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FinTech Financing Platforms and Bank Lending to SMEs in Malaysia: Complements or Substitutes

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Abstract: This study examines the complementarities or substitutability between financial technology (FinTech) financing platforms and bank financing for small and medium-sized enterprises (SMEs) in Malaysia. The study uses a six-variable structural vector autoregression (SVAR) framework, which includes the Overnight Policy Rate (OPR), Industrial Production Index (IPI), Consumer Price Index (CPI), peer-to-peer (P2P) financing, equity crowdfunding (ECF) capital raised, and aggregate outstanding SME bank loans, with monthly observations from 2017 to 2026. The SVAR results are complemented by structural impulse response functions (IRFs) with 95% bootstrap confidence intervals, forecast error variance decomposition (FEVD), diagnostic tests, stability assessment, and alternative lag specifications. The results show that P2P and ECF shocks generate small dynamic responses in SME bank lending and their 95% bootstrap confidence intervals generally include zero. An OPR shock produces a positive point response in SME bank lending, which is statistically distinguishable from zero only over part of the response horizon, while the P2P response is statistically distinguishable from zero only at an early horizon. FEVD results indicate that P2P and ECF shocks account for a growing share of the forecast-error variance of SME bank loans. Overall, the aggregate evidence does not provide robust support for a definitive complementarity, substitution, or fallback credit-valve mechanism.

Keywords: *FinTech, SME Financing, Bank Lending, P2P, ECF*

1. Introduction

Micro, small and medium enterprises (MSMEs) constitute a vital component of Malaysia's socio-economic structure, contributing 39.5% of the country's gross domestic product (GDP) and 48.7% of total employment in 2024 (Department of Statistics Malaysia [DOSM], 2025). Although these firms play a key role in localizing industrial production and job creation, they continue to face financing frictions. In this context, the rapid growth of financing platforms in the FinTech industry in Malaysia is significant because such platforms may reduce information asymmetry and transaction costs for credit-constrained SMEs (Sanga & Aziakpono, 2023).

The rapid use of alternative FinTech channels for financing has driven Malaysia to enact capital market guidelines that govern these sources. In 2015, Malaysia was the first region in ASEAN to introduce a formal regulatory regime for Equity Crowdfunding (ECF), and in 2016, Malaysia also introduced a formal regulatory regime for Peer-to-Peer (P2P) financing platforms (Securities Commission Malaysia, 2017). The amount of money raised in these digital alternative channels has grown exponentially over the past ten years, from a nascent financing avenue to a significant part of the national capital market architecture. But as these platforms grow in popularity and numbers, they pose an important macroeconomic issue for the structure of the domestic credit market. There are conflicting perspectives regarding the complementary role of digital lending to complement traditional financial institutions' credit offerings and the disruptive role of digital lending to challenge traditional banking models, potentially by substituting for conventional risk assessment systems (Agu et al., 2024). Empirically, it is unclear whether these FinTech financing platforms are complements or substitutes to the traditional banking system.

Despite the growing literature on financial technology, existing evidence does not establish a uniform relationship between alternative financing and traditional bank lending. Studies emphasizing complementarity argue that FinTech can expand access to underserved borrowers and generate information that may facilitate subsequent bank financing, whereas the substitution perspective suggests that alternative lenders may directly displace bank credit when they compete for similar borrowers. This distinction is particularly important in Malaysia because P2P financing and ECF represent debt- and equity-based channels with different balance-sheet implications. Moreover, much of the existing Malaysian evidence relies on annual, cross-sectional, or survey-based data, limiting the ability to examine the timing and persistence of financing shocks. The present

study therefore uses monthly data to investigate the dynamic interaction between P2P, ECF and SME bank lending while accounting for monetary and real-economy shocks.

The present study is an attempt to bridge these gaps in the empirical as well as methodological aspects. This study is conducted using a framework of Structural Vector Autoregression (SVAR), which produces high-frequency monthly time-series data from 2017 to 2026. The study objectives are:

- To estimate the impact of the volume of P2P financing on the volume of bank credit to traditional SMEs.
- To measure the impact of the ECF capital on the existing bank loans to SMEs.
- To examine the central bank monetary policy and macroeconomic shocks' propagation in both financing systems.

The remainder of this paper is structured as a series of well-connected and independent parts to allow for a systematic analytical flow. Section 2 provides a reviewed on the theoretical underpinning and empirical work. In Section 3, the econometric approach is described, including the identification framework for the SVAR, exclusion matrices, descriptions of the data, and estimation procedures. The empirical results are presented in Section 4, and a discussion of the findings is undertaken in Section 5. Section 6 highlights the discussion of the findings and an indication of the implications for structure and limitations to guide future research directions.

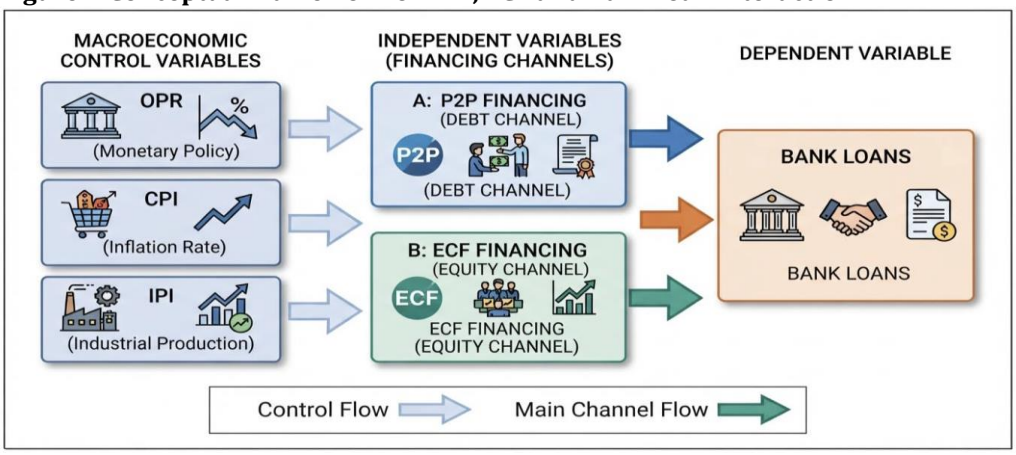
2. Literature Review

Theoretical Foundations

The integration of financial technology platforms and traditional financial institutions interacting on the structure of a credit market is derived from classical credit market theory as well as a classical theory on technological disruption. The theory of credit market failure is a basic paradigm that stems from Stiglitz and Weiss' (1981) Credit Rationing Theory. If the commercial banking institutions were to meet the increased demand for credit by increasing interest rates, they would have to deal with the problems of adverse selection and moral hazard in the presence of asymmetric information. The nature of bank requirements for collateral in project financing thus results in a non-price mechanism for risk management, which is one of the most significant constraints to financing projects for information-illiquid SMEs (Palmieri & Ferilli, 2024). In this context, FinTech platforms are used as a technological tool to overcome information asymmetry and use alternative, granular data to assess the creditworthiness of borrowers, which can help to reduce traditional bank rationing (Guo et al., 2025).

On the other hand, Christensen's (1997) Disruptive Innovation Theory predicts the substitution effect if digital lenders can offer lower costs to outcompete traditional lenders for borrowers with high-tech requirements and high-quality information (Ul-Durar et al., 2024). It establishes a complex relationship between traditional and relational banking practices, as well as transactional and data-driven banking practices (Nugraha et al., 2022). Digital IF can be used to tackle the "attribute-based mismatch" issue of traditional IF in emerging economies; however, empirical evidence from recent studies shows that FinTechs are increasingly emerging as a replacement for firms with limited capital access (Gaibulloev et al., 2025).On the one hand, the expansion of non-bank financing may broaden access to finance, and on the other hand, it may be associated with a rise in systemic risk in the overall system of institutional finance, which is called the "inclusion-stability nexus" by Banna et al. (2021). To evaluate the empirical relationship between digital alternative assets and institutional liabilities, the structural pathways between macroeconomic policies/decisions and volumes of alternative financing and the SME credit market need to be identified. This study does not consider FinTech as a single entity or a homogeneous entity but rather builds a dual-channel transmission model that comprises two channels: the debt channel and the equity channel. These alternative capitalization flows are not immune to today's innovations in both central bank monetary policy and the demand of the real economy (see Figure 1).

Figure 1:Conceptual framework of P2P, ECF and Bank loan interaction



P2P Financing Volume and SME Bank Loans

There is a highly controversial discussion on financial systems in the recent literature of banking and development economics on the part of financial technology platforms (P2P) versus the part of traditional commercial banking credit portfolios. This institutional setup depends on how much decentralized digital lending networks are used as a channel to expand markets or as a full-fledged and aggressive competitor. The results show that the digital providers are more likely to be direct substitutes in banking markets with greater concentration, and more likely to be complements in more dispersed banking markets in providing liquidity services. In addition, longitudinal evidence indicates that FinTech companies tend to take up the slack in the market for small loan applications, while also helping to meet the needs of more intricate and higher-value credit market applications that depend on traditional banking technology (Waliszewski et al., 2024; Cumming et al., 2021).

This strategic unit yields two empirically opposed ideas of complementarity and substitution. In the complementary paradigm, this solution suggests that the applications of peer-to-peer lending platforms are largely limited to a subprime, information-opaque, or even unrated SME segment that goes way beyond the risk appetite and regulatory mindset of commercial lenders. These platforms can supplement the lack of formal credit information, or they can use non-traditional data such as logistics performance and social media data to increase access to credit but without taking credit away from traditional banks (Iyer et al. 2015). Moreover, the rapid growth of P2P lending is now being considered in terms of indirect network externalities; the presence of institutions in digital platforms and the validation of borrower creditworthiness reduce the information asymmetries that have traditionally required banks' presence (Ribeiro-Navarrete et al., 2021). This relationship is made even better by the lower cost for banks in providing smaller credit facilities that are not very efficient to process (Farag & Johan, 2022). However, the substitution hypothesis implies that these platforms will become more competitive as they evolve and become more equally regulated in the future, and that this will lead to a shift in credit intermediation that is likely to be permanent, eroding the bank's traditional customer base (Kohardinata et al., 2023). Incumbent banks' market power and stability may be undermined by FinTech banks, as the competition may lead to smaller interest margins for incumbent banks (Cuadros-Solas et al., 2024; Naceur et al., 2025). As the share of portfolios decreases, incumbent banks are incentivized to be more competitive and/or riskier in their lending practices in this competition (Yin et al., 2022).

The market segment is structurally separated, which suggests that the conventional interest margins will be stabilizing in the long term, although the short term may experience competitive pressure and squeeze the interest margins. Traditional commercial banking networks are less efficient in underwriting the typical small, information-poor credit facility, and thus more prone to failure, so P2P systems that can underwrite credit facilities using data-driven models can strip away the liquidity requirement of commercial banks from the high-risk areas. This operational partitioning fills the credit void of firms that lack institutional forms and then comes back into the fold of the institutional matrix. But the outcome of a long-term coexistence is not an exclusive one, but a complementary one as alternative debt markets are forming in the Malaysian regulatory set-up. Hence, the following hypothesis is formulated:

Hypothesis 1 (H1): P2P financing is positively associated with SME bank lending over the longer response horizon, consistent with a potential complementarity or market-incubation mechanism.

Equity Crowdfunding (ECF) Volume and SME Bank Loans

An equity-based option of alternative financing refers to a variation of leverage in structure. This mechanism can be best understood through the structural parameters of the Pecking Order Theory: Companies would prefer internal financing and/or debt over equity financing because the latter dilutes the shareholder base and involves the strict disclosure requirements of the public capital markets. The Pecking Order Theory (POT) is a good example for explaining this mechanism, as it explains that corporations prefer to raise funds internally through debt and/or equity financing by preference, rather than equity financing, which results in ownership dilution and the rigorous capital market disclosure requirements (Eldridge et al., 2019). These platforms allow these companies to obtain capital to develop their innovation, which is hard to achieve when they are backed by debt-based financing, as the innovation is too risky for bankers (Laso et al., 2025). Stability under this alternative financing is available, but it is crucial that players also be integrated into institutional arrangements to diminish banks' fragility risk (Mamatzakis et al., 2021). Moreover, these platforms can be useful in solving the "principal-agent friction" associated with traditional intermediation, since the platform is able to match the capital needs and enhance the credit access of the SMEs, with a lesser amount of collateral (Block et al., 2017).

The use of ECF in overcoming these challenges can result in suboptimal capital structures; however, since the SMEs might be more focused on the immediate need for capital than the long-term strategic goals for the company, this may not be the best approach (Fasano et al., 2025). In the end, the rise of such platforms highlights the need to consider the whole landscape of entrepreneurial finance, in which intermediaries, both digital and traditional, must deal with intricate relationship dynamics to better address multiple market segments (Butticè & Vismara, 2021). Empirical evidence also indicates that the ownership of such platforms is likely to be associated with a higher debt load and/or lower internal liquidity of companies, suggesting a complementary rather than competitive relationship with traditional banking (Troise et al., 2024). A key difference with the traditional conventional banking filter for collateral for typical borrowers of ECF platforms differs from conventional banking, where it is early-stage startups, seed-phase companies, and asset-light innovative SMEs with high intangible asset capital (Hervé & Schwienbacher, 2018). These types of deals tend to fall short of commercial banks' strict interest coverage ratios, which makes them more likely to turn to ECF as a main gateway to evade the credit rationing that is common in traditional institutional settings (Mazzocchini & Lucarelli, 2022).

The digital platforms allow the transition and provide an important signal to investors, beyond financial needs, of the viability of the project, minimizing information asymmetries, which banks are not well positioned to solve (Estrin et al., 2022; Vismara, 2016). Conversely, studies have shown that the whole landscape is changing towards professionalization, as venture capitalists and business angels have entered these campaigns (Coakley et al., 2021). This new combination of expert signaling and retail investor capitalization may buffer early-stage investment risk and close the gap between informal financing and institutional VC investment (Wang et al., 2019). The developments demonstrated earlier illustrate that the sector is not just a displacement phenomenon, but an addition to the financial system, and an appealing source of capital which adds to the diversity of the entrepreneurial ecosystem (Estrin et al., 2018). This results in positive network effects that provide new pipelines and processes for the certification of deals in subsequent institutional funding rounds (Coakley & Lazos, 2021; Drover et al., 2017).

In contrast, while these ecosystem theories present equity crowdfunding as an additional signaling channel, it is also possible that corporate finance mechanisms are based on the Pecking Order parameters. In a situation of the credit market in Malaysia, if the campaign in the ECF is successful, the change in capital structure will be immediate, since commercial banking facilities require highly collateralized loans. Once the SMEs are able to acquire a long-term equity injection from crowd networks, they will have a huge cash buffer and become operationally independent of the commercial bank's overdraft and short-term loans at high rates of interest to maintain the flow of flexibility. In this sense, the current corporate optimization process is more about reducing debt and not the flow of banking connections. Therefore, the second hypothesis is:

Hypothesis 2 (H_2): ECF financing is negatively associated with SME bank lending over the longer response horizon, consistent with a potential substitution mechanism.

Macroeconomic Shock: OPR, Inflation and Industrial Output

Primary institutions of alternative digital finance and conventional finance are not isolated from the real economy or institutional changes by central bank monetary policy adjustments. In a risk-averse monetary policy, institutional credit constraints can also affect the monetary cost, with the risk of pushing small businesses towards the adoption of the crowdfunding approach (Camilleri & Bresciani, 2022). This is an example of a substitute relationship where companies have been moving to digital versions as bank credit has come in short supply in tight money markets. The three macroeconomic control variables are important to include in the monthly time-series modelling to isolate pure financial innovations. The three macroeconomic control variables are crucial in capturing the financial innovations and avoiding large omitted variable biases in the monthly time-series modelling.

The main policy channel through OPR is the conventional monetary transmission mechanism of the domestic credit market: the impact on the marginal cost of funds to SMEs from changes in commercial banks' prime rates because of the evolution of the liquidity situation. Any changes in the benchmark rate will thus directly affect the risk-adjusted return of the other credit sources and can also worsen the substitution effects observed during monetary tightening, as banks' credit is negatively related to credit from FinTech platforms (Khan et al., 2021). The tightening shock would manifest as the OPR hike by Bank Negara Malaysia resulting in commercial banks having to pay more for interbank funds. This therefore puts a conservative mindset on the credit sentiments of commercial lenders, who consequently have an impact on the credit sentiments of their SME customers, who rely heavily on external credit facilities for operating liquidity (Ololade, 2024). As a result, these credit-challenged firms are more likely to obtain liquidity from FinTechs that are not affiliated with a conventional bank but can readily provide them with credit when macroeconomic uncertainties arise (Finnegan & Kapoor, 2023).

The impact of these costs on the real economy is through the base lending rate and the reduction of loans outstanding, which means the risk of the asset is also reduced. Economic fluctuations usually occur in time series following a contraction of bank credit supply, since the contraction of credit supply can lead to a reduction in credit availability by lenders, who are worried about reducing default risk. (Wang et al., 2020). This institutional rationing causes a "credit vacuum" in the ability to access SME financing, but it's the technology-enabled platforms that will be able to make use of it, and not the traditional measures of creditworthiness that are often tied to collateral. Due to the tightening of traditional credit lines, other credit options are expected to increase even more, specifically in rate-sensitive or credit-rationed SMEs that are turning to online digital platforms, which should further accentuate the "effect of substitution" in the market (Degryse et al., 2018). The transition underscores the primary function of shadow banking and digital finance mechanisms to cushion the real economy during monetary contraction (Le et al., 2022). These relationships are consistent with previous theories on credit rationing that highlight the importance of interest rates in accessing credit and the information asymmetry of lenders and SMEs regarding liquidity constraints among SMEs (Gertler & Gilchrist, 1994; Le et al., 2021). The quality upgrading is similar with actioned when high-risk or marginalized borrowers are forced to switch to less regulated digital intermediaries during the systemic credit shock (Le et al., 2022). These alternative channels not only serve as a buffer to minimize negative shocks to the real economy from institutional credit rationing (Finnegan & Kapoor, 2023) but also provide a source of demand reduction for discouraged borrowers in lending (Brown et al., 2017).

In summary, the function of a systemic pressure valve in the credit market is the function played by the central bank interest rate policy. Monetary tightening causes commercial bank credit supply contraction due to risk aversion of commercial banks and tight interest rates, and is offset by digital alternative credit sources that absorb the contraction of commercial bank credit supply. This scenario leaves digital finance as a crucial macro shock absorber when monetary contraction is happening. Thus, the third hypothesis is formulated as follows:
Hypothesis 3 (H_3): A contractionary monetary-policy shock is associated with weaker SME bank lending and stronger P2P financing activity, consistent with a potential fallback credit-valve mechanism.

3. Methodology

Data Description and Model Specification

Monthly time-series data utilized in this study were sourced from Bank Negara Malaysia statistics and the Securities Commission's digital analytics websites. The total observations are 109 months from January 2017 to January 2026. The empirical variables are SME bank loans, P2P financing, ECF capital raised, OPR, CPI, and IPI. P2P and ECF are treated as monthly financing flows, whereas SMELOAN represents aggregate outstanding SME financing. Positive-valued financing and IPI series are transformed using natural logarithms; OPR and month-on-month CPI changes are retained in percentage form. No seasonal adjustment is applied because the source series are analyzed in their reported monthly form; possible seasonal patterns are therefore acknowledged in interpretation. Non-numeric spreadsheet cells outside the 109-observation sample are excluded from estimation.

Table 1: Variable Definitions and Data Construction

Variables	Definition	Transformation	Role
SMELOAN	Aggregate outstanding SME bank loans	ln(SMELOAN)	Dependent variable
P2P	Monthly P2P financing issuance	ln(P2P)	Alternative debt financing
ECF	Monthly ECF capital raised	ln(ECF)	Alternative equity financing
OPR	Monthly Overnight Policy Rate	Level (%)	Monetary-policy shock
CPI	Monthly month-on-month CPI change	Level (%)	Price shock
IPI	Industrial Production Index	ln(IPI)	Real-economy activity

$$\ln(SME\ Loan_t) = \beta_0 + \beta_1 \ln(P2P_t) + \beta_2 \ln(ECF_t) + \beta_3(OPR_t)z + \beta_4 (CPI_t) + \beta_5 \ln(IPI_t) + \varepsilon_t$$

The dependent market equilibrium variable is the natural logarithm of aggregate total outstanding SME loans issued by commercial and Islamic banking groups. $ln(SME\ Loan_t)$. The alternative financing channel of debt-based financing refers to the natural logarithm of monthly P2P financing issuance volumes. $\ln(P2P_t)$. The alternative financing channel of equity-based financing uses the natural logarithm of monthly ECF capital successfully raised. $ln(ECF_t)$. The primary monetary policy transmission instrument is the absolute monthly OPR percentage tier. (OPR_t). The structural baseline proxy for macroeconomic inflation (month-to-month changes) (CPI_t) and the purchasing power index is the natural logarithm of the Industrial Production Index.$\ln(IPI_t)$.

SVAR Identification Framework and Contemporary Restrictions

The conventional Vector Autoregression (VAR) models are limited by the arbitrary recursive ordering (Cholesky decompositions). The approach assumes that all the shocks to the variables in the system at the same time do not influence the subsequent variables in the system. To overcome this limitation, this study applies the Structural Vector Autoregression (SVAR) approach to decompose the economic shocks from the financial system of Malaysia. Mathematically, the reduced-form VAR model is given by:

$$Y_t = \sum_{i=1}^{p} A_i Y_{t-i} + e_t$$

The endogenous variables in this case are a matrix of endogenous variables, Y_t 6 X 1 in the Malaysian economy in a systematic order according to the structural responsiveness and the operational friction.

$$Y_t = [OPR_t, (\ln IPI_t), (CPI_t), (\ln P2P_t), (\ln ECF_t), (\ln SMELOAN_t)]$$

The sample contains 109 monthly observations for a six-variable SVAR and is therefore relatively small for a system of this dimensionality. The identification is kept parsimonious, and the results are interpreted cautiously. Dynamic estimates are evaluated using residual diagnostics, stability tests, bootstrap confidence intervals and alternative lag specifications rather than relying on a large-sample assumption.

Figure 2: The Matrix Composition Equation

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ a_{21} & 1 & 0 & 0 & 0 & 0 \\ a_{31} & a_{32} & 1 & 0 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & 1 & 0 & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & 1 & 0 \\ a_{61} & a_{62} & a_{63} & a_{64} & a_{65} & 1 \end{bmatrix} \begin{bmatrix} e_t^{OPR} \\ e_t^{IPI} \\ e_t^{CPI} \\ e_t^{P2P} \\ e_t^{ECF} \\ e_t^{SMELOAN} \end{bmatrix} = \begin{bmatrix} b_{11} & 0 & 0 & 0 & 0 & 0 \\ 0 & b_{22} & 0 & 0 & 0 & 0 \\ 0 & 0 & b_{33} & 0 & 0 & 0 \\ 0 & 0 & 0 & b_{44} & 0 & 0 \\ 0 & 0 & 0 & 0 & b_{55} & 0 \\ 0 & 0 & 0 & 0 & 0 & b_{66} \end{bmatrix} \begin{bmatrix} u_t^{OPR} \\ u_t^{IPI} \\ u_t^{CPI} \\ u_t^{P2P} \\ u_t^{ECF} \\ u_t^{SMELOAN} \end{bmatrix}$$

The contemporaneous ordering is motivated by economic timing and institutional decision-making. OPR is placed first because monetary-policy decisions are made by the Monetary Policy Committee and respond to information available at policy-setting dates. IPI is placed before CPI because real activity can affect contemporaneous price conditions. P2P and ECF are placed after the macroeconomic variables because digital-financing activity can respond rapidly to current monetary and real-economy conditions. ECF is allowed to respond contemporaneously to P2P activity because both are alternative financing channels. SME bank lending is placed last because outstanding bank credit is a stock that adjusts more gradually to current shocks. These restrictions are economic timing assumptions rather than statistical identities; an alternative recursive ordering is therefore used as a robustness check.$e_t^{OPR} e_t^{IPI}$, $e_t^{CPI} e_t^{P2P}$, $e_t^{ECF}) e_t^{SMELOAN})$

4. Findings

Preliminary Analysis

To test the operational characteristics and historical changes in the compiled data, descriptive statistics are estimated for all variables after the transformation to natural logarithms (ln) to remove scaling differences and allow for constant elasticity parameters. However, the absolute percentage form is preserved for the OPR and the month-on-month changes in the CPI. The main summary metrics are given in Table 2.

Table 2: Summary Descriptive Statistics (T=109)

Statistic	*ln(SMELOAN)*	*ln(P2P)*	*ln(ECF)*	*OPR(%)*	*CPI(%)*	*ln(IPI)*
Mean	12.776	17.756	15.452	2.681	0.168	4.791
Maximum	12.990	19.548	17.169	3.250	1.300	4.951
Minimum	12.562	11.156	10.656	1.750	-1.400	4.379
Std. Dev	0.114	1.688	1.285	0.539	0.286	0.091

From the estimation, ln(SMELOAN) had a mean of 12.776 with a standard deviation of 0.114. Whereas ln(P2P) and ln(ECF) have means of 17.756 and 15.452, and standard deviations of 1.688 and 1.285, respectively. OPR averages 2.681%, CPI month-on-month change averages 0.168%, and ln(IPI) averages 4.791. These figures resembled a visual assessment of trends and an estimation of changes prior to the formal stability and integration tests.

The monthly trend of SME bank loans, P2P financing, and ECF capital raised from January 2017 to January 2026 is shown in Figure 3. The trend of SME bank loans is relatively stable and upward, while the trend of P2P financing is significant and shows a rising trend over the sample period, especially since 2020. ECF financing remains more volatile and at a substantially lower reported level than P2P financing. The figure provides descriptive evidence of the increasing scale of alternative financing, while the different measurement scales mean that the visual comparison of absolute levels should be interpreted cautiously.

Figure 3: Monthly SME Bank Loans and Alternative Financing

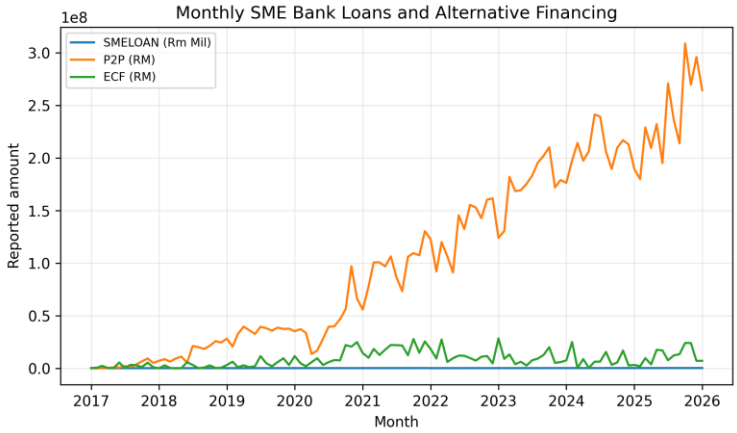
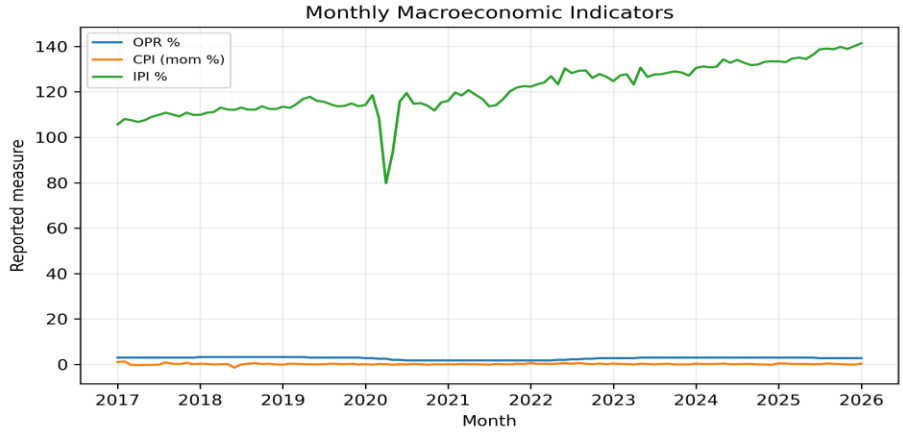


Figure 4 presents the monthly movements in OPR, CPI month-on-month changes and IPI. The series show a marked disruption around the COVID-19 period, including a sharp decline in IPI and a reduction in OPR, followed by a recovery in industrial activity and a subsequent normalization of monetary conditions. CPI month-on-month changes fluctuate around a relatively narrow range. These movements provide a visual indication of macroeconomic variation that may affect both conventional bank lending and alternative financing activity.

Figure 4: Monthly Macroeconomic Indicators



To avoid spurious regression results arising from non-stationary time-series data, the Augmented Dickey-Fuller (ADF) unit-root test is applied to each variable. The results in Table 3 indicate that ln(P2P), CPI and ln(SMELOAN) are stationary in levels, I(0), while OPR, ln(IPI) and ln(ECF) become stationary after first differencing, I(1). The mixed order of integration means that the variables cannot be treated as uniformly I(1). The Johansen analysis is therefore restricted to the I(1) subset, while the baseline SVAR is estimated using the transformed variables in levels as specified in the methodology.

Table 3: Augmented Dickey-Fuller (ADF) Unit-Root Test Statistics

Variables	Level	First Difference	Integration Status
ln(SMELOAN)	-0.643	-10.179***	I(1)
ln(P2P)	-5.025***	–	I(0)
ln(ECF)	-2.152	-5.765***	I(1)
OPR	-1.672	-3.962***	I(1)
CPI	-8.785***	–	I(0)
ln(IPI)	-0.625	-7.642***	I(1)

*Note: *** denotes rejection of the unit-root null at the 1% level. ADF lag length is selected automatically using the Akaike information criterion.*

Johansen Cointegration Analysis

The ADF results indicate that OPR, ln(IPI) and ln(ECF) are integrated at I(1); a Johansen cointegration test is conducted for this I(1) subset before drawing long-run conclusions. P2P, CPI, and ln(SMELOAN), which are I(0) in the revised spreadsheet, are not included in the Johansen system. The reported Johansen specification uses two lagged differences and a constant. Both the trace and maximum-eigenvalue statistics indicate one cointegrating relationship at the 5% level. This result supports a long-run relationship within the I(1) macro-financing subset, but it should not be interpreted as evidence of a long-run complementarity or substitution relationship between P2P/ECF and SME bank loans because the latter variables are I(0) in the reported ADF results. Note: The Johansen test is applied to the I(1) subset OPR, ln(IPI), and ln(ECF), using two lagged differences and a constant.

Table 4: Johansen Cointegration Test Results

Rank	Trace statistic	5% critical	Max-eigen statistic	5% critical
None	42.356	29.796	36.578	21.131
At most 1	5.778	15.494	3.704	14.264
At most 2	2.073	3.841	2.073	3.841

The AIC, SIC and HQ criteria reported in Table 5 select two lags in the reported estimation output. The two-lag specification is therefore retained as the baseline and is subsequently subjected to residual autocorrelation, heteroskedasticity, normality and stability diagnostics.

Table 5: VAR Lag Order Selection Statistics

Lag Length	LogL	AIC	SIC	HQ
0	-412.142	7.964	8.112	8.024
1	215.841	-3.845	-3.412	-3.671
2	284.125	-4.9128*	-4.214*	-4.625*
3	291.054	-4.814	-3.854	-4.425

** Indicates the optimal lag order selected by the respective criterion.*

SVAR Short-Run Contemporaneous Matrix Estimation Results

Following the optimization of the current structural restriction scheme using maximum likelihood, the current interactions between the variables are estimated in the same month. The estimated structural parameters of the target left-hand side contemporaneous matrix (A) are given in Table 6. The columns are independent variables that might bring about an abrupt change over the 30-day time frame, and the rows are dependent variables that would change directly because of the shock.($Ae_t = Bu_t$)

The contemporaneous structural matrix (A) is constructed to isolate the short-run transmission channels in the Malaysian SME credit market. The estimates indicate that the contemporaneous OPR coefficient in the SME bank-loan equation is negative and statistically significant (β = −0.384, p < 0.01), while the IPI coefficient is positive and statistically significant (β = 0.212, p < 0.05). In contrast, the contemporaneous coefficients for P2P financing (β = −0.056) and ECF (β = −0.021) are not statistically significant in the reported matrix. These contemporaneous coefficients describe immediate within-period relationships and should not be equated with the dynamic IRFs, which trace the response over subsequent months.

Table 6: Estimated Contemporary Structural Coefficients (Matrix A)

Affected Endogenous Variables (Rows)	ΔOPR_t	$\Delta\ln(IPI_t)$	CPI_t	$\Delta\ln(P2P_t)$	$\Delta\ln(ECF_t)$	$\Delta\ln(SMELOAN_t)$
ΔOPR_t	1.000					
$\Delta\ln(IPI_t)$	-0.154	1.000				
	(0.114)					
CPI_t	-0.092	0.114	1.000			
	(0.084)	*(0.075)*				
$\Delta\ln(P2P_t)$	0.284**	0.312***	0.185*	1.000		

	(0.124)	*(0.094)*	*(0.101)*			
$\Delta\ln(ECF_t)$	0.054	0.142*	0.094	0.215**	1.000	
	(0.048)	*(0.082)*	*(0.071)*	*(0.105)*		
$\Delta\ln(SMELOAN_t)$	-0.384***	+0.212**	-0.056	-0.056	-0.021	1.000
	(0.093)	*(0.087)*	*(0.055)*	*(0.055)*	*(0.032)*	

*Note: Standard errors are reported in parentheses ( ). Symbols ***, **, and * denote statistical significance at the 1%, 5%, and 10% rejection tiers, respectively.*

SVAR Diagnostic and Stability Tests

The two-lag VAR does not exhibit statistically significant multivariate residual autocorrelation at six lags (Portmanteau statistic = 153.753, p = 0.274). The multivariate normality test rejects normality (statistic = 17,165.951, p < 0.001). The univariate ARCH-LM results identify conditional heteroskedasticity in the ln(P2P) equation (LM = 22.186, p = 0.035), while the remaining equations do not reject homoskedasticity at the 5% level. The VAR satisfies the stability condition, with all inverse roots inside the unit circle. Given the non-normal residuals and the identified heteroskedasticity, bootstrap confidence intervals are used for the IRFs to provide more cautious inference.

Table 7: SVAR Diagnostic and Stability Tests

Diagnostic	Statistic	p-value	Assessment
Portmanteau residual autocorrelation, lag 6	153.753	0.274	No significant autocorrelation
Multivariate normality	17,165.951	<0.001	Normality rejected
ARCH-LM, ln(P2P), 12 lags	22.186	0.035	Heteroskedasticity detected
Stability	All inverse roots < 1	—	Stable VAR

Structural Impulse Response Function (IRF) Analysis

Figure 5 shows that a P2P financing shock generates a small negative response in SME bank loans during the first three months. The point estimate then becomes positive from around Month 4 and rises gradually to 0.00151 at Month 12. However, the 95% bootstrap confidence interval contains zero throughout the 12-month horizon. Thus, the pattern is consistent with a possible delayed positive association, but it does not provide statistically significant evidence of long-run complementarity or a market-incubation effect.

Figure 5: Response of ln(SMELOAN) to a P2P Financing Shock with 95% Bootstrap Confidence Interval.

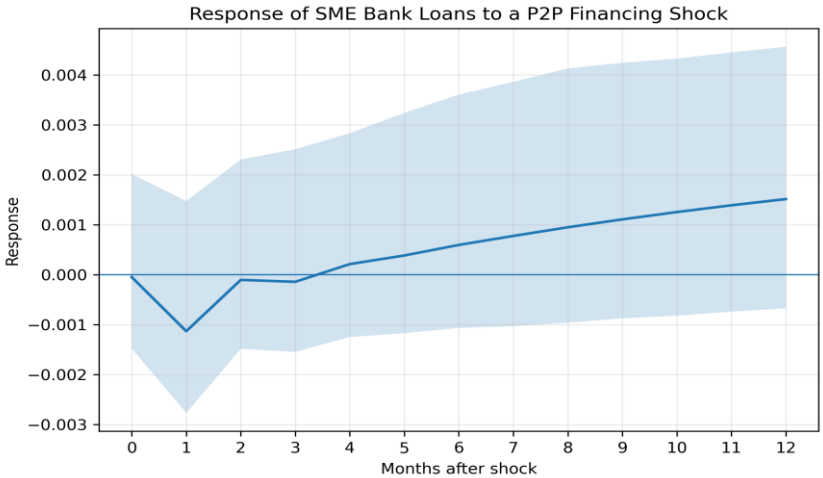


Figure 6 shows a negative point response of SME bank loans to an ECF shock throughout most of the horizon, with the response moving gradually toward zero and reaching approximately 0.00002 at Month 12. The 95% bootstrap confidence interval contains zero on the entire horizon. The evidence thus does not statistically confirm a substitution effect of ECF on SME bank lending.

Figure 6: Response of ln(SMELOAN) to an ECF Shock with 95% Bootstrap Confidence Interval.

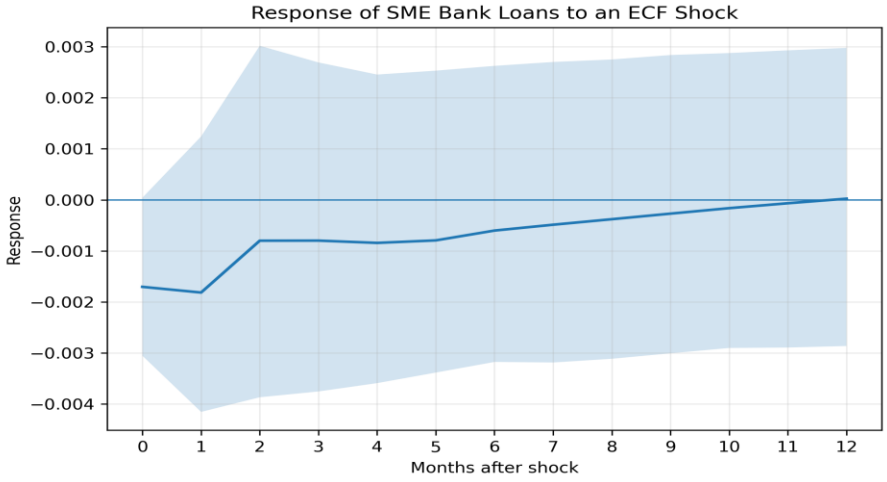


Figure 7 illustrates that the positive point response of SME bank loans to an OPR shock is positive, rising from around 0.0009 at Month 0 to 0.00512 at Month 12. The 95% confidence interval includes zero at the start of the horizon, is completely positive from about Months 5 to 10, and includes zero again at Months 11 and 12. The dynamic response is therefore positive in point-estimate terms, but the evidence is not uniformly significant across the 12-month horizon. This result does not support the hypothesized contractionary effect of an OPR shock on SME bank lending in the dynamic IRF.

Figure 7: Response of ln(SMELOAN) to an OPR Shock with 95% Bootstrap Confidence Interval.

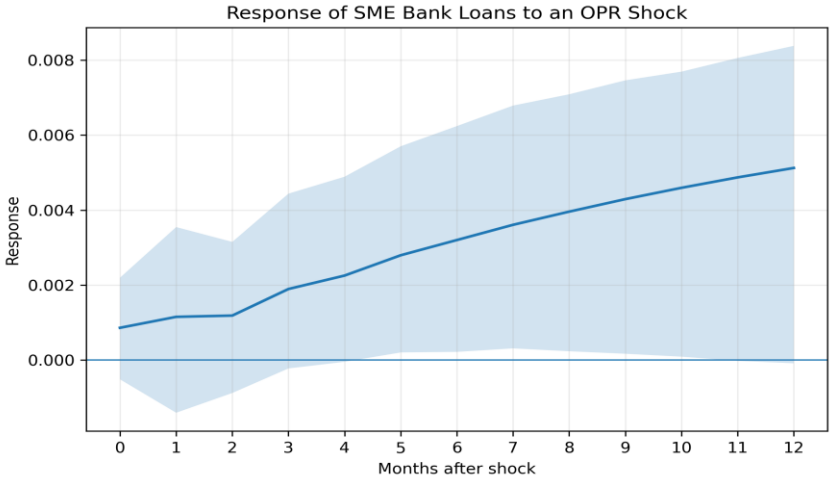
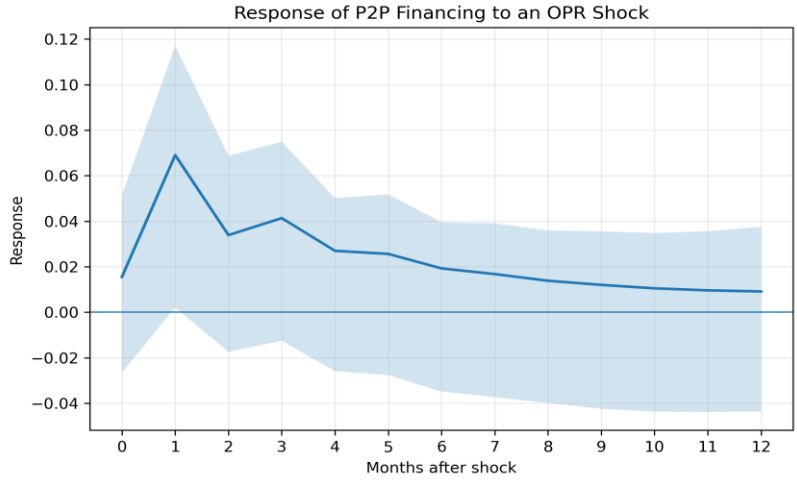


Figure 8 shows a positive point response of P2P financing following an OPR shock, rising sharply to 0.06903 at Month 1 and then gradually declining to 0.00912 by Month 12. The 95% confidence interval excludes zero only at Month 1 and includes zero thereafter. Thus, the response provides limited early-horizon evidence of increased P2P activity following an OPR shock, but it does not establish a persistent fallback credit-valve mechanism.

Figure 8: Response of ln(P2P) to an OPR Shock with 95% Bootstrap Confidence Interval



Forecast Error Variance Decomposition (FEVD) Results

The SME Bank Loans variable is then allocated using the FEVD approach, which allows for the isolation of the variation in the structure of SME bank loans available due to alternative digital finance, versus conventional macroeconomic drivers. The proportion of each structural shock to the total variance of the institutional credit portfolio for 12 months' forecast is presented in Table 8.

FEVD analysis indicates that the contribution of FinTech shocks to the forecast-error variance of SME bank loans increases over the forecast horizon. The own SME bank-loan shock remains the largest contributor at 53.14% in Month 12, while P2P and ECF shocks account for 17.12% and 6.56%, respectively. Thus, alternative financing shocks jointly explain 23.68% of the forecast-error variance of SME bank loans at Month 12. This indicates that FinTech shocks are economically relevant within the system, but FEVD does not by itself establish whether the relationship is complementary or substitutive. The interpretation is thus based on the FEVD shares, IRFs, and the coefficients at the time.

Table 8: Forecast Error Variance Decomposition of ln(SMELOANt) (%)

Horizon (Months)	Standard error	ln($SMELOAN_t$) %	OPR %	ln(IPI_t) %	CPI_t %	ln($P2P_t$) %	ln(ECF_t) %
Month 1	0.011	91.24	3.12	2.45	1.14	2.05	0.00
Month 3	0.025	78.45	7.15	4.12	1.89	6.45	1.94
Month 6	0.039	64.12	11.24	5.84	2.14	12.45	4.21
Month 12	0.052	53.14	13.84	6.78	2.56	17.12	6.56

Note: The rows total 100% across each forecast milestone, and represent the systematic allocation of structural economic innovations over time.

Robustness Analysis

Robustness is evaluated with alternative lag lengths. Responses are orthogonalized and then recalculated for 12-months under one-, two-, and three-lag specifications. The aim is to determine if the direction and persistence of the primary responses are affected by the choice of lag. The same 109-observation sample and recursive ordering are maintained. The Month-12 P2P and ECF responses in Table 11 are reported as the alternative results and are found to differ in magnitude and sign depending on the lag length, suggesting some sensitivity to dynamic specification.

Alternative recursive identification is also explored by reversing the contemporaneous ordering of P2P and ECF, while keeping the macroeconomic ordering and SME bank lending as the last variable. The Month-12 P2P response is unchanged at 0.00151, and the ECF response is slightly adjusted from 0.00002 to −0.00002. The OPR response remains 0.00512. These results suggest that the main Month-12-point estimates are relatively stable for P2P and OPR, but the ECF response is sensitive to the contemporaneous ordering.

Table 10: Robustness Analysis Using Alternative Identification

Identification	P2P → SME loans, Month 12	ECF → SME loans, Month 12	OPR → SME loans, Month 12
Baseline: OPR–IPI–CPI–P2P–ECF–SMELOAN	0.00151	0.00002	0.00512
Alternative: OPR–IPI–CPI–ECF–P2P–SMELOAN	0.00151	-0.00002	0.00512

Table 11: Robustness Analysis Using Alternative Lag Lengths

Specification	P2P → SME loans, Month 12	ECF → SME loans, Month 12	OPR → SME loans, Month 12
VAR(1)	0.00310	-0.00031	0.00455
VAR(2)	0.00151	0.00002	0.00512
VAR(3)	0.00013	-0.00246	0.00450

Structural Break and Regime-Change Assessment

The sample spans the COVID-19 period and substantial changes in monetary and digital-financing conditions. A fixed-date Chow-type stability check, around March 2020, is thus reported as a sensitivity assessment. The test is based on comparing the pooled two-lag VAR equation with the pre- and post-March-2020 regressions separately. The evidence of a break is mixed across equations, and COVID-19 is therefore not considered a single deterministic regime shift, but rather a potential source of parameter instability. The OPR is specifically added to the system to reflect monetary-policy variation, and the time-series figures and stability-root test are used to gauge the overall financing environment. The regulatory change in the FinTech market is recognized as an additional institutional source of instability; as the dataset supplied does not contain a complete set of dated regulatory-event indicators, a full model of regulatory breaks is left for future research.

Table 9: COVID-19 Structural Break Assessment

Equation	Chow-type F	p-value	Assessment
OPR	2.104	0.022	Break detected at 5% level
ln(IPI)	2.873	0.002	Break detected at the 5% level
CPI	2.443	0.008	Break detected at the 5% level
ln(P2P)	1.710	0.074	No Break detected at the 5% level
ln(ECF)	2.909	0.002	Break detected at the 5% level
ln(SMELOAN)	0.368	0.976	No Break detected at the 5% level

Discussion

The P2P Debt Channel and Market Incubation

There is limited evidence of a market-incubation/complementarity mechanism in the P2P response. The estimated reaction of SME bank loans to a P2P shock is slightly negative at first and positive in point-estimate terms after a few months, when the reaction is 0.00151 in Month 12. But the 95% bootstrap confidence interval contains zero across the entire horizontal axis. Therefore, H1 is not supported statistically; the pattern is indicative of possibly a positive association at some later time, but there is not enough evidence of the pattern to suggest long-run complementarity. The lack of an ability to observe actual movement of individual firms from P2P financing to bank lending limits the market incubation interpretation from being an observation of the actual process of the firms and should be considered a plausible mechanism.

The ECF Equity Channel and Capital Structure Shifts

The initial reaction to the ECF is negative for SME bank lending, and weakens to near zero by Month 12. There is a 95% chance that the bootstrap confidence intervals contain zero on the horizon. Thus, the statistical support for H2 will be rejected. Although the FEVD result shows the economic relevance of ECF shocks within the banking system in terms of bank loans to SMEs at Month 12, it should not be read as evidence that firms substitute bank loans for equity finance.

The ECF pattern is thus best viewed as a negative, but more-or-less statistically certain, pattern of dynamic response, rather than as an actual structural change from bank debt. The individual firm data cannot be used to determine whether firms are using ECF to lower bank borrowing, to raise overall investment, or to eventually revert to bank financing. The aggregate ECF response should not then be considered as evidence of long-term substitution by regulators.

The Macro Policy Valve and the Inclusion Stability Nexus

The hypothesized fallback credit-valve mechanism does not seem to be strongly supported by monetary-policy results. The OPR shock has a positive point response in SME bank lending for the first part of the horizon, but only over the middle part (Months 5-10), while the rest of the area is covered by confidence intervals that do not exclude zero. The P2P response is also positive, but it is not statistically significant before Month 1 and is statistically imprecise thereafter. Therefore, there is no persisting contractionary-credit-valve effect supporting H3. The variance share of OPR in the FEVD (13.84% at Month 12) does not necessarily imply that there is a statistically proven transmission channel.

5. Conclusion

Complements or Substitutes

The current study revisits the complement versus substitute debate in the SME financing sector in Malaysia, employing monthly data and a six-variable SVAR setup. According to the updated analysis, P2P and ECF shocks increasingly represent a share of forecast-error variance of bank loans to SMEs in the 12-month time horizon, accounting for 23.68% of the total in Month 12. The bootstrap IRFs, however, reveal that neither the P2P nor ECF response is statistically different from zero on the 12-month horizon. P2P response is positive in the first few months, and the confidence interval around the response is still broad and includes zero. The ECF response remains negative in point-estimate terms before approaching zero, with the confidence interval also including zero. The evidence therefore does not justify describing either channel as a definitive long-run complement or permanent substitute. Instead, alternative financing appears to be an economically relevant component of the broader SME financing system whose interaction with bank lending warrants continued monitoring.

Integrated Policy Recommendations and Future Research Framework

The findings have several policy implications. First, since P2P and ECF shocks jointly account for 23.68% of the forecast-error variance of SME bank loans at Month 12, BNM and SC Malaysia may benefit from coordinated monitoring across bank and non-bank financing channels. Second, the statistical uncertainty surrounding the IRFs suggests that regulation should avoid assuming a uniform substitution or complementarity effect across all SMEs. Third, non-normality and some heteroskedasticity support conservative inference when using high-frequency FinTech indicators for macroprudential surveillance. Fourth, the positive point response to an OPR shock should not be interpreted as evidence that monetary tightening expands bank lending; rather, it highlights the sensitivity of aggregate dynamics to the chosen structural identification. Finally, firm-level data are needed to determine whether the aggregate patterns correspond to actual transitions between P2P, ECF, and bank financing.

Limitations

Several limitations should be acknowledged. The analysis is conducted at the aggregate monthly level and cannot identify firm-level movements between alternative financing and bank credit. Diagnostic tests also indicate non-normal residuals and evidence of conditional heteroskedasticity in the P2P equation. The sample spans COVID-19 and changes in monetary and FinTech-market conditions, which may introduce parameter instability even though the baseline VAR satisfies the formal stability condition. Future research should consider longer samples, firm-level data, explicit structural-break or regime-switching models, and alternative methods such as local projections or Bayesian VARs.

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