THE LONG TERM IMPACT OF DEPOSIT DOLLARIZATION ON STOCK MARKETS IN MIST ECONOMIES[1]

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Ahmet Melik SAHABİ
Asst. Prof. Dr.
Bingöl University
Faculty of Economics and Administrative Sciences,
Bingöl, Türkiye
asahabi@bingol.edu.tr
ORCID ID: 0000-0002-8038-4627

Sacit SARI
Asst. Prof. Dr.
Munzur University
Faculty of Economics and Administrative Sciences,
Tunceli, Türkiye
sacitsari@anadolu.edu.tr
ORCID ID: 0000-0002-1305-5727

Mesut ASLAN
Asst. Prof. Dr.
Bingöl University
Faculty of Economics and Administrative Sciences,
Bingöl, Türkiye
mesutaslan@bingol.edu.tr
ORCID ID: 0000-0003-2338-7474

ABSTRACT

With the globalization and financial liberalization, deposit dollarization and increasing use of foreign currency deposits by households and firms have garnered significant attention and become an important subject in recent years. In this study, we tried to uncover the relationship between deposit dollarization, which is a form of financial dollarization, and stock market in MIST economies for the period between 2003Q1 and 2022Q2. With the help of second-generation methods of panel econometrics, we have identified a significant, adverse long-term influence of deposit dollarization on stock markets. This outcome has been substantiated through the utilization of three distinct estimation methodologies. Moreover, our Granger non-causality test demonstrates the presence of a causal relationship emanating from deposit dollarization to the stock market.

Keywords: *Deposit dollarization, stock market, panel cointegration*
JEL Codes: *G, G0, G17.*

Scope: *Business Administration*
Type: *Research*

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[1] 1 Compliance with the ethical rules of the relevant study has been declared.

MİST EKONOMİLERİNDE MEVDUAT DOLARİZASYONUNUN PAY PİYASALARINA UZUN DÖNEM ETKİSİ

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Ahmet Melik SAHABİ
Dr.Öğr. Üyesi
Bingöl Üniversitesi
İktisadi ve İdari Bilimler Fakültesi, Bingöl, Türkiye
asahabi@bingol.edu.tr
ORCID ID: 0000-0002-8038-4627

Sacit SARI
Dr. Öğr. Üyesi
Munzur Üniversitesi
İktisadi ve İdari Bilimler Fakültesi, Tunceli, Türkiye
sacitsari@anadolu.edu.tr
ORCID ID: 0000-0002-1305-5727

Mesut ASLAN
Dr. Öğr. Üyesi
Bingöl Üniversitesi
İktisadi ve İdari Bilimler Fakültesi, Bingöl, Türkiye
mesutaslan@bingol.edu.tr
ORCID ID: 0000-0003-2338-7474

ÖZ | Küreselleşme ve finansal liberalizasyon sürecinde mevduat dolarizasyonu, hanehalkları ve firmalar'a ait yabancı para mevduatların artması, son yıllarda birçok çevreler için dikkat çekici ve önemli bir konu haline gelmiştir. Bu çalışmada MIST ekonomilerinde 2003Q1 ile 2022Q2 dönemleri arasında finansal dolarizasyonun bir türü olan mevduat dolarizasyonu ile pay piyasaları arasındaki ilişki incelenmiştir. İkinci nesil panel ekonometrik yöntemlerin kullanıldığı çalışmada mevduat dolarizasyonun uzun dönemde pay piyasalarını negatif yönde etkilediği bulunmuştur. Bu etki üç farklı tahmin yöntemi ile doğrulanmıştır. Ayrıca Granger nedensellik testi sonuçları mevduat dolarizasyonundan pay piyasalarına doğru bir nedensellik ilişkisini ortaya çıkarmıştır.

Anahtar Kelimeler: *Mevduat dolarizasyonu, pay piyasaları, panel eş-bütünleşme*
JEL Kodları*: G, G0, G17*

Alan: *İşletme*
Türü: *Araştırma*

1. INTRODUCTION

Dollarization refers to the practice of incorporating foreign currencies alongside domestic ones, serving various purposes such as facilitating transactions, acting as a benchmark for valuation, and functioning as a repository of economic worth. To align with these three fundamental monetary functions, three distinct forms of dollarization can be observed: payment dollarization, characterized by the utilization of foreign currency for transactional purposes; financial dollarization, involving the adoption of foreign currency as a standardized unit for valuing assets; and real dollarization, denoting the incorporation of foreign currency as a fundamental unit for accounting purposes (De Nicoló, Honohan, & Ize, 2005, p. 1701). This study focuses on deposit dollarization, which is a form of financial dollarization, and how it impacts stock markets.

The large holdings of foreign currency deposits and portfolio diversification are commonly used in transition economies to hedge against inflation, macroeconomic instability, and currency depreciation. This situation is defined as financial dollarization (Yeyati, 2006, p. 67). Financial dollarization can manifest in two distinct manners: deposit dollarization, which is assessable by comparing the amount of foreign currency deposits to the total of deposits or the broader money supply; and loan dollarization, which is determined by identifying the portion of credits denominated in foreign currency out of the total credits. (Neanidis & Savva, 2013, p. 407). Loan dollarization is evident in situations where the cost of capital in the domestic currency is relatively high, and businesses heavily rely on imported raw materials for production. This results in a highly risky state commonly referred to as an "open position" (Yalçiner & Topcu, 2022, p. 501). Deposit dollarization can happen when the domestic currency is unstable or lacks credibility, and depositors seek to hold their savings in a more stable and credible currency. For 16 selected transition economies, Christiano, Dalgıç and Nurbekyan (2021) found that the deposits dollarization rate was 38% on average for the period between 2010-2019. This phenomenon has gained momentum during and after COVID-19 with high macroeconomic risk and inflation. For example, Turkiye, one of the countries in our dataset, reached a record high level of 61% in the last quarter of 2021.

Financial dollarization can have negative effects on balance sheets with maturity (Eichengreen, 2001, p. 267) and currency mismatches (Yalçiner & Topcu, 2022, p. 501), and cause a weaker monetary policy transmission (Yeyati, 2006, p. 97). When a significant share of deposits are denominated in foreign currency, central banks' control over domestic money supply may be weakened, as they cannot directly influence the demand for foreign currency deposits. This

can result limiting effectiveness of monetary policy in promoting economic growth and stability. Negative aspects of financial dollarization can lead to more fragile financial system with increased solvency and liquidity risks, particularly in the event of large currency depreciations (De Nicolo, Ize, & Honohan, 2003). Moreover, studies show that financial dollarization can slow down financial deepening (Bannister, Turunen, & Gardberg, 2018). But the relationship between deposit dollarization and the financial market, or more precisely the stock market in the long term is still an unknown phenomenon. Although studies imply that this relationship is negative, when we consider that dollarization is mostly associated with high inflation, one might think that a positive relationship can also be seen. This type of thinking is mostly due to the fact that investors tend to buy stocks to store the value of their wealth in an inflationary environment.

Given the potential risks associated with deposit dollarization, policy makers may need to consider a range of measures to address this phenomenon. For a consistent de-dollarization process, credible monetary policies, regulations to impede the provision of foreign currency deposits, and enhancing the credibility of local currencies can be considered necessary steps (Hake, Lopez-Vicente, & Molina, 2014, p.27; Kokenyne, Ley, & Veyrune, 2010). In this study, we tried to uncover the relationship between deposit dollarization and the stock market for one well-known transition economies groups, namely MIST (Mexico, Indonesia, South Korea, and Turkiye).

MIST is a group of emerging economies first introduced in 2011 by Jim O'Neill, a Goldman Sachs economist who also came up with the name BRIC (Brazil, Russia, India, and China). He explained that each of these countries accounted for more than 1% of the world's GDP and stated that they had high growth potential. The motivation behind choosing this group is because it consists of important countries for their region and the world and is a composition of high and moderate dollarized economies (Reinhart, Rogoff, & Savastro 2014, p.29).

This paper seeks to explore whether, in the long term, deposit dollarization has any impact on stock markets within the MIST economies and, if so, the direction of this impact. Additionally, we endeavor to unveil any causal relationships between these variables. We employ contemporary second-generation panel cointegration and causality analysis methods to accomplish this. We expect our work will contribute to the ongoing debate on the costs of deposit dollarization and its implication for overall economy.

The remaining part of the study is structured like this: In section 2, we gathered and explained what other experts have written about dollarization and

stock markets. After that, in section 3, we shared the information we collected and discussed how we conducted our study. The most important results are in section 4. We talk about how deposit dollarization affects the stock market. Then we look at how other things also affect it. In the end, in section 5, we put together the main things we found and discussed what they mean for policies.

2. LITERATURE REVIEW

Examining the studies based on dollarization reveals that there is a limited number of studies examining the effect of financial and deposit dollarization on stock market indices (some examples are, Jansen and Ortiz (2007), Ben (2016), Balima (2017), Kaya and Açdoyuran (2019)). Conversely, numerous studies have explored the connection between dollarization and exchange rates, some of them are Sever (2012), Udoh and Udeajaa (2019) while, the studies of Bahmani-Oskooee and Domaç (2003), Neanidis and Savva (2009) examine the relations between dollarization and various macroeconomic variables. As far as our understanding goes, this study represents, if not the first, one of the few endeavor to examine the impacts of financial dollarization on stock markets in MIST economies. Consequently, this study is anticipated to enhance the current body of literature by introducing novel insights into this domain.

Using the EGARCH-M approach, Akçay, Alper and Karasulu (1997) investigated the impact of dollarization on exchange rate instability for the Turkish economy between 1987:01 and 1996:03. The analysis outcomes reveal that as dollarization intensifies, the associated risk linked to exchange rates also rises.

In a study conducted by Lay, Kakinaka and Kotani (2010), they examined the connection between dollarization and currency exchange rate changes within the Cambodian economy. They employed monthly data spanning from June 1998 to January 2008. The findings from their GARCH analysis indicate that dollarization contributes to the depreciation of the Cambodian riel and amplifies exchange rate fluctuations.

In the period spanning from December 1989 to December 2010, Sever (2012) conducted an investigation into the correlation between dollarization and exchange rate uncertainty within the Turkish economy. This analysis employed the Granger causality test. The author, who determined bidirectional causality relationships between the related variables until the 6th lag, stated that dollarization would cause exchange rate uncertainty in the later lags.

In their study conducted between December 2009 and September 2018, Udoh and Udeaja (2019) delved into the connection between exchange rate

volatility and financial dollarization within the Nigerian economy. They employed the TARCH method for their analysis. The findings of the TARCH method highlight that the extent of financial dollarization in Nigeria stands as the predominant influencer of nominal exchange rate fluctuations.

Kal (2019) examined the impact of credit and deposit dollarization on exchange rate volatility and risk with the help of EGARCH-M method, using monthly data in the Turkish economy between 2003 and 2018. It shows that increases in deposit and loan dollarization in the Turkish economy increase exchange rate volatility and risk.

Several studies have examined the connection between dollarization and specific macroeconomic indicators. The findings from these studies can be succinctly summarized as follows.

Honohan and Shi (2001) examined the relationship between deposit dollarization and various variables in 58 emerging economies for the period 1980–2000. The findings revealed a noteworthy and statistically significant association between deposit dollarization and both the real interest rate and inflation, mainly through the exchange rate pass-through mechanism. Simultaneously, the rise in deposit dollarization was found to diminish the accessibility of credit.

Bahmani-Oskooee and Domaç (2003) investigated the relationship between inflation, base money, exchange rate, public sector price, and dollarization over the period 1990:M01-2001:M12 for the Turkish economy. According to the VAR results, dollarization has a positive impact on inflation, exchange rate, and public sector price, while the effect of dollarization on the money base is negative in the short term.

Bacha, Holland and Gonçalves (2008) analyzed the connection between financial dollarization and real interest rate for 66 countries between 1996 and 2004 by adding the capital liberalization index and jurisdictional uncertainty variables to the model. The model estimation results showed that the jurisdictional uncertainty variable has a significant positive impact on financial dollarization, and the removal of barriers to capital will reduce dollarization. Finally, the authors stated that dollarization has negative effects on the real interest rate.

Neanidis and Savva (2009), employed an unbalanced panel dataset of monthly observations in 11 emerging economies for the period between 1993-2006. Analysis results could be summarized as follows. A decrease in the value of the local currency tends to elevate deposit dollarization. Additionally, the difference in deposit interest rates has a substantial adverse effect on short-term deposit dollarization. Conversely, inflation does not exhibit a significant impact

on deposit dollarization. Moreover, the dollarization of short-term loans is considerably influenced by the exchange rate and factors associated to money, with a depreciation encouraging banks to increase foreign-currency loans and a monetary expansion causing it to decline.

Vieria, Holland and Resende (2012) examined the determinants of dollarization in 79 selected countries for the period 1996-2006 using the GMM method. The variables related to inflation (inflation, inflation volatility, MVP) and institutional quality have a positive relationship with financial dollarization. The authors assert that a heightened ratio of public debt to GDP is more closely linked to an increase in dollarization compared to the risks associated with current inflation.

Fabris and Vujanovic (2017) used the VAR method to examine the effects of financial dollarization on prices and exchange rates in the Serbian economy between 2006:Q1 and 2016:Q1. The analysis results show that financial dollarization has statistically significant positive effects on the general level of prices and the exchange rate, while the Granger causality test shows that financial dollarization has a one-way causality relationship with the related variables.

Using a VAR model, Yılmaz and Uysal (2019) at the relationship between dollarization and inflation in the Turkish economy between 2012:M01 and 2018:M09. The results indicated that dollarization explained 0.63% of a 1% change in inflation and that inflation explained 5.32% of a 1% change in the dollarization rate.

Özkul (2021) used VAR method to examine the relationships between deposit dollarization, credit dollarization, inflation, and employment between 2005:M12 and 2020:M09 in the Turkish economy. The model estimation result derived from VAR system showed a causal interaction between deposit dollarization inflation and employment and only a direct relationship from credit dollarization to inflation.

Işık and Yüncü (2022) examined the effect of deposit dollarization on the bank performance (represented ROA and ROE) in the Turkish economy for the period between 2012:Q1 and 2017:Q4 by using panel data methods. The analysis results indicate that deposit dollarization exerts a statistically significant adverse influence on Return on Assets (ROA) and Return on Equity (ROE).

Finally, it's worth noting that the interaction between dollarization and stock market performance has been the subject of examination in a relatively restricted number of studies, and a summary of some of these studies is presented below.

Jansen and Ortiz (2007) examined the impact of dollarization on stock returns. They used daily data from the Equatorial stock exchange between 3 August 1993 and 5 March 2006. The authors, using the GARCH model as the analysis method, stated that dollarization affects stock returns (increasing the volatility of returns).

In a study conducted by Ben (2016), an examination was carried out to assess the influence of dollarization on the performance of the Zimbabwe Stock Exchange during the period spanning from 2003 to 2014. The analysis of this study reveals that dollarization has indeed had an impact on the performance of the Zimbabwe Stock Exchange.

Balima (2017) examined the relationship between domestic bond market participation and financial dollarization for 114 countries between 1985 and 2009. The results indicate that engaging in the domestic bond market has a noteworthy adverse impact on financial dollarization. Moreover, this effect is more pronounced in countries that follow an inflation-targeting framework compared to those that do not adopt such a framework.

Kaya and Açdoyuran (2019) conducted a study to explore the relationship between deposit and credit dollarization and the returns of the BIST-100 index in the Turkish economy. Their investigation spanned from January 2000 to September 2017, and they employed the VAR model and Granger causality methods for their analysis. The study's findings, revealing dynamic connections among these variables, indicate a one-way causal relationship: BIST-100 index returns influence deposit and credit dollarization.

Our review of the existing literature has revealed a noticeable absence of research concerning the connection between dollarization and the stock market. It has been observed that the existing literature has primarily concentrated on assessing the influence of dollarization on various macroeconomic indicators. Studies regarding the stock market have predominantly centered on short-term effects. Remarkably, there has been a scarcity of research investigating this relationship over the long term, which is of particular concern to both policymakers and economists. This study, therefore, seeks to address this gap by employing contemporary second-generation panel econometrics techniques to investigate the long-term relationship. The present study aims to provide fresh evidence for this phenomenon by utilizing three distinct long-term estimation procedures.

Furthermore, there is a notable absence of similar studies conducted within the MIST economies. The primary significance of this research predominantly derives from the composition of the sample employed. This group consists of economies with varying degrees of dollarization,

encompassing both highly and moderately dollarized nations. The exploration of the outcomes of deposit dollarization holds great significance for the policymakers of MIST economies.

3. DATA AND METHODOLOGY

This study primarily intends to explore the impact of deposit dollarization on stock markets in MIST economies between 2003Q1 and 2022Q2. These 78 quarters were selected merely because of data availability.[2] Major stock indices for each country were used to represent stock market and selected according to Tradingview's major world indices list.[3] The measurement of deposit dollarization was achieved by calculating the proportion of foreign currency deposits in relation to the entirety of deposits within the banking system. Consumer price index with all items included and industrial production index based on total manufacturing were also used for overall price and production level in the economies respectively. Seasonally adjusted indices were taken directly from the data sources for the industrial production index.[4] Data sources of all variables can be seen in Table 1.

Table 1: Data Variables and Sources

Variables	***Symbol***	***Description***	***Data Source***
Stock Index	SI	Major stock indices	Tradingview
Deposit Dollarization Rate	DDOLL	Foreign currency deposits divided by total deposits	National Central Banks
Consumer Price Index	CPI	Indices with all items included	National Central Banks
Industrial Production Index	IPI	Seasonally adjusted indices based on total manufacturing	National Central Banks, FRED

[2] Banking system data for Mexico was only available from the early days of 2003.

[3] These indices are IPC Index for Mexico, IDX Composite Index for Indonesia, Korea Composite Stock Price Index for South Korea and BIST 100 Index for Turkiye.

[4] Because industrial production index data was not available in National Central Bank Database for Indonesia, we used Federal Reserve Economic Database (FRED) for the respective country.

Similar to the approach taken in the works of Ben (2016), Balima (2017), and Kaya and Açdoyuran (2019), we focus on deposit dollarization as our variable of interest to evaluate its role in expressing stock market movements. In line with the literature, the Consumer Price Index (CPI) and the Industrial Production Index (IPI) have been incorporated as additional regressors in this study (Gençturk, 2009, p. 130; Özer, Kaya, & Özer, 2011, p. 175; Forson & Janrattanagul, 2017, p. 169). With a set of econometric methods, which we discussed in this section, we examined functional relationships formed as follows:

$$SI = f(DDOLL, CPI, IPI) \quad (1)$$

For empirical analysis, different panel methods were used, which were compatible with the structure of the dataset. In the remainder of this section, we discussed the tests and estimators of panel econometrics used in the study.

Recent studies of both theoretical and applied panel econometrics emphasize the necessity of considering cross-sectional or intergroup dependency in panel modeling (Atanda, 2017, p. 312). Cross-sectional dependency arises from the same known or unknown factors affecting cross-sectional units and causes a correlation between group-specific error terms. If the factors are known, cross-sectional dependency can be eliminated by directly adding them to the model, otherwise econometric tests and estimators account for cross-sectional dependency should be used.

Prior to selecting the appropriate tests and estimators, it is essential to ascertain the presence of cross-sectional dependency. In this study, four distinct cross-sectional dependency tests are employed for this purpose: LM (Breusch & Pagan, 1980), CD (Pesaran, 2004), CD_{LM} (Pesaran, 2004), and LM_{adj} (Pesaran, Ullah, & Yamagata, 2008). These tests essentially examine whether there is a correlation among error terms specific to different groups, with the null hypothesis being that there is no cross-sectional dependency. Moreover, the assumption of slope homogeneity needs to be tested if it holds true. We used two different methods; $\tilde{\Delta}$ and $\tilde{\Delta}_{adj}$, both developed by Pesaran and Yamagata (2008) and based on Swamy approach, to test this assumption under the null hypothesis of slope homogeneity.

Before choosing an appropriate cointegration test, the stationarity of variables should be examined. This study employs four different methods to test the stationarity of the variables: IPS (Im, Pesaran, & Shin, 2003), MW (Maddala & Wu, 1999), HK (Hadri & Kurozumi, 2012), and CIPS (Pesaran, 2007). IPS and MW are among the so-called first-generation unit root tests that

operate under the assumption of no cross-sectional dependency and yield unreliable results if the assumption does not hold (Doğan & Aslan, 2017, p. 243). Meanwhile, HK and CIPS are among the so-called second-generation stationarity and unit root tests that account for cross-sectional dependency. IPS, MW and CIPS have a null hypothesis of unit root, while HK has a null hypothesis of stationarity.

For long-run relationships, a cointegration test proposed by Westerlund (2008) was employed in the study. Westerlund developed two different panel cointegration tests based on using Durbin-Hausman (DH) statistics. One of these tests (DH_p) is based on the assumption of homogeneity, while the other (DH_g) is based on the assumption of heterogeneity in slope parameters. The test searches for a cointegration relationship under the assumption of cross-sectional dependency by factor decomposition on error terms in the model. This method can assess the cointegration relationship, irrespective of whether the explanatory variables possess I(1) or I(0) characteristics, as long as the dependent variable is of I(1) nature. This approach applies the Principal Component (PC) method, as proposed by Bai and Ng (2002), to derive factors. It tests a null hypothesis, asserting the absence of cointegration across all groups, against an alternative hypothesis, which posits cointegration within all groups, assuming homogeneity or within some groups, assuming heterogeneity.

As stressed earlier, a problem frequently encountered when using panel cointegration estimators is cross-sectional dependency. Cross-sectional dependency can have serious effects on the efficiency and consistency characteristics of standard panel estimators, especially as T goes to infinity (Hsiao & Tahmiscioglu, 2008, p. 2701). To deal with problems related to cross-sectional dependency, common factors should be added to model as additional regressors.

Common Correlated Effects Mean Group (CCE) estimator, developed by Pesaran (2006), is used in the study to address cross-sectional dependency. The CCE estimator estimates the hidden common factors by using a linear combination of the average values of the dependent and explanatory variables across the observed samples. Besides accounting for cross-sectional dependency, CCE estimator also allows heterogeneity in slope coefficients. CCE estimator can be formulated as follows:

$$y_{it} = \alpha_i + X_{it}\beta_i + \mu_{1i}\overline{y_t} + \mu_{2i}\overline{X_t} + \varepsilon_{it} \quad (2)$$

Here X_{it} is a (k × 1) vector of explanatory variables, μ_{1i} and μ_{2i} are factor loadings, $\overline{y_t}$ and $\overline{X_t}$ are factors as averages of dependent and explanatory

variables respectively. And finally ε_{it} is the idiosyncratic error term. With this procedure, after estimating individual coefficients β_i for each group, simple averages of coefficients can be computed as:

$$\hat{\beta}_{CCEMG} = N^{-1} \sum_{i}^{N} \hat{\beta}_i \tag{3}$$

In addition, Interactive Fixed Effects (IFE), proposed by Bai (2009), and Factor Augmented Regression (FAR), proposed by Greenaway-McGrevy, Han and Sul (2012), are also used in the study. Both methods are able to be aplied in the presence of cross-sectional dependency. Based on their findings, Giannone and Lenza (2010) demonstrated that high correlation is observed when shocks are assumed to have homogeneous effects across cross-sections (additive effects); the correlation is absent when shocks are assumed to have heterogeneous effects (interactive effects). IFE estimator uses heterogeneous interactive effects as common factors and factor loadings. The formula can be expressed as:

$$y_{it} = X_{it}\beta + \lambda_i F_t + \varepsilon_{it} \tag{4}$$

Where X_{it} is a (k × 1) vector of observable regressors, λ_i is a (r × 1) vector of individual factor loadings, constant over time, F_t is a (r × 1) vector of unobserved factors, same across all individuals, and ε_{it} is idiosyncratic error component. This way interaction of factor loadings (heterogeneous individual effects) and factors (heterogeneous time effects) are added to the equation to account for cross-sectional dependency. Common factors are obtained by PC method. It is noted that adding additive effects to the model can also improve efficiency (Bai, 2009; Mallatt, 2018).

Third and the last procedure used in the study to estimate long-run coefficients is Factor Augmented Regression estimator. FAR formula can be expressed as:

$$y_{it} = X_{it}\beta + F_t^u \lambda_i^u + \varepsilon_{it} \tag{5}$$

Where F_t^u is a (r × 1) vector of common factors, and λ_i^u is a (r × 1) vector of factor loadings. ε_{it} is idiosyncratic error component. (k × 1) vector of regressors $X_{it} = F_t^X \lambda_i^X + V_{it}$ and $F_t^X \lambda_i^X$ is allowed to be correlated with $F_t^u \lambda_i^u$. FAR estimator uses PC analysis to determine common factors, can be used in the presence of cross-sectional dependency, and is efficient when factor

loadings are heterogeneous (Greenaway-McGrevy et al., 2012; Kwak, 2020).

Granger causality analysis reveals how one variable's previous values help predict another variable. But in the process of testing causality, the complexity of panel structures leads to the same two problems that arose in long-run coefficient estimation: cross-sectional dependency and slope heterogeneity. This study employs Dumitrescu and Hurlin (2012) panel non-causality test, which deals with both issues. This test uses Fisher test statistics that utilizes individual statistics to test the null hypothesis of non-causality. In a bivariate VAR system with both variables following I(0) process, the equation can be expressed as:

$$y_{it} = \alpha_i + \sum_{k=1}^{K} \beta_i^{(k)} y_{it-k} + \sum_{k=1}^{K} \gamma_i^{(k)} x_{it-k} + \varepsilon_{it} \quad (6)$$

Where K represents lag order and ε_{it} is individual error term. The test has null hypothesis of non-causality for all individuals, alternative hypothesis of causality for some individuals, and is based on individual Wald test statistics. In the case of time dimension is higher than cross-section units, results of the asymptotic test (Z_{NT}) should be used for inference. Furthermore, it is noted that bootstrap critical values should be used in the presence of cross-sectional dependency. In the case of T>N, the formulation of Wald test statistics can be seen below as:

$$Z_{NT} = \sqrt{\frac{N}{2K}}(W_{NT} - K) \quad (7)$$

Where $W_{NT} = (1/N)\sum_{i=1}^{N} W_{it}$. This way average of individual Wald test statistics (W_{it}) is used to calculate asymptotic test statistics (Andriansyah & Messinis, 2019; Dumitrescu & Hurlin, 2012).

4. FINDINGS

In order to determine if the variables contain a unit root, first, unit root and stationarity tests were performed in the study. In the standard process before performing panel unit root tests, the existence of cross-section dependency in the models created for each variable, which is very likely, should be tested. However, this process was not followed in this study. Instead, four different unit root and stationarity tests were used in the study, two of which were the so-called first generation and two were the so-called second generation. While the first generation tests were IPS and MW, the second generation tests were preferred as HK and CIPS. The result of unit root and stationarity tests can be seen in Table 2.

Table 2: Results from unit root and stationarity tests

	IPS	***MW***	***HK***	***CIPS***
Level	***Constant***			
SI	1.635	6.177	0.975	-1.127
	[0.949]	[0.624]	[0.165]	
DDOLL	-0.084	11.348	2.595***	-2.933***
	[0.466]	[0.183]	[0.005]	
CPI	4.776	0.592	19.582**	-0.415
	[1.000]	[1.000]	[0.012]	
IPI	1.261	10.878	-0.134	-1.102
	[0.896]	[0.209]	[0.553]	
	Constant and Trend			
SI	-0.331	10.842	3.076***	-2.230
	[0.370]	[0.211]	[0.001]	
DDOLL	-2.166**	17.915**	0.979	-3.258***
	[0.015]	[0.022]	[0.164]	
CPI	6.076	0.918	3.141***	-2.701
	[1.000]	[0.999]	[0.001]	
IPI	-2.037**	24.621***	4.394***	-1.921
	[0.021]	[0.002]	[0.000]	
First-difference	***Constant***			
Δ*SI*	-11.656***	208.037***	0.901	-7.814***
	[0.000]	[0.000]	[0.184]	
Δ*DDOLL*	-15.521***	284.029***	-0.519	-7.268***
	[0.000]	[0.000]	[0.698]	
Δ*CPI*	-0.044	202.942***	1.643*	-6.205***
	[0.482]	[0.000]	[0.050]	
Δ*IPI*	-16.514***	322.421***	-0.009	-9.303***
	[0.000]	[0.000]	[0.504]	
	Constant and Trend			
Δ*SI*	-11.399***	184.594***	-0.209	-6.896***
	[0.000]	[0.000]	[0.583]	
Δ*DDOLL*	-15.885***	254.445***	-1.720	-6.896***
	[0.000]	[0.000]	[0.957]	

ΔCPI	0.751	183.925***	0.578	-6.401***
	[0.773]	[0.000]	[0.282]	
ΔIPI	-14.494***	279.400***	-0.716	-9.377***
	[0.000]	[0.000]	[0.763]	

Note: The maximum number of lags is set to 4 and the optimal number of lags is determined by Schwarz information criterion. For CIPS test, critical values are taken directly from Pesaran's (2007) paper. CIPS critical values are -2.54(1%), -2.33(5%), and -2.21(10%) for constant model; and -3.04(1%), -2.83(5%), and -2.72(10%) for constant and trend model. The numbers in brackets are p-values. ***, ** and * shows significance level of 1%, 5% and 10% respectively.

The result shows that in their levels, SI, CPI, and IPI variables have a unit root process, while DDOLL variable is stationary, especially under the assumption of cross-sectional dependency. Moreover, in their first difference, all three non-stationary variables become stationary. Thus, it is concluded that three of our variables (SI, CPI, and IPI) are I(1), and the other remaining variable (DDOLL) is I(0).

The detection of cross-sectional dependency and slope homogeneity for the model is critical for selecting appropriate cointegration tests and estimators in the further phase of the study. Four different tests examined cross-sectional dependency. The results of LM (for fixed N, $T \rightarrow \infty$), CD_{LM} (for large N and T), CD (for large N and small T), and LM_{adj} (for exogenous regressors and normal errors) tests were demonstrated in Table 3. All of these tests have the null hypothesis of no cross-sectional dependency. On the other hand, slope homogeneity tests for the model were conducted by employing $\tilde{\Delta}$ and $\tilde{\Delta}_{adj}$ tests. The results from these tests were also shown in Table 3. The null hypothesis of these two tests is homogeneity in slope parameters.

Table 3: Results from cross-sectional dependency and homogeneity tests

	Cross-Sectional Dependency Tests				***Homogeneity Tests***	
Model	***LM***	$\boldsymbol{CD_{lm}}$	***CD***	$\boldsymbol{LM_{adj}}$	$\tilde{\Delta}$	$\tilde{\Delta}_{adj}$
SI=f(DDOLL,CPI, IPI)	53.914***	13.832***	6.825***	13.021***	34.477***	35.623***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]

Note: The numbers in brackets are p-values. *** shows cross-sectional dependency and heterogeneity at the significance level of 1%.

Results from the table show that, with the rejection of the null hypothesis, there is cross-sectional dependency in the model meaning some variables are affecting all cross-sectional units simultaneously. Furthermore, homogeneity test results show that our slope parameters in the model are in fact heterogeneous.

Because the dependent variable follows I(1) process and the explanatory variables have different integration levels, the model has both cross-sectional dependency and heterogeneous slope parameters; in other words, given the combined results of Table 2 and Table 3, the long-run relationship in the model was investigated by Durbin-Hausman tests proposed by Westerlund (2008). Durbin-Hausman test presents two different statistics. One of them (DH_p) is used under the assumption that slope parameters are homogeneous, while the other (DH_g) is used under the assumption that slope parameters are heterogeneous. The main difference between the two statistics is that in DH_p statistics N terms are first summed and then multiplied, while in DH_g statistics N terms are multiplied first and then summed. The results from the cointegration tests are presented in Table 4.

Table 4: Results From Cointegration Tests

	Westerlund DH Cointegration tests	
Model	$\boldsymbol{DH_g}$	$\boldsymbol{DH_p}$
SI=f(DDOLL,CPI,IPI)	2.235**	6.197***
	[0.013]	[0.000]

Note: The numbers in brackets are p-values. *** and ** shows cointegration at the significance level of 1% and 5%, respectively.

Once the results from cointegration tests are examined, it is seen that the null hypothesis of no cointegration relationship is rejected under the assumption of heterogeneity in the slope parameters. As a result, it was established that there exists a long-term connection between the linear combination of the explanatory variables and the dependent variable.

Given the evidence of the cointegration relationship, the cointegrating coefficients of the model were estimated by three different panel cointegration estimators. We used CCE, IFE, and FAR estimation procedures which allow cross-sectional dependencies likely to arise from unknown common factors. The HAC (heteroscedasticity and auto-correlation) standard errors of Newey and West (1987) are used for IFE and FAR estimation procedure. The CCE estimator has the advantage of accounting for slope homogeneity by following the mean group procedure and computing the average of individual coefficients. Results from panel cointegration estimators are presented in Table 5.

Table 5: Results From Panel Cointegration Estimators

	Dependent Variable: *SI*		
	CCE	***IFE***	***FAR***
DDOLL	-4316.512**	-4409.067***	-3181.149**
	(-2.242)	(-5.951)	(-2.022)
	[0.025]	[0.000]	[0.043]
CPI	-68.840	1.145**	0.388
	(-1.635)	(2.314)	(0.368)
	[0.103]	[0.022]	[0.713]
IPI	35.223***	37.096***	20.819***
	(-1.633)	(6.972)	(3.468)
	[0.003]	[0.000]	[0.001]

Note: The numbers in parentheses are t-ratios and in brackets are p-values. *** and ** shows significance level of 1% and 5% respectively.

The table presents the result of CCE, IFE, and FAR estimation procedures, demonstrating a significant negative coefficient for deposit dollarization, -4316.512, -4409.067, and -3181.149 respectively. This means a mere increase of 0.01 units in the deposit dollarization rate leads to an approximate decrease of 43, 44 and 32 units in the stock market index, according to CCE, IFE, and FAR estimator results, respectively. These panel results indicate a significant negative long-run impact of deposit dollarization on stock market in MIST economies. Close coefficient findings for deposit dollarization also imply that the results are robust to estimation procedures. The results also show consistency in terms of industrial production. It is found that industrial production has a significant positive effect on stock market. This expected result confirms production level's contribution to firm value. However, only the results of the IFE estimator confirmed a significant positive effect of the consumer price index on stock market. The other estimators show the effect is insignificant. Hence, we concluded that deposit dollarization has a negative but limited, and industrial production has a positive and critical effect on long-run stock market performance.

In the study, Dumitrescu and Hurlin (2012) Granger non-causality tests

are conducted from stock index to deposit dollarization, from stock index to consumer price index, from stock index to industrial production index, and vice versa. Because our time dimension is much bigger than the number of cross-sectional units, we only computed asymptotic test (Z_{NT}) statistics. And because our model presents cross-sectional dependency, we only used bootstrapped critical values to make a statistical inference. We took the first differences of all variables except dollarization, because they follow a unit root process with I(1) integration level. The test results and corresponding critical values are presented in Table 6.

Table 6: Results From Panel Non-Causality Test

		Bootstrap Critical Values		
Null Hypothesis	***Panel Z_{NT}***	***1%***	***5%***	***10%***
DDOLL *does not cause* SI	2.165**	3.420	2.106	1.462
SI *does not cause* DDOLL	1.346	3.777	2.136	1.452
CPI does not cause SI	4.026***	3.639	2.184	1.520
SI *does not cause CPI*	-0.162	3.307	2.051	1.487
IPI does not cause SI	1.827*	4.501	2.431	1.575
SI *does not cause IPI*	24.997***	3.866	2.177	1.495

Note: The maximum number of lags is set to 4 and the optimal number of lags is determined by Schwarz information criterion. Critical values were obtained after 10,000 bootstrap replications. ***, ** and * shows significance level of 1%, 5% and 10% respectively.

The findings presented in the table indicate that there is a one-way causal relationship, running from deposit dollarization to the stock index and from the consumer price index to the stock index. These relationships are statistically significant at the 5% and 1% significance levels, respectively. Even though significance levels differ, it is also evident that there is a bidirectional Granger causality relationship between the industrial production index and stock index. We rejected the null hypothesis of the industrial production index does not cause stock index at 10%, and stock index does not cause industrial production index at 1% significance level. As a result, it is revealed that in the model we formed all the right-hand side variables have a causal relationship with the stock market.

5. CONCLUSIONS

As globalization shapes world trade and economy, financial dollarization, which is a direct result of financial liberalization, became a subject of interest. This study looked at the impact of deposit dollarization which is one of the two forms of financial dollarization, alongside price and

production level, on the stock market in MIST economies between 2003Q1 and 2022Q2. We discovered indications of a lasting connection between the stock index and the linear composition of deposit dollarization, the consumer price index, and the industrial price index. Upon estimating the cointegrated coefficients, it became evident that deposit dollarization negatively influences the stock market.

This indicates that investors tend to store their savings in foreign currency deposits instead of directly investing in the stock market in a dollarized environment. The continuous growth of stock prices can play a significant role in promoting overall economic prosperity. This holds particular significance for the MIST group, comprising four vital emerging economies in their respective regions. Considering countermeasures, such as stabilization of local currencies with credible monetary policies and regulations to discourage investors to keep their savings in foreign currencies, to reduce deposit dollarization would be helpful to increase stock market performance. One of the initial policies to consider is the gradual and consistent increase in policy interest rates to attract foreign investors. Policymakers should diligently implement this strategy while minimizing disruptions to economic growth.

Our results also confirm a positive effect of production level on stock market as expected. This holds true as production increases; investors tend to acquire more stocks. But we found little evidence of a positive effect of price level on stock market with only one estimator yielding significant results. This still shows in an inflationary environment, investors tend to purchase more stocks as a means of safeguarding their savings from the erosive effects of inflation. For economies grappling with the challenge of achieving a stable growth rate and characterized by a history of persistent high inflation, as is the case with the MIST economies, policymakers should contemplate proactive measures aimed at elevating production levels and curbing inflation. This is not only essential for sustaining economic growth and price stability but also for bolstering stock prices, which in turn contributes to a more equitable distribution of wealth.

We also looked causal relationship with a Granger non-causality test. The results show that there is unidirectional causality from deposit dollarization and consumer price index to stock index and bidirectional causality between production index and stock index. The existence of causality running from all of the explanatory variables to stock index and significant long-run effects suggest that policymakers could stabilize local currencies and promote production increase to boost stock market performance. Our analysis result in line with the theory and literature. Our empirical analysis results are compatible with the

studies of Jansen and Ortiz (2007), Balima (2017), Kaya and Açdoyuran (2019) and Işık and Yüncü (2022). This demonstrates the robustness of present study.

In conclusion, deposit dollarization presents itself as a versatile phenomenon, carrying potential ramifications for both the stability of the financial system and the efficiency of monetary policy. Our study's findings indicate that higher levels of deposit dollarization are associated with the lower stock market returns, underlining the necessity for policymakers to remain mindful of the risks linked to this pattern. Promoting the use of domestic currency deposits, for example, through the introduction of instruments like inflation-indexed savings accounts can be considered as one policy option. Additonally, central banks may need to increase their foreign exchange reserves and provide foreign currency liquidiy to the banking sector in times of stress. Further research is needed to more fully understand the underlying mechnaisms and to identify appropriate and effective policy responses to deal with the difficulties posed by deposit dollarization.

6. CONFLICT OF INTEREST STATEMENT

There is no conflict of interest between the authors.

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8. AUTHOR CONTRIBUTIONS

AMS.: The Idea;
MA: Design;
SS: İnspection;
MA: Collection and/or processing of resources
AMS.: Empirical Analysis and / or interpretation;
SS: Literature search;
AMS.: Written;
SS: Critical review

9. ETHICS COMMITTEE STATEMENT

Ethics committee approval is not required for the study.

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