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Application of path analysis of the effect of macroeconomic conditions to the share prices of PT AKR Corporindo Tbk

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Abstract:
Prior to known as path analysis, causal modelling has been widely utilised by many researchers in many different areas, such as education, social science, transportation, and economics. This study aims to hypothesize whether the existence of direct and indirect effects of INFL to INTR; INFL and INTR to EXCR; EXCR and INTR to GDP; and INTR and GDP to SP is available based on the constructed models. The application of path analysis in this study is used to measure the causal modelling between share prices of AKRA (SP) and its macroeconomic factors affecting it directly and/or indirectly. The proxy of macroeconomics in this study are inflation rate (INFL), exchange rate (EXCR), interest rate (INTR), and Gross Domestic Product (GDP). The findings suggest that all four estimated models either have only a direct effect or have both direct and indirect effects. Furthermore, the static analysis determines that not all effects satisfying both significant and meaningfulness criteria, which some are only meaningfulness but they need to remain on the models. The decomposition of correlation among variables is also constructed and the computation shows that some have a strong correlation and others have a slightly weak correlation. The model can be a measurement for taking a call or a put for the investors' decision holding AKRA shares.

Keywords:*Share prices, path analysis, direct effect, indirect effect, energy industry*

I INTRODUCTION

It is widely argued that share prices of some certain entities are highly volatile. This makes investors who have intention to put their fund in stock markets analyse the market more deeply before making an action. The high volatility means high uncertainty, but on the good side it might generate higher return.

Some macroeconomics indicators are frequently applied as independent variables to determine their impact on the movement of share prices. Government policies play a very fundamental role on affecting investors' judgment. They can use the causal effect for each variable that fits their analysis in order to minimize the potential loss.

PT AKR Corporindo Tbk is an oil and gas company that has a volatile share price. Also, Indonesian government has a significant role to make decisions in oil and gas sector. Therefore, one way to see the relationship between those factors in affecting oil and gas share price on stock market is by applying path analysis as it examines each causal correlation among variable either directly or indirectly.

II LITERATURE REVIEW

Wright (1921) introduced path analysis as the tool in analysing the direct and indirect effects as well as their correlation between variables. However, Striner (2005) argued that the causality

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between variables cannot be either established or construct the correct specific model. It is due to path analysis is only to ensure consistency of the model. The model uses the standardized data (Milligan and Cooper, 1988) which requires linear causal fashion (Wonnacott and Wonnacott, 1990). Pedhazur (1997) expressed for the shifting of linear assumption that the decomposition of correlation is required into direct and indirect effect. This is defined by Gilmour (1978) which stated that linked variables are led by other intervening variables and direct link among them.

The model of path analysis has been widely applied in many fields of study. Sewell et al. (1970) studied the model in educational area to explain occupational attainment of Wisconsin high school students, while in business and marketing it was conducted by Bagozzi (1980). Furthermore, researches by applying path analysis in transportation study are done by Gilmour (1978) and Osada et al. (1997).

In making decision to invest in stocks of some certain companies, it basically needs the ability to analyse more deeply the factors affecting its volatile movements (Nurfadilah et al., 2017). Not only have they come from the fundamental analysis of financial statements like some ratios measuring the performances of the corporation to have better knowledge on judgment for investing in stocks(Muhammad and Ali, 2018), but it also necessarily considers macroeconomic factors which may have been directly or indirectly engaged on the changes of share prices (Kyereboah-Coleman and Agyire-Tettey, 2008).

The ups and downs of share prices occur very frequently. By that, some studies have proved many factors influenced it, particularly the share prices from energy sector (Antono et al., 2019). This study aims to model the predetermined variables affecting directly and indirectly PT AKR Corporindo, Tbk share prices (Code: AKRA), listed in Jakarta Islamic Index (JII) as one of the blue chip stocks, by applying path analysis. However, instead of financial factors, this study prefer to analyse the macroeconomic factors to measure the direct and indirect effect of share price of AKRA, such as inflation, exchange rate, interest rate, and Gross Domestic Product (GDP).

III METHOD AND STATISTICAL MODELLING

The path diagram of Inflation (INFL), Exchange Rate (EXCR), Interest Rate (INTR), Gross Domestic Product (GDP), and Share Price (SP) of AKRA is detailed as follows.

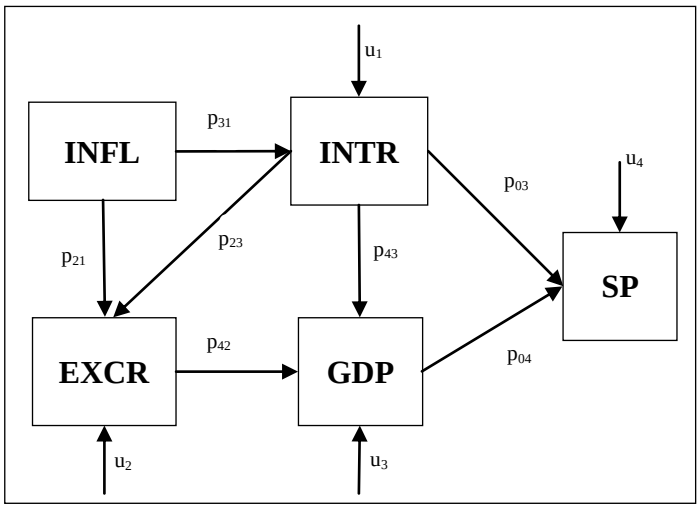

Fig. 1.Path diagram of INFL, EXCR, INTR, GDP, and SP

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From the diagram on figure 1, the static model according to Wooldridge (2013) is written as follows:

Model (1): $INTR = p_{31} INFL + u_1$ (1)

Model (2): $EXCR = p_{21} INFL + p_{23} INTR + u_2$ (2)

Model (3): $GDP = p_{42} EXCR + p_{43} INTR + u_3$ (3)

Model (4): $SP = p_{03} INTR + p_{04} GDP + u_4$ (4)

Where u_1, u_2, u_3, and u_4 are error terms, which can be calculated as the following equation:

$u_i = \sqrt{1 - Rsquares_i}$; and i = 1,2,3,4 (5)

In this study, we construct four hypothesis to be tested from the models, such as: (1) there is no direct effect of INFL to INTR; (2) there is no direct effect of INFL and INTR to EXCR; (3) there is no direct effect of EXCR and INTR to GDP; and (4) there is no direct effect of INTR and GDP to SP. Moreover, it is necessity to compose the total effects of one variable to other variables to complete the direct and indirect effects. Striner (2005) elaborated path analysis as the "chains" of influence that have some dependent variables, for example variable X affects variable Y, which in turn influences variable Z. Russo (2009) supports this argument where total effect is the value of paths tracking the arrows from X to Z.

Decomposition of Correlations

Alwin and Hauser (1975) argued that there are one or more components containing the correlation between any two variables in path model. They are which those correlations engaged in unanalysed correlation among fixed variables, those correlations due to some dependences on correlated variables and effects. The latter is explicitly as the total of direct and indirect effects. Since it is necessarily to transform the data into standardized with mean of zero and variance equal to one. From the theory of statistics for the standardized data (Milligan and Cooper, 1988), for example Z_1 and Z_2 are in standardized form, then the expected value, $E(Z_1)=0$, $E(Z_2)=0$, $E(Z_1.Z_1)=1$ (variance of Z_1), $E(Z_2.Z_2)=1$ (variance Z_2), and $E(Z_1.Z_2)=r_{12}$ (correlation of Z_1 and Z_2), then we can formulate the expected value for each correlation among variables as follows.

Table 1
Expected values of combination of variables

Expectation of Variables	Expected Value
E(INFL.INFL)	1
E(EXCR.EXCR)	1
E(INTR.INTR)	1
E(GDP.GDP)	1
E(SP.SP)	1
E(INFL.INTR)	r_{13}
E(INFL.EXCR)	r_{12}
E(INTR.EXCR)	r_{32}
E(EXCR.GDP)	r_{24}
E(INTR.GDP)	r_{34}
E(INTR.SP)	r_{30}
E(GDP.SP)	r_{40}

Where r is the correlation between variables. Furthermore, we can mathematically decompose those correlations between one variable to another variable from each model. For model (1), it is

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simply multiplying both sides by INFL to proceed the expected value of its correlation.

$E(INFL.INTR) = p_{31}.E(INFL.INFL)r_{13} = p_{31}$ (6)

Correlations in model (2) can be decomposed as r_{12} and $r_{32.}$ For r_{12} all variables in the model should be multiplied by INFL, so the expected value of correlation is computed as:

$E(INFL.EXCR) = p_{21}.E(INFL.INFL) + p_{23}.E(INFL.INTR)$

$r_{12} = p_{21} + p_{23}.r_{13}$

$r_{12} = p_{21} + p_{23}.p_{31}$ (7)

For r_{32}, both sides are multiplied by INTR and the expected value of correlation is computed as:

$E(INTR.EXCR) = p_{21}.E(INTR.INFL) + p_{23}.E(INTR.INTR)$

$r_{32} = p_{21}.r_{13} + p_{23}$

$r_{32} = p_{21}.p_{31} + p_{23}$ (8)

In model (3), the decomposition of correlation is r_{24} and r_{34}. For r_{24}, all variables is multiplied by EXCR to find the expected value of its correlation.

$E(EXCR.GDP) = p_{42}.E(EXCR.EXCR) + p_{43}.E(EXCR.INTR)$

$r_{24} = p_{42} + p_{43}.r_{32}$

$r_{24} = p_{42} + p_{43}(p_{21}.p_{31} + p_{23})$

$r_{24} = p_{42} + p_{43}.p_{21}.p_{31} + p_{43}.p_{23}$ (9)

For r_{34}, both sides are multiplied by INTR and the expected value of correlation is computed as:

$E(INTR.GDP) = p_{42}.E(INTR.EXCR) + p_{43}.E(INTR.INTR)$

$r_{34} = p_{42}.\ r_{32} + p_{43}$

$r_{34} = p_{42}\ (p_{21}.p_{31} + p_{23}) + p_{43}$

$r_{34} = p_{42}.p_{21}.p_{31} + p_{42}.p_{23} + p_{43}$ (10)

Correlation for model (4) is decomposed as r_{30} and r_{40}. Correlation of r_{30} can be detailed by multiplied both sides INTR as follows.

$E(INTR.SP) = P_{03}.E(INTR.INTR) + p_{04}.E(INTR.GDP)$

$r_{30} = p_{03} + p_{04}.r_{34}$

$r_{30} = p_{03} + p_{04}\ (p_{42}.p_{21}.p_{31} + p_{42}.p_{23} + p_{43})$

$r_{30} = p_{03} + p_{04.}p_{42}.p_{21}.p_{31} + p_{04}.p_{42}.p_{23} + p_{04}.p_{43}$(11)

For r_{40}, both sides are multiplied by GDP and the expected value of correlation is computed as:

$E(GDP.SP) = p_{03}.E(GDP.INTR) + p_{04}.E(GDP.GDP)$

$r_{40} = p_{03}.r_{34} + p_{04}$

$r_{40} = p_{03}\ (p_{42}.p_{21}.p_{31} + p_{42}.p_{23} + p_{43}) + p_{04}$

$r_{40} = p_{03}.p_{42}.p_{21}.p_{31} + p_{03}.p_{42}.p_{23} + p_{03}.p_{43} + p_{04}$(12)

IV RESULT AND DISCUSSION

The data used in this study are inflation rate in Indonesia (INFL) taken from Bank Indonesia 2019, exchange rate (EXCR) from US Dollar to Indonesian Rupiah (www.investing.com), interest rate (INTR) issued by Bank Indonesia up to the last quartile 2018, Gross Domestic Product (GDP) of Indonesia published at Central Bureau of Statistic (BPS), and share prices (SP) of AKRA from 2006 to 2018. Milligan and Cooper (1988) stated that before analysing the data which have different ranges, they are transformed into standardized form to have a mean of zero and standard deviation of one that can enhance the comparison process, displayed on figure 2.

Data analysis for model (1) is shown on table 2 as follows.

Table 2
Variance Analysis for Testing Model (1)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	37.504	37.504	138.951	<.0001
Error	50	13.495	0.269		
Corrected Total	51	50.999			
R-Squares = 0.735					

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F-test and p-value (138.951and <0.0001 respectively) are clearly examined that the null hypothesis is rejected, indicating there is a direct effect on INFL to INTR. In addition, R-squares shows that the model explains 73.5% of the variation of INTR.

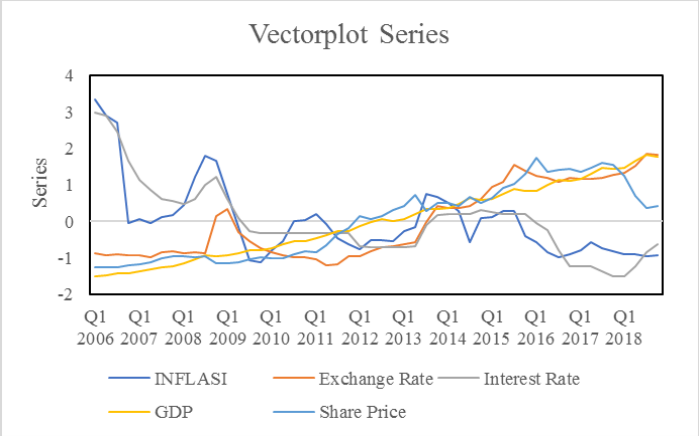

Fig.2.the Series of INFL, EXCR, INTR, GDP, and SP Plotting after Standardization

Table 3
Estimation Parameters for Model (1)

Parameter	Estimate	Standard Error	t Value	Pr > |t|
INFL	0.858	0.072	11.788	<.0001

Table 3 gives the estimated parameters of model (1), in which p_{31} = 0.858. For the partial test of model (1), testing H_0: p_{31} = 0, it is computed that t-value = 11.78 and p-value = <0.0001 and the null hypothesis is rejected. Hence, INFL gives the direct effect on INTR significantly.

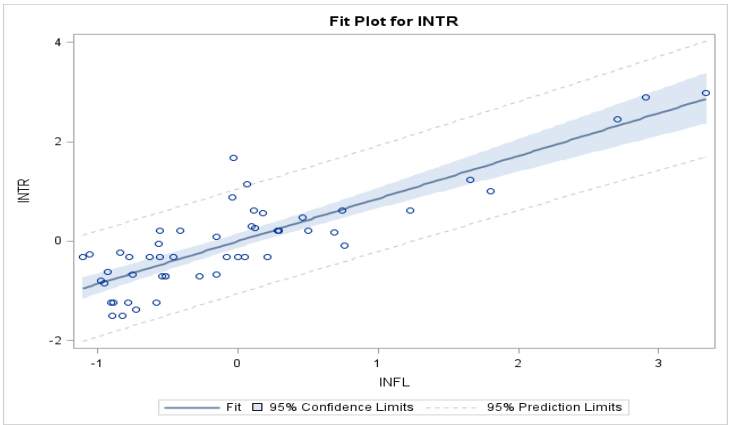

Fig. 3.The Counter Fit Plot for Model (1)

From figure 3, counter fit plot model (1) shows that a positive trend, shown in light blue area, which in line with the value of estimated parameter p_{31}=0.858. The increasing INFL of one standard deviation affects directly to increase INTR of 0.858 standard deviation by holding other variables are constant.

Analysis of data for model (2) are shown in table 4.

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Table 4
Analysis of Variance for Testing Model (2)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	9.116	4.558	5.333	0.008
Error	49	41.883	0.854		
Corrected Total	51	50.999			
R-Squares = 0.179					

Table 4 presents the F-value = 5.333 with p-value = 0.008 meaning the null hypothesis is rejected which in turn there are direct effects of INFL and INTR to EXCR. The R-squares of 0.179 represents 17.9% of variation of EXCR explained by the model.

Table 5
Estimation Parameters for Model (2)

Parameter	Estimate	Standard Error	t Value	Pr > |t|
INFL	0.056	0.251	0.224	0.824
INTR	-0.470	0.251	-1.868	0.068

The parameters estimated for model (2) are p_{21} = 0.056 and p_{23} = -0.470. On the basis of partial test from table 5, to test H_0: p_{21} = 0, the determination of t-value is 0.224 and p-value is 0.824, making the null hypothesis is not rejected. Meanwhile, for testing H_0: p_{23} = 0, it is calculated that t-value is -1.868 and p-value is 0.068 which confirms to not reject the null hypothesis. However, the estimate of both p_{21} and p_{23} are still above 0.05 and they are considered meaningfulness (Pedhazur, 1997; Heisse, 1969; Land, 1969), thus it is not necessary to remove them from the model. Hence, both inflation and interest rate have a direct effect on exchange rate.

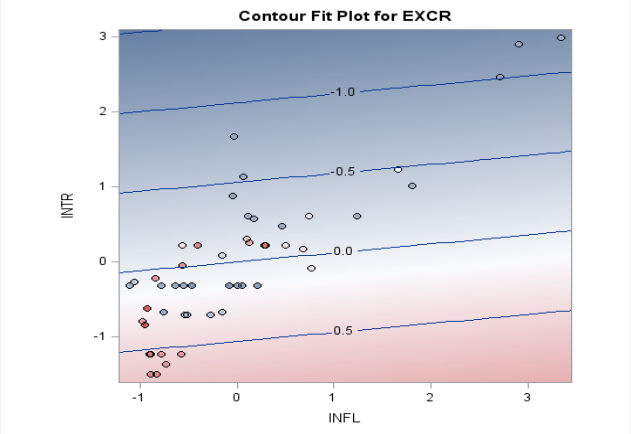

Fig. 4.The Counter Fit Plot for Model (2)

Figure 4 confirms model (2) counter plot which illustrates that as the values of INFL close to -1 and the values of INTR are more than -1, the values of EXCR are getting higher shown in red

area. On other word, blue area is indicating the lower or negative EXCR.

Model (3) is analysed based on the following table.

Table 6
Analysis ofVariance for Testing Model (3)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	46.516	23.258	254.190	<.0001
Error	49	4.483	0.091		
Corrected Total	51	50.999			
R-Squares = 0.912					

From the variance analysis presented on table 6, the null hypothesis for model (3) is rejected as the F-value gives of 254.190 with p-value of <0.0001. This is a clear evidence that the variables simultaneously have direct effect on the GDP. R-squares of 0.912 also supports this finding as 91.2% of the variation of SP is explainable by the model.

Table 7
Estimation Parameters for Model (3)

Parameter	Estimate	Standard Error	t Value	Pr > |t|
EXCR	0.692	0.046	14.818	<.0001
INTR	-0.428	0.046	-9.158	<.0001

Table 7 examines to conduct the partial test of each variable for model (3) in which the estimate parameter of p_{42}=0.692, and p_{43}=-0.428. In association of partial test, each variable has the same p-value of <0.0001 and t-value of 14.818, -9.158 respectively, which makes the null hypothesis is rejected. Thus, exchange rate and interest rate significantly have direct effect on GDP.

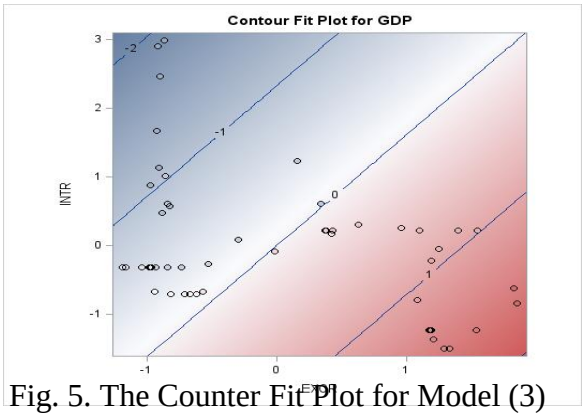

Fig. 5. The Counter Fit Plot for Model (3)

The graph supports what is on figure 1 that there is an upward trend of EXCR in affecting GDP of p_{42}=0.692. This implies an increase of one standard deviation of exchange rate will increase

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GDP on average by 0.692 holding others being constant. On the other hand, INTR has a negative trend to affect GDP, meaning when INTR increases by one standard deviation, GDP will decrease by 0.428. Figure 5 also explain us that given EXCR values above 1 and INTR < -1, GDP plots on red areas indicating it a high value (more than 1), shown in red area.

The last model (4) is measured as data analysis presented on table 8.

Table 8
Analysis of Variance for Testing Model (4)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	42.913	21.456	130.024	<.0001
Error	49	8.086	0.165		
Corrected Total	51	50.999			

R-Squares = 0.841

Simultaneously with F-value of 130.024 and p-value of <0.0001 table 8 suggests us to reject the null hypothesis. The strong R-squares of 0.841 indicates that the model can explain the variation of share prices.

Table 9
Estimation Parameters for Model (4)

Parameter	Estimate	Standard Error	t Value	Pr > |t|
INTR	0.056	0.081	0.680	0.500
GDP	0.957	0.081	11.673	<.0001

Model (4) has the estimation of variable p_{03}=0.056 and p_{04}=0.957. To test partial estimated parameter of H_0: p_{03}=0, the statistical calculation is t-value=0.680 and p-value=0.500 which we fail to reject the null hypothesis. In spite of this insignificant result, the parameter is still more than 0.05 in which based on Heisse (1969), Land (1969), and Pedhazur (1997) it is still meaningfulness and no need to remove it from the model. To test H_0: p_{04}=0 with t-value of 11.673 and p-value of <0.000, the null hypothesis is rejected. On the other words, there are direct effect of INTR and GDP to SP.

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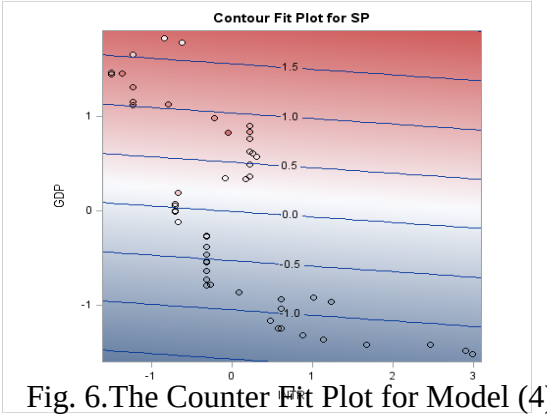

Fig. 6.The Counter Fit Plot for Model (4)

Figure 6 clarifies that both there are a positive trend on both variables affecting the share prices of AKRA. By all means, if GDP increases its deviation, SP will follow the increase. Similarly, share price will also go up its standard deviation if interest rate increase it by one unit of standard deviation. This is proven by the red area which demonstrate the higher value of SP, and blue are a lower value of SP.

Direct, Indirect, and Total Effects

From the results of coefficient parameters in four models, the path diagram with its estimation is depicted as follows.

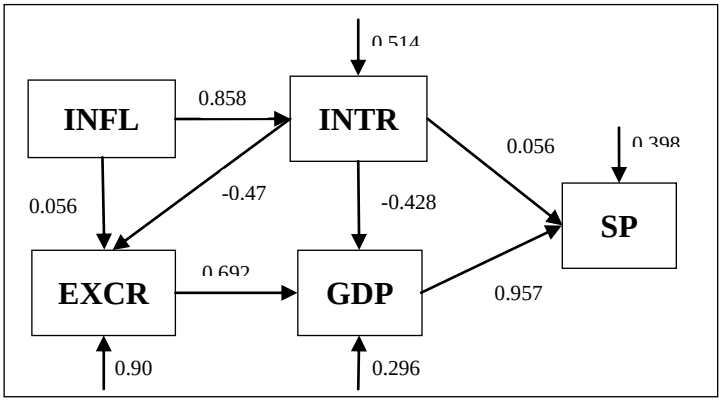

Fig. 7.Path Diagram of the Models along with its parameter estimations

Based on the statistical analysis, model (1) is estimated as:

INTR = 0.858 INFL (13)

R-squares: 0. 735$u_1 = \sqrt{1 - 0.735} = 0.5147$

Model (1) examines that direct effect of INFL to INTR is p_{31}=0.858. It is strongly significant with p-value < 0.0001 and gives positive effect of approximately 85.8% increase on INTR if standard deviation in inflation increases. Model (2) is estimated as:

EXCR = 0.056 INFL – 0.470 INTR (14)

R-squares: 0.178

$$u_2 = \sqrt{1 - 0.179} = 0.90$$

Despite both estimated parameter variables have insignificant p-value as they are above 0.05, it is inevitable that according to Heisse (1969) they are still in meaningfulness. This is argued as the coefficient parameters are above 0.05 so as that they still contribute a direct effect meaningfully to EXCR. Inflation allows a slight significance of 0.056 to the increase of standard deviation of exchange rate, while a negative trend is committed by interest rate to affect the decrease of 0.470 of exchange rate's standard deviation. The decomposition of direct and indirect effect on the other hand from INFL to EXCR is presented as follows.

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Direct Effect	p_{21}		=	0.056
Indirect Effect	p_{31} . p_{23}	= (0.858)(-0.470)	=	-0.403
Total Effects	p_{21} + (p_{31} . p_{23})		=	-0.347

Whereas the effect of INTR to EXCR has only a negative direct effect of p_{23}=-0.470. Model (3) is estimated as:

GDP = 0.692 EXCR – 0.428 INTR (15)

R-square: 0.912

$u_3 = \sqrt{1 - 0.912} = 0.296$

Equation (3) presents the direct effects of EXCR and INTR to GDP, of which both effects are very significant with each p-value is <0.0001 and meaningfulness. While exchange rate involves in increasing GDP standard deviation by 0.692 positively, interest rate contributes in decreasing it by 0.428 negatively. The path diagram on figure 5 suggest that the effect of INTR to GDP can be decomposed into direct and indirect effects.

Direct Effect	p_{43}		=	-0.428
Indirect Effect	p_{23} . p_{42}	= (-0.470)(0.692)	=	-0.325
Total Effects	p_{43} + (p_{23} . p_{42})		=	-0.753

On the other side, the effect of EXCR is only direct effect positively into GDP of 0.692 standard deviation.Model (4) is estimated as:

SP = 0.056 INTR + 0.957 GDP (16)

R-square: 0.841

$u_4 = \sqrt{1 - 0.841} = 0.398$

Model (4) indicates the direct effect from INTR and GDP to SP. The effect of INTR to SP is not significant (p-value > 0.05) but as the meaningful criterion, it is meaningfulness and can still contribute to effect SP variation by 5.6%. In contrast, GDP give a strong significance (p-value <0.0001) to induce an increase of standard deviation of SP by 95.7%. Furthermore, the effect of INTR to SP commits into the decomposition of direct and indirect effect as follows.

Direct Effect	p_{03}		=	0.056
Indirect Effect	p_{43} . p_{04}	= (-0.428)(0.957)	=	-0.409
Total Effects	p_{03} + (p_{43} . p_{04})		=	-0.353

While GDP only has a direct effect of 0.957 positively.

Decomposition of Correlations

Variable correlations are presented as follows.

Table 10
Coefficients of Pearson Correlation, with N=52

	INFL	EXCR	INTR	GDP	SP
INFL	1.0000	-0.347 (0.012)	0.858 (<0.0001)	-0.571 (<0.0001)	-0.498 (<0.0001)
EXCR		1.0000	-0.422 (0.002	0.873 ((<0.0001)	0.805 (<0.0001)
INTR			1.0000	-0.720 (<0.0001)	-0.633 (<0.0001)
GDP				1.0000	0.916 (<0.0001)
SP					1.0000

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First correlation decomposition is analysed for model (1) as INFL to INTR, r_{13}. This is analysed as $r_{13} = p_{31} = 0.858$, indicating that the direct effect of INFL on INTR is 0,858.

For model (2), the decomposed correlations are between INFL to EXCR (r_{12}) and INTR to EXCR (r_{32}). Correlation of $r_{12} = p_{21} + (p_{23}.p_{31})$ is explained as in table 10.

Table 11
Decomposed correlation between INFL and EXCR, r_{12}

Components	Numerical quantity	Meaning
p_{21}	0.056	Inflation (INFL) has direct effect to exchange rate (EXCR).
$p_{23}.p_{31}$	-0.403	Inflation (INFL) has direct effect to interest rate (INTR) and INTR has direct effect to EXCR.
Total (r_{12})	-0.753	

And correlation of $r_{32} = (p_{21}.p_{31)} + p_{23}$ is explained as follows.

Table 12
Decomposed correlation between INTR and EXCR, r_{23}

Components	Numerical quantity	Meaning
$p_{21}.p_{31}$	0.048	Inflation (INFL) has direct effect to exchange rate (EXCR) and INFL has direct effect INTR.
p_{23}	-0.470	Interest rate (INTR) has direct effect to exchange rate (EXCR).
Total (r_{32})	-0.422	

Associated to model (3), variable correlations decomposed are EXCR to GDP, r_{24}, and INTR to GDP, r_{34}. The explanation of $r_{24} = p_{42} + (p_{43}.p_{21}.p_{31}) + (p_{43}.p_{23})$ is as follows.

Table 13
Decomposed correlation between EXCR and GDP, r_{24}

Components	Numerical quantity	Meaning
p_{42}	0.692	Exchange rate (EXCR) has direct effect to Gross Domestic Product (GDP).
$p_{43}.p_{21}.p_{31}$	-0.020	Inflation (INFL) has direct effect to exchange rate (EXCR)
$p_{43}.p_{23}$	0.201	and interest rate (INTR), and INTR has direct effect on Gross Domestic Product (GDP). Interest rate (INTR) has direct effect on exchange rate (EXCR) and INTR has direct effect on Gross Domestic Product (GDP)
Total (r_{24})	0.873	

And correlation of $r_{34} = (p_{42}.p_{21}.p_{31}) + (p_{42}.p_{23}) + p_{43}$ is presented as follows.

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Table 14
Decomposed correlation between INTR and GDP, r_{34}

Components	Numerical quantity	Meaning
$p_{42}.p_{21}.p_{31}$	0.033	Inflation (INFL) has direct effect on exchange rate (EXCR) and interest rate (INTR), and EXCR has direct effect on Gross Domestic Product (GDP).
$p_{42}.p_{23}$	-0.325	Interest rate (INTR) has direct effect on exchange rate (EXCR) and EXCR has direct effect on Gross Domestic Product (GDP).
p_{43}	-0.428	Interest rate (INTR) has direct effect on Gross Domestic Product (GDP).
Total (r_{34})	-0.720	

In terms of model (4), the decomposition of variable correlations is INTR to SP (r_{30}) and GDP to SP (r_{40}). $r_{30} = p_{03} + (p_{04}.p_{42}.p_{21}.p_{31}) + (p_{04}.p_{42}.p_{23}) + (p_{04}.p_{43})$ can be elaborated as shown in table 14 [26-28].

Table 15
Decomposed correlation between INTR and SP, r_{30}

Components	Numerical quantity	Meaning
p_{03}	0.056	Interest rate (INTR) has direct effect on share price (SP).
$p_{04}.p_{42}.p_{21}.p_{31}$	0.032	Inflation (INFL) has direct effect on exchange rate (EXCR) and interest rate (INTR), EXCR has direct effect on gross domestic product (GDP), and GDP has direct effect on share price (SP).
$p_{04}.p_{42}.p_{23}$	-0.311	Interest rate (INTR) has direct effect on exchange rate (EXCR) and gross domestic product (GDP), and GDP has direct effect on share price (SP).
$p_{04}.p_{43}$	-0.409	Interest rate (INTR) has direct effect on gross domestic product (GDP), and GDP has direct effect on share price (SP).
Total (r_{30})	-0.633	

And correlation of $r_{40} = p_{03}.p_{42}.p_{21}.p_{31} + p_{03}.p_{42}.p_{23} + p_{03}.p_{43} + p_{04}$ is presented as follows.

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Table 16
Decomposed correlation between GDP and SP, r_{40}

Components	Numerical quantity	Meaning
$p_{03}.p_{42}.p_{21}.p_{31}$	0.002	Inflation (INFL) has direct effect on exchange rate (EXCR) and interest rate (INTR), EXCR has direct effect on gross domestic product (GDP), and INTR has direct effect on share price (SP).
$p_{03}.p_{42}.p_{23}$	-0.018	Interest rate (INTR) has direct effect on exchange rate (EXCR) and gross domestic product (GDP), and INTR has direct effect on share price (SP).
$p_{03}.p_{43}$	-0.024	Interest rate (INTR) has direct effect on gross domestic product (GDP), and INTR has direct effect on share price (SP).
p_{04}	0.957	Domestic product (GDP) has direct effect on share price (SP).
Total (r_{40})	0.916	

V CONCLUSION

This study examines causal modelling of some variables such as INFL, EXCR, INTR, GDP, and SP by implementing path analysis. From the statistical analysis, it is found that all four hypothesis are rejected, indicating that the models have direct effects on their respective variables. However, not all direct effects satisfies the significance and meaningfulness criteria, as some have only a meaningfulness. The direct effects for each model can be explained in details. Model (1) have a direct effect of 0.858 for INFL to INTR. Model (2) have direct effect and indirect effect on INFL and INTR to EXCR, in which direct effect of INFL to EXCR is 0.056 and INTR to EXCR is -0.47. Indirect effect in model (2) is decomposed for INFL to EXCR of -0.347. The next model (3) measures the direct and indirect effect of INTR and EXCR to GDP. The direct effects of EXCR to GDP and INTR to GDP are 0.692 and -0.428 respectively, while indirect effect of INTR to GDP is calculated of -0.325. The last model (4) compose into direct and indirect effects of INTR and GDP to SP. The direct effect of INTR to SP is 0.056 and GDP to SP is 0.957, whereas indirect effect of INTR to SP is computed by -0.409. In addition, model of path analysis is utilized to decompose the correlation among component variables, and in this study the decomposition of correlation can be explained on INFL to INTR, INFL to EXCR, INTR to EXCR, EXCR to GDP, INTR to GDP, INTR to SP, and GDP to SP.

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