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The Dynamics of Cointegration between Equity Crowdfunding Performance and Economic Indicators in Malaysia: ARDL Approach

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Abstract:
The financial scene underwent significant transformation when equity crowdfunding (ECF) provided businesses and individuals with an alternative approach to obtain funding. Established enterprises together with startups gain funding from investors of different backgrounds through ECF platforms. ECF has achieved significant importance but researchers still need to investigate further how ECF performance relates to standard economic metrics including unemployment data along with inflation patterns, GDP measures and interest rates. Research on ECF generally focuses on micro-level elements within their framework while ignoring substantial relationships between ECF performance and economic indicators. Therefore, this research seeks to comprehensively establish the relationship that may exist between the ECF performance and economic indicators in Malaysia context. This study utilizes the Autoregressive Distributed Lag (ARDL) approach to understand the long-run and short-run associations between ECF performance measurements and primary economic indicators. The time series and ECF monthly data from 2017 to 2022 were collected from the Department of Statistics Malaysia (DOSM) and Securities Commission Malaysia (SC). The ARDL revealed a mix result on the existence of significant long-run and short-run relationship between the ECF performance and some economic indicators. The results reveals that there are significant long-run and short-run relationships between the GDP and BLR with the ECF amount raised, while unemployment and BLR influence the number of investors.

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INTRODUCTION

The arrival of the internet has ushered in a transformative era in business practices, characterized not only by technological advancements in equipment but also by the adoption of innovative business strategies (Ashta & Herrmann, 2021; Ding et al., 2022; Muganyi et al., 2022). This era has not only witnessed remarkable technological advancements but has also seen the assimilation of inventive strategies that continue to redefine the way enterprises operate. As businesses adapt to the digital age, financial development becomes an essential in the broader narrative. The synergy between the internet and financial evolution creates a dynamic ecosystem, catalyzing new possibilities and avenues for economic growth. Financial technologies, commonly referred to as fintech, play a crucial role in this nexus, acting as catalysts for further disruption and innovation in the financial sector. Following the evolution of the internet, financial development, and fintech, crowdfunding has emerged as a transformative phenomenon, serving as a fundamental element in the entrepreneurial landscape. This innovative funding method facilitates a diverse range of individuals in providing financial support to creators and inventors, bridging the gap between visionaries and potential investors (Walthoff-Borm et al., 2018).

In recent years, ECF performance has emerged as a dynamic force in the financial landscape, offering innovative ways for businesses and individuals to access capital. ECF platforms serve as a vital financial innovation, that allows various

types of businesses to attract investments from a large number of investors. However, there is limited research on investor decision-making within ECF and its relationship with traditional economic indicators such as Gross Domestic Product (GDP), inflation, unemployment, and interest rates. Prior studies have primarily concentrated on micro-level factors, Y. Li et al., (2018), resulting a gap in understanding the relationship between ECF performance and economic indicators. Therefore, this research may help to fill the gap by examines the dynamic relationship between ECF performance and main economic indicators. Based on Autoregressive Distributed Lag (ARDL) model, the study hypothesizes that there are significant both, long-run and short run relationship between ECF performance and economic indicators, primarily GDP and interest rate (BLR). The findings prompt a holistic evaluation within the ECF field, encouraging stakeholders to consider not only variations in economic indicators but also the broader economic forces within the fintech industry, particularly in the context of ECF.

LITERATURE REVIEW

Equity crowdfunding is having been seen as one of the funding initiatives implemented by the government to ease and facilitate most businesses, especially SMEs and MSMEs to raise funds for their businesses. ECF is an innovative form of alternative fundraising that allows small businesses to raise capital from the public using online platforms registered by the Securities Commission Malaysia (SC). ECF allows these small businesses to offer equity in their companies to investors, who in turn invest in ideas they see potential in. Malaysia was the first ASEAN country to create and provide a framework aimed at facilitating crowdfunding, with the objective of allowing SMEs and other small businesses to raise early-stage financing. Empirical researchers show that Fintech and Crowdfunding may accelerate industry development by giving more opportunities to businesses and to the socio-economic as a whole (Faisal & M M, 2018; Jiang et al., 2022).

Meanwhile, a recent study by Erasmus et al., (2022) collectively supports those investors and entrepreneurs' motivation to participate in crowdfunding is not solely financially driven, which also suggests that there are maybe other factors influencing their decision in ECF initiatives. Based on the statistics from Securities Commissions (SC) Malaysia and the Department of Statistic Malaysia (DOSM), it shows that the ECF amount raised significant variability across the year, ranging from 14.76 MYR million in 2018 to 220.72 MYR million in 2021. On the other hand, the economic indicators such as GDP, inflation rate, unemployment rate, and the base lending rate also indicated a variability of performance throughout the years. It is uncertain whether the relationship between ECF performance and GDP is a long-term phenomenon or merely short-term.

Similarly, the irregularities observed in the unemployment rate and inflation rate raise questions about the long-term influence of ECF performance. While the potential impact of ECF performance on long-term unemployment and inflation also remains uncertain, there is also a possibility that economic indicators may display short-term sensitivity to ECF performance while others may reveal longer-term reactions. This can be seen from a study by Ben Romdhane et al., (2023), who also suggests further investigation on the long-run impact of fintech on inflation and unemployment in Asia. The study highlights that Fintech can potentially become a new driver of economic development.

Relationship between ECF Performance and Economic Indicators

Gross Domestic Product (GDP)

While most literature stands that ECF can positively contribute to economic growth by fostering innovation and supporting startups, it is crucial to recognize potential limitations. Contrary to the optimistic outlook, some literature contends that ECF, in certain instances, may not lead to substantial economic growth. Kiss G et al., (2006) presents theoretical arguments supporting a negative correlation between GDP growth and credit demand. According to their assertions, increased productivity and profits during economic expansion diminish the necessity for external funding. Conversely, in times of crisis, households may seek to stabilize consumption by augmenting their debt levels. These raise concerns about the sustainability of ECF as a primary driver of

GDP expansion, citing instances where projects may fail to deliver anticipated economic returns or where the overall impact on the broader economy might be limited (Parker et al., 2014). Based on the literature review, its shows that the relationship between performance in ECF and economic indicators has varying perspectives as well as different outcomes. While many researchers emphasized how ECF performance have a positive relationship to the economic growth through innovation and the support of startup initiatives, there are other analyses that acknowledge the existence of trends that may restrain ECF and at the same time. Opposing views such as (Kiss et al., n.d.) and others cited in the article show complexity of the relationship where, economic growth decreases the need for external financing and, during periods of economic difficulties, the level of indebtedness may increase without necessarily stimulating innovation or sustainable development. Therefore, concerns in the sustainability of ECF as the main economic engine raise the class global factors including viability of the project, maturity of the market, and impact of shocks to the outcome.

Unemployment Rate

As for the unemployment rate, research conducted by the World Bank Group and the University of Cambridge in 2013 found that crowdfunding as general has the potential to significantly increase access to finance for small and medium-sized enterprises (SMEs), which are a critical driver of economic growth in many countries World Bank Group, (2013). The study found that number of successful crowdfunding campaigns can lead to increased employment, meaning a decreased in unemployment, higher revenues, and faster growth for participating firms. According to Adamek & Janku, (2022) examine the factors that influence the demand for crowdfunding funds in 27 OECD countries, finds that the total amount raised of required crowdfunding funds responds counter-cyclically to changes in the unemployment rate. In the study conducted by Astrauskaitė, (2017), an investigation was carried out into how crowdfunding affects the economy of the nation. However, according to the Department of Statistics Malaysia (DOSM), the unemployment rate remained high for two consecutive years from 2020 to 2021, despite the increase in ECF in Malaysia in the same year. This statistic highlights the contradiction between the high unemployment rate and the increasing popularity of ECF. Typically, a growing economy with increased investment opportunities (such as ECF) might lead to job creation and reduced unemployment. However, this analysis suggests that this expected relationship did not hold true in Malaysia during the specified period.

Inflation

The third factor explaining the ECF is inflation. It is a persistent rise in the general price level of goods and services within an economy, stands as a critical economic indicator with far-reaching implications for individuals, businesses, and policymakers. Research have developed diverse indices to quantify inflation, with the Consumer Price Index (CPI) and the Producer Price Index (PPI) among the most commonly use, empirical findings demonstrate a substantial impact of Fintech on a nation's inflation, as it directly shapes consumer preferences, particularly evident in China and Malaysia (Deng et al., 2019). In a study conducted by Astrauskaitė, (2017) the number of successful campaigns and the total amount raised were employed as key indicators to investigate crowdfunding's relationship with economic indicators, specifically focusing on inflation. The finding demonstrated a significant and positive correlation between crowdfunding and economic indicators such as inflation. The positive correlation suggests that as crowdfunding activities increase, there is a simultaneous rise in inflation rates. When projects receive funding through crowdfunding platforms, it introduces new capital into the market. This influx of capital might lead to increased spending, as businesses and individuals utilize the funds for various purposes, potentially driving up demand for goods and services and further contributing to overall inflation.

However, Saraswati et al. (2023), suggest that when crowdfunding is facilitated through financial technology (fintech), it can actually help lower the inflation. Fintech makes it easier for businesses to access funds, leading to increased productivity and reduced costs. This efficiency extends to financial services, ensuring a stable

money supply and better service quality. As a result, businesses may be less likely to raise prices, contributing to a more controlled and even reduced inflationary environment. This contradicts the common belief that more crowdfunding necessarily leads to higher inflation, presenting fintech as a potential mitigating factor.

Interest Rate

Interest rate fluctuations wield significant influence across various economic sectors, prompting a critical investigation into how the growing prevalence of alternative financing methods, such as ECF, shapes these fluctuations. This focus canters on assessing the extent and nature of this impact and exploring how these changes might reshape the broader landscape of alternative financing. The total amount raised was employed in a study conducted by (Adamek & Janku, 2022). The finding suggests that higher interest rates and a scarcity of bank branches contribute to an increased number of newly created crowdfunding projects and a surge in the demand for funds through crowdfunding platforms. In essence, elevated interest rates and improved economic conditions lead to heightened demand for crowdfunding loans. In addition, in the issuers point of view, they may opt for crowdfunding as a means to raise capital instead of traditional channels, and this choice is driven by primary incentives, specifically, the lower cost of capital associated with crowdfunding (Parker et al., 2014). Traditional channels of capital raising, such as bank loans or venture capital, there are often higher associated costs, including interest rates, fees, or equity stakes. ECF platforms may offer a more cost-effective alternative. Investors might find that the expenses related to crowdfunding, including platform fees and other transaction costs, are lower than those associated with traditional financing methods.

Given the limited literature on this subject, many studies tend to adopt a fintech perspective. For instance, Buchak et al., (2017) propose that the combination of high interest rates and expanding market shares results in growing consumer demand for fintech services as technology advances. These findings indicate that the entry of fintech into this market is not solely driven by cost-saving technology. Additionally, Mumtaz and Smith, (2020) identify the impact of fintech parameters, suggesting a negative relationship between fintech and the output gap. Fintech, by facilitating online transactions and digital currencies, positively influences GDP growth, thus reducing the output gap in an economy, especially when interest rates are on the rise.

Theoretical Framework: Theory of Economic Development

The theory associated with financial intermediation was developed starting with the work of Gurley and Shaw, (1956). According to Newlyn and Goldsmith (1970), and McKinnon (1974), an increase in the efficiency of financial instruments increases growth. The financial system encourages economic growth as it ensures the efficient use of resources in the long run. The endogenous growth model predicts that financial development affects economic growth through the savings rate, the rate of savings transferred to investment, and the social marginal efficiency of investment.

Traditionally, financial intermediaries have served as essential channels, seamlessly directing capital from savers to borrowers and providing a stable backbone to economic structures. However, the rise of ECF platforms introduces a transformative paradigm, challenging established norms, and ushering in a new era of financial dynamics. The conventional function of financial intermediaries as channels for capital allocation is experiencing a significant transformation in the finance industry due to the emergence of crowdfunding (Belleflamme et al., 2015a).

DATA AND METHODOLOGY

All data was based on Malaysian data and acquired through DataStream and from ECF platforms regulated by the Securities Commission Malaysia on a monthly basis. The research utilizes monthly time series data from 2017 to 2022, comprising 72 observations for each variable. Amount of funds and number of investors been use as ECF performance

metrics following prior studies (Adamek & Janku, 2022; Ma'zzi et al., 2023; Walthoff-Borm et al., 2018b). The set of data series used in the empirical analysis comprises macroeconomic variables such as Growth Domestic Product (GDP), inflation rate, interest, and unemployment rate. The research evaluates ECF performance in relation to macroeconomic indicators by using the Autoregressive Distributed Lag (ARDL) bounds test as proposed by Pesaran et al. (2001). The approach proves suitable for working with limited sample data regardless of variable stationarity status at level I(0) or I(1). The ARDL approach in the current study is rewritten as Equation below:

$$ECF_{i,t} = \alpha + \beta_0 ECF_{t-1} + \beta_1 GDP_{t-1} + \beta_2 BLR_{t-1} + \beta_3 CPI_{t-1} + \beta_4 Unempl_{t-1} + \sum_{i=1}^{p-1} ECF_{t-1} + \sum_{i=1}^{p-1} GDP_{t-1} + \sum_{i=1}^{p-1} BLR_{t-1} + \sum_{i=1}^{p-1} CPI_{t-1} + \sum_{i=1}^{p-1} Unempl_{t-1} + \varepsilon_t$$

Where, $ECF_{(i,t)}$ is the ECF performance over a time of t, GDP*t* is the Gross Domestic Product over a time of t, BLR *t*, is the base lending rate over a time of t, CPI_t is the consumer price index over a time of t, $Unempl_t$ is the unemployment rate over a time of t and ε, *t* is the error term and lag order.

RESULTS AND DISCUSSION

Descriptive Statistic

Table 4.1, presents a comprehensive summary of the descriptive summary of ECF performance behaviour and various economic variables over a period spanning from January 2017 to December 2022. This analysis encompasses key metrics such as the mean, median, maximum, minimum values, standard deviation, skewness, kurtosis, and the Jarque-Bera test statistic, each calculated from 72 observations.

The value of ECF amount raised amounted to MYR7.648 million per month while exhibiting high variability due to the standard deviation measurement of 7.887. The distribution of ECF investors shows a wide range of values since both mean values and standard deviation reach 257.861 and 252.882 respectively. Statistical tests validate the positive skewness of both variables which demonstrate non-normality patterns. GDP growth together with inflation (CPI) and base lending rate (BLR) and unemployment rate failed normality tests due to significant skewness and kurtosis levels. Constructing models with natural logarithm transformations is recommended to improve model stability and parameter estimation. This methodology maintains consistency with study by Zhang and Chen, (2017 demonstrating how natural logarithms serve as widespread econometric and financial techniques for managing non-normality and heteroscedasticity when enhancing statistical analysis robustness.

Table 4.1: Descriptive Statistics of Variables

Variable Statistic	Mean	Max	Min	Std Dev	Skewness	Kurtosis	Jarque-Bera	Prob.
ECF Amt	7.648	27.530	0.00	7.887	0.967	2.752	11.409	0.003
ECF Inv	257.861	952.00	0.00	252.882	0.996	3.184	12.010	0.002
GDP	0.126	0.156	0.101	0.012	0.802	3.175	7.814	0.020
CPI	122.017	129.20	117.6	2.791	1.052	3.467	13.952	0.000
BLR	6.255	6.922	5.490	0.586	-0.323	1.354	9.383	0.009
Unempl	3.822	5.300	3.200	0.612	0.779	2.068	9.881	0.007

Unit Root Test

Table 4.2 displays the unit root test results that establish the order of integration within time series data. The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests provided evidence for assessing the null hypothesis about the presence of unit roots in the data which signifies non-stationarity. The Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test evaluated the null hypothesis which stated that the time series existed around constant or deterministic trends.

Results from ADF and PP tests show that both LnECF and LnInv variables are stationary at level (I(0)) yet LnGDP, LnBLR, LnCPI, and LnUnempl require first differencing to achieve stationarity confirming I(1). These findings receive additional support from the KPSS test because all examined variables fall below its critical threshold while operating as stationary variables. The research validity across different tests allows researchers to use the ARDL bounds testing method for robust estimation of long-run relationships between variables of mixed I(0) and I(1) stationarity. The application of first differencing will be performed on non-stationary variables to eliminate spurious effects and stabilize models and strengthen statistical modelling approaches

Table 4.2: Stationarity Test Results

	ADF test statistics		PP test statistics		KPSS test statistics	
Series	**Level**	**1st Difference**	**Level**	**1st Difference**	**Level**	**1st Difference**
LnECF	-6.8014***	-	-7.3392***	-	0.1368	-
LnInv	-7.4248***	-	-5.7829***	-	0.1150	-
LnGDP	-3.0609	-5.6233***	-1.9057	-3.4997**	0.1548	-
LnBLR	-0.7165	-10.5406***	-1.0878	-11.8648***	0.1363	-
LnCPI	-1.7606	-6.1441***	-1.3381	-6.4908***	0.1989	-
LnUnempl	0.9235	-6.4126***	-0.8728	-3.9682***	0.1342	-

Notes: (***) significant at the 1%, (**) significant at the 5%

ARDL Estimation

Cointegration Test

The examination of the cointegration relationship addressed the performance of ECF and major economic variables through the bounds testing approach of the ARDL model. This section presents the results of the F-bound test, which was applied to two different dependent variables representing ECF performance: This involves the total amount raised through crowdfunding known as the ECF amount and the number of ECF investors (ECF Investors). To determine whether long-run equilibrium relationship exists between these performance measures and economic conditions, the bounds test is use. In case of each dependent variable the F-statistic is compared with the one given by Pesaran et al. (2001) for (Unrestricted constant and restricted trend). The critical bounds are provided for three significance levels: They include 10 %, 5 % and 1%. The overall findings of the test results are presented in the subsequent sub-sections.

Cointegration for ECF amount and Economic Indicators

The first test determines the level of association between the dependent variable, the ECF Amount and the economic indicators. Therefore, the F-statistic for this model is given as 16. 434, and the critical values for a sample size of 70 are already shown in table 4.3.

The computed F-statistic (16.434) greater than the upper bound critical value of F at all levels of significance (10%, 5% and 1%). The obtained values have to be lower than the critical values or upper bound which at 5% level of significance is 4.512. As can be seen, the calculated F-statistic is 4.512 while the Chi-square statistic is much smaller. This outcome enables us to reject the null hypothesis of non-cointegration with a high degree of certainty. Thus, it can be concluded that there is a significant, positive and long-run relationship between total ECF raised and the selected economic variables. Thus, there is an implication that the economic environment affects the level of funding raised via ECF platforms in the course of time.

Table 4.3: The Results of the F-Bound test for Cointegration Relationship for the ECF Performance (ECF Amount) and Economic Condition

Dependent Variable: ECF Amount **F-statistic critical value bounds: Unrestricted constant and Restricted Trend (Case 4)** **K= 4, n=71**						
Computed F-Statistic 16.434	10%		5%		1%	
Sample size	I (0)	I (1)	I (0)	I (1)	I (0)	I (1)
70	3.098	3.92	3.6	4.512	4.76	5.798
75	3.11	3.9	3.624	4.488	4.808	5.786
Asymptotic	2.97	3.74	3.38	4.230	4.3	5.23

Notes: (*) Critical values with 10%, 5% and 1%, accordingly to the I (0) represents the lower bound of F-Bound test, I (1) represents the upper bound of F-Bound test adapted from Narayan (2005)

Cointegration for ECF Investors and Economic Condition

The second model examines the existence of cointegration between the ECF Investors and economic conditions. The F-statistic calculated for this model is equal to 12. 210, as indicated in Table 4.4.

In this case, the computed F-statistic is 12. 210 also has a value higher than the upper bound critical values for all the tested significance levels. At the 5% level of significance, the upper bound equal to 4. 512, so the F-statistic computed by the procedure is significantly greater than this critical value, showing that the null hypothesis of no cointegration must be rejected. The obtained result sheds light on the presence of long-run cointegration between the number of investors and the economic indicators, which evidences the reliance of the investors' activity on macroeconomic factors.

Table 4.4: The Results of the F-Bound Test for Cointegration Relationship for the ECF Performance (ECF Investors) and Economic Condition

Dependent Variable: ECF Investors **F-statistic critical value bounds: Unrestricted constant and Restricted Trend (Case 4)** **K= 4, n=71**						
Computed F-Statistic 12.2100	10%		5%		1%	
Sample size	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
70	3.098	3.92	3.6	4.512	4.76	5.798
75	3.11	3.9	3.624	4.488	4.808	5.786
Asymptotic	2.97	3.74	3.38	4.23	4.3	5.23

Notes: (*) Critical values with 10%, 5% and 1%, accordingly to the I(0) represents the lower bound of F-Bound test, I(1) represents the upper bound of F-Bound test adapted from Narayan (2005)

Estimation of Long-Run Coefficient

ARDL Lag Structure

As for the choice of the optimal lag length for the ARDL model, the following criteria were employed namely Log-Likelihood (LogL), Likelihood Ratio (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Criterion (SC), and Hannan-Quinn (HQ). It was tested for all lag lengths from 0 to 6. Refer to table 4.5, the findings showed that with an increase in the number of lags the obtained LogL also grows that may point to the augmentation of the model fitness. For instance, the LR test to test for the significance of adding extra lagged variables showed that Lag-4 gave the best fit to the model while FPE which provides an estimate of the mean squared error was minimum at Lag-4. Among all possible tested values AIC selected Lag 4 because it established the most reasonable balance between model accuracy and model simplicity. Lag 4 emerged as the preferred model choice by the model assessors after SC and HQ recommended Lag 3 since the predictions were more accurate at Lag 4. The selected model proved reliable because it demonstrated a high R^2 (0.9711) combined with a high Adjusted R^2 (0.9657) value which validates the use of Lag 4 for empirical evaluation

Results of long-run estimation coefficient

Table 4.5 describes the results of the estimation of the ARDL model of the first order (1,0,0,0,0) in which the dependent variable being the ECF Amount as a proxy of ECF performance. The model includes one lag of the dependent variable and the contemporaneous values of GDP, CPI, unemployment, and BLR.

Table 4.5: Results of Vector Autoregression (VAR) Estimates on Lag Order Selection for ARDL Model

Lag	LogL	LR	FPE	AIC	SC	HQ
0	498.0967	NA	5.32e-12	-14.6089	-14.0781	-14.3992
1	784.6061	503.5621	1.47e-15	-22.8062	-21.7446	-22.3867
2	835.3755	83.07711	5.19e-16	-23.8598	-22.2673	-23.2306
3	873.1213	57.19056	2.75e-16	-24.5188	-22.3955*	-23.6798*
4	892.7025	27.29511*	2.56e-16*	-24.6273*	-21.9732	-23.5785
5	907.2104	18.46451	2.85e-16	-24.5821	-21.3971	-23.3236
6	916.0637	10.19474	3.87e-16	-24.3655	-20.6497	-22.8972
Var Estimates						
R^2	0.9711					
Adj R^2	0.9657					
AIC	-3.9241					
SBC	-3.5386					

Notes: (*) Indicates the selection of lag order by the criterion.LR sequential modified LR, FPE: Final predictor error, AIC: Akaike Information Criterion, SBC/SIC: Shwarz Bayesian Information Criterion, HQ: Hannan Quinn

Table 4.6 displays the ARDL estimation on ECF amount and ECF number of investors as a proxy for the ECF performance. For the ECF amount, it reveals that GDP and BLR serve as key economic factors that produce substantial effects on the performance of equity crowdfunding (ECF). A positive relationship exists between GDP and equity crowdfunding funding which proves significant at p = 0.0697 (10% level) with a value of 0.4110. An increased GDP by 1% leads to a 0.41% growth in ECF funding levels. Economic growth generates investor self-assurance as well as business engagement that leads to increased participation in alternative funding solutions like ECF. The positive economic expansion produces improved attitudes and increased business operations among investors which drives their participation in alternative financing methods particularly ECF. Market expansions enable businesses to obtain more funding for expansion purposes while investors choose to support innovative financing methods which fosters ECF growth.

Furthermore, the ECF amounts show a significant negative relation to the base lending rate (BLR), whose coefficient value reaches -0.5324 and its p-value attains 0.0107 at a 1% significance level. The increase of_BLR by one percentage point results in a drop of 0.53% within ECF quantities. The negative coefficient is consistent with economic theory and with the notion that increased costs of borrowing make debt financing

less favorable than it is for firms to seek funds through means such as ECF. Meanwhile, in case of increase in BLR it indicates the advancement of monetary policy along with the changes of investor attitude towards risk capital, which in turn decreases the amount of funds available for ECF projects. The variables of CPI and unemployment show no statistical significance which implies that inflation together with labor market conditions have minimal effects on ECF performance levels. The model exhibits excellent explanatory power with its 0.7142 R^2 value and 26.6539 highly significant F-statistic, while the Durbin-Watson statistic (2.1161) suggests no serious autocorrelation issues.

Conversely, for the number of ECF investors, the ARDL method shows that base lending rate (LnBLR) together with unemployment data (LnUnempl) significantly affect the number of ECF at an alpha level of 1%. An increase in unemployment rates results in a reduction of participants who invest in ECF according to the negative -20.4091 (p=0.0144***) coefficient. The situation of financial insecurity makes individuals choose financial security above investment opportunities which leads them to reduce participation across alternative investment platforms including ECF. Investors show less interest in ECF when base lending rates rise as observed through the negative and significant coefficient (-20.1896 p = 0.0056***). As borrowing rates climb traditional financial methods become costlier for investors who respond by becoming more cautious about risking their money and withdrawing from crowdfunding opportunities.

Table 4.6: Results of long-run estimation coefficient

Dependent Variable: ECF Amount				
Variables	**Coefficient**	**Std.Error**	**T-stat**	**Prob**
LnECF(-1)	-0.1990	0.1212	-1.6419	0.1055
LnGDP	0.4110	0.2228	1.84448	0.0697*
LnCPI	-0.0482	0.8886	-0.05428	0.9568
LnUnempl	0.2015	0.1618	1.2454	0.2174
LnBLR	-0.5324	0.2027	-2.6261	0.0107***
Constant	-3.0232	5.9872	-0.5049	0.6153
@Trend	-0.0005	0.0014	-0.3758	0.7082
Dependent Variable: ECF Number of Investors				
Variables	**Coefficient**	**Std.Error**	**T-stat**	**Prob**
LnINV(-1)	-0.0477	0.1236	-0.3859	0.7009
LnGDP	-4.1499	7.1997	-0.5764	0.5664
LnCPI	60.7108	53.8895	1.1266	0.2643
LnUnempl	-20.4091	8.1092	-2.5168	0.0144***
LnBLR	-20.1896	7.0392	-2.8682	0.0056***
Constant	276.0328	185.9267	1.4846	0.1427
@Trend	0.0745	0.0446	1.6693	0.1001*

Notes: (***) significance at 1% level, (**) significance at 5% level, (*) significance at 10% level

Results of short-run estimation coefficient

Following the establishment of the long run co-integrating relationship between economic indicators and ECF performance, the subsequent stage of analysis involves the examination of short-run dynamics by employing the Error Correction Model (ECM) which implemented based on the ARDL method. As study done by (Pesaran et al., 2001) the ECM is useful in showing how short-run fluctuations bring about change to the long-run equilibrium established by the long-run relationship. In the short-run, dependent variable (in this case, the ECF amount) may again deviate from its long run means due to some external shocks or some changes in economy. With the help of the ECM framework, it is able to measure the speed at which these short-run deviations are corrected, and how it goes back to the long-run equilibrium. This is achieved by use of error correction term (ECT), which depicts the extent to which disequilibrium is corrected in each differentiated

period. A highly significant ECT with negative coefficient suggests a strong adjustment mechanism that is, the model has the ability to adjust to short-term disturbance soon.

Compared to other techniques, the ARDL approach allows for capturing both short-run and long-run dynamics, thus enabling to evaluate how such economic factors as GDP, CPI, unemployment, and interest rates affect the ECF performance in the long run and in the short-run at the same time. This is helpful in the analysis for not only the existence of long-term impacts, but also the short-term responsiveness or otherwise of the system.

Table 4.7: Results of Short-run Estimation Coefficient for the Economic Indicators on ECF Performance

ARDL (1,0,0,0,0) selected based on AIC Dependent Variable: ECF Amount				
Variables	**Coefficient**	**Std.Error**	**T-stat**	**Prob**
LnECF(-1)	-0.1990	0.1212	-1.6419	0.0000
LnGDP	0.4110	0.2228	1.84448	0.0697*
LnCPI	-0.0482	0.8886	-0.05428	0.9569
LnUnempl	0.2015	0.1618	1.2454	0.2175
LnBLR	-0.5324	0.2027	-2.6261	0.0107***
Constant	-3.0232	5.9872	-0.5049	0.6153
@Trend	-0.0005	0.0014	-0.3758	0.7082
ECT (-1)*	-1.1990	0.1163	10.3107	0.0000
R^2 = 0.6064, F-stat = 16.4344, Durbin Watson = 2.1161				
ARDL (1,0,1,0,1) selected based on AIC Dependent Variable: ECF Investors				
Variables	**Coefficient**	**Std.Error**	**T-stat**	**Prob**
LnINV(-1)	-1.0477	0.1236	-8.8977	0.0000***
LnGDP	-4.1499	7.1997	-0.5764	0.5664
LnCPI	-10.4372	28.4825	-0.3664	0.7153
LnUnempl	-10.3952	5.4836	-1.8957	0.0627*
LnBLR	-20.1896	7.0391	-2.8682	0.0056***
Constant	276.0328	185.9267	1.4846	0.1427
@Trend	0.0745	0.0046	1.6693	0.1001
ECT (-1) *	-1.0477	0.1177	10.3107	0.0000
R^2 = 0.5441, F-stat = 9.2476, Durbin Watson = 2.0124				

Table 4.7 presented the results of short-run analysis for both ECF amount and ECF investors. For the ECF amount, the coefficient of Autoregressive term, LnECF(-1) is negative and statistically significant at 1 % level and has a value of -0.1990 and a t-statistic of -1.6419 (P-value = 0. 0000). This implies that the amount of ECF that was in the previous period would have a negative effect on the amount in the current period which bring into focus the presence of a correcting mechanism of the ECF performance in the short-run. The magnitude of the coefficient suggests that for every 1% increase in the lagged ECF amount, the current ECF amount decreases by approximately 0.20%, ceteris paribus.

The economic development proxy by LnGDP shows a direct relationship with ECF performance. Based on findings, coefficient of LnGDP is 0.4110 and its t-statistic is 1.84448, with a p-value of 0.0697, significant at the 10% level. This indicates that GDP positively influences the ECF amount in the short run. A 1% increase in GDP leads to an approximately 0.41% increase in ECF amounts, holding all other variables constant. This finding aligns with the theoretical proposition that there will always be an effect caused by better economic conditions indicated by GDP on both the investors' confidence and the possibility of participating in crowdfunding.

Interestingly, the base lending rate (LnBLR) has a negative and statistically significant impact on the quantity of ECF, with a coefficient of -0.5324, a t-statistic of -2.6261, and a p-value of 0.0107, significant at the 1% level. This indicates that higher lending rates are associated with lower ECF amounts. Thus, an increase of the BLR by 1% leads to the approximate decline by 0.53% of the total ECF amounts required to meet a given obligation at a particular time. This is in line with the understanding that higher borrowing costs lead to lower investment activities and reduced funds' availabilities to crowdfunding platforms; all factors which reduce the ECF overall performance. Finally, the error correction term, ECT (-1), is highly significant and carries a coefficient of -1.1990 and a t-statistic of 10.3107 (p-value = 0.0000), confirming the presence of a strong adjustment mechanism.

Next, for the ECF investors, the error correction term (ECT) is significant at 1 percent level and it has estimated coefficient of -1.0477 indicating that deviations from the long-run equilibrium are corrected rapidly in the short run. Specifically, approximately 104.77% of the disequilibrium from the previous period is corrected in the current period, implying that the system converges back to its long-run path quickly when shocks occur. The absolute value of the ECT coefficient is high, and this can characterize the speed of adjustment; thus, it can be concluded that short-term fluctuations in the ECF investor activity in relation to the equilibrium value do not have long-term effects and are quickly eliminated.

The coefficient of the lagged dependent variable, ECF investors (LnInv(-1)) is highly significant at 1% level. The negative sign indicates that there exists a strong correcting mechanism in the short-run through flexible investor numbers in the subsequent period. Particularly, a one percentage point change in the lagged number of ECF investors is associated with a one percent change1.05 % reduction in the current period meaning that the investor has an over correction behavior due to past variations. Contrary to expectations, the short-run coefficient for GDP (LnGDP) is not statistically significant (coefficient = -4.1499; p-value = 0.5664). This indicates that changes in GDP do not affect ECF investor participation in the short term. Even though economic growth, measured by the GDP per capita, is presumed to be positively related with the increase in investor confidence and financial capacity, insignificance points towards the fact that the impact of GDP on ECF investor behaviour might reveal itself in the long run. It may also be true that in the short run, investors decisions solidified in the ECF market may be more inclined to micro economic of market influences as opposed to macro-economic factors. This result aligns with prior literature suggesting that GDP may not always exert an immediate influence on investment decisions, particularly for retail investors who form a large part of the ECF market.

The unemployment rate (LnUnempl) also shows negative coefficient of -10. 3952 and is statistically significant at the 10% level (p-value= 0. 0627). This means that increased unemployment leads to decrease in ECF market participation. A 1% increase in the unemployment rate leads to an approximately 10.4% decline in the number of ECF investors. This is in line with the Keynesian multiplier theory that suggests that conditions such as high unemployment, which leads to low disposable income and higher risk perceptions, discourages individuals from investing in the risky equity crowdfunding. The fairly large impact of unemployment indicates that ECF platforms are sensitive to the state of the demand for labor, with a decline in economic well-being reducing investors' confidence and ability to invest.

4.5 Diagnostic test

Having established how the variables are related in the long run and in the short run, it is now important to assess the reliability and stability of the statistical models that have been used for estimation. Because of this, several diagnostic tests (the normality test, Serial Correlation, Heteroscedasticity test and Ramsey reset test) are carried out in order to get a reliable outcome. These tests determine whether or not the assumptions made in the development of regression model are valid so that reliability of the model can be ascertained.

Table 4.8: Summary of Diagnostic Test Results

Test	Statistic	ECF Amount	ECF Investor
Normality (Jarque-Bera Prob.)	Probability	0.7158	0.1195
Serial Correlation (Durbin Watson)	DW Stat	1.9492	2.0608
Serial Correlation (Chi-Square Prob)	Probability	0.2184	0.2212
Heterosedasticity (F-Stat Prob.)	Probability	0.0592	0.0438
Heterosedasticity (Chi-Square Prob.)	Probability	0.0906	0.0934

Several diagnostic tests confirmed the robustness and reliability of the ARDL model by performing normality, serial correlation and heteroscedasticity evaluations. Table 4.8 provides a summary of the obtained results. The Jarque-Bera normality test shows that residuals for ECF Amount ($p = 0.7158$) and ECF Investor ($p = 0.1195$) differ from normal distribution at a statistically insignificant level. These p-values exceeding 5% indicate the normality assumption remains intact as there is no violation. The Durbin-Watson statistics from all models indicates no autocorrelation in residuals (ECF Amount = 1.9492 and ECF Investor = 2.0608) since DW values stayed within their accepted range of 2. The Chi-Square probabilities exceeding 0.05 level confirm that the model does not face serial correlation problems.

On the other hand, the heteroscedasticity test investigates fluctuating patterns in residual variances throughout the data sample. The probability value from F-statistic analysis at 0.0438 (ECF Investor) and 0.0592 (ECF Amount) approaches or exceeds the 5% threshold which signals possible heteroscedasticity problems. The Chi-Square analysis confirms no critical variance inconsistencies occur in the model since all probabilities exceed the threshold value of 0.05. Test results confirm that the model meets important statistical criteria because no serious issues of normality violations, serial correlation or heteroscedasticity have been detected. The minor heteroscedasticity issues found in ECF Amount and ECF Investor models require employing robust standard errors or alternative estimation methods to enhance efficiency.

5.0 Implication and Conclusion

The current study has contributed to understanding the conceptualize and analyze the ECF landscape and understand how ECF performance varies according to various economic parameters and the related implications for all the players involved in this entrepreneurial ecosystem. Using econometric model such as, ARDL cointegration modelling technique, the research has revealed significant relationship between the economic indicators like GDP, BLR, inflation and unemployment rate with the performance of ECF. The study also highlights how the ECF serves as one of the financial innovations that drives economic growth especially for start- up and SMEs in emerging markets like Malaysia. The bound test of the ARDL supported the existence of long and short-run co-integrating relationship between ECF performance and the identified economic factors that incorporated GDP, BLR and unemployment as jointly significant factors with ECF performance in the long run and short-run.

Beyond its empirical contribution, this research advances to the existing body of literature on financial innovation. The analysis aligns with the Schumpeter's (1934c) Theory of Economic Development, which emphasizes financial innovation as well as financial resources driving crucial role for economic growth. In the context of Malaysia, ECF can be seen as the innovative financial tool which stimulate to new economic activities by offering the necessary financing to start-ups and SMEs that become the sources of increased GDP in the country.

These findings carry important implications, especially for the entrepreneurs who want to secure funds for their ventures through the ECF platforms. Since entrepreneurs are crucial players in the ECF ecosystem, the investigations in the impact of economic factors on ECF performance is helpful in improving capital-raising effectiveness. The study establishes a positive correlation between GDP growth and ECF performance, which implies that entrepreneurs ought to align their campaigns with sectors that greatly contribute to Malaysia's economy development, such as technology, renewable energy, and manufacturing. Strategizing of their businesses in these expanding industries increases the chances of attracting potential investor during phases of economic growth.

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