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The Effect of Capital Accumulation and Unemployment Rates on GDP in South Korea between 2000 and 2005

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Abstract

Purpose: This research investigates the paths of some important economic variables: government domestic product (GDP), capital accumulation, unemployment rates. Decreasing GDP, declining capital accumulation and higher unemployment affect to South Korea economy. The macroeconomic policies discussed are all capital financed accumulation policy and an enactment of unemployment regulation. **Research design, data and methodology:** The GDP, capital accumulation rates and unemployment rates are the main macroeconomic issues in the South Korea. This research studies the correlations of the GDP, capital accumulation, and unemployment rates by time series data from 2000 to 2005 in a Vector Autoregressive (VAR). **Results:** The first, GDP relates a positive effect between the GDP and capital accumulation in the long term. The second, there is the negative relationship between GDP and unemployment rates. Economic growth was strongly supported by employment growth and by declining unemployment. The third, There is positive relationship between unemployment rates and capital accumulation. **Conclusions:** This research provides that fiscal policy introduce to increasing GDP, private investments and employment rates. The GDP should be major on capital accumulation to increase employment rates in South Korea.

Keywords : GDP, Capital Accumulation, Unemployment

JEL Classification Code : O16, E22, E24

1. Introduction

This research investigates the dynamic paths of s ome important economic variable: government domes tic product (GDP), capital accumulation, unemployme nt rates, for example, under various macroeconomic policies in an economy with two distinct sectors: ca pital accumulation and unemployment rates in S. Ko rea between 2000 and 2005. The GDP is subject to a Chris-type government budget constraint according to which total government expenditure for all purpos e must equal total financing from all sources. The macroeconomic policies discussed are all capital fina nced accumulation policy and an enactment of unem ployment regulation. The interaction among these ma croeconomic policies will be analyzed.

The model presented here is different from the fa miliar neo-classical model in that there are no forces in this model which would tend to bring the rate o f the economy up to the growth rate of the populati on, because of the effective unemployment rates (Hal l, 1979). Thus, the economy might not converge to a full-employment steady-state growth path as it wou ld in the neo-classical model (Sim, 2017). This resea rch also differs from earlier ones on the natural rate of unemployment in that here the research assume th ere are two distinct types of macroeconomic sectors (Beine et al., 2001). Accordingly, there are three inp

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ut factors in the production function: GDP, capital a ccumulation, and unemployment. Earlier researches u sually assume a unique production sector and hence, commonly use the conventional two-input production function. Since the effect of GDP in a two sector m odels are very sensitive to the elasticity of substituti on between two sectors (Fan & Stark, 2007).

The South Korea was facing these matters as the 1990s when the IMF was facing (Chang & Rhee, 2 004). The unemployment rates and slow GDP rates t hat have been economic issues. Despite facing slow GDP rates and unemployment, increasing capital for mation can increase job opportunities and employme nt rates (Connolly & Yi, 2015). Therefore, the relati onship among GDP, capital accumulation and unemp loyment rates has become macroeconomic policies (World Bank Data 2015; World Bank Data 2021).

2. Literature Review and Hypothesis Development

The government domestic constraint into the model affects macroeconomic analysis. The government domestic constraint requires the total of government expenditures for all purpose to equal the total of government expenditures for all purpose to equal the total of government receipts from all sources (Sims, 1980). When there is an exogenous change in one government expenditures variable, there must be at least on other parameter changed in order to satisfy GDP constraint. For instance, an exogenous increase in government purchases of goods and services must have effects on other government policy parameter changed in order to satisfy the GDP constraint (Engle & Yoo, 1987). For instance, an exogenous increase in government purchases of goods and services must have effects on other government domestic variable, e.g., government transfer payments might have to be reduced, or tax rates might have to be raised, or more capital accumulation or more government spendings might have to be issued (Hsiao, 1987).

Following those initial changes in the government domestic product variables, at least one variable must adjust endogenously in order for the GDP constraint to be satisfied during the subsequent periods. The chosen endogenously variables can be the initially changed exogenous variables or any other policy variables (Limosani et al., 2017). For example, following an initial capital accumulation change in the form of an open-market purchase of government bonds the public holds more money but fewer bonds. Fewer bonds result in smaller debt interest payment, which means the expenditure side of the government domestic constraint is lower (Sohn & Liu, 2015). Therefore, the government domestic constraint will not be satisfied unless some kind of endogenous variables is used to reduce financing the government sector. The chosen endogenous variables can be either a tightening of the money supply, a tax-cut, or others (Harris & Li, 2008).

It turns out that the stability conditions of the system and the long-run multipliers of the effects depend on which GDP variable is chosen to be endogenous (Gujarati, 2004). Most researches show that in an under-employed economy when money-financed accumulation policy is chosen as the endogenous variable, the system is more likely to be unstable (Ramudo et al., 2014).

It has long been debated whether an expansionary fiscal policy financed by capital formation is effective in stimulating the economy. Some economists have argued that capital formation would influence private investment to such an extent that “expansionary” fiscal action financed in this manner could, in fact, be contractionary. Others tend to believe the opposite. That is, endogenous financed deficit policy, if it is stable, leads to an even more expansionary effect on the economy in the long run (Mahadea et al., 2010).

The different conclusions on the capital accumulation originate from the different assumptions regarding both price flexibility and the substitute ability of various assets (Xu, 1996). Some economists argue that capital formation and money are closer substitutes because both asset prices are subject to uncertainty in the future. Some economists have argued that capital accumulation and physical capital are closer substitutes because both assets yield a certain rate of return. Presumably, they assign a zero rate of return to economic growth rates. (Granger, 1981).

In the gross capital accumulation (GCA), if the capital accumulation and consumption are assumed to be perfect substitutes, an endogenous bond-financed deficit capital accumulation policy can be either expansionary or contractionary. Under these assumptions, the impact of the increase in capital accumulation is to raise the private sector’s net wealth (Davidson & Martin, 1999). The capital accumulation raises the private sector’s consumption demand; this implies a rightward shift id the IS curve, which drives up the interest rate. But it expands income on the other. As income roses investment, the demand will increase accelerator effect (Kim et al., 2016). However, a higher interest rate will tend to reduce private investment. At the same time, larger wealth also raises the private sector’s money demand, which implies a left ward shift of the LM curve; this drives up the interest rate. But, shrinks income on the other. Both of these forces discourage private investment (Sahnoun et al., 2019). For

a capital formation policy to increase investment, the first type of wealth effect must dominate the second type of wealth effect, as the latter always crowds out private investment. There has been some controversy over whether wealth should be included as an argument of the money demand function (Abbring, 2013). It has been shown by Granger (1981), that in a GCA model, when an endogenous bond-financed deficit policy is stable, there is a net expansionary effect from financed deficit policy is stable, there is a net expansionary effect from financing a deficit with capital accumulation. Futhermore, an endogenous bond-financed deficit policy, in the long run, will have a more expansionary effect than a money-financed policy under this circumstance (Lee & Lee, 2014). This is because an increase in capital accumulation gives rise to larger debt interest payment in the future, which requires more capital accumulation to be issued in order to finance the larger deficit. Therefore, a deficit policy is more expansionary with capital financing than with money financing in the long run (Redding, 1999). The system is stable under either type of debt financing mode. Another relevant point is that following an exogenous change in the supply of capital accumulation, if the money stock is chosen as the endogenous policy variable, the system is more likely to be stable; thus, an expansionary effect is more certain, if flexible prices are assumed and bonds are perfect substitutes for capital, the effect of capital accumulation financed deficit policy is to raise the interest rates which would result contractionary on private investment (Li & Li, 2017). Often the system can be unstable, the flexible-capital case differs from the fixed- capital case in that in the former, capital accumulation definitely crowd out investment in the fixed capital case the effect on investment is indeterminate. The wealth effect in the money-demand function causes prices in the commodity market to rise in a flexible-capital accumulation model. An increase price shrinks the real money supply which reinforces the leftward shift of the LM curve (Stark et al., 1998). Therefore, a policy of financing deficits with capital accumulation leads to increase in the interest rate—and a greater crowding out of private investment—in the flexible-capital. If capital accumulation is sufficiently low to keep the growth of capital, growth of population, an increase in unemployment in the labor market will occur if there is an effective minimum real wage. The insufficient capital accumulation relative to effective labor brings down the marginal productivity of labor which in turn will discourage the demand for labor (Mankiw & Ricardo, 2002).

The effects of a minimum real wage in a one-labor-sector model depend on how high the minimum real wage is set. One of the interesting results of the model in this case is that there are only two possibilities: either the minimum real wage becomes ineffective or the unemployment rate of the total labor force eventually approaches 100%. The economy cannot coverage to some path on which the unemployment rate stays permanently somewhere between 0% and 100%. For example, the unemployment rate could not converge to a level of, say, 40%. In the long run the unemployment rate converges to 100%, or else there is no unemployment. The reason is that, under this circumstance, there is no link between the growth of capital in line with the growth of population (Mai, 2017).

In the case that the minimum real wage is effective, employed workers receive a real wage greater than the full-employment real wage (Lee & Lee, 2014). Thus, labor becomes more expensive. Therefore, the supply of labor is larger. The amount of labor demanded depends on the magnitude of the minimum real wage and the capital stock. If, for some reason, the labor force increases, the research simply have an increase in the number if unemployed workers, but no change in the number of employed workers. Hence, an increase in the labor force does not, in itself, induce any change on level of real output (Shimer, 2005).

Similarly, other economic variables such as real investment, interest, etc., are not in any way influenced by an increase in the stock of labor. As long as the minimum real wage remains effective, an increase in the stock of labor only increases the residual this research call “unemployment” and has no effect on any other economic variables (Kim et al., 2015). Logically, there can be no link between the rate of population and the rate of income or capital. Other studies have shown that as long as the minimum real wage remains effective, the economy tends to converge to a state in which the growth of income, the growth of capital, and the growth of employed labor all become equal. However, there are no forces which tend to make the growth of GDP equal to the growth of employment, as explained above. If the rate of growth of employed labor is less than the total labor force, then the ratio of employed labor to the total labor force gets closer ad closer to 0%, and the unemployment rate gets closer and closer to 100%. On the other hand, if the rate of the labor force, eventually the entire labor force becomes fully employed and the minimum real wage becomes ineffective (Sims, 1980).

3. Research Design, Data, and Methodology

3.1. Objective of Study

The purpose of this research is to quantify with the belows: 1) To find the relationship between GDP and capital accumulation of S. Korea. 2) To find the relationship between GDP and unemployment of S. Korea. 3) To find the relationship between unemployment and capital accumulation of S. Korea.

3.2. Data Sample

This research used panel data (World Bank Data, 2021). - GDP and capital accumulation are negative effect to unemployment in S. Korea (http://data.worldbank.org/country/korea-rep).

The results imply that GDP and capital accumulation increases the chances of employment in South Korea. There are issues on the relationship on GDP growth, unemployment rates and capital accumulation. In addition, all these studies used panal data and VAR among GDP, unemployment, and capital accumulation (Engle & Granger, 1987).

The macroeconomic model presented in this research consists of two types of equations: static equations and dynamic equations. The static equations describe the short-run equilibrium conditions in all four macroeconomic markets—labor, commodity, money, and capital accumulation. This assumes given values of exogenous variables and those endogenous variables whose time derivatives appear in the dynamic equations. The dynamic equations describe how some of the variables change through time (Granger, 1981). The model is confined to a closed economy, so no foreign sector will be taken into consideration. In the relationship unemployment, gross domestic product and capital accumulation in S. Korea - this paper tested Vector Autoregressive (VAR) (Lutkepohl, 1985). The VAR tests interdependently between variables. The Augmented Dickey Fuller is used to Gross Domestic Product(GDP), Capital Accumulation (CA), Unemployment (UNEMP).

3.3. Methodology

The following models was formulated:

$$GDP = GDP.Lag1\text{-}t + CA.Lag1\text{-}t + UNEMP.Lag1\text{-}t + CONST$$

(1) To find the relationship between GDP and capital accumulation equation:

$$GDP = GDP.Lag1\text{-}t + CA.Lag1\text{-}t + CONST$$

(2) To find the relationship between GDP and unemployment equation:

$$GDP = GDP.Lag1\text{-}t + UNEMP.Lag1\text{-}t + CONST$$

(3) To find the relationship between unemployment and capital accumulation:

$$UNEMP = UNEMP.Lag1\text{-}t + CA.Lag1\text{-}t + CONST$$

$_{i = 1,\ldots,t}$ represent the lengths.

3.4. Explanation of Variables

GDP represents the standard measure of the value added created through the fiscal year. While GDP is the single most important indicator to capture economic activity.

Capital accumulation refers to a rise in the value of an asset as a result of investment or profits generated. The capital accumulation is to create profits or revenue for nation. Therefore, the variable was referred in economic analyses.

Unemployment are people of working age who are without work, are available for work, and have taken specific steps to find work. This macro indicator is measured in numbers of unemployed people as a percentage of the labour work force.

3.5. Findings and Results

After estimating the VAR, the Durbin-Watson test were conducted. A DW test results that there is no correlation. This research used GDP at constant 2000 prices. The second element is Capital Accumulation (CA) was investment element. Other papers concur that CA is the most important contributor of GDP. The third element is unemployment rate by International Labor Organization (IOL). The relationship is positive effects between GDP and CA. Between GDP and unemployment rates are negatively related. The GDP can positively related whether technological inventions or innovations.

4. Empirical Results

The ADF test indicates Capital Accumulation (CA) is constant where Gross Domestic Product (GDP_C) at 2000 prices below.

Table 1: ADF results

Element	T-value	Prob
CA	-2.0123	0.3520
D(CA)	-2.8936	0.0322

GDP_C	-3.1480	0.4301
D(GDP_C)	-3.4437	0.0021
UNEMP	-2.6805	0.1210
D(UNEMP)	-2.4509	0.0022

Note: 5% significance level.

The table 2 shows Granger causality test results. The factors explain each other under the Vector Autoregressive (VAR) by granger causality test. GDP_C was shown to Granger cause CA. The results shows that both GDP_C and CA Granger effect UNEMP.

Table 2: Granger Causality Test.

Hypothesis	T-value	Prob	Reject	Result
GDP do not effect CA	4.0373	0.0356	X	GDP→CA
Unemployment does not CA	1.66732	0.3633	0	No cause
CA do not effect GDP	2.7336	0.3331	0	No cause
Unemployment do not effect GDP	2.3453	0.4271	0	No causality
CA does not cause Unemploymen	13.5937	0.0040	X	CA→Unempl oyment
GDP does not cause Unemployment	18.4454	0.0002	X	GDP→Unemp loyment

Note: 5% significance level.

Table 3: Estimation Results

Period	S.E.	GDP_C	CA	UNEMP
(a)				
1	2.32×10^{10}	100	0	0
2	4.13×10^{10}	73.7653	0.003211	2.88760
3	5.29×10^{10}	75.56176	1.005432	4.078466
4	6.23×10^{10}	78.34499	4.326544	5.315255
5	6.31×10^{10}	73.71433	5.357656	6.87497
(b)				
1	05.09563	2.086764	86.9835	1.05432
2	1.98654	13.98342	70.5432	6.84532
3	1.97864	32.7653	57.9854	32.9856
4	1.3452	31.0004	21.0975	21.8765
5	2.0987	32.9865	22.7543	22.0975
(c)				
1	0.9876	6.6543	23.0987	43.0987
2	1.9786	13.985	21.987	23.876
3	1.9087	21.987	23.987	13.432
4	1.9965	20.876	24.987	21.546
5	1.9976	24.983	19.875	24.924

Note: GDP-C is constant GDP, 2000.

The second equation resulted that both GDP and CA are significantly related. Similar fi results were also observed for CA and positively correlated. Unemployment rates have positively effect on investment levels. In the third equation, the GDP effect positively the unemployment rates. Thus, GDP is an important part in reducing unemployment levels. The classical production function indicates that GDP function is both labor and capital. The tests results capital accumulation effects positively influence unemployment rates. Between labor and capital are negatively related. The negative signs shown in the model which re ect an inverse relationship between unemployment and GDP.

The Table 3 shows that the S.E. are increasing due to uncertainty e ect from 1st to 5th yearly. Furthermore, the variance for GDP, CA, and Unemployment are 73.71%, 22.75% and 24.92%. Thus, Table 3 shows that both capital accumulation (CA) and unemployment (UNEMP) positively related GDP_C yearly through. Therefore, CF and UNEMP results on GDP as process. This implies the current GDP shows by past capital accumulation and unemployment over more goes through. The unemployment rates are both capital accumulation and unemployment. But the value decrease from 43.09% to 23.09% in 1st year. Mainly, GDP become more reflect by a 24.98% effect in 5th period compared to 6.65% 1st year. This means that GDP effects a more significant in unemployment rates.

5. Conclusions

The capital accumulation is to increasing both unemployment and GDP. This research examined time series analysis (granger causality analysis). This research tested that capital accumulation positively affect both unemployment and GDP. Thus, the capital accumulation was seen positive both employment and GDP. However, unemployment did not affect GDP positively. The results concluded that GDP effects capital accumulation. The GDP improves private investments in South Korea. Based on results shows fiscal policies introduce expansionary expanding GDP and unemployment level. The GDP should be major on capital accumulation to increasing employment.

This research have explored the interaction between

government macro-economic policies—a money-financed capital accumulation, unemployment, and investment—in an economy with labor sector. Even though alternative financing capital accumulation can result in different sets of long-run unemployment paths and GDP paths, the causes of an unstable unemployment path are all the same: because the capital accumulation is effective in both unemployment.

It has been shown that in a less extreme case in which both types of capital accumulation and unemployment are not perfect substitutes, it is possible for the GDP sector to be affected by unemployment and still converge to some long-run rate of unemployment. This happens provided that the minimum real capital accumulation does not also affect the GDP. This is a sharp contrast to both the one capital accumulation model and the perfectly substitutable unemployment model. This research suggests, therefore, that when a capital accumulation is imposed, a model with unemployment is more stable than a model.

The unstable effects on labor employment caused by a minimum capital accumulation cam be aggravated by other policy variables if these discourage capital accumulation. This is indeed the case when either the monetary GDP rate os too low or when the deficit-income ratio is too high. When either occurs, capital accumulation will increase to satisfy the government budget constraint. Even though this research keep the deficit-income ratio constraint throughout this study. This research cannot prevent the crowding out of private investment that results from larger quantities of government capital accumulation. It follows that if that the crowding out effect is so severe that the resulting capital accumulation cannot keep up with the effective labor growth, then the marginal products of both types of labor will fall. Consequently, the unemployment situation will be worsened.

This analysis results in an economy with effective fiscal policies, if the government attempts to reduce the unemployment rate by lowering the initial period tax rate, more unemployment may result. However, if the GDP raises the monetary growth rate, the unemployment rate can be reduced. However, this will be at the cost of price stability. Hence, the choice of fiscal policy is very important to stimulate economic growth, private investments and employment rates.

6. Limitations and Future Studies

This research came across additional factors such as inflation, government spending, international trade are not used in the VAR regressions. Therefore, such macroeconomic variables should be taken in future studies.

This research has empirically analyzed on economic growth between 2000 and 2005 from World Bank Development Indicators. The data was motivated by lack of periods to test by Vector Auto-Regressive Model. Future research will include longer comparative panel analysis on the economic growth in South Korea.

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