UNIVERSIDAD DE COSTA RICA

Link between financial system's development and economic growth: Cointegration analysis and time series analysis for Costa Rica.

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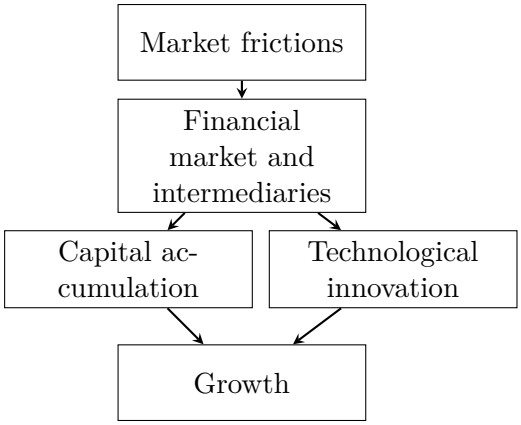
1 Introduction

There are economic theories that suggest that an efficient operation of the financial system generates positive impact in the economic growth of a country since it mitigates market frictions. In this sense, in order to solve such inefficiencies, the financial systems fulfill five basic functions: 1) mobilize savings, 2) allocation of these savings in high-performance activities, 3) monitor managers and exert corporate control, 4) facilitate the exchange of goods and service and 5) facilitate the trading, hedging, diversifying, and pooling of risk (Levine, 1997).

On the other hand, through the functions of the financial system, economic growth is positively affected by the accumulation of capital as a result of the modification of the savings rates and by the relocation of non-performing resources to capital-generating technologies. It also promotes technological innovation, as financial intermediaries identify and provide resources to firms more likely to implement innovate products and better production processes (Levine, 1997). This means that the financial system development is manifested in an increase in access to credit, which results in more resources for investments, which in turn promotes labor specialization and the entry of new technology, consequently generating more economic growth (Blanco, 2013). This theoretical relationship between financial system and economic growth is outlined in the illustration 1.

Illustration 1: Theoretical relationship between economic growth and financial development



Source: Levine (1997, figure 1)

Notwithstanding, some authors warn of the destabilizing effect on economy as a consequence of financial liberalization, where the rapid growth of bank credit, public debt and stock prices stand out as strong predictors of the occurrence and intensity of financial crisis (Loayza *et al.*, 2017). Similarly, there are discrepancies among experts on the direction of causality, for instance, empirical investigations based on panel data have shown that the financial development causes economic growth (Levine *et al.*, 2000), on the other hand, some time series analyses have identified causality in both directions (Liu y Calderón, 2002).

In the case of Costa Rica, the financial system began to modernize during the 80's decade, with deregulation reforms that led to the emergence of private banks and cooperatives, along with measures to eliminate portfolio ceilings and reduce state intervention in setting interest rates (Loría Sagot, 2013).

However, the development of the financial system has not been sufficient; in a study carried out by Castro y Serrano (2013), focused on analyzing financial intermediation margin, it concludes that the market structure of Costa Rican banking system is oligopoly, where the prices of financial services are higher than those that would be offered under a competitive equilibrium scenario. Likewise, using a different methodology Salas-Alvarado *et al.* (2015) affirm that the presence of large players in the Costa Rican banking market is associated with lower competition indicators, whith the state banking segment being less competitive compared to private banks. Similarly, Yong (2007) highlights that Costa Rica has high levels of financial intermediation margin and market concentration, specially when measured by assets.

In accordance with the aforementioned, it is verified that the financial system in Costa Rica has not reached sufficient maturity, which is why it is particularly important to study the link that its performance has had with economy, and thus provide empirical evidence that could serve as input for the formulation of policy aimed at promoting economic growth. Therefore, the following research problem arises: what is the relationship between Costa Rican financial development and the economic growth experienced from 1997 to 2020? To answer this question, the objective of this paper is to **study the relationship between the development of the financial system and economic growth in Costa Rica, through the analysis of multivariate time series analysis, for the period 1997 - 2020.**

2 Methodology

2.1 Variables of interest

The variables under study are the annual growth of Costa Rica's real Gross Domestic Product (GDP) and bank loans to the non-financial private sector in terms of nominal GDP. In addition, exogenous variables associated with the variables of interest were included. The source of the data is the Central Bank of Costa Rica for all variables except the real GDP of United States, whose source is the US Bureau of Economic Analysis. The periodicity of the data is quarterly, the variables are described below:

2.1.1 Real GDP annual growth for Costa Rica

This variable represents the economic growth and is calculated as $log(\frac{GDP_t}{GDP_{t-4}})$.

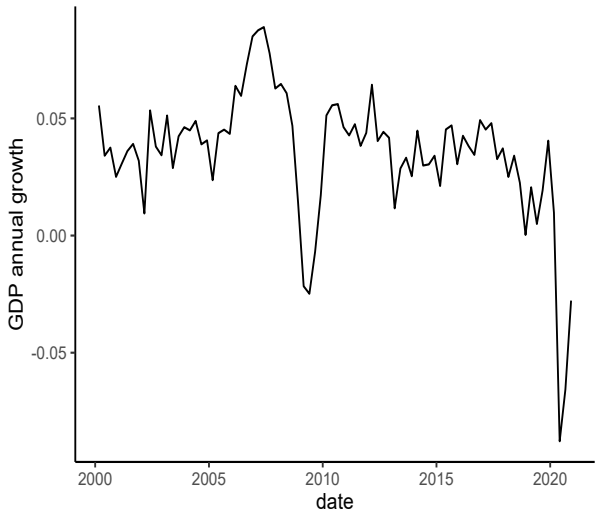


Figure 1: real GDP growth of Costa Rica

2.1.2 Financial system loans

Although there are different ways to measure the development of the financial system, for this study the ratio bank loans to the non-financial private sector to nominal GDP was used, as it allows focusing on credits lent to productive activities (Swamy y Dharani, 2018).

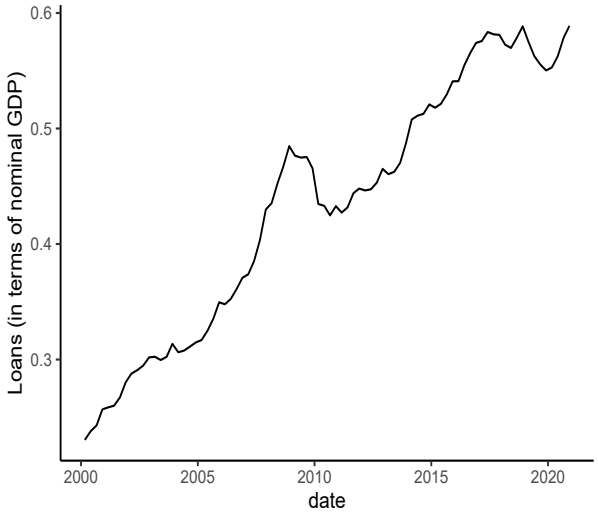


Figure 2: Financial system loans in terms of nominal GDP

2.1.3 Covariables

Based on the literature reviewed and the economic development model of Costa Rica, characterized by commercial openness (Oviedo *et al.*, 2015); exogenous variables include the trade openness index, the United States' economic growth (the country's main trading partner (Banco Central de Costa Rica, 2021)) and the annual variation of the local currency exchange rate expressed in US dollar. Additionally, the inflation rate and the deposits interest rate (TBP) are also included. these indicators are explained below.

1. **Trade openness index:** It is calculated as total exports and imports in terms of nominal GDP.

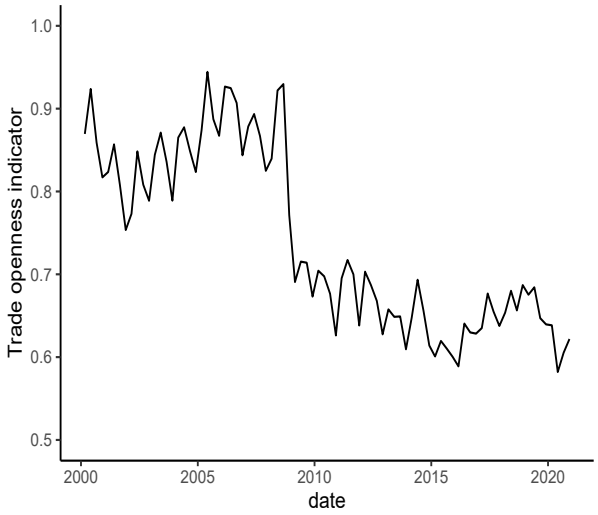


Figure 3: Trade openness index

2. **Annual growth of real GDP of USA:** Calculated as $log(\frac{GDP_t}{GDP_{t-4}})$.

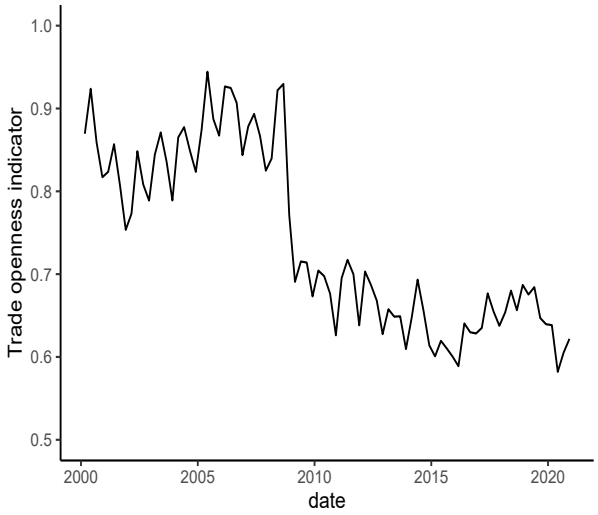


Figure 4: USA economic growth

3. **Inflation:** Represents the general annual increase in prices of products and services.

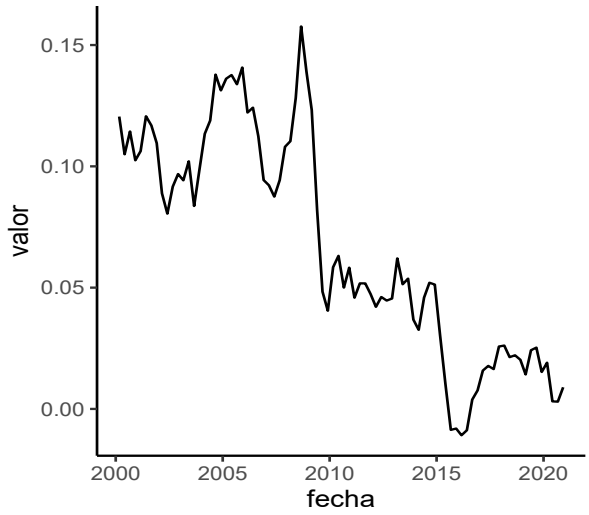


Figure 5: Inflation

4. **Deposits interest rate (TBP):** Represents the financial cost incurred by the intermediaries to collect resources in local currency, in addition, it is used as a reference rate for most of the loans in Colones with a floating rate (Banco Central de Costa Rica, 2015).

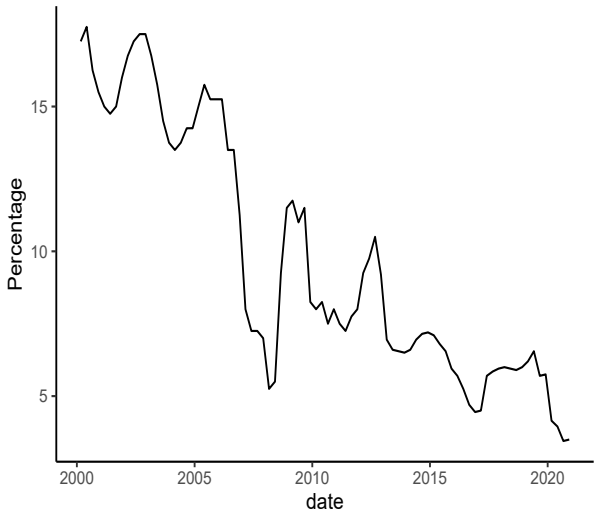


Figure 6: Deposit interest rate

5. **Annual variation of the exchange rate**

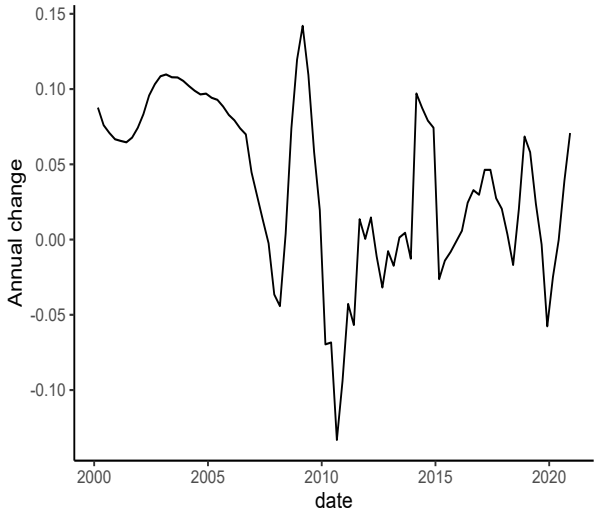


Figure 7: Annual variation of the exchange rate

2.2 Statistical techniques

2.2.1 VAR models

These models consist of a system of equations that are estimated simultaneously, generating an equation for each endogenous variable, and the explanatory variables are lagged values of the endogenous variables. The equation 1 represents a VAR model for two dependent variables and their values lagged one period as independent variables (Enders, 2015)

$$\begin{aligned} y_t &= b_{10} + b_{12} z_t + \gamma_{11} y_{t-1} + \gamma_{12} z_{t-1} + \epsilon_{y_t} \\ z_t &= b_{20} + b_{21} y_t + \gamma_{21} y_{t-1} + \gamma_{22} z_{t-1} + \epsilon_{z_t} \end{aligned} \tag{1}$$

where y y z are stationary and the innovations ϵ_{y_t} y ϵ_{z_t} are uncorrelated white noises with standard deviation σ_Y y σ_Z and don't present serial correlation (Enders, 2015). The generalized VAR model is defined as:

$$\mathbf{y}_t = A_1 \mathbf{y}_{t-1} + \cdots + A_p \mathbf{y}_{t-p} + C D_t + \mathbf{u}_t \tag{2}$$

where $\mathbf{y}_t$ is a vector of K endogenous variables ($\mathbf{y}_t = y_{1t}, \ldots, y_{kt}, \ldots, y_{Kt}$), A_i is a matrix of coefficients of size $(K \times K)$ with $i = 1, \ldots, p$, $\mathbf{u}_t$ is a vector of white noise processes that do not vary in time of K dimensions and positive definite covariance

$E(\mathbf{u}_t\mathbf{u}_t') = \sum u$, C is a matrix of coefficients of possible deterministic variables of size $(K \times M)$ and D_t are the deterministic variables associated with C, such as constants, trend, dummy variables, among others (Pfaff, 2008).

2.2.2 Granger causality

In Granger (1969) it is defined that a variable Y_t caused X_t if the prediction of X_t is better using all available information than if all information is used excluding Y_t.

$$\sigma^2(X|U) < \sigma^2(X|\overline{U - Y}) \tag{3}$$

where U represents all available information and $\overline{Y}$ the lagged values of Y. If this condition is met, it is asserted that Y Granger-causes X.

2.2.3 VECM

The economic chronological series, such as those analyzed in this paper, tend to have trend and are not stationary of order 0. In these cases, a model of the variables without any transformation can lead to a spurious regression, characterized by a high significance of the parameters, high R^2 and a auto-correlated error (Pfaff, 2008) and (Engle y Granger, 1987), but without a theoretical basis to justify this relationship. However, if the residual of the model with non-stationary variables is effectively stationary, it is affirmed that the series cointegrate in the long term, because there is a lineal combination between the variables that results in a residual with an integration order lower than that of the variables in question (Lütkepohl, 2005).

Assuming that the variables in equation 4 are non-stationary of order 0 and the residual is stationary of order 0, that is, the series cointegrate, the following equation represents the equilibrium in the long term:

$$y_t = \alpha_1 x_{t,1} + \alpha_2 x_{t,2} + \ldots + \alpha_k x_{t,k} + z_t \text{ para } t = 1, \ldots, T \tag{4}$$

In addition, the error correction model represents the change of a variable as a function of its deviations from an equilibrium level (Lütkepohl, 2005). This model is presented below for the long-term relationship described in the equation 5:

$$\begin{aligned}\Delta y_t &= \psi_0 + \gamma_1 \hat{z}_{t-1} + \sum_{i=1}^{K} \psi_{1,i} \Delta x_{t-i} + \sum_{i=1}^{L} \psi_{2,i} \Delta y_{t-i} + \epsilon_{1,t} \\ \Delta x_t &= \xi_0 + \gamma_2 \hat{z}_{t-1} + \sum_{i=1}^{K} \xi_{1,i} \Delta y_{t-i} + \sum_{i=1}^{L} \xi_{2,i} \Delta x_{t-i} + \epsilon_{2,t}\end{aligned} \tag{5}$$

This model explains the changes of the dependent variable based on its own history, the lagged values of the explanatory variables and the long-term equilibrium error of previous periods ($\gamma \hat{z}_{t-1}$), where γ determines the speed of adjustment and γ_1 must always be negative. Meanwhile, $\epsilon_{1,t}$ and $\epsilon_{2,t}$ are white noise processes (Pfaff, 2008).

3 Analysis and results

3.1 Preliminary analysis

The sample has 84 observations with a quarterly periodicity that goes from the first quarter of 2000 to the fourth quarter of 2020.

The correlation matrix presented in table 1 shows a correlation coefficient of -0.35 between economic growth and financial development, this indicates a level of inverse association and of moderate magnitude between the variables, which contradicts the thesis of a high and positive relationship between economic growth and development of the financial system, however, drawing conclusions from a bi-variate relationship can be misleading, due to external factors being ignored.

Table 1: Correlation matrix

	Economic growth	Financial develop-ment	Trade openness index	USA econ. growth	Inflation	TBP	Exchange rate YoY
Economic growth	1.00	-0.35	0.45	0.69	0.31	0.20	-0.15
Financial development	-0.35	1.00	-0.79	-0.30	-0.81	-0.91	-0.42
Trade openness	0.45	-0.79	1.00	0.28	0.89	0.73	0.48
USA econ. growth	0.69	-0.30	0.28	1.00	0.16	0.26	-0.04
Inflation	0.31	-0.81	0.89	0.16	1.00	0.77	0.50
TBP	0.20	-0.91	0.73	0.26	0.77	1.00	0.63
Exchange rate YoY	-0.15	-0.42	0.48	-0.04	0.50	0.63	1.00

Regarding the association between the exogenous and endogenous variables, the economic growth has a positive correlation with the trade openness index and the USA economic growth, according to the country's economic development model

(Oviedo *et al.*, 2015). On the other hand, there is a negative and high association between financial development and openness trade index, which has not theoretical basis, however, the parameter of the trade openness index is not significant for the financial development equation in the VAR and the VECM results.

3.2 VAR model

The VAR model estimated includes 4 lags of the dependent variables, taking as reference the Akaike criterion, five exogenous variables, the constant and the trend as deterministic variables, and dummy variables to capture seasonality. The results of the model are presented in table 2. The following equation represents the estimated VAR model:

$$y_{1t} = \pi_0 + \sum_{i=1}^{4} \beta_{1i} y_{1t-i} + \sum_{i=1}^{4} \beta_{2i} y_{2t-i} + X_t B_1 + \Phi_1 D_t + S_t T_1 + \epsilon_{1t} \tag{6a}$$

$$y_{2t} = \psi_0 + \sum_{i=1}^{4} \beta_{1i} y_{1t-i} + \sum_{i=1}^{4} \beta_{2i} y_{2t-i} + X_t B_2 + \Phi_2 D_t + S_t T_2 + \epsilon_{2t} \tag{6b}$$

Table 2: Estimated coefficients of model VAR(4)

Variable	$y_{1,t}$	$y_{2,t}$
$y_{1,t-1}$	0.324 (3.77) ***	0.047 (1.04)
$y_{2,t-1}$	-0.055 (-0.22)	1.15 (8.83) ***
$y_{1,t-2}$	-0.037 (-0.4)	0.035 (0.7)
$y_{2,t-2}$	0.577 (1.53)	-0.235 (-1.18)
$y_{1,t-3}$	0.232 (2.1) *	0.085 (1.46)
$y_{2,t-3}$	0.23 (0.61)	0.019 (0.1)
$y_{1,t-4}$	-0.337 (-3.26) **	0.001 (0.02)
$y_{2,t-4}$	-0.676 (-2.77) **	-0.056 (-0.44)
const	-0.055 (-1.62)	0.041 (2.29) *
trend	-0.001 (-3.07) **	0 (2.36) *
trade openness index	0.157 (5.01) ***	-0.004 (-0.23)
USA econ.growth	0.585 (7.53) ***	-0.071 (-1.74).
inflation	-0.306 (-3.93) ***	-0.019 (-0.46)
tbp	-0.002 (-1.57)	-0.001 (-2.08) *
vartc	-0.141 (-3.19) **	0.042 (1.8).
est.d2	-0.006 (-1.3)	0.008 (2.95) **
est.d3	0.001 (0.12)	0.009 (4.08) ***
est.d4	0.011 (2.76) **	0.012 (5.83) ***

Notes:
Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
t test in parenthesis

where y_{1t} is the economic growth, y_{2t} is the financial system's development, π_0 y ψ_0 are constants, X_t is the covariables matrix, D_t is the trend, S_t is a matrix of dummy variables to capture seasonality, ϵ_{1t} and ϵ_{2t} are white noise processes.

The table 3 shows that the model successfully meets all conditions. The Portmanteau test indicates that there is no statistical evidence to reject the null hypothesis that the autocorrelation of the residuals is different from zero. According to the result of the Arch test, there is not enough empirical evidence to reject the null hypothesis that the residuals are homoscedastic, taking as reference a significance level of 5%. The residuals follow a normal distribution according to the Jarque-Bera test.

Table 3: VAR model diagnostics test

Test	Statistics	P value
Portmanteau	50.60	0.37
ARCH	31.04	0.94
Jarque-Bera	2.44	0.66

In line with the above, figure 8 shows that the impact on economic growth is positive when financial development increases by one unit, and this impact is statistically different from zero, given that the confidence interval (grey dashed line) does not include the zero axis for the period $t + 3$.

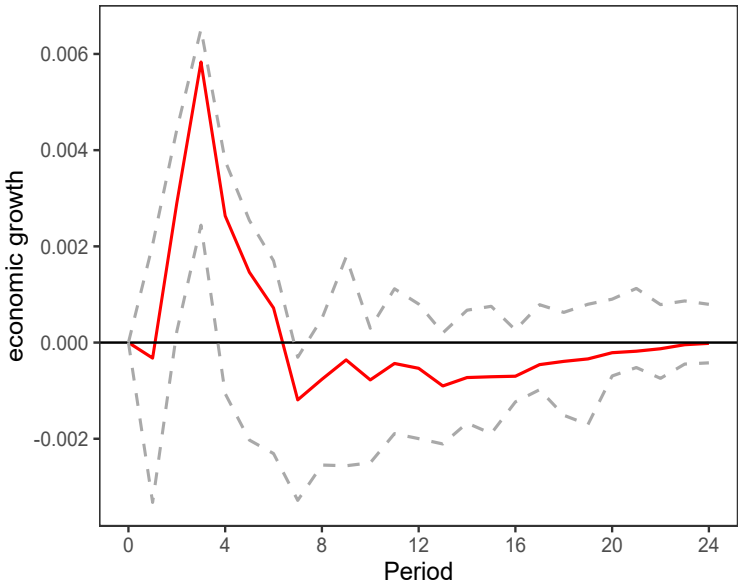


Figure 8: Orthogonal impulse response from financial development

Similarly, the impact on financial development, when a shock is applied to economic growth, is statistically significant for period 4 to 7, as it is shown in figure 9.

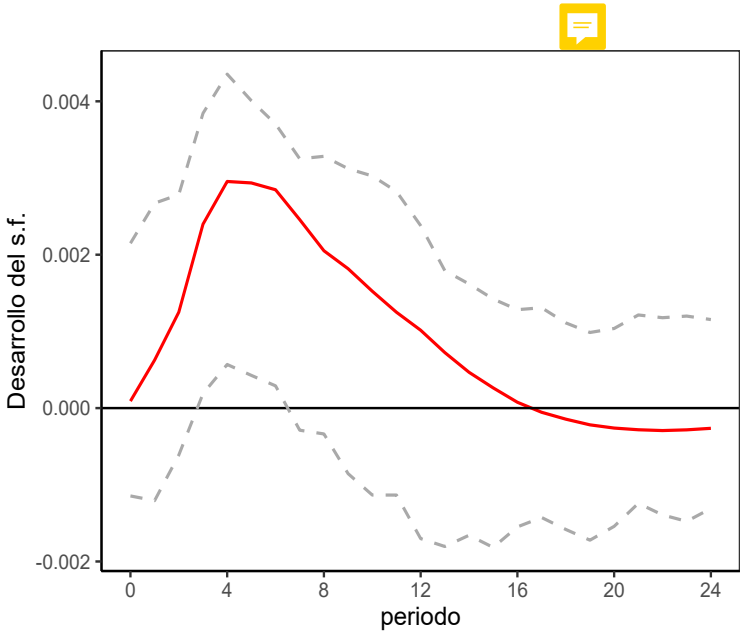


Figure 9: Orthogonal impulse response from economic growth

In the context of VAR models, it is possible through an F test to contrast the null hypothesis that the coefficients of the lagged values of x_t are different from zero in the y_t equation. In case this hypothesis is rejected, x_t is said to cause y_t in a Granger sense (Pfaff, 2008). The results of this test for this particular case show that there is sufficient evidence to reject the null hypothesis that the financial development does not Granger-cause economic growth. Similarly, the null hypothesis that the economic growth does not Granger-cause financial development is also rejected 4.

Table 4: Causality test

Test	Statistic	P value
F.S.D causes in a Granger sense E.C.	5.650	0.000
E.C. causes in a Granger sense F.S.D	3.205	0.015

Notes:
E.C. = Economic growth
F.S.D. = Financial system development

3.3 VECM

Below is the VEC model estimated 7.

$$\Delta y_{1t} = \psi_0 + \text{ect1}_1 \hat{z}_{t-1} + \sum_{i=1}^{5} \psi_{1,i} \Delta y_{1t-i} + \sum_{i=1}^{5} \psi_{2,i} \Delta y_{2t-i} + \beta_1 \Delta X_i + \gamma_1 T_i + \alpha_1 \mathrm{S}_i + \epsilon_{1,t} \tag{7a}$$

$$\Delta y_{2t} = \xi_0 + \text{ect1}_2 \hat{z}_{t-1} + \sum_{i=1}^{5} \xi_{1,i} \Delta y_{1t-i} + \sum_{i=1}^{5} \xi_{2,i} \Delta y_{2t-i} + \beta_2 \Delta X_i + \gamma_2 T_i + \alpha_2 \mathrm{S}_i + \epsilon_{2,t} \tag{7b}$$

where ect1_i is the error term correction term, ψ_i and ξ_i are the parameters of endogenous variables in first differences, β_i correspond to exogenous variables in first differences, γ_i is the trend parameter α_i is a vector of parameters of the variables that capture seasonality and ϵ_i are the residuals. The estimated parameters are shown in the following table 5.

Table 5: Estimated coefficients of the VECM

Variable	$\Delta y_{1,t}$	$\Delta y_{2,t}$
ect1	-0.659 (-5.78) ***	0.233 (3.65) ***
constant	-0.035 (-1.08)	0.012 (0.65)
Trade openness	0.149 (4.7) ***	-0.004 (-0.25)
cpib.usa	0.609 (7.77) ***	-0.064 (-1.46)
inflation	-0.319 (-4.08) ***	-0.026 (-0.6)
tbp	-0.001 (-1.12)	-0.001 (-1.35)
vartc	-0.136 (-3.06) **	0.046 (1.86).
est.d2	-0.004 (-0.81)	0.009 (3.2) **
est.d3	0.001 (0.27)	0.011 (4.11) ***
est.d4	0.01 (2.06) *	0.012 (4.39) ***
trend	-0.001 (-5.49) ***	0 (0.93)
$\Delta y_{1,t-1}$	-0.64 (-7.25) ***	0.067 (1.35)
$\Delta y_{2,t-1}$	0.058 (0.24)	0.221 (1.63)
$\Delta y_{1,t-2}$	-0.708 (-8.52) ***	0.089 (1.92).
$\Delta y_{2,t-2}$	0.44 (1.74).	-0.077 (-0.54)
$\Delta y_{1,t-3}$	-0.464 (-4.6) ***	0.2 (3.54) ***
$\Delta y_{2,t-3}$	0.642 (2.49) *	-0.122 (-0.84)
$\Delta y_{1,t-4}$	-0.868 (-7.41) ***	0.2 (3.05) **
$\Delta y_{2,t-4}$	0.027 (0.13)	-0.093 (-0.78)

Notes:
Significance code: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
t statistics in parenthesis

Regarding the diagnostic tests, the adjusted VECM successfully meets all the conditions as well, as it is shown in table 6.

The VECM's results of the impulse response on economic growth when a shock is applied to financial development, are similar to those of the VAR, as can be seen in

Table 6: VECM diagnostic tests

Test	Statistic	P value
Portmanteau	50.99	0.28
ARCH	41.84	0.61
Jarque-Bera	2.17	0.70

figure **??**. Nonetheless, there is a significant difference in the results of the impulse response on financial development when economic growth increases by one unit, since in the VECM results the impact is statistically different from zero from period 4 (figure **??**). In the literature reviewed for this study, there is no theory that explains this behaviour, since it implies that the impact on financial development in the event of a shock to economic growth would persist for the rest of the periods, while the expected impact would be transitory in line with the VAR results. Therefore, the simulation analysis was performed with the VAR model.

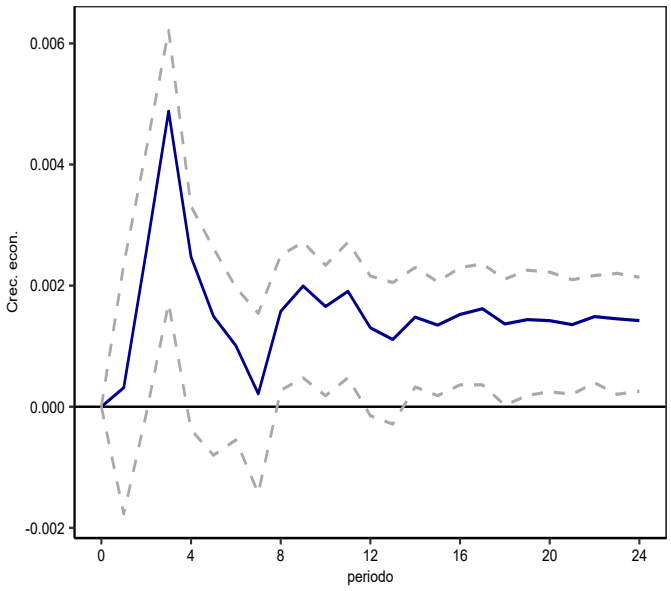


Figure 10: Orthogonal impulse response from financial development

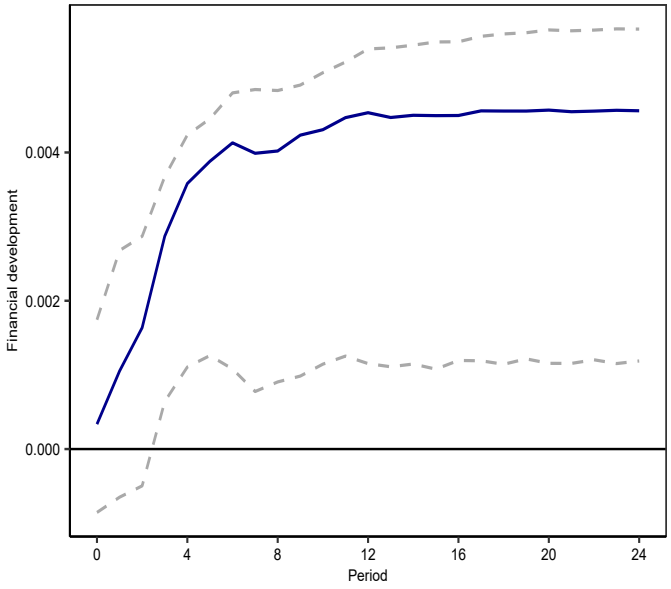


Figure 11: Orthogonal impulse response from economic growth

3.4 Simulation analysis

The inclusion of exogenous variables in this work is useful to study the relationship between the variables of interest and to perform the Granger test. However, in case of using this model for forecasting, it is necessary to define predicted values for the exogenous variables, either through additional econometric models (which would add more uncertainty) or other methods. In this study it was chosen to analyze the projections using simulations.

The year 2021 is the period under analysis and the results of the simulations are compared with a baseline scenario taking as a reference the latest observed values (as of October 1st) for the exogenous variables, with the exception of the annual growth of US GDP where a value of 0.0597 was assumed according to IMF (IMF, 2021) and the trade openness index assumed to be the average of the last 7 years. The assumed values for the exogenous variables in the baseline scenario are presented in table 9.

The baseline scenario estimates are shown in table 8. Furthermore, the estimates are calculated for the entire year and the results are described in table 9, in order to compare the estimates of the model with the estimates of the Central Bank of Costa Rica.

Table 7: Values of the exogenous for the baseline scenario

Date	Trade openness index	US GDP	Inflation	TBP	Exchange rate (YoY)
2021-03-01	0.6609	0.0055	0.0047	3.4	0.0484
2021-06-01	0.7623	0.1150	0.0191	3.2	0.0659
2021-09-01	0.6457[a]	0.0569[a]	0.0191[a]	2.9	0.0380
2021-12-01	0.6457[a]	0.0569[a]	0.0191[a]	2.9[a]	0.0380[a]

[a] Estimated values

Table 8: VAR model estimates for the baseline scenario

	Economic growth			Financial development		
Date	Estimate	Lower lim.	Upper lim.	Estimate	Lower lim.	Upper lim.
2021-03-01	-0.01	-0.03	0.01	0.58	0.57	0.59
2021-06-01	0.10	0.08	0.12	0.56	0.55	0.58
2021-09-01	0.08	0.06	0.10	0.57	0.55	0.59
2021-12-01	0.05	0.03	0.08	0.58	0.56	0.61

The simulation exercise was carried out in the form of a sensitivity analysis whose objective is to identify which variations in the exogenous variables could cause strong deviations from the baseline scenario. Therefore, the steps to run the simulation are as follows:

1. The starting point is the baseline scenario described in tables 8 and 9.

2. For each range of quantiles and each independent variable, 100 new data points were generated based on historical data, maintaining the base scenario for the rest of the variables.

3. With the new data sets, the values were estimated with the VAR model.

The results of the simulation for the economic growth are presented in table 10 where each cell represents the median of the economic growth in each simulation, for instance, the median of economic growth for the data generated with trade openness index within the quantile range of $[0.0, 0.20]$ is 0.0434, keeping the base scenario for the rest of the variables.

Therefore, it is noted that values of the trade openness index greater than the 60^{th} percentile would be associated with an economic growth greater than the confidence interval of the baseline scenario (table 10). On the other hand, it is observed that the economic growth of Costa Rica is highly correlated with the performance of

Table 9: Annual estimates of the VAR model for the baseline scenario

	Modelo VAR			
Variable	BCCR	Estimate	Lower Lim.	Upper Lim.
Economic growth	0.039	0.0552	0.0314	0.079
Financial development	NA	0.5810	0.5560	0.606

the US economy, so that values of this variable below the 80th percentile would be associated to economic growth in Costa Rica below the confidence interval of the base scenario. This is explained as an extraordinary growth is expected in US in 2021 (IMF, 2021). In addition, the economic growth of Costa Rica, would be below the confidence interval of the baseline scenario, when the values of the inflation rate are greater than the 60th percentile and interest rates values above 80th percentile.

Table 10: Medians of the simulations for economic growth

Quantiles range	Trade openness index	USA GDP	Inflation	Interest Rate	Exchange rate (YoY)
0 - 0.2	0.0434	0.0000†	0.0589	0.0507	0.0723
0.2 - 0.4	0.0517	0.0247†	0.0466	0.0463	0.0628
0.4 - 0.6	0.0668	0.0286†	0.0330	0.0413	0.0563
0.6 - 0.8	0.0862*	0.0332	0.0189†	0.0317	0.0503
0.8 - 1	0.0995*	0.0405	0.0077†	0.0208†	0.0460

* > Above the CI upper limit in the baseline scenario

† < Below the CI lower limit in the baseline scenario

Conversely, values of financial development below the confidence interval are only associated with interest rates above the 40th percentile. As expected, the variations of the other independent variables are not associated with strong deviations in financial development from the baseline scenario, as shown in table 11.

Table 11: Medians of the simulations for financial development

Quantiles range	Trade openness index	USA GDP	Inflation	Interest rates	Exchange rate (YoY)
0 - 0.2	0.5782	0.5911	0.5823	0.5720	0.5683
0.2 - 0.4	0.5804	0.5882	0.5767	0.5630	0.5759
0.4 - 0.6	0.5832	0.5875	0.5707	0.5530†	0.5806
0.6 - 0.8	0.5868	0.5872	0.5642	0.5339†	0.5848
0.8 - 1	0.5896	0.5865	0.5590	0.5123†	0.5879

* > Above the CI upper limit in the baseline scenario

† < Below the CI lower limit in the baseline scenario

4 Conclusions

Analyzing the link between economic growth and financial development, ignoring the interaction of the variables over time and without controlling for third variables, could lead to erroneous conclusions. Therefore, through VAR and VEC models (which consider lagged values of the dependent variables) and adding exogenous variables relevant to the country's economic model, this study demonstrated the presence of this link as indicated by the theory.

With the impulse-response functions it is concluded that an innovation of one unit in the financial development causes a statistically significant increase in economic growth of around 0.4% and 0.6% for period $t + 3$, which then it disappears. The explanation for this behaviour is that the financial system works as a channel to allocate resources to activities that would generate more production, so it is not a means in itself to generate economic growth.

On the other hand, the impulse-response functions for the financial development when a shock is applied to economic growth, also show a statistically significant impact, nonetheless, the results of the VAR and the VECM are different, since the former exhibited a transitory effect while the latter presented a permanent impact. Furthermore, the Granger test provides evidence of a bidirectional causality among the variables, in line with what has been observed in other countries (please refer to Liu y Calderón (2002)).

In the current economic context, characterized by high uncertainty aggravated by the appearance of an external factor such as the pandemic, it is essential to have tools that allow the design of different decision-making scenarios. Thus, in the final section of this paper, a simulation analysis was carried out in which it was detected that the economic performance of Costa Rica would be strongly associated with the growth of the US economy.

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