

# Effects of Economic Performance and Immigration on Unemployment of Low-Skilled Working Force

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*The main purpose of this study is to examine the relationship between new arrivals from the mainland of China holding one-way permit holders (OWPH), inflation, gross domestic product (GDP) and low-skilled unemployment. This study covered the quarterly data from the first quarter of 1982 to the second quarter of 2009. The low-skilled unemployment in this research is the level of unemployment among young people typically measured as those aged 20-29. From the second quarter of 2009, the unemployment rate of young people rose to 7.2%. Hong Kong is expected to undergo a continuous economic slowdown and a shrinking labour market under the financial crisis. Young people, especially those with low educational attainment, low levels of skill and those continuously unemployed, will find it even harder to secure a job. To find a way and offer them support so that they will not be marginalized in the labour market is one of our major concerns. This paper found that the Johansen test result reveals that the variables are cointegrated and the ordinary least squares estimator suggest that inflation and GDP are closely related to low-skilled unemployment in Hong Kong. Also, the ordinary least squares test reveals that we may not conclude that the OWPH are related to the low-skilled unemployment in Hong Kong.*

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## 1. Introduction

Phillips curve was developed by William Phillips (1958) who wrote a paper titled The Relationship between Unemployment and the Rate of Change of Money Wages in the United Kingdom 1861–1957, which was published in the quarterly journal *Economica*. In the paper Phillips describes how he observed an inverse relationship between money wage changes and unemployment in the British economy over the period examined. Similar patterns were found in other countries and in 1960 Paul Samuelson and Robert Solow took Phillips' work and made explicit the link between inflation and unemployment: when inflation was high, unemployment was low, and vice-versa. Hong Kong is belonging to a small economy with Linked Exchange Rate. Under the Linked Exchange Rate system, the Hong Kong dollar is officially linked to the US dollar at the rate of 7.8 Hong Kong dollars to one US dollar. It is interesting to investigate the validity of Phillip's curve in Hong Kong with Linked Exchange

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Rate. The relation between inflation and unemployment will be examined to be valid for the different age groups.

In this paper, OWPH stand for the new arrivals from the mainland of China holding one-way permit holders when they first enter Hong Kong via the Lo Wu control point. In Hong Kong, data collection mechanism has been set up by the Immigration Department to collect data on the demographic and social characteristics of one-way permit holders when they first enter Hong Kong via the Lo Wu control point.

The present paper provides the discussion of the relationship between unemployment, inflation, GDP and immigrant. It is admitted that these factors depend essentially on the economic, political and social situation in the country. This leads to the need of distinguishing between the economic characteristics such as inflation, unemployment, GDP and other, in the developed and developing countries. The peculiarities of the developing countries include the need of developing their credibility in order to successfully fight inflation and reduce the level of unemployment. Still, there can hardly be found ideal situation when the inflation and unemployment are low, and GDP is high. However, certain balance should be found. This would mean keeping unemployment at a certain level in order not to let the growth of inflation. Phillips curves and their modifications can be used effectively for inflation forecast only in the short run. The correlation between the unemployment, inflation, GDP and immigration is also demonstrated in the paper.

Also, this paper provides the description of different types of tests such as the augmented Dickey-Fuller unit root test (ADF), Johansen co-integration test, and ordinary least squares (OLS). Moreover, the paper discusses the relationship between unit root test, co-integration test and ordinary least squares with the examples taken from the empirical studies. The conditions, under which these tests are used, are discussed in the present paper.

First, after the literature review, I found that few articles invested on small economy. This research aims to investigate one of the small economies, that is the Hong Kong's economy. Hong Kong owns some special economies when comparing with the counterparts. For example, in terms of monetary system, the inflation rate and interest rate of Hong Kong follows the USA due to the execution of the Linked Exchange Rate system<sup>2</sup>, which has been in existence since 17 October 1983, is the cornerstone of Hong Kong's financial system. Under the Linked Exchange Rate system, the Hong Kong dollar is officially linked to the US dollar at the rate of 7.8 Hong Kong dollars to one US dollar. It is interesting to investigate the validity of Phillip's curve under the small economy with fixed exchange rate, for example Hong Kong.

Second, the relationship between Hong Kong and China is very close since most Hong Kong people or their parents came from the mainland China. Also, immigrants were migrated from various countries to Hong Kong every year. However, the Phillip's curve ignores the effects of immigration may mislead the result. Because immigration is systematic behavior and this may cause functional misspecification. Therefore, a new independent variable, i.e. number of immigrants (OWPH), will be included into consideration when

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<sup>2</sup> This Linked Exchange Rate system, which has been in existence since 17 October 1983, is the cornerstone of Hong Kong's financial system. The Link ensures that the Hong Kong dollar has a stable external value against major world currencies. This stability plays an important part in supporting Hong Kong's role as a trading and financial centre. The Link is maintained through a strict and robust Currency Board system, which ensures that Hong Kong's entire Monetary Base is backed with US dollars at the Linked Exchange Rate. The resources for this backing are kept in Hong Kong's Exchange Fund, which is among the largest official reserves in the world.

estimating the Phillip's curve. However, I decided not to investigate the effect of dividing OWPH into age group due to the data limitation. Also, according to my observation, the structure of OWPH's age group of each year was similar. Most of the OWPH were 30-39 years-old women.

Third, in the previous research of Hong Kong's unemployment rate, regression analysis, e.g. Ordinary least squares (OLS), is used for modeling and analyzing several variables, when the focus is on the relationship between a dependent variable and one or more independent variables. The application of the Ordinary least squares (OLS) depends on the stationary stochastic process. In case of the non-stationary stochastic process, the results of the ordinary least square estimated can be invalid. These results would be called "spurious regression" as in the article by Granger and Newbold (1974). As a result, this paper looks for a better time-series technique to investigate the long-run relationship according to the following steps. First, all dependent and independent variables were proved to be stationary. Therefore we may dig out the long-run equilibrium of unemployment rate using co-integration test. As a result, long-run relationship between inflation rate, GDP, number of immigrants, and unemployment rate aged 20 - 29 and rationale are proposed.

## 2. Previous Research

Unemployment is the inability of a person capable of working to find a job. This is an economic concept that is mutually dependent with the economic situation in the country: unemployment negatively influences the economy development, but it can be stated that the economic development has greater influence upon unemployment. Unemployment can be of several kinds: structural, cyclical, frictional, seasonal and classical unemployment (Sullivan and Sheffrin, 2003). Statistics does not distinguish between the types of unemployment when it concerns inflation forecast. Unemployment is considered to be the tool that can be helpful in restricting the growth of GDP to maintain the levels that can be sustained in the long term (Mankiw, 2002).

As it has been already mentioned, unemployment, inflation and GDP are the concepts that cannot be considered from the same point of view in the developed and developing countries. Developed countries have developed economy with all its traditions, standards and processes occurring in cycle. Even if there is some violation in that cycle, the government and economic authorities have certain tools to cope with the unexpected situation. Quite different is the situation with developing countries. Their economies have hardly been stable at any point of their development. This stability is much harder to reach. The balance between unemployment, inflation and GDP is not the major problem of the government, because there are a number of other problems that prevent stability in the country (Abel and Bernanke, 2005). These can be the political and social challenges in the first place. Some researchers (Mendonc, 2009) argue that the development of credibility should be the ultimate goal of the government of developing countries. This would be helpful for the achievement of aims of the inflation targeting policy. Brazil can be considered as a positive example of such policy. The inflation targeting was successful in reducing inflation at the lowest social costs possible.

Judd and Motley (1992) in "Controlling inflation with an interest rate instrument" investigate the efficiency of regulating "long-run inflation of feedback rules for monetary policy that link changes in a short-term interest rate to an immediate target for either nominal GDP or M2" (Judd and Motley, 1992). The authors conclude that a feedback rule targeting the control over the growth level of nominal GDP with a tool for interest rate would regulate

it to a certain extent. The authors expect such approach to be beneficial for the inflation control without the related growth of real GDP or interest rates volatility.

Karanassou, Sala and Snower (2010) in the article "Phillips Curves and Unemployment Dynamics: A Critique and a Holistic Perspective" recognize the commonly accepted fact that unemployment and inflation are not interrelated in the long run. The authors demonstrate in the study that the development and stagnation of the economy, and the related variability in its central concepts may lead to the need of the inflation-unemployment trade-off in the long term period. This results in the conclusion that the development of unemployment and inflation should be explained through the chain reaction theory. The main advantage of this approach is the "synthesis of the traditional structural macro-econometric models and the (structural) vector autoregressions" (Karanassou, Sala and Snower, 2010). There is no single and all-embracing explanation for the relation between unemployment and inflation.

The issue of immigration in relation to unemployment can be considered on the example of the small economy of Barbados. The article "Aging population, emigration and growth in Barbados" by Banik and Bhaumik (2006) outlines the main problems facing the economy of Barbados before the outbreak of the global financial crisis. Here the issue of the demography comes to the foreground. Indeed, while there is much concern about the unemployment rate, i.e. about the insufficient labor supply and resulting challenges to the economies, Barbados seems to suffer from the insufficient labor demand because of ever-growing population aging and emigration (Banik and Bhaumik, 2006). Small states vulnerability in economic terms is essential because of insufficient development of the economic policies, and the challenges associated with the demography to a great extent. The researchers aim to discover the twofold influence of the demographic challenges and emigration of younger people on the small economies, and particularly that of Barbados. They developed and implemented their own theoretical model that was applied to the situation in Barbados. It was found as a result of this research that the growth of the incomes influenced the demographic situation in small Caribbean countries and in Barbados in particular, and the closeness of the large economies has added to emigration. Looking for opportunities of increasing their incomes, people moved to more prosperous and more prospective countries where the issue of unemployment is not so critical. This has resulted in the essential losses of the economies of the small Caribbean countries, the outflow of the skilled labor force and growth of the rates of unemployment in these countries, including Barbados. Banik and Bhaumik (2006) suggest that the potential way out of this situation is the restructuring of the labor market with the help of the programs dedicated to the solution of these particular problems. The governments should aim the reduction of the gap between the demand and supply of the particular skills of the labor force.

Tsaliki (2009) in the article "Economic Development and Unemployment: Do They Connect?" consider unemployment as the integral part of the economic development that does not ensure the absolute employment of labor under any conditions. The author uses the principles of common and Keynesian economics to investigate the correlation existing between the economic development and its influence on employment. The findings of the research demonstrate that the capital employment and the unemployment rates do not have direct correlation, and there can be high rate of unemployment even under condition of the full employment of capital. Policies targeting the labor flexibility have increased the discrepancy between the distributions of income between different groups of labor force, and increased the rate of poverty in the European countries.

The issue of immigration is rather relevant in the United States due to a number of historical and modern reasons. The United States have always been an attractive country for immigrants because of the significant employment opportunities, high standards of life and the powerful system of social support. In his publication "Immigration: An Overview of Information Resources", Chapman (2000) considers the issue of immigration from both the historical and modern points of view and analyzes the complexities accompanying this notion. According to Chapman (2000), there is essential controversy existing between the proponents and opponents of the immigration as the integral part of the US political and economic life. The supporters of immigration to the United States state that immigrants contribute to the economy of the country with their labor. They are also said to contribute to the demography of the US. The opponents of the unlimited rates of immigration indicate that the US economy spends significant funds on keeping the immigrants. Moreover, the national identity of the current residents of the country can be violated, as well as their social unity. This debate can hardly be solved with the particular outcomes and conclusions, because there are a lot of issues and variables connected with the concept of immigration.

The issue of immigration is very important for any economy. According to Chapman, immigration involves a number of concepts that become inter-correlated through it, such as the following: "national identity, societal cohesion, national security, the rule of law, economic opportunity and economic costs, health care, social assistance, education, bilingualism, assimilation, acculturation, limits on national fiscal resources, morality, and a variety of other issues encompassing numerous disciplinary boundaries" (2000).

The issue of the application of skills of the immigrants to the economy of the receiving country is important. As Brucker and Defoort argue, "the skill bias of migration is a crucial issue from the perspective of the sending and receiving countries" (2009). Indeed, here the issue of supply and demand comes to the foreground. The authors target analyzing the self-selection of the migrant in terms of the skills they possess. Their article "Inequality and the self-selection of international migrants: theory and new evidence" provides insight into the processes of choosing the country for migration by the people attempting emigration (Brucker and Defoort, 2009). The methodology used in the paper is the enhanced Roy model that takes into account random migration costs. The researchers provide empirical research of the self-selection reasoning of migrants according to the skills they possess. With this aim, the researchers apply "a new panel data set on the educational attainment of migrants, which covers migration from 143 sending countries into the six main receiving countries in the OECD from 1975 to 2000" (Brucker and Defoort, 2009). The findings of the study allow stating that migrants reasonably evaluate their skills and opportunities, and "tend to be positively self-selected on observable skills" (Brucker and Defoort, 2009). This happens even disregarding the inequality in earnings in the sending and receiving country. The research demonstrates that as a rule, the discrepancy between the potential earnings in the sending and receiving country results in the positive influence upon the perception of skills by migrants. Using regression analysis in their study, Brucker and Defoort find that "a higher earnings inequality in both the receiving and the sending country is positively correlated with a favourable selection bias with respect to observable skills" (2009). Therefore, this shapes correct perception of one's skills and the earnings that can be obtained for those skills. In addition, the receiving country is likely to benefit from immigration skills due to the fact that it obtains the best ones, or at least better than those staying in the sending country. This happens because cost of migration is high, and the selective and restrictive immigration policies are rather strict. This leads to the situation when only the most skilled migrants are likely to legally enter the country as immigrants.

Consequently, the conclusion that can be made on the basis of evidence presented by Brucker and Defoort (2009) is that the higher is the difference between the incomes of people in the sending and receiving country, the higher is the number of migrants.

McGregor, Swales, and Yin (1995) in their article "Migration Equilibria/Disequilibria and the Natural Rate of Unemployment in a Regional Context" investigate "the theory of regional equilibria in the presence of endogenous migration of the form specified in Layard et al. (1991) and Treyz et al. (1993), where net migration flows (relative to lagged labour force) are determined by real consumption wage and unemployment-rate differentials" (McGregor, Swales, and Yin, 1995). In addition, the importance of concepts of equilibrium for the regional labour market is analyzed. Short-term and long-term equilibrium between the local demand in labor and the government expenses for this position are in the center of discussion. The findings of the study demonstrate that migration has significant influence upon the response to the violations of the regional demand (McGregor, Swales, and Yin, 1995). The authors find that "where there is full population and capital stock adjustment, a unique natural rate input-output model applies" (McGregor, Swales, and Yin, 1995). At the same time, the authors admit that it takes essential time of the market system to recover and return to the steady condition, especially if the wages are sensitive to market forces.

Though labor migration of people is mostly induced by the higher wages in the receiving country and higher standards of living, there is one more factor that may contribute to the decision of the potential migrants as for their moving. This is the housing market of the receiving country. Millington (1994) in the work "Migration, Wages, Unemployment and the Housing Market" describes correlations existing between the concepts of wages, migration, unemployment rate and the situation in the housing market of the receiving country as influencing the actual rate of migration. Using the empirical research, the author analyzes the correlations between the housing and labor market in the UK. Millington argues that "spatial differences in house prices and the availability of rented accommodation may be expected to exert substantial influence over the pattern of response exhibited by economic agents to spatial labour market disparities" (1994). The potential migrants are likely to reject the idea of migration if they have negative perception of the housing market of the receiving country. For instance, the significant variances in the house price and anticipated house price inflation may prevent labor migration. This can be considered essential, as far as housing market is the reflection of the economic growth of the country (Hamnett, 1992). Taking into account the fact that labor migrants search for better living, it is understandable that they are likely to postpone or refuse their migration plans. The correlation between labor and housing market is direct: the higher is the demand for labor, the higher are the house prices. Millington (1994) used "gravity model" (Gordon, 1992) to examine the above-mentioned relationships. Millington concluded stating that the reasons and stimuli for migration change with age, that's why it is rather unreasonable to model the migration structure for all ages. The author rejects the correctness of the conclusions made by Bover et al. (1989), who connected the net emigration from the South East of the UK to the rest of the country as being associated with the growth of the house price. The researchers argued that "Wage increases in the South East, quickly followed by even larger house price increases there, can give labour in the South East an incentive to leave the region and, given credit rationing, can be relatively ineffective in attracting new workers" (Bover et al., 1989).

Richardson (2007) in the article "Migration: new urgencies replace traditional welcome" provide an insight into the accelerated moving of people from their native countries to non-native countries. The advantages and disadvantages of such moving was

considered. Using the methodology of the soft-system analysis, the author provides the views of specialists in migration issues, and outlines the relations existing between the economic, social and cultural policies.

The findings of the study by Richardson (2007) emphasize that migration has increased essentially. The modern restrictions to the migration rates differ from those that were relevant previously. Nowadays, the decision-making as for migration is taken by the potential migrants based on the immigration policies of the receiving country. While at the beginning of the globalization tendency growth many countries welcomed the free movement of capital, goods and people across the borders, "politicians and their constituents in the United States, Europe and China have grown increasingly nervous about letting capital, goods, and people move freely across their borders" (Abdelal and Segal, 2007). This made them to introduce restrictions and limitations in order to stop the uncontrolled movement of goods, capital and people throughout the borders. This was absolutely needed at least due to the fact that it has negatively influenced the economies of the nations, to which labor migrants moved.

The article "Some Implications of External Labour Mobility for the Development of Micro-States" by Treadgold and Laplagne (1996) aims consideration of some factors of the actual role that can be played by the labor mobility between countries on the economic growth of the small states. International labor mobility is relevant for those states that have experienced migration influences. At the same time, the small population of such state does not represent any problem or threat to the labor markets of other states. Treadgold and Laplagne (1996) consider the argument by Tisdell (1990) who stated that in the micro-states with the underdeveloped economies, the potential donors should provide the migration outlets as the aid. This can be considered as sufficient aid to the economy of the micro-states due to the fact that it is likely to raise the per capita income of the state.

Therefore, the immigration is essentially interconnected with the concepts of unemployment, inflation and GDP. Immigration is particularly important for the expectations and forecasts made for the national economy, as far as this group of labor market participants will not only contribute to the economy, but will also require essential expenditures. In this light, it is important for the governments to have a clear picture of the overall situation and be able to control it. Freedom of movement of people, capital and goods has been the founding idea of the European Union, but it turned out to be excessive if there are no restricting policies. Globalization is not beneficial for the large countries that can control and regulate their economies and labor markets, but it can be advantageous for small countries that require additional opportunities for earnings for their citizens. Here one can find important correlation to the developed and developing countries. The immigration from developing countries to developed countries is rather frequent. But it is not always legal, and it especially undermines the stability of the developed economies. In this light, it is particularly important to control and monitor all changes that shift economic expectations, and particularly immigration rate.

### 3. Hypothesis

For studying the associations of low-skilled unemployment, GDP, inflation rate and OWP, we test the following hypotheses:

$H_{01}$ : There is no significant association between GDP and the unemployment rate aged 20-29

$H_{02}$ : There is no significant association between inflation rate and the unemployment rate aged 20-29

$H_{03}$ : There is no significant association between OWP and the unemployment rate aged 20-29

$H_{11}$ : There is a significant association between GDP and the unemployment rate aged 20-29

$H_{12}$ : There is a significant association between GDP and the unemployment rate aged 20-29

$H_{13}$ : There is a significant association between OWP and the unemployment rate aged 20 – 29

### 4. Research Method

Unit root test is to be applied in the situations when there is the need in determining whether the variable of the time series is stationary or non-stationary. This determination is accomplished with the help of the autoregressive model. Co-integration tests are used to identify the co-integration of the time series. The latter are considered to be co-integrated when they have the same type of the stochastic drift. In other words, the time series are co-integrated when they demonstrate similar behavior in long-term deviations; however, they do not have other related characteristics. Johansen co-integration test is usually implemented in cases when it is important that the test variables were treated as endogenous variables (Wassell and Saunders, 2008). The augmented Dickey-Fuller test helps to determine when time series data should be differentiated to become stationary. The ordinary least squares test is to be used when there are unknown coefficients in a linear regression model, and they have to be identified.

In these tests, the presence of the unit root in the model is the null hypothesis, and all above-mentioned tests target either to reject or to support this hypothesis. The choice of the test for application is accomplished on the basis of the data available and the circumstances, in which this test is to be implemented.

#### 4.1. Tests and Techniques

##### 4.1.1 ADF Unit Root Test

Unit root test is a statistical technique used to discover whether a variable of time series is non-stationary. For this, the autoregressive model is also applied. The most widespread and most frequently used test is the augmented Dickey-Fuller test, which will also be considered below.

##### 4.1.2 Johansen Cointegration Test

The concept of co-integration defined and developed in Granger's works found its further development in the article "Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models" by Johansen (1991). In this article, Johansen targets presenting the methods of likelihood for the "analysis of cointegration in VAR models with Gaussian errors, seasonal dummies, and constant terms" (Johansen, 1991). The researcher discusses the issue of co-integration and discovers the asymptotic distribution of the test statistics (Johansen, 1991). The findings of the study demonstrate that the asymptotic distribution is mixed Gaussian when the maximum likelihood estimator is used. The findings of the study suggest that the issue of determining the co-integration rank  $r$  can be solved



through using systematic approach as described by Stock and Watson (1988). They propose an algorithm accepted by Johansen: estimate  $\beta$ , filter the common tendencies using the auto-regression, and regress the residuals of the total residuals. The coefficient matrix is considered in terms of the unit roots. The steps of the algorithm are repeated till the moment when the correct number of co-integrating relations is determined.

#### **4.1.3 Ordinary Least Square**

Ordinary least squares (OLS) represent a statistical method of estimating the unidentified elements in a linear regression model. This technique minimizes the total of squared distances between the obtained results contained in the dataset, and the results forecasted by the linear approximation (Hayashi, 2000). The estimator that is obtained as a result of the OLS method is reflected through the simple formula. Also, the estimator of the ordinary least squares is consistent in case of exogenous regressors and in case of absence of the multicollinearity. The estimator of ordinary least squares is optimal when the errors are serially non-correlated and homoscedastic. According to Hayashi (2000), OLS can be obtained as the maximum likelihood estimator in case of the normal distribution of errors. Still, this technique has positive statistical conditions for a wider class of distributions.

#### **4.2. Scope of the research**

This study is restricted to the data collection mechanism set up by the Immigration Department to collect data on the demographic and social characteristics of one-way permit holders (OWPH) when they first enter Hong Kong via the Lo Wu control point.

Due to the limitation of data collection, the research period is restricted from the first quarter of 1982 to the second quarter of 2009. The only exception is the figures about the OWPH which is restricted from the fourth quarter of 1998 to the second quarter of 2009.

#### **4.3. Sample**

The sample used in this paper involves the following online documents published by the Government of the Hong Kong Special Administrative Region.

Quarterly Report on General Household Survey (first quarter of 1982 to second quarter of 2009)

Statistics on New Arrivals from the Mainland of China Holding One-way Permit (second quarter of 1998 to second quarter of 2009)

Monthly Report in the Consumer Price Index (January 1982 to June 2009)

Gross Domestic Product (First Quarter of 1982 to second quarter of 2009)

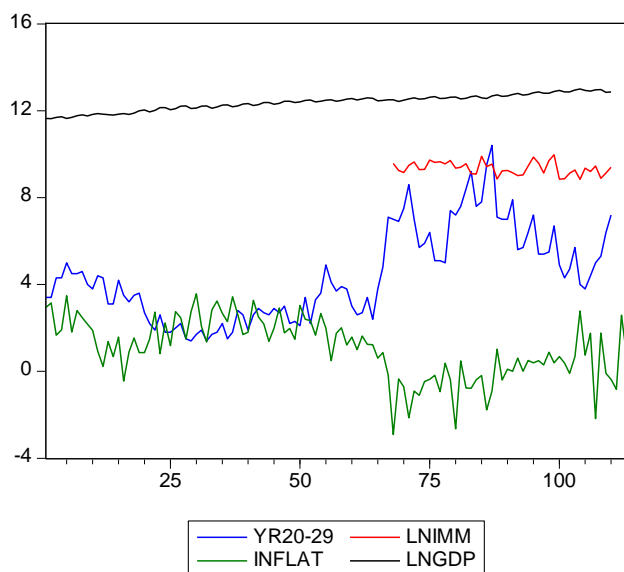


Figure 1. Unemployment Rate (YR20-29), inflation rate (INFLAT), Natural Log of OWP (LNIMM) and natural log of GDP (LNGDP) from the first quarter of 1982 to second quarter of 2009

The unemployment rate Hong Kong was reported at 5.5 percent from second quarter of 2009. From first quarter of 1982 until second quarter of 2009, Hong Kong's Low-skilled unemployment Rate averaged 4.4 percent reaching an historical high of 10.4 percent in third quarter of 2003 and a record low of 1.4 percent in fourth quarter of 1989.

The inflation rate in Hong Kong was last reported at 0.63 percent in second quarter of 2009. From first quarter of 1982 until second quarter of 2009, the average quarterly inflation rate in Hong Kong was 1.07 percent reaching an historical high of 3.57 percent in second quarter of 1989 and a record low of -2.91 percent in fourth quarter of 1998.

The Gross Domestic Product (GDP) in Hong Kong expanded 1.7 percent in the second quarter of 2009 over the previous quarter. From first quarter of 1982 until second quarter of 2009, Hong Kong's average quarterly GDP Growth was 1.3 percent reaching an historical high of 13.8 percent in third quarter of 1987 and a record low of -11.4 percent in first quarter of 2009.

The OWP in Hong Kong was last reported at 12015 in second quarter of 2009. From fourth quarter of 1998 until second quarter of 2009, the average OWP in Hong Kong was 11995.1 reaching an historical high of 21388 in third quarter of 2006 and a record low of 6909 in fourth quarter of 2007.

#### 4.4. Source of Data

In this research, only secondary data about GDP, inflation rate, OWP, unemployment rate of Hong Kong were involved and they were collected from the following sources through on-line searching as well as email requests.

Information of Gross Domestic Product (GDP), consumer price index and unemployment were collected from the website of Census and Statistics Department of Hong Kong Special Administrative Region (HKSAR).

Information about the Number of New Arrivals from the Mainland of China Holding One-way Permit (OWPH) was collected from the website of Home Affairs Department and Immigration Department of Hong Kong Special Administrative Region (HKSAR).

## 5. Results and Findings

In this section of paper we present analysis the results of research hypotheses. The following subsections provide analysis of results of hypotheses testing.

### 5.1. Results of ADF Unit Root Test

A stationary time series is one whose basic properties don't change over time. In contrast, a non-stationary variable has some sort of upward and downward trend.

Dickey-Fuller (1979) unit root test comes in a variety of forms, including an augmented test to use in cases of a serially correlated error term.

#### 5.1.1 Testing stationary of GDP, Inflation Rate, OWPH, Low-skilled unemployment

The table.1 presents the result for ADF unit root test on testing variables. The ADF unit root test has shown that the hypothesis that all of the independent variables have a unit root cannot be rejected at the 5% significance level.

Table 1. ADF unit root tests

ADF unit root test Independent variables	MacKinnon (1996)one- sided p-values	Conclusion
GDP (Natural Log)	0.2964	Has a unit root cannot be rejected**
Inflation rate	0.4982	Has a unit root cannot be rejected**
OWPH (Natural Log)	0.7731	Has a unit root cannot be rejected**

Notes: \*\*denotes significance at 5% level.

The table.2 presents the result for ADF unit root test on testing variable. The ADF unit root test has shown that the hypothesis that all of the dependent variables have a unit root cannot be rejected at the 5% significance level.

Table 2. ADF unit root tests

ADF unit root test Dependent variables	MacKinnon (1996)one- sided p-values	Conclusion
Unemployment rate aged 20-29	0.7897	Has a unit root cannot be rejected**

Notes: \*\*denotes significance at 5% level.

## 5.2. The Results of Johansen Cointegration

The finding that many macro time series may contain a unit root has spurred the development of the theory of non-stationary time series analysis. Engle and Granger (1987) pointed out that a linear combination of two or more non-stationary series may be stationary. If such a stationary linear combination exists, the non-stationary time series are said to be cointegrated. The stationary linear combination is called the cointegrating equation and may be interpreted as a long-run equilibrium relationship among the variables.

The purpose of the cointegration test is to determine whether a group of non-stationary series are cointegrated or not. Cointegration test is only valid when you are working with series that are known to be non-stationary. Thus, we apply unit root tests to each series in the VAR.

Considering the deterministic trend case considered by Johansen (1995, p. 80–84). Independent variables investigated are listed as; natural log of the GDP, natural log of the one

lagged GDP, natural log of the two lagged GDP, natural log of the three lagged GDP, natural log of the fourth lagged GDP, inflation rate, natural log of OWPH. Dependent variables investigated are listed as; unemployment rate aged 20-29.

Table 3. Johansen cointegration test (summary)

Independent variables	Unrestricted Cointegration Rank Test (Trace)	Dependent variable, Unemployment rate aged 20 - 29 Unrestricted Cointegration Rank Test (Maximum Eigenvalue)
Inflation rate	1	0
Ln(OWPH)	0	0
Ln(GDP)	1	0
Ln(one lagged GDP)	1	1
Ln(two lagged GDP)	1	1
Ln(three lagged GDP)	0	0
Ln(four lagged GDP)	0	0
Inflation rate & Ln(OWPH)	0	0
Inflation rate & Ln(GDP)	1	0
Inflation rate & Ln(one lagged GDP)	1	1
Inflation rate & Ln(two lagged GDP)	1	1
Inflation & Ln(three GDP)	1	1
Inflation & Ln(four lagged GDP)	0	1
Ln(No. of Immigrants) & Ln(GDP)	0	0
Ln(OWPH) & Ln(one lagged GDP)	0	0
Ln(OWPH) & Ln(two lagged GDP)	0	0
Ln(OWPH) & Ln(three lagged GDP)	0	0
Ln(OWPH) & Ln(four lagged GDP)	0	0
Inflation & Ln(OWPH) & Ln(GDP)	0	1
Inflation & Ln(OWPH) & Ln(one lagged GDP)	0	1
Inflation & Ln(OWPH) & Ln(two lagged GDP)	0	1
Inflation & Ln(OWPH) & Ln(three lagged GDP)	0	0
Inflation & Ln(OWPH) & Ln(four lagged GDP)	0	0

According to the above table, there is strong evidence that age group 20 – 29 denotes rejection of the hypothesis at the 0.05 level. In other words, the corresponding independent variable(s) own certain relation(s) with the dependent variable.

Unemployment aged 20-29, one lagged GDP

Unemployment aged 20-29, two lagged GDP

Unemployment aged 20-29, one lagged GDP, inflation

Unemployment aged 20-29, two lagged GDP, inflation

Unemployment aged 20-29, three lagged GDP, inflation

Table 4. Johansen cointegration test

Independent variables	Dependent variable, Unemployment rate aged 20 - 29	
	Unrestricted Cointegration Rank Test (Trace)	Unrestricted Cointegration Rank Test (Maximum Eigenvalue)
Inflation rate & Ln(one lagged GDP)	0.0847	0.0847
Inflation rate & Ln(two lagged GDP)	0.1037	0.1037
Inflation rate & Ln(one lagged GDP) & Inflation rate	0.3779	0.6270
Inflation rate & Ln(two lagged GDP) & Inflation rate	0.5423	0.6723
Inflation rate & Ln(three lagged GDP) & Inflation rate	0.7882	0.8456

### 5.3. The Results of Ordinary Least Square

Then, the ordinary least squares test was applied to find out the unknown coefficients among the testing variables. After executing the ordinary least square testes, we concluded that the following equations may be applied when different types of variable are provided as listed above.

Table 5. Ordinary least squares

Independent variables	Adjusted R-squared	Durbin-Watson statistics	Dependent variable,
			Unemployment rate aged 20 - 29 Coefficient
Ln(one lagged GDP)	0.828197	2.124537	0.033592
Ln(two lagged GDP)	0.828195	2.112275	0.034555
Ln(one lagged GDP) Inflation rate	0.844866	2.068080	0.107879 -0.286632
Ln(two lagged GDP) Inflation rate	0.846052	2.068508	0.111653 -0.300269
Ln(three lagged GDP) Inflation rate	0.848669	2.084213	0.113216 -0.307677

#### 5.3.1 The result of Unemployment rate aged 20 – 29, Ln(One lagged GDP)

Constant is insignificant so that it will not be included in the above table. According to the above table, the findings are consistent with the implications of the Phillips curve. GDP of last quarter is positively related to the unemployment rate aged 20-29, in particular when there is one per cent increase in Ln(one lagged GDP), there will be 0.033592 per cent increase in unemployment rate aged 20-29. Lastly, the present unemployment rate is affected by its previously one lagged unemployment rate, which is also consistent with current literature on unemployment. It's important to note that all the estimated coefficients as reported above are significant at the 5 per cent significance level.

With regard to the explanatory power of the proposed model, the adjusted  $R^2$  is 0.83, which implies the regressors can explain about 83 per cent of the variation of the unemployment rate aged 20-29, which is satisfactory. By looking at the Durbin-Watson statistic of 2.12, the model is said to be specified appropriately, and the problem of autocorrelation can be ignored here.

#### 5.3.2 The result of Unemployment rate aged 20 – 29, Ln(Two lagged GDP)

Constant is insignificant so that it will not be included in the above table. According to the above table, the findings are consistent with the implications of the Phillips curve. GDP of last quarter is positively related to the unemployment rate aged 20-29, in particular when there is one per cent increase in Ln(two lagged GDP), there will be 0.034555 per cent

increase in unemployment rate aged 20-29. Lastly, the present unemployment rate is affected by its previously one lagged unemployment rate, which is also consistent with current literature on unemployment. It's important to note that all the estimated coefficients as reported above are significant at the 5 per cent significance level.

With regard to the explanatory power of the proposed model, the adjusted  $R^2$  is 0.83, which implies the regressors can explain about 83 per cent of the variation of the unemployment rate aged 20-29, which is satisfactory. By looking at the Durbin-Watson statistic of 2.11, the model is said to be specified appropriately, and the problem of autocorrelation can be ignored here.

### **5.3.3 The result of Unemployment rate aged 20 – 29, Ln(One lagged GDP), inflation rate**

Constant is insignificant so that it will not be included in the above table. According to the above table, the findings are consistent with the implications of the Phillips curve. Inflation rate is negatively related to the unemployment rate aged 20-29, in particular when there is one per cent increase in inflation rate, there will be 0.286632 per cent decrease in unemployment rate aged 20-29. Another finding is that the GDP of last quarter is positively related to the unemployment rate aged 20-29, in particular when there is one per cent increase in Ln(one lagged GDP), there will be 0.107879 per cent increase in unemployment rate aged 20-29. Lastly, the present unemployment rate is affected by its previously one lagged unemployment rate, which is also consistent with current literature on unemployment. It's important to note that all the estimated coefficients as reported above are significant at the 5 per cent significance level.

With regard to the explanatory power of the proposed model, the adjusted  $R^2$  is 0.84, which implies the regressors can explain about 84 per cent of the variation of the unemployment rate aged 20-29, which is satisfactory. By looking at the Durbin-Watson statistic of 2.07, the model is said to be specified appropriately, and the problem of autocorrelation can be ignored here.

### **5.3.4 The result of Unemployment rate aged 20 – 29, Ln(Two lagged GDP), inflation rate**

Constant is insignificant so that it will not be included in the above table. According to the above table, the findings are consistent with the implications of the Phillips curve. Inflation rate is negatively related to the unemployment rate aged 20-29, in particular when there is one per cent increase in inflation rate, there will be 0.300269 per cent decrease in unemployment rate aged 20-29. Another finding is that the two lagged GDP is positively related to the unemployment rate aged 20-29, in particular when there is one per cent increase in Ln(two lagged GDP), there will be 0.111653 per cent increase in unemployment rate aged 20-29. Lastly, the present unemployment rate is affected by its previously one lagged unemployment rate, which is also consistent with current literature on unemployment. It's important to note that all the estimated coefficients as reported above are significant at the 5 per cent significance level.

With regard to the explanatory power of the proposed model, the adjusted  $R^2$  is 0.85, which implies the regressors can explain about 85 per cent of the variation of the unemployment rate aged 20-29, which is satisfactory. By looking at the Durbin-Watson statistic of 2.07, the model is said to be specified appropriately, and the problem of autocorrelation can be ignored here.

### 5.3.5 The result of Unemployment rate aged 20 – 29, Ln(Three lagged GDP), inflation rate

Constant is insignificant so that it will not be included in the above table. According to the above table, the findings are consistent with the implications of the Phillips curve. Inflation rate is negatively related to the unemployment rate aged 20-29, in particular when there is one per cent increase in inflation rate, there will be 0.307677 per cent decrease in unemployment rate aged 20-29. Another finding is that the three lagged GDP is positively related to the unemployment rate aged 20-29, in particular when there is one per cent increase in Ln(two lagged GDP), there will be 0.113216 per cent increase in unemployment rate aged 20-29. Lastly, the present unemployment rate is affected by its previously one lagged unemployment rate, which is also consistent with current literature on unemployment. It's important to note that all the estimated coefficients as reported above are significant at the 5 per cent significance level.

With regard to the explanatory power of the proposed model, the adjusted  $R^2$  is 0.85, which implies the regressors can explain about 85 per cent of the variation of the unemployment rate aged 20-29, which is satisfactory. By looking at the Durbin-Watson statistic of 2.08, the model is said to be specified appropriately, and the problem of autocorrelation can be ignored here.

## 6. Summary and Concluding Remarks

The previous GDPs have no relationship with the unemployment rate aged 30 or above. It could be explained by the fact that the unemployment rate lags behind the current economy (reflected by GDP) one to three quarters individually. In other words, GDP affects the unemployment rate of those aged below 30 at most three consecutive quarters. Also, the young people aged below 30 can be classified as the low-paid and low-skilled working force when comparing with those aged 30 or above. As a result, the unemployment rate of those low-paid and low-skilled working force was easier affected by the changes of economy (reflected by GDP).

During the research period, unemployment rate for those aged 20 to 29 had increased from 3.8% in first quarter of 2008 to 7.2% in second quarter of 2009. The youngsters aged 20 to 29 can be classified as the low-experienced working force. As the world's economy continues to globalize and be knowledge-based, the labour market has an ever-increasing thirst for experienced candidates who are highly educated and well trained. For those young people who are not adequately trained, not only do they not benefit from an improved economy, but they also find themselves trapped in a vicious cycle of low income, on-the-job poverty and even intergenerational poverty. During the research period, low-skilled unemployment rate was 1.17 times higher than total unemployment rate on average.

The result of OLS implicated that there is insufficient associations between OWPH and unemployment rate aged 20-29 during the research period. It could be explained by the fact that most of the OWPH are married and low educated middle-aged women. They acted as housewife and didn't seek for a job. For example during first quarter of 2010, 84.0% of the one-way permit holders (OWPH) aged 15 and above were or had been married as most of the young and middle age female one-way permit holders (OWPH) were wives of Hong Kong men. Other than the variations in certain quarterly statistics, the proportion of one-way permit holders (OWPH) who were or had been married remained 80% and above throughout 2005 to first quarter of 2010. 73.6% and 14.4% of one-way permit holders (OWPH) aged 15 and above had attained secondary education and post-secondary education or above respectively.

There were some problems in this research. Some further study may be required to enhance the findings of this research. First, due to the potential problem of endogenous biased which is we cannot have two or more independent variables which are closely correlated. Otherwise, misleading results will be generated or we have singularity problem. For example one lagged GDP and two lagged GDP are closely correlated. Second, the information about the OWPH in each quarter was not completely cover the whole research period, that is from first quarter of 1982 to second quarter of 2009 (totally 111 records). In contrast, the information about the immigration starts since fourth quarter of 1998 (totally 43 records). As a result, the result of data analysis involving OWPH was restricted to 43 records only. This is subject to data availability of Hong Kong Special Administrative Region (HKSAR).

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