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Is inflation targeting compatible with economic growth ?

Korean experience based on ARDL and NARDL

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Abstract

The relationship between inflation and growth has been one of the most widely researched topics in economics. Studies have shown various outcomes, deeming positive, negative and non-existence of relationship between the two macroeconomic variables, and the result varies among the areas of study. The complex dynamics between inflation and growth has made it difficult for policy makers to comprehend whether inflation targeting policy will result in favourable or adverse effect to the economic growth. This paper aims to study the relationship between inflation and economic growth in South Korea, one of the fastest growing economies in Asia. Consumer Price Index (CPI) will be used as an indicator for inflation and GDP by market price is used to represent the economic growth. Using the recent time series techniques, ARDL and NARDL, the study seeks to find the long-term relationship and causality between the two variables. Based on the results, it is found that inflation is exogenous, while GDP is endogenous. The relationship between inflation and GDP is also found to be asymmetric in the long run. The policy implication of this study is that the central bank of Korea should not adopt inflation targeting policy while having the objective of boosting the GDP in mind since they are conflicting macroeconomic objectives. Instead, inflation targeting policy should be applied mainly to focus on keeping the price stability.

Keywords: Inflation, Economic growth, ARDL, NARDL

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Introduction

Inflation is a condition when there is a general rise in the price of goods and services in the market. It can be caused by a number of reasons, for instance the overall demand for goods and services in an economy increases more rapidly than the economy's production capacity. It creates a demand-supply gap. With higher demand and lower supply, price will increase. Besides that, increase in money supply in an economy also leads to inflation. With more money available to the individuals, there will be more spending. This increases the demand, and leads to price rise. In all such cases when demand increases, the money loses its purchasing power. Therefore, inflation is always expressed as percentage decrease in the purchasing power of a nation's currency. As prices rise, the impact to general cost of living for the common public will push the monetary authority of a country to take the necessary measures to keep inflation within permissible limits and keep the economy running smoothly. Therefore, inflation targeting has been one of the most popular monetary policy objective both for developed and developing countries. Inflation targeting involves keeping the inflation level to a certain low percentage by using monetary policy tools such as interest rate.

However, inflation may not necessarily be bad for the economy. The existence of inflation is often a sign that an economy is booming and growing. Studies have shown that a certain level of inflation helps to boost the economy, and is important to trigger production. This raises a crucial question, whether inflation should be controlled in order to ensure continuous and sustainable economic growth?

The paper will seek to address the issue by looking at empirical data derived from South Korea. South Korea is known as one of the most fastest growing economies in Asia and was the quickest to recover after the Asian financial crisis in 1997-98. It is also interesting to note that South Korea has been adopting inflation targeting policy since 1988 (Kim & Park, 2006). This study will make an humble attempt to identify the lead-lag relationship between inflation and GDP, as the focus variables, while export, import and exchange rate as control variables.

Based on this study, it is found that inflation should not be used as a policy measure to enhance economic growth since inflation is the most exogenous variable while GDP is the most endogenous variable. The direction of causality is from inflation to GDP, instead of the other way around. The relationship between inflation and GDP is also found to be asymmetric in the long run. The policy implication of this study is that the central bank of Korea should not adopt

inflation targeting policy while having the objective of boosting the economy in mind since they are conflicting macroeconomic objectives. Instead, inflation targeting policy should be applied mainly to focus on keeping the price stability.

The subsequent sections of this paper are organised as follows: Section 2 describes the theoretical underpinnings of inflation and economic growth; Section 3 provides the empirical evidences of prior literatures; Section 4 outlines the data used in this study; Section 5 deliberates on the methodology, results and the economic interpretation; while Section 6 concludes with policy implications and limitations as well as suggestion for further research.

Theoretical Underpinnings

Inflation is one of macroeconomic variables that has been frequently quoted against the growth and well-being of an economy. There are two sides of arguments for and against inflation, although the general view is inflation comes as detrimental to the economic growth. This is supported by the fact that there are a lot of countries which implement inflation-targeting strategy as a part of their monetary policy. The country in study, which is South Korea, has also deployed the strategy since 1998, as a consequence to the Asian financial crisis at that time.

In the first year of implementing the inflation targeting policy, the rate of change of the CPI decelerated sharply to a little over 1% in 1999 - after years of inflation averaging more than 5%. Since then, the annual rates of inflation in terms of the CPI and core CPI have remained around 3-4%, mostly within the target ranges. Generally, this record suggests that inflation targeting has been effective in sustaining price stability in Korea(Kim & Park, 2006). However, since the crisis, economic recession is seen as the bigger concern than inflation. The lowered inflation level at that moment was not seen as the biggest contributor to the spiking economic growth following the years after.

To elaborate more on the arguments against inflation, firstly, we take the condition when inflation in the economy is high. The high inflation means prices of goods and services is expensive, therefore lowering exports volume. This could be detrimental to economic growth since domestic goods and services lose its competitiveness. Households and companies may opt for imported goods which are relatively cheaper to domestic products. On top of that, high

inflation will cause households to lose their purchasing power, and thus lowering consumption. On the firm level, companies may choose to defer capital investment in expectation of lower demand for goods and services. In relating inflation with exchange rate, high inflation will also increase the probability of depreciation in home currency. The uncertainty associated with high inflation will also reduce the inflow of foreign investments into the country. These aggravating effects to the economy are the basis of why policy makers choose to adopt the inflation-targeting policy.

However, inflation may not always be bad for the economy. Advocates of inflation would rather emphasize that only inflation of extreme level would be detrimental, while a low and adequate inflation might be essential to trigger growth in a stagnant economy. When the economy is not running at maximum capacity, there is unused labor or resources. Inflation theoretically helps boost production, as when there is increased spending, it translates to higher aggregate demand. In addition, economist Keynes (2013) is of view that inflation is needed to avoid a condition called Paradox of Thrift. If consumer prices fall consistently because the country is becoming too productive, consumers learn to hold off their purchases to wait for a better deal. The effect of this paradox is reduced aggregate spending, leading to less production, layoffs and eventually slowed economy. Besides that, higher wages during inflationary period is seen to ease debt burden as people would have more money to pay back their debts.

However, the above arguments stand in theory while empirical evidences yield mixed results. The following section will present the empirical evidences obtained from prior literatures.

Literature Review

Among literatures that founds negative relationship between inflation and economic growth is Saaed (2007) that explored the relationship between inflation and economic growth in Kuwait, using annual data of real GDP and CPI for the period of 1985 to 2005. The result shows a long-run and strong inverse relationship between CPI and real GDP in Kuwait. Ahmed and Mortaza (2005) studies the same relationship using the same indicators for Bangladesh and finds that there exists a statistically significant long-run negative relationship between inflation and economic growth for the country. Faria and Carneiro (2001) investigated the relationship in the context of Brazil and finds that although there is negative relationship between inflation and economic growth in the short-run, inflation does not affect economic growth in the long-run. Shitundu and Luvanda (2000) examine the impact of inflation on economic growth in Tanzania.

The empirical results obtained suggest that inflation has been harmful to economic growth in Tanzania. These are but a few recent literatures that stands on the premise of negative relationship between inflation and economic growth.

On the other hand, there are also studies that have proven otherwise. Mallik and Chowdhury (2001) for instance, have found out that inflation and economic growth are positively related. They have conducted cointegration analysis of inflation on economic growth for four South Asian countries, namely Bangladesh, India, Pakistan, and Sri Lanka). Xiao (2009) also finds that in the long run inflation is positively relate to economic growth from the empirical data of China from the year 1978 to 2007. Additionally, there are also studies that finds that there is no conclusive empirical evidence for either positive or negative relationship between the two variables.

In recent studies, the focus when it comes to inflation is to find an optimum level that is not excessive and too high that would adversely impact the economy, but also not to a point of non-existence or zero inflation, as that would mean absence of stimulating factor for the economy. (Mubarik, 2005) for example, suggests 9 percent threshold level of inflation for Pakistan based on his study using the data from 1973 to 2000. However, the optimum level of inflation or measuring inflation threshold is beyond the scope of this paper. This study will only focus the existence of long run relationship between inflation and economic growth in South Korea, as well as the causal direction between the two. It will determine whether inflation is the leading or lagging variable and the result will determine whether it can be used to spur economic growth.

Data and Variables

The study employs quarterly data of extracted from the Thomson Reuters Datastream, from a period of Q4 1980 until Q2 2018. All data comes from one resource, which is the Bank of Korea. The variables used in the study are represented in the table below;

Variable	Symbol	Proxy
GDP	GDP	GDP at market price
Inflation	INF	Consumer Price Index
Import	IP	Total import of goods and services
Export	EP	Total export of goods & services

Exchange rate	XR	KRW/USD
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Methodology and Empirical Results Analysis

The study used a combination of time series techniques, autoregressive distributed lags model (ARDL) and non-linear autoregressive distributed lags (NARDL). Time series is adopted as it is the most suitable technique compared to regression. Unlike regression that assumes linear relationship between variables and that a certain economic theory applies, the time series techniques seeks the theoretical relationship to be determined by the data. Besides that, time series technique is also used to find the long term relationship between the variables, which conforms to the focus of the paper; to study the relationship between inflation and GDP in long run.

Common issues of time series data includes auto correlation and heteroscedasticity. To ensure that the data will run smoothly, a series of test will be conducted to take care of both issue. Three unit root tests, namely the Augmented Dickey-Fuller (ADF), Phillips-Perron (PP) and KPSS tests will be conducted on the level and differenced forms of the variables. These tests are essential to confirm that the variables are non-stationary. The results of the tests are as follows;

Unit Root Test

ADF Test

	VARIABLE	ADF	VALUE	T-STAT.	C.V.	RESULT
LOG FORM	LGDP	ADF(1)=SBC	393.0996	- 1.079	- 3.413	Non-Stationary
		ADF(1)=AIC	399.0668	- 1.079	- 3.413	Non-Stationary
	LINF	ADF(5)=SBC	499.1539	0.115	- 3.415	Non-Stationary
		ADF(5)=AIC	511.0883	0.115	- 3.415	Non-Stationary
	LEP	ADF(1)=SBC	268.2023	- 0.145	- 3.413	Non-Stationary
		ADF(4)=AIC	276.6589	- 0.457	- 3.411	Non-Stationary
	LIP	ADF(1)=SBC	219.8540	- 1.532	- 3.413	Non-Stationary
		ADF(2)=AIC	225.8212	- 1.532	- 3.413	Non-Stationary
	LXR	ADF(1)=SBC	204.7174	- 3.042	- 3.384	Non-Stationary
		ADF(5)=AIC	212.0259	- 2.793	- 3.396	Non-Stationary

1ST DIFF. FORM	VARIABLE	ADF	VALUE	T-STAT.	C.V.	RESULT
	DGDP	ADF(1)=SBC	379.6332	- 5.047	- 3.027	Stationary
		ADF(4)=AIC	385.1982	- 2.798	- 3.094	Non-Stationary
	DINF	ADF(4)=SBC	497.6978	- 3.606	- 3.094	Stationary
		ADF(4)=AIC	506.6280	- 3.606	- 3.094	Stationary
	DEP	ADF(2)=SBC	267.1115	- 5.133	- 3.010	Stationary
		ADF(3)=AIC	274.2379	- 5.585	- 3.012	Stationary
	DIP	ADF(1)=SBC	218.2550	- 7.983	- 3.027	Stationary
		ADF(1)=AIC	222.7201	- 7.983	- 3.027	Stationary
	DXR	ADF(1)=SBC	202.3398	- 8.797	- 2.920	Stationary
ADF(4)=AIC		208.1026	- 5.369	- 2.911	Stationary	

The null hypothesis for the ADF test is variable is non-stationary. From the results, all variables in the log form fail to reject the null hypothesis at 5% level, and thus indicates that all are non-stationary. In their first difference form however, all variables appears to be stationary with the exception of GDP. Since ADF test is known to have limitations, which is it can only correct autocorrelation problem (Dickey and Fuller, 1979), the study then proceeds to the PP test. The results are as follows;

PP Test

LOG FORM	VARIABLE	T-STAT.	C.V.	RESULT
	LGDP	- 1.160	- 3.502	Non-Stationary
	LINF	- 0.887	- 3.502	Non-Stationary
	LEP	0.173	- 3.502	Non-Stationary
	LIP	- 0.987	- 3.502	Non-Stationary
	LXR	- 2.474	- 3.408	Non-Stationary

1ST DIFF. FOR	VARIABLE	T-STAT.	C.V.	RESULT
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	DGDP	-	11.782	-	2.901	Stationary
	DINF	-	9.793	-	2.901	Stationary
	DEP	-	12.058	-	2.901	Stationary
	DIP	-	11.252	-	2.901	Stationary
	DXR	-	10.070	-	2.884	Stationary

The Phillips-Perron(PP) test solve both the problem of auto correlation and heteroscedasticity (Phillips and Perron,1988). The results shows that all variable are non-stationary in level form and stationary in its first difference form. The study then proceed to the KPSS test. The results are as follows;

KPSS Test

LOG FORM	VARIABLE	T-STAT.	C.V.	RESULT
	LGDP	0.192	0.139	Non-Stationary
	LINF	0.184	0.139	Non-Stationary
	LEP	0.168	0.139	Non-Stationary
	LIP	0.175	0.139	Non-Stationary
	LXR	0.098	0.139	Stationary

1ST DIFF. FORM	VARIABLE	T-STAT.	C.V.	RESULT
	DGDP			

		0.657	0.428	Non-Stationary
	DINF	0.575	0.428	Non-Stationary
	DEP	0.348	0.428	Stationary
	DIP	0.260	.42757	Stationary
	DXR	0.109	.42757	Stationary

The KPSS test has shown mixed results of the variables in log form and difference form, where the variable LXR is stationary in its level form and both DGDP and DINF are still non-stationary after the first difference. Based on the KPSS test results, the data is not suitable for cointegration test. However, the prevailing ADF and PP test has confirmed that the variables are all non-stationary in level form and stationary in its first difference. Therefore, the study will proceed to the Engle-Granger and Johansen test. The study will later adopt another cointegration test, which is the ARDL test that can identify the long run relationship between the variable while relaxes the requirement for variables to be non-stationary.

VAR Order Selection

Prior to the co-integration tests, it is crucial to determine the optimum number of lag for the variables, hence the order of vector autoregression (VAR) test is conducted. The lag was determined by comparing the results of Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC). The figure below shows the result of the VAR;

Selection criteria	No. of Lags
AIC	5
SBC	1

From the results, AIC indicates five lags while SBC use one lag. The AIC less concerned on over parameter and tend to choose higher order of VAR while SBC on the other hand is more concerned on over parameter and tend to choose lower order of VAR. Given the contradicting

nature of AIC and SBC, this study will choose three lag order, i.e. the midpoint of AIC and SBC results. The study now moves to the cointegration tests.

Cointegration Test

Engle-Granger

The cointegration test is conducted to determine whether there is theoretical relationship between the variables in the study. The first cointegration test conducted is the Engle-Granger test that determine the existence of cointegration by examining the error terms of variables. The results are as below;

VARIABLE	ADF	VALUE	T-STAT.	C.V.	RESULT	CONCLUSION
LGDP	ADF(5)=AIC	300.718	-3.179	-4.5129	NON-STATIONARY	NO COINTEGRATION
	ADF(2)=SBC	294.7022	-2.8811	-4.5129	NON-STATIONARY	NO COINTEGRATION

The results of the Engle-Granger(EG) test shows that the null hypothesis is failed to be rejected as t-statistics are smaller than critical value, hence the variables are non-stationary. The results further indicate that there is no cointegration between the variables. This unfavourable result might be connected and explained by the mixed results in unit root test (KPSS test) that discover not all variables were non-stationary. The study will then proceed with Johansen cointegration test.

Johansen Test

The second cointegration test done is the Johansen test. This test is considered more advanced than Engle-Granger test as it could identify the number of cointegrating vectors that exist between the variable (Johansen, 1991). The result of the test as follows;

Cointegration LR Test Based on Maximal Eigenvalue of the Stochastic Matrix				
Null	Alternative	Statistic	95% Critical Value	Result
r = 0	r = 1	51.161	37.860	cointegration
r <= 1	r = 2	27.958	31.790	

Cointegration LR Test Based on Trace of the Stochastic Matrix				
Null	Alternative	Statistic	95% Critical Value	Result
r = 0	r >= 1	121.886	87.170	cointegration

r<= 1	r>= 2	70.724	63.000	cointegration
r<= 2	r>= 3	42.766	42.340	cointegration
r<= 3	r>= 4	24.932	25.770	

The results of the test based at 5% significant level based on both Maximal Eigenvalue and Traces shows rejection of the null hypothesis. This proves that there is cointegration between the variables used in the study. The Johansen test however possess certain limitations. First of all, the test requires all variable to be stationary at I(1). The results of the test is also variant to the number of lag order by VAR and lastly, the stationary test is bias as it tend to accept the null at 95% at a time. Therefore, the study adopted another cointegration test that can overcome these limitations, which is ARDL.

Autoregressive Distributed Lags (ARDL)

The ARDL technique does not require data to be tested through the unit root test as it can accommodate both stationary and non-stationary variable. Besides being free from the restrictions of the Johansen test, the ARDL also can be used to study small sample size of data. For ARDL, the F-test is observed to determine whether there is long run relationship between the variables. The calculated F-statistic will be compared against the upper and lower critical values as connoted by Pesaran et al. (2001). The results of the F-statistics will be interpreted according to the following situations;

- F-statistics fall above the upper bound: The null hypothesis of no co-integration can be rejected and it can be concluded that the variables move together in the long run.
- F-statistics falls below the lower bound: The null hypothesis cannot be rejected and there is no co-integration between the variables.
- F-statistics to fall between the two asymptotic critical values: No conclusive result can be made.

The result of the test is shown in the table below;

Variables	F-statistics	p-value	Critical Lower Bound	Critical Upper bound	Conclusion
DGDP	7.3677	[.000]	3.189	4.329	Co-integration
DINF	7.5337	[.000]	3.189	4.329	Co-integration

DEP	2.4147	[.040]	3.189	4.329	No co-integration
DIP	4.8633	[.000]	3.189	4.329	Co-integration
DXR	2.9642	[.015]	3.189	4.329	No co-integration

From the results, we can see that F-statistics falls above the upper bound when the variable in focus, which is GDP is set to be the dependent variable. This shows that long run relationship exists between GDP, inflation, export, import and exchange rate, and the relationship is not spurious. Though the result shows that there is no cointegration when export(EP) and exchange rate(XR) was set to be the dependent variable, ARDL test only requires one cointegration to conclude that all the variables are cointegrated. Now that the theoretical relationship among the variables is confirmed, the study will move to the next step which is to determine the causality of the variables.

Vector Error Correction Model (VECM)

The Vector Error Correction Method (VECM) uses the estimated error correction term to decide whether a variable is exogenous or endogenous. If an error correction term is found to be significant, it is an endogenous variable. On the other hand, if the error correction term is insignificant, this can be interpreted as the dependant variable being exogenous or a leader. Below is the result for the VECM test;

ecm1(-1)	Coefficient	Standard Error	T-Ratio [Prob.]	C.V.	Result
dIGDP	-.028133	.0039352	-7.1490[.000]	5%	Endogenous
dLINF	-.0022452	.0021924	-1.0241[.308]	5%	Exogenous
dLEP	-.028384	.010404	-2.7282[.007]	5%	Endogenous
dLIP	-.024735	.012892	-1.9186[.057]	5%	Exogenous
dLXR	0.002124	0.016771	.12665[.899]	5%	Exogenous

From the results, the study identifies two endogenous variables, which are GDP and export, whereas inflation, import and exchange rate are shown as exogenous. The results can be interpreted as inflation, import and exchange rate have information about GDP and export. This is rather logical in economic perspective. GDP and export are easily influenced by the changing of exchange rate. For instance, depreciation of the currency can enhance export competitiveness, and subsequently increase the GDP. Inflation, which is the focus of this paper,

is definitely going to impact export and GDP. From the common arguments as presented in the theoretical underpinnings section above, when inflation increase, the level of consumption increased and thus elevate GDP (if the relationship is positive). Likewise, increase inflation also induce production, thus increase exports.

Another information to be derived from the VECM result is the coefficient of the error term. The coefficient will show the speed of adjustment to equilibrium. If the value is closer to 1, it means a faster adjustment, and if it is closer to 0, it means rather slow adjustment. The sign of the coefficient, either positive or negative, indicates whether the variable will move away or return to the equilibrium.

From the results, it can be seen that all variables except exchange rate has negative coefficient. This means that the variables will return to equilibrium after a shock. However, since the variables show values closer to zero, it means the speed of adjustment is rather slow.

Variance Decomposition (VDC)

The VECM test can only tell the absolute endogeneity or exogeneity of a variable. Thus, this study will perform variance decomposition (VDC) analysis to determine the relative exogeneity of the variables. This step is especially important to know the causal direction between the variables. There are two types of VDC test, namely generalised or orthogonalised VDC. However, since orthogonalised VDC test is rather variant to a particular ordering of the VAR, the generalised VDC will be adopted for this study. The generalised VDC is unique and does not depend on the ordering of the variable. Below are the results for the test;

Horizon	Variable	LGDP	LINF	LEP	LIP	LXR	Exogeneity	Ranking
48	LGDP	44.98%	1.68%	1.89%	27.49%	23.97%	44.98%	5
	LINF	16.88%	79.92%	0.24%	1.13%	1.83%	79.92%	2
	LEP	2.02%	2.34%	68.68%	20.51%	6.46%	68.68%	3
	LIP	2.87%	0.38%	4.80%	46.62%	45.33%	46.62%	4
	LXR	0.39%	0.06%	0.49%	10.78%	88.28%	88.28%	1
Horizon	Variable	LGDP	LINF	LEP	LIP	LXR	Exogeneity	Ranking
60	LGDP	40.23%	1.75%	4.53%	26.71%	26.78%	40.23%	5
	LINF	17.29%	79.29%	0.85%	1.39%	1.18%	79.29%	2

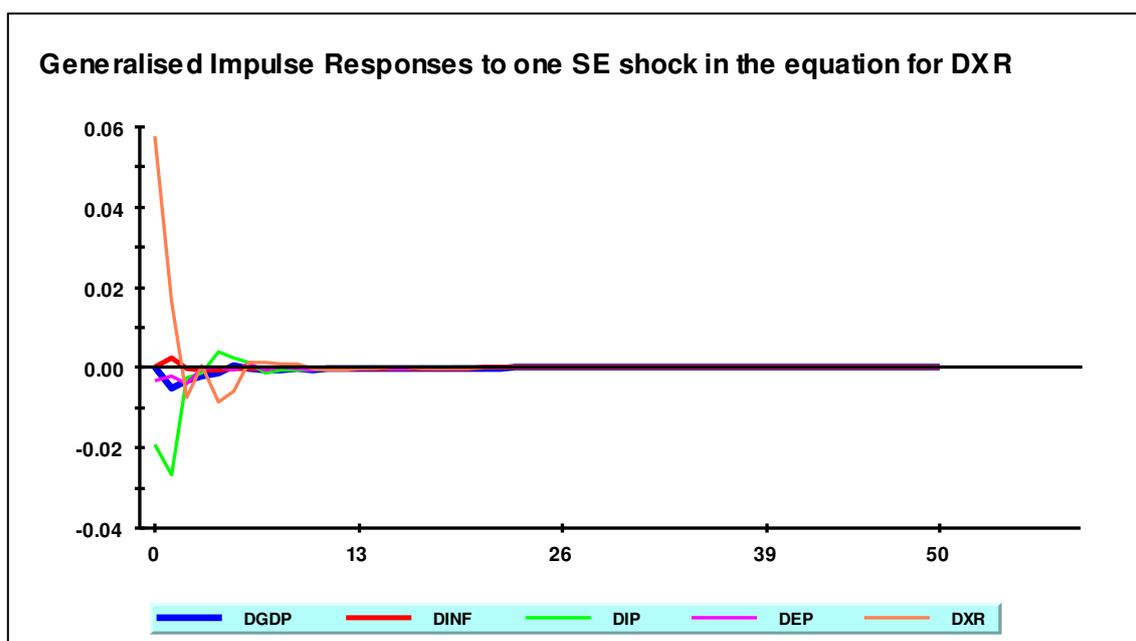
LEP	1.64%	2.58%	66.48%	21.61%	7.70%	66.48%	3
LIP	2.50%	0.34%	4.04%	46.10%	47.02%	46.10%	4
LXR	0.40%	0.05%	0.50%	10.32%	88.72%	88.72%	1

In the generalised VDC, a variable is regarded as most exogenous when the forecast error variance is mostly explained by its own shock. Though there is slight deviation in the shock for import in horizon 60 (shock to exchange rate is higher), the ranking of exogeneity for both horizon shows similar result. The most exogenous variable in the study is the exchange rate, while inflation which is the focus of the study took the second place. However, the result confirms to the estimated results, by which GDP who represents economic growth is at the bottom ranking. It shows that GDP is the least exogenous variable, which also implies as the most endogenous variable based on the result of VECM previously. The causal direction of the variables is illustrated in the diagram below;



The implication of the result is, since inflation is an exogenous variable, it means that it would be difficult for the authorities to control it. An exogenous variable means a variable that is influenced by external factor. It affects the model being tested without being affected by it, its qualitative characteristics and method of generation are not specified by the model. Therefore, should the monetary authority aim to boost the economic growth by controlling inflation, the outcome of the policy may not come out as planned. Level of inflation might be affected by various other external factors, for example as featured by the study, by the exchange rate, since it is superior in exogeneity than inflation. While a monetary authority targets to keep inflation at a certain percentage using various tools such as interest rate, the outcome may come out of the monetary authority control.

After exchange rate and inflation, export comes third in exogeneity. However, as shown by prior VECM test, export is an endogenous variable. It ranks higher than import and GDP in



The first picture shows the graphical illustration when the variable GDP is shocked, while the second picture is the result when exchange rate is shocked. As reflected earlier in by the coefficient of the error term in the VECM test, all variables returned to the equilibrium after the shock. However, since the size of error term is quite small, the variables took longer time to return to equilibrium.

Non-linear ARDL

The applied ARDL technique in this study however, do have several limitations. Firstly, it assumes linear and symmetrical adjustment. Linearity suggest that there should be proportional change to the dependent variable in reflection of changes to the independent variable. Symmetrical adjustment means constant speed of adjustment from equilibrium. These two assumptions are generally impossible to applies to the economic variables that has dynamic interactions among each other, and whose responses to stimuli varies unpredictably. Therefore, this study will adopt another more recent technique, which is non-linear ARDL (NARDL). This technique by Shin et al. (2014) are not restrictive by the two assumptions of ARDL. NARDL test linear and non-linear co-integration while differentiating the short run and long run effects of regressors to the dependant variable.

Cointegration Test

Variables	F-statistics	Critical Lower Bound	Critical Upper bound	Conclusion
INF	6.4033	3.17	4.14	Co-integration

Wald Test for Short and Long Run Symmetry

Independent: Inflation rate	F-statistics	p-value	Selected specification
Long run	70.99	0.000	Asymmetry
Short run	0.928	0.339	Symmetry

The NARDL test for this study only focused on two variables, which is GDP as the dependent variable and inflation as the independent variable. From the result, it can be seen that the F-stat value is more than the upper bound, therefore the result is significant. It means that inflation and GDP is cointegrated in the long run. In the Wald test for short and long run symmetry, the result shows that the result is only significant for the long run, thus we reject the null. The results can be interpreted as the relationship between inflation and GDP is not symmetry in the long run, however, their effects to each other may be symmetry in short run.

Concluding Remarks and Policy Implications

The long debated relationship between inflation and economic growth has yet to find its definite answer. The various studies in regard to the two macroeconomic variables has shown mixed results. Nonetheless, the existence of long run relationship between the two is valid and was reflected by the results of this study. However, the causality test has shown that inflation is an exogenous variable, which means it is a variable that is not defined by any other variable in this study. The policy implication of this result will be, inflation should not be used as an approach to boost the economic growth; which in this study is represented by GDP. Instead, inflation could only be applied when the focus is to maintain price stability in the market. It is reasonable to emphasise that inflation targeting policy and economic growth are two entirely different macroeconomic objectives that may have conflicting effects to each other, if proven to be inversely related. Therefore, it is wise for policy makers to have this in mind when they

seek to pursue inflation targeting policy in their respective country. Nonetheless, from this study, it is shown that inflation and economic growth have long run asymmetric relationship and the causal direction flows from inflation to GDP.

Limitations of this study will be the lack of more suitable variables that could be connected to inflation and economic growth. Besides that, when it comes to relationship between inflation and GDP, more focus has been put on the determination of the optimum level or threshold for inflation to be held at a particular country. Nonetheless, this study should serve the purpose of identifying the relationship between the two variables in the long run for South Korea. The aim of the study is significant regardless of numerous similar studies in the past, as the results varied from one country to another, and from one period to the other.

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