of point A as both unemployment and inflation increase.

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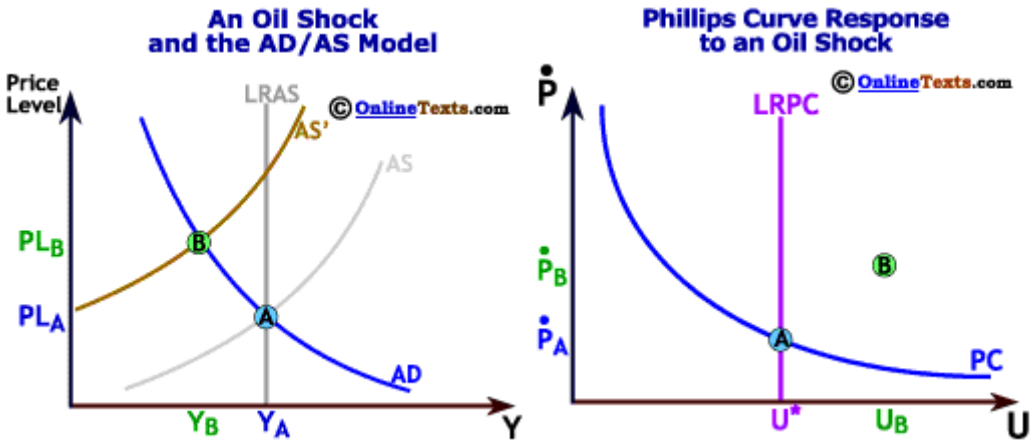

Often in response to a severe negative supply shock (such as an oil shock), inflation expectations rise quickly and the short-run Phillips curve shifts upward. Even after the economy's move northeast on the Phillips curve, policy makers are stuck with the short-run tradeoff between inflation and unemployment. If policy is contractionary to lower inflation, unemployment will rise even further. If policy is expansionary to eliminate the excess unemployment, inflation will rise even higher. In the long run the economy will end up back on the long-run Phillips curve with a high rate of inflation. What should the Federal Reserve do with regards to monetary policy in this scenario?

In the late 1970s the Federal Reserve faced just this decision. There is no good alternative for the Fed. Either they alleviate unemployment and live with higher inflation, or they cause a large recession and eliminate high inflation. The Fed opted for the latter which led to a deep recession in the United States. Unemployment peaked above 10 percent in the early 1982. However, in the long run (about six years after the 1982 recession), the economy had 3 to 4 percent inflation and was back to the natural rate of unemployment.

The overall point is that a leftward shift in the Aggregate Supply curve does not move the economy along the short-run Phillips curve, but it moves the economy to a point that is northeast of its present state. If inflation expectations increase, the Phillips curve shifts upward. Of course, a *positive* supply shock can shift the Phillips curve down as inflation expectations fall. Once either of these things happens however, the policy makers are still faced with the same short-run tradeoff between inflation and unemployment.

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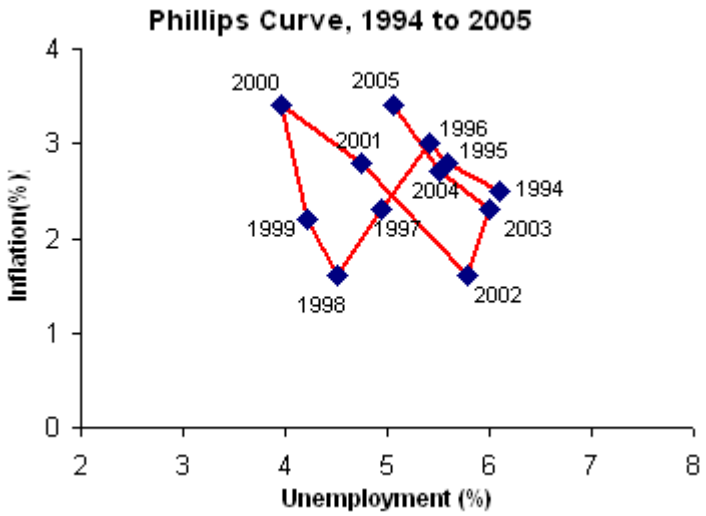
Is the Phillips Curve Dead?



Despite being reconstructed in the 1970s, the Phillips curve threw economists for a loop again in the 1990s. During much of the 1990s, the Phillips curve relationship was suspiciously absent, as the figure titled **"Phillips Curve, 1994 to 2005"**illustrates. The economy's rate of unemployment fell, for example, from 7.8 percent in 1992 to 4.0 percent in 1999. Despite this decline, inflation did not rise much. In fact, in 1997 and 1998 inflation fell even further relative to previous years. Economists are not exactly sure why this happened, although lower oil and food costs played a significant role.

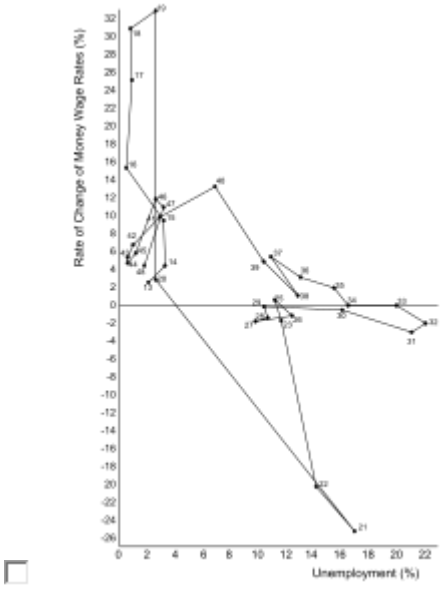
Another important factor explaining the odd behavior of the Phillips curve in the 1990s is labor productivity, or output per labor hour. (See Chapter 18, Economic Growth and Productivity.) Recall that one reason for the short-run trade-off between inflation and unemployment is that when unemployment declines, wage pressures increase, driving up prices. If productivity growth is high, however, firms can pay workers higher wages and still keep price increases modest becuase those workers are more productive. Productivity did begin to increase in the mid-1990s, and it has remained high through 2003. The surge in productivity is perhaps the key reason why wages and, hence, prices have not risen with the decline in unempoyment rates in the 1990s.

Similar to the 1970s, many economists are seriously questioning the usefulness of even the modified inflation-expectations version of the Phillips curve. The events of the 1990s indicate that, at the very least, the Phillips curve is not a reliable tool to forecast inflation. Indeed, some economists are discounting the supposed short-run relationship between inflation and unemployment altogether, arguing that the relationship is too volatile to be a reliable guide. No new consensus has emerged as of yet. Although many economists agree that the forecasting power of the Phillips curve is limited at best, they continue to believe that the Phillips curve does a fairly good job at explaining economic behavior after the fact.

Phillips curve

The **Phillips curve** is a single-equation economic model, named after William Phillips, describing an inverse relationship between rates of unemployment and corresponding rates of rises in wages that result within an economy. Stated simply, decreased unemployment, (i.e., increased levels of employment) in an economy will correlate with higher rates of wage rises. Phillips did not himself state there was any relationship between employment and inflation; this notion was a trivial deduction from his statistical findings. Samuelson and Solow made the connection explicit and subsequently Milton Friedman and Edmund Phelpsput the theoretical structure in place. In so doing, Friedman was to successfully predict the imminent collapse of Phillips' a-theoretic correlation.

While there is a short run tradeoff between unemployment and inflation, it has not been observed in the long run. In 1967 and 1968, Milton Friedman and Edmund Phelps asserted that the Phillips curve was only applicable in the short-run and that, in the long-run, inflationary policies would not decrease unemployment.[2][3][4][6] Friedman then correctly predicted that in the 1973–75 recession, both inflation and unemployment would increase. The long-run Phillips curve is now seen as a vertical line at the natural rate of unemployment, where the rate of inflation has no effect on unemployment. In the 2010s the slope of the Phillips curve appears to have declined and there has been controversy over the usefulness of the Phillips curve in predicting inflation. Nonetheless, the Phillips curve remains the primary framework for understanding and forecasting inflation used in central banks.



Rate of Change of Wages against Unemployment, United Kingdom 1913–1948 from Phillips (1958)

William Phillips, a New Zealand born economist, wrote a paper in 1958 titled *The Relation between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom, 1861-1957*, which was published in the quarterly journal *Economica*. In the paper Phillips describes how he observed an inverse relationship between money wage changes and unemployment in the British economy over the period examined. Similar patterns were found in other countries and in 1960 Paul Samuelson and Robert Solow took Phillips' work and made explicit the link between inflation and unemployment: when inflation was high, unemployment was low, and vice versa.

In the 1920s, an American economist Irving Fisher had noted this kind of Phillips curve relationship. However, Phillips' original curve described the behavior of money wages.

In the years following Phillips' 1958 paper, many economists in the advanced industrial countries believed that his results showed that there was a permanently stable relationship between inflation and unemployment.[*citation needed*] One implication of this for government policy was that governments could control unemployment and inflation with a Keynesian policy. They could tolerate a reasonably high rate of inflation as this would lead to lower unemployment – there would be a trade-off between inflation and unemployment. For example, monetary policy and/or fiscal policy could be used to stimulate the economy, raising gross domestic product and lowering the unemployment rate. Moving along the Phillips curve, this would lead to a higher inflation rate, the cost of enjoying lower unemployment rates.[*citation needed*] Economist James Forder argues that this view is historically false and that neither economists nor governments took that view and that the 'Phillips curve myth' was an invention of the 1970s.

Since 1974, seven Nobel Prizes have been given to economists for, among other things, work critical of some variations of the Phillips curve. Some of this criticism is based on the United States' experience during the 1970s, which had periods of high unemployment and high inflation at the same time. The authors receiving those prizes include Thomas Sargent, Christopher Sims, Edmund Phelps, Edward Prescott, Robert A. Mundell, Robert E. Lucas, Milton Friedman, and F.A. Hayek.

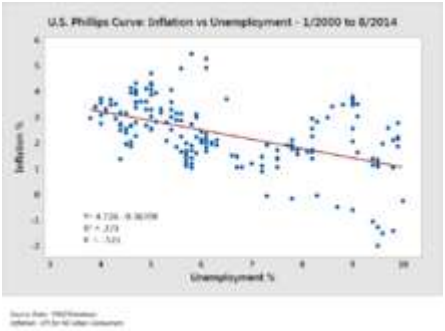
Stagflation

In the 1970s, many countries experienced high levels of both inflation and unemployment also known as stagflation. Theories based on the Phillips curve suggested that this could not happen, and the curve came under a concerted attack from a group of economists headed by Milton Friedman.[*citation needed*] Friedman argued that the Phillips curve relationship was only a short-run phenomenon. In this he followed eight years after Samuelson and Solow [1960] who wrote "All of our discussion has been phrased in short-run terms, dealing with what might happen in the next few years. It would be wrong,

though, to think that our Figure 2 menu that related obtainable price and unemployment behavior will maintain its same shape in the longer run. What we do in a policy way during the next few years might cause it to shift in a definite way." As Samuelson and Solow had argued 8 years earlier, he argued that in the long run, workers and employers will take inflation into account, resulting in employment contracts that increase pay at rates near anticipated inflation. Unemployment would then begin to rise back to its previous level, but now with higher inflation rates. This result implies that over the longer-run there is no trade-off between inflation and unemployment. This implication is significant for practical reasons because it implies that central banks should not set unemployment targets below the natural rate.

More recent research suggests that there is a moderate trade-off between low-levels of inflation and unemployment. Work by George Akerlof, William Dickens, and George Perry, implies that if inflation is reduced from two to zero percent, unemployment will be permanently increased by 1.5 percent. This is because workers generally have a higher tolerance for real wage cuts than nominal ones. For example, a worker will more likely accept a wage increase of two percent when inflation is three percent, than a wage cut of one percent when the inflation rate is zero.

Today



U.S. inflation and unemployment 1/2000 to 8/2014

Most economists no longer use the Phillips curve in its original form because it was shown to be too simplistic. This can be seen in a cursory analysis of US inflation and unemployment data from 1953–92. There is no single curve that will fit the data, but there are three rough aggregations—1955–71, 1974–84, and 1985–92—each of which shows a general, downwards slope, but at three very different levels with the shifts occurring abruptly. The data for 1953–54 and 1972–73 do not group easily, and a more formal analysis posits up to five groups/curves over the period.

But still today, modified forms of the Phillips curve that take inflationary expectations into account remain influential. The theory goes under several names, with some variation in its details, but all modern versions distinguish between short-run and long-run effects on unemployment. Modern Phillips curve models include both a short-run Phillips Curve and a long-run Phillips Curve. This is because in the short run, there is generally an inverse relationship between inflation and the unemployment rate; as illustrated in the downward sloping short-run Phillips curve. In the long run, that relationship breaks down and the economy eventually returns to the natural rate of unemployment regardless of the inflation rate.

The "short-run Phillips curve" is also called the "expectations-augmented Phillips curve", since it shifts up when inflationary expectations rise, Edmund Phelps and Milton Friedman argued. In the long run, this implies that monetary policy cannot affect unemployment, which adjusts back to its "natural rate", also called the "NAIRU" or "long-run Phillips curve". However, this long-run "neutrality" of monetary policy does allow for short run fluctuations and the ability of the monetary authority to temporarily decrease unemployment by increasing permanent inflation, and vice versa. The popular textbook of Blanchard gives a textbook presentation of the expectations-augmented Phillips curve.

An equation like the expectations-augmented Phillips curve also appears in many recent New Keynesian dynamic stochastic general equilibrium models. As Keynes mentioned: *"A Government has to remember, however, that even if a tax is not prohibited it may be unprofitable, and that a medium,*

rather than an extreme, imposition will yield the greatest gain". In these macroeconomic models with sticky prices, there is a positive relation between the rate of inflation and the level of demand, and therefore a negative relation between the rate of inflation and the rate of unemployment. This relationship is often called the "New Keynesian Phillips curve". Like the expectations-augmented Phillips curve, the New Keynesian Phillips curve implies that increased inflation can lower unemployment temporarily, but cannot lower it permanently. Two influential papers that incorporate a New Keynesian Phillips curve are Clarida, Galí, and Gertler (1999), and Blanchard and Galí (2007).

Mathematics

There are at least two different mathematical derivations of the Phillips curve. First, there is the traditional or Keynesian version. Then, there is the new Classical version associated with Robert E. Lucas, Jr.

The traditional Phillips curve

The original Phillips curve literature was not based on the unaided application of economic theory. Instead, it was based on empirical generalizations. After that, economists tried to develop theories that fit the data.

Money wage determination

The traditional Phillips curve story starts with a wage Phillips Curve, of the sort described by Phillips himself. This describes the rate of growth of money wages (gW). Here and below, the operator g is the equivalent of "the percentage rate of growth of" the variable that follows. The "money wage rate" (W) is shorthand for total money wage costs per production employee, including benefits and payroll taxes. The focus is on only production workers' money wages, because (as discussed below) these costs are crucial to pricing decisions by the firms.

This equation tells us that the growth of money wages rises with the trend rate of growth of money wages (indicated by the superscript T) and falls with the unemployment rate (U). The function f is assumed to be monotonically increasing with U so that the dampening of money-wage increases by unemployment is shown by the negative sign in the equation above.

There are several possible stories behind this equation. A major one is that money wages are set by *bilateral negotiations* under partial bilateral monopoly: as the unemployment rate rises, *all else constant* worker bargaining power falls, so that workers are less able to increase their wages in the face of employer resistance.

During the 1970s, this story had to be modified, because (as the late Abba Lerner had suggested in the 1940s) workers try to keep up with inflation. Since the 1970s, the equation has been changed to introduce the role of inflationary expectations (or the expected inflation rate, gP^{ex}). This produces the expectations-augmented wage Phillips curve:

The introduction of inflationary expectations into the equation implies that actual inflation can *feed back* into inflationary expectations and thus cause further inflation. The late economist James Tobin dubbed the last term "inflationary inertia," because in the current period, inflation exists which represents an inflationary impulse left over from the past.

It also involved much more than expectations, including the price-wage spiral. In this spiral, employers try to protect profits by raising their prices and employees try to keep up with inflation to protect their real wages. This process can feed on itself, becoming a self-fulfilling prophecy.

The parameter λ (which is presumed constant during any time period) represents the degree to which employees can gain money wage increases to keep up with expected inflation, preventing a fall in expected real wages. It is usually assumed that this parameter equals 1 in the long run.

In addition, the function **f**() was modified to introduce the idea of the non-accelerating inflation rate of unemployment (NAIRU) or what's sometimes called the "natural" rate of unemployment or the inflation-threshold unemployment rate:

$$[1]\ gW = gW^{T} - f(U - U^{*}) + \lambda \cdot gP^{ex}.$$

Here, U^* is the NAIRU. As discussed below, if $U < U^*$, inflation tends to accelerate. Similarly, if $U > U^*$, inflation tends to slow. It is assumed that $f(0) = 0$, so that when $U = U^*$, the f term drops out of the equation.

In equation [1], the roles of $\mathbf{gW^T}$ and $\mathbf{gP^{ex}}$ seem to be redundant, playing much the same role. However, assuming that $\boldsymbol{\lambda}$ is equal to unity, it can be seen that they are not. If the trend rate of growth of money wages equals zero, then the case where **U** equals **U*** implies that **gW** equals expected inflation. That is, expected real wages are constant.

In any reasonable economy, however, having constant expected real wages could only be consistent with actual real wages that are constant over the long haul. This does not fit with economic experience in the U.S. or any other major industrial country. Even though real wages have not risen much in recent years, there have been important increases over the decades.

An alternative is to assume that the trend rate of growth of money wages equals the trend rate of growth of average labor productivity (**Z**). That is:

$$[2]\ \mathbf{gW^T} = \mathbf{gZ^T}.$$

Under assumption [2], when **U** equals **U*** and $\boldsymbol{\lambda}$ equals unity, expected real wages would increase with labor productivity. This would be consistent with an economy in which actual real wages increase with labor productivity. Deviations of real-wage trends from those of labor productivity might be explained by reference to other variables in the model.

Pricing decisions

Next, there is price behavior. The standard assumption is that markets are *imperfectly competitive*, where most businesses have some power to set prices. So the model assumes that the average business sets a unit price (**P**) as a mark-up (**M**) over the unit labor cost in production measured at a standard rate of capacity utilization (say, at 90 percent use of plant and equipment) and then adds in the unit materials cost.

The standardization involves later ignoring deviations from the trend in labor productivity. For example, assume that the growth of labor productivity is the same as that in the trend and that current productivity equals its trend value:

$$\mathbf{gZ} = \mathbf{gZ^T} \text{ and } \mathbf{Z} = \mathbf{Z^T}.$$

The markup reflects both the firm's degree of market power and the extent to which overhead costs have to be paid. Put another way, all else equal, **M** rises with the firm's power to set prices or with a rise of overhead costs relative to total costs.

So pricing follows this equation:

P = **M** × (**unit labor cost**) + **(unit materials cost)**
= **M** × (**total production employment cost**)/(**quantity of output**) + **UMC**.

UMC is unit raw materials cost (total raw materials costs divided by total output). So the equation can be restated as:

$$\mathbf{P} = \mathbf{M} \times (\textbf{production employment cost per worker})/(\textbf{output per production employee}) + \mathbf{UMC}.$$

This equation can again be stated as:

$$\mathbf{P} = \mathbf{M}\times(\textbf{average money wage})/(\textbf{production labor productivity}) + \mathbf{UMC}$$
$$= \mathbf{M}\times(\mathbf{W}/\mathbf{Z}) + \mathbf{UMC}.$$

Now, assume that both the average price/cost mark-up (**M**) and **UMC** are constant. On the other hand, labor productivity grows, as before. Thus, an equation determining the price inflation rate (**gP**) is:

$$\mathbf{gP} = \mathbf{gW} - \mathbf{gZ}^{\mathbf{T}}.$$

Price

Then, combined with the wage Phillips curve [equation 1] and the assumption made above about the trend behavior of money wages [equation 2], this price-inflation equation gives us a simple expectations-augmented price Phillips curve:

$$\mathbf{gP} = -\mathbf{f}(\mathbf{U} - \mathbf{U}^*) + \boldsymbol{\lambda}\cdot\mathbf{gP}^{\mathbf{ex}}.$$

Some assume that we can simply add in **gUMC**, the rate of growth of **UMC**, in order to represent the role of supply shocks (of the sort that plagued the U.S. during the 1970s). This produces a standard short-term Phillips curve:

$$\mathbf{gP} = -\mathbf{f}(\mathbf{U} - \mathbf{U}^*) + \boldsymbol{\lambda}\cdot\mathbf{gP}^{\mathbf{ex}} + \mathbf{gUMC}.$$

Economist Robert J. Gordon has called this the "Triangle Model" because it explains short-run inflationary behavior by three factors: demand inflation (due to low unemployment), supply-shock inflation (**gUMC**), and inflationary expectations or inertial inflation.

In the *long run*, it is assumed, inflationary expectations catch up with and equal actual inflation so that $\mathbf{gP} = \mathbf{gP}^{\mathbf{ex}}$. This represents the long-term equilibrium of expectations adjustment. Part of this adjustment may involve the adaptation of expectations to the experience with actual inflation. Another might involve guesses made by people in the economy based on other evidence. (The latter idea gave us the notion of so-called rational expectations.)

Expectational equilibrium gives us the long-term Phillips curve. First, with $\boldsymbol{\lambda}$ less than unity:

$$\mathbf{gP} = [1/(1 - \boldsymbol{\lambda})]\cdot(-\mathbf{f}(\mathbf{U} - \mathbf{U}^*) + \mathbf{gUMC}).$$

This is nothing but a steeper version of the short-run Phillips curve above. Inflation rises as unemployment falls, while this connection is stronger. That is, a low unemployment rate (less than **U***) will be associated with a higher inflation rate in the long run than in the short run. This occurs because the actual higher-inflation situation seen in the short run feeds back to raise inflationary expectations, which in turn raises the inflation rate further. Similarly, at high unemployment rates (greater than **U***) lead to low inflation rates. These in turn encourage lower inflationary expectations, so that inflation itself drops again.

This logic goes further if $\boldsymbol{\lambda}$ is equal to unity, i.e., if workers are able to protect their wages *completely* from expected inflation, even in the short run. Now, the Triangle Model equation becomes:

$$-\mathbf{f}(\mathbf{U} - \mathbf{U}^*) = \mathbf{gUMC}.$$

If we further assume (as seems reasonable) that there are no long-term supply shocks, this can be simplified to become:

$-\mathbf{f}(\mathbf{U} - \mathbf{U^*}) = 0$ which implies that $\mathbf{U} = \mathbf{U^*}$.

All of the assumptions imply that in the long run, there is only one possible unemployment rate, **U*** at any one time. This uniqueness explains why some call this unemployment rate "natural."

To truly understand and criticize the uniqueness of **U***, a more sophisticated and realistic model is needed. For example, we might introduce the idea that workers in different sectors push for money wage increases that are similar to those in other sectors. Or we might make the model even more realistic. One important place to look is at the determination of the mark-up, **M**.

New classical version

The Phillips curve equation can be derived from the (short-run) Lucas aggregate supply function. The Lucas approach is very different from that of the traditional view. Instead of starting with empirical data, he started with a classical economic model following very simple economic principles.

Start with the aggregate supply function:

where $\boldsymbol{Y}$ is log value of the actual output, $\boldsymbol{Y_n}$ is log value of the "natural" level of output, $\boldsymbol{a}$ is a positive constant, $\boldsymbol{P}$ is log value of the actual price level, and $\boldsymbol{P_e}$ is log value of the expected price level. Lucas assumes that $\mathbf{Y_n}$ has a unique value.

Note that this equation indicates that when expectations of future inflation (or, more correctly, the future price level) are *totally accurate*, the last term drops out, so that actual output equals the so-called "natural" level of real GDP. This means that in the Lucas aggregate supply curve, the *only* reason why actual real GDP should deviate from potential—and the actual unemployment rate should deviate from the "natural" rate—is because of *incorrect expectations* of what is going to happen with prices in the future. (The idea has been expressed first by Keynes, *General Theory*, Chapter 20 section III paragraph 4).

This differs from other views of the Phillips curve, in which the failure to attain the "natural" level of output can be due to the imperfection or incompleteness of markets, the stickiness of prices, and the like. In the non-Lucas view, incorrect expectations can contribute to aggregate demand failure, but they are not the only cause. To the "new Classical" followers of Lucas, markets are presumed to be perfect and always attain equilibrium (given inflationary expectations).

We re-arrange the equation into:

Next we add unexpected exogenous shocks to the world supply $\boldsymbol{v}$:
Subtracting last year's price levels $\boldsymbol{P_{-1}}$ will give us inflation rates, because
and
where $\boldsymbol{\pi}$ and $\boldsymbol{\pi_e}$ are the inflation and expected inflation respectively.

There is also a negative relationship between output and unemployment (as expressed by Okun's law). Therefore, using

where $\boldsymbol{b}$ is a positive constant, $\boldsymbol{U}$ is unemployment, and $\boldsymbol{U_n}$ is the natural rate of unemployment or NAIRU, we arrive at the final form of the short-run Phillips curve:

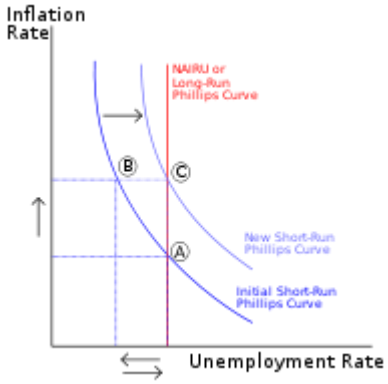
This equation, plotting inflation rate $\boldsymbol{\pi}$ against unemployment $\boldsymbol{U}$ gives the downward-sloping curve in the diagram that characterises the Phillips curve.

New Keynesian version

The New Keynesian Phillips curve was originally derived by Roberts in 1995,[22] and since been used in most state-of-the-art New Keynesian DSGE models like the one of Clarida, Galí, and Gertler (2000).[23][24]

where . The current expectations of next period's inflation are incorporated as

NAIRU and rational expectations



Short-Run Phillips Curve before and after Expansionary Policy, with Long-Run Phillips Curve (NAIRU)

In the 1970s, new theories, such as rational expectations and the NAIRU (non-accelerating inflation rate of unemployment) arose to explain how stagflation could occur. The latter theory, also known as the "natural rate of unemployment", distinguished between the "short-term" Phillips curve and the "long-term" one. The short-term Phillips Curve looked like a normal Phillips Curve but shifted in the long run as expectations changed. In the long run, only a single rate of unemployment (the NAIRU or "natural" rate) was consistent with a stable inflation rate. The long-run Phillips Curve was thus vertical, so there was no trade-off between inflation and unemployment. Edmund Phelps won the Nobel Prize in Economics in 2006 in part for this work. However, the expectations argument was in fact very widely understood (albeit not formally) before Phelps' work on it.

In the diagram, the long-run Phillips curve is the vertical red line. The NAIRU theory says that when unemployment is at the rate defined by this line, inflation will be stable. However, in the short-run policymakers will face an inflation-unemployment rate trade-off marked by the "Initial Short-Run Phillips Curve" in the graph. Policymakers can, therefore, reduce the unemployment rate temporarily, moving from point **A** to point **B** through expansionary policy. However, according to the NAIRU, exploiting this short-run trade-off will raise inflation expectations, shifting the short-run curve rightward to the "new short-run Phillips curve" and moving the point of equilibrium from **B** to **C**. Thus the reduction in unemployment below the "Natural Rate" will be temporary, and lead only to higher inflation in the long run.

Since the short-run curve shifts outward due to the attempt to reduce unemployment, the expansionary policy ultimately worsens the exploitable trade-off between unemployment and inflation. That is, it results in more inflation at each short-run unemployment rate. The name "NAIRU" arises because with actual unemployment below it, inflation accelerates, while with unemployment above it, inflation decelerates. With the actual rate equal to it, inflation is stable, neither accelerating nor decelerating. One practical use of this model was to explain stagflation, which confounded the traditional Phillips curve.

The rational expectations theory said that expectations of inflation were equal to what actually happened, with some minor and temporary errors. This, in turn, suggested that the short-run period was so short that it was non-existent: any effort to reduce unemployment below the NAIRU, for example, would *immediately* cause inflationary expectations to rise and thus imply that the policy would fail. Unemployment would never deviate from the NAIRU except due to random and transitory mistakes in developing expectations about future inflation rates. In this perspective, any deviation of the actual unemployment rate from the NAIRU was an illusion.

However, in the 1990s in the U.S., it became increasingly clear that the NAIRU did not have a unique equilibrium and could change in unpredictable ways. In the late 1990s, the actual unemployment rate fell below 4% of the labor force, much lower than almost all estimates of the NAIRU. But inflation stayed very moderate rather than accelerating. So, just as the Phillips curve had become a subject of debate, so did the NAIRU.

Furthermore, the concept of rational expectations had become subject to much doubt when it became clear that the main assumption of models based on it was that there exists a single (unique) equilibrium in the economy that is set ahead of time, determined independently of demand conditions. The experience of the 1990s suggests that this assumption cannot be sustained.

The Phillips curve started as an empirical observation in search of a theoretical explanation.[*citation needed*] Specifically, the Phillips curve tried to determine whether the inflation-unemployment link was causal or simply correlational. There are several major explanations of the short-term Phillips curve regularity.

To Milton Friedman there is a short-term correlation between inflation shocks and employment. When an inflationary surprise occurs, workers are fooled into accepting lower pay because they do not see the fall in real wages right away. Firms hire them because they see the inflation as allowing higher profits for given nominal wages. This is a movement along the Phillips curve as with change **A**. Eventually, workers discover that real wages have fallen, so they push for higher money wages. This causes the Phillips curve to shift upward and to the right, as with **B**. Some research underlines that some implicit and serious assumptions are actually in the background of the Friedmanian Phillips curve. This information asymmetry and a special pattern of flexibility of prices and wages are both necessary if one wants to maintain the mechanism told by Friedman. However, as it is argued, these presumptions remain completely unrevealed and theoretically ungrounded by Friedman.

Economists such as Edmund Phelps reject this theory because it implies that workers suffer from money illusion. According to them, rational workers would only react to real wages, that is, inflation adjusted wages. However, one of the characteristics of a modern industrial economy is that workers do not encounter their employers in an atomized and perfect market. They operate in a complex combination of imperfect markets, monopolies, monopsonies, labor unions, and other institutions. In many cases, they may lack the bargaining power to *act on* their expectations, no matter how rational they are, or their perceptions, no matter how free of money illusion they are. It is not that high inflation *causes* low unemployment (as in Milton Friedman's theory) as much as *vice versa*: Low unemployment raises worker bargaining power, allowing them to successfully push for higher nominal wages. To protect profits, employers raise prices.

Similarly, built-in inflation is not simply a matter of subjective "inflationary expectations" but also reflects the fact that high inflation can gather momentum and continue beyond the time when it was started, due to the objective price/wage spiral.

However, other economists, like Jeffrey Herbener, argue that price is market-determined and competitive firms cannot simply raise prices.[*citation needed*] They reject the Phillips curve entirely, concluding that unemployment's influence is only a small portion of a much larger inflation picture that includes prices of raw materials, intermediate goods, cost of raising capital, worker productivity, land, and other factors.

Gordon's triangle model

Robert J. Gordon of Northwestern University has analyzed the Phillips curve to produce what he calls the triangle model, in which the actual inflation rate is determined by the sum of

1. demand pull or short-term Phillips curve inflation,
2. cost push or supply shocks, and
3. built-in inflation.

The last reflects inflationary expectations and the price/wage spiral. Supply shocks and changes in built-in inflation are the main factors shifting the short-run Phillips curve and changing the trade-off. In this theory, it is not only inflationary expectations that can cause stagflation. For example, the steep climb of oil prices during the 1970s could have this result.

Changes in built-in inflation follow the partial-adjustment logic behind most theories of the NAIRU:

1. Low unemployment encourages high inflation, as with the simple Phillips curve. But if unemployment stays low and inflation stays high *for a long time*, as in the late 1960s in the U.S., both inflationary expectations and the price/wage spiral accelerate. This *shifts* the short-run Phillips curve upward and rightward, so that more inflation is seen at any given unemployment rate. (This is with shift **B** in the diagram.)
2. High unemployment encourages low inflation, again as with a simple Phillips curve. But if unemployment stays high and inflation stays low for a long time, as in the early 1980s in the U.S., both inflationary expectations and the price/wage spiral slow. This *shifts* the short-run Phillips curve downward and leftward, so that less inflation is seen at each unemployment rate.

In between these two lies the NAIRU, where the Phillips curve does not have any inherent tendency to shift, so that the inflation rate is stable. However, there seems to be a range in the middle between "high" and "low" where built-in inflation stays stable. The ends of this "non-accelerating inflation range of unemployment rates" change over time.

Fiscal policy

In economics and political science, **fiscal policy** is the use of government revenue collection (taxes or tax cuts) and expenditure (spending) to influence a country's economy. The use of government revenues and expenditures to influence macroeconomic variables developed as a result of the Great Depression, when the previous laissez-faire approach to economic management became unpopular. Fiscal policy is based on the theories of the British economist John Maynard Keynes, whose Keynesian economics theorized that government changes in the levels of taxation and government spending influences aggregate demand and the level of economic activity. Fiscal and monetary policy are the key strategies used by a country's government and central bank to advance its economic objectives. The combination of these policies enables these authorities to target inflation (which is considered "healthy" at the level in the range 2%–3%) and to increase employment. Additionally, it is designed to try to keep GDP growth at 2%–3% and the unemployment rate near the natural unemployment rate of 4%–5% This implies that fiscal policy is used to stabilize the economy over the course of the business cycle.

Changes in the level and composition of taxation and government spending can affect macroeconomic variables, including:

- aggregate demand and the level of economic activity
- saving and investment
- income distribution
- allocation of resources.

Fiscal policy can be distinguished from monetary policy, in that fiscal policy deals with taxation and government spending and is often administered by a government department; while monetary policy deals with the money supply, interest rates and is often administered by a country's central bank. Both fiscal and monetary policies influence a country's economic performance.

Monetary or fiscal policy?

Since the 1970s, it became clear that monetary policy performance has some benefits over fiscal policy due to the fact that it reduces political influence, as it is set by the central bank (to have an expanding

economy before the general election, politicians might cut the interest rates). Additionally, fiscal policy can potentially have more supply-side effects on the economy: to reduce inflation, the measures of increasing taxes and lowering spending would not be preferred, so the government might be reluctant to use these. Monetary policy is generally quicker to implement as interest rates can be set every month, while the decision to increase government spending might take time to figure out which area the money should be spent on.

The recession of the 2000s decade shows that monetary policy also has certain limitations. A liquidity trap occurs when interest rate cuts are insufficient as a demand booster as banks do not want to lend and the consumers are reluctant to increase spending due to negative expectations for the economy. Government spending is responsible for creating the demand in the economy and can provide a kick-start to get the economy out of the recession. When a deep recession takes place, it is not sufficient to rely just on monetary policy to restore the economic equilibrium. Each side of these two policies has its differences, therefore, combining aspects of both policies to deal with economic problems has become a solution that is now used by the US. These policies have limited effects; however, fiscal policy seems to have a greater effect over the long-run period, while monetary policy tends to have a short-run success.

In 2000, a survey of 298 members of the American Economic Association (AEA) found that while 84 percent generally agreed with the statement "Fiscal policy has a significant stimulative impact on a less than fully employed economy", 71 percent also generally agreed with the statement "Management of the business cycle should be left to the Federal Reserve; activist fiscal policy should be avoided." In 2011, a follow-up survey of 568 AEA members found that the previous consensus about the latter proposition had dissolved and was by then roughly evenly disputed.

Stances

Depending on the state of the economy, fiscal policy may reach for different objectives: its focus can be to restrict economic growth by mediating inflation or, in turn, increase economic growth by decreasing taxes, encouraging spending on different projects that act as stimuli to economic growth and enabling borrowing and spending. The three stances of fiscal policy are the following:

- **Neutral fiscal policy** is usually undertaken when an economy is in neither a recession nor an expansion. The amount of government deficit spending (the excess not financed by tax revenue) is roughly the same as it has been on average over time, so no changes to it are occurring that would have an effect on the level of economic activity.
- **Expansionary fiscal policy** is used by the government when trying to balance the contraction phase in the business cycle. It involves government spending exceeding tax revenue by more than it has tended to, and is usually undertaken during recessions. Examples of expansionary fiscal policy measures include increased government spending on public works (e.g., building schools) and providing the residents of the economy with tax cuts to increase their purchasing power (in order to fix a decrease in the demand).
- **Contractionary fiscal policy**, on the other hand, is a measure to increase tax rates and decrease government spending. It occurs when government deficit spending is lower than usual. This has the potential to slow economic growth if inflation, which was caused by a significant increase in aggregate demand and the supply of money, is excessive. By reducing the economy's amount of aggregate income, the available amount for consumers to spend is also reduced. So, contractionary fiscal policy measures are employed when unsustainable growth takes place, leading to inflation, high prices of investment, recession and unemployment above the "healthy" level of 3%–4%.

However, these definitions can be misleading because, even with no changes in spending or tax laws at all, cyclic fluctuations of the economy cause cyclic fluctuations of tax revenues and of some types of government spending, altering the deficit situation; these are not considered to be policy changes. Therefore, for purposes of the above definitions, "government spending" and "tax revenue" are normally replaced by "cyclically adjusted government spending" and "cyclically adjusted tax revenue". Thus, for example, a government budget that is balanced over the course of the business cycle is considered to represent a neutral and effective fiscal policy stance.

Methods of fiscal policy funding

Governments spend money on a wide variety of things, from the military and police to services such as education and health care, as well as transfer payments such as welfare benefits. This expenditure can be funded in a number of different ways:

- Taxation
- Seigniorage, the benefit from printing money
- Borrowing money from the population or from abroad
- Dipping into fiscal reserves
- Sale of fixed assets (e.g., land)

Borrowing

A fiscal deficit is often funded by issuing bonds, such as Treasury bills or consols and gilt-edged securities. These pay interest, either for a fixed period or indefinitely. If the interest and capital requirements are too large, a nation may default on its debts, usually to foreign creditors. Public debt or borrowing refers to the government borrowing from the public.

Dipping into prior surpluses

A fiscal surplus is often saved for future use, and may be invested in either local currency or any financial instrument that may be traded later once resources are needed and the additional debt is not needed.

Fiscal straitjacket

The concept of a fiscal straitjacket is a general economic principle that suggests strict constraints on government spending and public sector borrowing, to limit or regulate the budget deficit over a time period. Most US states have balanced budget rules that prevent them from running a deficit. The United States federal government technically has a legal cap on the total amount of money it can borrow, but it is not a meaningful constraint because the cap can be raised as easily as spending can be authorized, and the cap is almost always raised before the debt gets that high.

Governments use fiscal policy to influence the level of aggregate demand in the economy, so that certain economic goals can be achieved:

- Price stability;
- Full employment;
- Economic growth.

The Keynesian view of economics suggests that increasing government spending and decreasing the rate of taxes are the best ways to have an influence on aggregate demand, stimulate it, while decreasing spending and increasing taxes after the economic expansion has already taken place. Additionally, Keynesians argue that expansionary fiscal policy should be used in times of recession or low economic activity as an essential tool for building the framework for strong economic growth and working towards full employment. In theory, the resulting deficits would be paid for by an expanded economy during the expansion that would follow; this was the reasoning behind the New Deal.

Governments can use a budget surplus to do two things:

- to slow the pace of strong economic growth;
- to stabilize prices when inflation is too high.

Keynesian theory posits that removing spending from the economy will reduce levels of aggregate demand and contract the economy, thus stabilizing prices.

But economists still debate the effectiveness of fiscal stimulus. The argument mostly centers on crowding out: whether government borrowing leads to higher interest rates that may offset the stimulative impact of spending. When the government runs a budget deficit, funds will need to come from public borrowing (the issue of government bonds), overseas borrowing, or monetizing the debt. When governments fund a deficit with the issuing of government bonds, interest rates can increase across the market, because government borrowing creates higher demand for credit in the financial markets. This decreases aggregate demand for goods and services, either partially or entirely offsetting the direct expansionary impact of the deficit spending, thus diminishing or eliminating the achievement of the objective of a fiscal stimulus. Neoclassical economists generally emphasize crowding out while Keynesians argue that fiscal policy can still be effective, especially in a liquidity trap where, they argue, crowding out is minimal.[7]

In the classical view, expansionary fiscal policy also decreases net exports, which has a mitigating effect on national output and income. When government borrowing increases interest rates it attracts foreign capital from foreign investors. This is because, all other things being equal, the bonds issued from a country executing expansionary fiscal policy now offer a higher rate of return. In other words, companies wanting to finance projects must compete with their government for capital so they offer higher rates of return. To purchase bonds originating from a certain country, foreign investors must obtain that country's currency. Therefore, when foreign capital flows into the country undergoing fiscal expansion, demand for that country's currency increases. The increased demand, in turn, causes the currency to appreciate, reducing the cost of imports and making exports from that country more expensive to foreigners. Consequently, exports decrease and imports increase, reducing demand from net exports.

Some economists oppose the discretionary use of fiscal stimulus because of the inside lag (the time lag involved in implementing it), which is almost inevitably long because of the substantial legislative effort involved. Further, the outside lag between the time of implementation and the time that most of the effects of the stimulus are felt could mean that the stimulus hits an already-recovering economy and overheats the ensuing h rather than stimulating the economy when it needs it.

Some economists are concerned about potential inflationary effects driven by increased demand engendered by a fiscal stimulus. In theory, fiscal stimulus does not cause inflation when it uses resources that would have otherwise been idle. For instance, if a fiscal stimulus employs a worker who otherwise would have been unemployed, there is no inflationary effect; however, if the stimulus employs a worker who otherwise would have had a job, the stimulus is increasing labor demand while labor supply remains fixed, leading to wage inflation and therefore price inflation.

Keynesian economics

Keynesian economics (/ˈkeɪnziən/ *KAYN-zee-ən*; sometimes **Keynesianism**, named for the economist John Maynard Keynes) are various macroeconomic theories about how in the short run – and especially during recessions – economic output is strongly influenced by aggregate demand (total spending in the economy). In the Keynesian view, aggregate demand does not necessarily equal the productive capacity of the economy; instead, it is influenced by a host of factors and sometimes behaves erratically, affecting production, employment, and inflation.

Keynesian economics developed during and after the Great Depression from the ideas presented by Keynes in his 1936 book, *The General Theory of Employment, Interest and Money*. Keynes contrasted his approach to the aggregate supply-focused classical economics that preceded his book. The interpretations of Keynes that followed are contentious and several schools of economic thought claim his legacy.

Keynesian economics served as the standard economic model in the developed nations during the later part of the Great Depression, World War II, and the post-war economic expansion (1945–1973), though it lost some influence following the oil shock and resulting stagflation of the 1970s.[4] The advent of the financial crisis of 2007–08 caused a resurgence in Keynesian thought, which continues as new Keynesian economics.

Keynesian economists generally argue that as aggregate demand is volatile and unstable, a market economy often experiences inefficient macroeconomic outcomes in the form of economic recessions (when demand is low) and inflation (when demand is high), and that these can be mitigated by economic policy responses, in particular, monetary policy actions by the central bank and fiscal policy actions by the government, which can help stabilize output over the business cycle. Keynesian economists generally advocate a managed market economy – predominantly private sector, but with an active role for government intervention during recessions and depressions.

Pre-Keynesian macroeconomics

Macroeconomics is the study of the factors applying to an economy as a whole, such as the overall price level, the interest rate, and the level of employment (or equivalently, of income/output measured in real terms).

The classical tradition of partial equilibrium theory had been to split the economy into separate markets, each of whose equilibrium conditions could be stated as a single equation determining a single variable. The theoretical apparatus of supply and demand curves developed by Fleeming Jenkin and Alfred Marshall provided a unified mathematical basis for this approach, which the Lausanne School generalized to general equilibrium theory.

For macroeconomics the relevant partial theories were: the Quantity theory of money determining the price level, the classical theory of the interest rate, and for employment the condition referred to by Keynes as the "first postulate of classical economics" stating that the wage is equal to the marginal product, which is a direct application of the marginalist principles developed during the nineteenth century (see *The General Theory*). Keynes sought to supplant all three aspects of the classical theory.

Precursors of Keynesianism

Although Keynes's work was crystallized and given impetus by the advent of the Great Depression, it was part of a long-running debate within economics over the existence and nature of general gluts. A number of the policies Keynes advocated to address the Great Depression (notably government deficit spending at times of low private investment or consumption), and many of the theoretical ideas he proposed (effective demand, the multiplier, the paradox of thrift), had been advanced by various authors in the 19th and early 20th centuries. Keynes's unique contribution was to provide a *general theory* of these, which proved acceptable to the economic establishment.

An intellectual precursor of Keynesian economics was underconsumption theories associated with John Law, Thomas Malthus, the Birmingham School of Thomas Attwood,[8] and the American economists William Trufant Foster and Waddill Catchings, who were influential in the 1920s and 1930s. Underconsumptionists were, like Keynes after them, concerned with failure of aggregate demand to attain potential output, calling this "underconsumption" (focusing on the demand side), rather than "overproduction" (which would focus on the supply side), and advocating economic interventionism. Keynes specifically discussed underconsumption (which he wrote "under-consumption") in the *General Theory*, in Chapter 22, Section IV and Chapter 23, Section VII.

Numerous concepts were developed earlier and independently of Keynes by the Stockholm school during the 1930s; these accomplishments were described in a 1937 article, published in response to the 1936 *General Theory*, sharing the Swedish discoveries.

The paradox of thrift was stated in 1892 by John M. Robertson in his *The Fallacy of Saving*, in earlier forms by mercantilist economists since the 16th century, and similar sentiments date to antiquity.

Keynes's early writings

In 1923 Keynes published his first contribution to economic theory, *A Tract on Monetary Reform*, whose point of view is classical but incorporates ideas that later played a part in the *General Theory*. In particular, looking at the hyperinflation in European economies, he drew attention to the opportunity cost of holding money (identified with inflation rather than interest) and its influence on the velocity of circulation.

In 1930 he published *A Treatise on Money*, intended as a comprehensive treatment of its subject "which would confirm his stature as a serious academic scholar, rather than just as the author of stinging polemics", and marks a large step in the direction of his later views. In it, he attributes unemployment to wage stickiness and treats saving and investment as governed by independent decisions: the former varying positively with the interest rate, the latter negatively. The velocity of circulation is expressed as a function of the rate of interest. He interpreted his treatment of liquidity as implying a purely monetary theory of interest.

Keynes's younger colleagues of the Cambridge Circus and Ralph Hawtrey believed that his arguments implicitly assumed full employment, and this influenced the direction of his subsequent work. During 1933, he wrote essays on various economic topics "all of which are cast in terms of movement of output as a whole".

Development of *The General Theory*

At the time that Keynes's wrote the General Theory, it had been a tenet of mainstream economic thought that the economy would automatically revert to a state of general equilibrium: it had been assumed that, because the needs of consumers are always greater than the capacity of the producers to satisfy those needs, everything that is produced would eventually be consumed once the appropriate price was found for it. This perception is reflected in Say's law and in the writing of David Ricardo, which states that individuals produce so that they can either consume what they have manufactured or sell their output so that they can buy someone else's output. This argument rests upon the assumption that if a surplus of goods or services exists, they would naturally drop in price to the point where they would be consumed.

Given the backdrop of high and persistent unemployment during the Great Depression, Keynes argued that there was no guarantee that the goods that individuals produce would be met with adequate effective demand, and periods of high unemployment could be expected, especially when the economy was contracting in size. He saw the economy as unable to maintain itself at full employment automatically, and believed that it was necessary for the government to step in and put purchasing power into the hands of the working population through government spending. Thus, according to Keynesian theory, some individually rational microeconomic-level actions such as not investing savings in the goods and services produced by the economy, if taken collectively by a large proportion of individuals and firms, can lead to outcomes wherein the economy operates below its potential output and growth rate.

Prior to Keynes, a situation in which aggregate demand for goods and services did not meet supply was referred to by classical economists as a *general glut*, although there was disagreement among them as to whether a general glut was possible. Keynes argued that when a glut occurred, it was the over-reaction of producers and the laying off of workers that led to a fall in demand and perpetuated the problem. Keynesians therefore advocate an active stabilization policy to reduce the amplitude of the business cycle, which they rank among the most serious of economic problems. According to the theory, government spending can be used to increase aggregate demand, thus increasing economic activity, reducing unemployment and deflation.

Origins of the multiplier

The Liberal Party fought the 1929 General Election on a promise to "reduce levels of unemployment to normal within one year by utilising the stagnant labour force in vast schemes of national development". David Lloyd George launched his campaign in March with a policy document, *We can cure unemployment*, which tentatively claimed that, "Public works would lead to a second round of spending as the workers spent their wages." Two months later Keynes, then nearing completion of his *Treatise*

on money, and Hubert Henderson collaborated on a political pamphlet seeking to "provide academically respectable economic arguments" for Lloyd George's policies. It was titled *Can Lloyd George do it?* and endorsed the claim that "greater trade activity would make for greater trade activity ... with a cumulative effect". This became the mechanism of the "ratio" published by Richard Kahn in his 1931 paper "The relation of home investment to unemployment", described by Alvin Hansen as "one of the great landmarks of economic analysis". The "ratio" was soon rechristened the "multiplier" at Keynes's suggestion.

The multiplier of Kahn's paper is based on a respending mechanism familiar nowadays from textbooks. Samuelson puts it as follows:

> Let's suppose that I hire unemployed resources to build a $1000 woodshed. My carpenters and lumber producers will get an extra $1000 of income... If they all have a marginal propensity to consume of 2/3, they will now spend $666.67 on new consumption goods. The producers of these goods will now have extra incomes... they in turn will spend $444.44 ... Thus an endless chain of *secondary consumption respending* is set in motion by my *primary* investment of $1000.

Samuelson's treatment closely follows Joan Robinson's account of 1937 and is the main channel by which the multiplier has influenced Keynesian theory. It differs significantly from Kahn's paper and even more from Keynes's book.

The designation of the initial spending as "investment" and the employment-creating respending as "consumption" echoes Kahn faithfully, though he gives no reason why initial consumption or subsequent investment respending shouldn't have exactly the same effects. Henry Hazlitt, who considered Keynes as much a culprit as Kahn and Samuelson, wrote that ...

> ... in connection with the multiplier (and indeed most of the time) what Keynes is referring to as "investment" really means *any addition to spending for any purpose*... The word "investment" is being used in a Pickwickian, or Keynesian, sense.

Kahn envisaged money as being passed from hand to hand, creating employment at each step, until it came to rest in a *cul-de-sac* (Hansen's term was "leakage"); the only *culs-de-sac* he acknowledged were imports and hoarding, although he also said that a rise in prices might dilute the multiplier effect. Jens Warming recognised that personal saving had to be considered, treating it as a "leakage" (p. 214) while recognising on p. 217 that it might in fact be invested.

The textbook multiplier gives the impression that making society richer is the easiest thing in the world: the government just needs to spend more. In Kahn's paper, it is harder. For him, the initial expenditure must not be a diversion of funds from other uses, but an increase in the total expenditure: something impossible – if understood in real terms – under the classical theory that the level of expenditure is limited by the economy's income/output. On page 174, Kahn rejects the claim that the effect of public works is at the expense of expenditure elsewhere, admitting that this might arise if the revenue is raised by taxation, but says that other available means have no such consequences. As an example, he suggests that the money may be raised by borrowing from banks, since ...

> ... it is always within the power of the banking system to advance to the Government the cost of the roads without in any way affecting the flow of investment along the normal channels.

This assumes that banks are free to create resources to answer any demand. But Kahn adds that ...

> ... no such hypothesis is really necessary. For it will be demonstrated later on that, *pari passu* with the building of roads, funds are released from various sources at precisely the rate that is required to pay the cost of the roads.

The demonstration relies on "Mr Meade's relation" (due to James Meade) asserting that the total amount of money that disappears into *culs-de-sac* is equal to the original outlay, which in Kahn's

words "should bring relief and consolation to those who are worried about the monetary sources" (p. 189).

A respending multiplier had been proposed earlier by Hawtrey in a 1928 Treasury memorandum ("with imports as the only leakage"), but the idea was discarded in his own subsequent writings. Soon afterwards the Australian economist Lyndhurst Giblin published a multiplier analysis in a 1930 lecture (again with imports as the only leakage). The idea itself was much older. Some Dutch mercantilists had believed in an infinite multiplier for military expenditure (assuming no import "leakage"), since ...

> ... a war could support itself for an unlimited period if only money remained in the country ... For if money itself is "consumed", this simply means that it passes into someone else's possession, and this process may continue indefinitely.

Multiplier doctrines had subsequently been expressed in more theoretical terms by the Dane Julius Wulff (1896), the Australian Alfred de Lissa (late 1890s), the German/American Nicholas Johannsen (same period), and the Dane Fr. Johannsen (1925/1927). Kahn himself said that the idea was given to him as a child by his father.

Public policy debates

As the 1929 election approached "Keynes was becoming a strong public advocate of capital development" as a public measure to alleviate unemployment. Winston Churchill, the Conservative Chancellor, took the opposite view:

> It is the orthodox Treasury dogma, steadfastly held ... [that] very little additional employment and no permanent additional employment can, in fact, be created by State borrowing and State expenditure.

Keynes pounced on a chink in the Treasury view. Cross-examining Sir Richard Hopkins, a Second Secretary in the Treasury, before the Macmillan Committee on Finance and Industry in 1930 he referred to the "first proposition" that "schemes of capital development are of no use for reducing unemployment" and asked whether "it would be a misunderstanding of the Treasury view to say that they hold to the first proposition". Hopkins responded that "The first proposition goes much too far. The first proposition would ascribe to us an absolute and rigid dogma, would it not?"

Later the same year, speaking in a newly created Committee of Economists, Keynes tried to use Kahn's emerging multiplier theory to argue for public works, "but Pigou's and Henderson's objections ensured that there was no sign of this in the final product" In 1933 he gave wider publicity to his support for Kahn's multiplier in a series of articles titled "The road to prosperity" in *The Times* newspaper.

A. C. Pigou was at the time the sole economics professor at Cambridge. He had a continuing interest in the subject of unemployment, having expressed the view in his popular *Unemployment* (1913) that it was caused by "maladjustment between wage-rates and demand" – a view Keynes may have shared prior to the years of the *General Theory*. Nor were his practical recommendations very different: "on many occasions in the thirties" Pigou "gave public support ... to State action designed to stimulate employment." Where the two men differed is in the link between theory and practice. Keynes was seeking to build theoretical foundations to support his recommendations for public works while Pigou showed no disposition to move away from classical doctrine. Referring to him and Dennis Robertson, Keynes asked rhetorically: "Why do they insist on maintaining theories from which their own practical conclusions cannot possibly follow?"

The *General Theory*

John Maynard Keynes (1883–1946) set forward the ideas that became the basis for Keynesian economics in his main work, *The General Theory of Employment, Interest and Money* (1936). It was written during the Great Depression, when unemployment rose to 25% in the United States and as high as 33% in some countries. It is almost wholly theoretical, enlivened by occasional passages of satire

and social commentary. The book had a profound impact on economic thought, and ever since it was published there has been debate over its meaning.

Keynes and classical economics

Keynes begins the *General Theory* with a summary of the classical theory of employment, which he encapsulates in his formulation of Say's Law as the dictum "Supply creates its own demand".

Under the classical theory, the wage rate is determined by the marginal productivity of labour, and as many people are employed as are willing to work at that rate. Unemployment may arise through friction or may be "voluntary," in the sense that it arises from a refusal to accept employment owing to "legislation or social practices ... or mere human obstinacy", but "...the classical postulates do not admit of the possibility of the third category," which Keynes defines as *involuntary unemployment*.

Keynes raises two objections to the classical theory's assumption that "wage bargains ... determine the real wage". The first lies in the fact that "labour stipulates (within limits) for a money-wage rather than a real wage". The second is that classical theory assumes that, "The real wages of labour depend on the wage bargains which labour makes with the entrepreneurs," whereas, "If money wages change, one would have expected the classical school to argue that prices would change in almost the same proportion, leaving the real wage and the level of unemployment practically the same as before." Keynes considers his second objection the more fundamental, but most commentators concentrate on his first one: it has been argued that the quantity theory of money protects the classical school from the conclusion Keynes expected from it.

Keynesian unemployment

Saving and investment

Saving is that part of income not devoted to consumption, and consumption is that part of expenditure not allocated to investment, i.e., to durable goods. Hence saving encompasses hoarding (the accumulation of income as cash) and the purchase of durable goods. The existence of net hoarding, or of a demand to hoard, is not admitted by the simplified liquidity preference model of the *General Theory*.

Once he rejects the classical theory that unemployment is due to excessive wages, Keynes proposes an alternative based on the relationship between saving and investment. In his view, unemployment arises whenever entrepreneurs' incentive to invest fails to keep pace with society's propensity to save (*propensity* is one of Keynes's synonyms for "demand"). The levels of saving and investment are necessarily equal, and income is therefore held down to a level where the desire to save is no greater than the incentive to invest.

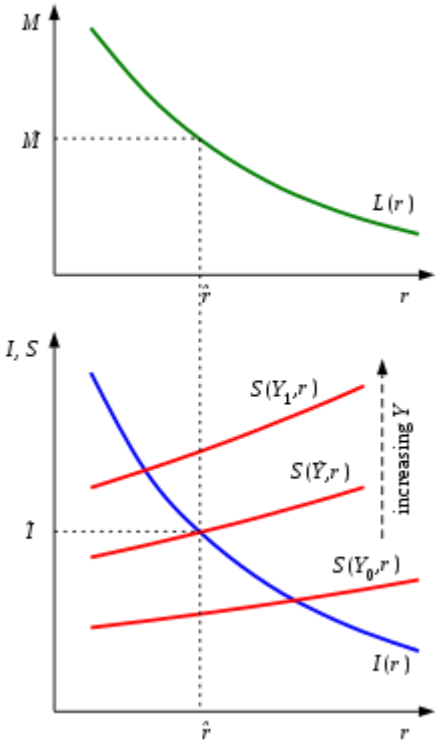
The incentive to invest arises from the interplay between the physical circumstances of production and psychological anticipations of future profitability; but once these things are given the incentive is independent of income and depends solely on the rate of interest *r*. Keynes designates its value as a function of *r* as the "schedule of the marginal efficiency of capital".

The propensity to save behaves quite differently. Saving is simply that part of income not devoted to consumption, and:

> ... the prevailing psychological law seems to be that when aggregate income increases, consumption expenditure will also increase but to a somewhat lesser extent.

Keynes adds that "this psychological law was of the utmost importance in the development of my own thought".

Liquidity preference



Determination of income according to the *General Theory*

Keynes viewed the money supply as one of the main determinants of the state of the real economy. The significance he attributed to it is one of the innovative features of his work, and was influential on the politically hostile monetarist school.

Money supply comes into play through the *liquidity preference* function, which is the demand function that corresponds to money supply. It specifies the amount of money people will seek to hold according to the state of the economy. In Keynes's first (and simplest) account – that of Chapter 13 – liquidity preference is determined solely by the interest rate *r*—which is seen as the earnings forgone by holding wealth in liquid form: hence liquidity preference can be written $L(r)$ and in equilibrium must equal the externally fixed money supply $\hat{M}$.

Keynes's economic model

Money supply, saving and investment combine to determine the level of income as illustrated in the diagram, where the top graph shows money supply (on the vertical axis) against interest rate. $\hat{M}$ determines the ruling interest rate $\hat{r}$ through the liquidity preference function. The rate of interest determines the level of investment $\hat{I}$ through the schedule of the marginal efficiency of capital, shown as a blue curve in the lower graph. The red curves in the same diagram show what the propensities to save are for different incomes Y; and the income $\hat{Y}$ corresponding to the equilibrium state of the economy must be the one for which the implied level of saving at the established interest rate is equal to $\hat{I}$.

In Keynes's more complicated liquidity preference theory (presented in Chapter 15) the demand for money depends on income as well as on the interest rate and the analysis becomes more complicated. Keynes never fully integrated his second liquidity preference doctrine with the rest of his theory, leaving that to John Hicks: see the IS-LM model below.

Wage rigidity

Keynes rejects the classical explanation of unemployment based on wage rigidity, but it is not clear what effect the wage rate has on unemployment in his system. He treats wages of all workers as proportional to a single rate set by collective bargaining, and chooses his units so that this rate never

appears separately in his discussion. It is present implicitly in those quantities he expresses in wage units, while being absent from those he expresses in money terms. It is therefore difficult to see whether, and in what way, his results differ for a different wage rate, nor is it entirely clear what he thought about the matter.

Remedies for unemployment

Monetary remedies

An increase in the money supply, according to Keynes's theory, leads to a drop in the interest rate and an increase in the amount of investment that can be undertaken profitably, bringing with it an increase in total income.

Fiscal remedies

Keynes' name is associated with fiscal, rather than monetary, measures but they receive only passing (and often satirical) reference in the *General Theory*. He mentions "increased public works" as an example of something that brings employment through the *multiplier*, but this is before he develops the relevant theory, and he does not follow up when he gets to the theory.

Later in the same chapter he tells us that:

> Ancient Egypt was doubly fortunate, and doubtless owed to this its fabled wealth, in that it possessed two activities, namely, pyramid-building as well as the search for the precious metals, the fruits of which, since they could not serve the needs of man by being consumed, did not stale with abundance. The Middle Ages built cathedrals and sang dirges. Two pyramids, two masses for the dead, are twice as good as one; but not so two railways from London to York.

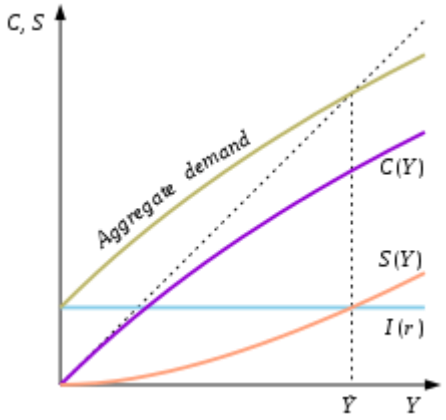
But again, he doesn't get back to his implied recommendation to engage in public works, even if not fully justified from their direct benefits, when he constructs the theory. On the contrary he later advises us that ...

> ... our final task might be to select those variables which can be deliberately controlled or managed by central authority in the kind of system in which we actually live ...

and this appears to look forward to a future publication rather than to a subsequent chapter of the *General Theory*.

Keynesian models and concepts

Aggregate demand



Keynes–Samuelson cross

Keynes' view of saving and investment was his most important departure from the classical outlook. It can be illustrated using the "Keynesian cross" devised by Paul Samuelson. The horizontal axis denotes total income and the purple curve shows $C(Y)$, the propensity to consume, whose complement $S(Y)$ is the propensity to save: the sum of these two functions is equal to total income, which is shown by the broken line at 45°.

The horizontal blue line $I(r)$ is the schedule of the marginal efficiency of capital whose value is independent of *Y*. Keynes interprets this as the demand for investment and denotes the sum of demands for consumption and investment as "aggregate demand", plotted as a separate curve. Aggregate demand must equal total income, so equilibrium income must be determined by the point where the aggregate demand curve crosses the 45° line.This is the same horizontal position as the intersection of $I(r)$ with $S(Y)$.

The equation $I(r) = S(Y)$ had been accepted by the classics, who had viewed it as the condition of equilibrium between supply and demand for investment funds and as determining the interest rate (see the classical theory of interest). But insofar as they had had a concept of aggregate demand, they had seen the demand for investment as being given by $S(Y)$, since for them saving was simply the indirect purchase of capital goods, with the result that aggregate demand was equal to total income as an identity rather than as an equilibrium condition. Keynes takes note of this view in Chapter 2, where he finds it present in the early writings of Alfred Marshall but adds that "the doctrine is never stated to-day in this crude form".

The equation $I(r) = S(Y)$ is accepted by Keynes for some or all of the following reasons:

- As a consequence of the *principle of effective demand*, which asserts that aggregate demand must equal total income (Chapter 3).
- As a consequence of the identity of saving with investment (Chapter 6) together with the equilibrium assumption that these quantities are equal to their demands.
- In agreement with the substance of the classical theory of the investment funds market, whose conclusion he considers the classics to have misinterpreted through circular reasoning (Chapter 14).

The Keynesian multiplier

Keynes introduces his discussion of the multiplier in Chapter 10 with a reference to Kahn's earlier paper (see below). He designates Kahn's multiplier the "employment multiplier" in distinction to his own "investment multiplier" and says that the two are only "a little different".[62] Kahn's multiplier has consequently been understood by much of the Keynesian literature as playing a major role in Keynes's own theory, an interpretation encouraged by the difficulty of understanding Keynes's presentation. Kahn's multiplier gives the title ("The multiplier model") to the account of Keynesian theory in Samuelson's *Economics* and is almost as prominent in Alvin Hansen's *Guide to Keynes* and in Joan Robinson's *Introduction to the Theory of Employment*.

Keynes states that there is ...

> ... a confusion between the logical theory of the multiplier, which holds good continuously, without time-lag ... and the consequence of an expansion in the capital goods industries which take gradual effect, subject to a time-lag, and only after an interval ...

and implies that he is adopting the former theory. And when the multiplier eventually emerges as a component of Keynes's theory (in Chapter 18) it turns out to be simply a measure of the change of one variable in response to a change in another. The schedule of the marginal efficiency of capital is identified as one of the independent variables of the economic system: "What [it] tells us, is ... the point to which the output of new investment will be pushed ..." The multiplier then gives "the ratio ... between an increment of investment and the corresponding increment of aggregate income".

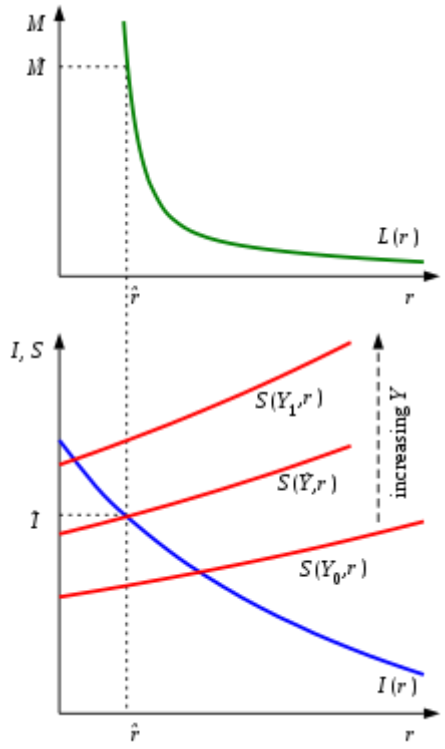
G. L. S. Shackle regarded Keynes' move away from Kahn's multiplier as ...

> ... a retrograde step ... For when we look upon the Multiplier as an instantaneous functional relation ... we are merely using the word Multiplier to stand for an alternative way of looking at the marginal propensity to consume ...,

which G. M. Ambrosi cites as an instance of "a Keynesian commentator who would have liked Keynes to have written something less 'retrograde'".

The value Keynes assigns to his multiplier is the reciprocal of the marginal propensity to save: $k = 1 / S'(Y)$. This is the same as the formula for Kahn's mutliplier in a closed economy assuming that all saving (including the purchase of durable goods), and not just hoarding, constitutes leakage. Keynes gave his formula almost the status of a definition (it is put forward in advance of any explanation). His multiplier is indeed the value of "the ratio ... between an increment of investment and the corresponding increment of aggregate income" as Keynes derived it from his Chapter 13 model of liquidity preference, which implies that income must bear the entire effect of a change in investment. But under his Chapter 15 model a change in the schedule of the marginal efficiency of capital has an effect shared between the interest rate and income in proportions depending on the partial derivatives of the liquidity preference function. Keynes did not investigate the question of whether his formula for multiplier needed revision.

The liquidity trap



The liquidity trap.

The liquidity trap is a phenomenon that may impede the effectiveness of monetary policies in reducing unemployment.

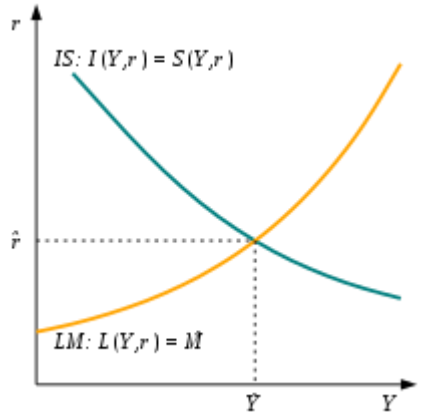
Economists generally think the rate of interest will not fall below a certain limit, often seen as zero or a slightly negative number. Keynes suggested that the limit might be appreciably greater than zero but did not attach much practical significance to it. The term "liquidity trap" was coined by Dennis Robertson in his comments on the *General Theory*, but it was John Hicks in "Mr. Keynes and the Classics" who recognised the significance of a slightly different concept.

If the economy is in a position such that the liquidity preference curve is almost vertical, as must happen as the lower limit on r is approached, then a change in the money supply $\hat{M}$ makes almost no difference to the equilibrium rate of interest $\hat{r}$ or, unless there is compensating steepness in the other curves, to the resulting income $\hat{Y}$. As Hicks put it, "Monetary means will not force down the rate of interest any further."

Paul Krugman has worked extensively on the liquidity trap, claiming that it was the problem confronting the Japanese economy around the turn of the millennium. In his later words:

> Short-term interest rates were close to zero, long-term rates were at historical lows, yet private investment spending remained insufficient to bring the economy out of deflation. In that environment, monetary policy was just as ineffective as Keynes described. Attempts by the Bank of Japan to increase the money supply simply added to already ample bank reserves and public holdings of cash..

The IS–LM model



IS–LM plot

Hicks showed how to analyze Keynes' system when liquidity preference is a function of income as well as of the rate of interest. Keynes's admission of income as an influence on the demand for money is a step back in the direction of classical theory, and Hicks takes a further step in the same direction by generalizing the propensity to save to take both Y and r as arguments. Less classically he extends this generalization to the schedule of the marginal efficiency of capital.

The IS-LM model uses two equations to express Keynes' model. The first, now written $I(Y, r) = S(Y,r)$, expresses the principle of effective demand. We may construct a graph on (Y, r) coordinates and draw a line connecting those points satisfying the equation: this is the IS curve. In the same way we can write the equation of equilibrium between liquidity preference and the money supply as $L(Y,r) = \hat{M}$ and draw a second curve – the LM curve – connecting points that satisfy it. The equilibrium values $\hat{Y}$ of total income and $\hat{r}$ of interest rate are then given by the point of intersection of the two curves.

If we follow Keynes's initial account under which liquidity preference depends only on the interest rate r, then the LM curve is horizontal.

Joan Robinson commented that:

> ... modern teaching has been confused by J. R. Hicks' attempt to reduce the *General Theory* to a version of static equilibrium with the formula IS–LM. Hicks has now repented and changed his name from J. R. to John, but it will take a long time for the effects of his teaching to wear off.

Hicks subsequently relapsed.

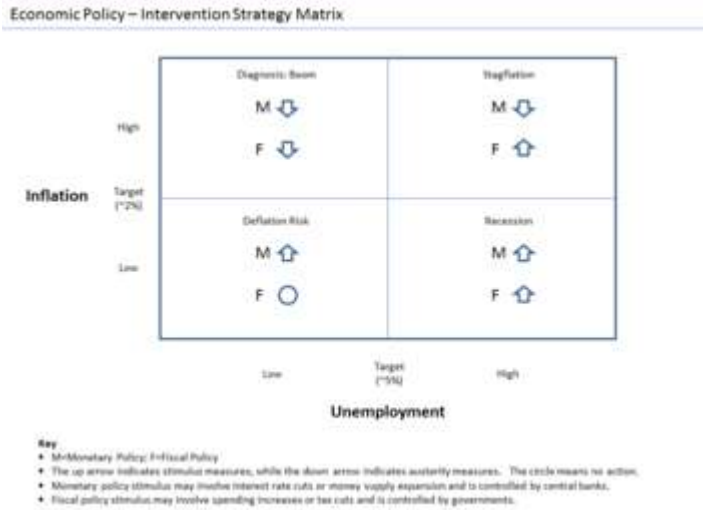
Keynesian economic policies

Active fiscal policy

This section has multiple issues. Please help **improve it** or discuss these issues on the **talk page**. *(Learn how and when to remove these template messages)*

This section includes a list of references, but **its sources remain unclear because it has insufficient inline citations**. *(October 2015)*

This section **is written like a personal reflection, personal essay, or argumentative essay** that states a Wikipedia editor's personal feelings or presents an original argument about a topic. *(October 2015)*



Typical intervention strategies under different conditions

Keynes argued that the solution to the Great Depression was to stimulate the country ("incentive to invest") through some combination of two approaches:

1. A reduction in interest rates (monetary policy), and
2. Government investment in infrastructure (fiscal policy).

If the interest rate at which businesses and consumers can borrow decreases, investments that were previously uneconomic become profitable, and large consumer sales normally financed through debt (such as houses, automobiles, and, historically, even appliances like refrigerators) become more affordable. A principal function of central banks in countries that have them is to influence this interest rate through a variety of mechanisms collectively called *monetary policy*. This is how monetary policy that reduces interest rates is thought to stimulate economic activity, i.e., "grow the economy"—and why it is called *expansionary* monetary policy.

Expansionary fiscal policy consists of increasing net public spending, which the government can effect by a) taxing less, b) spending more, or c) both. Investment and consumption by government raises demand for businesses' products and for employment, reversing the effects of the aforementioned imbalance. If desired spending exceeds revenue, the government finances the difference by borrowing from capital markets by issuing government bonds. This is called deficit spending. Two points are important to note at this point. First, deficits are not required for expansionary fiscal policy, and second, it is only *change* in net spending that can stimulate or depress the economy. For example, if a government ran a deficit of 10% both last year and this year, this would represent neutral fiscal policy. In fact, if it ran a deficit of 10% last year and 5% this year, this would actually be contractionary. On the other hand, if the government ran a surplus of 10% of GDP last year and 5% this year, that would be expansionary fiscal policy, despite never running a deficit at all.

But – contrary to some critical characterizations of it – Keynesianism does not consist solely of deficit spending, since it recommends adjusting fiscal policies according to cyclical circumstances. An example of a counter-cyclical policy is raising taxes to cool the economy and to prevent inflation when there is abundant demand-side growth, and engaging in deficit spending on labour-intensive infrastructure projects to stimulate employment and stabilize wages during economic downturns.

Keynes's ideas influenced Franklin D. Roosevelt's view that insufficient buying-power caused the Depression. During his presidency, Roosevelt adopted some aspects of Keynesian economics, especially after 1937, when, in the depths of the Depression, the United States suffered from recession yet again following fiscal contraction. But to many the true success of Keynesian policy can be seen at the onset of World War II, which provided a kick to the world economy, removed uncertainty, and forced the rebuilding of destroyed capital. Keynesian ideas became almost official in social-democratic Europe after the war and in the U.S. in the 1960s.

The Keynesian advocacy of deficit spending contrasted with the classical and neoclassical economic analysis of fiscal policy. They admitted that fiscal stimulus could actuate production. But, to these schools, there was no reason to believe that this stimulation would outrun the side-effects that "crowd out" private investment: first, it would increase the demand for labour and raise wages, hurting profitability; Second, a government deficit increases the stock of government bonds, reducing their market price and encouraging high interest rates, making it more expensive for business to finance fixed investment. Thus, efforts to stimulate the economy would be self-defeating.

The Keynesian response is that such fiscal policy is appropriate only when unemployment is persistently high, above the non-accelerating inflation rate of unemployment (NAIRU). In that case, crowding out is minimal. Further, private investment can be "crowded in": Fiscal stimulus raises the market for business output, raising cash flow and profitability, spurring business optimism. To Keynes, this accelerator effect meant that government and business could be *complements* rather than substitutes in this situation.

Second, as the stimulus occurs, gross domestic product rises—raising the amount of saving, helping to finance the increase in fixed investment. Finally, government outlays need not always be wasteful: government investment in public goods that is not provided by profit-seekers encourages the private sector's growth. That is, government spending on such things as basic research, public health, education, and infrastructure could help the long-term growth of *potential output*.

In Keynes's theory, there must be significant slack in the labour market before fiscal expansion is justified.

Keynesian economists believe that adding to profits and incomes during boom cycles through tax cuts, and removing income and profits from the economy through cuts in spending during downturns, tends to exacerbate the negative effects of the business cycle. This effect is especially pronounced when the government controls a large fraction of the economy, as increased tax revenue may aid investment in state enterprises in downturns, and decreased state revenue and investment harm those enterprises.

Views on trade imbalance

In the last few years of his life, John Maynard Keynes was much preoccupied with the question of balance in international trade. He was the leader of the British delegation to the United Nations Monetary and Financial Conference in 1944 that established the Bretton Woods system of international currency management. He was the principal author of a proposal – the so-called Keynes Plan – for an International Clearing Union. The two governing principles of the plan were that the problem of settling outstanding balances should be solved by 'creating' additional 'international money', and that debtor and creditor should be treated almost alike as disturbers of equilibrium. In the event, though, the plans were rejected, in part because "American opinion was naturally reluctant to accept the principle of equality of treatment so novel in debtor-creditor relationships".

The new system is not founded on free-trade (liberalisation of foreign trade but rather on regulating international trade to eliminate trade imbalances. Nations with a surplus would have a powerful

incentive to get rid of it, which would automatically clear other nations deficits.Keynes proposed a global bank that would issue its own currency - the bancor - which was exchangeable with national currencies at fixed rates of exchange and would become the unit of account between nations, which means it would be used to measure a country's trade deficit or trade surplus. Every country would have an overdraft facility in its bancor account at the International Clearing Union. He pointed out that surpluses lead to weak global aggregate demand – countries running surpluses exert a "negative externality" on trading partners, and posed far more than those in deficit, a threat to global prosperity. Keynes thought that surplus countries should be taxed to avoid trade imbalances. In *"National Self-Sufficiency" The Yale Review, Vol. 22, no. 4 (June 1933)*, he already highlighted the problems created by free trade.

His view, supported by many economists and commentators at the time, was that creditor nations may be just as responsible as debtor nations for disequilibrium in exchanges and that both should be under an obligation to bring trade back into a state of balance. Failure for them to do so could have serious consequences. In the words of Geoffrey Crowther, then editor of The Economist, "If the economic relationships between nations are not, by one means or another, brought fairly close to balance, then there is no set of financial arrangements that can rescue the world from the impoverishing results of chaos."

These ideas were informed by events prior to the Great Depression when – in the opinion of Keynes and others – international lending, primarily by the U.S., exceeded the capacity of sound investment and so got diverted into non-productive and speculative uses, which in turn invited default and a sudden stop to the process of lending.

Influenced by Keynes, economic texts in the immediate post-war period put a significant emphasis on balance in trade. For example, the second edition of the popular introductory textbook, *An Outline of Money*, devoted the last three of its ten chapters to questions of foreign exchange management and in particular the 'problem of balance'. However, in more recent years, since the end of the Bretton Woods system in 1971, with the increasing influence of Monetarist schools of thought in the 1980s, and particularly in the face of large sustained trade imbalances, these concerns – and particularly concerns about the destabilising effects of large trade surpluses – have largely disappeared from mainstream economics discourse and Keynes' insights have slipped from view. They are receiving some attention again in the wake of the financial crisis of 2007–08.

Postwar Keynesianism

Keynes's ideas became widely accepted after World War II, and until the early 1970s, Keynesian economics provided the main inspiration for economic policy makers in Western industrialized countries. Governments prepared high quality economic statistics on an ongoing basis and tried to base their policies on the Keynesian theory that had become the norm. In the early era of social liberalism and social democracy, most western capitalist countries enjoyed low, stable unemployment and modest inflation, an era called the Golden Age of Capitalism.

In terms of policy, the twin tools of post-war Keynesian economics were fiscal policy and monetary policy. While these are credited to Keynes, others, such as economic historian David Colander, argue that they are, rather, due to the interpretation of Keynes by Abba Lerner in his theory of functional finance, and should instead be called "Lernerian" rather than "Keynesian".

Through the 1950s, moderate degrees of government demand leading industrial development, and use of fiscal and monetary counter-cyclical policies continued, and reached a peak in the "go go" 1960s, where it seemed to many Keynesians that prosperity was now permanent. In 1971, Republican US President Richard Nixon even proclaimed "I am now a Keynesian in economics."

Beginning in the late 1960s, a new classical macroeconomics movement arose, critical of Keynesian assumptions (see sticky prices), and seemed, especially in the 1970s, to explain certain phenomena better. It was characterized by explicit and rigorous adherence to microfoundations, as well as use of increasingly sophisticated mathematical modelling.

With the oil shock of 1973, and the economic problems of the 1970s, Keynesian economics began to fall out of favour. During this time, many economies experienced high and rising unemployment, coupled with high and rising inflation, contradicting the Phillips curve's prediction. This stagflation meant that the simultaneous application of expansionary (anti-recession) and contractionary (anti-inflation) policies appeared necessary. This dilemma led to the end of the Keynesian near-consensus of the 1960s, and the rise throughout the 1970s of ideas based upon more classical analysis, including monetarism, supply-side economics, and new classical economics.

However, by the late 1980s, certain failures of the new classical models, both theoretical (see Real business cycle theory) and empirical (see the "Volcker recession") hastened the emergence of New Keynesian economics, a school that sought to unite the most realistic aspects of Keynesian and neo-classical assumptions and place them on more rigorous theoretical foundation than ever before.

One line of thinking, utilized also as a critique of the notably high unemployment and potentially disappointing GNP growth rates associated with the new classical models by the mid-1980s, was to emphasize low unemployment and maximal economic growth at the cost of somewhat higher inflation (its consequences kept in check by indexing and other methods, and its overall rate kept lower and steadier by such potential policies as Martin Weitzman's share economy).

Schools

Multiple schools of economic thought that trace their legacy to Keynes currently exist, the notable ones being Neo-Keynesian economics, New Keynesian economics, and Post-Keynesian economics. Keynes's biographer Robert Skidelsky writes that the post-Keynesian school has remained closest to the spirit of Keynes's work in following his monetary theory and rejecting the neutrality of money.[94][95] Today these ideas, regardless of provenance, are referred to in academia under the rubric of "Keynesian economics", due to Keynes's role in consolidating, elaborating, and popularizing them.

In the postwar era, Keynesian analysis was combined with neoclassical economics to produce what is generally termed the "neoclassical synthesis", yielding Neo-Keynesian economics, which dominated mainstream macroeconomic thought. Though it was widely held that there was no strong automatic tendency to full employment, many believed that if government policy were used to ensure it, the economy would behave as neoclassical theory predicted. This post-war domination by Neo-Keynesian economics was broken during the stagflation of the 1970s. There was a lack of consensus among macroeconomists in the 1980s. However, the advent of New Keynesian economics in the 1990s, modified and provided microeconomic foundations for the neo-Keynesian theories. These modified models now dominate mainstream economics.

Post-Keynesian economists, on the other hand, reject the neoclassical synthesis and, in general, neoclassical economics applied to the macroeconomy. Post-Keynesian economics is a heterodox school that holds that both Neo-Keynesian economics and New Keynesian economics are incorrect, and a misinterpretation of Keynes's ideas. The Post-Keynesian school encompasses a variety of perspectives, but has been far less influential than the other more mainstream Keynesian schools.

Interpretations of Keynes have emphasized his stress on the international coordination of Keynesian policies, the need for international economic institutions, and the ways in which economic forces could lead to war or could promote peace.

Is Keynesianism liberal?

In a 2014 paper, economist Alan Blinder argues that, "for not very good reasons," public opinion in the United States has associated Keynesianism with liberalism, and he states that such is incorrect. For example, both Presidents Ronald Reagan (1981-89) and George W. Bush (2001-09) supported policies that were, in fact, Keynesian, even though both men were conservative leaders. And tax cuts can provide highly helpful fiscal stimulus during a recession, just as much as infrastructure spending can. Blinder concludes, "If you are not teaching your students that 'Keynesianism' is neither conservative nor liberal, you should be."

Other schools of macroeconomic thought

The Keynesian schools of economics are situated alongside a number of other schools that have the same perspectives on what the economic issues are, but differ on what causes them and how to best resolve them. Today, most of these schools of thought have been subsumed into modern macroeconomic theory.

Stockholm School

The Stockholm school rose to prominence at about the same time that Keynes published his General Theory and shared a common concern in business cycles and unemployment. The second generation of Swedish economists also advocated government intervention through spending during economic downturns although opinions are divided over whether they conceived the essence of Keynes's theory before he did.

Monetarism

There was debate between monetarists and Keynesians in the 1960s over the role of government in stabilizing the economy. Both monetarists and Keynesians agree that issues such as business cycles, unemployment, and deflation are caused by inadequate demand. However, they had fundamentally different perspectives on the capacity of the economy to find its own equilibrium, and the degree of government intervention that would be appropriate. Keynesians emphasized the use of discretionary fiscal policy and monetary policy, while monetarists argued the primacy of monetary policy, and that it should be rules-based.

The debate was largely resolved in the 1980s. Since then, economists have largely agreed that central banks should bear the primary responsibility for stabilizing the economy, and that monetary policy should largely follow the Taylor rule – which many economists credit with the Great Moderation.[101][102] The financial crisis of 2007–08, however, has convinced many economists and governments of the need for fiscal interventions and highlighted the difficulty in stimulating economies through monetary policy alone during a liquidity trap.

Marxian economics

Some Marxist economists criticized Keynesian economics. For example, in his 1946 appraisal Paul Sweezy—while admitting that there was much in the *General Theory*'s analysis of effective demand that Marxists could draw on—described Keynes as a prisoner of his neoclassical upbringing. Sweezy argued that Keynes had never been able to view the capitalist system as a totality. He argued that Keynes regarded the class struggle carelessly, and overlooked the class role of the capitalist state, which he treated as a *deus ex machina*, and some other points. While Michał Kalecki was generally enthusiastic about the Keynesian revolution, he predicted that it would not endure, in his article "Political Aspects of Full Employment". In the article Kalecki predicted that the full employment delivered by Keynesian policy would eventually lead to a more assertive working class and weakening of the social position of business leaders, causing the elite to use their political power to force the displacement of the Keynesian policy even though profits would be higher than under a laissez faire system: The erosion of social prestige and political power would be unacceptable to the elites despite higher profits.

Public choice

James M. Buchanan criticized Keynesian economics on the grounds that governments would in practice be unlikely to implement theoretically optimal policies. The implicit assumption underlying the Keynesian fiscal revolution, according to Buchanan, was that economic policy would be made by wise men, acting without regard to political pressures or opportunities, and guided by disinterested economic technocrats. He argued that this was an unrealistic assumption about political, bureaucratic and electoral behaviour. Buchanan blamed Keynesian economics for what he considered a decline in America's fiscal discipline. Buchanan argued that deficit spending would evolve into a permanent disconnect between spending and revenue, precisely because it brings short-term gains, so, ending up

institutionalizing irresponsibility in the federal government, the largest and most central institution in our society. Martin Feldstein argues that the legacy of Keynesian economics–the misdiagnosis of unemployment, the fear of saving, and the unjustified government intervention–affected the fundamental ideas of policy makers. Milton Friedman thought that Keynes's political bequest was harmful for two reasons. First, he thought whatever the economic analysis, benevolent dictatorship is likely sooner or later to lead to a totalitarian society. Second, he thought Keynes's economic theories appealed to a group far broader than economists primarily because of their link to his political approach. Alex Tabarrok argues that Keynesian politics–as distinct from Keynesian policies–has failed pretty much whenever it's been tried, at least in liberal democracies.

In response to this argument, John Quiggin, wrote about these theories' implication for a liberal democratic order. He thought that if it is generally accepted that democratic politics is nothing more than a battleground for competing interest groups, then reality will come to resemble the model. Paul Krugman wrote "I don't think we need to take that as an immutable fact of life; but still, what are the alternatives?" Daniel Kuehn, criticized James M. Buchanan. He argued, "if you have a problem with politicians - criticize politicians," not Keynes. He also argued that empirical evidence makes it pretty clear that Buchanan was wrong. James Tobin argued, if advising government officials, politicians, voters, it's not for economists to play games with them. Keynes implicitly rejected this argument, in "soon or late it is ideas not vested interests which are dangerous for good or evil."

Brad DeLong has argued that politics is the main motivator behind objections to the view that government should try to serve a stabilizing macroeconomic role. Paul Krugman argued that a regime that by and large lets markets work, but in which the government is ready both to rein in excesses and fight slumps is inherently unstable, due to intellectual instability, political instability, and financial instability.

New classical

Another influential school of thought was based on the Lucas critique of Keynesian economics. This called for greater consistency with microeconomic theory and rationality, and in particular emphasized the idea of rational expectations. Lucas and others argued that Keynesian economics required remarkably foolish and short-sighted behaviour from people, which totally contradicted the economic understanding of their behaviour at a micro level. New classical economics introduced a set of macroeconomic theories that were based on optimizing microeconomic behaviour. These models have been developed into the real business-cycle theory, which argues that business cycle fluctuations can to a large extent be accounted for by real (in contrast to nominal) shocks.

Beginning in the late 1950s new classical macroeconomists began to disagree with the methodology employed by Keynes and his successors. Keynesians emphasized the dependence of consumption on disposable income and, also, of investment on current profits and current cash flow. In addition, Keynesians posited a Phillips curve that tied nominal wage inflation to unemployment rate. To support these theories, Keynesians typically traced the logical foundations of their model (using introspection) and supported their assumptions with statistical evidence. New classical theorists demanded that macroeconomics be grounded on the same foundations as microeconomic theory, profit-maximizing firms and rational, utility-maximizing consumers.

The result of this shift in methodology produced several important divergences from Keynesian macroeconomics:

1. Independence of consumption and current income (life-cycle permanent income hypothesis)
2. Irrelevance of current profits to investment (Modigliani–Miller theorem)
3. Long run independence of inflation and unemployment (natural rate of unemployment)
4. The inability of monetary policy to stabilize output (rational expectations)
5. Irrelevance of taxes and budget deficits to consumption (Ricardian equivalence)

Rational expectations

In economics, "**rational expectations**" are **model-consistent expectations**, in that agents inside the model are assumed to "know the model" and on average take the model's predictions as valid Rational expectations ensure internal consistency in models involving uncertainty. To obtain consistency within a model, the predictions of future values of economically relevant variables from the model are assumed to be the same as that of the decision-makers in the model, given their information set, the nature of the random processes involved, and model structure. The rational expectations assumption is used especially in many contemporary macroeconomic models.

Since most macroeconomic models today study decisions under uncertainty and over many periods, the expectations of individuals, firms, and government institutions about future economic conditions are an essential part of the model. To assume rational expectations is to assume that agents' expectations may be wrong, but are correct *on average* over time. In other words, although the future is not fully predictable, agents' expectations are assumed not to be systematically biased and collectively use all relevant information in forming expectations of economic variables. This way of modeling expectations was originally proposed by John F. Muth (1961) and later became influential when it was used by Robert Lucas, Jr. in macroeconomics.

Deirdre McCloskey emphasizes that "rational expectations" is an expression of intellectual modesty:

> Muth's notion was that the professors [of economics], even if correct in their model of man, could do no better in predicting than could the hog farmer or steelmaker or insurance company. The notion is one of intellectual modesty. The common sense is "rationality": therefore Muth called the argument "rational expectations".

Hence, it is important to distinguish the rational-expectations assumption from assumptions of individual rationality and to note that the first does not imply the latter. Rational expectations is an assumption of aggregate consistency in dynamic models. In contrast, rational choice theory studies individual decision making and is used extensively in, among others, game theory and contract theory.

Theory

Rational expectations theory defines this kind of expectations as being the *best guess of the future* (the optimal forecast) that uses all available information. Thus, it is assumed that outcomes that are being forecast do not differ systematically from the market equilibrium results. As a result, rational expectations do not differ systematically or predictably from equilibrium results. That is, it assumes that people do not make systematic errors when predicting the future, and deviations from *perfect foresight* are only random. In an economic model, this is typically modelled by assuming that the expected value of a variable is equal to the expected value predicted by the model.

where .is the rational expectation and is the random error term, which has an expected value of zero, and is independent of ..

Implications

Rational expectations theories were developed in response to perceived flaws in theories based on adaptive expectations. Under adaptive expectations, expectations of the future value of an economic variable are based on past values. For example, people would be assumed to predict inflation by looking at inflation last year and in previous years. Under adaptive expectations, if the economy suffers from constantly rising inflation rates (perhaps due to government policies), people would be assumed to always underestimate inflation. Many economists have regarded this as unrealistic, believing that rational individuals would sooner or later realize the trend and take it into account in forming their expectations.

The rational expectations hypothesis has been used to support some strong conclusions about economic policymaking. An example is the policy ineffectiveness proposition developed by Thomas Sargent and Neil Wallace. If the Federal Reserve attempts to lower unemployment through expansionary monetary policy economic agents will anticipate the effects of the change of policy and raise their expectations of future inflation accordingly. This in turn will counteract the expansionary effect of the increased money

supply. All that the government can do is raise the inflation rate, not employment. This is a distinctly New Classical outcome. During the 1970s rational expectations appeared to have made previous macroeconomic theory largely obsolete, which culminated with the Lucas critique. However, rational expectations theory has been widely adopted as a modelling assumption even outside of New Classical macroeconomics thanks to the work of New Keynesians such as Stanley Fischer.

If agents do not (or cannot) form rational expectations or if prices are not completely flexible, discretional and completely anticipated economic policy actions can trigger real changes.

Criticism

Rational expectations are expected values in the mathematical sense. In order to be able to compute expected values, individuals must know the true economic model, its parameters, and the nature of the stochastic processes that govern its evolution. If these extreme assumptions are violated, individuals simply cannot form rational expectations.

Testing empirically for rational expectations

Suppose we have data on inflationary expectations, such as that from the Michigan survey. We can test whether these expectations are rational by regressing the actual realized inflation rate .on the prior expectation of it, *X*, at some specified lead time *k*:

where *a* and *b* are parameters to be estimated and .is the error term. We can test the rationality of expectations by testing the joint null hypothesis that failure to reject this null hypothesis is evidence in favor of rational expectations. A stronger test can be conducted if the one above has failed to reject the null: the residuals of the above regression can themselves be regressed on other variables whose values are available to agents when they are forming the expectation. If any of these variables has a significant effect on the residuals, agents can be said to have failed to take them sufficiently into account when forming their expectations, leading to needlessly high variance of the forecasting residuals and thus more uncertainty than is necessary about their predictions, which hampers their effort to use the predictions in their economic choices for things such as money demand, consumption, fixed investment, etc.

BIJAN B. AGHEVLI • MOHSIN S. KHAN The estimates of equations (7) and (7a) can then be substituted into equation (5a): or, i< H [A A i' . i· A ri P n1] D iJ R = R O!o + O!t Y + 0!2 ; + 0!3 IT + P -; - R . D i H [· A p A r A r A ri "'] D iJ -= -{3o + {31 -+ {32 - + {33 -+ {34 - - - - - · -R R P Y r IT m RD In equation (Sa) if$\hat{1}$ = I, then the two equations will be identical. (S) (Sa) Equations (S) and (Sa) can be simulated for the rate of growth in international reserves, and the simulated values can be compared with the actual values to test the tracking ability of the model. The other method of testing the theory implied by equation (6) would be to estimate the unrestricted reduced form directly.13 Rft. P r r i1 H R = 'Yo + 'Yt p + 'Y2 y + 'Y3 ; + 'Y4 IT m D iJ + 'Ys -+ 'Y6 - • -+ e m H D where the pattern of signs is expected to be as follows: 'Yl = 1, 'Y2 > 0, 'Y3 < 0, 'Y4 < 0, ')'6 = 'Y6 = -I and e is a random error term. Since 'Y& = 'Y6, a second alternative could be to estimate: Rft. P r r i1 -· - = Ao + At -+ A2 -+ A3 -+ X4 -HR P Y r rr where As = 'Ys = 'Y6· (9) (9a) After estimating the parameters, equations (9) and (9a) can be solved, and the rate of growth in international reserves can be simulated.14 Both types of tests are made in the paper. This procedure will allow an approximate test of the restrictions imposed with regard to the sizes of u Including a constant term and multiplying both sides by the ratio $\hat{}$ " Multiplying the estimated equation through by $\hat{}$ 281 MONETARY APPROACH TO PAYMENTS DETERMINATION various coefficients. For example, equation (8) involves restricting the coefficient on the rate of growth in prices to be equal to unity and the coefficients on the rates of growth in the money multiplier and net domestic assets of the central bank to be minus unity. Equation (8a) removes the restriction on the rate of growth in prices and allows the coefficient to be estimated. Equation (9) represents the most general case, since no restrictions are imposed on the coefficients. II. Results This section discusses first the estimates obtained for equations (7), (7a), (9), and (9a). The simulation results are discussed later. Each of the four equations was estimated using cross-sectional data for 39 developing countries.11' Unfortunately, the interest rate variable had to be eliminated from the estimates, since such a series is not available for a large number of countries in the sample. Even in those countries where such a series is available, it is not very meaningful in that it tends to be constant

over substantial time periods. The first test was to estimate the demand for money function assuming homogeneity in prices. The results were as follows: (MM-P) = -9.9207 + 2.8192 _YY -0.4566!! (2.35) (3.55) (3.31) II R2 = 0.4751 SEE = 7.7753 (10) The values in parentheses below the estimated coefficients are the t-values. /?.2 is the corrected coefficient of determination, and SEE is the estimated standard error of the regression. It can be seen from equation (10) that both the income elasticity and the inflation elasticity have the correct signs and are significantly different from zero at the I per cent level. The size of the income elasticity of demand for money is relatively large. To some extent, this is to be expected for developing economies, since the public holds most of its savings in money form, owing to the absence of alternative financial assets. Insofar as savings increase more than proportionately with economic growth, the estimated income elasticity will exceed unity. The general fit of the equation is poor, but that is not unusual for cross-sectional data. 16 Appendix 1 provides a description of the data. 282 ©International Monetary Fund. Not for RedistributionBIJAN B. AGHEVLI • MOHSIN S. KHAN Estimating the demand for money function in nominal terms yields: M M i> :Y rr -3.8100 + 0.2611 p + 2.3575 y-0.1142-(1.22) (2.19) (4.20) (1.03) IT R2 = 0.3374 SEE= 5.4479 (II) Clearly the assumption of homogeneity in prices is rejected, since the coefficient of the rate of growth in prices is significantly less than unity. Whether a great deal of confidence can be established in this result is uncertain, as now the coefficient of the rate of growth in inflation is not significantly diflerent from zero and this may be due to multicollinearity between inflation and the rate of growth in inflation. The fit of this equation, as measured by the !?.2, is poorer than that obtained for equation (II). The estimates for equation (9) are as follows: R R H R i> y ir -4.2476 + 0.2569 -+ 1.0276 - - 0.1214 -(2.74) (3.39) P (3.67) Y (2.00) n n1 D b - 0.1452 --0.4150 - . -(0.58) m (6.62) H D R2 = 0.6244 SEE = 2.6921 (12) All estimated coefficients in this equation have the expected signs, and, apart from the coefficient of the rate of growth in the money multiplier, all are significantly different from zero, at least at the 5 per cent level. The coefficient of the rate of inflation is substantially less than unity, indicating a high degree of money illusion in the demand for nominal money balances. The income coefficient is now much closer to what would be expected, as its value is not significantly different from unity. The positive signs of the first two coefficients confirm two key monetary propositions, namely, that, ceteris paribus, an increase in inflation or in the rate of growth in income will lead to an improvement in the balam;e of payments. This is at variance with the Keynesian view that an increase in these variables would result in an increase in imports and would necessarily worsen the balance of payments.16 The coefficient of the rate of growth in inflation is about the 16 This is a very simple representation of the Keynesian view and deals only with the trade balance. Recent models of the balance of payments. however, specify capital flows in terms of other economic variables. If capital flows move procyclically and the trade balance moves anticyclically, the balance of payments would move procyclically or anticyclically depending on the relative strengths of the trade and capital balance. See Aghevli (1975) and Williamson (1963). 283 ©International Monetary Fund. Not for RedistributionMONETARY APPROACH TO PAYMENTS DETERMINATION same size as it was in the estimate of the nominal demand for money equation (12), except that it is now significantly different from zero at the 5 per cent level. The estimated coefficient of the rate of growth in domestic assets is significantly different from unity. This would imply that all increases in this variable would not leak out in the balance of payments. This is so perhaps because some of the assumptions behind the theory-for example, the exogenous nature of inflation-are not satisfied. To the extent 'that prices rise in response to an increase in net domestic assets, it would reduce the effect on the balance of payments. The fit of the equation is much better than was obtained in the demand for money equations, with more than 60 per cent of the variation of the dependent variable being captured by this specification. In the final equation that was estimated, the coefficients of the rates of growth in domestic assets and the money multiplier were constrained to be equal. The results were as follows: R R -.-= H R p y ii -4.3246 + 0.2351 -+ 1.0437 - - 0.1134 -(2.78) (3.22) p (3.73) y (1.88) l1 -0.4045 + -. -[. D b] (6.52) m H D !?.2 = 0.6226 SEE = 2.6985 (13) It is obvious that there is no major difference between the unconstrained equation (12) and equation (13). 17 It could be argued that the results are biased owing to the inclusion of high-inflation countries, such as Argentina, Bolivia, Brazil, Chile, Colombia, and Uruguay in the sample, since the domestic rate of inflation is substantially different from the world rate of inflation. In our empirical tests we converted all the series used into U.S. dollars so that this would not 11 We also estimated equation (13a) with a further constraint that the coefficient of inflation was equal to unity (an assumption that strictly we are not able to make in the light of our previous results). The results were as follows: R R P Y ri ["; D D] ·-. ---= -7.3308 + 1.1445 -- 0.4951 - - 0.7866 -+ -. -H R p (2.37) (2.02) y (5.10) n (7.74) m H D Rt = 0.7369 SEE = 5.4637 (13a) Note that both the coefficients of :!: and the rate of growth in domestic assets plus the ,.. money multiplier increase in size, compared with equation (13). It is interesting to observe that the Jit also improves. 284 ©International Monetary Fund. Not for RedistributionBIJAN B. AGHEVLI • MOHSIN S. KHAN be too much of a

problem. Nevertheless, we did estimate the equations excluding the high-inflation countries, and the results are shown in Appendix II. The estimates obtained in equations (10) and (II) were substituted into equations (8) and (Sa) to determine the rate of growth in international reserves. The simulated values obtained, along with the actual values of the rate of growth in reserves, are shown in Chart I, A and B. Neither model appears to do very well in simulating reserves. The simple correlations between the actual and simulated values for the two cases were 0.7011 and 0.7659, respectively. A similar simulation was performed using the estimates obtained from equations (12) and (13). The actual and simulated values are plotted in Chart I, C and D. Even visually it is obvious that these two models do far better than did the previous two, shown in Chart I, A and B. The correlations between the actual and simulated values were 0.8139 and 0.8069, respectively. From both the equation estimates and the simulation results, it appears to be better to estimate the reduced form equaticn for the rate of growth in international reserves directly than to follow the two-step procPdure of first estimating a demand for money equation (in real or nominal terms) and then substituting the estimates into the identity determining the growth in reserves. DI. Conclusion The purpose of this paper has been to provide estimates for the monetary approach to the determination of the balance of payments. The exercise was performed on a cross-sectional basis using data for 39 developing countries. The results gave strong indication of the usefulness of this approach in explaining the rate of growth in international reserves of developing countries. Two types of tests of the theory were conducted, and both gave plausible results with most of the relevant explanatory variables exerting statistically significant influence on either the rate of growth in money balances (real or nominal), which represents a crucial relationship of the monetary approach, or the rate of growth in international reserves. Apart from the ability of the monetary approach to explain the behavior of the balance of payments, the results also yielded some interesting policy implications. An increase in the domestic component of high-powered money will not all leak out in the balance of payments. In other words, there does not appear to be a one-to-one correspondence between these 285 ©International Monetary Fund. Not for RedistributionMONETARY APPROACH TO PAYMENTS DETERMINATION 30 2S 20 IS 10 s 0 -S -10 -IS 30 2S 20 IS 10 s 0 -S ·10 -IS CHART I. SELECTED DEVELOPING COUNTRIES: RATE OF GROWTH IN INTERNATIONAL RESERVES A. Simulated and Actual Values Obtained by Applying Equation (10) Artual ---r-1-Simula1ed T.tnl.lm.t lndt.t Rolt\tJe C\rn•'• Th.ul.tnde eCiun.t, R.:-p ,,1 A!'):\"OIIOJ. .:\h. ;H;t.."lli.l • Phtl.pptnt'" P.tr-.tJ;U..I\ hu.tdm e •eM.tll)'"IJ el-tC"tn durac. • lr.m • • • (,r<,'i.'i.'t t-1 $,.h,ador ("o.,ra kt..:J ..... •L'rusu:a) •Jam:w.:a • Mt:)'.ICO 1-Dvl'ltnlt'\..Hl t<\·r • \lur., .. -,·o !'.utl.me . . (»Jkt,l.an • Sn l.tn..Gtult'tn.tla . lhoOptJ • e("olomj,ta Vt•nt•tuda •Turk") """)':t • • •C'htlt• f-lun"'·• • BtJIII • ..:.ortJ e)lf.!JIHb I I I I I I I I .I -20 -IS -10 -s 0 s 10 IS 20 2S hr.u:le ---P\"tue -•P.ut:JmJ ---I I 30 3S B. Simulated and Actual Values Obtained by Applying Equation (II) >-----1-Simu/aled r-MtH<"-' .. ·o• r-I I -20 -15 Actual •lsr3tl • Ooh\tJ •C')pru< tun ... kt:r or • • Thatbnd •Peru • Nt..:araJu:. • ..-\rt;,.•nfln.J Phthrpant•t • •PJn.am.t P . .r .. r••·•.• • h·uJdor • \t.tl.t)'\13 HnnJut.l\ • • hm.w,\'1 • lr.me /. •ch't'"l" El So.h.ador ("(1\I.J R..... Mt>\u.·o el)n•f!UJ) •C.uJh.'m.aiJ T.u'IL;n, .. l>l'lrum .. ·:an R.:-p -ltldl.l r lhonr··· , e f • e Vl'n\.'/Ut'IJ • Sud.tn C'h•t..-•• Rr,ml luUI\1.1 . I •lllg,unl. l -10 -s 0 Ken' \Qiombta P.J ._t.,lotn Sft Lank.a • Turk\')' •KorcJ I I I s 10 IS I I I I 20 2S 30 3S -------286 ©International Monetary Fund. Not for RedistributionBIJAN B. AGHEVLI • MOHSIN S. KHAN LHART I (concluded). SELECTED 0E\EL..OPING COUNTRIES: RATE OF GROWT!-i IN INTERNATIONAL RESERVES C. Simulated and Actual Values Obtained by Applying Equation (12) 30 Actual 25 '----20 '----eBull\1.1 IS '----10 '-----·5 '----10 8r.Jt.tle • I UOI .. \.1 -o,ndJ • -IS ._..__l_l.__-.li'--__.l_-L-----.!.l _ _.l.l_...l...l_...._. I_..__I_.L--I_J -20 -15 -10 -5 0 5 I 0 IS 20 25 30 35 D. Simulated and Actual Values Obtained by Applying Equation (13) 30 25 20 '---IS 1--Actual lhJII.md ,,._ .. rJ}'l l,,·n• .. f hlllJ, K .. ·p 111 • t•hthppm•.• • \rl!nllft,t flJt.I•U.I) • P.ut;JIU.t (,r .,.•u• • • \bl.t\ .. ,.a ll•llhlnr.t' 1'-. • h1 1 1a1.1 lrJn • • I-I s .• h .• Jor -----·-. O =S•im•u...t•e•d _____ ·· ···· J··o•r•'l_<_"<•_• _____ -1 llntjtll.l• • (u .. t...· m.la -51--10 ..... th .. ,tl. t •• ni,IOI:t , •• 11.1 .. ,,',!!. Kh • .l)l,,,llllh.Jil :<[.... e\\•rh,'/tWI.I .. 'k:.. f • ('(ll.lfllhl.i "••rtt-t: .. ·••• e Su Lu1lr.o• rur. ... , i. ,.,,.... SuJ.m •1 UI11\IJ eK.,n.·J --•l t.lfhl.t I I -IS .__..__l_ji._____._____.-L----.._...LI_...LI_...l...I_..._I _..__I_.L__ I_J -20 -IS -10 -5 0 5 I 0 IS 20 25 30 35 287 ©International Monetary Fund. Not for RedistributionMONETARY APPROACH TO PAYMENTS DETERMINATION two variables. This is possibly so because our assumptions that prices and real income were exogenous are not strictly justified. If a change in domestic credit leads to a change in either of these variables, and therefore changes the public's demand for money, the effect on the balance of payments would be reduced. An increase of 10 per cent in domestic credit would result in a proportionate loss in international reserves only if all other relevant variables were constant. In the estimation, when a one-toone restriction was imposed, it appeared that the explanatory power of the model was lower in comparison with the unrestricted case. In the context of policy, therefore. a

much larger change in net domestic assets would be called for to achieve a given balance of payments target. Another interesting result was the positive relationship between economic growth and the balance of payments. At first sight, this would tend to contradict the view that developing countries are constrained in their growth objectives by foreign exchange availability. However. this conclusion would be valid only if an initial increase in economic growth could be achieved independently of the balance of payments position. Since developing countries generally require foreign investment and imports of capital goods in order to increase real income, it would be unlikely that growth could be achieved without taking into account the balance of payments position. The version of the monetary approach tested here involved certain very restrictive assumptions, namely, fixed exchange rates, full employment, infinite capital mobility, and free trade. These assumptions are obviously not satisfied in the group of countries studied here. It is. therefore, an indication of the robust nature of the theory that all the major propositions were still verified by the results. This provides further evidence of the validity of the monetary approach for long-run analysis of the balance of payments. APPENDICES I. Data Definitions and Sources Thc data used in this study were obtained from two sources: International Monetary Fund, lntemational Financial Statistics VFS), various issues. Sherman Robinson, "Sources of Growth in Less-Developed Countries: A CrossSection Study," Department of Economics, Discussion Paper No. 5 (London School of Economics, June 1970). The definitions and sources of the variables are as follows: 288 R = net international reserves {IFSl M = money plus quasi-money (IFS)
 P = consumer price index, 1966 = 100 (IFS) Y = gross national product in constant 1966 prices (Robinson) D = net domestic asset holdings of the central bank (IFS) m = money multiplier, defined as�(IFS) H = reserve money (I FS) All data are measured in U.S. dollars using the official exchange rate for conversion. The growth rates are calculated as average annual compound rates for the period 1957-66, using three-year averages for the end points. The variables, in level form, are all annual averages centered at midyear. The countries in the sample were Argentina. Bolivia, Brazil, Chile, Colombia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Jamaica. Mexico, Nicaragua, Panama. Paraguay, Peru, Uruguay, Venezuela, Ethiopia, Kenya, Morocco, the Sudan, Tanzania, Tunisia, Uganda, Sri Lanka, India, fran, lsrad, Pakistan, Cyprus, Greece. Turkey, the Republic of China, Korea, the Philippines, Thailand, and Malaysia. I I. Alternative Equation Estimates Since it is possible that the inclusion of high-inflation countries in the sample could distort the results obtained, we re-estimated the equations excluding Argenti11a, Bolivia, Brazil, Chile, Colombia, and Uruguay from the sample. The results for the reduced sample, shown below, are not very different from the results in the text and, although the effect of inflation on the rate of growth in international reserves is somewhat reduced, do not affect the conclusions of the paper.18 The equation numbers correspond to those in the text: (�) = -2.321 + 1.661 �+ 0.108 (0.81) (3.13) Y (0.60) n R2 = 0.203 S£ = 4.913 M P Y iT -- = I .476 + 0.561 -+ 1.7 54 ·.y + 0.208 -M (0.50) (1.38) P (3.27) (1.04) n R2 = 0.317 S£ = 4.898 R H R . -= R P Y iT Jir -0.710 + 0.201-+ 0.522- - 0.193 --0.169 -(0.58) (1.43) P (2.45) Y (2.84) n (1.07) 111 D iJ -0.777 . -(9.46) H D R.t = 0.857 S£ = 1.632 (10') (II') (12') R R P Y ii [,;, D b] -- . -= -2.575 + 0.306 -+ 0.748 - -0.234- -0.564 + -. -tl3') H R (1.58) (1.58) p (2.59) y (2.50) n (5.70) 111 H D R2 = o.ns S£ = 2.268 •Since all data used in the paper. including prices, are expressed in U.S. dollars. the rate of inflation in these countries is fairly constant over the period. 289