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What Drives Government Security Yields in Developing Countries? Evidence from the Countries in the West African Economic and Monetary Union (WAEMU)

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Abstract

The purpose of this study is to analyze the determinants of government security yields in relation to the recent development of WAEMU government securities market. The determinants are grouped into three categories of factors; namely macroeconomic factors, microstructure factors, and the external factors. The results show that economic growth rate, as well as countries capacity to effectively organize government securities issuances, are the main drivers of government securities yields. The policy implication of the study is that WAEMU countries should monitor their economic performance and implement structural reforms in order to maintain sustained economic growth.

Keywords: Sovereign Debt Market, Government Bond Yields, Fiscal Policy, WAEMU

1. Introduction

To finance their ambitious public investment projects in infrastructure, WAEMU member states have used extensively sovereign debt market by issuing government securities¹. In recent years, the regional securities market has become the main source of internal financing for WAEMU countries. In 2017, these countries raised 2 644 billion FCFA (approximately 4.5 billion USD).

Although they belong to the same Economic and Monetary Union, the government securities yields differ from one country to another. For instance, during the period of 2013-2014, the weighted average interest rate on a twelve months Treasury bonds varies from 4.477% (in Mali) to 6.084% (in Guinea-Bissau). This interest rate differential could mean that investors do not have the same perception of risk in all WAEMU countries. However, there seems to be some convergence in recent month as the cost of one-year government securities in the region fluctuate between 6% and 6.15% in the last quarter of 2018.

¹ In WAEMU, government securities are essentially composed of Treasury bills (bonds) with a maturity of at 0 to 24 months and bonds (obligations) with a maturity of more than 24 years.

Beyond investor's perception, several factors could impact government securities interest rates. Indeed, studies (Gale and Orszag, 2002, Engen and Hubbard, 2004; Edwards, 1986; Zigman and Cota, 2011) showed that the budget deficit, inflation, the degree of openness of the economy and global liquidity significantly determine government securities interest rate. Very few studies (Diouf and Boutin-Dufresne, 2012; Hitaj and Onder, 2013) focused on the determinants of government securities yields in WAEMU Countries. These studies highlighted the relationship that may exist between the yield and a number of macroeconomic variables. However, these authors fail to take into account the microstructure of the WAEMU securities market and the international financial environment in their analysis. In addition, these studies were completed when the government securities market was still at its embryonic stage. Since then a Regional Agency in Support of the Issuance and Management of Public Securities in the WAMU (Agence UMOA-titres²) was created. The agency has contributed to the development of the securities market by reducing transaction costs.

The purpose of this study is to analyze the determinants of government securities yields in relation to the recent development of WAEMU sovereign debt market. Specifically, the study seeks to answer the following questions. What are the macroeconomic variables that significantly influence government securities yields? Can the investors' perception explain the variations in the yield? Is there any relationship between the yield and the global economic environment, including global liquidity?

The rest of the study is organized according to the outline below. The next section goes over the determinant of government securities yields. Section III presents a description of the data and methodology used. Section IV analyses the empirical results. Finally, section V concludes the study with some policy recommendations.

2. WAEMU government security market

2.1 Institutional framework

WAEMU zone is currently composed of eight countries, including Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, and Togo. WAEMU treaty went into effect in 1996 to complete the economic and monetary integration and with the main objective being the macroeconomics and fiscal convergence of member countries. The treaty also aims to improve the competitiveness of its members by ensuring free movement of goods and services as well as factors production. Interestingly, the integration process of the region started with the West African Monetary Union (WAMU), which was established in 1962 after the independence of former French colonies in West Africa. The WAMU treaty which was modified in 1973 gave the Central Bank of West African countries (BCEAO) full authority to conduct monetary policy.

WAEMU countries share a common currency, named: *franc de la Communauté Financière Africaine (FCFA)*. The FCFA is pegged to the euro, which means the region adopt a fixed exchange regime. Currently, 1 Euro is equivalent to 655.96 FCFA. The framework to ensure the convertibility of FCFA into Euro is rather unusual. Based on UMOA treaty, the French treasury in charge of maintaining the fixed exchange between Euro and FCFA. In return, WAEMU countries must keep 50% of their foreign exchange reserves at the French treasury. The reserve is kept in an account and earn 0.75% interest. That means BCEAO doesn't directly intervene in the foreign exchange market to maintain the fixed exchange rate. The only time the FCFA was devaluated was in 1994 with the aim of increasing the UMOA competitiveness.

2.2 WAEMU government securities market

The WAEMU government securities market more precisely, the T-bills market was created in 1996 to create a condition for greater domestic or regional resources mobilization. The second objective for developing the market had to do with the open-market operation for a more effective monetary policy. However, the results were disappointing as the WAEMU countries were reluctant to use the market to raise the much need resources for their development. For instance, from 1996 to 2000, only 51,9 billion FCFA was raised in the securities market. The

² One of the missions of Agence UMOA-Titres is to not only provide assistance to member states in their financing operations on the financial markets, but also to assist them with the organization of securities issues on the local market under optimal conditions of safety and success for all market stakeholders.

poor performance of the market is because WAEMU countries continued to use the direct assistance from the BCEAO. Indeed, countries had the option of getting monetary advances (statutory advances) of up to 20% of their last year tax revenue from the central bank according to the criteria set in article 16 of the BCEAO Statutes. Countries found it convenient to raise fund using this type of financing than going through the hustle of issuing T-bills. From 264.7 billion FCFA in 1990, the statutory advances increased to 361.6 billion of FCFA in 1998.

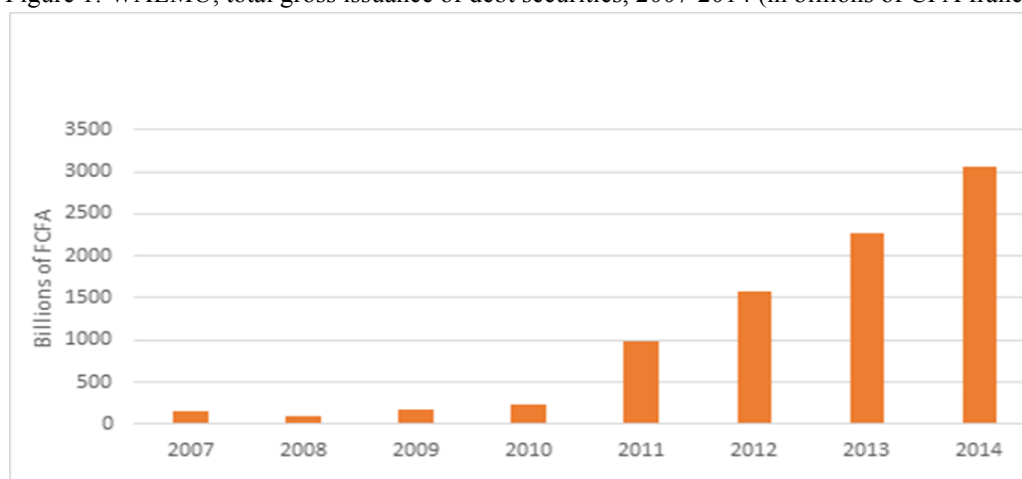
There is only one problem with statutory advances in that it is a source of money creation, and the central bank has limited control over it. For that reason, the Central Bank decided to phase out the use of statutory advances by 2001 and started a vast reform of the securities market in 1999. The objectives of this reform are threefold. First, the goal is to modernize the management of sovereign debt. Second, it aimed to create more investment opportunities to savers and investors in the region. Finally, it would allow the Central Bank to obtain a new avenue of conducting an effective monetary policy. The reform went to effect in July of 2001 and replaced the existing rules regulating the security market thus far. One of the major innovations in the new framework is the introduction of T-bills with a maturity of two years. Moreover, the minimum nominal amount has been reduced from 5 million to 1 million in the new regulation.

2.3 Recent development

The reform of 2001 was followed by the rapid growth of government securities in the regional market, as shown in figure 1. Between 2001 and 2014, issuances of government securities increased from 54.9 billion CFA francs to 3070.5 billion⁴. Over the first nine months of 2015, funds mobilized amount to 2087.0 billion CFA francs which is identical to the amount mobilized a year ago. As a result, and as shown in figure 2, the number of government securities issued by year increase substantially since 2010. This dynamism is due, firstly, to the abandonment of direct monetary assistance from the Central bank to the national treasuries of WAEMU countries, and secondly, the ambitious public investment programs that are underway in the region.

At the early stages⁵, issuance focused on long term government securities, namely 3-, 5-, 7-, and 10-year bonds. Since 2012 it was observed an increase in T-bills in the market with the most popular being the 6 months and 1-year T-bills. The issuance of long-term government (securities with a maturity of more than 2 years) also grew steadily since 2009. The longest maturity for a long-term government bond is 13 years, which was issued in March 2015 by Côte d'Ivoire. In total, from 2007 to 2014, 208 government bonds (all maturities combined) were issued of which more than a half were issued in 2013 and 2014.

Figure 1: WAEMU, total gross issuance of debt securities, 2007-2014 (in billions of CFA francs)



Note: The figure shows the volume of WAEMU countries government securities issuance by year from 2007 to 2014.

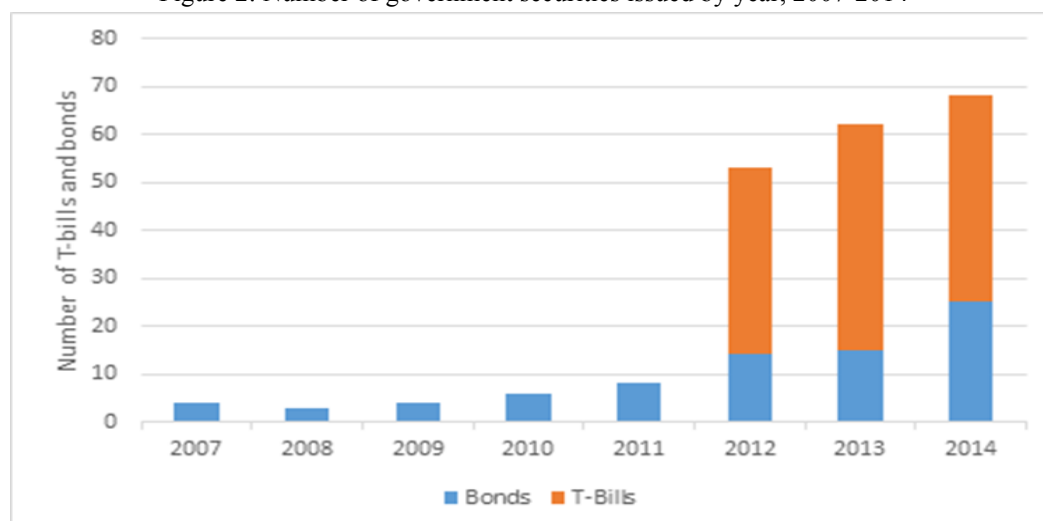
Source: Authors' calculations, based on data from Agence UMOA-Titres.

³ Amount of Treasury bills and Treasury bonds issued through auctions or syndications.

⁴ Source: Agence UMOA-titres

⁵ Prior to 2007, only four T-bills with a maturity of one year were issued in the region.

Figure 2: Number of government securities issued by year, 2007-2014



Note: The figure shows the number of WAEMU countries government securities issued by year from 2007 to 2014.

Source: Authors' calculations, based on data from Agence UMOA-titres

Table 1 shows a timeline for the introduction of different maturities from 2007 to 2015. The maturity of government securities in WAEMU varies from 3 months to 13 years. Some of the government securities (4 and 13 years' government bonds) are only issued once. Other government securities were introduced and then discontinued. For example, the 9 months T-bills were introduced in 2012, and they were phased out in 2014. Likewise, the 8 years' government bond was introduced and issued twice in 2014 and then discontinued.

One striking feature of the WAEMU government securities market is the irregularities of issuances. For instance, in Senegal, the one-year T-bills was issued 8 times in 2012, 3 times in 2013, and once in 2014. As a comparison, in the US, the one-year T-bills is issued every four weeks, on a Thursday.

Table 1: Issuance history by maturity

| Year | Maturity (years) | | | | | | | | | | | |
|------|------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| | 0.25 | 0.5 | 0.75 | 1 | 2 | 3 | 4 | 5 | 7 | 8 | 10 | 13 |
| 2007 | | | | | | | | | | | 27/06/07 | |
| 2008 | | | | | | | | | | | | |
| 2009 | | | | | | | | | 08/09/09 | | | |
| 2010 | | | | | | | | 24/02/10 | | | | |
| 2011 | | | | | | 08/12/11 | | | | | | |
| 2012 | 16/02/12 | 22/02/12 | 19/12/12 | 12/01/12 | 27/03/12 | | | | 17 | | | |
| 2013 | | | 6 | | | 18 | | 37 | | | | |
| 2014 | 13 | 30 | 12/06/14 | 67 | 26 | | 02/07/14 | | | 28/04/14 | 2 | 16/12/14 |
| 2015 | 20/01/15 | 05/03/15 | | 12/03/15 | 12/03/15 | 02/04/15 | | 03/03/15 | 18/03/15 | 15/05/14 | | 03/03/15 |

Note: The table illustrates the issuance history for the different maturities of WAEMU countries government securities. For each maturity, the first issuance date is in green. The last issuance date as of April 2, 2015, is in red. The number next to each arrow is the total number of issuance dates for the given maturity. The date in black are for securities issued only once.

Source: Authors' calculations, based on data from Agence UMOA-titres

3. The determinant of government securities yields

In this section, I present the factors that may influence government securities yields in WAEMU countries. Additionally, I highlight the expected nature of the relationship between these factors and the yields based on the literature and the specificities of the WAEMU government securities market. I group factors into three categories: mainly macroeconomics factors, market microstructure factors, and external factors.

3.1 Macroeconomic factors or country-specific factors

Risk, whether political or economic, affects investors' assessment of a country's ability to honor its commitments vis-à-vis its creditors. It is well established in the literature that investors always ask for a risk premium when facing uncertainty. I expect this rule to hold in the WAEMU area, and as a country risk increases, so does the government securities yields. Therefore, there is a positive relationship between country risk and yields.

Economic growth has long been a major determinant of government securities yields. In fact, the bond yield curve is widely used by forecasters to predict GDP growth, which means the former is a leading indicator of the latter. According to Harvey (1993), the current shape of the yield curve provides a good prediction of future economic growth. Some authors (Laubach, 2009; Pham, 2015) have tried to link potential GDP to bond yields. For instance, Laubach (2009) found that the best framework to analyze the relationship between potential GDP and sovereign bond yield is the Ramsey model of optimal growth. Pham (2015) using an empirical analysis for China's sovereign bond yield, found that potential GDP affect bonds yields negatively, whereas GDP growth rate affects it positively, albeit not statistically significant. For this study, I hypothesize that the economic growth rate has a negative effect on government securities yields.

Edwards (1986) and Zigman and Cota (2011), among others, showed that inflation and inflation expectations are a major determinant of government securities yields. Higher inflation must be compensated with high government securities yields. Just like for country risk, investors want to be rewarded for rising prices. Inflation expectations may arise out of fear that the Central Bank may monetize government debt, which then leads to a nominal increase in interest rates. I predict that inflation and government securities yields move in the same direction in the WAEMU area.

As noted by Gruber and Kamin (2012), there are many channels through which government fiscal position may increase bond yields. One important channel is the crowding-out effect where fiscal deficit may put pressure on governments to compete with the private sector for the limited financial resource to finance their deficit. Thus, the equilibrium interest rate will be higher; and therefore, discourage the private sector investment. In addition, an increase in government debt may increase interest rate since investors need to be compensated for accumulating more of the debt in their portfolio. Nonetheless, Gruber and Kamin (2012) observed in G-7 countries, in the past several decades, that an increase in government debt did increase bond yields. However, in these countries, as government debt increases, the bond yields have declined even after controlling for inflation. Perovic (2015) has even found, for 10 Central and Eastern European (CEE) countries during the period 2000–2013, a set of non-linearities in the debt-bond yields relationship. He found that the relationship between government debt and bond yields becomes positive only after a threshold debt to GDP ratio of approximately 30% is reached.

Given the above empirical evidence, it is clear that the relationship between government fiscal position and government securities yields is ambiguous. In total, it is difficult to predict the relationship between the two variables. It may be either positive or negative, depending on the structure of the economy in question.

3.2 Market Microstructure factors

The structure of the market for sovereign debt and its functioning play an important effect on bond yields. In their study, Abbas and Sobolev (2009) found that segmentation of the T-bill market between sophisticated financial market players (foreign-controlled banks) and a less-experienced group of investors (domestic pension funds and small banks) explains the volatility of T-bill yields in Tanzania. Additionally, for a panel of 6 West

European countries, Bias et al. (2004) have shown that irregularly issuing securities raises the yields government must pay. The reasoning they put forth for this result is as follows:

“When describing their issuance policies, Treasury agencies also emphasize the regularity of the amounts auctioned. Funds or banks, who buy Treasury bills, may indeed value this regularity. Of course, Treasury securities have short maturities, and investors interested in consistently allocating a fraction of their assets to bills must regularly purchase new securities. When there is a steady flow of issues, investors participate consistently in Treasury auctions, to meet the objectives of their asset allocation policies. If in contrast, the flow of issues is erratic, investors can't rely on it to consistently fit their portfolio allocation strategy. This reduces the attractiveness of the security.” (Bias et al., 2004)

As shown in table 1, WAEMU countries government securities issuances do not follow clear calendar pattern. As a result, I anticipate that this phenomenon may increase bond yields in WAEMU countries. More precisely, the regularity of government securities issuance may lower their yields.

Another market microstructure variable that affects government securities yields is the bid-to-cover ratio. By definition, the bid-to-cover ratio is a ratio that compares the number of bids received in a Treasury security auction to the number of bids accepted. Usually, a higher ratio means a stronger demand for particular government security, which will increase the price of that security and reduce its yield. For example, Forest (2017) has shown that an increase in bid-to-cover ratio reduces U.S. Treasury interest rates during the 1990s. Likewise, Beetsma et al. (2013) have found for a sample of European countries a negative relationship between bid-to-cover ratio and bond yields. I expect this relationship between bid-to-cover ratio and bond yields to hold also in the WAEMU government securities market.

Up until recently, WAEMU treasuries agencies could borrow, in the securities market, more than the amount they announced. This happens when the bid-to-cover ratio is high, which means higher demand for the securities. As a result, countries in WAEMU tend to cover all the bids or at least go over the amount they previously announced due to higher demand. One consequence of this behavior is that yields tend to be higher when countries issued more amount of security than they previously announced.

3.3 External factors

External factors variables affect WAEMU countries uniformly. I include two external factors, namely regional and global excess liquidity⁶. Theoretically, excess liquidity affects negatively government bond yields. That is the bond price tends to increase with excess liquidity. Most empirical studies dealing with liquidity and bond yields focus more on liquidity risk rather than excess liquidity. One exception is Matsumoto (2011), who studied the impact of global liquidity on bond yields in Latin America countries. He found that an increase in global liquidity is associated with low bond yields.

Hitaj and Onder (2013) in their study, used the ratio of bank reserves to GDP as a proxy for liquidity and found that it is negatively related to government security yields in WAEMU countries. Sy (2010) has noted, excess liquidity in the banking systems has helped the development and sustainability of the WAEMU government securities market. Indeed, regional commercial banks and institutional investors are the largest buyers of WAEMU debt security. In this study, liquidity in the WAEMU banking sector is used as a measure of excess liquidity in the region. I hypothesize, as the theory suggests, that excess liquidity negatively influences securities yields in the WAEMU. Global liquidity will have a similar effect albeit at a lesser degree since very few Eurobonds were issued in recent years.

In total, Table 1 summarizes the factors that determine the variability of government securities yields. It also shows the expected relationship between these factors and government securities yields in the WAEMU countries.

⁶ Liquidity is defined as the availability of funds in the economy.

Table 1: Summary of exogenous variables and relationship with the dependent variable

| Macroeconomic factors or country-specific factors | Microstructure factors | External factors |
|---|---|--|
| Perception of risk (+) Inflation (+) Fiscal balance (+/-) Domestic debt (+/-) Debt service (+/-) Growth rate (-) | Ecart (-) Bid-to-cover ratio (-) Regularity (-) | WAEMU liquidity (-) World liquidity (-) |

Note: The positive (+) and negative (-) represent the expected relationship between the dependent and independent variables.

4. Data and methodology

4.1 Data and sources

The data used in this article covers the period between 2007 and 2015 and came from several sources. Data on the government securities yields are provided by the Agence UMOA-titres. Table 2 shows the summary statistics of the dependent variable by country.

Additionally, Agence UMOA-titres provided the data which served to compute the difference between the auction announcement amounts and the amounts of securities issued (ECART), the bid-to-cover ratio (TXCOUV), and the regularity of the amounts issued (REG). TXCOUV is computed by taking the ratio of the value of bids received to the value of bids accepted. As for the REG variable, it is computed based on the standard deviation of the amounts issued during the sample period, normalized by the average amount issued. REG is calculated for each country, for each year, and for each maturity bucket.

Table 2: Summary Statistics of the dependent variable (YIELD) by country

| | Benin | Burkina | Cote d'Ivoire | Guinea-Bissau | Mali | Niger | Senegal | Togo |
|-----------------|-------|---------|---------------|---------------|-------|-------|---------|-------|
| Mean | 5.662 | 4.883 | 6.022 | 6.145 | 5.243 | 5.381 | 6.505 | 5.857 |
| Median | 5.650 | 4.250 | 5.960 | 6.145 | 5.031 | 5.019 | 6.398 | 5.637 |
| Max | 6.918 | 6.605 | 7.601 | 6.210 | 6.721 | 6.496 | 9.882 | 8.205 |
| Min | 4.710 | 3.840 | 3.021 | 6.080 | 4.170 | 4.410 | 4.915 | 4.560 |
| St. Dev. | 0.631 | 1.079 | 0.836 | 0.092 | 0.610 | 0.761 | 1.133 | 1.047 |
| Obs | 37 | 23 | 45 | 2 | 32 | 14 | 50 | 27 |

The data on the following variables: inflation rate, the ratio of the basic fiscal balance to nominal GDP, the ratio of household debt to nominal GDP, the ratio of debt service to nominal GDP and real growth rates come from the EDEN database. In addition, data on banking sector excess liquidity are from the monetary analysis department at BCEAO.

The definition used for country risk is that of the Organization for Economic Cooperation and Development (OECD). According to this definition, country risk consists of risk of transfer and convertibility risk (that is to say, the risk that a government imposes controls on capital movements or currency that prevent an entity to convert local currency into foreign currency and/or transfer funds to creditors outside the country) in case of emergency (eg, war, expropriation, revolution, civil unrest, floods). Thus, data on this variable were obtained from the OECD. Regarding the global liquidity variable, the definition used in this study is that of the Bank for International Settlements (BIS). The data for this variable is from the BIS database.

4.2 Model and estimation

In the literature, several methodologies are used to analyze the determinants of government securities yields. Generally, studies conducted in rich and emerging countries use the yield spread as the dependent variable. Yield

spread measures the difference between the yield of government securities of a country relative to that of a reference country (US or Germany) or the average for a group of countries (Alexopoulou et al., 2009). Another approach is to use directly the government securities yields as the dependent variable (Hitaj and Onder, 2013). In both approaches, the dependent variable is a function of key domestic variables (macroeconomic and fiscal). In this study, the model used by Hitaj and Onder (2013) is extended to incorporate government securities market microstructure factors as well as variables common to all WAEMU countries. Thus, the generic function will be:

$$YIELD = f(X, Y, Z) + \text{Error term} \quad (1)$$

Where YIELD is the interest rate on the government securities, X, Y, and Z are matrices, which contain the fundamental domestic variables, market microstructure variables, and common factors to all WAEMU countries respectively. Specifically, the X matrix is composed of the variable that measures investor perceptions (RISK) and macroeconomic and fiscal variables, including the rate of inflation (INFL), the ratio of fiscal balance to nominal GDP (FISCBAL), the ratio of domestic debt to nominal GDP (DOMDEBT), the ratio of debt service to nominal GDP (INTDEBT) and the real growth rate (GPIB). Matrix Y includes security market microstructure variables. These variables include the difference between the amounts tendered and the amounts served (ECART), bid-to-cover ratio (TXCOUV), and regularity of the amounts issued in the securities market (REG). Finally, matrix Z has two variables, namely excess reserves in WAEMU area (LIQUID) and global liquidity (WLIQUID).

Following Biais et al. (2004), the econometric equations to estimate are:

$$YIELD_i = \alpha + \sum_{j=1}^J \beta_j X_{ij} + \sum_{k=1}^7 \gamma_k 1_k + \theta * INSTR_i + \varepsilon_i \quad (2)$$

$$YIELD_i = \alpha + \delta * Risk_i + \rho * Infl_i + \tau * Intdebt_i + \sum_{j=1}^J \beta_j Y_{ij} + \sum_{k=1}^7 \gamma_k 1_k + \theta * INSTR_i + \varepsilon_i \quad (3)$$

$$YIELD_i = \alpha + \delta * Risk_i + \rho * Infl_i + \sum_{j=1}^J \beta_j Z_{ij} + \sum_{k=1}^7 \gamma_k 1_k + \theta * INSTR_i + \varepsilon_i \quad (4)$$

Where the indexes i and j denote, the observed data for each variable over the period 2007-2015 and the variables in the matrix X, Y, and Z respectively. 1_k are the countries dummies for the seven nations in the region which take the value of 1 for the country k and 0 everywhere else. The eighth country (Guinea-Bissau) was excluded to avoid perfect multicollinearity. These dummies variables allow to take into account the specificities of each country that are not captured by the explanatory variables. Finally, $INSTR_i$ is a dichotomous variable that takes the value 1 for the YIELD of a treasury bill and 0 if not (obligation note). $INSTR_i$ differentiates the average impact that these two types of instruments have on the yield. In addition, the variables $Risk_i$ and $Infl_i$ are added to equations 3 and 4 to control respectively for the effect of investors perception and price levels on the yield.

All three econometrics equations (2, 3, and 4) were estimated using Fixed Effects (FE) regressions methods. More precisely, Least Square Dummy Variable (LSDV) models were utilized instead of the “within” estimations. Indeed, LSDV estimations require dummies variables whereas for the “within” estimations do not. Although both estimations techniques yield the same results, the LSDV estimations are widely used in relation to their ease of estimation and interpretation of the coefficients.

5. Empirical results

Table 1 shows the estimation results of macroeconomic variables on the yield. In accordance with economic theory, inflation acts positively on the government securities yields. Indeed, in all the models that were estimated, the coefficient of inflation is positive and significant at the 5% level of significance. In other words, investors take into account the level of inflation when investing in government securities. In this regard, the BCEAO should continue its inflation targeting policy at around 2% to 3% in order to reduce the government securities yields in the region.

The perception of country risk also impacts positively the government securities yields in WAEMU area. This result corroborates the predictions of the theory, which states that investors demand higher interest rates in the

presence of uncertainties related to the ability of a state to honor its commitments. This result also suggests that WAEMU countries should take appropriate measures to remove all ambiguities over their solvency.

On the other hand, the fiscal variables, including the public deficit, domestic debt, and debt service, have the expected signs but are not statistically significant. In addition, the coefficients associated with these variables are very low. In other words, the interest rates on government securities are not influenced by budgetary performance. These results confirm those obtained by Hitaj and Onder (2013). However, the ratio of debt service becomes negative and significant when the regularity of issuances is taken into account. This result means that investors take into account the regularity of government securities issuance in their assessment of fiscal variables, including debt service.

Table I: The results of macroeconomic variables

| | Model I | Model II | Model III | Model IV | Model V |
|-------------------------|-----------------------|-----------------------|-----------------------|------------------------|------------------------|
| CONST | 3.85*** (3.085) | 3.80*** (2.984) | 3.80*** (3.006) | 3.87*** (3.077) | 3.87*** (3.116) |
| RISK | 0.350** (1.894) | 0.347* (1.858) | 0.344* (1.863) | 0.371** (2.026) | 0.339** (1.851) |
| INFL | 0.076** (2.313) | 0.076** (2.303) | 0.08** (2.336) | 0.078*** (2.403) | 0.080** (2.450) |
| FISCBAL | | 0.000 (0.376) | | | |
| DOMDEBT | | | 0.01 (0.657) | | |
| INTDEBT | | | | 0.195 (1.311) | |
| GPIB | | | | | -0.001** (-2.015) |
| INSTR | -1.35*** (-13.780) | -1.35*** (-13.750) | -1.36*** (-13.815) | -1.357*** (-13.834) | -1.368*** (-13.843) |
| BEN | -0.46*** (-3.705) | -0.4*** (-1.891) | -0.37*** (-1.647) | -0.614*** (-2.390) | -0.412*** (-2.578) |
| BUR | -1.46*** (-8.715) | -1.4*** (-5.811) | -1.37*** (-5.556) | -1.626*** (-5.930) | -1.405*** (-7.087) |
| RCI | -0.99*** (-6.016) | -0.93*** (-3.741) | -0.9*** (-3.614) | -1.161*** (-4.232) | -0.937*** (-4.920) |
| MAL | -1.07*** (-7.429) | -0.83 (-3.836) | -0.8*** (-3.583) | -1.061*** (-4.206) | -0.817*** (-5.050) |
| NIG | -0.08*** (-8.896) | -1.01*** (-4.876) | -0.97*** (-4.382) | -1.235*** (-4.781) | -1.009*** (-6.393) |
| SEN | -0.89 (-0.376) | -0.03 (-0.097) | 0 (0.000) | -0.234 (-0.732) | -0.042 (-0.170) |
| TOG | -0.87*** (-6.021) | -0.81*** (-3.661) | -0.78*** (-3.332) | -1.04*** (-3.926) | -0.82*** (-4.605) |
| Adjusted R ² | 61.29% | 61.15% | 61.18 | 61.32 | 61.36% |
| Obs | 229 | 229 | 229 | 229 | 229 |

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T-statistics in parentheses (***) significant at 1%; (**) significant at 5%; (*) significant at de 10%.

The results of fiscal variables can be explained by the negative relationship between the yields and the real GDP growth rate. Indeed, the coefficient for this variable is negative and significant, although relatively small. This result means that investors are more concerned about the overall dynamics of the economy than the public deficit and domestic debt. The reason is that countries with high rates of economic growth would be able to honor its commitments vis-à-vis its creditors.

Table 2 shows the results of the impact of microstructure variables on the yields. The coefficient of ECART has the expected sign. Thus, the government securities yields are low when differences between the announcement amounts and the amounts issued gets smaller. In other words, countries that issued the amounts, they previously announced benefit from relatively low yields.

The bid-to-cover ratio negatively impacts the government securities yields. Hence, an increase in investor participation in Issuances has the effect of reducing the borrowing rate on the regional market. This result calls on WAEMU countries to maintain investor confidence through sound public finances management and rigorous macroeconomic policies in order to create the conditions for a massive participation of investors in the government securities market.

Regarding the coefficient of the regularity, it is negative and significant. In other words, erratic issuance of government securities raises the yield, on the other hand smoothing the flow of Issuances reduced it. The same result was obtained by Bias et al. (2004) on the government bond market in the Eurozone. It would be appropriate that WAEMU countries take steps to ensure the regularity of tendered amounts. In this regard, countries should develop and disseminate issuance calendars of government securities with amounts programmed to allow investors to better plan their investments. Moreover, countries must impose rigor and discipline regarding the calendar that they choose to develop⁷.

Table II: Results of the variables related to the microstructure

| | Model VI | Model VII | Model VIII | Model IX |
|---------|-----------------------|------------------------|------------------------|------------------------|
| CONST | 3.36** (2.505) | 3.80*** (3.262) | 3.56*** (3.067) | 4.18*** (3.460) |
| RISK | 0.551*** (-3.313) | 0.542*** (3.347) | 0.530*** (3.180) | 0.331* (1.849) |
| INFL | 0.128*** (5.276) | 0.127*** (5.277) | 0.125*** (5.244) | 0.078** (2.337) |
| ECART | -0.076*** (-3.261) | -0.074*** (-3.214) | -0.071*** (-2.968) | |
| TXCOUV | | | | -0.24*** (-3.261) |
| REG | | | -0.182** (-1.753) | |
| INTDEBT | | -0.425** (-1.807) | | |
| INSTR | -1.46*** (-12.697) | -1.445*** (-12.448) | -1.460*** (-13.129) | -1.272*** (-13.017) |
| BEN | -0.538*** | -0.976*** | -0.670*** | -0.380** |

⁷. One of the goals of Agence UMOA-titres is to help WAEMU countries to achieve this objective.

| | | | | |
|-------------|------------------------|-----------------------|------------------------|-----------------------|
| | (-4.568) | (-3.530) | (-4.595) | (-2.415) |
| BUR | -1.789*** (-10.261) | -2.217*** (-7.654) | -1.857*** (-11.084) | -1.368*** (-7.084) |
| RCI | -1.114*** (-8.592) | -1.546*** (-5.923) | -1.191*** (-8.554) | -0.981*** (-5.220) |
| MAL | -1.135*** (-11.314) | -1.557*** (-6.450) | -1.223*** (-10.815) | -0.883*** (-7.886) |
| NIG | -1.246*** (-10.968) | -1.626*** (-7.548) | -1.325*** (-11.164) | -0.974*** (-6.274) |
| SEN | -0.199 (-1.216) | -0.633** (-2.104) | -0.320** (-1.833) | -0.030 (-0.125) |
| TOG | -1.19*** (-9.000) | -1.6*** (-6.768) | -1.27*** (-9.444) | -0.834*** (-4.862) |
| Adjusted R2 | 75.00% | 75.20% | 75.42% | 62.21% |
| Obs | 229 | 229 | 162 | 229 |

T-statistics in parentheses (***) significant at 1%; (**) significant at 5%; (*) significant at de 10%.

Table 3, which summarizes the impact of external factors on the Yield, shows that contrary to the predictions of the theory, the variable liquidity in the WAEMU positively affects the yield of government securities. Several factors could explain this result. Indeed, some Member States tend to incur debt beyond the needs expressed through the amounts they might have chosen to issue. In addition, countries that come on the market for government securities from time to time without meeting their own emission calendars, manage to raise funds due to excess liquidity of investors. However, these investors demand higher interest rates in conjunction with the disruption that this may have on their own investment planning.

Table III: Results of the external factors variables

| | Model XI | Model XII |
|---------|------------------------|------------------------|
| CONST | -4.95 (-1.575) | 7.82 (2.815) |
| RISK | 0.376** (2.088) | 0.365** (1.987) |
| INFL | 0.089*** (2.901) | 0.083*** (2.598) |
| LIQUID | 0.659*** (3.103) | |
| WLIQUID | | -0.454 (-1.530) |
| INSTR | -1.425*** (-14.018) | -1.378*** (-14.367) |
| BEN | -0.451*** (-3.674) | -0.488*** (-4.243) |
| BUR | -1.466*** (-8.767) | -1.501*** (-9.268) |
| RCI | -0.709*** (-3.917) | -1.056*** (-6.314) |
| MAL | -0.862*** | -0.922*** |

| | | |
|-------------|-----------------------|-----------------------|
| | (-7.192) | (-8.006) |
| NIG | -1.057*** (-8.490) | -1.111*** (-9.649) |
| SEN | 0.078 (0.348) | -0.101 (-0.475) |
| TOG | -0.9*** (-6.440) | -0.91*** (-6.732) |
| Adjusted R2 | 62.75% | 61.55% |
| Obs | 229 | 229 |

T-statistics in parentheses (***) significant at 1%; (**) significant at 5%; (*) significant at de 10%

The coefficient of global liquidity variable has the expected sign but is not significant. This result could be explained by the relatively low presence of foreign investors on the government securities market in the region. However, it should be noted that some WAEMU countries, including Côte d'Ivoire and Senegal, are gradually opening up to foreign investors through the issuance of Eurobonds. Other WAEMU countries plan to follow suit, and eventually, global liquidity is expected to play a decisive role on government securities yields in the region.

6. Conclusion and recommendations

WEAMU countries have come a long way since the reform of 2001, which established the regional government securities market. Recently, this market has experienced an exponential growth both in volume and issuance of government securities. Yields associated with these securities vary vastly across countries even though they belong to the same monetary Union.

In order to identify the main drivers of government securities yields, this study uses econometric models to analyze a number of relevant variables choosing on the basis of theory and empirical literature. The results show that government securities yields are positively impacted by inflation and country risk. However, growth rate, bid-to-cover ratio, the regularity of issuance, and the differences between the announcement amounts and the amounts issued impact the yields negatively. Overall, the study showed that government securities yields depend on countries economic growth, as well as their organizational capacity of effectively managing the issuance of government securities.

In this context, WAEMU countries should monitor their economic performance and implement structural reforms in order to maintain sustained growth. In addition, WAEMU countries are invited to disseminate quality data on their macroeconomic and fiscal conditions. Finally, WAEMU should improve their organizational skills in the emission of government securities. In this regard, they should implement strategies to enable them to ensure a regular presence in the government securities market.

Overall, it should be noted that the creation of WAMU-Securities Agency has allowed to take into account the recommendation related to the dissemination of quality data on the macroeconomic condition as well as the improving organizational capacity in the issuance of government securities. To consolidate this achievement, WAEMU countries should rely more on WAMU-Securities Agency to strengthen its implementation of these recommendations.

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