

Empirical analysis of the relationship between the exchange rate and the inflation rate with the VAR model case of Vietnam (1995-2016)

Quang NGUYEN

**CRIISEA
UNIVERSITY OF PICARDIE JULES VERNE**

The analyses in Chapter 2 lead us to a question on the relationship between foreign exchange reserves and the monetary base. Changes in the foreign exchange reserve will affect changes in exchange rates. We can use the foreign exchange reserve as a tool to modify and anticipate the exchange rate in the economy. Moreover, inflation has a strict relationship with the quantity of currency and Vietnam's monetary source depends in particular on changes in external assets. In the case of Vietnam, after the periods of hyperinflation (1954-1975; 1973-1975; 1985-1989)¹, the value of the Vietnamese currency was significantly devalued. In this case, based on the analyses of post-Keynesian authors, we can see that the reason for the substitution of the national currency for the foreign currency in this context can be explained by the preference for liquidity, which is a preference for holding highly liquid assets with stable values (Charles and Marie, 2016). If the value of the domestic currency is not stable due to high inflation or depreciation, foreign currencies can better satisfy the liquidity preference. Subsequently, the use of the dollar (or another foreign currency) as a unit of account is observed, followed by an increased tendency to make payments in foreign currency. In addition, the volatility of the inflation rate and the exchange rate has strongly influenced the objectives of balance of payments stabilization and economic growth².

¹ During the period 1954 to 1975, in southern Vietnam, the inflation rate was very high because the money supply was growing too fast (the United States was paying too much money in the form of subsidies to the Saigon government). Between the end of 1973 and 1975, there was an economic crisis in both Vietnam and the United States, which led to a reduction in subsidies, which caused inflation to exceed 200% in South Vietnam.

In 1985, the consequences of the bad policy "Giá - Lương - Tiền" continuously led Vietnam to a situation of hyperinflation. Hyperinflation appeared continuously from 1985 to 1988, with inflation rates ranging from 300% to 800% per year.

In 1986, the inflation rate reached 774.7%, causing economic unrest. Superinflation continued in the following two years (1987: 323.1%; 1988: 393%). In 1989, when the inflation rate was less than 100%, Vietnam had just escaped hyperinflation.

² See balance of payments risk analyses in Vietnam of LE Phuong Ninh (*Tài chính Việt Nam 2014-2015, Ổn định vĩ mô - Hội Nhập toàn diện*, pg. 424-429)

These two variables, including the inflation rate, will also continue to have an impact on imports and exports, as well as on economic growth in Vietnam. Therefore, studies on these two variables are still needed for this country.

This chapter will systematize views on inflation and the exchange rate, the impact of these two variables on the economy and their relationship in economic theories. After that, we will use the vector autoregressive (VAR) model to test the relationship between the inflation rate and the exchange rate. From the results obtained with the VAR model, we can see the impacts of the exchange rate on the inflation rate as well as the bilateral relationship of the foreign exchange reserve and inflation in the period 1995-2016.

Therefore, for developing countries, exports can be considered as an "engine" of economic growth, but in Vietnam, more than 90% of the raw materials needed for production, investment and economic activities must be imported³, indeed, it is necessary to adjust the exchange rate in a flexible and reasonable way to help stabilize inflation, "stabilize prices", by creating consumer confidence.

Based on the reality of the Vietnamese economy (see Chapter 1), the origin of the monetary source (see Chapter 2) and the results of the tests of the econometric model in this chapter, we can propose recommendations on the adjustment of the exchange rate in order to limit its negative effects on inflation, which contributes to the stabilization of economic growth and social stability.

3.1 Review of the literature on inflation theories

Inflation is a common economic phenomenon in countries around the world. Inflation occurs at different frequencies and levels in developed and developing countries alike, in times of economic crisis and also in times of economic development. Inflation is not a neutral phenomenon (CHARLES; MARIE, 2018): it can be, to some extent, a means of contributing to economic development, increasing demand and promoting investment. Yet, when inflation exceeds a certain limit, it will threaten the positive performance of the economy. This is why research on inflation appeared very early in all countries of the world, where currency is introduced and circulates in the economy.

When we talk about the 3 functions of money, inflation often has a direct influence on the two functions, which are the value standard function and the value reserve function. When this happens, it reduces the purchasing power of money, i.e. the value of the goods it allows to acquire, and no longer creates the confidence of the whole population in the reserve of money as a "patrimony" and causes acquisitions to be postponed into the future.

In this section, inflation considerations will be summarized in terms of time and perspectives from different business schools. Inflation is not limited to countries with high GDP, it also prevents many developing countries from covering government expenditure when they rely too heavily on printing money.

³ Giáo trình kinh tế Việt Nam (Vietnamese Economic Manual), pg.369

At the end of the 20th century, in Pindak's studies, when countries had put in place models of the centrally planned economy such as the USSR and Eastern Europe⁴, *"Soviet Russia suffered from inflation, or even for a few years from hyperinflation, almost continuously from 1917 to the 1947 monetary reform. Similarly, the Eastern European communist countries experienced similar post-war inflation until around 1953-1954."*

Economists very early on researched inflation. Most researchers agreed that "inflation is a general and sustained increase in the general level of prices of goods and services across an economy". However, the increase in the general price level is not due to inflation. If the price only increases temporarily and in the short term, for example during the traditional New Year's Eve in Vietnam, it will then fall. It is the result of temporary fluctuations in supply and demand on the financial market.

The two economists Laidler and Parkin confirmed that *"Inflation is a process of continuously rising prices, or equivalently, of a continuously falling value of money"*⁵, we can understand that the purchasing power of money in a country is continuously reduced. Samuelson also stated that "inflation represents an increase in the general price level". The general price level is defined as the average price of the "basket of goods and services" in a country. Each country has different types of goods and services depending on its standard of living and GDP. When the general price increases, the components of the economy will have to pay more for the same type of goods and services in this basket, which proves that the value of the currency or the purchasing power of the currency in this country has decreased.

According to Keynes and the post-Keynesian authors, inflation is shown by the increase in demand resulting from full employment and production factors. When the quantity of goods and services demanded exceeds the quantity of goods offered, a price increase is necessary to restore balance in a market economy (demand inflation). Inflation occurs when there is excess demand for goods and services and supply remains inelastic. The excess of demand over supply results in higher prices, national income rises but only in nominal terms and not in real terms.

Keynes does not believe that the economy is still at full employment, that is, it has not yet reached its potential level. Therefore, before full employment is available, policies must be put in place to increase demand, which is essential for the birth of full employment. Production factors are also needed to promote production (aggregate supply) and create more jobs (aggregate demand), in which case this does not cause inflation (there is no "inflationary gap"). On the contrary, inflationary pressures would have emerged in the case of an excessive expansion in relation to the supply of one or more elements of final demand (consumption or exports, for example). However, Keynes has always argued that demand inflation is necessary for the economy, because if it does not yet reach its level of full employment, it would be a "motivation" for economic development.

⁴ PINDAK Frantisek. L'inflation en U.R.S.S. et en Europe de l'Est, *Revue d'études comparatives Est-Ouest*, vol. 7, 1976, n°3. pp. 7-24.

⁵ Laidler, D., & Parkin, M. (1975). Inflation: A Survey, *The Economic Journal*, 85(340), 741-809

In addition, we can mention a price increase based on cost increases (cost inflation), in this case to distinguish between *real* and *monetary imbalances*. In general, inflation may have come from price increases due to autonomous cost increases, as higher production costs have been passed on to consumers. This can only be achieved during a period of economic growth, when consumers are willing to pay a higher price. We can take an example of cost-inflation analysis based on costs paid in the form of wages (wage inflation): if wages represent a significant share of production and service costs and wages increase faster than productivity, total production costs will increase. If producers can pass on this increase in costs to consumers, the selling price will increase, workers and communities will demand higher wages in advance to meet the increased cost of living, resulting in the price/wage loop [Kaldor (1955-1956; 1966) & Kalecki (1935; 1938; 1942)]. Inspired by Kalecki's work, Charles and Marie provide the following definition of hyperinflation in an open economy: "a very rapid rise in prices and a general tendency to convert units of the national currency into foreign currency"⁶. We can also say that inflation is the consequence of the struggle between workers and capitalists for the sharing of added value. Moreover, inflation may have come from either higher raw material and imported energy costs due to higher exchange rates or limited exploitation, or higher capital costs due to increases in interest rates.

Other authors, such as Hicks, Lange and Keynes, argue that forms of expectations also have an impact on inflation⁷. Every year, all countries in the world experience a certain level of inflation. If there is no change in the economy, this rate can be preserved. In the inertial inflation mechanism, expectations and anticipations play a very important role. As expectations are always the basis for the behaviour of inflation triggers in the economy. Inflation is prevented on the basis of experience and the results of analysis, processing of information obtained from previous periods and the government's economic policies. Since then, economic sectors will plan their activities in line with expected inflation. In fact, they will raise the price to the level of expected inflation.

In fact, when we talk about the monetary sphere (monetary imbalances) in order to explain inflation, we must start with the classical and neoclassical authors who founded the quantitative theory of money, which showed that, under certain conditions, the general price level is strictly proportional to the money supply. Inflation comes from excessive money creation. As the general price level depends only on the quantity of currency in circulation. Faced with the rise in prices in England at the beginning of the 19th century, the classics considered that English inflation had "real" causes, but the Bullionists admitted that it was the excessive issuance of inconvertible currency that caused the rise in commodity prices, the fall in the exchange rate and the increase in the price of gold. The phenomenon of excess money creation has been demonstrated by the devaluation of the national currency in an economy, compared to other instruments, such as gold or currencies. In the market, households do not want to have savings or send money to banks, they want to invest directly in commercial activities or withdraw all the money to buy gold and real estate. As a result, the banking system is seriously lacking in liquidity, while the market is flooded with money. Loan applications to banks are rejected for lack of security.

⁶ Charles, S. and Marie, J. (2016): "Hyperinflation in a small open economy with a fixed exchange rate: A post Keynesian view", *Journal of Post-Keynesian Economics*, 39(3), 1-26.

⁷ FRISCH H. (1983), *Theories of inflation*, Cambridge (U.K), pg.20

The money supply of each country has a major influence on production, employment and prices in that country. The central bank can use its control of money supply to stimulate the economy when economic growth is slower than expected, or restrict it when prices rise faster than expected. When monetary policy is well managed, the economy's output can steadily increase with stable prices. If there is a problem in the monetary system, the quantity of money can increase or decrease very quickly, leading to inflation or recession.

In detail, in order to show more clearly the role of money supply, we can recall Fischer's equation: $M \cdot V = P \cdot T$ (1)

Where M is the money supply, V is the speed of money, P is the general price in the economy, T is the real volume of transactions with the assumption $T = Y$. Assuming that the economy is in full employment, there will be aggregate supply: $AS = Y$ (2) and aggregate demand AD is determined:

$$AD = (M \cdot V) / P \quad (3)$$

The balance of the goods and services market is achieved when $AS = AD$, so the Fischer equation can be written as follows: $M \cdot V = P \cdot Y$ (4)

When there is a percentage change, the above equation can be rewritten as follows:

$$\ln M + \ln V = \ln P + \ln Y \quad (5)$$

$$\Delta M + \Delta V = \Delta P + \Delta Y \text{ equivalent to } \Delta P = \Delta M + \Delta V - \Delta Y \quad (6)$$

Assuming that V is constant, this variable depends on the development of the financial system, which does not change immediately. Fischer adds to hypothesis V is a long-term constant. Therefore, when the monetary speed is constant, all changes in the money supply will lead to a change in nominal GDP. Since factors of production and production functions determine real GDP, each change in nominal GDP is reflected in the change in the general price level. The above argument shows that the evolution of the general price level is compatible with the evolution of the money supply

Based on these analyses, Friedman's monetarists and the Chicago School developed the new quantitative theory of money. They discussed the relationship between money supply movements and price fluctuations. In addition, they stated that inflation is a monetary phenomenon that creates excess demand for cash in real terms relative to the volume of money in circulation. In other words, the money supply in the economy is a little "heavy" to keep up with the limited quantity of goods and services. This theory was explained by the principle of a neutral currency. This principle states that the increase in the money supply has absolutely no impact on the quantity of goods and services and on the number of jobs.

Friedman argues that "inflation is always and everywhere a monetary phenomenon", whose responsibility is based on state policy. This inflation can be avoided by controlling the monetary stock. Traditional monetarism still considers the money supply as an exogenous variable. Thus, Friedman argues that monetary authorities must anticipate and announce the growth rate of a

monetary aggregate for a sustainable period. So far, most economists around the world have agreed to define inflation according to the two fundamental points of Samuelson and Friedman⁸. Therefore, the research in this chapter will follow Friedman's view of inflation, among other things.

Friedman argues that in order to curb inflation, it is necessary to curb the growth of the quantity of money and, in order to avoid inflation, the velocity of money circulation must be associated with real output growth. In 1972, Tobin drew inspiration from Friedman's inflation-based approach, saying that the difference between real and potential output is also a cause of inflation.

In summary, although they address the analysis of the source of inflation from different angles and under different causes, economists all agree that inflation occurs when aggregate demand for goods exceeds their aggregate supply in the economy.

It is an imbalance in supply-demand relationships. The main reason is that demand is growing too fast while supply is not increasing (or is increasing slowly). Monetarists say that the quantity of money is the root cause of demand inflation. Assuming that AS is constant, the economy is always at the level of potential output, when money supply increases, it leads to an increase in overall demand for goods and services while their supply cannot be increased, because the economy is at a potential level of full employment. Therefore, it is natural that prices increase in line with the growth of the money supply, which will lead to inflation.

It can be seen that the phenomenon of price increases based on excess demand occurs when factors change the curve of aggregate demand to the right (or when there is an increase in demand in the economy, often including the increase in the money supply). First, to support economic growth, government often increases public spending, or the private sector increases the investment needed to increase production because when household income increases, household consumption increases. Second, if the share of exports increases, it is the cause of the economy's overall demand growth. If the value of one of the explanatory variables in the equation below increases, the economy's overall demand will also increase, assuming that the other factors are constant.

$$Y = C + I + G + (\text{Exports} - \text{Imports})$$

When demand increases rapidly while supply is insufficient, the general level of prices in the economy will increase. Second, the money supply and product exports will affect the country's foreign exchange reserves. Since exports are a source of foreign currency, they increase foreign exchange reserves. In some cases, countries can increase their money supply to buy more currencies in order to increase their foreign exchange reserves (for example, currencies from FDI projects are converted into national currencies). For the phenomenon of inflation resulting from a

⁸ "Friedman only accepts approaches to excess demand as a source of inflation. Thus, unlike Samuelson and Solow's analysis, full employment and price stability are not contradictory policy objectives in Friedman's analysis. For him, an arbitrage between inflation and unemployment only appears during surprise inflation" Cf. Johannes A. Schwarzer, "Samuelson and Solow on the Phillips Curve and the "Menu of Choice": A Retrospective", *Oeconomia*, 3-3 | 2013, 359-388.

rise in costs, it is often due to factors that increase production costs or cause the global supply curve to shift to the left.

First of all, it is necessary to talk about the factors of production that are often inputs to production processes such as the price of raw materials, fuel (electricity, gasoline), labour costs and the cost of the loan are reflected in the interest rate. As interest rates rise, investment projects will become more expensive and production expansion will be halted. When the value of one of the factors changes, it will affect the overall supply of the economy. In the event that the increase in imports is limited to compensate for the shortage of supply due to domestic production, the general price level would increase on the domestic market.

Second, production instability also leads to a decline in supply; in agriculture, natural disasters and epidemics can be the cause of productivity instability. In the manufacturing sector, instability in input supplies, such as rising commodity prices or political instability in oil-exporting countries, can also cause supply shocks⁹. Technological changes may also be a reason in this case, for example, an uncertified technology that cannot be used to produce goods when it would be more economical for the manufacturer. Monopolies are also a cause of reduced supply in the economy, which refers to the concept of marginal profit (marginal revenue - marginal cost), monopolies will only produce the quantity of goods that will bring them the highest profit, no highest turnover, there will be a shortage of goods, while the economy has not reached the potential production level.

In addition, the change in the structure of the economy will result in a difference in income between sectors of the economy. This will result in a shift of labour from the low-income sector to the high-income sector, specifically from the agricultural sector to the industrial sectors. This creates shortages in some key agricultural products and high wages in other sectors will raise the overall price level in the economy, a situation that is glaring in the Vietnamese economy.

Among the factors influencing inflation, it can be seen that the exchange rate plays an important role, with exchange rate fluctuations affecting production inputs. For sectors that have to import inputs, the exchange rate will pass through the input production channel and affect production prices. In particular, for countries that have to import oil, the change in exchange rates will cause the price of oil to change immediately, especially in market economies. The difference between national interest rates and interest rates on the international financial market will change the flow of short- and medium-term investments in this country. In the event of a sudden change in foreign currency inflows into the financial market, abnormal fluctuations in the exchange rate of that country will occur. When the exchange rate changes, the supply and demand for import and export products on the domestic market are also changed, as the price of imported and exported products depends on the exchange rate. In reality, each country needs a certain amount of foreign exchange reserves, which allows the central bank to intervene in the foreign exchange market when necessary and to meet the economy's import and export demand. When the increase or decrease in foreign exchange reserves occurs, there will be an impact on the money supply and the exchange rate. In the opposite direction, when the exchange rate changes, foreign exchange reserves and money supply (as well as inflation) are also affected. To fight inflation, many banks have sold

⁹ The typical example is that of increases in the price of petroleum products (1973-1974 & 1979-1981)

foreign currency to collect national currency in order to reduce the amount of cash in circulation in the economy.

3.2. Reflections on the exchange rate

International trade was born very early, sales and purchases were made in precious metals (gold, silver). However, when the currency is introduced into the payment system, traders need an exchange regime between currencies. In the trend towards an open economy since the mid-twentieth century and in the direction of globalization in the twenty-first century, international trade has grown strongly. To convert currencies between countries, it is necessary to have an exchange rate system. To have an overview of the exchange rate in order to adapt it to the current situation, when countries' financial markets are more closely linked, it is necessary to take into account exchange rate concepts.

The exchange rate is an economic concept derived from the need to exchange goods and services directly derived from currency and monetary relations between countries / regions. Therefore, the exchange rate plays a very important role in international trade activities, through this rate, we can compare the prices of goods and services of countries around the world.

According to Mishkin, "the price of one currency in term of another is called the exchange rate". The State Bank of Vietnam law, adopted on 16 June 2010, clearly states that "the exchange rate of the *dong* is the price of a unit of a currency in a Vietnamese currency unit". From the above concepts, it is generally understood that the exchange rate is the conversion rate/rate of comparison from one currency to another, between countries/regions of the world. Or, more simply, the exchange rate is the parity of a currency that expresses the value of a defined currency against a monetary standard. The exchange rate is fixed on the foreign exchange market where currency supply and demand are compared.

Currently, there are two quotation systems, dual price quotation (bid and ask price) and uncertain or certain quotation. For the first quotation system, the bid price is the price at which the bank is willing to buy a currency, the ask price is the price at which the bank is willing to sell a currency. For the second rating system, certain rating is referred to as certain rating when a unit in domestic currency is quoted in foreign currencies, i.e. the domestic currency is fixed at one unit, while a foreign currency acts as a valuation with the number of units following changes according to developments in the foreign exchange market. For example, in the United Kingdom, the exchange rate is quoted as follows, GBP 1 = USD 1.27. Moreover, when we talk about the uncertain quotation, it indicates the equivalent in national currency of a unit in foreign currency. At that time, the foreign currency will play the role of a unit, while the national currency of that country will be the valuation price. In reality, this quotation is often used in most countries. For example, Vietnam indicates the exchange rate as follows: USD 1 = 23,311 *dong* and EUR 1 = 26,286 *dong*¹⁰.

In this chapter, in order to be able to discuss the analysis of the Vietnamese market, the exchange rate will be analysed according to the quotation on the Vietnamese foreign exchange market. The exchange rate VND/ USD = 23,311 means that 1 USD = 23,311 VND. If the exchange rate increases, it means that the *dong* depreciates against the US dollar, while the exchange rate

¹⁰ The figures are taken from the daily statistics on the site: <https://www.xe.com/currencyconverter/>

decreases, which means that the *dong* appreciates against the US dollar. To provide a basis for determining the exchange rate between the two currencies, economists around the world often use two main instruments, the purchasing power parity theory (PPP)[Cassel (1920)], representing the goods and services market, and the interest rate parity theory[Keynes (1923)], representing the money and financial market.

In order to understand the impact of the exchange rate, it is necessary to understand the nature and objectives of macroeconomic policy from a macro perspective in order to stabilize domestic prices and stabilize the financial market, while in the micro aspect maintaining the international competitiveness of domestically produced goods. At the same time, exchange rate stability will generate confidence among trading partners and the public that the value of the national currency in the internal and external balance will remain stable.

Exchange rate policy always goes hand in hand with the monetary policy of each country, it includes the activities of the authorities which, through the exchange rate mechanism and the intervention tool system, make it possible to change the exchange rate parity. The government or the BEV uses them to influence the national currency and intervene in the foreign exchange market in order to have a positive impact on import and export activities in that country. The exchange rate is a relatively important variable for the economy, it is the engine of growth, especially for exporting countries. Therefore, in the trend towards globalization and free trade, countries are still using the exchange rate as an effective tool to regulate import and export activities in that country.

An exchange rate policy must emphasize the importance of establishing a clear and reliable anchor to stabilize domestic prices and financial markets. In addition, exchange rate policy must also aim to maintain the international competitiveness of export products, so that it is also associated with economic growth variables. From this point on, the exchange rate policy objective can be generalized as follows:

- Examine the purchasing power of the national currency: if other factors are assumed to be constant, as the exchange rate increases, imported products will be more expensive and the overall price level of the economy will increase, which is one of the causes of inflation. This can be seen from the formula below, if P is called the general price level of the economy, then P is calculated as follows:

$$P = \alpha P_D + (1 - \alpha)eP^*$$

In which:

α is the proportion of goods produced and consumed in the country

$(1-\alpha)$ is the proportion of imported goods

e is the exchange rate

P_D is the price of goods produced in the country in local currency

P^* is the price of imported goods

Assuming that other factors are constant, when the central bank raises the price of the national currency or devalues the national currency, the general level of economic prices will be affected. When the inflation rate reduces the purchasing power of the national currency, if the exchange rate remains constant, domestic goods will be more expensive than foreign goods, leading imports to increase, creating an imbalance in the trade balance, followed by a shortage of foreign exchange. In order to avoid this situation, it is imperative to change the exchange rate, in this case adjust the national currency against foreign currencies.

- Promote economic growth by increasing exports: assuming that other conditions remain unchanged, when the devaluation of the national currency will stimulate exports and limit imports. This will directly increase national income, as we can see from this formula:

$$Y = C + I + G + (X - M)$$

Y: national income, I: investment, C: consumption, G: government expenditure, X: export and M: import.

However, to achieve this, it is necessary to have preconditions in the economy, such as export production capacity, import substitutes and export markets.

In addition, the tools that the Central Bank can use to regulate exchange rates are direct and indirect tools that affect the foreign exchange market, such as:

- Foreign exchange market operations: The Central Bank trades foreign currencies on the foreign exchange market in order to maintain the desired exchange rate. If you want the local currency to fall, the central bank can sell it on the market. This means that the increase in money supply and foreign exchange reserves will increase accordingly. On the contrary, when it wants to increase the national currency, the BEV will sell currencies to buy the local currency. In order to be able to intervene in the exchange rate on the foreign exchange market, the central bank must have significant foreign exchange reserves, but the BEV's capacity to intervene is proportional to its foreign exchange reserves. This intervention must follow the economic rules of the market, the future direction of economic development, the money market and the prices of each country.

- Interest rate adjustment: when using the interest rate calculation tool, the BEV wants to create an instant change in the exchange rate. When domestic interest rates change, the return on domestic and foreign currency assets will change, which will affect international investment flows. Of course, investors will themselves choose a currency with a higher interest rate. Second, the demand for and supply of assets in domestic and foreign currencies will change, leading to a change in the exchange rate. For example, assuming that other factors remain unchanged, when the central bank raises interest rates, short-term capital flows in the international financial market will go to the country, components that hold foreign currency in the country will also switch. If interest rates are higher, the local currency will appreciate or exchange rates will fall. Conversely, when the central bank reduces its interest rates, the exchange rate will increase. As interest rates are a very sensitive tool and cannot change constantly, they will have a negative impact on the economy if there are false expectations about exchange rate movements.

- Amplitude of exchange rate fluctuations: In conjunction with the official exchange rate announcement, the Central Bank may apply a fluctuation band for each period, thus allowing the exchange rate on the interbank market as well as the exchange rate of transactions between banks and customers fluctuating within this range. When the BEV applies a narrow margin, it shows that the economy is under pressure on the supply and demand for foreign exchange and that it must closely monitor the functioning of the foreign exchange market. The easing of the fluctuation range occurs when the market stabilizes or the country's foreign exchange reserves are large enough.

- Devaluation measures of the national currency: a devaluation consists in reducing the value of the national currency of the Central Bank in order to improve the current account balance. Devaluation is also considered to be a sudden decline in the value of a currency relative to another country's gold or currency. At present, there is no specific limit in the world between devaluation and monetary devaluation adjustment. Unlike exchange rate adjustment, currency devaluation is a strong and extreme measure, often used in special cases. The devaluation of the currency has the direct effect of improving the trade balance deficit situation. However, the improvement in the trade balance deficit depends on other factors. Devaluation will be detrimental to holders of national currency and will benefit those who hold foreign currency. For countries with high dollarization, the dollarization situation will worsen. Therefore, when taking the decision to devalue the national currency, the Central Bank must take into full account relevant factors such as the stability of the economy, import and export activities and the people's beliefs in the national currency, social and psychological development when there is a declaration of dumping.

- Measures to increase the price in local currency: when the central bank has an impact on the official exchange rate to increase the value of the national currency in relation to the foreign currency. A country must increase the value of the national currency when the trade balance increases and is under pressure from deficit trading partners, thereby limiting the depreciation of the foreign currency in their countries and slowing the high-growth economy (encouraging import and export restrictions). Countries often do not want to raise the price of the national currency, if they are not obliged to do so, due to external pressures.

- Use of a foreign exchange reserve fund: this is the last measure that the BEV must use to prevent an imbalance in the supply and demand of foreign exchange on the market. Therefore, if a country's foreign exchange reserves are relatively small, it is difficult to protect the value of the national currency under pressure from market forces, usually speculators invest in large quantities. The use of foreign exchange reserves to intervene under normal conditions is unnecessary and ineffective. As a result, central banks today make very little use of this direct intervention. In general, the Asian economy tends to maintain larger foreign exchange reserves than Latin American countries.

3.3. Studies of the relationship between inflation and the exchange rate

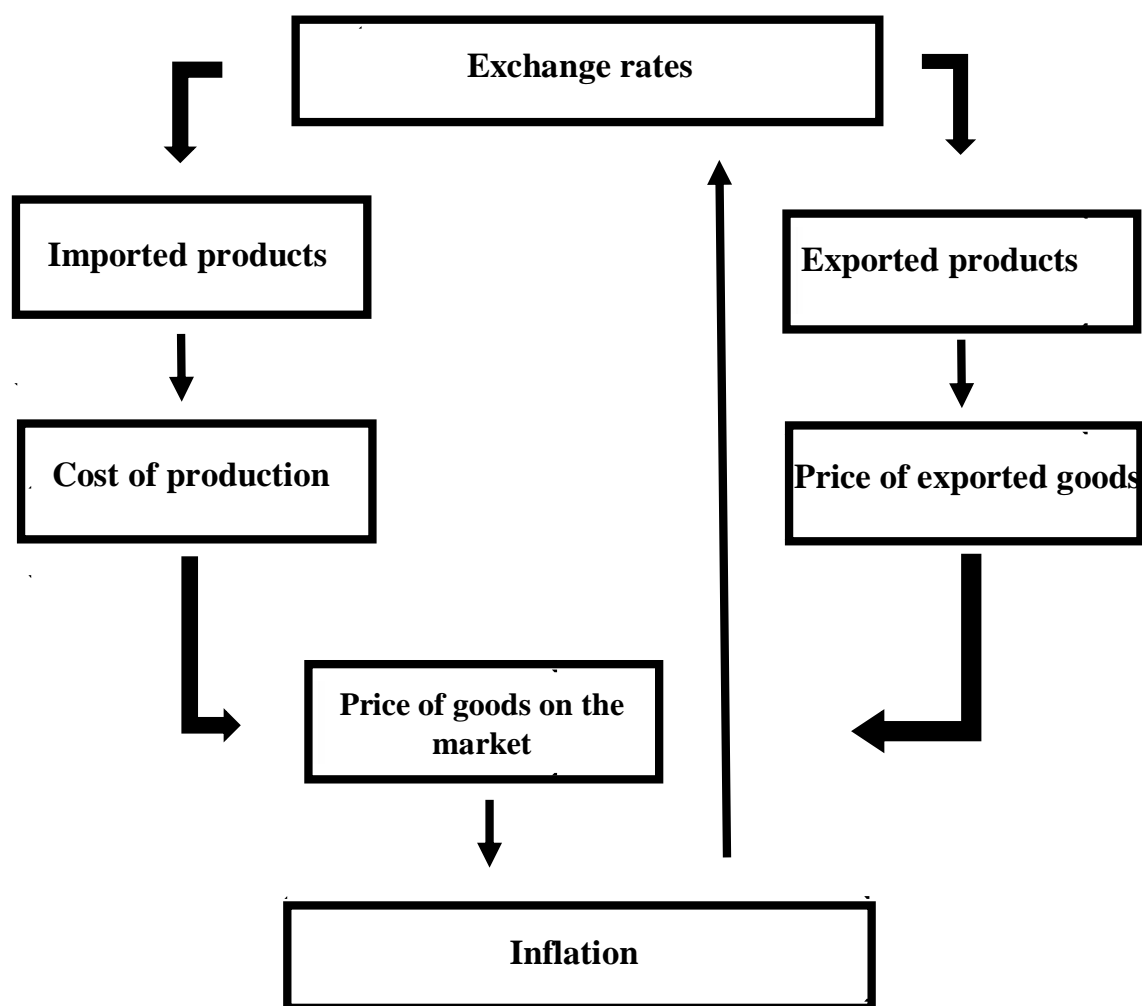
In theory, if the exchange rate can be kept stable, public confidence in the national currency can be increased, particularly in countries with high levels of "dollarization" in the financial system¹¹. In the relationship between inflation and the exchange rate, the question is which index is the cause and which index is the result. In order to answer this question, it is necessary to identify the factors driving inflation and the factors affecting the exchange rate. Some researchers, in their

¹¹ For more detailed analyses, see Ponsot J-F. (2002 p.14-17)

studies, suggest that exchange rate stability is necessary to control inflation. However, the exchange rate, in particular the situation of the Vietnamese economy, is one of the main factors influencing the main inflation rate. For example, when monetary policy is weak, although it can stimulate exports, it also contributes to cost inflation in Vietnam. Vietnamese production is now heavily dependent on imported materials such as oil, cement, iron, steel, machinery, etc. When the value of the dollar increases, there is an increase in the price of imported goods essential for *dong* production, which will cause the increase in domestic production costs, leading to an increase in the price of goods on the market.

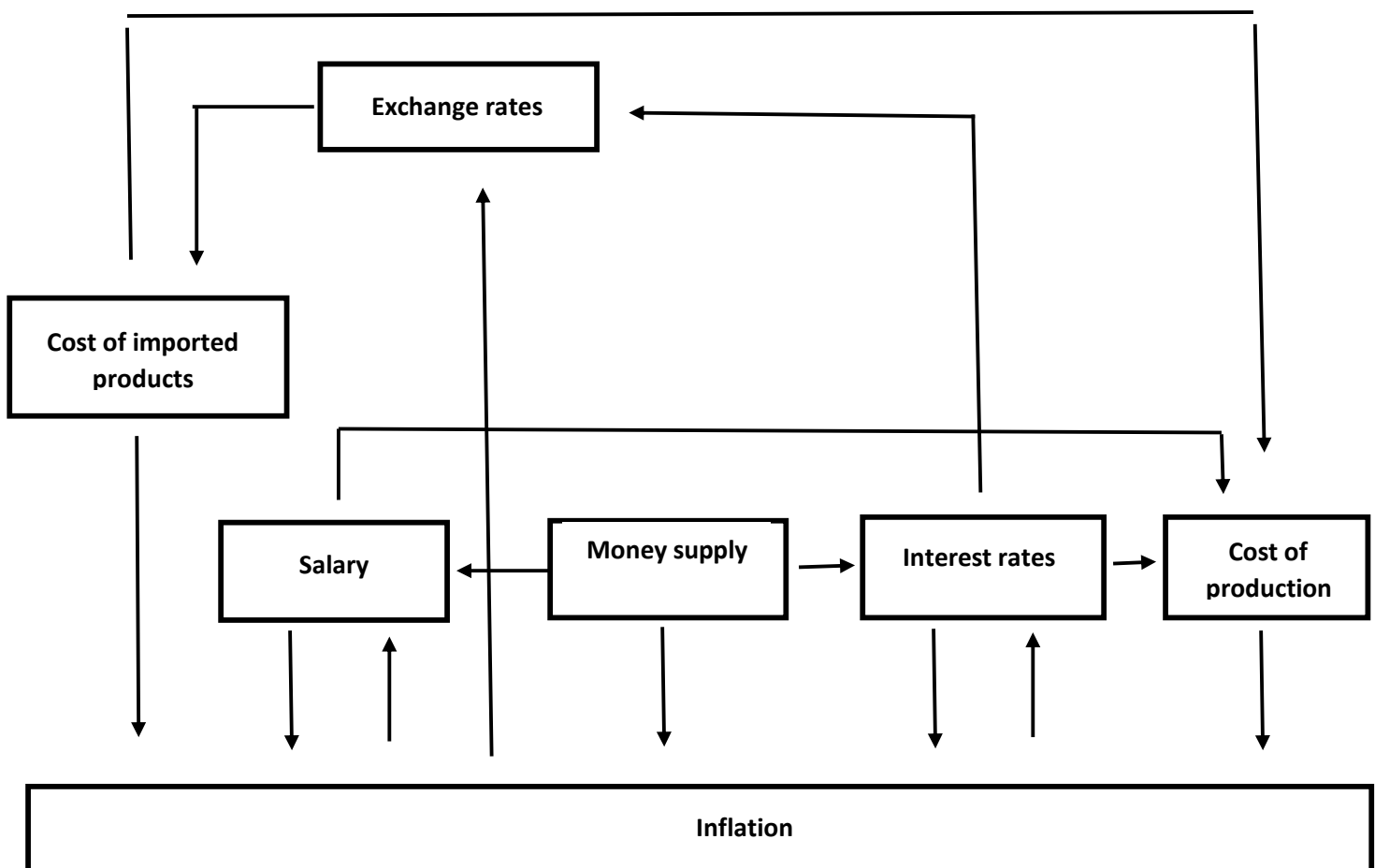
The factors affecting both exchange rate and inflation variables are commodities, interest rates and foreign exchange reserves. Commodities and interest rates will influence the production prices of goods and services in the economy. As the price of these inputs increases, the overall price of the entire economy will increase, leading to higher inflation. At the same time, it will also lead to a fall in exports, as domestic products become more and more expensive, and price competitiveness will decrease. If this happens, foreign currency earnings from product exports will decrease, which will affect the supply of foreign currency on the foreign exchange market.

We can describe the above phenomenon through the diagram below



The above diagram shows that when the exchange rate increases due to a specific cause, it leads to an increase in the price of goods, imported materials also increase when they are converted into national currency. As a result of this phenomenon, the general level of domestic product prices will increase. At the same time, when the exchange rate increases, the price of export products becomes cheaper and demand for export products increases. If producers prioritize exports over domestic sales, this will lead to shortages of aggregate domestic demand and demand for replacement of exported goods. This leads to a general increase in prices in the economy. Conversely, when the inflation rate changes, business activities will be affected. Under the transmission mechanism, these commercial activities will affect the money supply and demand for money, and then they will affect the exchange rate.

Since the early 1960s, economists around the world have studied the relationship between two inflation variables and the exchange rate. However, due to the different economic, political and socio-cultural characteristics of each country, the evolution of inflation and exchange rates varies from one country to another. Therefore, studies on inflation and exchange rates using qualitative, quantitative or a combination of the two methods of macro variables in each economy are always required for each country. Horska (2004) in her research synthesized the relationship between inflation and the exchange rate as a synthesis of factors, as shown in the diagram below.



Inflation will affect real wages and interest rates, while these two factors affect the overall production price of the economy. In addition, interest rates also have an impact on the exchange rate, as the difference in interest rates between countries will lead to a change in international capital flows. This will lead to a change in the supply and demand of foreign currencies on the foreign exchange market.

The relationship between inflation and the exchange rate can be considered a two-way relationship. It is also an image of the relationship between macro variables in the economy. Therefore, when selecting a tool to study the relationship between these two quantities, the thesis should pay attention to the characteristics mentioned above.

The research of Kara, Nelson (2002) "The Exchange rate and Inflation in the UK" formulated the following formula:

$$P_t = s_D P_t^D + s_M P_t^M$$

Where: P_t is the consumer price index in quarter t , P_t^D is the price index of goods produced and consumed on the domestic market in quarter t ; P_t^M is the import price index in quarter t ; $s_D = (1 - s_M)$ is the proportion of goods produced in the country in the CPI and s_M is the proportion of imports. From equation 1, it is possible to convert the percentage equivalent to the following equation:

$$\pi_t = (1 - s_M)\pi_t^D + s_M\pi_t^M$$

Where π_t is the inflation rate in quarter t , π_t^M is the global inflation rate in quarter t

According to purchasing power parity theory or the single price rule, if all domestic products can participate in trade, there will be a balance between the domestic price index and the world price index via exchange rate adjustments, from which the equation of the third form is expressed as follows:

$$\pi_t = 1 - s_M\pi_t^D + s_M\pi_t^M = 1 - s_M\pi_t^M + \Delta s_t + s_M\pi_t^M + \Delta s_t = \pi_t^M + \Delta s_t$$

Where Δs_t is the change in the nominal exchange rate calculated per quarter t . It should be noted that in equation 3, the author estimated that the import price index reflected the change in the general world price index. If the domestic inflation rate is higher than the global rate, the exchange rate will adjust so that equation 3 is still in need. The results of this study are similar to those of Thygesen's (1977) study, suggesting that the exchange rate fluctuation is close to the difference in inflation rates between European Union countries. However, this theory is based on unrealistic assumptions that ignore the effects of transport costs and tariffs.

In addition to research on global inflation and exchange rates, Vietnamese economic research organizations, universities and economists also conduct research on Vietnam's inflation rate and exchange rates in each different period.

Thi Tuan Nghia (2004) published the study "Hoàn thiện cơ chế điều hành tỷ giá nhằm nâng cao hiệu quả chính sách tiền tệ tại Việt Nam" (Completing the exchange rate management mechanism to improve the effectiveness of monetary policy in Vietnam). This study focuses on the analysis of monetary policy instruments such as open market operations, reserve requirement ratios, interest rates and exchange rates. The author focuses on two analytical contents, which constitute the operating mechanism of the exchange rate and monetary policy in Vietnam. In this paper, the author draws on the experience of the United States, South Korea and China to cite the application of monetary policy instruments in Vietnam.

In 2011, Viet Trung, Nguyen Thi Thuy Vinh conducted the study "The impact of oil prices, real effective exchange rate and inflation on economic activity: Novel evidence for Viet Nam". This study used macroeconomic data from 1995 to 2009 to include the VAR model to test the relationship between oil prices, inflation and exchange rates in Vietnam during this period. The study confirmed a long-term relationship between these macro variables.

It can be seen that, so far, many studies on inflation and the exchange rate with other macroeconomic variables have been conducted around the world and in Vietnam at various times using different research methods. However, due to the economic, political and socio-cultural characteristics of each country, inflation and exchange rates also vary between countries. Therefore, qualitative, quantitative or a combination of the two methods of macro variables in each economy are always required for each country. In Vietnam, after 1986, the Vietnamese economy was built in the direction of a market economy based on socialism. In particular, the State plays a role in regulating the economy by taking decisions on economic, political and social development orientations. At present, the State Bank still retains a role in exchange rate regulation, with fuel prices remaining controlled by the government in order to stabilize the economy. This is a different characteristic from other countries in the region and the world. From 2009 to 2015, the Vietnamese economy became deeply integrated into the global economy.

3.4. Model and Discussion of the results

3.4.1. Model

To determine the interaction of macro factors: the inflation rate and the exchange rate, this chapter will use the vector autoregressive (VAR) model to test the relationship between the two factors. The vector autoregressive model allows to test the effect of independent variables on the dependent variable, the VAR is actually the connection of two methods: autoregression (AR) to the multivariate case and simultaneous equations (SE). The VAR is a good model for taking advantage of RA: it is easy to estimate using the residual minimization method (OLS), but it takes advantage of the ES to estimate several variables in the same system. At the same time, it eliminates the disadvantages of social entities, which do not necessarily have to worry about the endogeneity of economic variables. In other words, macroeconomic variables are often endogenous when they interact with each other. This property causes the classical regression method to use a multiple regression equation when it is biased in the estimation. These are the fundamental reasons why VAR is popular in macroeconomic research.

The VAR model examines the relationship between different time series, which is a very specific model of systems of autoregression equations. When we talk about the representation of

the VAR in which we consider two variables y_1 and y_2 . Each of these variables is a function of its own lagged values and those of the others. Autoregressive models are used in the VAR in which the delayed variable is the endogenous variable and the exogenous variables appear with several lags.

The structural form of the VAR representation is written:

$$y_{1t} = a_1 + \sum_{i=1}^p b_{1i} y_{1t-i} + \sum_{i=1}^p c_{1i} y_{2t-i} - d_1 y_{2t} + \varepsilon_{1t}$$

$$y_{2t} = a_2 + \sum_{i=1}^p b_{2i} y_{1t-i} + \sum_{i=1}^p c_{2i} y_{2t-i} - d_2 y_{1t} + \varepsilon_{2t}$$

Where y_{1t} and y_{2t} are considered stationary, innovations ε_{1t} and ε_{2t} are white noises of constant variances $\sigma_{\varepsilon_1}^2$ and $\sigma_{\varepsilon_2}^2$ and not self-correlated. Indeed, it appears that it is not in reduced form, y_{1t} has an immediate effect on y_{2t} and vice versa y_{2t} has an immediate effect on y_{1t} . We can see that the vector process $Y_t = (y_{1t} y_{2t})'$ can be written as an AR process (p). With :

$$B = \begin{bmatrix} 1 & d_1 \\ d_2 & 1 \end{bmatrix} \quad A_0 = \begin{bmatrix} a_1 \\ a_2 \end{bmatrix} \quad A_i = \begin{bmatrix} b_{1i} & c_{1i} \\ b_{2i} & c_{2i} \end{bmatrix} \quad \varepsilon = \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix}$$

In matrix form, this model becomes:

$$BY_t = A_0 + \sum_{i=1}^p A_i Y_{t-i} + \varepsilon_t$$

Where $Y_t = (Y_{1t}, \dots, Y_{kt})$ Vector of "k" endogenous variables, where each variable constitutes an equation or variable whose value is given by the system.

A_0 vectors of "k" constant system terms ("k" constant terms in case of k variables).

A_i Square matrix of order "kxk" of the coefficients

In the standard form, the model is written:

$$y_{1t} = a_1^0 + \sum_{i=1}^p a_{1i}^1 y_{1t-i} + \sum_{i=1}^p a_{1i}^2 y_{2t-i} + \vartheta_{1t}$$

$$y_{2t} = a_2^0 + \sum_{i=1}^p a_{2i}^1 y_{1t-i} + \sum_{i=1}^p a_{2i}^2 y_{2t-i} + \vartheta_{2t}$$

In this model, each equation has p offsets of each variable. With 2 variables, we have 2^2p of correlation coefficient. If we have the generalization of the VAR representation with k variables and p offsets (noted $\text{VAR}(p)$), there will be k^2p of coefficient. This means that, when the quantity of k increases, we also have to increase the estimated coefficient quantity.

The condition for the existence of the VAR model is that the variables over time must be stationary - that is, the mean, variance and covariance have both the same lag. Thus, the coefficients of the VAR process can only be estimated from stationary series, either by difference, prior to the estimation of the parameters in the case of a stochastic trend, or it is possible to add a trend component to the VAR specification, in the case of a deterministic trend (BOUBONNAIS, 2015). The VAR model has the advantage of capturing the variation in model parameters over time, and thus allows us to better capture the dynamics of the system, which helps us to analyze the effects of economic policy or macroeconomic forecasts (the socio-economic environment), through random shock simulations (innovations) and the decomposition of error variance.

In fact, there are advantages to the VAR model. If the limitation of the ARIMA model is that it only performs an analysis on one time series, the VAR model allows different time series to be examined. This helps researchers to analyze many different series and take into account their relationships. In addition, the VAR model also has the advantage that it is not necessary to determine which variables are endogenous and which are exogenous (endogenous and exogenous variables are necessarily known). We can also use the OLS method to estimate each of the equations in the VAR process. By allowing endogenous interactions between system variables.

In addition, the VAR model also has disadvantages. When examining it, we must consider the stationarity of time series in the model. When estimating the VAR model, it is imperative that all series be stationary. Otherwise, as mentioned above, the difference must be realized to ensure stationarity. In addition, there is also the difficulty in the appropriate time frame to choose. Suppose that the VAR model envisages having three variables and that each variable will have five offsets included in each equation. As indicated above, the number of coefficients to be estimated is $3^2 * 5 + 3 = 48$. If the number of variables is increased and the number of delays included in each equation, the number of coefficients to be estimated is quite large. In addition, the analysis carried out by the VAR model assumes the constancy of the economic environment "all other things being equal". Indeed, the time series analyses that are carried out simultaneously in the VAR process do not give us a reality of the economic situation, they can cause a bias in economic policy.

3.4.2. Model estimation process

When using the VAR model, this chapter aims to determine the strength of the impact of inflation on the exchange rate by the coefficients of the VAR model. To achieve this objective, it is necessary to test the VAR model in the following order: (i) checking the stationarity of time series, (ii) determining the number of lags of variables in the model, (iii) checking causality to detect a link between variables, (iv) analyzing the orthogonalization of "shocks", with the impulse response function to measure the impact of a change in an innovation on the variables. We also need to apply the variance decomposition to calculate for each of the innovations its contribution to the variance of the error.

First, we begin by checking the stationarity of time series. A common problem with macroeconomic variables is that they often fluctuate over time, the condition to be included in the VAR model is that the time series must be stationary, i.e. its expectation and variance - is unmodified over time. Formally, the stochastic Y_t is stationary if:

$$E(Y_t) = \mu \quad \forall t \text{ and } \forall m \text{ the average is constant and independent of time}$$

$$\text{Var}(Y_t) < \infty \quad \forall t \text{ the variance is finite and time-independent}$$

$$\text{Cov}(Y_t, Y_{t+k}) = E[(Y_t - \mu)(Y_{t+k} - \mu)] = \gamma_k \quad \forall t \text{ covariance is independent of time}$$

Therefore, this chapter should first use the augmented Dickey and Fuller tests to check the stationarity of all time series included in the model¹². Formally, under the alternative hypothesis $|\phi_1| < 1$ the ADF tests are based on OLS' estimation of the following models:

$$\Delta y_t = \alpha_0 + \beta y_{t-1} + \sum_{i=1}^p \phi_i \Delta y_{t-i} + \varepsilon_t \quad (1)$$

$$\Delta y_t = \alpha_0 + \alpha_1 t + \beta y_{t-1} + \sum_{i=1}^p \phi_i \Delta y_{t-i} + \varepsilon_t \quad (2)$$

Where: $\Delta y_t = y_t - y_{t-1}$

p is the number of delays (offsets)¹³

The difference between the model (2) and the model (1) is that there is a trend variable at time t . The trend variable is a variable with values from 1 to n , where 1 represents the first observation in the series and n represents the last observation. White noise is a term that indicates a random error derived from the classical assumption that it has an average value of 0, the variance is constant and autocorrelation does not exist.

Second, we need to determine the number of delays, in which case, the Akaike and Schwarz criteria can be used to determine the order p of the model. The selection of the order is carried out by estimating all VAR models with an order ranging from 0 to h (h being the maximum delay allowed by economic theory). The $AIC(p)$ and $SC(p)$ functions are calculated:

$$AIC(p) = \ln\left(\frac{SCR_p}{n}\right) + \frac{2k^2 p}{n}$$

¹² Unit root tests (Dickey-Fuller tests (1979)) make it possible to highlight the stationary or non-stationary nature of a chronicle by determining a deterministic or stochastic trend. In its models, the process ε_t is, by hypothesis, a white noise. The increased Dickey and Fuller tests help us in the case, *a priori*, where the error is uncorrelated

¹³ The value of p can be determined according to Akaike or Schwarz criteria, or, starting from a sufficiently large value of p , a model with $p-1$ delays, then $p-2$ delays, is estimated until the coefficient of the p -ième delay is significant (BOURBONNAIS, 2015)

$$SC(p) = \ln\left(\frac{SCR_p}{n}\right) + \frac{k^2 p \ln(n)}{n}$$

With SCR_p Sums of the Residue Squares for the p-delay model

K: number of system variables

n: number of observations available (Each delay results in the loss of one observation)

Ln : logarithm naperian

The delay p which minimizes the AIC or SC criteria is retained.

Third, the Granger test is used to highlight the causal relationship between economic variables at the theoretical level, i.e. which variables are the causes and which variables are affected. Thanks to the Grange test in the VAR model, the direction of causality between inflation and the exchange rate will be clearer in order to give us food for thought for a better understanding of economic phenomena.

Finally, it can be seen that the VAR model results in an assessment of the interaction between the variables included in the model. But if we focus on the result of the VAR model estimation without analyzing the "impulse response function", the link between system variables will not be visible, as shock analysis is an effective tool in analyzing the contemporary relationship between residues, the relationship of errors (to understand the direction of causality), and the impact of a shock on variables. From this, we can see the experiences and analyse the effectiveness of economic policy. In the VAR model, a shock on a variable in the equation not only affects that variable, but also spreads to other endogenous variables through the dynamic structure of the VAR (for example, a variation at a given time of ε_{1t} has an immediate impact on y_{1t} then on y_{2t+1}). The impulse response function will describe the effect of a shock on both current and future endogenous variables.

After the impulse response function, it is necessary to analyze the decomposition of the variance, by choosing the decomposition order, we can calculate for each of the innovations its contribution to the variance of the error.

3.4.3. Variables and database

After joining the WTO, the Vietnamese economy becomes more sensitive and vulnerable to the impact of external shocks, in particular, the prices of goods on the domestic market are easily affected by the price shock of imported products (e.g. gasoline and oil prices, prices of raw materials for production, etc.). The impacts of the financial crisis externally or internally will devalue the value of the *dong* and have a significant effect on the fluctuation of the price of imported products, for domestic production and commercial activities. In addition, changes in the quantity of the national currency have a direct impact on foreign exchange reserves (see Chapter 2). In addition, the control and management of foreign exchange reserves influences foreign

exchange policy, which shows that the exchange rate relationship is becoming increasingly important for monetary policy (the first goal is to stabilize the price as well as the inflation rate).

The logical relationship between two inflation and exchange rate variables:

- The change in the exchange rate will result in a change in the price of inputs to the production process, such as gasoline prices and building materials. It causes foreign currency debts of the government and companies on the international financial market to be changed, even leading to a change in the interest rates on these debts. Everything increases the general price level of the economy.

- When domestic inflation is higher than the inflation of other countries and exchange rates between the two currencies do not change, foreign purchasing power is higher than domestic purchasing power. However, according to purchasing power parity theory, the exchange rate will not remain, but will adjust to maintain purchasing power parity.

In this empirical part, this chapter will use two times series of two variables:

- The exchange rate (e) in Vietnam, between the *dong* and the dollar, because at present, Vietnam's international trade activities with the world's main trading partners use the US dollar as the main currency.
- The inflation rate (π) is calculated according to the CPI

In a market economy, prices are used as a reference to measure economic values and business direction. Economists studying inflation often use indicators to measure the general level of price. In fact, this level is calculated using construction price indicators, which are the average values of consumer or producer prices. The price index is a measure of the general price, which is the weighted average of the prices of many goods and services. When developing this index, planners take into account each type of individual price according to the importance and economic significance of each product, itself associated with a weighting factor for each product in the basket of products. The three most important price indices are the consumer price index, the GDP deflator and the producer price index. Inflation is measured by the Consumer Price Index (CPI), which is considered to be the most widely used measure of inflation. The CPI measures the cost of purchasing a basket of standard goods at different times. This basket of goods includes food, clothing, shelter, fuel, transportation, medical services, school fees, and other goods and services purchased for daily living. Of course, a product will be added according to its importance in the economy. The CPI is calculated according to the following formula:

$$IPC = \frac{\sum_{i=1}^k P_i^t Q_i^0}{\sum_{i=1}^k P_i^0 Q_i^0} \times 100\%$$

With :

k the number of items in the basket of goods

P_i^t is the price of product i of year t

P_i^0, Q_i^0 is the price and quantity of product i in the base year

The inflation rate calculated by the change in the CPI is calculated according to the following formula:

$$\pi = \frac{IPC_t - IPC_{t-1}}{IPC_{t-1}} \times 100\%$$

Since 1994, Vietnam has adopted the calculation of the International Standard CPI. When legalizing the publication and calculating the monthly CPI, it was easier for economic actors to access the index.

The database in this research was created from the IMF's quarterly data collection (International Financial Statistics) in the period January 1996 - December 2015.

Table 3.1. Descriptive statistics of variables

	π	e
Mean	0.015941	0.008807
Median	0.011595	0.002316
Maximum	0.089687	0.089425
Minimum	-0.015351	-0.009603
Std. Dev.	1.425053	0.017129
Skewness	1.425053	2.706458
Kurtosis	5.913641	10.52972
Jarque-Bera	54.68251	279.4879
Probability	0.000000	0.000000
Sum	1.259300	0.686954

Sum Sq. Dev.	0.031416	0.022591
Observations	79	80

Source: Personal analysis by Eviews 8.0

Statistics include centralized measurement values (Mean, Median), normality of a statistical distribution (Skewness - Kurtosis, Jarque-Bera). From the descriptive statistics of the variables, it can be seen that the distribution values of the variables are relatively uniform in terms of values, which makes the test results more meaningful.

Table 3.2. Correlation matrix

	π	e
π	1,000000	0,235309
e	0,235309	1,000000

Source: Personal analyses by Eviews 8.0

In Table 3.2, the matrix of correlations between the variables, we can see that inflation and the exchange rate are quite strongly correlated with each other.

3.4.4. Empirical results of the evaluation of the relationship between inflation and the exchange rate with the VAR model

We see that the relationship between the exchange rate and inflation is a bilateral one. In other words, the error of the inflation variable has the effect of changing the exchange rate and, in the opposite direction, the error of the exchange rate has an impact on inflation.

Inflation \longleftrightarrow Exchange rates

Time series analyses and structural models concern the simultaneity of relationships and are used to determine the long-term relationship between the variables that should be used in the Vietnamese inflation model. If the variables used in the model are related to each other in accordance with economic theories, they will not deviate from this relationship in the long term. The long-term relationship between inflation and exchange rates that this chapter considers here is the relationship based on purchasing power parity theory.

In this chapter, the VAR model was constructed by the following two equations:

$$\pi_t = a_1 + \sum_{i=1}^p b_{1i}\pi_{t-i} + \sum_{i=1}^p c_{1i}e_{t-i} + \varepsilon_{1t}$$

$$e_t = a_2 + \sum_{i=1}^p b_{2i}e_{t-i} + \sum_{i=1}^p c_{2i}\pi_{t-i} + \varepsilon_{2t}$$

With π_t the inflation rate in period t and it is calculated by the CPI

e_t the exchange rate in period t (*dong* /dollar)

3.4.4.4.1 Checking the stationarity of time series

First, for the construction of the VAR model, one of the conditions is that the residues are alternated, the variance error is constant and the errors have no autocorrelation¹⁴. Then, the other condition for estimating the VAR model is to check the stationarity of the time series used in the model. For this purpose, the study was based on the Dickey and Fuller Augmented test. Correlograms are performed with Eviews, providing the results of the simple (AC column) and partial (PAC column) autocorrelation functions, in order to verify the stability of the Dickey and Fuller Augmented test¹⁵

Assuming with the models:

$$\pi_t = \beta e_{t-1} + \varepsilon_t$$

$$e_t = \beta \pi_{t-1} + \varepsilon_t$$

We can give the hypothesis:

H0 : $\beta = 1$: the process is non-stationary

H1 : $\beta \neq 1$: the process is stationary

It is estimated that $t = \beta/SE(\beta)$ according to the unit root test criteria

If you $|t| > |t_\alpha|$ H0 is rejected and H1 is accepted, the process is stationary

The table below shows the results of the Dickey and Fuller Augmented test for all data series with a difference of 0.

¹⁴ The attached graphs show that the autocorrelation is negative as the residues are alternated.

¹⁵ See Annex 3

Table 3.3. Dickey and Fuller test results Augmented to difference 0

Series	t-Statistic	Critical value*
π_t	-4.633808	-2.899115
e_t	-1.618720	-2.899115

Source: Personal analyses by Eviews 8.0

From Table 3.3 to difference 0, the absolute value of the Dickey and Fuller test result Increased by the CPI inflation data series (π_t) is above the critical value at the 5% threshold, indicating that the time series of inflation is stationary at the difference 0.

The exchange rate data series (e_t) In order for the VAR model to be used, the exchange rate data set must test at the first difference, the result of the Dickey and Fuller Increased test for this series at the first difference is presented in the table below.

Table 3.4. Dickey and Fuller test results Augmented to difference 1

Series	t-Statistic	Critical value*
e_t	-8.915661	-2.899115

Source: Personal analyses by Eviews 8.0

The exchange rate data series is stationary, the first condition for applying the VAR model is met. Then, we will determine the optimal number of delays for the VAR model using Aikake criteria.

3.4.4.4.2 Determination of the number of delays

We can determine the optimal number of delays in the VAR model using Aikake's criteria[AIC(p)]. The delay p which minimizes the AIC criteria is retained. The results are presented in the table below.

Table 3.5. Number of delays

Lag	LogL	LR	MER	AIC	SC	HQ
0	209.4944	NA	9.92e-06	-5.844912	-5.781174	-5.819565
1	385.8103	337.7319	7.74e-08	-10.69888	-10.50767*	-10.62284*
2	390.1937	8.149382	7.66e-08	-10.70968	-10.39099	-10.58295
3	393.6809	6.286896	7.78e-08	-10.69524	-10.24907	-10.51781
4	396.8341	5.506960	7.97e-08	-10.67138	-10.09775	-10.44327
5	402.6442	9.819937	7.60e-08	-10.72237	-10.02126	-10.44356
6	408.8657	10.16471*	7.16e-08*	-10.78495*	-9.956363	-10.45545
7	410.1543	2.032728	7.76e-08	-10.70857	-9.752511	-10.32838
8	414.0691	5.954793	7.83e-08	-10.70617	-9.622634	-10.27528

* indicates lag order selected by the criterion
 LR: sequential modified LR test statistic (each test at 5% level)
 FPE: Final prediction error
 AIC: Akaike information criterion
 SC: Schwarz information criterion
 HQ: Hannan-Quinn information criterion

Source: Personal analyses by Eviews 8.0

The delay p that minimizes the AIC criteria is 6, so we choose the optimal delay of the model is 6. The VAR model used for the study is:

$$\pi_t = a_1 + \sum_{i=1}^6 b_{1i}\pi_{t-i} + \sum_{i=1}^6 c_{1i}e_{t-i} + \varepsilon_{1t}$$

$$e_t = a_2 + \sum_{i=1}^6 b_{2i}e_{t-i} + \sum_{i=1}^6 c_{2i}\pi_{t-i} + \varepsilon_{2t}$$

3.4.4.3. Determination of causality

In economic theory (as well as in the results of other empirical work) the relationship between inflation and the exchange rate is a long-term bilateral relationship. In order to determine the direction of causality between the two variables of the model, namely which variables are the causes and which variables are affected, we will perform the Granger test.

Table 3.6. Granger test results

Pairwise Granger Causality Tests			
Date: 01/20/19 Time: 01:54			
Sample: 1996Q1 2015Q4			
Lags: 6			
Null Hypothesis:	Obs	F-Statistic	Prob.
DE does not Granger Cause INF	73	2.24364	0.0410
INF does not not Granger Cause DE		1.31429	0.2648

Source: Personal analyses by Eviews 8.0

The first hypothesis has the $p - \text{value} = 0.0410 < 5\% < 5\%$ we therefore reject H_0 with a level of significance of 5%, in other words, there is therefore a causality in the Granger sense of the exchange rate (e) to the inflation rate (π). For the second hypothesis, $p - \text{value} = 0.2648 > 5\%$, so there is no reason to reject H_0 at the 5% significance level.

3.4.4.3. Result of the VAR model

With the coefficient of $R^2 = 99.06\%$ ¹⁶, the model is very suitable, which shows the ability to explain the model's inflation variable and the relationship between the two variables. From this result, the VAR model will have been presented as an equation. To analyze the relationship between inflation and exchange rates, the VAR model estimate shows that the following equation is significant:

$$INF = 0,274581 \times INF(-1) + 0,174814 \times DTG(-2) + 0,167736$$

In this equation, inflation and exchange rates can be seen in the same direction from the second half of the year and also in the long run. This shows that these two variables change in the same direction and are influenced by previous cycles.

If this is the case, the importance of the VAR model for research has not been fully understood and the conclusions regarding the relationship between the variables are weak. At the same time, it is impossible to know to what extent the impacts of the variables are positive or negative. In order to understand the interactions between the variables, it is necessary to estimate the impulse response function and the variance decomposition for the VAR model, these two tools will show more clearly the relationship between the variables.

3.4.4.4. Shock" analysis

¹⁶ See Annex 4

The impulse response function will show the reciprocal fluctuations of the variables when there is a variation of an innovation on the variables. In the diagram¹⁷, we can see not only the contemporary relationship but also the sense of causality of the two variables. A change in the exchange rate (e_t) has an impact on inflation (π_t) and vice versa. Thus, an exchange rate shock (e_t) has a contemporary impact on inflation. We can see that inflation and the exchange rate fluctuate in the same direction, and that the transition from one macroeconomic variable to another is about 5 semesters behind. In this study, the confidence level of the estimates was 95%.

The analysis of the "shock" that gives impacts of the exchange rate on inflation showed reasonable results in the case of Vietnam. Current production in Vietnam is heavily dependent on imported materials such as oil and cement, iron and steel, machine tools, etc. In the event of a "shock" to the exchange rate regime or a change in foreign exchange reserves, the exchange rate has a strong influence on inflation (the price rises continuously and for a long time, leading to inflation) and this phenomenon will continue until the following year. The fluctuation in inflation is in line with the exchange rate fluctuations in the following six months. The graph¹⁸ shows us a fluctuation in inflation and the exchange rate in the same direction between January 1996 and December 2015 in Vietnam.

Although the impulse response function provides general statements on the degree of transmission of exchange rates to inflation, it does not represent the share of the contribution of each of the exchange rate innovations to the variance of the inflation error.

3.4.4.4. Variance decomposition

To assess the importance of exchange rate innovations for inflation, we need to implement the error variance analysis method. On the basis of the results of the variance decomposition in Table 3.7, we can see the relatively large impact of the exchange rate on inflation over the period 1996-2015. Even in the first three semesters, the exchange rate explained a variation in average inflation of about 10%. From one year onwards, the exchange rate explains more than the volatility of inflation. Over the long term, the exchange rate accounts for nearly 29% of inflation fluctuations. In addition to the exchange rate factor, "shocks" to the inflation rate in the past also have a significant impact on inflation at the present time, which can be considered as an expectation of market inflation. However, as this anticipation decreases over time, when there are innovations in inflation, starting in the second half of the year, the influence of the previous period at the moment is still about 92% on inflation.

¹⁷ See Annex 5

¹⁸ See Annex 5

Table 3.7. Results of the decomposition of the inflation variance

Period of time	H.E.	DE	INF
1	0.016417	4.172421	95.82758
2	0.021826	7.180517	92.81948
3	0.026025	10.13587	89.86413
4	0.029453	13.02808	86.97192
5	0.032378	15.84412	84.15588
6	0.034948	18.58863	81.41137
7	0.037254	21.26565	78.73435
8	0.039361	23.87646	76.12354
9	0.041314	26.41974	73.58026
10	0.043146	28.89259	71.10741

Source: Personal analyses by Eviews 8.0

It should be noted that, since the number of model delays is equal to 6, this means that changes in model variables will affect the next 6 periods (model data are calculated in semester). It is also a basic feature of macroeconomic policies, which will have impacts after a certain lag. Therefore, the monetary policy that is currently being implemented must be effective over time to promote economic efficiency.

The vector autoregressive model can show that the exchange rate has had a significant impact on the inflation rate in recent times. This corresponds to the reality in Vietnam, when the BEV decided to devalue the *dong* in 2010 and 2011, the inflation rate in 2011 increased to 18.13% from 11.8% in 2010.

Therefore, if the exchange rate is kept stable, there will be no unusual inflation rate "shocks". The results of this study suggest that it is possible to focus on stabilizing the inflation rate in order to maintain exchange rate stability or to adjust it according to market fluctuations.

3.4.5. Recommendations for monetary policy

For an export-oriented economy, while inputs for production activities in the economy must be imported up to 70%, monetary policy management is the main focus. The exchange rate book is flexible enough to help "stabilize prices" in order to create a climate of trust with the public.

After analyzing and verifying the vector autoregressive model, we see the real impact of the exchange rate on relatively high inflation in the past. This is the basis for monetary policy adjustment (exchange rate policy and tools help to stabilize prices). The exchange rate is one of the transmission channels for monetary policy, turning the tools into a reference for monetary policy. The most important is in particular the objective of price stability. The devaluation of the national currency can increase inflation.

3.4.5.1. Adjustments to the exchange rate regime in line with macroeconomic conditions

International economic integration requires economic policies and exchange rate policy in particular to adapt flexibly to the often changing international environment, thus minimizing losses due to negative shocks that result in domestic impacts on the national economy.

The flexible exchange rate helps to limit the increase in money supply and the factors that have caused inflation in the past (2010-2011)

When Vietnam joined the WTO, the amount of foreign investment in Vietnam increased significantly. In principle, when there is more foreign capital inflows into Vietnam, the value of the *dong* will increase to create a balance. However, the BEV has increased the quantity of the *dong* in order to buy back this amount in foreign currency to maintain the exchange rate (against the US dollar) which is below equilibrium. This improves the competitiveness of export prices.

Keeping the value of the *dong* low is a form of export subsidy, but the disadvantage of this policy is that it is necessary to increase the amount of *dong* to buy a large amount of currency. This is a huge increase and a significant inflation factor in recent years. If the exchange rate is flexible, when the exchange rate regime is appropriate, the State will decide to buy US dollars and will benefit from the reduction in the amount of the *dong* to buy dollars to be added to the foreign exchange reserves.

The flexible exchange rate helps the *dong* to follow the market's reaction when the dollar devalues globally.

For the flexible exchange rate in terms of *dong*, even if it can increase exports, contributes at the same time to inflation in Vietnam. In reality, Vietnamese production now depends heavily on imported materials, when there is a depreciation of the US dollar in the world, in other words, the increase in the price of imported goods essential for *dong* production, this will be the main reason for the increase in domestic production costs, leading to an increase in commodity prices. The devaluation of the *dong* against foreign currencies increases the cost of imported goods, leading to a large trade deficit. If the exchange rate is more flexible and therefore the *dong* stronger, it will reflect the trend of the market economy.

3.4.5.2. Small reduction in the value of the dong

In order to contribute to improving the international competitiveness of Vietnamese products and maintaining macroeconomic stability, under current conditions, the depreciation of the Vietnamese dong is necessary to simultaneously improve the internal and external balance of the Vietnamese economy, by effectively exploiting the benefits and minimizing the risks associated with international economic integration. However, in the current context, there should not be a significant devaluation of the national currency for the following reasons:

Although the devaluation of the national currency makes domestic goods more attractive than foreign products, this means that the economy must become more competitive and encourage export and import restrictions, but this impact is quite limited under current conditions. The main reason is that most exports are crude products (crude oil, seafood, rice, coffee, etc.). Production of

these products is highly dependent on natural conditions (resource reserves, land, weather conditions, etc.), global supply will decrease if prices increase, especially in the short term. While products of the processing industry are often considered to be more sensitive to relative price fluctuations, some products with good turnover, such as clothing and footwear, are highly dependent on imported raw material resources, so the devaluation of the *dong* has fewer advantages.

The majority of imports are machinery, equipment, raw materials and spare parts that domestic production cannot satisfy and are therefore less sensitive to exchange rate fluctuations.

The fact that inflation is often accompanied by a policy of devaluation due to the rise in the prices of imported machinery, equipment, raw materials, fuels, materials and other intermediate products, the improvement in the international competitiveness of Vietnamese products will be partially limited by the effect of the devaluation.

Psychologically, the devaluation of the *dong* will negatively affect citizens' confidence in Vietnam's currency and monetary policy. An unstable policy makes it difficult for domestic investors to provide capital to start businesses instead of speculating on real estate, holding gold or US dollars. On the other hand, at present, in Vietnam's real situation, individuals are allowed to hold foreign currency or can deposit money directly in foreign currency. If the exchange rate is too high, psychological pressure will result. Households have significantly modified their savings structure to be interested in strong foreign currencies, which has led to an artificial increase in demand for foreign currencies and a depreciation of the national currency greater than that targeted by the monetary authorities. Public confidence in the national currency will therefore be compromised, as its means of payment and the preservation of its value may be eroded and the achievement of macroeconomic stability threatened.

Finally, currency devaluation will lead to economic losses for business operations related to foreign currency borrowing, which means that the foreign currency debts of the national currency will automatically increase. Government and companies that have borrowed in foreign currencies will have to spend a large portion of their income to repay their foreign currency debts, making their financial situation more stressful.

The above analysis shows that Vietnam should not devalue the national currency significantly. However, it can currently slightly reduce the value of the *dong* to strengthen the international competitiveness of its products, which is low both on the international and domestic markets.

3.4.5.2. Improving monetary policy

Flexible management and coordinated coordination of monetary policy tools, combined with macroeconomic objectives, have an impact on monetary policy instruments, the interest rate and credit structure. In addition, the BEV strictly controls changes in money supply and monetary regime through monetary policy instruments such as:

- Indirect tools (open-market operations, discount, currency swaps) will be the main tools of operational monetary policy. Their purpose is to improve the efficiency of the use of open market operations to regulate the available capital of credit institutions. Interest rates on open market transactions must be correlated with other interest rates regulated by the BEV.
- Interest rate tool: it is established in accordance with international regulations. When using interest rate tools, market factors require particular attention. The BEV must monitor and analyse the evolution of interest rates on national and international financial markets, thus actively adjusting the base interest rate to broadcasting signals according to market interest rates. The BEV may use the refinancing rate and the rediscount interest rate as the key rate. The refinancing interest rate was gradually increased to reach the ceiling, while the discount rate was kept at a low level in order to create a short-term capital supply channel for commercial banks. The interest rate policy must create favourable conditions for credit institutions to raise capital and encourage the development of investment in production.

REFERENCES (SELECTED)

- AGHEVLI, BB & KHAN MS (1977), The monetary approach to balance of payments determination: An empirical text. In International Monetary Fund (eds.), *The monetary approach to the balance of payments*, Washington, DC: IMF
- AGLIETTA M. (1976), "Monnaie et inflation : quelques leçons de l'expérience américaine des dix dernières années", *Economie et statistique*, April, pp. 49-71.
- BHATTACHARYA R. (2013), *Inflation Dynamics and Monetary Policy Transmission in Vietnam and Emerging Asia*, IMF Working Papers, WP/13/155
- BERAUD A. (2012), Kaldor and the Keynesian theory of distribution, *Cahiers d'Economie Politique = Papers in political economy*, L'Harmattan, 61, p.113-155
- BOWEN (1960), "Cost Inflation" Versus "Demand Inflation": a Useful Distinction? *Southern Economic Journal* 26(3), pp. 199-206.
- BOYER R.; MISTRAL J. (1976), "Capital formation, relative prices, inflation", *Economy and Statistics*, April, pp. 29-48.
- BRONFENBRENNER, MARTIN, and FRANKLYN D. HOLZMAN (1963), Survey of Inflation Theory, *The American Economic Review* 53 (4), p. 593–661.
- CAMEN U. (2006), Monetary policy in Vietnam: The case of a transition country, *Monetary policy in Asia: approaches and implementation*, vol. 31, pp 232-252
- DAVIDSON P. (1972), A Keynesian View of Friedman's Theoretical Framework for Monetary Analysis, *Journal of Political Economy*, 80(5), p. 864–882.
- DE VROEY M. (2001), Friedman and Lucas on the Phillips Curve: from a Disequilibrium to an Equilibrium Approach, *Eastern Economic Journal*, 27(2), p. 127–148.
- DHLIWAYO R. (1996), The balance of payments as a monetary phenomenon: An econometric study of Zimbabwe's experience, *African economic research consortium*, Research Paper 46
- ENGEL FR. & GRANGER CWJ. (198), Co-integration and error correction representations, estimation, and testing, *Econometrica*, 53, p. 251–276
- FISHER I. (1926), A Statistical Relation Between Unemployment and Price Changes, *International Labour Review*, 13(6), p. 785–792.
- FLEMING M. (1961), Cost-induced Inflation and the Quantity Theory of Money, *The Economic Journal*, 71(283), p. 512–520.

FUZZY D. & BOISSIEU C. (2004), *Économie contemporaine*, 3 tomes, Paris : Presses universitaires de France, Thémis- Sciences économiques collection, (ISBN 2-13-054705-2)

FRENKEL J. & JOHNSON H. (1976), The monetary approach to the balance of payments: Essential concepts and historical origins. In Frenkel, J & Johnson, H (eds.), *The monetary approach to the balance of payments*. London: Allen and Unwin

FRIEDMAN M. (1966), What Price Guideposts? In George P. Shultz and Robert Z. Aliber (eds.), *Guidelines, Informal Controls, and the Market Place: Policy Choices in a Full Employment Economy*, Chicago, IL.: University of Chicago Press, p. 17–39.

FRIEDMAN M. (1968), The Role of Monetary Policy, *The American Economic Review*, 58(1), 1–17.

FRIEDMAN M. (1975), Unemployment Versus Inflation? An Evaluation of the Phillips Curve. In Milton Friedman and Charles A. E. Goodhart (eds.), *Money, Inflation and the Constitutional Position of the Central Bank*, London: Institute of Economic Affairs, p. 41–63.

FRIEDMAN M. (1976), *Price Theory*. Chicago, IL.: Aldine Publishing Company, First edition published 1962.

FRIEDMAN M. (1977a), The Monetarist Controversy: A Seminar Discussion. *Federal Reserve Bank of San Francisco Economic Review*, (Spring Supplement), p. 12–26.

FRIEDMAN M. (1977b), Nobel Lecture: Inflation and Unemployment. *The Journal of Political Economy*, 85(3), p. 451–472.

FRIEDMAN M. (2010), Trade-offs in Monetary Policy. In Robert Leeson (ed.), *David Laidler's Contributions to Economics*, New York: Palgrave Macmillan, p. 114–118.

HAHN H. (1982), *Money and Inflation*, Oxford: Basil Blackwell.

HOLZMAN D. (1959), Creeping Inflation, *The Review of Economics and Statistics*, 41(3), p. 324–329.

HOLZMAN D. (1960), Inflation: Cost-push and Demand-pull, *The American Economic Review*, 50(1), p. 20–42.

JIMOH A. (1990), The monetary approach to balance of payments: Evidence from Nigeria, *Eastern Africa economic review*, 6(1), p. 69–75

JOHNSON W. (1959), The Wage-push Inflation Thesis, 1950-1957: Comment, *The American Economic Review*, 49(5), p. 1033–1035.

JOHNSON, W. (1968), Problems of Efficiency in Monetary Management. *Journal of Political Economy*, 76(5), p. 971–990.

JOHNSON HG. (1972), The monetary approach to balance of payments theory, *Journal of financial and quantitative analysis*, 7, p. 1555–1572

Joint Economic Committee (1958),. *The Relationship of Prices to Economic Stability and Growth*. Washington, D.C.: United States Government Printing Office.

KALDOR N. (1955-1956), "Alternatives theories of distribution", *Review of Economics Studies*, vol. 23, No. 2, pp. 83-100.

KALDOR N. (1966), « Marginal productivity and the macroeconomic theories of distribution», *Review of Economic Studies*, vol. 33, n° 4, p. 309-320.

KALECKI M. (1935a), "Essai d'une théorie du mouvement cyclique des affaires", *Revue d'Économie Politique*, vol. 49, no. 2, pp. 285-305.

KALECKI M. (1935b), "A Macro-dynamic Theory of Business Cycles", *Econometrica*, vol. 3, No. 3, pp. 327-44.

KALECKI M. (1938), « The determinants of the distribution of national income», *Econometrica*, vol. 6, n° 2, p. 97-112.

KALECKI M. (1942), « A theory of profits», *The Economic Journal*, vol. 52, p. 258-267.

LACHMAN D. (1975), A monetary approach to the South African balance of payments, *The South African journal of economics*, 43(3), p. 271–283

LAIDLER D. (1990), The Legacy of the Monetarist Controversy, *Federal Reserve Bank of St. Louis Review*, 72(2), p. 49–64.

LAIDLER D. (2010), Discussion. In Robert leeson (ed.), *David Laidler's Contributions to Economics*. New York: Palgrave Macmillan, p. 121–127.

LAIDLER D. ; PARKIN M. (1975), Inflation: A Survey, *The Economic Journal*, 85(340), 741-809

LE T-N. & LE H-Q. (2000), Measuring the Impact of Doi Moi on Vietnam's Gross Domestic Product, *Asian Economic Journal*, Volume 14, Issue 3, p. 317–332

LEHMAN P-J. (1999), *Économie monétaire : théories et politique*, Le Seuil, Paris, 281 p.

LEART M. (2011), *Le système monétaire international*, La découverte, 125 p.

LEON H. (1988), A monetary approach to the balance of payments: A simple test of Jamaican data, *Social and economic studies*, 37(4), p. 1–37

LUCAS R. (1969), Real Wages, Employment, and Inflation. *The Journal of Political Economy*, 77(5), p. 721–754.

LUCAS R. (1972), Expectations and the Neutrality of Money, *Journal of Economic Theory*, 4(2), p. 103–124.

LUCAS R. (1973), Some International Evidence on Output-inflation Tradeoffs. *The American Economic Review*, 63(3), p. 326–334.

MUNDELL RA. (1968), *International economics*, London: Macmillan.

MUNDELL RA. (1971), *Monetary theory: inflation, interest and growth in the world economy*, Pacific Palisades: Goodyear.

NENOVSKY N. & HRISTOV K. (2002), The new currency boards and discretion: empirical evidence from Bulgaria, *Economic Systems*, Elsevier, vol. 26(1), pages 55-72

NGO TT. (2009), *Monetary and exchange rate policy in emerging markets - the case of Vietnam*, Thesis for the Master in Management Science, University of Van Tilburg, 49 p.

ODIZ G., STEHDYNIK H. (1982), "Inflation, employment and external constraint, an overview of the French economy in the 1970s", *Annales de l'INSEE*, 47-48, pp. 397-430.

PLIHON D. (2013), *La monnaie et ses mécanismes*, La découverte, 126 p.

PLIHON D. (2012), *Le taux de change*, La découverte, 124 p.

PHILLIPS W. H. (1962), Employment, Inflation and Growth. *Economica*, 29(113), p. 1–16.

POLAK JJ. (1957), Monetary Analysis of Income Formation and Payments Problems, IMF Staff Papers, Palgrave Macmillan, vol. 6(1), pages 1-50, November

POLAK JJ. (2001), *The Two Monetary Approaches to the Balance of Payments: Keynesian and Johnsonian*, IMF Working Paper, WP/01/100

POLLIN J-P. (1981), "Industrial Prices in Inflation", *Economic Review*, December, pp. 892-929.

SAMUELSON P. (1960), Reflections on Monetary Policy, *The Review of Economics and Statistics*, 42(3), p. 263–269.

SAMUELSON; PAUL; SOLOW (1960), Analytical Aspects of Anti-inflation Policy, *American Economic Review*, 50(2), p. 177–194.

SELDEN, RICHARD T. (1959), Cost-push Versus Demand-pull Inflation, 1955–57, *Journal of Political Economy*, 67(1), p. 1–20.

SOLOW R.M. (1968), Recent Controversy on the Theory of Inflation: An Eclectic View. In Stephen William Rousseas (ed.), *Inflation: Its Causes, Consequences, and Control*, Wilton, CT: The Calvin K. Kazanjian Economics Foundation, p. 1–29

SOLOW R.M. (1979), What We Know and Don't Know About Inflation, *Technology Review*, 81(3), p. 30–46.

SOLOW R.M. (2002), “Analytical Aspects of Anti-inflation Policy” After 40 Years. In Karigirappa Puttaswamaiah (ed.), *Paul Samuelson and the Foundations of Modern Economics*, New Brunswick, USA; London, UK: Transaction Publishers, p. 71–77.

TAYLOR, JOHN B. (2001), An Interview with Milton Friedman. *Macroeconomic Dynamics* 5 (1), p. 101–131.

TOBIN J. (1972) Inflation and Unemployment, *The American Economic Review*, 62(1/2), p. 1–18.

TRUITT A. (2012), The Price of Integration: Measuring the Quality of Money in Postreform Vietnam, *East Asia Cultures Critique*, Volume 20, Number 2, pp. 629-656

VILAR P. (1974), Gold and Money in History

WATSON PK. (1990), Modelling the balance of payments of Trinidad and Tobago, 1965–1985, *Social and economic studies*, 39(1):51–70