Causality tests between stock market development and economic growth in West African Monetary Union

Teste de cauzalitate între dezvoltarea pieţei de capital şi creşterea economică în Uniunea Monetară a Africii de Vest

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Abstract

This paper examines the causal relationship between stock market development and economic growth for the West African Monetary Union economy over the last decade or so. By applying the techniques of unit–root tests and the long–run Granger non-causality test proposed by Toda and Yamamoto (1995), the causal relationships between the real GDP growth rate and two stock market development proxies are tested. The results are in line with the supply leading hypothesis in the sense that there is strong causal flow from the stock market development to economic growth. A unidirectional causal relationship is also observed between real market capitalization ratio and economic growth.

Keywords: *stock market development; economic growth; Toda and Yamamoto causality test; West African Monetary Union*

Rezumat

Această lucrare analizează relaţia de cauzalitate între dezvoltarea bursei de valori şi creşterea economică a Uniunii Monetare a Africii de Vest în ultimul deceniu. Prin aplicarea tehnicilor bazate pe teste unit-root şi pe testul Granger de non-cauzalitate pe termen lung propus de Toda şi Yamamoto (1995), sunt testate relaţiile de cauzalitate între rata reală de creştere a PIB şi doi indici ai dezvoltării bursei de valori. Rezultatele sunt în concordanţă cu ipoteza că oferta financiară este conducătoare, în sensul că există flux puternic de cauzalitate de la dezvoltarea bursei de valori la creşterea economică. De asemenea este observată o relaţie de cauzalitate unidirecţională între rata reală de capitalizare a piaţei şi creşterea economică.

Cuvinte-cheie: *dezvoltarea bursei de valori; creşterea economică; testul Toda şi Yamamoto de cauzalitate; Uniunea Monetară a Africii de Vest*

JEL Classification: G28, G32, E2, O55

Introduction

The growing importance of stock market around the world has reinforced the belief that finance is an important ingredient for growth. The focus is mainly on stock market development and economic growth. The academic literature on the relationship between financial development and economic growth dates back to as early as the early twentieth century (Schumpeter, 1911).The issue has been of great interest and generated considerable amount of debate among economists for many years. The debate primarily revolved around two major questions: *first* whether at all there is a relationship between development of financial sector on economic growth and *second*: what could be the nature and direction of the causal relationship, if any i.e. does development of financial sector promote economic growth or does economic development foster financial sector development? The possible directions of causality between financial sector development and economic growth were highlighted by Patrick (1966) in his '*supply leading*' and '*demand following*' hypotheses. The 'supply leading' hypotheses claims a causal relationship from financial development to economic growth by saying that intentional creation and development of financial institutions and markets would increase the supply of financial services and thus lead to economic growth while the demand following hypothesis claims that it is the growth of the economy which causes increased demand for financial services which in turn leads to development of financial markets.

The structure of this paper is as follows, section 2 presents a brief overview of the literature and we present a brief overview of West African stock market in section 3. The methodology and data measurement is described in section 4. Section 5 depicts the empirical results and we conclude in section 6.

Literature review on stock market and economic growth

Theoretically, a growing literature argues that stock market development boost economic growth. Greenwood and Smith (1997) show that large stock markets can decrease the cost of mobilizing savings, thus facilitating investment in most productive technologies. Bencivenga *et al* (1996) and Levine (1991) argue that stock market liquidity (the ability to trade equity easily) is crucial for growth. Although many profitable investments require a long run commitment of capital, savers do not like to relinquish control of their savings for long periods. Liquid equity markets ease this tension by providing an asset to savers that they can quickly and inexpensively sell. Simultaneously, firms have permanent access to capital raised through equity issues. Moreover, Kyle (1984) and Holmstrom and Tirole (1998) argue that liquid stock markets can increase incentives for investors to get information about firms and improve corporate governance. Finally, Obstfeld

(1994) show that international risk sharing through internationally integrated stock markets improves resource allocation and can accelerate the rate of growth. From the point of view of Greenwood and Jovanovic (1990); King and Levine (1993), a new stock exchange can increase economic growth by aggregating information about firms' prospects, thereby directing capital to investment with returns. These effects of a stock market opening result in a measured increase in productivity. Stock exchanges exist for the purpose of trading ownership rights in firms, and a new stock exchange may increase productivity growth for this reason as well. According to North (1991), the creation of a stock exchange can increase economic growth by lowering the costs of exchanging ownership rights in firms, an important part of some institutional stories of economic growth. Furthermore, Bencivenga and Smith (1992) state that a new stock market also can increase economic growth by reducing holdings of liquid assets and increasing the growth rate of physical capital, at least in the long run. In the shortrun, however, the equilibrium response of the capital stock to a new stock exchange can be negative because the opening of an exchange can increase households' wealth and raise their contemporaneous consumption enough to temporarily lower the growth rate of capital.

In principle, a well-developed stock market should increase saving and efficiently allocate capital to productive investments, which leads to an increase in the rate of economic growth. Stock markets contribute to the mobilisation of domestic savings by enhancing the set of financial instruments available to savers to diversify their portfolios. In doing so, they provide an important source of investment capital at relatively low cost (Dailami & Aktin, 1990). In a well-developed stock market share ownership provides individuals with a relatively liquid means of sharing risk when investing in promising projects. Stock markets help investors to cope with liquidity risk by allowing those who are hit by a liquidity shock to sell their shares to other investors who do not suffer from a liquidity shock. The result is that capital is not prematurely removed from firms to meet short-term liquidity needs. Moreover, stock markets play a key role in allocating capital to the corporate sector, which will have a real effect on the economy on aggregate. Debt finance is likely to be unavailable in many countries, particularly in developing countries, where bank loans may be limited to a selected group of companies and individual investors. This limitation can also reflect constraints in credit markets (Mirakhor & Villanueva, 1990) arising from the possibility that a bank's return from lending to a specific group of borrowers does not increase as the interest rate it charges to borrowers rises (Stiglitz & Weiss, 1981).

The arguments for stock market development were supported by various empirical studies, such as Levine and Zervos (1993); Atje and Jovanovic (1993); Levine and Zervos (1998). Although these studies emphasise the importance of stock market development in the growth process, they do not simultaneously examine banking sector development, stock market development, and economic growth in a unified framework. On the other hand Levine and Zervos (1993); Atje and Jovanovic (1993); Levine and Zervos (1998); Rousseau and Wachtel (2000) and Beck and Levine (2003) show that stock market development is strongly

correlated with growth rates of real GDP per capita. More importantly, they found that stock market liquidity and banking development both predict the future growth rate of the economy when they both enter the growth regression. They concluded that stock markets provide different services from those provided by banks. This is also consistent with the work by Levine and Zervos (1995) and the argument by Demirguc-Kunt (1994) that stock markets can give a big boost to economic development.

Stock exchanges are expected to accelerate economic growth by increasing liquidity of financial assets, making global risk diversification easier for investors, promoting wiser investment decisions by saving-surplus units based on available information, forcing corporate managers to work harder for shareholders' interests, and channeling more savings to corporations. In accordance with Levine (1991), and Benchivenga and Smith and Starr (1996) they emphasized the positive role of liquidity provided by stock exchanges on the size of new real asset investments through common stock financing. Investors are more easily persuaded to invest in common stocks, when there is little doubt on their marketability in stock exchanges. This, in turn, motivates corporations to go to public when they need more finance to invest in capital goods.

The study done by Levine and Zervos (1998), find a positive and significant correlation between stock market development and long run growth. Greenwood and Smith (1996) show that stock markets lower the cost of mobilizing savings, facilitating investments into the most productive technologies. Obstfeld (1994) shows that international risk sharing through internationally integrated stock markets improves resource allocation and accelerates growth. Bencivenga *et al.* (1996) and Levine (1991) have argued that stock market liquidity, the ability to trade equity easily, plays a key role in economic growth; although profitable investments require long run commitment to capital, savers prefer not to relinquish control of their savings for long periods. Liquid equity markets ease this tension by providing assets to savers that are easily liquidated at any time.

The one important study mentioned earlier is one by Levine and Zervos (1998) who are among the first to ask whether stock markets are merely burgeoning casinos or a key to economic growth and to examine this issue empirically, finding a positive and significant correlation between stock market development and long run growth. However, Levine and Zervos's use of a cross-sectional approach limits the potential robustness of their findings with respects to country specific effects and time related effects. The legal liberalization of the stock market increased the importance of the stock market. It does not only link the importance of the stock market to economic growth over time, but also interpret it in relationship to the universal banking system. In a frictionless Arrow-Debreu world there is no room for financial intermediation. Explaining the role played by stock markets or banks requires building in frictions such as informational or transaction costs into the theory. Different frictions motivate different types of financial contracts, markets and institutions.

Recent Empirical Evidence

Guryay et al (2007) empirically examines the relationship between financial development and economic growth. The study employed Ordinary Least Squares technique to show that there is insignificant positive effect of financial development on economic growth for Northern Cyprus. They posit that causality runs from growth to financial development without a feed back.

Mohammed and Sidiropoulos (2006) investigate the effect of financial development on economic performance in Sudan from 1970 to 2004. The study estimated the short-run and long-run relationship between financial development and economic growth and other conditioning variables on economic growth using the autoregressive distributed lag (ARDL) model to co- integration analysis by Pesaran and Smith (1995). Their empirical results indicate a weak relationship between financial development and economic growth in Sudan due to the inefficient allocation of resources by banks, the absence of an appropriate investment climate required to foster significant private investment in order to promote growth in the long run, and the poor quality of bank credit allocation.

Wadud (2005) examines the long-run causal relationship between financial development and economic growth for 3 South Asian countries namely India, Pakistan and Bangladesh. He disaggregated financial system into "bank-based" and "capital market based" categories. The study employed a cointegrated vector autoregressive model to assess the long-run relationship between financial development and economic growth. The empirical findings suggest that the results of error correction model indicate causality between financial development and economic growth but running from financial development to economic growth.

An overview of the West African stock market

The establishment of an organized financial market was provided for in the treaty of November 14, 1973 forming the West African Monetary Union (WAMU), initially made up of seven countries (Benin, Burkina-Faso, Ivory Coast, Mali, Niger, Senegal, and Togo). The Union recently expanded with the addition of an eighth member (Guinea Bissau). In 1991, monetary authorities began considering setting up a single, efficient financial market for all WAMU countries. Since economies in the West African Monetary Zone were opening up more and more, economic regulation mechanisms, particularly those used to indirectly manage currency and generate savings, had to be adopted. Furthermore, creating a common financial market for all countries in the WAMU sub-region seemed to be a good way to strengthen regional integration for developing trade among the member states. From then on, besides the various integration sites in the zone-insurance, social assistance and commercial law-the existence of a central bank (BCEAO), a common banking commission and now a financial market-including a common

securities exchange-seemed the best option without minimizing the symbolic aspect it gave to the project and the economies of scale. From that date on, many types of expertise were used, particularly that from France, the US, Canada and the World Bank, to conduct the project's design phase. Also, the Union's Council of Ministers decided in December 1993 to create a Regional Financial Exchange (BRVM: Bourse Regionale des Valeures Mobilieres) and so mandated the Central Bank of West African States (BCEAO) to conduct the project. The stock exchange creates a market place where companies can raise capital, often referred to as primary market. At this market shares are issued for the first time to the public; and shareholders can trade in shares of listed companies, that is, secondary market. At this market, shareholders buy and sell existing shares.

Market Indices

Market movements and trends in the West African regional stock market are depicted by two market indices namely the BRVM Composite, and BRVM 10. This information is made available on the BRVM's website in order to allow even foreign investors to have information on a real time basis.

- The BRVM COMPOSITE consists of all stocks admitted to trading.
- The BRVM 10 is composed of ten companies most active in the market

The formulation and the selection criteria for the BRVM COMPOSITE and BRVM 10 inspired by the main stock market indices in the world, especially in the index FCG, the International Financial Corporation, a company affiliated with the World Bank.

The formula takes into account the indices of market capitalization, the volume of transactions per session and frequency of transactions. In addition, only the shares are used for the calculation of indices.

Methodology

A brief outline of the traditional causality test (Viz), Granger causality (1969) and subsequent improvements, namely, Toda and Yamamoto (1995) version of Granger causality is presented below, followed by discussion of the principal variables employed.

Granger Causality Test

Traditionally Granger (1969) and subsequent improvements, namely, Toda and Yamamoto (1995) version of Granger causality is employed to test for the causal relationship between two variables. This test states that, if past values of a variable y significantly contribute to forecast the future value of another variable x then y is said to Granger cause x . Conversely, if past values of x statistically improve the prediction of y, then we can conclude that x Granger causes y.

The test is based on the following regressions:

$$y_t = \beta_0 + \sum_{k=1}^{M} \beta_k y_{t-k} + \sum_{l=1}^{N} \alpha_l x_{t-l} + u_t \quad (1)$$

$$x_t = \gamma_0 + \sum_{k=1}^{M} \delta_k x_{t-k} + \sum_{l=1}^{N} \gamma_l x_{t-l} + v_t, \quad (2)$$

where:

y_t and x_t are the two variables, u_t and v_t are mutually uncorrelated error terms, *t* denotes the time period and *'k'* and *'l'* are the number of lags. The null hypothesis is $\alpha_l = 0$ for all *l*'s and $\delta_k = 0$ for all *k*'s versus the alternative hypothesis that $\alpha_l \neq 0$ *l* and $\delta_k \neq 0$ for at least some *l*'s and *k*'s. If the coefficient α_l's are statistically significant but δ_k's are not, then *x* causes *y.* In the reverse case, *y* causes *x.* But if both α_l and δ_k are significant, then causality runs both ways.

The F-statistics are the Wald statistics:

$$F = \frac{(RSS_r - RSS_u)/l}{RSS_u/(T-2l-1)}, \quad (3)$$

where RSS_r is the restricted sum of squared-residual while RSS_u is the unrestricted sum of squared-residual, T is the number of observations; l is the lagged order and degree of freedom of the statistics is (*T-2l-1*). The joint hypothesis is $\beta_1 = \beta_2 = \ldots = \beta_l = 0$ for each equation. The null hypothesis is that *x* does not Granger-cause *y* in the first regression and that *y* does not Granger-cause *x* in the second regression.

Recent studies on time-series econometrics have highlighted several crux issues pertaining to Granger causality test. *First*, the direction of causality depends critically on the number of the lagged terms included. If the chosen lag length is smaller than the true lag length, the omission of relevant lags may cause bias. Conversely, the inclusion of extraneous lags in the equation may cause the estimates to be inefficient. In our model, we have used the Akaike and Schwarz information criterion (AIC / SIC) to fix the choice of lag length. *Secondly,* traditional Granger causality test is based on the assumption that the variables are stationary, or even if non-stationary must have the same order of integration. As observed by Toda and Phillips (1993), any causal inference in Granger jargon is questionable when there are stochastic trends and the F – test is not valid unless the variables in levels are co-integrated.

There are tests for co-integration and co-integrating ranks namely, error correction model (ECM) due to Engle and Granger (1987) and the vector auto-regression error correction model (VECM) due to Johansen and Jesulius (1990). Unfortunately, these tests are not easily comprehensible and requires fulfillment of the sufficient rank conditions based on trace and maximum eigen value test for co-integration.

Toda and Yamamoto Test

Toda and Yamamoto (1995) proposed an alternative causality test which can be applied "whether the VAR's may be stationary (around a deterministic trend), integrated of an arbitrary order, or co-integrated of an arbitrary order" (Toda and Yamamoto, 1995, pp. 227). The testing procedure is similar to Granger causality, but augmented with extra lags depending on the maximum order of integration of the series under consideration. It is essentially a two step procedure:

Step 1: To identify the maximum order of integration (d_{max}), we need to test for stationary of the series. The most popular and widely used test of stationary is the unit root test, also known as the "augmented" Dickey and Fuller (ADF, 1979) test.

This test involves estimating the following equation:

$$\Delta y = (\phi - 1) y_{t-1} + \sum_{j=1}^{k} \delta_j \Delta y_{t-j} + \varepsilon_t , \qquad (4)$$

where $\varepsilon_t \sim \text{WIN}(0, \sigma^2)$.

Test of unit root requires testing the null H_0: (ϕ-1) = 1, the series is non-stationary *versus* the alternative H_1: (ϕ) <1 under the assumption that ε_t is a Gaussian white noise. It involves carrying out the usual *t*- ratio of the estimate of ($\phi - 1$) to its standard error. But Dickey and Fuller (1979) have shown that this statistic does not have a Student's *t*- distribution under H_0, i.e., when the series is non-stationary.

The authors have computed critical values of the statistic on the basis of Monte Carlo simulations.

While the null hypothesis of a drift less random walk is appropriate for some series, many often contain a drift parameter and a linear trend. Then an appropriate test may be suggested by way of an extension of the testing methodology described above. Here we test for the significance of the coefficient ($\phi - 1$) associated with y_{t-1} in the following regression:

$$\Delta y = \beta_0 + \beta_1 t + (\phi - 1) y_{t-1} + \sum_{j=1}^{k} \delta_j \Delta y_{t-j} + \varepsilon_t , \qquad (5)$$

where β_0 is the drift parameter.

Step 2: We construct a vector autoregressive model (VAR) in their levels with a total of ($k + d_{max}$) lags, where *k* is the optimal number of lagged terms included which is determined by AIC / SIC criteria. Thus, if *k = 1* and if two series *t y* and *t x* have different orders of integration, viz., I (0) and I (1) respectively so that d_{max} =1, then one extra lag is added to each variable.

Thus a VAR with *2 lags* is constructed as follows

$$\begin{bmatrix} y_t \\ x_t \end{bmatrix} = \begin{bmatrix} \beta_{10} \\ \beta_{20} \end{bmatrix} + \begin{bmatrix} \beta_{11}^{(1)} \beta_{12}^{(1)} \\ \beta_{21}^{(1)} \beta_{22}^{(1)} \end{bmatrix} \begin{bmatrix} y_t \\ x_t \end{bmatrix} + \begin{bmatrix} \beta_{11}^{(2)} \beta_{12}^{(2)} \\ \beta_{21}^{(2)} \beta_{22}^{(2)} \end{bmatrix} \begin{bmatrix} y_{t-1} \\ x_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \qquad (6)$$

A Wald test (also called the modified Wald or MWALD) is carried out to determine the relationship between the two variables. The Wald statistic follows asymptotic χ^2 distribution, and can be applied even if y_t and x_t are I (0), I (1) or I (2), non-cointegrated and/or the stability and rank conditions are not satisfied, provided "…the order of integration of the process does not exceed the true lag length of the model…" (Toda & Yamamoto, 1995, pp. 225).

Data was obtained from different source. Market capitalization and total trade value was obtained from Brvm journal 2005-2006; the GDP was obtained from West African regional Stock Market various bulletin.

Empirical Result

As discussed in the earlier section, we first check whether the series under consideration are stationary or not. In the latter case, we also determine their order of integration. The results of Augmented Dickey Fuller (ADF, 1979) unit root test are depicted in Tables 1. The results suggest all variables, real market capitalization ratio (MCR), real value traded ratio (VTR) and real GDP growth rate (GDPGR) has a unit root, but the first difference of each is stationary. Thus the four variables in our model are not cointegrated and hence F-test in Granger causality may not be reliable in inferring leads and lags among such variables, with different orders of integration (Toda & Phillips, 1993).

Results for the Unit Root Test in First Difference

Table 1

	Augmented Dickey-Fuller			Phillips-Perron		
Variable	**ADF statistic**	**Critical Value**		**P-P Statistic**	**Critical Value**	
GDP	-4.9737	1%	-3.5814	-7.001	1%	-3.5778
		5%	-2.9271		5%	-2.9256
		10%	-2.6013		10%	-2.6005
MCR	-5.0178	1%	-3.5814	-7.0472	1%	-3.5778
		5%	-2.9271		5%	-2.9256
		10%	-2.6013		10%	-2.6005
TTV	-4.6462	1%	-3.5814	-6.6924	1%	-3.5778
		5%	-2.9271		5%	-2.9256
		10%	-2.6013		10%	-2.6005

Mckinnon (1991) critical values for rejection of hypothesis of a unit root

Given that the maximum order of integration ($d_{\max}$) equals 1, we next determine the number of lagged terms (*k*) to be included using AIC / SIC rule and find it to be 2. Finally, we construct a VAR in levels, similar to that depicted in (5) with a total of (k + $d_{\max}$) equaling 3 lags.

$$\begin{bmatrix} GDP \\ MCR \\ TTV \end{bmatrix} = B_0 + B_1 \begin{bmatrix} GDP_{t-1} \\ MCR_{t-1} \\ TTV_{t-1} \end{bmatrix} + B_2 \begin{bmatrix} GDP_{t-2} \\ MCR_{t-2} \\ TTV_{t-2} \end{bmatrix} + B_3 \begin{bmatrix} GDP_{t-3} \\ MCR_{t-3} \\ TTV_{t-3} \end{bmatrix} + E_t \text{, (7)}$$

where

B_o is the intercept vector and E is the vector of error terms. The above system of equations is estimated by seemingly unrelated regression (SUR) method. For example, if we want to test that *GDP* does not Granger-cause *MCR*, the null hypothesis will be H_0: $B_{11}^1 = B_{11}^2 = 0$, where B_{11}^i , i =1, 2, are the coefficients of *GDP* appearing in the first equation in (7). The results of the Toda-Yamato tests of Granger causality are in Table 2.

Result of Long Run Causality due to Toda-Yamamoto (1995) Procedure

Table 2

Null Hypothesis:	**MWALD Statistics**	**p-value**
Real GDP Growth(GDPGR) versus Market Capitalization Ratio(MCR)		
MCR does not Granger Cause GDP	4.82296**	0.01329
GDP does not Granger Cause MCR	1.94993	0.15557
Real GDP Growth(GDPGR) versus Value Traded Ratio(TTV)		
GDP does not Granger Cause TTV	2.12485	0.47842
TTV does not Granger Cause GDP	6.75402*	0.00023
Market Capitalization Ratio(MCR) versus Value Traded Ratio(VTR)		
TTV does not Granger Cause MCR	1.8796	0.12658
MCR does not Granger Cause TTV	5.7271*	0.00074

Note: Asterisk (*), (**), (***) denote statistically significant at 1%, 5% and 10% levels respectively.

The results in table 2 suggest unidirectional causality between economic growth proxied by GDP and stock market proxied by market capitalization and total trade value.

In the Toda-Yamamoto sense, the causality test suggests that stock market development proxied by market capitalization and total trade value causes economic growth without a feedback. These two outcomes suggest stock market development led "economic growth" in the West African monetary union. This empirical result validates Levine et al (1999) and Jung (1986) but fails to validate Waqabaca (2004) and Kar and Pentecost (2000).

Policy recommendations

The findings from this study raise some policy issues and recommendations, which will reinforce the link between the stock market and economic growth in West African monetary union.

Given that the stock market operate in a macroeconomic environment, it is therefore necessary that the environment must be an enabling one in order to realize its full potentials.

The demand for the services of the stock market is a derived demand. With the existence m of a positive relationship between stock market development and economic growth, it is pertinent to recommend that there should be sustained effort to stimulate productivity in both the public and private sectors.

The determination of stock prices should be deregulated. Market forces should be allowed to operate without any hindrance. Interference in security pricing is inimical to the growth of the market.

The stock market is known as a relatively cheap source of funds when compared to the money market and other sources. The cost of raising funds in the West African monetary union market is however, regarded to be very high. There should be a review downward, of the cost, so as to enhance its competitiveness and improve the attractiveness as a major source of raising funds.

Given the present political dispensation, all the tiers of government should be encouraged to fund their realistic developmental programmes through the stock market. This will serve as a leeway to freeing the resources that may be used in other sphere of the economy.

Conclusion

The empirical results suggest that financial sector development and economic growth is positively co-integrated indicating a stable long-run equilibrium relationship between stock market deepening and economic growth. The paper primarily revolved around two major questions: *first* whether at all any relationship exists between stock market development and economic growth and *secondly*, what could be the nature and direction of the causal relationship, if any i.e. does development of stock market promote economic growth or vice versa? To test this hypothesis, we employ the methodology of *Granger non-causality* proposed by Toda and Yamamoto (1995). In this study, the Brvm Index is used as a proxy for the West African stock market. The two important indicators for stock market development variables included in the study are real market capitalization

ratio and, total trade value. Real GDP growth rate is used as a proxy for economic development. The findings of the paper suggest that there is a unidirectional causality between stock market development and economic growth running from economic growth to financial development. This means that high but sustainable economic growth would lead to financial sector development. This suggests that financial sector development would lead to high but sustainable economic growth in West African monetary union. Therefore, the performance of financial intermediaries influences real sector development as well as real economic activity.

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