

# **THE COINTEGRATION OF MACROECONOMIC VARIABLES TOWARDS DISTRIBUTION YIELD OF REAL ESTATE INVESTMENT TRUSTS (REITS) IN MALAYSIA AND SINGAPORE: THE INVESTOR PERSPECTIVES**

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**Purpose** – This study determines to examine the effect of macroeconomic variables on the distribution yield of REITs in Malaysia and Singapore.

**Methodology** – The authors used the Multiple Regression Model Test to measure the association amongst macroeconomic variables and REITs distribution yield and also to investigate whether distribution yield in selected countries responds differently towards macroeconomic variables. Besides, Johansen's Cointegration Test is used to examine the cointegration of REITs distribution yield and macroeconomic variables.

**Findings** – All correlation coefficients for Malaysia are significant while only CPI and M3 are significant in Singapore. Besides that, GDP, OPR and M3 have significant effect to REITs distribution yield in Malaysia whereas GDP and CPI have significant effect to distribution yield of REITs in Singapore. In addition, there is cointegration among macroeconomic variables and REITs distribution yield in Malaysia and Singapore.

**Significance** – The findings can assist investors to have better estimation and understanding prior to decision making on investment by study the distinction of REITs market in different country with same variables.

**Keywords:** Real Estate Investment Trusts (REITs), Conventional REITs, Islamic REITs, Malaysia, Singapore

# Introduction

- REITs: A defensive and secure investment that offers continuing capital appreciation and stable dividend yield.
- The REITs in Malaysia are rather newly developed in Malaysia compared to Singapore REITs.
- The average of Malaysian REITs yield has been volatile irregularly (2010: 8.56% while 2018: 6.24%) (MREIT, 2018).
- The researcher would like to investigate the causes and macroeconomic factors that have an impact on these irregular data.
- Previous studies lacking in addressing the same macroeconomic variables given on different regional basis.

## Introduction

- Malaysia and Singapore likely to be more active in the real estate market (Al-Ahad and Hossain, 2018) .
- There is a lack of studies looking into the comparative performance of REITs in different countries that offer Islamic REITs.
- Analysis in the real estate field used economic index as variables and the outcome was found to be satisfactory (Tsolacos, 2012).
- Similarly, Agarwal and Hu (2014), Chang, Chen and Leung (2013), and Fei, Ding and Deng (2008) used macroeconomic variables as factors to identify the changes in REITs performance and they found a significant relationship between those variables.

# Methodology

Research design	<p>Independent variables</p> <ol style="list-style-type: none"><li>i. GDP</li><li>ii. RPI</li><li>iii. CPI</li><li>iv. OPR</li><li>v. M3</li></ol> <p>Dependant variable</p> <ol style="list-style-type: none"><li>i. REITs DY</li></ol>
Research sampling	<p>Population: Malaysia and Singapore Source: DataStream and Worldbank data Periodicals: Monthly basis data</p>
Research analysis	<p>Eviews</p> <p>Unit root test</p> <ol style="list-style-type: none"><li>i. Augmented dickey-fuller test</li><li>ii. Phillips-perron test</li></ol> <p>Diagnostic test</p> <ol style="list-style-type: none"><li>i. Normality test: Jarque-bera</li><li>ii. Autocorrelation: Durbin watson statistics, breusch-godfrey</li></ol>

# Methodology

<p>Research analysis</p>	<p>Diagnostic test</p> <ul style="list-style-type: none"> <li>iii. Arch test (white test)</li> <li>iv. Multicollinearity</li> </ul> <p>Cointegration Test</p> <ul style="list-style-type: none"> <li>i. VECM</li> <li>ii. VAR</li> <li>iii. Johansen test</li> <li>iv. Engle-grager test</li> </ul>																
<p>Sampling size</p>	<p>Year: Jan 2010-Dec 2018 Observations: 216</p>																
<p>Data collection method</p>	<table border="1" data-bbox="1370 886 2262 1268"> <thead> <tr> <th>Independent Variables</th> <th>Unit</th> </tr> </thead> <tbody> <tr> <td>GDP</td> <td>RM/SGD</td> </tr> <tr> <td>RPI</td> <td>RM/SGD</td> </tr> <tr> <td>CPI</td> <td>Index points</td> </tr> <tr> <td>OPR</td> <td>Percent</td> </tr> <tr> <td>M3</td> <td>RM/SGD</td> </tr> <tr> <th>Dependent Variable</th> <th></th> </tr> <tr> <td>DY</td> <td>Percent</td> </tr> </tbody> </table>	Independent Variables	Unit	GDP	RM/SGD	RPI	RM/SGD	CPI	Index points	OPR	Percent	M3	RM/SGD	Dependent Variable		DY	Percent
Independent Variables	Unit																
GDP	RM/SGD																
RPI	RM/SGD																
CPI	Index points																
OPR	Percent																
M3	RM/SGD																
Dependent Variable																	
DY	Percent																



# Unit Root Test

	Augmented Dickey Fuller				Phillips-Perron			
	Level		1 <sup>st</sup> difference		Level		1 <sup>st</sup> difference	
	No trend	Trend	No trend	Trend	No trend	Trend	No trend	Trend
GDP	-6.6207 (0.0000)***	-6.6573 (0.0000)***	-5.9151 (0.0000)***	-5.9987 (0.0000)***	-4.5541 (0.0003)***	-4.2436 (0.0055)***	-3.4506 (0.0113)	-3.6059 (0.0340)**
RPI	-0.3221 (0.9168)	-6.8402 (0.0000)***	-9.6072 (0.0000)***	-9.6729 (0.0000)***	-1.5635 (0.4977)	-7.3174 (0.0000)***	-34.1841 (0.0001)***	-62.7532 (0.0001)***
CPI	-0.4589 (0.8937)	-3.3637 (0.0619)*	-8.6552 (0.0000)***	-8.6172 (0.0000)***	-0.4488 (0.8956)	-2.9913 (0.1396)	-8.5316 (0.0000)***	-8.4861 (0.0000)***
OPR	-3.2882 (0.0179)**	-3.0119 (0.1339)	-10.4647 (0.0000)***	-10.6795 (0.0000)***	-3.3395 (0.0155)**	-3.0021 (0.1366)	-10.4644 (0.0000)***	-10.6787 (0.0000)***
M3	-0.4901 (0.8878)	-1.4292 (0.8469)	-10.6277 (0.0000)***	-10.5923 (0.0000)***	-0.4901 (0.8878)	-1.4165 (0.8508)	-10.6274 (0.0000)***	-10.5921 (0.0000)***
DY	-2.4066 (0.1423)	-1.9311 (0.6314)	-11.0603 (0.0000)***	-11.4167 (0.0000)***	-2.4009 (0.1439)	-1.7850 (0.7053)	-11.0596 (0.0000)***	-11.4421 (0.0000)***

Notes: \*\*\* Significant at 1% level, \*\* Significant at 5% level, \* Significant level at 10%

# Unit Root Test

Singapore

	Augmented Dickey-Fuller				Phillips-Perron			
	Level		1 <sup>st</sup> difference		Level		1 <sup>st</sup> difference	
	No trend	Trend	No trend	Trend	No trend	Trend	No trend	Trend
GDP	-4.3924 (0.0006) <sup>***</sup>	-4.7904 (0.0009) <sup>***</sup>	-11.2420 (0.0000) <sup>***</sup>	-11.7166 (0.0000) <sup>***</sup>	-4.9072 (0.0001) <sup>***</sup>	-4.2669 (0.0051) <sup>***</sup>	-3.9452 (0.0025) <sup>***</sup>	-3.9525 (0.0132) <sup>**</sup>
RPI	-0.7082 (0.8389)	-1.8099 (0.6923)	-4.9979 (0.0001) <sup>***</sup>	-5.0066 (0.0005) <sup>***</sup>	-2.7631 (0.0671) <sup>*</sup>	-4.5049 (0.0024) <sup>***</sup>	-10.1701 (0.0000) <sup>***</sup>	-10.1229 (0.0000) <sup>***</sup>
CPI	-5.0360 (0.0000) <sup>***</sup>	-2.5385 (0.3094)	-2.1432 (0.2285)	-12.2974 (0.0000) <sup>***</sup>	-4.8047 (0.0001) <sup>***</sup>	-2.2010 (0.4838)	-11.1239 (0.0000) <sup>***</sup>	-12.6681 (0.0000) <sup>***</sup>
OPR	1.6696 (0.9996)	-0.2836 (0.9902)	-11.6907 (0.0000) <sup>***</sup>	-12.1996 (0.0000) <sup>***</sup>	-0.7589 (0.8262)	-3.9877 (0.0119)	-19.2401 (0.0000) <sup>***</sup>	-21.8171 (0.0000) <sup>***</sup>
M3	-10.5898 (0.0000) <sup>***</sup>	-10.5600 (0.0000) <sup>***</sup>	-17.6486 (0.0000) <sup>***</sup>	-17.5638 (0.0000) <sup>***</sup>	-10.6396 (0.0000) <sup>***</sup>	-10.6087 (0.0000) <sup>***</sup>	-105.2872 (0.0001) <sup>***</sup>	-104.8535 (0.0001) <sup>***</sup>
DY	-2.7072 (0.0761) <sup>*</sup>	-2.6999 (0.2389)	-10.1987 (0.0000) <sup>***</sup>	-10.1562 (0.0000) <sup>***</sup>	-2.7629 (0.0671) <sup>*</sup>	-2.7668 (0.2128)	-10.1984 (0.0000) <sup>***</sup>	-10.1552 (0.0000) <sup>***</sup>

Notes: \*\*\* Significant at 1% level, \*\* Significant at 5% level, \* Significant level at 10%

# Correlation Analysis (RO1)

	DY	GDP	RPI	CPI	OPR	M3
DY	1.0000	0.4727 (0.0000)***	-0.5020 (0.0000)***	-0.7873 (0.0000)***	-0.6545 (0.0000)***	-0.8321 (0.0000)***
GDP		1.0000	-0.2011 (0.0369)**	-0.3661 (0.0001)***	-0.6981 (0.0000)***	-0.4298 (0.0000)***
RPI			1.0000	0.6745 (0.0000)***	0.3613 (0.0001)***	0.6288 (0.0000)***
CPI				1.0000	0.6718 (0.0000)***	0.9627 (0.0000)***
OPR					1.0000	0.7766 (0.0000)***
M3						1.0000

Notes: \*\*\* Significant at 1% level, \*\* Significant at 5% level, \* Significant level at 10%

# Correlation Analysis (RO1)

	DY	GDP	RPI	CPI	OPR	M3
DY	1.0000	0.1403 (0.1476)	-0.1568 (0.1051)	-0.3222 (0.0007)***	-0.1006 (0.3002)	-0.1615 (0.0950)*
GDP		1.0000	-0.5809 (0.0000)***	-0.7996 (0.0000)***	-0.4816 (0.0000)***	-0.2493 (0.0093)***
RPI			1.0000	0.6350 (0.0000)***	-0.6074 (0.0001)***	0.2596 (0.0067)***
CPI				1.0000	0.3454 (0.0003)***	0.3248 (0.0006)***
OPR					1.0000	0.3363 (0.0004)***
M3						1.0000

Notes: \*\*\* Significant at 1% level, \*\* Significant at 5% level, \* Significant level at 10%

Coefficient	Coefficient Value	
F-Statistic	52.9791 (0.0000) <sup>***</sup>	→ At least one IV has significant effect to DY
$\beta_0$	9.1727 (0.0000) <sup>***</sup>	
$\beta_{gdp,dy}$	0.1360 (0.0022) <sup>***</sup>	→ Positive significant effect
$\beta_{rpi,dy}$	0.0100 (0.6634)	
$\beta_{cpi,dy}$	0.4287 (0.2290)	
$\beta_{opr,dy}$	0.3021 (0.0333) <sup>**</sup>	→ Positive significant effect
$\beta_{m3,dy}$	-0.7011 (0.0000) <sup>***</sup>	→ Negative significant effect
$R^2$	0.7219	→ 27.81% of variation in DY is explained by other variables

Notes: \*\*\* Significant at 1% level, \*\* Significant at 5% level, \* Significant level at 10%

# Diagnostic Test

Test	Coefficient Value	
Residual Mean	0.0000	
Jarque-Bera Test	1.8404 (0.3984)	→ Normally distributed
Durbin-Watson Statistic	0.2651	→ Not free from autocorrelation problem
Breusch-Godfrey Test		
F-statistic	59.5617 (0.0000)***	→ Rejects null hypothesis at 99% confidence interval The model is not adequate in capturing the actual data
$\chi^2$	81.4656 (0.0000)***	
White Test		
F-statistic	11.1368 (0.0000)***	→ Rejects null hypothesis at 99% confidence interval The model has heteroscedasticity problem The result should be cautiously interpreted
$\chi^2$	73.2019 (0.0000)***	
Ramsey's RESET Test		
T-statistic	6.3398 (0.0000)***	→ Rejects null hypothesis at 99% confidence interval There is misspecification of functional form The result could be bias
F-statistic	40.9578 (0.0000)***	
Likelihood ratio	36.7642 (0.0000)***	

Notes: \*\*\* Significant at 1% level, \*\* Significant at 5% level, \* Significant level at 10%

Coefficient	Coefficient Value	
F-Statistic	3.6880 (0.0041) <sup>***</sup>	→ At least one IV has significant effect to DY
$\beta_0$	6.2043 (0.0000) <sup>***</sup>	
$\beta_{gdp,dy}$	-0.0458 (0.0282) <sup>**</sup>	→ Negative significant effect
$\beta_{rpi,dy}$	0.0629 (0.4258)	
$\beta_{cpi,dy}$	-0.0123 (0.0004) <sup>***</sup>	→ Negative significant effect
$\beta_{opr,dy}$	-0.0069 (0.3758)	
$\beta_{m3,dy}$	-0.0108 (0.7095)	
$R^2$	0.1531	→ 84.69% of variation in DY is explained by other variables

Notes: \*\*\* Significant at 1% level, \*\* Significant at 5% level, \* Significant level at 10%

# Diagnostic Test

Test	Coefficient Value		
Residual Mean	0.0000		
Jarque-Bera Test	1.8404 (0.3984)	—————>	Normally distributed
Durbin-Watson Statistic	0.2651	—————>	Not free from autocorrelation problem
Breusch-Godfrey Test			
F-statistic	59.5617 (0.0000)***	—————>	Rejects null hypothesis at 99% confidence interval The model is not adequate in capturing the actual data
$\chi^2$	81.4656 (0.0000)***		
White Test			
F-statistic	11.1368 (0.0000)***	—————>	Rejects null hypothesis at 99% confidence interval The model has heteroscedasticity problem The result should be cautiously interpreted
$\chi^2$	73.2019 (0.0000)***		
Ramsey's RESET Test			
T-statistic	6.3398 (0.0000)***	—————>	Fail to reject null hypothesis at 90% confidence interval There is no misspecification of functional form The model are not bias
F-statistic	40.9578 (0.0000)***		
Likelihood ratio	36.7642 (0.0000)***		

Notes: \*\*\* Significant at 1% level, \*\* Significant at 5% level, \* Significant level at 10%



Hypothesized No. of CE(s)	Trace Statistic	Critical Values (5%)
$r = 0$	112.3961	95.7537
$R \leq 1$	69.6446	69.8189
$R \leq 2$	36.4759	47.8561
$R \leq 3$	19.3985	29.7971
$R \leq 4$	9.0893	15.4947
$R \leq 5$	0.0282	3.8415

Notes: \*\*Significant level at 5%    \*\*MacKinnon-Haug-Michelis (1999) p-values

- > Non-existence of cointegration between variables
- > Fail to reject null hypothesis at 5% significant level for lag 1

Hypothesized No. of CE(s)	Trace Statistic	Critical Values (5%)
$r = 0$	42.7516	40.0776
$R \leq 1$	33.1686	33.8769
$R \leq 2$	17.0774	27.5843
$R \leq 3$	10.3092	21.1316
$R \leq 4$	6.0849	14.2646
$R \leq 5$	3.0044	3.8414

Notes: \*\*Significant level at 5%    \*\*MacKinnon-Haug-Michelis (1999) p-values

- > Max-eigen values > 5% critical value for none rank
- > IV exhibit a relationship with DV on short term horizon only

Error	D(DY)	D(GDP)	D(RPI)	D(CPI)	D(OPR)	D(M3)
<b>Correction</b>						
CointEq1	0.0012	0.0025	0.2558	-0.0002	0.0018	-0.0011
	(0.0041)	(0.0071)	(0.0380)	(0.0006)	(0.0033)	(0.0012)
	[0.3032]	[0.3566]	[6.7249]	[-0.2413]	[0.5312]	[-0.8919]

—————> The existence of short run equilibrium

—————> The error terms are positive except for CPI and M3

Dep. Variables	Independent Variables						ECTt-1 Coefficient (t-ratio)
	X2 – statistic of lagged 1 <sup>st</sup> differenced term (p-value)						
	DY	GDP	RPI	CPI	OPR	M3	
DY	-	1.2368 (0.4184)	0.4184 (0.8113)	8.2689 (0.0160)**	3.0693 (0.2155)	4.5599 (0.1023)	20.0559 [0.0287]
GDP	1.2058 (0.5472)	-	4.8776 (0.0873)	1.3058 (0.5205)	2.3884 (0.3030)	3.1113 (0.2110)	11.0931 [0.3503]
RPI	3.9689 (0.1375)	2.6152 (0.2705)	-	0.0554 (0.9727)	1.7718 (0.4123)	4.9333 (0.0849)	10.1843 [0.4245]
CPI	0.2781 (0.8702)	0.7894 (0.6739)	0.1858 (0.9113)	-	0.6123 (0.7363)	0.5069 (0.7761)	1.7571 [0.9979]
OPR	1.8785 (0.3909)	14.1511 (0.0008)***	1.0034 (0.6055)	0.0344 (0.9830)	-	0.4183 (0.8113)	17.2521 [0.0690]
M3	2.6303 (0.2684)	1.0425 (0.5938)	2.2327 (0.3275)	0.3681 (0.8319)	0.8488 (0.6541)	-	6.2916 [0.7902]

Notes: \*\*\* Significant at 1% level, \*\* Significant at 5% level

Chart 4.1 Causality Existence between Variables



—————→ Unidirectional causality relationship between:

- i. CPI and DY
- ii. GDP and OPR

Hypothesized No. of CE(s)	Trace Statistic	Critical Values (5%)
$r = 0$	173.3240	95.7537
$R \leq 1$	117.3868	69.8189
$R \leq 2$	63.4649	47.8561
$R \leq 3$	32.7813	29.7971
$R \leq 4$	14.5374	15.4947
$R \leq 5$	03.7096	3.8415

Notes: \*\*Significant level at 5%    \*\*MacKinnon-Haug-Michelis (1999) p-values

- > Existence of cointegration between variables
- > Reject null hypothesis at 5% significant level for lag 1

Hypothesized No. of CE(s)	Trace Statistic	Critical Values (5%)
$r = 0$	55.9372	40.0776
$R \leq 1$	53.9219	33.8769
$R \leq 2$	30.6836	27.5843
$R \leq 3$	18.2439	21.1316
$R \leq 4$	10.8278	14.2646
$R \leq 5$	3.7096	3.8415

Notes: \*\*Significant level at 5%    \*\*MacKinnon-Haug-Michelis (1999) p-values

- > Max-eigen values > 5% critical value for none rank
- > IV exhibit a relationship with DV on long term horizon only

Error	D(DY)	D(GDP)	D(RPI)	D(CPI)	D(OPR)	D(M3)
<b>Correction</b>						
CointEq1	-0.1912	-0.0317	-0.0054	-0.0105	2.2756	1.1533
	(0.0507)	(0.2080)	(0.0287)	(0.0068)	(1.2634)	(0.5102)
	[-3.7757]	[-0.1525]	[-0.1862]	[-1.5335]	[1.8013]	[2.2603]

- > The existence of long run equilibrium
- > The error terms are negative except for OPR and M3



Dep. Variables	Independent Variables						ECTt-1 Coeff. (t-ratio)
	X2 – statistic of lagged 1 <sup>st</sup> differenced term (p-value)						
	DY	GDP	RPI	CPI	OPR	M3	
DY	-	35.5762 (0.0000) <sup>***</sup>	14.1010 (0.0494) <sup>**</sup>	5.6523 (0.5809)	9.2994 (0.2319)	42.3747 (0.0000) <sup>***</sup>	104.0413 [0.0000]
GDP	5.9233 (0.5487)	-	7.5119 (0.3776)	8.1391 (0.3205)	1.0714 (0.9936)	16.5792 (0.0203) <sup>**</sup>	46.5151 [0.0923]
RPI	13.7246 (0.0563)	11.7828 (0.1070)	-	11.5443 (0.1166)	10.6952 (0.1525)	9.6369 (0.2101)	73.6573 [0.0001]
CPI	20.1349 (0.0053) <sup>***</sup>	17.1915 (0.0162) <sup>**</sup>	10.0949 (0.1833)	-	4.3784 (0.7353)	24.6214 (0.0009) <sup>***</sup>	81.6999 [0.0000]
OPR	2.5399 (0.9241)	9.1693 (0.2407)	2.7389 (0.9081)	4.3015 (0.7445)	-	7.7106 (0.3588)	26.9133 [0.8344]
M3	14.5335 (0.0425) <sup>**</sup>	3.5446 (0.8305)	10.9556 (0.1406)	10.5106 (0.1614)	3.3312 (0.8528)	-	40.3319 [0.2462]

Notes: \*\*\* Significant at 1% level, \*\* Significant at 5% level

(Continuation)

Bidirectional causality relationship between:

i. DY and M3

Unidirectional causality relationship between:

i. GDP and DY

ii. GDP and CPI

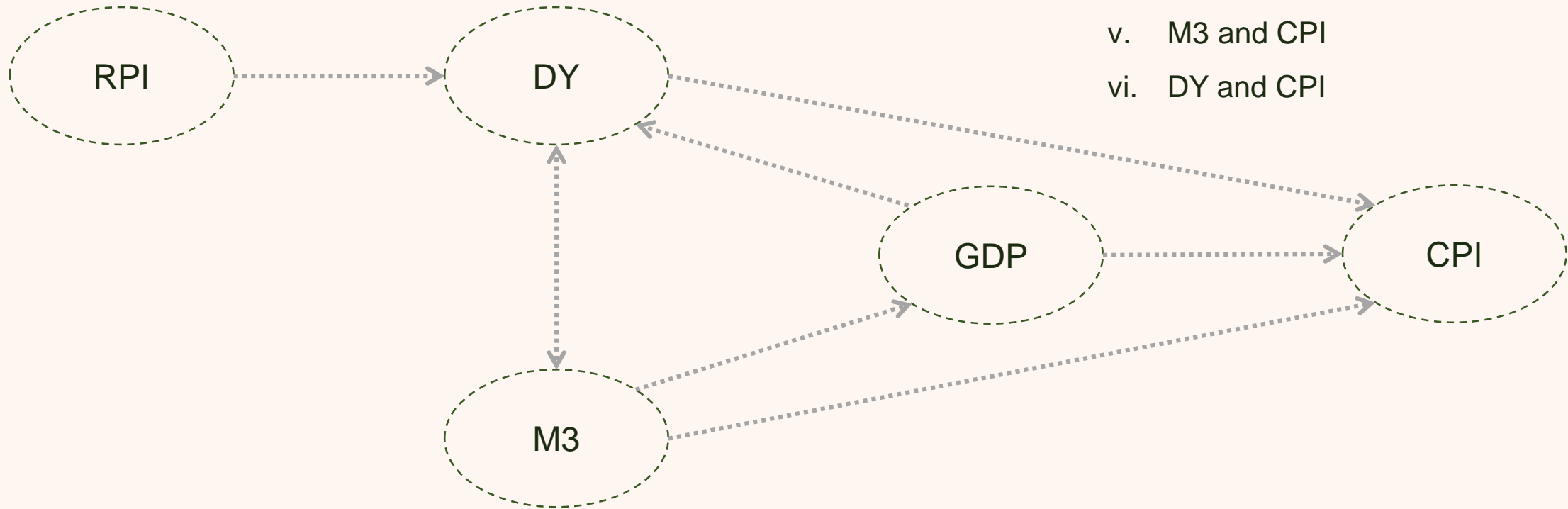
iii. RPI and DY

iv. M3 and GDP

v. M3 and CPI

vi. DY and CPI

Chart 4.3 Causality Existence between Variables



# Conclusion

## RO1

- All correlation coefficients of variables in Malaysia are significant at 1%.
- Moderate positive correlation between GDP and DY, moderate negative correlation between RPI and DY and between OPR and DY while both CPI and M3 have strong negative correlation with DY.
- Only CPI and M3 are significant with DY in Singapore at 1% level of significant and 10% level of significant respectively.
- Weak negative correlation between CPI and DY, and between M3 and DY.

## RO2

- GDP, OPR and M3 have significant effect on DY. Both GDP and OPR cause positive effect while M3 cause negative effect to DY in Malaysia.
- Only GDP and CPI have significant effect on DY of REITs in Singapore while other macroeconomic variables changes are insignificant to DY.
- GDP and CPI cause negative effect to DY in Singapore.
- Overall, distribution yield of REITs in Malaysia and Singapore respond differently towards changes in macroeconomic variables.

## RO3

- Two unidirectional causality relationships between CPI and DY and between GDP and OPR in Malaysia.
- Lack of diversification benefits exist in these variables in short term holding period.
- Six unidirectional causality relationships between GDP and DY, GDP and CPI, RPI and DY, M3 and GDP, M3 and CPI, DY and CPI and one bidirectional causality between M3 and DY in Singapore.
- The independent variables maintain its resilient dynamic effect towards dependent variable on unidirectional basis.

*Thank You*

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