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Financial conditions index and economic growth: Empirical evidence from Vietnam

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Abstract

This paper measures and investigates the impact of the financial conditions index (FCI) on Vietnam's economic growth. Using principal component analysis (PCA) and a monthly time series macroeconomics dataset from January 2013 to December 2022, we calculated Vietnam's FCI. Furthermore, this paper employs the autoregressive distributed lag (ARDL) model to assess the influence of the FCI on Vietnam's economic growth, both in the short and long term. Research results indicate that easing financial conditions will promote Vietnam's economic growth in the short term. In addition, factors such as public investment, the labour employment index of industrial enterprises, exports, and the M2 money supply positively influence Vietnam's economic growth. In contrast, imports have a negative impact on Vietnam's economic growth in both the short-term and long-term models. This paper proposes several strategies for policy enforcement agencies to enhance the effectiveness of monetary policy management in Vietnam. These include: (i) encouraging public investment and foreign trade, especially by increasing exports; and (ii) keeping monetary and credit policies flexible and closely watching both domestic and international macroeconomic developments so that they can have ready-made policies for how to respond. Our research findings and recommendations are useful to policymakers and investors.

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1. Introduction

The real economy and financial markets have a close relationship and mutual impact; in particular, national financial conditions are the country's current financial variables, which have an impact on the behaviour of entities in the economy (Hatzius, Hooper, Mishkin, Schoenholtz, & Watson, 2010). Financial conditions are understood as a measure that reflects the ease of receiving domestic capital sources for businesses, households, and the government of each country (International Monetary Fund (IMF), 2014). Financial conditions affect the savings and investment plans of households and businesses; therefore, they play an important role in influencing current economic activity as well as future economic prospects (Chow, 2013). Changes in financial conditions are critical to the monetary policy transmission mechanism, and economic growth is one of the most influential macroeconomic variables (Osario, Unsal, & Pongsaparn, 2011). Therefore, assessing financial conditions plays a crucial role in implementing monetary policy that promotes economic growth.

To assess financial conditions, international organizations (such as the International Monetary Fund - IMF, Asian Development Bank - ADB, European Central Bank - ECB, and Organisation for Economic Co-operation and Development - OECD), central banks, and independent research organizations (such as Bloomberg and Goldman Sachs) have studied and developed the monetary conditions index (MCI) as well as the financial conditions index (FCI).

Researchers have extensively studied the monetary conditions index, yet it solely incorporates two aspects of the currency market: interest rates and exchange rates (Hyder & Khan, 2006). Given the complexity of the financial market, particularly in the wake of the global financial crisis, policymakers recognize the need to integrate and incorporate additional factors that reflect the long-term capital market, such as credit and equities, into the Monetary Conditions Index (MCI) to provide a more comprehensive view of financial markets (International Monetary Fund (IMF), 2017).

The Covid-19 pandemic and recent geopolitical shocks in the world have had a negative impact on the world economy in general and financial markets in particular (Sharif, Aloui, & Yarovaya, 2020). During this period, countries' monetary policies changed continuously, from expansionary monetary policies to cope with the negative impacts of the Covid-19 pandemic to contractionary monetary policy in order to curb inflation (Benmelech & Tzur-Ilan, 2020).

Furthermore, central banks' monetary policy management aims to promote sustainable economic growth (Ebiringa, Onuorah, & Obi, 2014). Therefore, given its importance, FCI has received much attention from scholars and policymakers in recent years. Most studies show that FCI has a positive impact and plays an important role in forecasting economic growth (Ganchev & Paskaleva, 2020; Gumata, Klein, & Ndou, 2012; Hatzius et al., 2010; Kuloğlu & Akar, 2024; Osario et al., 2011).

However, in Vietnam, current studies have only developed the FCI index (Nguyen, Tran, Pham, & Tran, 2021), while there is a lack of studies assessing the impact of FCI on macroeconomic variables of the economy. Therefore, our study fills the research gap by focusing on investigating the impact of financial conditions on economic growth in Vietnam through the autoregressive distributed lag (ARDL) model for the period 2013–2022.

The paper organizes the remaining parts as follows: Section 2 presents an overview of the theories and mechanisms via which the FCI influences economic growth, along with a literature review. Section 3 delineates our economic methodology. Section 4 highlights the main research findings. Section 5 presents the concluding remarks.

2. Literature Review

2.1. Mechanism of Impact of Financial Conditions on Economic Growth

The concept of FCI has attracted notable attention from many researchers because of the complexity of the financial industry (International Monetary Fund (IMF), 2017). Zheng and Yu (2014) define FCI as a comprehensive index constructed from a combination of variables in the currency market (including interest rates and exchange rates) and asset markets (comprising stock indices and real estate prices). Meanwhile, Osario et al. (2011) described FCI as an instrument for extracting information from current financial variables to predict the future economic condition by excluding cyclical components.

Moreover, Eika, Ericsson, and Nymoen (1996) suggest that the FCI serves as an extension of the Monetary Conditions Index (MCI) by incorporating variables that represent asset prices and financial conditions of a country, besides interest rates and exchange rates. Overall, despite the variety of definitions, the financial conditions index (FCI) essentially expands upon the monetary conditions index (MCI) when it includes a large set of information from all the financial variables that represent the financial environment. The FCI eliminates the cyclical influence of macroeconomic variables, so it only reflects short-term fluctuations in the financial environment and is an effective tool for policymakers to properly assess the current state of financial conditions in their country (Hatzius et al., 2010).

Economic growth is an ongoing increase in the production of commodities, services, and employment opportunities aimed exclusively at enhancing societal economic and financial welfare (Ogbulu & Torbira, 2012). Meanwhile, Hardwick, Khan, and Langmead (1994) define economic growth as an augmentation of a nation's productive capacity, determined by a persistent rise in real national income. As a result, economic growth is a critical concern for policymakers, regarded as a fundamental prerequisite for enhancing societal welfare and serving as the primary objective of economic policy.

Regarding the impact mechanism, the FCI can influence economic growth through the following channels (Figure 1):

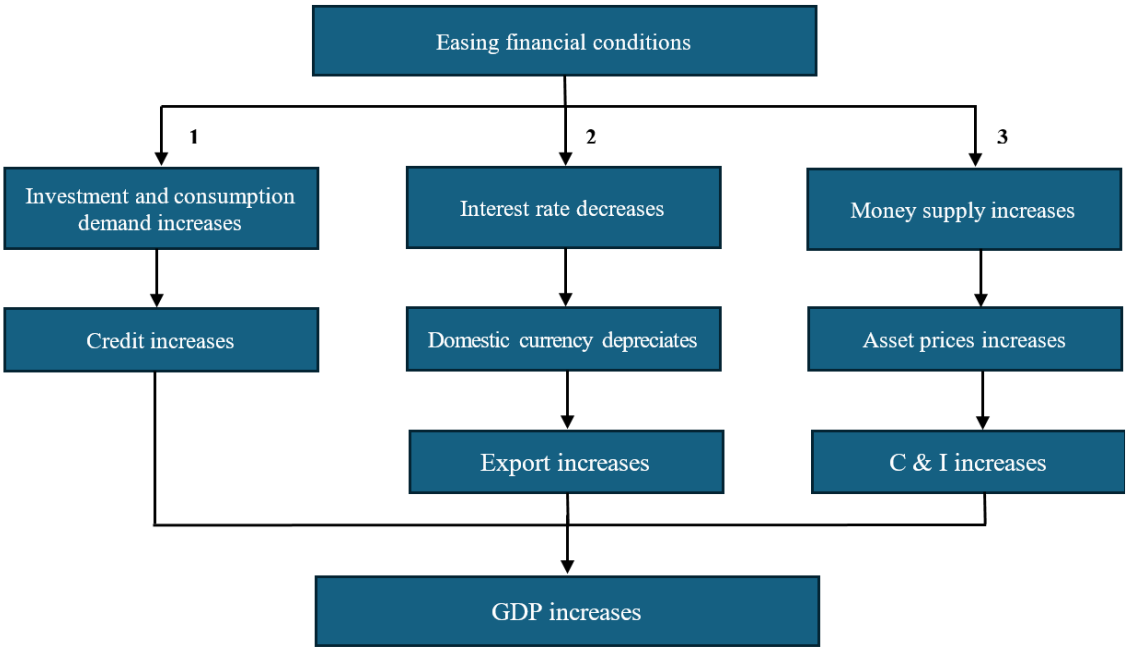

Figure 1. Impact mechanism of financial conditions index on economic growth.

Credit channel (first channel): The credit channel is one of the important mechanisms in the financial system, and it has a significant impact on economic growth (Teresienė, Keliuotytė-Staniulėnienė, & Kanapickienė, 2021). Accordingly, the credit channel involves banks and other financial institutions providing loans to individuals, households, and businesses (Farajnezhad, Ziaei, Choo, & Karimiyan, 2016). During the period of easing financial conditions, the money supply is abundant and interest rates are low, thereby stimulating the investment and consumption demand of businesses and people. Additionally, the credit channel plays an important role in promoting economic growth through public investment activities. Public investment projects, such as building transport infrastructure, energy, or information technology, often require large-scale investment capital, and credit channels help support the provision of capital for these projects, create favourable conditions for infrastructure development, and enhance the economy's competitiveness.

Exchange rate channel (second channel): The exchange rate channel refers to the fluctuation of exchange rates between national currencies. During periods of easing financial conditions, interest rates tend to decrease, causing the domestic currency to depreciate, thereby stimulating exports (Udeaja & Udoh, 2017). In addition, exchange rates have a significant impact on the tourism and service industries (Agiomirgianakis, Serenis, & Tsounis, 2015). Furthermore, exchange rates also impact foreign direct investment (FDI) (Alba, Wang, & Park, 2010). Specifically, when a country's currency depreciates relative to other countries' currencies, it can become more attractive to foreign investors. This can create new investment capital, technology, knowledge, and jobs, contributing to economic growth (Goldberg, 2009).

Asset price channel (third channel): Through several channels of influence, asset prices have a significant impact on economic growth. Accordingly, asset prices, such as real estate, stocks, commodities, and other types of assets, have a significant influence on the investment decisions of businesses and individuals (Sharpe, 2011). During periods of easing financial conditions, an increased money supply causes asset prices to rise, and the total value of assets owned by individuals and businesses increases, creating increased net assets and increasing borrowing capacity. This often promotes investment and business expansion, contributing to economic growth (Olulu-Briggs & Ogbulu, 2015). Conversely, a decrease in asset prices can make people and businesses less able to borrow capital, leading to a decrease in investment and a negative impact on economic growth. Moreover, asset prices are impacting the financial system and economic stability. When asset prices rise, the value of collateral increases, helping to improve financial institutions' credit and borrowing abilities. This often leads to credit expansion and increased financial activity, creating favourable conditions for economic growth (Cooper, 2013). Furthermore, when asset prices increase, people tend to spend more, thereby contributing to promoting economic growth (Altissimo et al., 2005).

2.2. The Impact of Financial Conditions on Economic Growth

Following the global financial crisis, numerous studies not only sought to identify the root causes and outcomes of the crisis but also conducted in-depth research and developed indicators to monitor financial conditions with the aim of warning and preventing future crises. Furthermore, studies have demonstrated the effectiveness of FCIs in predicting financial and monetary market conditions and guiding effective policy interventions, particularly in developing countries where financial market crises frequently occur and

significantly influence monetary and real aggregates (Capasso, Napolitano, & Viveros Jiménez, 2023). At the same time, the relationship between financial conditions and macroeconomic variables in general and economic growth in particular has also become an important research topic for economists. Although many previous studies have evaluated the impact and relationship between FCI and economic growth in many countries, the results have not been consistent.

Zheng and Yu (2014) assert that the FCI is an extensive index derived from a combination of factors, including currency rates and asset prices. It can address the shortcomings of certain traditional indicators, such as money supply and interest rates, in assessing financial conditions and predicting economic changes. Zheng and Yu (2014) also pointed out that the FCI has emerged as a significant reference metric in financial analysis and policymaking inside some central banks and international organizations. The authors constructed China's Financial Conditions Index utilizing variables including money supply, interest rates, exchange rates, stock prices, and housing prices through principle component analysis (PCA) and dynamic factor modelling. The findings indicate that FCI can predict GDP for a duration of two quarters without correlation to other variables, suggesting that FCI is also proficient in forecasting general economic trends and serves as a leading indicator of GDP.

Hatzius et al. (2010) built the Financial Conditions Index (FCI) and explored the relationship between financial conditions and economic growth in the United States, using a data set that included five single financial indicators from Q1 1961 to Q4 2006 and an AR model. The results demonstrate that, among individual indices, the stock market index has the ability to predict two to four quarters ahead. In addition, the FCI performs particularly well in times of unusual financial stress originating from within asset markets. This result is similar to the study of Brave and Butters (2011) when constructing a US FCI using PCA combined with quarterly data sets from Q1/1973 to Q2/2010. According to Brave and Butters (2011) the FCI provides a timely assessment of the degree of tightening or easing of financial markets relative to past economic and financial conditions, while the residual contains information about future economic activity, making it highly predictive. Similarly, Koop and Korobilis (2014) developed an FCI index for the US using 18 financial variables based on quarterly data from 1970 to 2013. The authors created a factor-augmented vector auto regression (FAVARs) model by creating a time-varying parameter factor-augmented vector auto regression (TVP-FAVAR) model with a lot of financial variables (defined as those used to find latent FCI) and main macroeconomic variables like GDP, inflation, and unemployment rate. This was done to see how FCI related to these variables. The results indicate that financial variables have predictive power with respect to macroeconomic variables (GDP growth, inflation, and unemployment) measured in real time.

The FCI is also commonly studied in Asian countries. Osario et al. (2011) constructed an FCI using the weighted sum method based on VAR and the PCA method based on the general dynamic factor model (GDFM), combining it with a data set from 2001–2011 of 13 Asian countries to study the economic predictability of the FCI. The results show that FCI can be considered a predictive parameter for GDP growth. Accordingly, financial conditions in Asia were already substantially tightening before the 2008 global crisis, and the FCI bottomed out before GDP in most countries fell sharply by one to two quarters. Except for Australia, Hong Kong, and Japan, the FCI of most remaining Asian countries in the sample reflects GDP 1–3 quarters in advance. Similarly, Kwark and Lee (2021) constructed the FCI of Korea and analysed the impact of financial conditions on future GDP growth. Furthermore, Kwark and Lee (2021) expanded the model to account for the spillover effects of the United States on Korea, incorporating both US GDP growth and US FCI into the quantile regression model. The results show that the impact of FCI on GDP varies at different quantile levels. In other words, tightening financial conditions lead to a significant reduction in future GDP growth at the low end. Furthermore, difficult financial conditions force the next quarter's GDP distribution to follow the binomial law. In addition, the deterioration of US financial conditions is likely to widen the variance in the distribution of South Korea's expected GDP growth in the following quarter. Meanwhile, in India, Khundrakpam, Kavediya, and Anthony (2017) created financial condition indices for India and evaluated the ability of FCIs to predict the economic cycle. Accordingly, Khundrakpam et al. (2017) constructed the FCIs utilizing two methodologies: PCA and a weighted sum approach based on VAR. Then, they tested how well these FCIs could predict GDP, showing that they were good at making predictions three quarters of the time (9 months ahead of time) using a large high-frequency dataset (monthly). The findings indicate that lenient financial conditions marked a significant portion of the pre-crisis era in the 2000s, which later constricted during the global financial crisis and persisted into the period of 2010–2011, according to FCI estimates.Both methodologies on FCI indicate that exchange rates, stock prices, bank credit, money supply, and the spreads between 10-year bond yields in India and the US are significant determinants of overall financial conditions. The forecasting model exhibits a robust association between FCI and GDP growth, concluding that the PCA-based FCI surpasses the VAR-based FCI in predicting future GDP growth.

In South Africa, Gumata et al. (2012) developed the FCI based on two methods, PCA and Kalma filter, to study South Africa's FCI from 1999 to 2011. Research results show that in periods when the value of FCI is tighter than average, conventional monetary policies are no longer effective; instead, policymakers need to consider other more feasible options, such as unconventional monetary policy. Furthermore, the study's findings show that the FCI is capable of forecasting GDP growth up to four quarters and is more effective than the South African Reserve Bank's (SARB) leading indicators. Similarly, Kabundi and Mbelu (2021) constructed the FCI

for South Africa using monthly time series data from January 2000 to April 2017. The results show that tight financial conditions reduce both economic growth and inflation.

In Europe, Ganchev and Paskaleva (2020) developed the FCI for 11 European economies—Bulgaria, Czech Republic, Croatia, Estonia, Hungary, Lithuania, Latvia, Poland, Romania, Germany, and Turkey—covering the period from 2000 to 2017. The results demonstrate that the tightening of financial conditions leads to a reduction in GDP growth and an escalation in inflation. Furthermore, Ganchev and Paskaleva (2020) illustrate that local financial conditions exert a more rapid and pronounced influence than global financial shocks. Similar, Kuloğlu and Akar (2024), utilizing Turkish data from Q1 2010 to Q2 2022 and employing the VAR model, also determined a causal association between FCI and real GDP growth. Moreover, Kapetanios, Price, and Young (2018) utilized monthly data from January 2004 to June 2014 to compute the FCI for the United Kingdom. The study's results indicated that the FCI possesses significant predictive capability about the UK's economic growth.

In general, despite attracting the attention of numerous scholars worldwide, there is no consensus in research regarding the impact of the FCI on GDP growth. Moreover, the majority of research in Vietnam has only focused on developing the FCI. This study will further evaluate the impact of FCIs on Vietnam's economic growth, thereby proposing recommendations and policies to help Vietnam promote economic growth.

3. Data and Methodology

3.1. Financial Conditions Index Measurement

To study the impact of FCI on Vietnam's economic growth, following Zheng and Yu (2014); Brave and Butters (2011); Osario et al. (2011) and Gumata et al. (2012) we constructed a financial condition index based on the principal component analysis (PCA) method with the variables mentioned in Table 1.

Table 1. Summary of variables to construct the Vietnam's FCI.

No.	Market	Component variable to construct the Vietnam's FCI	Source
1	Currency market	Overnight interbank interest rate	IMF
		Lending and borrowing interest rates are spread	
		M2 money supply	
2	Forex market	Foreign exchange reserves	IMF Bruegel
		Exchange rate	
		Real effective exchange rate (REER)	
3	Stock market	VN-index	Fiinpro
4	Real estate market	Average house price	General statistics office of VietNam (GSO)
5	Bond market	Volume of government bond issuance	Vietnam bond market association
6	Commodity market	Oil price	IndexMundi

Principal component analysis (PCA) is one of the most commonly used methods to synthesize factors, particularly when synthesizing and analysing individual indicators. English, Tsatsaronis, and Zoli (2005) highlight the advantage of the PCA method in that it can synthesize and construct indices without depending on any specific type of economic model. Furthermore, the PCA evaluates the contribution of financial indicators in accordance with significant historical fluctuations in the expansion of the financial system and allows for an explanation of the systemic importance of each component (Brave & Butters, 2011). The PCA method also gets around the issue of not having enough data, and it lets you use a lot of variables to find the FCI index without affecting the precision of the degrees of freedom of econometric models (Debuque-Gonzales & Gochoco-Bautista, 2017; Hatzius et al., 2010). The higher the PCA's FCI index, the more favorable the financial conditions are, and vice versa. Moreover, the novelty in this paper is that we added house prices in the real estate market to calculate FCI in Vietnam, whereas previous studies only used variables such as interest rates, exchange rates, credit, and financial markets.

To build the FCI index using the PCA method, we follow four steps, including: (i) Selecting variables to build the FCI; (ii) Standardizing variables using the Normed PCA method; (iii) Calculating principal components using the PCA method; and (iv) Aggregating the index according to the weighted average of the main components.

3.2. Research Model

This paper employed the autoregressive distributed lag (ARDL) model to evaluate the impact of the FCI on Vietnam's economic growth due to the following advantages: (i) The ARDL model is appropriate for research involving limited sample sizes; (ii) ARDL model can conduct regression analyses with variables exhibiting

varying lags, irrespective of their differencing order I(0), I(1), or both; (iii) ARDL model estimates a single equation rather than a system of equations, as seen in the Johansen and Granger tests; and (iv) it facilitates short-term computations through the ECM model via linear transformation without compromising degrees of freedom (Pesaran, Shin, & Smith, 2001). We estimate the ARDL model to assess the influence of FCI on Vietnam's economic growth using the following steps: (1) Select the ARDL model with the optimal lag order determined by the Akaike Information Criterion (AIC); (2) Employ the bound test to assess the cointegration relationship; (3) Utilize the error correction model (ECM) to estimate both short-run and long-run effects; (4) Assess the model's stability and robustness by: (i) conducting the ARCH test for heteroskedasticity; (ii) performing the Breusch-Godfrey test for serial correlation; (iii) utilizing the Ramsey RESET test to identify omitted variables; (iv) evaluating the stability of regression models via the cumulative sum of residuals (CUSUM) and the adjusted cumulative sum of residuals (CUSUM-SQ). Moreover, in following Cole (1958) and Kennedy (1993) we use the Industrial Production Index (IPI) to measure Vietnam's monthly economic growth. The equations are specified as follows:

$$lnIPI_t = \alpha_1 + \sum_{i=1}^{a1} b_{1i} lnIPI_{t-i} + \sum_{j=1}^{a2} c_{1j} FCI_{t-j} + \sum_{k=1}^{a3} d_{1k} lnCPI_{t-k} + \sum_{l=1}^{a4} e_{1l} lnLABOUR_{t-l} + \sum_{m=1}^{a5} f_{1m} lnINVEST_{t-m} + \sum_{n=1}^{a6} g_{1n} lnEX_{t-m} + \sum_{p=1}^{a7} h_{1p} lnIM_{t-p} + \sum_{q=1}^{a8} x_{1q} lnM2_{t-q}$$

Table 2. Summary of variables in the research model.

No	Variable	Abbreviation	Source	Expected sign.	References
Dependent variable					
1	Industrial production index	IPI	GSO		Cole (1958) and Kennedy (1993)
Independent variables					
2	Financial conditions index	FCI	Authors' calculation	+	Zheng and Yu (2014); Hatzius et al. (2010); Osario et al. (2011) and Gumata et al. (2012).
3	Consumer price index	CPI	GSO	+	Yin (2023); Adaramola and Dada (2020) and Madurapperuma (2016)
4	Labor employment index of industrial enterprises	LABOUR	GSO	+	Authors' recommendation
5	Realized investment capital under the State budget (Billions VND)	INVEST	GSO	+	Milbourne, Otto, and Voss (2003); Ramirez and Nazmi (2003) and Bayraktar (2019)
6	Export (Thousands USD)	EX	GSO	+/-	Nguyen (2016); Ahmad, Afzal, and Khan (2017) and Subasat (2002)
7	Import (Thousands USD)	IM	GSO	+/-	(Kogid et al., 2011) and Uddin and Khanam (2017)
8	Total money supply M2 (Billions VND)	M2	IMF	+	Razia and Omarya (2022) and Chude and Chude (2016)

This paper uses a monthly secondary data set of Vietnam's macroeconomic variables from January 2013 to December 2022 with 120 observations. We collected the data used to build the FCI for Vietnam from reputable sources such as the World Bank, IMF, Bruegel, Vietnam Bond Market Association, FiinPro, and the General Statistics Office of Vietnam (GSO). After gathering the data, we standardized it using the Normed PCA method, calculated the principal components, and synthesized the index based on the weighted average of these main components. We also collected other data, including the Industrial Production Index (IPI), consumer price index (CPI), labour employment index of industrial enterprises (LABOUR), realized investment capital under the state budget (INVEST), and import and export value from the General Statistics Office of Vietnam. Data on total money supply (M2), oil prices, and the USD/VND exchange rate is collected from reliable data sources like the IMF, Index Mundi, and Investing.com. Table 2 presents the description of all variables in our paper.

4. Empirical Results

Table 3 presents the descriptive statistics results of the variables. In the period 2013-2022, Vietnam's FCI fluctuates from -1.718 to 2.452, with an average value of 2.28e-09 and a standard deviation of 0.977. According to the AIC standards of the Augmented Dickey-Fuller (ADF) technique and the Phillips-Perron (PP) method, the model's variables pass the unit root test because they are all stationary at level I (0) or at the first difference I (1). This means they can be used with the ARDL model.

Table 3. Descriptive statistics.

Variables	IPI	FCI	CPI	LABOUR	INVEST	EX	IM	M2
Mean	151.980	2.28e-09	156.879	100.955	27,200.35	19,437.740	18,961.440	8,006,685
Max.	267.162	2.452	180.065	107.7	65945	35,257	32,905	12,864,954
Min.	89.000	-1.718	135.125	94.7	9124	7,146	7,240	3,551,305
SD	35.184	0.977	12.799	1.008	12223.440	6,845.573	6,352.903	2,932,294
ADF I(0)	-1.983	0.406	-0.453	-0.963	-0.092	-0.065	-0.847	-2.575 ***
ADF I(1)	-2.217	-14.080 ***	-7.614 ***	-3.063 ***	-3.576 ***	-9.653 ***	-3.033 **	
PP I(0)	-1.118	-0.174	-0.475	-1.776	-2.877	-1.825	-1.725	-4.419 ***
PP I(1)	-19.839 ***	-17.950 ***	-7.656 ***	-30.632 ***	-20.598 ***	-38.599 ***	-30.156 ***	

Note: Number of observations: N = 120. ***, ** indicate that the variable is stationary at the 1%, 5%, and 10% significance level respectively.

Based on the AIC (Appendix 1), the optimal lag is (2, 4, 2, 1, 3, 3, 1, 4). The results of the diagnostic tests are presented in Appendix 2. The results in Appendix 2 show that the research model (i) has a cointegrating relationship. (ii) Homoscedasticity; (iii) No serial correlation; (iv) No omitted variables; and (v) Stability. Appendix 3 and Appendix 4 also confirm that the research model is stable.

Table 4. Empirical results.

Short-run		Long-run	
Variables	**Coefficient**	**Variables**	**Coefficient**
D(lnCPI)	0.710	lnCPI	-5.127
D(lnIPI(-1))	- 0.193 **		
D(FCI)(-1))	0.044 **	FCI	-0.087
D(lnINVEST)	0.043 **	lnINVEST	0.031
D(lnLABOUR)	57.229 ***	lnLABOUR	182.447 **
D(lnEX)	0.255 ***	LnEX	0.813
D(lnIM)	- 5.808 ***	lnIM	-18.694 *
D(lnM2)	0.227	lnM2	1.301 *
EC = lnIPI - (-5.127*lnCPI – 0.087*FCI + 0.031*lnINVEST + 182.447*lnLABOUR + 0.813*lnEX – 18.694 *lnIM + 1.301*lnM2)			

Note: ***, **, * indicate significance at the 1%, 5%, and 10% level respectively

Table 4 presents the results of the short- and long-term effects of FCI on Vietnam's economic growth.

First, in the short-run model, the coefficient of the FCI variable has a positive value (0.044) and is statistically significant at the 5% level. This suggests that a 1 point increase in Vietnam's FCI from the previous month leads to an average 4.4% increase in the country's economic growth, as measured by the industrial production index, ceteris paribus. Meanwhile, we do not find a long-term relationship between FCI and growth in Vietnam. In other words, FCI only has an impact on Vietnam's economic growth in the short term. This result is similar to the research of Osario et al. (2011); Kabundi and Mbelu (2021) and Ganchev and Paskaleva (2020). Accordingly, when financial conditions ease, as indicated by a higher FCI index with a higher money supply and lower interest rates, people and businesses can readily obtain credit capital to invest in production and business activities, contributing to economic growth. In contrast, in a period of tighter financial conditions with contractionary monetary policy, which leads to higher interest rates and a lower money supply, people and businesses have difficulty accessing credit to expand production and business activities, resulting in a decline in economic growth.

Second, the coefficient of realized investment capital under the state budget (lnINVEST) in the short-term model has a positive value and is statistically significant at the 5% level, showing that when the state makes more public investment, the index of industrial production will be higher, or economic growth will be better. In addition, the industrial employment index variable's regression coefficient (lnLABOUR) is also positive in both short-term and long-term models, with significance levels of 1% and 5%, respectively. This means that an increase in the industrial employment index will increase the industrial production index. This is consistent with the Cobb-Douglas production function. Furthermore, in terms of economic growth, this result is also in line with our expectations. Specifically, public investment plays a significant role, not only directly contributing

to GDP but also creating positive effects that promote the development of private investment through the infrastructure system or by prioritizing investment in key industries. Additionally, it contributes to the creation of more jobs, thereby increasing the growth rate of the economy. Particularly, during periods of crisis like the COVID-19 pandemic, the role of public investment becomes even more crucial. During the COVID-19 period, while numerous sectors of production, business, and services experienced adverse effects, investment emerged as a mechanism to facilitate economic recovery and serve as a catalyst for growth, playing a pivotal role in attracting capital from various economic sectors and society at large.Moreover, public investment stimulates demand, creates jobs, and builds infrastructure to support economic growth and improve people's quality of life, thereby motivating economic development.

Third, the export coefficient (lnEX) is positive and statistically significant at the 1% level in the short-run model, indicating that, in the short term, export value exerts a substantial positive influence on economic growth in Vietnam. This outcome parallels the study of Mishra (2011). Consequently, there seems to be no lag in the relationship between exports and Vietnam's economic growth, which is logical considering that export activities directly enhance economic development. Conversely, the imports coefficient (lnIM) has negative values in both short-run and long-run models, with statistical significance at the 1% and 10% levels, respectively, indicating that importation adversely affects Vietnam's economic growth in both timeframes. A high import value, from a positive perspective, signifies robust domestic demand and an expanding economy. If these imports mostly consist of raw materials for the production of high-value items, such as machinery and equipment, they are particularly advantageous for a country, as its finance manufacturing will enhance the economy's productivity over the long term. Conversely, an increase in a country's product imports may result in a significant capital outflow. Moreover, excessive imports that surpass governmental regulation would result in a depletion of foreign currency, adversely affecting domestic output. Additionally, an influx of consumer products will diminish domestic demand, thereby hindering economic growth.

Fourth, in the long-run model, the coefficient of M2 money supply has a positive value and is statistically significant at the 10% level, implying that it has a positive impact on Vietnam's growth in the long term. Accordingly, increasing the money supply will reduce interest rates in the economy, creating conditions for people and businesses to have better access to credit capital, thereby promoting investment and production activities and contributing to economic growth.

5. Conclusion, Recommendations, and Limitations

This paper measures the FCI and evaluates the impact of FCI on Vietnam's economic growth in the period 2013–2022. According to research results from the ADRL model, easing financial conditions (higher FCI) will promote economic growth in the short term but have no long-term impact. Besides, the research results also show that public investment, the industrial labour utilization index, exports, and the M2 money supply have a positive impact on Vietnam's economic growth.

Based on the research results, this paper proposes some recommendations for Vietnam. First, the Vietnamese government should consider calculating and applying the FCI index as an operating tool to promote economic growth. Furthermore, the Vietnamese government must implement policies aimed at promoting public investment and foreign trade activities, particularly increasing exports, which will in turn create incentives for Vietnam's economic growth. Regarding monetary policy, the State Bank of Vietnam must flexibly and synchronously operate monetary policy tools to control money supply growth at a reasonable level and closely follow domestic as well as international macroeconomic developments in order to have proactive and appropriate response policies. Moreover, the State Bank of Vietnam needs to operate credit flexibly, directing credit flow to the production and business sectors, especially priority areas for economic recovery.

However, this paper has several limitations. First, despite our efforts to incorporate numerous components into the construction of FCI in Vietnam, data constraints have prevented us from including all components in the calculation formula, including household stock wealth (following Zheng and Yu (2014)). Besides principal component analysis, the VAR approach is another commonly used method to measure FCI. Therefore, in the future study, the authors aim to collect more components to construct the FCI of Vietnam more accurately. They will also calculate the FCI of Vietnam using a variety of methods to verify the robustness of the research results.

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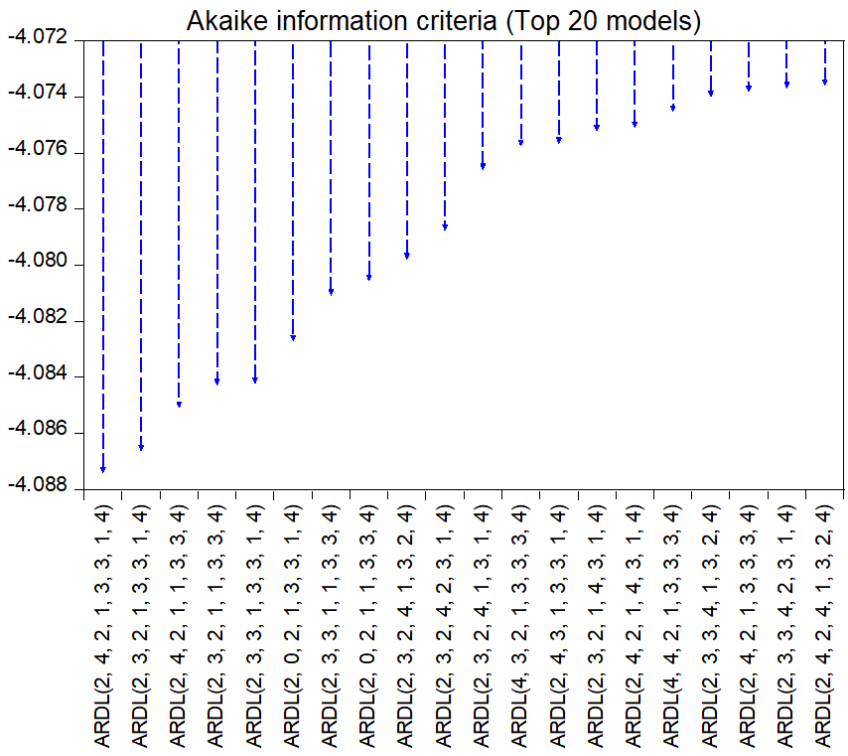
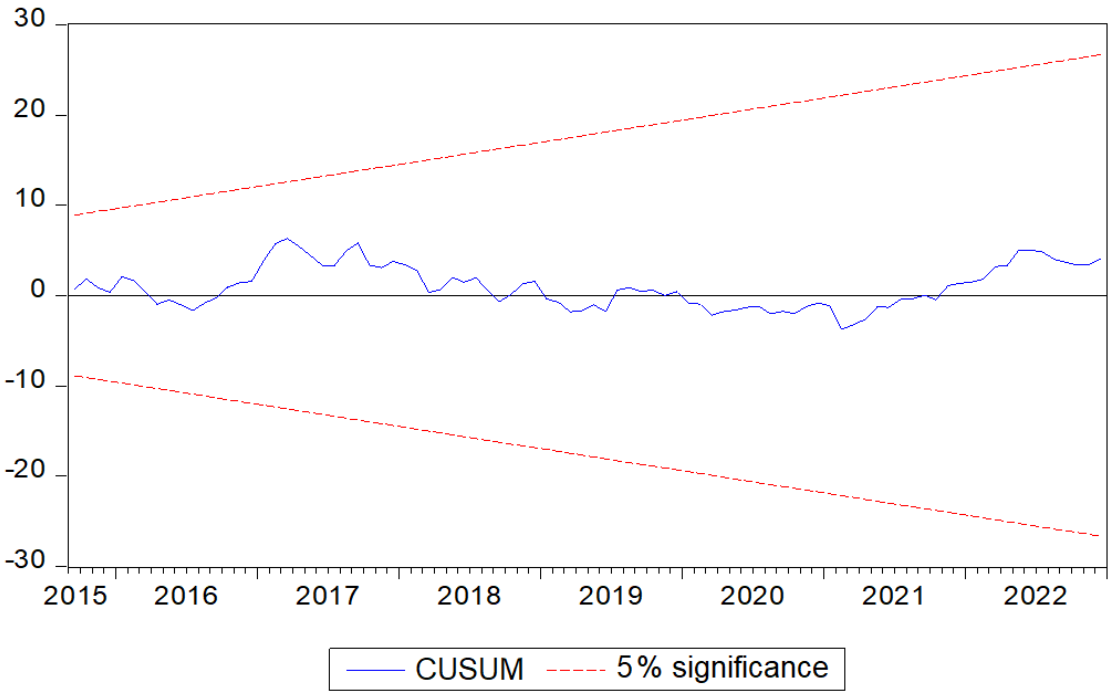


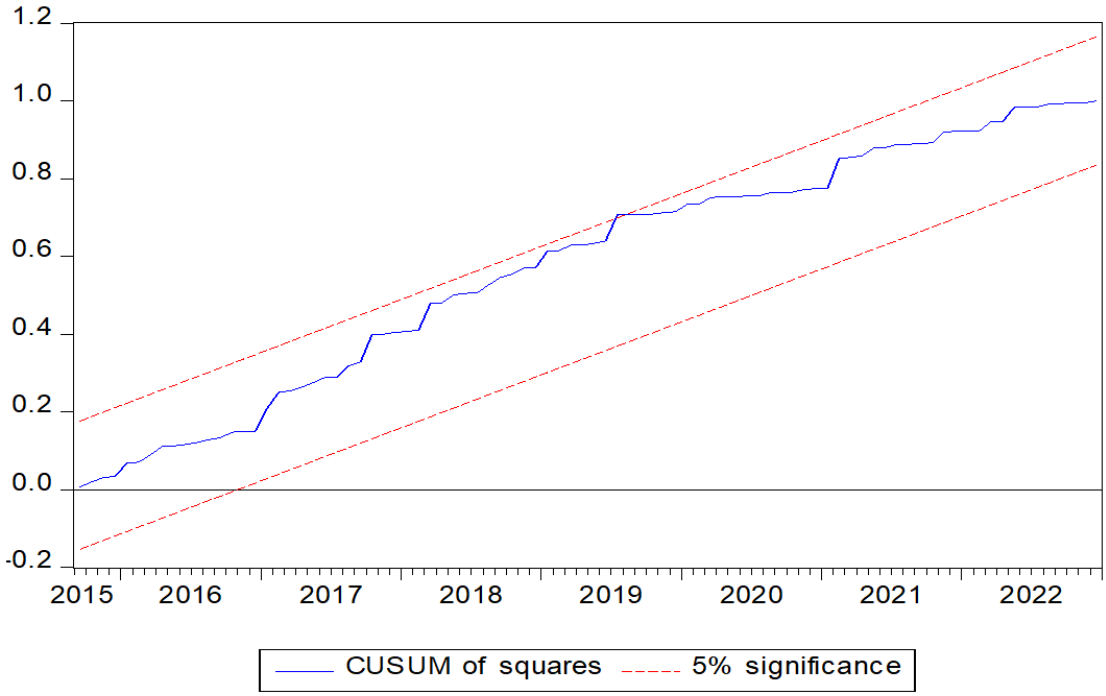
Appendix 1. Estimation results of selecting ARDL model with optimal lag.

Appendix 2. Diagnostic tests results.

Diagnostic tests	Value	Probability
ARCH heteroskedasticity	0.451258	0.5031
Breusch-Godfrey LM	0.495351	0.7392
Ramsey RESET	1.427417	0.1565
CUSUM	Stability	
CUSUM-SQ	Stability	



Appendix 3. Results of cumulative sum of residuals test.



Appendix 4. Results of the adjusted cumulative sum of residuals test.