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Asymmetric Effect of Market Sentiment on Banking: A Nonlinear ARDL Approach

(Kesan Asimetri Sentimen Pasaran terhadap Perbankan: Pendekatan ARDL Tidak Linear)

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ABSTRACT

This study explores the asymmetric impact of market sentiment on commercial bank deposits over long-run and short-run periods. Two attitude-based sentiments, the business condition index (BCI) and the consumer sentiment index (CSI) are used to proxy the market sentiment. By utilizing the Nonlinear Autoregressive Distributed Lag (NARDL) method on Malaysian data, the study found the existence of long-run and short-run asymmetric impact of market sentiment on bank deposit flow. Empirical results show that negative changes in market sentiment appear to affect bank deposits significantly in the long run while positive changes in the market sentiment show otherwise. This phenomenon would partially suggest that households might gone through a difficult phase such as job losses and rely on their saving to survive. Income and money supply, amongst other variables, demonstrate a long-run positive relationship with bank deposits, whereas interest rate has a long-run significant negative relationship. Results from NARDL also show that exchange rate, money supply, interest rate, income, and negative changes in BCI and CSI have a short-run effect on deposits. Overall, our study confirms the behavioural finance hypothesis which claims human behaviour affects financial decisions. The government should implement specific measures to reduce the impact of negative sentiment, as an increase in negative sentiment indicates households are likely to withdraw their deposit. Consequently, this phenomenon would affect household savings during their retirement age. Thus, the government should take the initiative or provide incentives to households during a hard time to cushion the impact of bad market sentiment.

Keywords: Asymmetric; bank deposit; behavioral finance; market sentiment; NARDL.

ABSTRAK

Kajian ini meneroka kesan asimetri sentimen pasaran terhadap deposit bank komersial dalam tempoh jangka panjang dan jangka pendek. Dua sentimen berasaskan sikap iaitu indeks keadaan perniagaan (BCI) dan indeks sentimen pengguna (CSI) digunakan sebagai proksi kepada sentimen pasaran. Dengan menggunakan kaedah Lat Tertabur Autoregresif Tidak Linear (NARDL) ke atas data Malaysia, kajian ini mendapati kewujudan kesan asimetri jangka panjang dan jangka pendek oleh sentimen pasaran terhadap aliran deposit bank. Keputusan empirik menunjukkan bahawa perubahan negatif dalam sentimen pasaran memberi kesan yang signifikan terhadap deposit bank dalam jangka panjang manakala perubahan positif dalam sentimen pasaran menunjukkan sebaliknya. Fenomena ini memberi gambaran bahawa isi rumah mungkin melalui fasa sukar seperti kehilangan pekerjaan dan bergantung pada simpanan mereka untuk terus bertahan. Selain itu, pendapatan dan bekalan wang menunjukkan hubungan positif jangka panjang dengan deposit bank, manakala kadar faedah mempunyai hubungan negatif yang signifikan. Keputusan daripada NARDL juga menunjukkan bahawa kadar pertukaran, bekalan wang, kadar faedah, pendapatan, dan perubahan negatif dalam BCI dan CSI mempunyai kesan jangka pendek terhadap deposit. Secara keseluruhan, kajian kami mengesahkan hipotesis kewangan tingkah laku yang menyatakan bahawa tingkah laku manusia mempengaruhi keputusan kewangan. Kerajaan perlu mengambil langkah-langkah tertentu untuk mengurangkan kesan sentimen negatif, kerana peningkatan dalam sentimen negatif menunjukkan isi rumah berkemungkinan besar akan mengeluarkan deposit mereka. Akibatnya,

fenomena ini akan memberi kesan kepada simpanan isi rumah semasa mereka mencapai usia persaraan. Oleh itu, kerajaan harus mengambil inisiatif atau menyediakan insentif kepada isi rumah ketika masa sukar untuk meredakan kesan sentimen pasaran yang buruk.

Kata kunci: Asimetri; deposit bank; tingkah laku kewangan; sentimen pasaran; NARDL
JEL: C50, D10, E40, E50, G21, G40
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INTRODUCTION

The stock and currency markets, foreign direct investment and bank deposit flows are all significantly impacted by investor sentiment (Brown & Cliff 2005; Burdekin & Redfern 2009). According to behavioural finance, there are several behavioural biases that affect investors' decisions, preventing them from always acting rationally (Rupande et al. 2019). Investors are affected by their emotions, and some traders may behave irrationally and decide to invest without considering a company's fundamentals (Sayim & Rahman 2015). The Investor Sentiment Index (ISI), a product of plethora of theories and data sources, familiarizes users with the application of sentiment in financial and economics analyses (Brown & Cliff 2005; Baker et al. 2012). According to earlier research on the American stock market (Brown & Cliff, 2005; Bandopadhyaya & Jones 2006; Qiang & Shu-e 2009), psychological biases are the main predictors of investor sentiment and asymmetric information is a significant consideration that influences financial market behaviour (Siddiqi 2022). However, Kapoor & Prosad's (2017) research suggests that behavioural biases are considered by behavioral portfolio theory, fundamental risk and behavioural asset pricing models. Meanwhile, according to López-Cabarcos et al. (2020), theories on efficient market and behavioural finance are useful in explaining the investor sentiment.

Past studies on changes in bank deposits, incidents of terrorism, and corporate clarity in mature financial markets like the UK and Germany have used investor sentiment indicators and comparable U.S. models to elucidate these occurrences (Bergman & Roychowdhury 2008; Burdekin & Redfern 2009; Drakos 2010). However, in Malaysia, investor sentiment drives and moves the stock market (Bursa Malaysia 2009) which results in any facts or projections that are favourable to retail investors or unfavourable to them having an impact on the market. According to Ibrahim (2007), a financial instability will negatively impact Malaysia's economic growth due to its firm ties with Malaysia's financial market. The study's conclusion however is based on limited evidence that the financial industry cannot compensate for the loss in the banking sector which its reveals a minimal connection between these two linked sectors. Meanwhile, several researchers found that sentiment, proxied by investor sentiment index can behave as a short-term adverse predictor of stock return (Baker & Stein 2004; Baker et al. 2012). In term of measurement of market sentiment, Khan and Ahmad (2018) stated that it can be measured directly or indirectly. Direct measures are survey-based, which capture information from individuals regarding their intuitive feelings on the market and economic conditions via physical interaction, or virtually (internet). Indirect measures however are based on economic, market and financial indicators representing investors' attitudes.

In every country's financial and economic activity, investor sentiment is one of the key determinants. In Malaysia, the Business Conditions Index (BCI) and Consumer Sentiments Index (CSI), formulated by the Malaysian Institute of Economic Research (MIER) are two indexes that are used as proxy to measure the Malaysian market's sentiment. The MIER conducts the Business Conditions Survey and Consumer Sentiments Survey quarterly respectively, which outcomes form the basis for the BCI and CSI. Both indices are market sentiment indicators reflecting those of the institutional investors, company owners, and consumers, according to Tuyon et al. (2016). These measurements have the potential to affect investors' perceptions and choices. Additionally, BCI and CSI serve as valuable indicators of economic health, reflecting the confidence and optimism of businesses and consumers. Positive indices can have a cascading effect on bank deposits in Malaysia, influencing business investments, consumer spending and saving behavior and contributing to the overall stability and growth of the banking sector. The BCI and CSI provided by the Malaysian Institute of Economic Research (MIER), ranges from 0 to 200, with 100 as the neutral point. In the past, factors from the financial market, including turnover, the undervaluation of IPOs, the quantity of IPOs, and options volume, were used to develop the investor sentiment index (Brown & Cliff 2005; Baker & Wurgler 2007; Baker et al. 2012). Strong market sentiment often reflects the positive future implications of asset allocation and economic expansion while weak market sentiments shows otherwise.

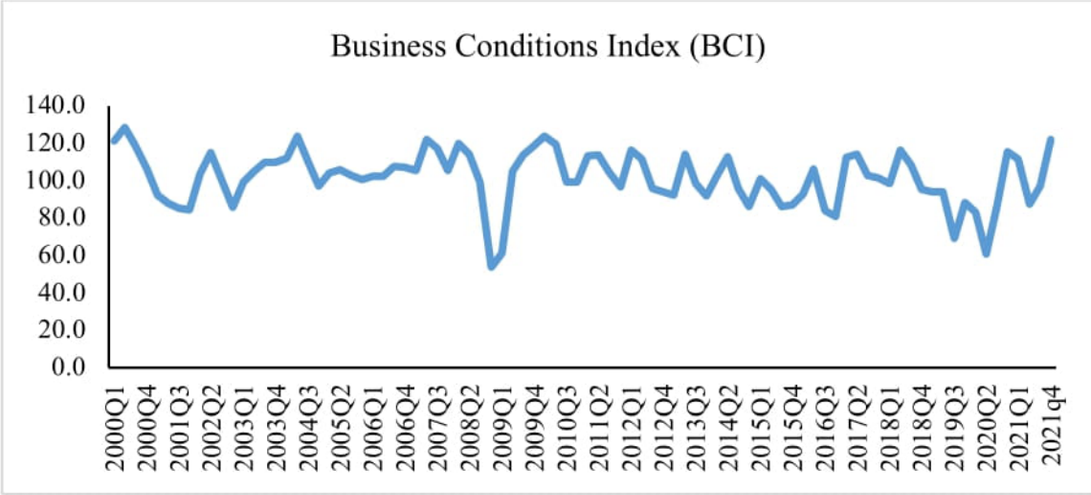

FIGURE 1. Business Condition Index (BCI)
Source: Economic Planning Unit (2022)

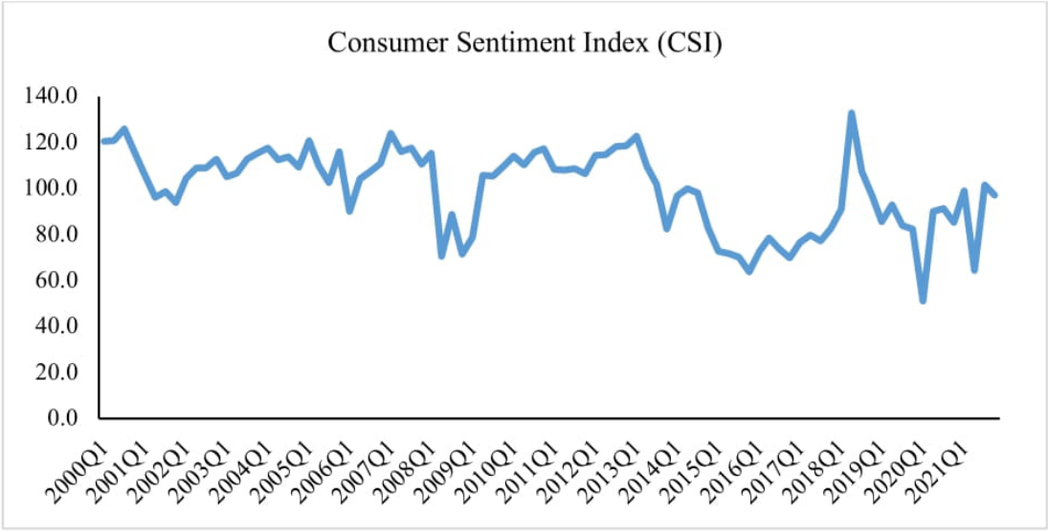

FIGURE 2. Consumer Sentiment Index (CSI)
Source: Economic Planning Unit (2022)

Figure 1 and 2 shows the BCI and CSI trend from 2000 until 2021, respectively. The index underwent significant fluctuations during the financial turmoil of 2007 to 2008. In the financial crisis of 2007–2008, there was a decline in market sentiment concerning the index's slump, which later rebounded. Between 2012 and 2015, the index's trend was notably affected by 1Malaysia Development Berhad (1MDB) scandal, credit limitations and government fiscal policies. Following the unprecedented opposition's victory in Malaysia's 14th General Election (PRU14) since independence, the index conversely displayed marked progress in the second quarter of 2018. The index fell once more in 2019 during the US-China trade conflict. The index scores at the end of the year are consistently lower than those in the middle. The emergence of Covid-19 in the fourth quarter of 2019 has disturbed Malaysia's economy and caused the index to further drop. Nevertheless, by the fourth quarter of 2021, Malaysia began to exhibit signs of economic resurgence, bolstered by the country's National Recovery Plan (NRP). This plan was designed to revitalize the local economy following the setbacks caused by Covid-19-related movement constraints, implemented through different versions of the Movement Control Order (MCO) to curb the pandemic's spread. Consequently, both the BCI and CSI indexes demonstrated an upward trajectory as 2021 concluded.

The investigation of deposit flows and their sources has been increased during the past several years. A banking crisis can be triggered by excessive deposit withdrawals which will disrupt or suspend credits to businesses and households Demirgüç-Kunt and Detragiache (1998).

Consequently, investment and consumption decline, potentially leading to widespread bankruptcy. By that virtue, the excessive bank deposit withdrawals must have a significant effect on the macroeconomic environment. In the instance whereby bank deposit outflows are caused by non-fundamental factors (such as herding behaviour or economic sentiment), a study by Maechler and McDill (2006) found numerous bank insolvencies caused by significant deposit withdrawals can be excessive, reaching up to half of the GDP. In this situation, a government's intervention via macroprudential policy to suppress deposit flows volatility are appealing (Choi & Furceri 2019). While research on behavioural finance mostly focusing on investors' attitude impact on the equity markets, the understanding of the causes of the recent financial crisis relates to impact of behavioural finance on the banking sector. As a result, our hypothesis is that, the market sentiment has an impact towards bank deposit.

Specifically, the objective of this study is to investigate the impact of the market sentiment on commercial bank deposits over the period of short-run and long-run and to empirically determine whether the impact is symmetry or otherwise. To achieve this, the Nonlinear Autoregressive Distributed Lag (NARDL) model is utilized to test the effects of positive and negative in market sentiment on banking deposits. Empirical results show that negative changes in market sentiment significantly affect bank deposits in the long run, whereas positive changes show the opposite effect.

Given this context, this study might provide two contributions to both relevant stakeholder and the body of knowledge. From the stakeholder perspective, understanding the asymmetric impact of market sentiment on bank deposits enables bankers to adjust their risk management strategies in response to changes in sentiment. Identifying how positive or negative changes in sentiment can significantly influence bank deposits, bankers could formulate more effective liquidity management strategies to mitigate potential outflows. Meanwhile, in terms of contributions to the body of knowledge, many researchers such as Brown and Cliff (2005), Baker and Wurgler (2007), Tetlock (2007), Luo et al. (2013) and Mehmood and Hanif (2014) used an indirect method of sentiment assessment. These methods however, may not accurately reflect market sentiment when measuring sentiment. Therefore, our study makes extensive use of the survey-based direct method. To represent market sentiment in Malaysia, our study will employ the BCI and CSI indices formulated by MIER. While Karim et al. (2022, 2024) and Tuyon et al. (2016) used the BCI and CSI to explore the relationship with equity returns in Malaysia, our study aims to investigate the impact on bank deposits. In addition, our study also proposes a nonlinear approach to investigate the impact of market sentiment on bank deposits, which Fauzias et al. (2014) did not consider. We hoped to contribute to the growing literature focusing on behavioural finance by addressing the gaps and demonstrating how investor sentiment affects the bank deposits market.

The remaining sections of the article are organized as follows: the second section delivers a review of the literature, the third section includes the empirical model and data used, and the fourth section contains the empirical findings. The final part concludes with policy implication.

LITERATURE REVIEW

MARKET SENTIMENT

Market sentiment shocks are the primary driver of business and financial cycles, with banks tightening lending requirements in response to a dropin market sentiment caused by a procyclical shadow banking sector that transfers risk to investors through refinancing (Bécard & Gauthier 2021). The movement in financial markets that is influenced by investors' trade perception reflected by market sentiment often referred to as investor sentiment (Limongi & Ravazzolo 2019). Investor sentiment indexes which represent the aggregate changes in investor behaviour in an economy may be used to measure investor sentiment. The theoretical foundations of investor sentiment claimed that the fluctuations in the bunch of proxies are utilized to produce the index. Traditionally, the index of investor sentiment was derived from financial market trading indicators such as turnover, the underpricing and volume of initial public offerings and options trading volume (Brown & Cliff 2005; Baker & Wurgler 2007; Baker et al. 2012). Investor sentiment is measured either directly or indirectly. Direct measurement involves the usage of daily internet search volume as proposed by Da and Gao (2015). Their measurement involves the data from millions of homes in calculating the Financial and Economic Attitudes Revealed by Search (FEARS) index. Papapanagiotou (2023) constructed new index based on Google search to proxy investor sentiment, while studying its effect on the oil price. The search terms relating to crude oil market are considered when constructing the index, such as "oil", "oil stock" and "oil price", amongst others. Another search-engine-based proxy utilised Baidu, a Chinese search engine to measure investor sentiment. Qin et al. (2023) employed Baidu-based proxy to represent investor sentiment in their study on its relationship with the Chinese online loan's liquidity. Besides, the investor sentiment can also be measured indirectly, as proposed by Baker and Wurgler (2007) whom introduced market-based measure. Alternatively, Tetlock (2007) and Luo et al. (2013) implemented another indirect measure known as media-based. Recent studies proposed combining different sentiment proxies (Tuyon et al. 2016; Rupande et al. 2019; Abdul et al. 2019). In addition, Edmans et al. (2007), Bollen et al. (2011) and Kaplanski and Levy (2012) captured internet-based comments and views on the outcomes of several World Cup games to gauge

investor sentiment while Bollen et al. (2011) used Twitter feeds. More recently, war-induced investor sentiment was also developed following recent eruption of the Russia-Ukraine war, especially by Abakah et al. (2023) whom constructed a comprehensive war-induced economic sanction sentiment index. The index incorporated more than what its predecessors had utilised such as newspapers and Google Trends, by adding Wikipedia and Twitter trends as well as social media sentiment. The theory of overconfidence and optimism pessimism was supported by other research, which used survey-based proxies like the Michigan Consumer Sentiment Index (Schmeling 2009). In a technique employed by Finter et al. (2012), investor sentiment is measured using time-series and cross-section proxies combined. Some unique investor sentiment indicators are also suggested. For instance, while discerning relationship between investor's mood and asset prices, Shu (2010) employed the attitude proxies, including weather and biorhythms. The cross-section of stock returns may be significantly impacted by investor's attitude, as demonstrated by Baker and Wurgler (2007) in which a composite sentiment index was created based on the first principal component of the six sentiment proxies. According to associated empirical research by Tetlock (2007), significant media pessimism leads to stock prices decline, which precede their later return to fundamental values.

The behavioural finance theory explains how human behaviour can significantly influence financial decisions or arrangements (Masini & Menichetti 2012). An investor's attitude toward specific security or financial market is known as investor sentiment (Ajzen 2005). The actions and price changes of securities used in the market are just two examples of how investors' sentiment is reflected in their sentiments, moods, or psychological states. Many stocks are overpriced when the mood of investors is highly bullish. Investors' optimism and speculation is powerful enough to boost up credit rating of low-rated stock, further improving the rating, overpricing it and hence improving its future returns (Bagheri & Seddighi 2023). Investors make quick decisions to sell overpriced stocks and purchase undervalued ones in an efficient market where they may immediately identify equities that are too costly or too inexpensive. When overpriced stocks are less in demand, the price drops until it is no longer expensive, but underpriced equities experience an increase in demand, which raises the cost (Boda & Sunitha 2018). A time-series mood poll can be used to measure someone's attitude toward financial markets, according to research by Ajzen and Driver in 1992. Attitude is thought to be the foundation of human decision-making.

Cubillas et al. (2021) demonstrated that positive investor sentiment affects bank lending, leading to increased risk-taking and reduced bank stability. Yet, this impact is mitigated in countries with strong creditor rights protection. Burdekin and Redfern (2009) found that investor sentiment adversely affect the availability of saving deposits in Chinese ADR market from their study. An inverse and significant relationship between time deposit growth and investor sentiment was found when the study extended to cover the Chinese time deposit market spanning the period from 2003 to 2007. Similar finding was also evident in the American market, in where Grossman et al. (2007) shown that the U.S. consumer sentiment affects American Depository Receipts (ADR) and the associated underlying assets. The linkage between deposit inflows and consumer sentiment is also positive in Eurozone as shown by Anastasiou et al. (2023). The deposit market should thus shift negatively while investor confidence in the stock market is increasing in countries with higher levels of financial liberalization, according to theory. The case whereby the bank deposit activity declining during stock market boom (the instance when it is supposedly raising investor sentiment to put more money in stock market), was shown by Lin (2020). To analyze investor sentiment in Malaysia, Fauzias et al. (2014) created a sentiment index that incorporates both market-based and survey-based proxies, namely Business Conditions Index (BCI) and the Consumer Sentiments Index (CSI). This article discusses the effect of the investor sentiment index on bank deposit flows. The long-term and short-term positive influence of sentiment on deposit flows in Malaysian banks are unveiled by the VECM test, despite the finding's inability to explain asymmetric relation between the two. Karim et al. (2022) on the other hand, employed dynamic panel GMM estimation technique and the same market sentiment proxy while studying firm-level equity impacted by the market sentiment. The results exhibit favourable and substantial influence on company stock returns. It was discerned that the positive market attitude motivates bullish approach, leading to share price escalation and thus, higher returns. A recent study by Karim et al. (2024) shows that both market sentiment indicators (BCI and CSI) significantly influence private firms' investment in Malaysia. Higher market sentiment indices create optimism for firms and increase business fixed investment. By combining the BCI, CSI, and stock index futures as a proxy of market sentiment in one regression model, Tuyon et al. (2016) studied the investor sentiment's effect on the stock market. The major conclusions of this study, which were reached using the ARDL method, were that, regardless of the size of the firm or the industry groups, investor sentiment affects all stock prices. This demonstrated how sentiment affects investing decisions made by Malaysian investors because they live in a collectivist culture (Statman & Weng 2010). The presence of the effect of investor sentiment on the stock return regardless of the firm's size was concurred by Sulaiman et al. (2019).

Investment attitude manifests as both optimism and pessimism. The flow of bank deposits is increased (decreased) by excessive optimism or pessimism. In addition, the investors underlying overconfidence plays a role in optimistic decision making. Parveen et al. (2020) shown overconfidence and heuristic decision making significantly affects investment decision and stock trading

volume at the Pakistan Stock Exchange. Optimism leads to higher stock return while pessimism leads to otherwise, regardless of channels of investment as demonstrated by Wang et al. (2022). The results are however, reversed when bearish market is considered regardless of the type of channels.

According to the noise trader theory, it is difficult for arbitrageurs to adjust to noise traders' influence (DeLong et al. 1990; Shleifer & Summers 1990). By that virtue, the long-term effects of investor sentiment is anticipated to surpass the short-term impact on stock returns (Brown & Cliff 2005) and investors are more likely to use market returns as a guiding principle when making trading decisions (Kudryavtsev 2017). However, the investor attitude effect on non-stock market performance over long or short term is less known, which includes, amongst others, the bank deposit flow.

According to Huong et al. (2021), factors such as inflation, bank capital, money supply, loan loss coverage, and GDP growth have an impact on how well banks perform in Southeast Asian countries. Income (proxied by growth in GDP) and rising interest rates in banks are positively correlated with bank deposit flow (Warman & Thirlwall 1994; Verma & Prakash 2011). Nevertheless, Kasri et al. (2009) shows that bank interest rate negatively correlates with bank deposit flow, illustrating the displaced commercial risk phenomenon, which can arise in a dual banking system (encompassing both Islamic and conventional banks) like Malaysia's. A study in Bahrain by Rouetbi et al. (2023) concurred this finding, stating that the displaced commercial risk significantly affects the performance of Islamic banks there as well. They reasoned the phenomenon arose from the dissatisfaction of the depositors leading them to switch to higher interest-bearing banks (including other Islamic banks). Hassan (2016) examines the effect of interest rates on Nigerian commercial bank deposits via Ordinary Least Square (OLS) multiple regression method and concluded that changes in interest rates do not move the banks' customers. Nevertheless, the research might have failed to recognise the non-linearity of the interest rates-deposit relationship, reflected by the results of a non-existent linear relationship. A more robust home currency may attract foreign investors to invest abroad through local banks, where they can profit from the difference in exchange rates while sending the money back home (Calvo 2001). A higher money supply significantly impacts bank deposits' availability, especially when seen in the context of the central banks' money supply control system. Reduced bank deposit flow in local banks will undoubtedly result from a restricted money supply policy (Gedeon 2013).

BANK DEPOSITS

The factors affecting bank deposits and individual savings have been the subject of several research studies. As an illustration, Beck et al. (2000) proposed that real GDP per capita and inflation impact private savings positively, globally. While Cohn and Kolluri (2003) showed that G7's interest rates positive influence on households' savings is evident, the government savings in OECD countries is adversely impacted by the credit constraints as investigated by Sarantis and Stewart (2001). According to Hondroyiannis (2004), over the long run, the real interest rate and the country's public finances in Greece have an impact on private sector deposits. Current research indicates that deposit withdrawals are not influenced by the bank or macroeconomic fundamentals but rather by other factors, including individual attitudes. Depositors can penalize banks for misconduct by withdrawing their funds for personal reasons, according to Martinez and Schmukler (2001). Anastasiou and Drakos (2021) found that depositor's fear has significant role in driving deposits outflow from European Union banks. Their study utilised Panel Vector Autoregressive model and employed the Google-search-based crisis sentiment indicators to proxy depositor sentiment. Meanwhile, a recent study by Wicaksono (2022) on the determinant of Islamic bank deposits during COVID-19 pandemic indicates that the pandemic, along with capital financing and bank assets had a distinct spatial impact on deposits.

According to research by Osili and Paulson (2014), individuals who have experienced a systemic banking crisis in the U.S. are less likely to hold bank accounts in the country compared to those who have never experienced such a crisis. According to Brown et al. (2020), the so-called withdrawal risk may be suppressed by a strong bank-depositor relationship. Iyer and Puri (2012) emphasized the importance of social networks in influencing depositor behaviour, concluding that the tendency of deposit withdrawal is positively influenced by the extensiveness of the depositor's network. According to Hasan et al. (2013), unfavourable "press rumours" substantially impact depositors' decisions more than fundamentals. The alternative is investor sentiment determined by Google search queries, such as the direct indicator of crisis sentiment created by the terms "crisis," "bank crisis," "subprime crisis," and "credit crisis," which is employed by Irresberger et al. (2015). It is crucial to remember that CSI is the only indicator employed in the banking literature to look at goals similar to those of this study.

Considering this, the following are some ways that the present study may solve some literature gaps. This study is conducted to investigate the existence of an asymmetrical relationship between market sentiments and commercial bank deposits in Malaysia. Grasping how deposits respond to market sentiment is vital for financial entities since deposits represent the most affordable and abundant pool of funds for lending. Therefore, a surge in deposits can potentially indicate an expansion in financial aid to the public. Additionally, to the best of my awareness, from past research, this is the inaugural effort to examine the potential asymmetry in the relationship between short- and long-term using NARDL

for commercial deposits, referencing market sentiment (BCI and CSI) in Malaysia. Moreover, this study analyses information from the Central Bank of Malaysia to analyze how Malaysian banks react to market sentiment over the long and short term. The study's final objective is to discover how Malaysia's deposit market is affected by market sentiment. Therefore, this paper would make a humble attempt to fill up this significant gap in the literature.

DATA AND METHODOLOGY

This study used quarterly data spanning from the years 2000 until 2021 which give a total of 84 observations. Total Commercial Bank Deposit (DEP), expressed in millions of Ringgits is made the dependent variable and the data is obtained from monthly statistical bulletin of Bank Negara Malaysia. Next, our variables of interest include the Business Condition Index (BCI) and the Consumer Sentiment Index (CSI) which serve as a proxy for market sentiment and the both data is collected from Economic Planning Unit. Our control variables consist of the interest rate (INR), exchange rate (EXR), money supply (MNS) and real gross domestic product (RGDP) where the first three data is collected from monthly statistical bulletin of Bank Negara Malaysia and the rest is from Department of Statistic Malaysia. Table 1 summarizes all the variables employed.

All the control variables are taken from monthly statistical data published by the Malaysian central bank except for RGDP and market sentiment variables (BCI and CSI) which is taken quarterly from the Department of Statistics Malaysia (DOSM). All monthly data are converted to quarterly basis using the end of month in each quarter in order to standardize the data frequency according to RGDP, BCI and CSI as well as comparing and integrating external data into the research becomes easier by this consistency. All variables are expressed in logarithmic form except for interest rate (INR).

TABLE 1. Summary of variable

Abbreviation	Descriptions	Source
DEP	Total commercial bank deposit (in million Ringgit) as proxy of deposit market	Monthly Statistical Bulletin of Bank Negara Malaysia
BCI	Business Conditions Index as proxy of investor sentiment index	Economic Planning Unit
CSI	Consumer Sentiments Index as proxy of investor sentiment index	Economic Planning Unit
RGDP	Real gross domestic product (GDP in million Ringgit)	Department of Statistic Malaysia
MNS	Money-3 account (M3 in million Ringgit) as proxy of money supply	Monthly Statistical Bulletin of Bank Negara Malaysia
INR	Deposit rate as proxy of interest rate	Monthly Statistical Bulletin of Bank Negara Malaysia
EXR	Real Exchange Rate	Monthly Statistical Bulletin of Bank Negara Malaysia

The NARDL model established by Shin et al. (2014) was then employed in this study. Given that relationship between variables are not always linear, the nonlinear econometric paradigm has gained in popularity in recent years. A nonlinear ARDL cointegration technique (NARDL) is proposed by Shin et al. (2014) as an extension of the ARDL model proposed by Pesaran and Shin (1999) and Pesaran et al. (2001) that accounts both short- and long-run asymmetries in the variables employed. NARDL is chosen to capture potential asymmetries in the relationship between short- and long-term market sentiment and commercial bank deposits. This method allows for the identification of nonlinear patterns and dynamic adjustments in the relationship, which traditional linear models might overlook. Moreover, NARDL captures the dynamic adjustment process following shocks or changes in market sentiment. This is crucial in studying financial dynamics where responses may not be immediate but evolve over time. The underlying principle of the NARDL model is the ability to unearth the extend of difference between the positive and negative magnitude changes of each of the variables in the model. In addition, the significant of both positive and negative variables can also be different, either both are significant, both are not significant or one of the variables is significant.

In comparison to linear models, NARDL model interpretation could pose greater difficulties which when interpreting coefficients and comprehending the implication of asymmetry relationship. Therefore, caution should be exercised in order to draw a meaningful conclusion. By investigating the asymmetric relationship, the study can shed light on the efficacy of short-term and long-term policy initiatives in response to market sentiment changes. This information is useful for policymakers in developing particular measures to stabilise and support the financial industry. Understanding the asymmetric dynamics of market sentiment and bank deposits is essential for successful risk management.

The findings can help financial institutions adjust their strategy and risk mitigation procedures to account for sentiment-driven fluctuations in deposits over time.

A unit root test can be run to confirm that the time series data is integrable with maximum order of one in the NARDL model. Furthermore, if cointegration is observed in both the positive and negative components of time series data, this suggests that the variables' relationships are nonlinear (Granger & Yoon 2002). The NARDL framework provided a mechanism to model asymmetrical cointegration by partial sum decomposing positive and negative values to find both short- and long-run asymmetrical impacts. Additionally, the technique helps a joint analysis of the non-stationarity and non-linearity problems in an unrestricted error correction model setting. To begin, we specify the long-run equation of bank deposit as follows:

$$LDEP_t = \beta_1 + \beta_2 LMS_t^+ + \beta_3 LMS_t^- + \beta_4 LRGDP_t + \beta_5 LEXR_t + \beta_6 LMNS_t + \beta_7 INR_t + \varepsilon_1 \quad (1)$$

Where LMS is natural log of market sentiment of BCI or CSI while the rest of the variables has been discussed in the first paragraph of this section. LMS_t^+ and LMS_t^- are the partial sums of positive and negative changes in LMS whereby:

$$LMS_t^+ = \sum_{i=1}^{k} \Delta LMS_i^+ = \sum_{i=1}^{k} \max(\Delta LMS_i, 0) \quad (2)$$

and

$$LMS_t^- = \sum_{i=1}^{k} \Delta LMS_i^- = \sum_{i=1}^{k} \min(\Delta LMS_i, 0) \quad (3)$$

As shown in Shin et al., (2014), equation (1) can be framed into the linear ARDL model initiated by Pesaran et al. (2001) in order to obtain the following non-linear ARDL (NARDL) model.

Model 1:

$$\Delta \boldsymbol{LDEP_t} = \boldsymbol{\alpha_1 + \alpha_2 LBCI_{t-1}^+ + \alpha_3 LBCI_{t-1}^- + \alpha_4 LRGDP_{t-1} + \alpha_5 LEXR_{t-1} + \alpha_6 LMNS_{t-1} + \alpha_7 INR_{t-1}} + \sum_{i=1}^{p} \boldsymbol{\pi_i \Delta LDEP_{t-i}} + \sum_{i=0}^{q} (\boldsymbol{\theta_i^+ \Delta LBCI_{t-i}^+ + \theta_i^+ \Delta LBCI_{t-i}^-}) + \sum_{i=0}^{r} \gamma_i \Delta LGDP_{t-i} + \sum_{i=0}^{s} \delta_i \Delta LEXR_{t-i} + \sum_{i=0}^{u} \varphi_i \Delta LMNS_{t-i} + \sum_{i=0}^{v} \mu_i \Delta INR_{t-i} + \varepsilon_2 \quad (4)$$

Model 2:

$$\Delta LDEP_t = \alpha_1 + \alpha_2 LCSI_{t-1}^+ + \alpha_3 LCSI_{t-1}^- + \alpha_4 LRGDP_{t-1} + \alpha_5 LEXR_{t-1} + \alpha_6 LMNS_{t-1} + \alpha_7 INR_{t-1} + \sum_{i=1}^{p} \pi_i \Delta LDEP_{t-i} + \sum_{i=0}^{q} (\theta_i^+ \Delta LBCI_{t-i}^+ + \theta_i^+ \Delta LBCI_{t-i}^-) + \sum_{i=0}^{r} \gamma_i \Delta LGDP_{t-i} + \sum_{i=0}^{s} \delta_i \Delta LEXR_{t-i} + \sum_{i=0}^{u} \varphi_i \Delta LMNS_{t-i} + \sum_{i=0}^{v} \mu_i \Delta INR_{t-i} + \varepsilon_2 \quad (5)$$

where all variables are defined as above and p, q, r, s, u and v are the lag structure. $LBCI^+$, $LBCI^-$, $LCSI^+$ and $LCSI^-$ are partial sums of positive and negatives changes in LBCI and LCSI respectively. In this setting, both long- and short-run asymmetric market sentiment influences on bank deposits are captured.

The steps below describe how to empirically apply the nonlinear ARDL technique. To ensure that no I(2) variables are involved, a unit root test is first performed. This is crucial because the F-statistics obtained for evaluating cointegration are invalid when there is an I(2) variable present. For this purpose, we employ the well-known ADF and PP unit root tests to determine the variables' orders of integration. In the following phase, we estimate equations (6) and (7) using the typical OLS estimation technique. Third, using a bounds testing approach developed by Pesaran et al. (2001) and Shin et al. (2014), we test for the presence of cointegration among the variables based on the estimated NARDL. This involves testing the null hypothesis, $\delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \delta_7 = 0$ using the Wald-F test.

RESULT AND DISCUSSION

This part examines the asymmetrical effects of market sentiment on bank deposits utilizing the Nonlinear Autoregressive Distributed Lag (NARDL) model. The Philips-Perron (PP) and Augmented Dickey-Fuller (ADF) tests were used to detect any unit roots in the time series data. If variables integrated at I(2) are absent, the estimation may proceed. To determine the optimal lag order in the NARDL, Akaike Information Criterion (AIC) was employed. Akaike Information Criterion involves iteratively estimating models with different lag lengths and selecting the lag length associated with the lowest SIC value. This approach ensures that the chosen model achieves a good balance between fitting the data well and avoiding unnecessary complexity. According to the results in table 2, the proxy for sentiment is stationary at a level while the rest are stationary after first differencing. In summary, the variables consist solely of I(0) and I(1) types, with no I(2) series present. Consequently, the next phase involves applying the bound testing method for cointegration analysis.

TABLE 2. Unit Root Test

	Augmented -Dickey Fuller (ADF)		Philip Perron (PP)	
	Trend and intercept		Trend and intercept	
	Level	First Difference	Level	First Difference
LDEP	-3.075333 (0.1188)	-8.329542 (0.0000)***	-2.858704 (0.1811)	-8.630828 (0.0000)***
LBCI	-6.774581 (0.0000)***	-11.02564 (0.0000)***	-4.885230 (0.0007)***	-24.07930 (0.0001)***
LCSI	-4.991761 (0.0005)***	-13.83781 (0.0000)***	-5.062036 (0.0004)***	-15.08887 (0.0000)***
LEXR	-2.227355 (0.4684)	-8.240795 (0.0000)***	-2.378441 (0.3881)	-8.218542 (0.0000)***
LMNS	-0.995701 (0.9387)	-9.504798 (0.0000)***	-0.966259 (0.9427)	-9.504309 (0.0000)***
LRGDP	-1.590698 (0.7888)	-14.64885 (0.0000)***	-3.181772 (0.0949)*	-16.27337 (0.0000)***
INR	-2.317568 (0.4199)	-5.987154 (0.0000)***	-2.004053 (0.5908)	-6.021814 (0.0000)***

***, **, * indicate 1%, 5% and 10% significance respectively.

TABLE 3. Bounds test for nonlinear cointegration.

	Model 1 (k=6, n=84)		Model 2 (k=6, n=84)	
F-statistic	4.1315**		7.7637***	
Significant level	Lower bound	Upper bound	Lower bound	Upper bound
10%	2.236	3.381	2.236	3.381
5%	2.627	3.864	2.627	3.864
1%	3.457	4.943	3.457	4.943

***, **, * indicates 1%, 5% and 10% significance, respectively. k is the number of independent variable while n is the number of observation. The lower and upper bound F-statistics is based on Narayan (2005) case III.

Table 3 presents the outcomes of the bound test for nonlinear cointegration. Results in Table 3 indicate that, for both model 1 and 2, the F-statistics exceed the upper critical bounds at both 5% and 1% levels, providing substantial proof of cointegration among the variables. This finding corroborates the long-term co-movement among the examined variables. Following this finding, we move on to examine the bank deposit and positive and negative changes in BCI and CSI.

First, we estimate the nonlinear model as depicted by equations (4) and (5) and the results are outlined in Table 4. The significance of lag DEP signals the presence of cointegration in both models, which aligns with the bound test result. The model permits assessment of the deposit dynamic and its response to both positive and negative changes in market sentiment proxies (BCI and CSI). Table 4 Panel B presents the long-run coefficients estimated by the dynamic model shown in Table 4 Panel A. One of the important findings from this study is that market sentiment (BCI and CSI) is found to have an asymmetric impact on bank deposit flow, whereby both models show negative sentiment (bad news) has an impact on deposits compared to positive sentiment (good news). In model 1, the deposit effect of negative changes in the Business Condition Index (BCI) appears to be statistically significant at 10%, whereas the positive changes in BCI are found to be insignificant. Our estimates suggest that a 1% decrease in BCI is associated with a decrease of 0.16% in bank deposits. In model 2, the deposit effect of negative changes in Consumer Sentiment Index (CSI) appears to be statistically significant at 1%, whereas the positive change in CSI is found to be insignificant. Our estimates indicate that a 1% decrease in CSI is associated with a decrease of 0.07% in a bank deposit. We can infer from these two models that there is an asymmetric long-run relationship between market sentiment (BCI and CSI) and bank deposits. Although the impact is different in size, both negative changes in business and consumer sentiment indexes significantly affect bank deposits. This demonstrates how negative changes in sentiment or so called bad news affecting bank deposits flowing to Malaysian commercial banks. Both findings verified that market sentiment imparts significance in bank deposit flows. Further, the findings signify that good market sentiment is ineffective in influencing the decision of investors or consumer to deposit in banks. The results corroborate the assertions made by Fauzias et al. (2013) and Tuyon et al. (2016) that the BCI and CSI serve as preferred proxies for investor sentiment in the Malaysian stock market.

In addition, the results for both models reveal the long-run impact of money supply on bank deposits to be statistically significant at 1%. In model 1, a 1% increase in money supply will increase 1.14% of bank deposit while in model 2, 1% increase in money supply will increase 1.34% of bank deposits. This finding is aligned with theory and supported by the study conducted by Fauzias et al. (2013) and Latheef & Masih (2017). In a study by Ngula (2012), a percentage boost in money supply triggers positive growth of bank deposit, lending support to the hypothesis that the monetary supply growth manifests similar growth in bank deposit and gauge the monetary condition. On the other hand, both models show that interest rate has a negatively significant effect on bank deposits. Based on model 1, our estimates suggest that a one percentage point increase in interest rate will reduce 10% of bank deposits, while in model 2, one percentage point increase in interest is associated to a 13% reduction in deposits. This finding is confirmed by Latheef and Masih (2017), who discovered that an increase in interest rates has a negative impact on commercial deposits in the Maldives. Even though this discovery contradicts the theory, it is possible because Fauzias et al. (2013) discovered a bi-directional causal relationship between interest rate and deposit. Consequently, demand and supply of bank deposits affects the relationship between interest rates and deposit, and becoming part of the policy variables. A higher deposit supply lowers interest rate and vice versa. Furthermore, our study was conducted during the Covid-19 pandemic period, when people tend to reduce their living savings even while the deposit rate is high. Turhani and Hoda's (2016) research backs up this claim. The analysis results reveal that interest rates have a negative influence on deposits in Albania, which appears to be normal given that the study was done during a financial crisis. Moreover, in model 2, income has a significantly positive relationship with bank deposits. According to our estimations, a 1% rise in income will raise the deposit market by 1.34 %. It means that during times of significant economic growth, commercial bank deposits are higher since it increases people's lifetime incomes (Awole 2016; Teshome 2017).

Meanwhile, the result in Table 4 Panel A supports the existence of asymmetry in the short run. The outcome for model 1 demonstrates that there is the presence of short-run in exchange rate, money supply and negative changes in BCI. As for model 2, exchange rate, income, money supply, interest rate and positive changes in CSI show existence in the short run. Lastly, we ran a diagnostic test to determine whether the NARDL model was adequate. Jarque-Bera statistic was employed to test for normality in the error term. On the other hands, Breusch-Godfrey Serial Correlation LM (BG) test and Autoregressive Conditional Heteroscedasticity (ARCH) were run up to lag 2 to test for independence of the error term and non-constant variance of the error respectively. Results of diagnostics test in table 4, Panel C shows the NARDL model has pass the diagnostic checking. In addition, the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) tests as shown in Figure 3 are used to verify the structural stability in the model. From both tests, the results assure the stability of all the coefficients, reflected by the estimated parameters falling within the 5% significance line for CUSUM and CUSUM of squares tests.

TABLE 4. NARDL estimation, long run and diagnostic test

Panel A : Non-Linear estimation result			
Model 1 – ARDL (1, 0, 3, 3, 1, 4, 0)		Model 2 – ARDL (3, 2, 0, 4, 1, 1, 2)	
Variable	Coefficient	Variable	Coefficient
C	-2.044 (0.312)	C	-5.581** (0.019)
LDEP(-1)	-0.452*** (0.000)	LDEP (-1)	-0.775*** (0.000)
$LBCI^{+}$#	0.055 (0.154)	$LCSI^{+}$ (-1)	-0.007 (0.799)
$LBCI^{-}$ (-1)	0.071* (0.098)	$LCSI^{-}$#	0.060*** (0.006)
LEXR (-1)	-0.067 (0.443)	LEXR (-1)	-0.141 (0.172)
LRGDP (-1)	0.051 (0.343)	LRGDP (-1)	0.108** (0.096)
LMNS (-1)	0.517*** (0.005)	LMNS (-1)	1.039*** (0.000)
INR#	-0.048*** (0.007)	INR (-1)	-0.103*** (0.000)
$DLBCI^{-}$	0.040 (0.200)	DLDEP (-1)	0.332*** (0.003)

continue ...

... continued

$DLBCI^{-}$ (-1)	0.008 (0.853)	DLDEP (-2)	0.219** (0.040)
$DLBCI^{-}$ (-2)	0.066** (0.032)	$DLCSI^{+}$	0.007 (0.838)
DLEXR	-0.237 (0.114)	$DLCSI^{+}$ (-1)	0.085*** (0.017)
DLEXR (-1)	-0.485*** (0.002)	DLEXR	-0.298** (0.049)
DLEXR (-2)	-0.232 (0.111)	DLEXR (-1)	-0.462*** (0.003)
DLRGDP	-0.134 (0.219)	DLEXR (-2)	-0.260** (0.075)
DLMNS	1.861*** (0.000)	DLEXR (-3)	-0.225* (0.100)
DLMNS (-1)	1.038*** (0.009)	DLRGDP	-0.201* (0.092)
DLMNS (-2)	0.139 (0.727)	DLMNS	1.715*** (0.000)
DLMNS (-3)	-0.860** (0.029)	DINR	-0.026 (0.609)
		DINR (-1)	0.139*** (0.007)

Panel B: Long run relationship

Variable	Coefficient	Variable	Coefficient
$LBCI^{+}$	0.1212 (0.1379)	$LCSI^{+}$	-0.0085 (0.7986)
$LBCI^{-}$	0.1563 (0.0716)*	$LCSI^{-}$	0.0776 (0.0022) ***
LEXR	-0.1492 (0.4183)	LEXR	-0.1821 (0.1455)
LRGDP	0.1130 (0.3022)	LRGDP	0.1389 (0.0753)**
LMNS	1.1434 (0.0008)***	LMNS	1.3415 (0.0000)***
INR	-0.1071 (0.0003)***	INR	-0.1333 (0.0000)***

Panel C : Diagnostic test

JB	0.0358	0.1590
BG	0.6732	0.5997
ARCH	0.3412	0.5966

***, **, * indicate 1%, 5% and 10% significance respectively. # indicates the variable interpreted as Z = Z(- 1) + D(Z). Number in the parenthesis is p-value. JB refers to the Jarque-Bera normality test, BG is the Breusch-Godfrey Serial Correlation LM test for autocorrelation up to the lag order given in the bracket, and ARCH is the Autoregressive Conditional Heteroscedasticity test for heteroskedasticity up to the lag order given in the bracket.

ROBUSTNESS CHECKING

Following that empirical result in Table 4, the market sentiment proxies (BCI and CSI) are merged into a single regression equation as shown in Table 5 to ensure robustness of the main finding. Empirical findings reveal that negative changes in CSI have an influence on deposit while positive changes in CSI do not. Other coefficients hold the same result which is consistent with previous findings. Result of diagnostic test in Table 5 assures that the model has passed all the diagnostic checks. Hence, we conclude that our main finding is robust.

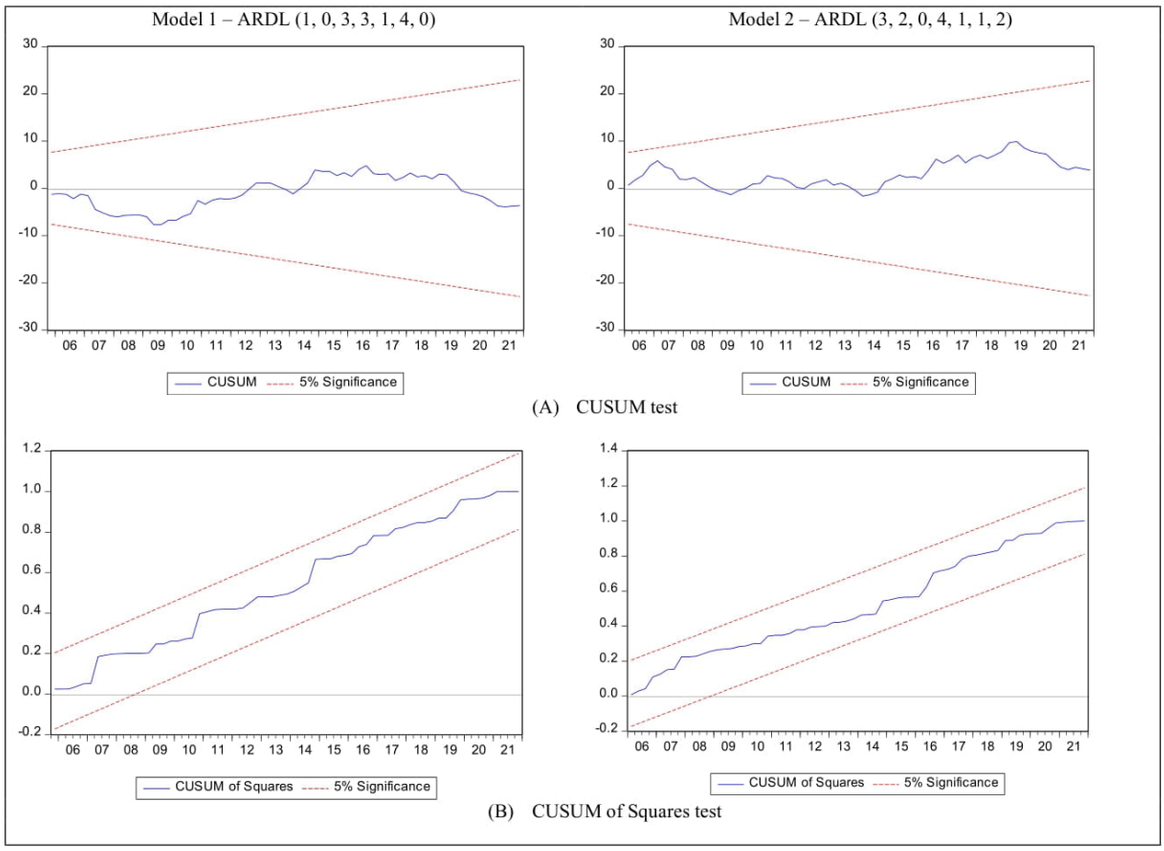

FIGURE 3. CUSUM and CUSUM of Square test

TABLE 5. Long-run equation

Variable	Coefficient	Diagnostic test (p-value)
ARDL	(3, 0, 0, 2, 0, 4, 1, 1, 2)	
$LBCI^{+}$	0.019916 (0.5984)	JB : 0.2881
$LBCI^{-}$	0.036775 (0.2958)	BG : 0.4468
$LCSI^{+}$	-0.009398 (0.8271)	ARCH : 0.4151
$LCSI^{-}$	0.063944 (0.0262)**	CUSUM: Stable
LEXR	-0.165528 (0.2124)	CUSUMSQ: Stable
LRGDP	0.160882 (0.0739)*	
LMNS	1.365136 (0.0000)***	
INR	-0.131332 (0.0000)***	

***, **, * indicate 1%, 5% and 10% significance respectively. Number in the parenthesis is p-value. JB is the Jarque-Bera test for normality, BG is the Breusch-Godfrey Serial Correlation LM test for autocorrelation up to the lag order given in the bracket, and ARCH is the Autoregressive Conditional Heteroscedasticity test for heteroskedasticity up to the lag order given in the bracket.

CONCLUSION AND POLICY IMPLICATION

Deposits are the largest source of available loanable funds. Hence it is critical for financial firms to understand how deposits behave with respect to market sentiment. Therefore, an increase in deposits could result in an increase in financial assistance provided to the public. This study aims at ascertaining the presence of any long or short-run asymmetric relationship between market sentiments and commercial bank deposits in Malaysia. The focus of this research is also to determine how market sentiment affects Malaysia's deposit market. In order to fulfil the objective, a nonlinear cointegration method known as Nonlinear Autoregressive Distributed Lag (NARDL) has been utilized.

To conduct the research, quarterly data from 2000 to 2021 are used. The outcomes from the two models employed ascertained the presence of long- and short-run relationships between market sentiments (proxied by BCI and CSI) and commercial deposits. The business and consumer confidence indices have a favourable and considerable impact on bank deposits, despite the impact having a variable magnitude. The finding shows how negative changes in market sentiment have an impact on bank deposits of Malaysia while positive changes in market sentiment do not. Particularly, the results suggest that negative changes in market sentiment will discourage households to place their money in banks. Instead, households tend to withdraw their saving during a bad time which eventually led to the decrease in their saving. This phenomenon would partially suggest that households might gone through a difficult phase (e.g job losses) and rely on their saving to survive. Long-run and significant positive impact of money supply and income, amongst other variables, on bank deposits has been detected, while interest rate has a long-run significant negative relationship. Moreover, this finding reveals that exchange rate, money supply, interest rate, income, negative changes in BCI and CSI impacted deposits in the short run. We conducted a robustness check by merging market sentiment (BCI and CSI) into a single regression equation. The result confirmed our finding that negative changes in sentiment have an impact on deposits while positive ones do not.

Overall, these findings are in line with the behavioural finance hypothesis, which claims that human behaviour has a big impact on financial decisions and arrangements. Therefore, the Government has to make sure that the implementation of macroeconomic policy (fiscal and monetary) would create favourable or optimistic sentiment in the market. In addition, a decrease in deposits during negative sentiment shows people likely to be more withdraw their saving during a bad time. This would have an immediate impact towards the households current saving and would also affecting the future saving (retirement saving). Thus, Government should give initiative or incentives to households and businesses in order to help them sustain during a bad time. This is essential because of the saving deposits eventually reflect the future retirement saving. The limitation of this study is that this study may not account for all external factors influencing market sentiment. Therefore, unforeseen events or global economic conditions not considered in the analysis could impact the results. Future research may

conduct event studies around significant economic or financial events which could help in identifying specific periods of asymmetry and understand the underlying dynamics during crises or market shocks.

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