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Original Sin and the CFA Franc – A case study of the West African Economic and Monetary Union

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Abstract

This paper investigates Original Sin in the West African Economic and Monetary Union in the framework of regional integration and cooperation initiatives. The phenomenon describes the inability of countries to borrow in their currency. The central hypothesis is that smaller South-South Coordination schemes do not possess the necessary magnitude to overcome Original Sin. The paper first substantiates the existence of Original Sin in West Africa. It then examines the influence of economic, fiscal, and monetary factors on the time variance of Original Sin in the region using a Tobit model. The results delivered mixed outcomes but confirm Original Sin's negative correlation with country size. The results uphold the hypothesis that financial and monetary integration and cooperation alone are not a panacea for Original Sin.

Keywords: Original Sin, WAEMU, CFA Franc, Tobit

JEL Codes: C33, C34, F3, F4, F6

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1. Introduction

At the end of 2019, Ivorian President Alassane Ouattara and French President Emanuel Macron jointly announced a new currency for francophone West Africa: the Eco. It should replace the CFA Franc, a currency circulating for almost 75 years since its creation in 1945. The impacted countries comprise the West African Economic and Monetary Union (WAEMU), encompassing eight countries, namely Benin, Burkina Faso, Guinea-Bissau, Ivory Coast, Mali, Niger, Senegal, and Togo (Pilling 2020).

The disputed CFA Franc caught broad international attention in 2017 when Beninese activist Kémi Seba publicly set a CFA 5000 note on fire (Chutel 2017). Critics long censured the CFA, denouncing it as an archaic colonial construct, and demanded the introduction of a new currency. Following the recent announcement, detractors quickly accused the Eco of being a masked CFA and a French effort to hijack the Economic Community of Western African States' (ECOWAS) plan to introduce a common currency. Criticism was not unexpected since the CFA Franc is also blamed for the region's sluggish growth and development. Contrastingly, advocates of the CFA Franc praise it for its offering of enduring economic and financial stability, such as persistently low inflation rates, effectively leading to political stability. From that perspective, the proponents argue that the Eco is a rational successor, relieved of its colonial burden. The discussion is heated and fueled by anger about colonial antecedents. On the other hand, it is a political intermezzo and a playing field for economic schools of thought arguing for and against monetary independence. Lastly, it is also a debate about the long-lasting ligatures between France, Francophone West Africa, and its governing bodies (McBain and Dietz 2020).

This paper will focus on the economic impact of the West African CFA Franc and looks at it as a combination of a South-South (SSC) and North-South Cooperation (NSC) as proposed by Fritz and Metzger (2006) and Metzger (2008). This monetary coordination perspective bases its roots on contemporary economic discussions that countries should cooperate to overcome systemic drawbacks. Original Sin (OS) explains the need for economic cooperation by describing the limited ability of most countries to raise debt in their own currency (Eichengreen et al. 2002).

1.1. Motivation

Panizza (2006, p. 34), one of the originators of OS theory, argued that smaller cooperation and integration initiatives, such as the CFA, would not have the requisite size to overcome OS. Unfortunately, to the author's knowledge, no comprehensive data analysis for the CFA countries has been published. This may be because consistent data for the region is challenging to obtain, which makes analysis difficult, an issue that also accompanied this paper in the whole process of its creation. Therefore, Panizza's conjecture was never falsified nor verified for the case of the CFA, although there is evidence that this presumption might be generally true (Fritz and Mühlich 2009, p. 9). Nevertheless, this work thus should function as an introductory approach to the OS framework in the West African CFA zone and can ideally incentivize further research on the subject in the region and promote the publication of further data.

The underlying research question is thus two-sided. First, are Panizza's assumption and the empirical evidence from other regions valid in CFA economies, and are they unable to escape OS? Second, if the first assumption is sound, which influences impact the development of OS in the region? The second question persists inversely even if Panizza's assumption is proven wrong. Consequently, the question reformulates to which factors cause the phenomenon to be absent?

1.2. Structure of the paper

The paper is divided into two main parts. The first establishes the work's theoretical framework and introduces OS, the focal theory of this working paper. As a thematic introduction, chapter 2 establishes regional integration and cooperation definitions. Subsequently, Eichengreen et al.'s (2002) OS theory is presented in chapter 2.1 and placed within the theory of monetary coordination. This part culminates with chapter 2.1.2 and the presentation of *OSIN* indicators in financial centers and major emerging economies. In order to derive the paper's case, an econometric model using Tobit regression follows Eichengreen et al.'s (2002) approach. Chapter 3 contains an empirical synopsis, encompassing a methodological introduction to the analysis. In chapter 4, a case study elaborates on the specificities of the WAEMU in light of the explored theory. Chapter 4.1 introduces the WAEMU, sketches the political history of the West African Franc, and presents numerical details about the region. The passage ends by presenting the region's OS indicators in chapter 4.2. Subsequently, the selection of indicators (chapter 4.3) delineates the variables for analysis, their origins, and the data treatment. Chapter 4.4 presents the results and is divided into subchapters according to the

identified general economic indicators in chapter 4.4.1 and fiscal and monetary variables in chapter 4.4.2. This sub-chapter closes with a discussion of the findings and limitations in chapter 4.5. Chapter 5 concludes.

2. Theoretical framework

Integration is a widely used notion often referred to without being explicitly defined. Recent approaches try to go beyond the relatively narrow perspective of integration solely determined by national state-centric considerations and trade. Instead, they frame factors such as financial and monetary integration as equally important, attributing more weight to components like financial and monetary cooperation and development in the framework of regional integration and cooperation (Ekpo and Chuku 2017, pp. 4–5; Burfisher et al. 2004, pp. 6–7).[1]

2.1. Original Sin – The inherent need for regional integration

This chapter proposes a theoretical framework that breaks down the need for regional cooperation and integration to a central issue almost all developing economies face: the net debtor status.

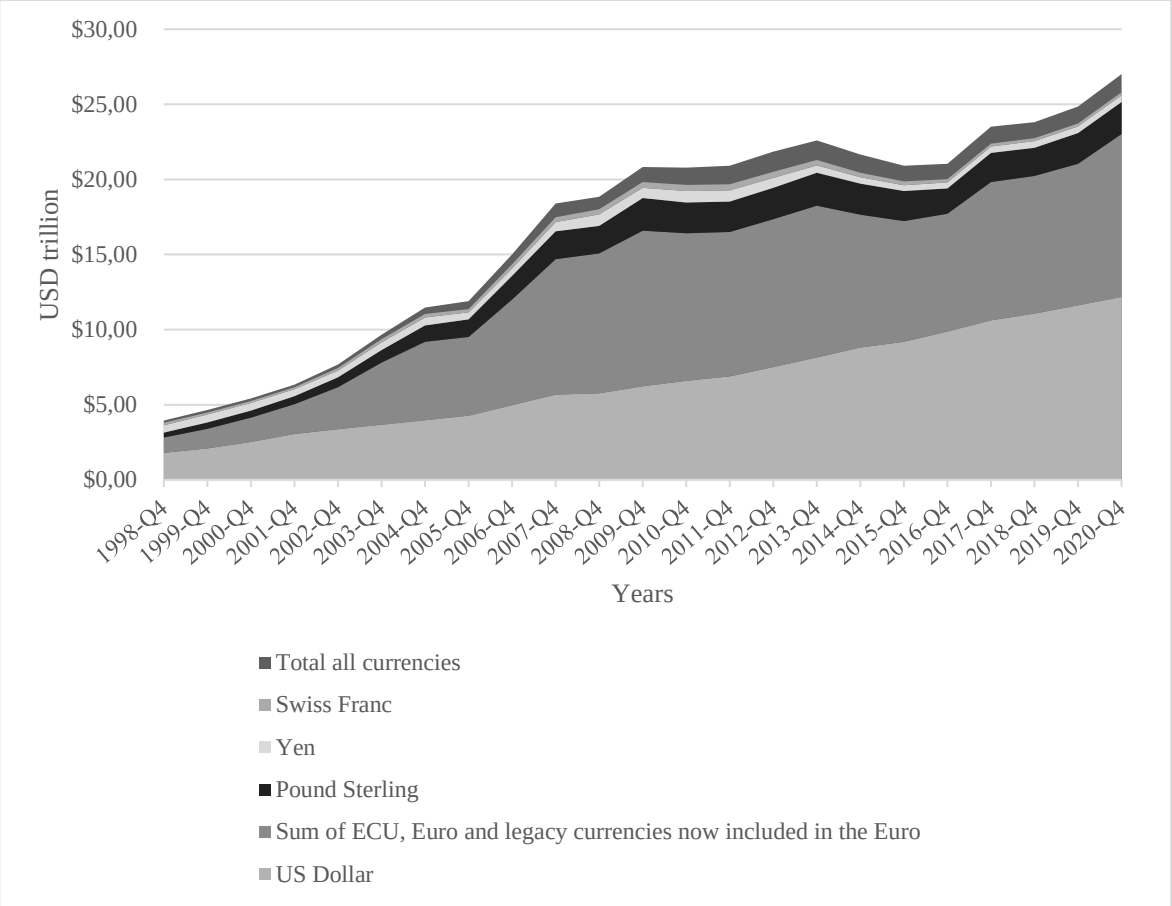
2.1.1. Rationale, momentousness, and causes

In the early 2000s, Eichengreen, Hausmann, and Panizza (2002, 2007) introduced the idea of Original Sin. The phenomenon describes the inability of countries to borrow in their own currency. Whilst developing their initial argument, they established a distinction between a domestic component, defined as: "*the difficulty they* [countries] *face when attempting to borrow at home at long maturities*" and an international component, following the definition of: "*the difficulty emerging markets face when attempting to borrow abroad in their own currencies*" (Eichengreen et al. 2007, pp. 122–123).

A slight foreshadowing of this phenomenon is painted by the outstanding stock of international debt securities by the currency of denomination, visible in Figure 1. This statistic shows the general distribution of currencies in international debt securities covered by the BIS debt securities database.

[1] For further information, see Söderbaum (2015) for a comprehensive overview, Burfisher et al. (2004) for an economically theoretical elaboration, and Väyrynen (2003) for a holistic introduction.

Figure 1: Outstanding international debt securities by currency of denomination



Source: Author's illustration based on the BIS (2021) debt securities database.

It is evident that the international debt security markets are primarily dominated by just a few currencies. However, to substantially analyze the situation, OS needed to be quantified. Thus, Eichengreen, Hausmann, and Panizza (2002, 2007) designed a parameter called *OSIN*. It exists in several variants, *OSIN1* to *OSIN3*. The range spreads from 0 to 1, and the higher the measure, the more abundant is OS. Described here are *OSIN1* and *OSIN3*. The author omits an explanation for *OSIN2* since it requires total securities, including loans, issued in a country's currency, for which reliable data is not attainable in many cases. For instance, the BIS, which provides the most frequented datasets, does not identify cross-border positions on a domestic currency level in its publicly available datasets, which would be needed for *OSIN2*.

OSIN3 covers hedging possibilities created by the issuance of debt by another country or institution in country i's currency. In this case, i denotes a country represented in the equation. Therefore, it can take on negative values as more securities in country i's currency could be issued than country i emitted. However, since one cannot hedge more than the

administered amount, the max ()-function locks the lower bound to 0. *OSIN3* includes an intermediate indicator $INDEXB_i$:

$$OSIN3_i = max(INDEXB_i, 0)$$

Where $INDEXB_i$ is defined as:

$$INDEXB_i = 1 - \frac{Securities\ in\ currency\ i}{Securities\ issued\ by\ country\ i}$$

The second used indicator, *OSIN1*, has a significant drawback: it only covers securities and no other forms of debt. Moreover, it does not include hedging possibilities. However, it is the first developed indicator and the simplest to apply to gain a comprehensive overview (Eichengreen et al. 2002, pp. 6–10, 2007, p. 133). Eichengreen et al. (2002) constructed it as follows:

$$OSIN1_i = 1 - \frac{Securities\ issued\ by\ country\ i\ in\ currency\ i}{Securities\ issued\ by\ country\ i}$$

Why does OS matter? Panizza (2006, pp. 29–30) explains that if a country accumulates net foreign debt (foreign debt exceeds local debt), the country may face a currency mismatch.[2] The mismatch makes economies prone to exchange rate swings, worsening their debt servicing ability, leading to adverse welfare effects. The consequences are, in the long run, detrimental to growth. A second phenomenon is ascribed to arise from the latter: The fear of floating, i.e., the situation in which a country chooses fixed rates over floating exchange rates to inter alia avoid the described drawbacks. Hence, the fear of floating is seen as the means to escape OS. However, giving up on volatile exchange rates renders a potent macroprudential tool unavailable and can have high costs, such as increased dependency. Therefore, it is not considered a sufficiently adequate solution from the OS perspective.[3] OS theory, thus, identifies net foreign debt as the key issue for emerging countries and their development (Fritz and Metzger 2006, p. 20).

What causes OS? Eichengreen et al. (2002, pp. 17–33) list several possible factors they empirically tested against countries in OS situations. Theory suggests that fragile or impaired institutional quality and lack of credibility are detrimental to the demand for currencies and bonds. However, the authors establish that economic development, qualitative institutions,

[2] Eichengreen et al. (2007, p. 122) define currency mismatches as: "*differences in the currencies in which assets and liabilities are denominated*".

[3] The issue here is also visible in the discussion about the two-corner hypothesis, which Eichengreen (1994, p. 64) described. It was argued that a decision must be made between free floats or rigid commitments in exchange rate regimes. Anything between or intermediate ought not to be beneficial.

and a lack of rule of law can only explain differences between countries but not the mere existence of OS. The same applies to the dearth of monetary credibility, which is considered a "necessary evil" for the redemption from OS but barely a sufficient raison d'être. Their findings suggest that only economic country size is a determining variable, having a strong negative correlation with OS. However, they acknowledge exceptional cases like Switzerland (Swiss Francs) and the UK (British Pounds). These exceptions do not suffer from OS, which might be attributed to historical developments and geographical advantages. Furthermore, they detected non-resident issuances in "exotic" currencies to be prevalent. The assumption is that markets estimate the currency and credit risks to be separated, making these financial certificates more attractive and viable to investors (Panizza 2006, pp. 30–32).

Where is the connection to regional integration? In light of OS identifying net foreign debt as the main problem for emerging countries, how does this connect to regional integration and cooperation? If a country's size is the determining factor, logic constitutes that its increase paves the way to redemption. However, this is easier said than done. Fritz and Metzger (2006) proffer two alternatives – North-South Coordination and South-South arrangements. According to the authors, SSCs exist when no key currency is involved in the cooperation initiative. Key currencies are those which dominate internationally. See Figure 1 for a sample of these currencies. Thus generally, the arrangements among developing economies are classified as SSCs, whereas joint arrangements between economies of the Global North and South denote NSCs (Fritz and Metzger 2006, pp. 3–4).

The latter might appear ideal for redemption from OS, though it is hardly an option for most countries in the Global South. Thus, an SSC is more feasible. They argue that SSCs can function: "*... as a multilateral policy-induced shield pre-empting mercantilist beggar-thy-neighbour-policies between member countries*" (Fritz and Metzger 2006, p. 10).

Nevertheless, the authors identify three framework-setting preconditions to function as such a shield. First, central banks need to commit to interventions if exchange rates deviate from agreed-upon face values. Second, short-term credits need to be assured as a means of financial support in the respective home currency. Third, consensus about the use of currencies in trade needs to prevail. Following the fulfillment of these conditions, it is argued that the result can be a deepened regional financial market (Fritz and Metzger 2006, p. 11).

2.1.2. Original Sin in financial centers and the BRICS states

Chapter 2.1.1 expounded on the theoretical foundation of OS. However, a practical approach to the subject is still missing at this point. Thus, this chapter presents *OSIN1* and *OSIN3* indicators for a snapshot of countries and periods. Table 1 and Table 2 scrutinize the OS indicators by the regions identified as major financial centers, thus the Euro area, the United States, Japan, Switzerland, and Great Britain. Furthermore, the indicators for the BRICS countries are presented.

Table 1: Average OSIN values for major financial centers and BRICS 2010-2015

Country/Region	OSIN1 (2010-2015)	OSIN3 (2010-2015)
Brazil	0.93	0.70
China	0.57	0.00
EURO Zone	0.28	0.00
India	0.99	0.85
Japan	0.61	0.00
Russia	0.96	0.77
South Africa	0.86	0.00
Switzerland	0.73	0.00
United Kingdom	0.62	0.38
United States	0.33	0.00

Source: Author's calculation based on BIS (2021) data.

Table 2: Average OSIN values for major financial centers and BRICS 2016-2020

Country/Region	OSIN1 (2016-2020)	OSIN3 (2016-2020)
Brazil	0.97	0.80
China	0.88	0.42
EURO Zone	0.31	0.00
India	0.93	0.68
Japan	0.84	0.00
Russia	0.97	0.86
South Africa	0.93	0.21
Switzerland	0.92	0.00
United Kingdom	0.63	0.38
United States	0.35	0.00

Source: Author's calculation based on BIS (2021) data.

Countries classified as major financial centers, Europe, Japan, Switzerland, the UK, and the US, face *OSIN3* indicators of zero or close to zero. Their *OSIN1* parameters, though, are significantly higher. The noteworthy differences between *OSIN3* and *OSIN1* are due to currency Eurobonds, i.e., debt in the respective currency issued elsewhere than in the domestic market, which the *OSIN1* calculation excludes. This circumstance underlines the significance of these currencies in world markets and the measurement difference in *OSIN1* and

OSIN3. In contrast, *OSIN3* and *OSIN1* indicators for other countries, like India, Russia, and South Africa, are notably higher. Moreover, for both *OSIN1* and *OSIN3* values, substantial jumps exist across the considered averages for economies like China and India.

The *OSIN* factors in Table 1 and Table 2 are based on the available BIS (2021) datasets for international debt securities (IDS) and calculated by an averaged value over the indicated period following Eichengreen et al.'s (2002) approach.

3. Methodology

The theoretical basis developed to this point explains why countries collaborate in or join larger economic units, setting the general framework of this paper. OS theory identifies the net debtor status as the inherent problem most developing economies face, corroborated by the presented *OSIN1* indicators. Analyzing the dynamics between OS and the WAEMU constitutes the quantitative part of the paper.

The model of Eichengreen et al. (2002) and Hausmann and Panizza (2003, p. 970) guides the empirical methodology. They primarily utilized a double-censored Tobit model, which can be understood through the mathematical conception of *OSIN*. When looking at the underlying data, one can assume that some form of time series or even panel data analysis is selected since the data is available in the format those methods require. Specifically, that means the data contains discrete time series data points in Eichengreen et al.'s (2002) case, the years examined, and the quarters of each period in this paper's case.

Moreover, cross-sectional data is available in both cases, i.e., *OSIN* values and the observed indicators for individual countries for each period. In combination, this composes a panel dataset. Furthermore, when looking at Eichengreen et al.'s (2002) and Hausmann and Panizza's (2003) initial datasets, an unbalanced set was prevalent, meaning that *OSIN* or independent variables were unavailable for individual countries for one or several points in time. The same issue exists for the author's dataset. The decision is to keep the unbalanced set to avoid losing the majority of observations. This approach means that the analysis can leverage the total capacity of a panel dataset.

The analysis itself will be conducted with the analytical statistics and econometrics tools STATA and Gretl. Microsoft Excel furnishes visual illustrations. Generally, the quantitative data originates from the databanks of the Bank for International Settlements (BIS, 2021), the World Bank (WB, 2021), the International Monetary Fund (IMF, 2021), and the Central Bank of West African States (BCEAO, 2021). The elaboration part of each respective

indicator specifies the exact origin of the data. Furthermore, the reader can consult all data tables in the appendix or retrieve them from the respective websites for further reference.

Why is the method of choice a Tobit model? *OSIN* yields several specificities that must be considered. First and foremost, the upper and lower values of 0 and 1 bound *OSIN* to frontiers. Thus, using a double-censored method is favorable (Wooldridge 2010, p. 517).[4] The Tobit model was initially developed to handle such censoring with lower or upper bounds, making other cross-sectional and panel regression models viable but not preferred (Amemiya 1984, pp. 3–6).[5] Therefore, concluding the considered factors, the model used will be a classical type 1 Tobit model according to the taxonomy of Amemiya (1984, pp. 29–33). Correspondingly, there is one latent variable, y_i. Therefore, Amemiya's (1984, p. 6) interpretation of a type 1 Tobit model is used to derive a function and its statistical properties, describing the observable variable y_i^*:

$$y_i^* = x_i\beta + u_i, \qquad u_i|x_i \sim N(0, \sigma^2)$$

In the formula, the subscript i generally stands for an observation in the sampled population, y_i^* represents the response variable, x_i the independent variable, β (beta) the coefficient, and u_i the stochastic error term assuming a normally weighted distribution reflected by $N(0, \sigma^2)$ (Amemiya 1984, p. 6).

Furthermore, the error term assumes homoskedastic residuals (Wooldridge 2013, p. 597). Therefore, it is imperative to test for heteroskedasticity and in panels and time series also for autocorrelation. Robust standard errors alone are prone to biased results when an indicator correlates with itself over time. Thus, if applicable, heteroskedasticity and autocorrelation consistent, short HAC, standard errors are used (Wooldridge 2013, p. 432). In Stata, this is taken care of by clustered robust standard errors. Moreover, the modified Wald and Wooldridge tests are conducted before every regression, checking for homoskedasticity and autocorrelation to verify the use of HAC standard errors.

Furthermore, McDonald and Moffitt (1980, p. 319) remark that the interpretation of the coefficient beta must not be the influence of x_i on the observable y_i^*. Primarily, this holds for linear regression models. Instead, they suggest interpreting it as:

[4] Amemiya (1984, p. 3) explains that censored refers to a statistical term meaning that: "*one can at least observe the exogenous variables*".
[5] Tobin developed the model initially in 1958 to analyze household expenditures on durable goods while taking into account that the analyzed expenditure cannot be zero (Amemiya 1984, pp. 3–5).

> "*(1) the change in y of those above the limit, weighted by the probability of being above the limit; and (2) the change in the probability of being above the limit, weighted by the expected value of y if above*" (McDonald and Moffitt 1980, pp. 318–319).

Secondly, to account for the bounded nature of *OSIN1*, y_i^* needs to be modified functionally. This is depicted below by the formerly discussed latent variable y_i, with the conditions that y_i has a lower bound of zero if y_i^* is zero or smaller than zero and an upper bound of one if y_i^* is one or greater than one:

$$y_i = \begin{cases} 0 & if \quad y_i^* \leq 0, \\ y_i^* & if \quad 0 < y_i^* < 1, \\ 1 & if \quad y_i^* \geq 1. \end{cases}$$

Having a classical regression analysis at hand, Tobit permits regressing against independent variables over a chosen period.[6] Consequently, the question of choice for independent variables (x_i) arises. The dependent, also called the response variable (y_i), is *OSIN1*.

When looking at Table 18, one realizes there is no actual censoring in the present panel. Although *OSIN1*, in theory, is bounded between zero and one, it is never the case in the dataset. The lowest value is 0.55 (GNB, 2019-Q4), and the highest is 0.97 (CIV, 2011-Q2). Therefore, standard ordinary least squares (OLS) regressions would deliver the same coefficients as a Tobit regression when run against the uncensored panel. However, the standard errors can vary (Wooldridge 2013, p. 610).

Furthermore, Hausmann and Panizza (2003, p. 969) explain that time-varying factors can explain the existence of *OSIN* only to a limited extent and state that OS is "*surprisingly persistent*". They underline this circumstance by referring to Flandreau and Sussman's (2004) study on the structure of historical bond markets. The countries that used to issue debt in local currency instead of gold are now amongst the countries possessing the lowest *OSIN* indicators. Once more, this corroborates that OS might be a historically grown and established phenomenon. Therefore, they only used time series analysis to control for reverse causalities. Hence, it dropped from their consideration as the primary method (Hausmann and Panizza 2003, pp. 969–970).

The same phenomenon seems to exist in the case of the WAEMU. Suppose one runs a standard OLS regression only containing country dummy variables. Doing so reveals that time-

[6] For more information and proofs on Tobit models, see Amemiya (1984) and Wooldridge (2010, Chapter 16).

invariant, country-specific factors represented by the dummies can explain almost 89% of the variance, which the R-squared value in Table 19 reflects. Therefore, the control for country-specific effects and the inclusion of country dummies in the model becomes necessary. This procedure delivers similar results to a fixed-effect model, which would automatically control for all time-invariant properties. The Hausman test, usually consulted to determine whether to use fixed or random models, corroborates this observation and decision (Wooldridge 2013, Chapter 14). Thus, before running each Tobit regression, the respective test is performed.

Note, however, that one country dummy variable must be omitted to avoid running into the phenomenon of a dummy variable trap, i.e., the situation in which a high correlation between two or more qualitative variables exists so that one variable can predict the values of the others. This situation is also called (multi)-collinearity. Guinea-Bissau's dummy was omitted in this case since the country is the smallest in the panel. Usually and thankfully, statistical software such as Stata automatically detects and takes care of these issues by excluding one dummy. The omission of a country dummy results in the inclusion of country individualistic effects in the intercept and coefficients of the other dummies. Therefore, they must be interpreted slightly differently than usual. Instead, Guinea-Bissau becomes a reference category, and other dummy coefficients and the intercept must be seen in proportion to Guinea-Bissau. That, however, is quasi-irrelevant since the focus and interest are on the beta coefficient, which remains unaffected by that change as long as there is control for the other country dummies (Wooldridge 2013, p. 236).

The work can only look at the development of *OSIN* in the last decade and the factors' influence on that development due to data limitations. Following Eichengreen et al.'s (2002) approach, the data is available as a panel. However, unlike Eichengreen et al. (2002), individual country observations are used to analyze time variance, which is controlled with the dummy country variables.

Why is this type of analysis utilized, even though time-variant factors can only explain OS' existence limitedly, according to the literature? First and most decisively, the dataset for analysis is, as stated before, limited, containing only four countries. Thus, a cross-sectional analysis would be relatively inefficient. Secondly, the presented *OSIN* indicators of the WAEMU have a magnitude of time variation of up to 0.1, a significant difference, making a time-series variation analysis compelling. Therefore, the analysis does not necessarily focus on the reasons for the mere existence of OS, which Eichengreen et al. (2002) were

already able to show, but on the factors influencing the development of *OSIN*. Hence, while there is little doubt about OS' existence, research minorly explored its time variance. When comparing the averages of 2010-2015 to 2016-2020, countries like China, India, Japan, and South Africa indicate even more significant jumps in their *OSIN* values, corroborating that insights into the time variation are valuable.

Finally, it is necessary to make one further note before going into detail about the variables. The paper deals with one major issue: the scarce data for the WAEMU. Hence, the methodology's strategic outline and data description discuss indicators (independent variables) that the author deemed vital. However, they might not be available with the needed consistency or might not be fully accessible. These constraints in the final model are explicitly elaborated when discussing the limitations of this paper.

4. The case

Table 1 and the presented *OSIN* values for the BRICS suggest that OS is still highly prevalent in emerging economies around the globe. The subsequent chapter focuses on Sub-Saharan Africa and, more specifically, the West African Economic and Monetary Union (WAEMU), a region very seldomly investigated in OS research. Chapter 4.1 glances at general facts and a brief historical outline introducing the WAEMU. Subsequently, in chapter 4.2, the WAEMU's *OSIN* values will be presented and analyzed, laying the foundation for further analytical proceedings in this paper.

4.1. General overview

The WAEMU also called *Union économique et monétaire Ouest-Africain* (UEMOA), is a monetary and customs union located in western Africa. The union comprises eight member states: Benin, Burkina-Faso, Cote d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, and Togo, which are also part of the Economic Communities of West African States (ECOWAS), a broader but looser scheme, organized as a political and economic union.[7] The ECOWAS includes the anglophone part of West Africa, e.g., Nigeria and Ghana (ECOWAS 2016).

The WAEMU was created on January 10, 1994, in Senegal as the successor of the West African Monetary Union (WAMU), which itself was established in 1962. In 1997, Guinea-Bissau joined, the only non-francophone but lusophone country. The WAEMU's self-declared target is to increase the economic integration of its member states (UEMOA 2021,

[7] Currently, Mali is suspended from all ECOWAS bodies due to ongoing political turmoil and a putsch movement (Reuters Media 2021).

2003). In 2019, approximately 127 million people lived within the region, while Guinea-Bissau is the smallest member, with approximately 2 million, and Cote d'Ivoire, the most prominent member, with around 25 million inhabitants. In 2017, total life expectancy was at around 60.9 years, and in 2015 46.3% of the population had to live with less than $1.90 per day (2011 PPP), while the region's GINI index was 40.8.[8] The zone combined an estimated nominal GDP of $151 billion in 2019 (International Monetary Fund 2021).

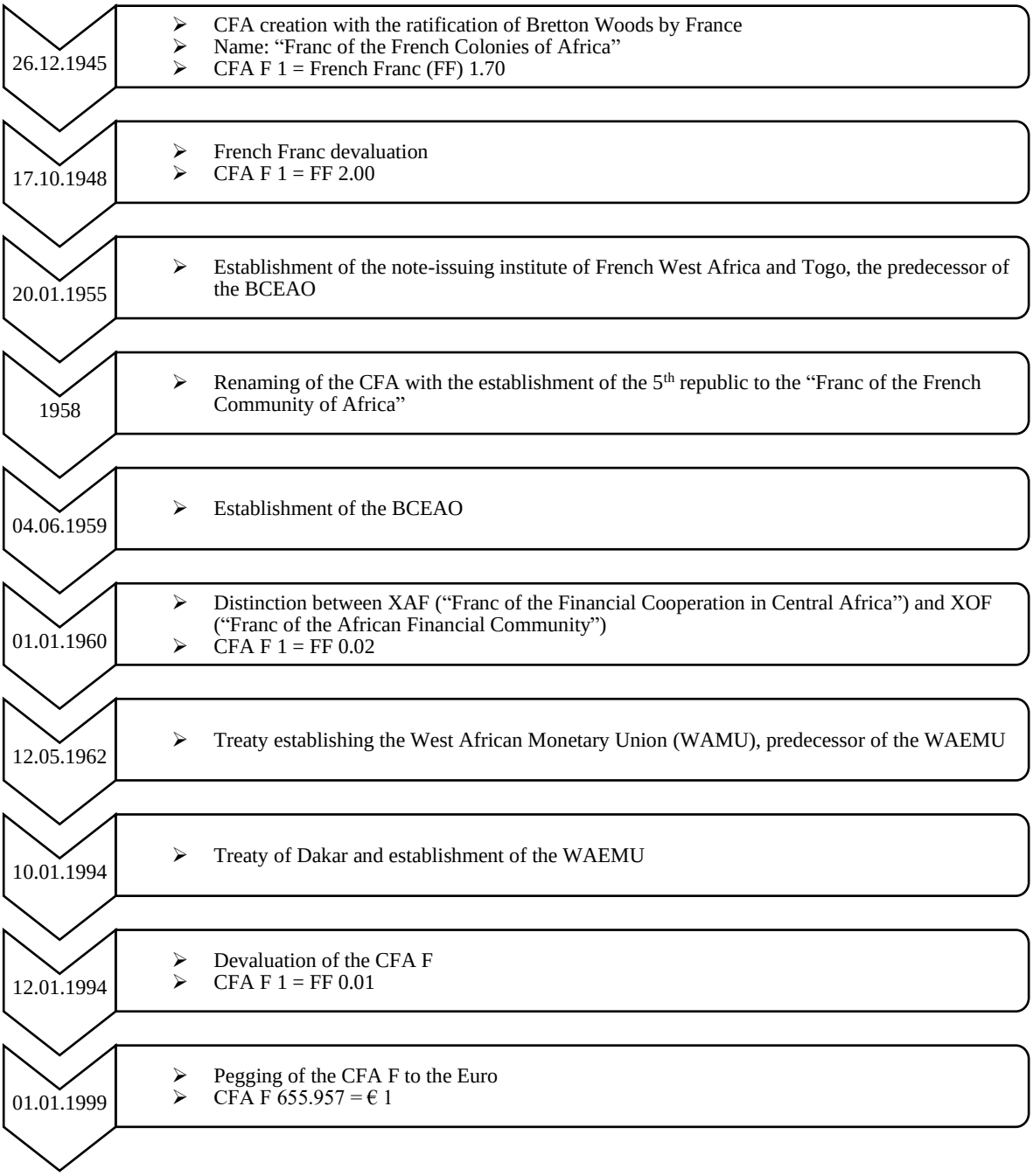
The common denominator, the member countries' past, is the colonization by France and, subsequently, the common currency: the West African CFA Franc (ISO: XOF), which was created in 1945 when France ratified the Bretton Woods agreement. The central organ administering the common currency is the Central Bank of West African States (BCEAO), established in 1959. Figure 2 depicts a brief historical summary (BCEAO 2018).

Noteworthy is that the CFA Franc exists in another structurally equivalent variant: the Central African CFA Franc (ISO: XAF). The XAF is used in the Central African States, organized in a union similar to the WAEMU called Central African Economic and Monetary Community (CEMAC), and shares a similar history and functioning (Sylla 2020, p. 40).9 However, the CEMAC is not in the scope of the paper and will be omitted from the analysis. For simplicity, the West African CFA is meant when speaking about the CFA Franc.

[8] PPP abbreviates purchasing power parity.

[9] The CEMAC comprises Cameroon, Central African Republic, Chad, Republic of the Congo, Equatorial Guinea, and Gabon (BCEAO 2017). Furthermore, the Comorian franc (ISO: KMF) used in the Comoros functions similarly and is guaranteed by France. However, several other conditions exist for this agreement (Ministry of Economics, Finance and Industrial and Digital Sovereignty 2021).

Figure 2: West African CFA Franc – timeline of major historical events

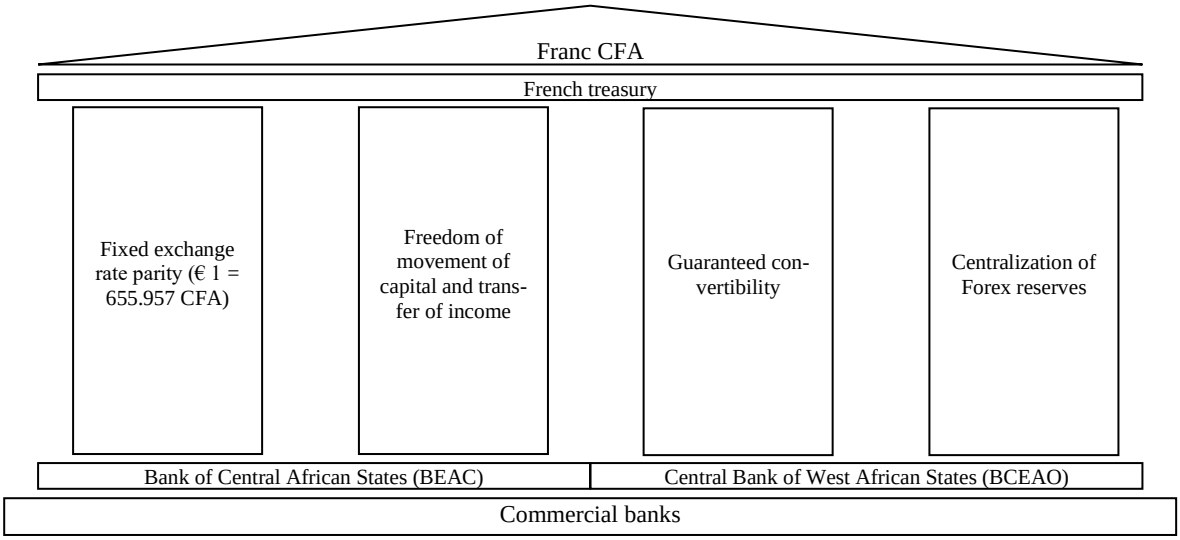


Source: Author's depiction adapted from BCEAO (2017, 2018) and Sylla (2020, pp. 40–43).

The CFA itself has some specialties distinguishing it from other currencies, rooted in the long-lasting historical relationship with France. Firstly, the French treasury guarantees a fixed parity of CFA 655.957 to 1 Euro. Secondly, the French treasury ensures the conversion of CFA into foreign currencies if the foreign exchange (Forex) reserves of the member countries are exhausted and thus functions as the lender of last resort. Thirdly and in return, the member countries must deposit 50% of their foreign exchange reserves in the French treasury, which pays interest for these deposits, a principle called the centralization of Forex

reserves.[10] Lastly, the WAEMU and BCEAO established the concept of total freedom of transfer within the Franc zone. Figure 3 summarizes the fundamental principles of the CFA (Ministry of Economics, Finance and Industrial and Digital Sovereignty 2021; Sylla 2020, p. 43).

Figure 3: The four pillars of the CFA Franc



Source: Author's depiction adapted from the Ministère de l'économie, des finances et de la relance (2021) and Sylla (2020, p. 43).

The general setup presents an intriguing economic and political structure. In light of the presented theories, Panizza (2006, p. 34) classifies the cooperation amongst the WAEMU states as an SSC initiative. However, the delineated ongoing cooperation with France increases the layer of the political and economic playing field. The WAEMU, holistically considered, and its ligatures with France can simultaneously be seen as an NSC arrangement (Metzger 2008, pp. 2–3). The combination of both constitutes a compelling case for economic analysis, especially for OS, portrayed in the following.

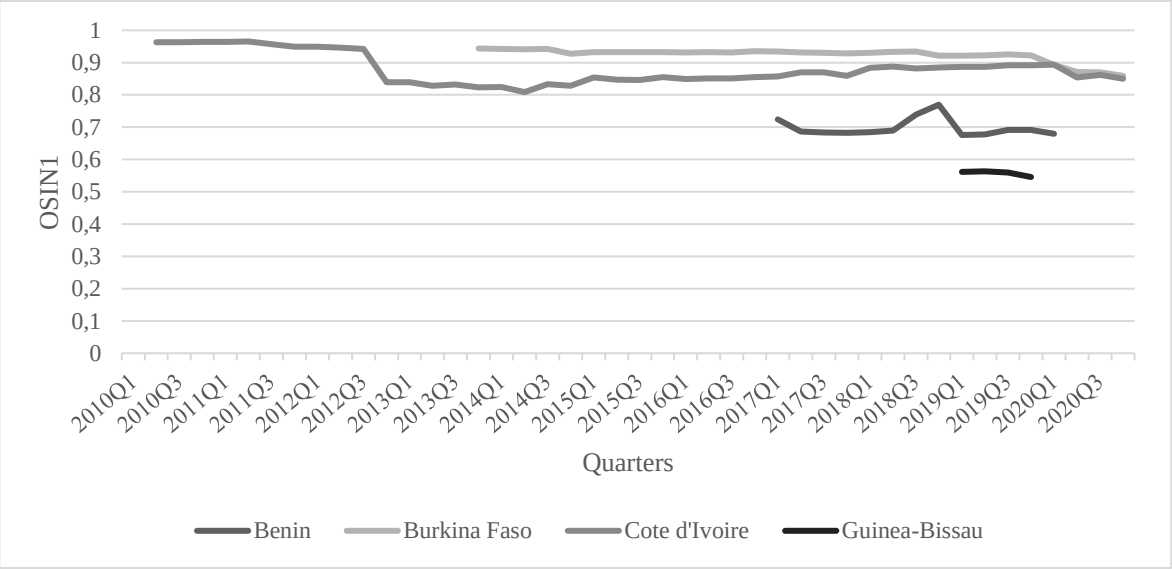
4.2. Original Sin in the WAEMU

Panizza (2006, p. 34) hypothesized that smaller SSCs, such as the CFA Franc in francophone West Africa, are most likely not to have a sufficient magnitude to overcome OS, despite forming a larger economic unit. The calculated *OSIN1* indicators in Table 18 amplify this assumption. *OSIN1* values for Cote d'Ivoire, the biggest country of the WAEMU, averaged 0.8879 for the period 2010-Q2 until 2015-Q4 and 0.8708 between 2016-Q1 and 2020-Q4. Burkina Faso seems to have similarly high *OSIN1* indicators with averages of 0.9363

[10] The deposit quota decreased over the years. Before 1973, 100% of Forex was required to be deposited. Between 1973 and 2005, the rate decreased to 65%. From 2005 onwards, the deposit rate was at 50% (Sylla 2020, p. 43).

between 2013-Q4 and 2015-Q4. In the lapse between 2016-Q1 and 2020-Q4, the data indicates a value of 0.9179. Benin (2017-Q1 – 2020-Q1: 0.6980) and Guinea-Bissau (2019-Q1 – 2019-Q4: 0.5575), both considerably smaller countries, indicate lower yet high *OSIN1* values.[11] Conclusions about the general trend, which hints toward a gradual decrease in OS, are limitedly possible due to the scarcity of available data. Moreover, *OSIN1* values remain high throughout the region. Figure 4 exposes and illustrates the available data and their magnitude. Table 18, in the appendix, contains the values in tabular format.

Figure 4: OSIN1 in the reporting WAEMU countries



Source: Author's illustration based on the World Bank's (2021) QEDS_GDDS dataset.

The shown *OSIN1* calculations for the WAEMU are premised on the *Quarterly External Debt Statistics General Data Dissemination System* (QEDS_GDDS) dataset of the World Bank (WB) (2021) for public and publicly guaranteed private sector external debt positions (PPG). In the WAEMU's case, the BIS (2021) dataset for debt securities was futile. It retrieves its information from a security-by-security database compiled from commercial providers' input (Gruić and Wooldridge 2012, p. 64). The main drawback is that those do not break down domestic currency debt positions for the WAEMU countries. Moreover, *OSIN3* calculations were infeasible since the documentation of international institutions' CFA Franc (XOF) entries is unavailable. Therefore, the WB dataset had to be constituted as a proxy, which, in juxtaposition, identifies domestic currency debt positions. Nevertheless, the non-recognition of foreign currency compositions and international institution debt issuances

[11] It is to note that only four WAEMU countries were reporting to the World Bank, of which only Cote d'Ivoire (CIV) consistently reported since 2010-Q2. Burkina Faso (BFA) started reporting from 2013-Q4 onwards. Benin (BEN) reported data for 2017 until 2019, and Guinea-Bissau (GNB) only reported in 2019. Therefore, inconsistent averages exist for the *OSIN1* values.

persists for the QEDS_GDDS dataset. Therefore, also with this dataset, regrettably, it was not possible to calculate $OSIN3_i$.

Panizza's conjecture and the apparent persistence of OS in the region beg the question of which advantages the CFA Franc warrants, if not redemption from OS. Fritz and Metzger (2006, p. 10) argued that it could be a shielding function from second-round effects of contagious external shocks and "*beggar-thy-neighborship*"-relations. Furthermore, the question might arise if deepened regional financial markets drive further regional economic integration and cooperation beyond just financial integration. Consequently, in the following, *OSIN1*'s development within the WAEMU region shall be investigated.

4.3. Selection of indicators

A strategic selection shall thus take place to approach the choice of independent variables. The selection is influenced mainly by three questions. First, what are the findings advocated by Eichengreen et al. (2002) and succeeding authors, and are they viable for this case? Second, the paper's subjects are inter alia regional integration and cooperation. Hence, the question arises what influence integration and cooperation factors have on OS, and which indicator can reflect their potential relationship? Lastly, are international or external indicators influencing OS in the WAEMU? Hence, the implicit question is which indicators can be chosen to reflect an exogenous influence on OS in the WAEMU countries?

Response variable: The dependent variable in the model is *OSIN1*, as discussed. The values were already presented in chapter 4.2 and are, for reference, in Table 18. Consequently, a first constraint becomes immediately visible. Unfortunately, the BIS (2021) dataset does not contain reliable data for the WAEMU. Instead, the WB's (2021) QEDDS database, only containing public and publicly guaranteed debt, provides values as a proxy.

Nonetheless, data in the database is limited. Since a reliable analysis requires data for the whole region, the period must be chosen for a consistent series. The author opted for the time frame 2010-Q4 until 2020-Q4 since values exist for the WAEMU countries only in this period. The unbalanced structure constitutes a total of 87 observations for the four reporting countries out of 164 possibilities. For an overview, see the summary statistics in Table 3.

Table 3: Summary statistics OSIN1 in the WAEMU

Variable	Observations	Mean	Standard deviation	Min	Max
OSIN1	87	0.8506	0.104	0.546	0.965

Source: Author's calculation based on WB's (2021) QEDDS_GDDS dataset.

The temporal limitation dictates the general time frame for all indicators and raises a second limitation simultaneously. Due to the quarterly structure of the response variable, all independent variables need to be assembled quarterly as well. This creates a severe constraint. As per expectation, not all data will be available in quarterly sets. Thus, data that is not structured quarterly needs to be disaggregated to fit the requirements. Disaggregated in this scenario means low-frequency data (e.g., yearly values) is converted into higher frequency sets such as quarters. The procedure is called temporal disaggregation. Eurostat (2013, pp. 140–149) describes several methodological approaches. For reasons of simplicity, the author chose linear interpolation to construct quarterly values.

The considerations above divide the model's independent variables into two broad categories. The first cohort relates to economic country size and regional integration, hence, general economic indicators. A second cohort relates to domestic and international fiscal and monetary indicators. These categories and their selection are explained more thoroughly below, together with the selected independent variables.

Economic indicators: Eichengreen et al. (2002) validated a relationship between economic size and OS. This influence should also be tested in the WAEMU case. Generally, the data is represented in two formats, a table showing the summary statistics and a graph illustrating the underlying data.

1. GDP: The literature review revealed that economic country size is a proven indicator influencing the existence of *OSIN*. The natural logarithm (Log) of the gross domestic product (GDP) was one of Eichengreen et al.'s (2002) independent variables utilized to represent economic size when constructing the model (Eichengreen et al. 2002, p. 17; Hausmann and Panizza 2003, p. 980).[12]

   As for all indicators in this subchapter, the dataset contains the individual GDP estimates and logged values for each of the four reporting countries.[13] The data stems from the BCEAO (2021), which provides GDP estimates on its statistical database website. Unfortunately, those values only exist on a yearly frequency. Although there is a documented effort of the BCEAO to publish data quarterly, the results are not publicly available in the respective database (BCEAO 2014).

[12] Other indicators for size as a proxy were the log of total trade, the log of domestic credit, and a comprehensive index summarizing all three latter components in one variable. Furthermore, Hausmann and Panizza (2003, p. 980) stressed that GDP and not GDP per capita, which is used as a proxy for economic development, shall be used.

[13] For a methodological explanation of why the log is used see, Wooldridge (2013, Chapter 6).

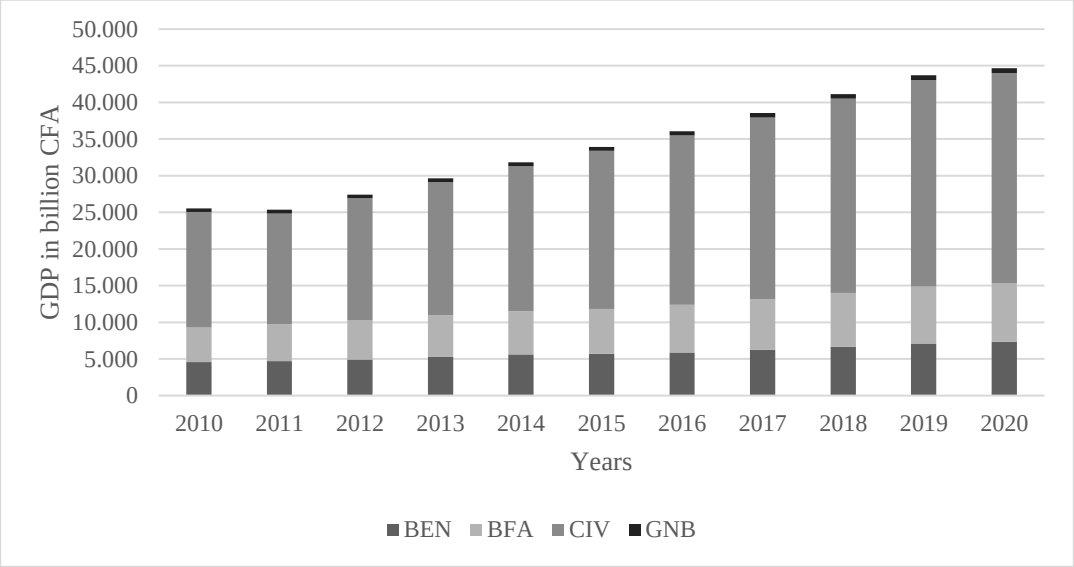
The log of GDP utilizes the logarithmic identities and properties to conduct the linear interpolation and fit into the model effectively (Wooldridge 2013, pp. 191–194). The result is depicted graphically in Figure 5 for the WAEMU member countries.

Table 4: Summary statistics logged GDP

Variable	Observations	Mean	Standard deviation	Min	Max
L_GDP	164	8.414	1.336	6.131	10.264

Source: Author's calculation based on BCEAO's (2021) GDP data.

Figure 5: GDP of the panel countries 2010-2020



Source: Author's calculation based on BCEAO's (2021) GDP data.

The panel's GDP constantly grew in the past decade, where Cote d'Ivoire is the most significant contributor and Guinea-Bissau the smallest. The total GDP of the region increased from approximately CFA 44,000 billion to CFA 76,000 billion in 2020. Therefore, the panel members represent approximately half of the region's total GDP (BCEAO 2021).

2. Intra-regional trade: describes the exchange between economies of the same region or economic zone. Eichengreen et al. (2002, p. 17) used the log of total trade to account for the variable of economic size. However, to include the integration and co-operation component, the log of total intra-regional trade is chosen as a proxy with quarterly values from 2010-Q4 onwards.

   The aspect is useful in two ways. First, trade is one of the main components employed in old regionalism and classical OCA theories (Fritz and Mühlich 2006, p. 9). Thus, considering these frameworks, it would be compelling to see whether trade has a substantial impact.

Second, opponents of the CFA Franc pillory the considerably low degree of intra-regional trade within the WAEMU compared to trade with the rest of the world and present it as a central argument against the CFA (BCEAO 2020; Pigeaud and Sylla 2019, p. 149). Therefore, the model examines whether a change in intra-regional trade influences the region's *OSIN1* values.

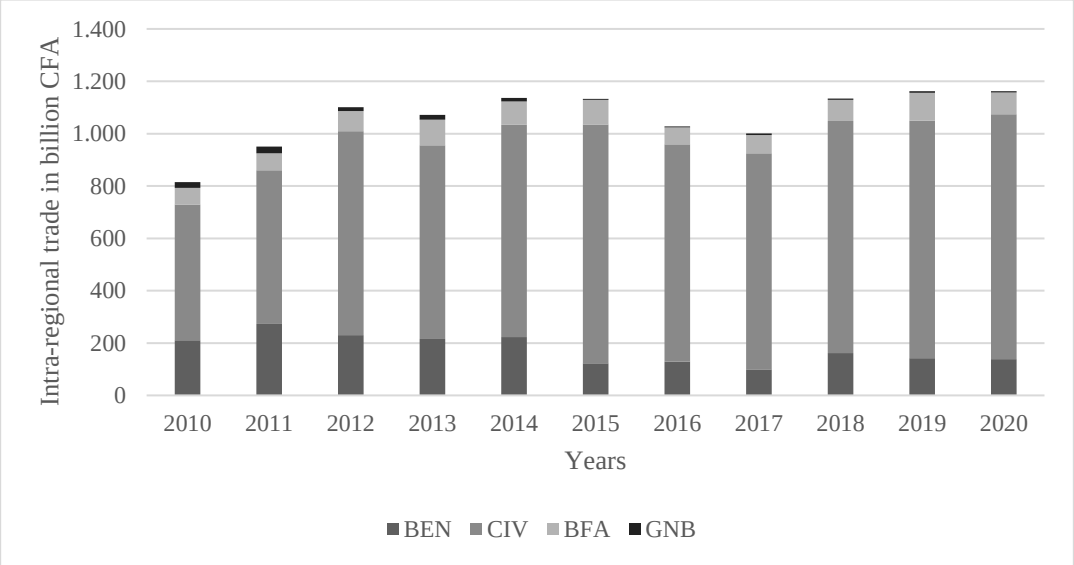
The data is retrieved from the BCEAO (2021) BOP report edition 6. Data exists only in yearly values. Hence, the same methodological procedure used for GDP was used to derive quarterly values. Figure 6 illustrates the results for the WAEMU in total.

Table 5: Summary statistics logged intra-regional trade

Variable	Observations	Mean	Standard deviation	Min	Max
L_IR-Trade	164	4.596	1.657	1.327	6.841

Source: Author's calculation based on BCEAO's (2021) edition 6 of the BOP.

Figure 6: Intra-regional trade of the panel countries 2010-2020



Source: Author's calculation based on BCEAO's (2021) edition 6 of the BOP.

Figure 6 shows that inter-regional trade did not grow as consistently as GDP. Nevertheless, total intra-regional trade increased by CFA 1,000 billion for the whole WAEMU between 2010 and 2020. Again, in the panel, Cote d'Ivoire is the most significant player concerning intra-regional trade, while Guinea-Bissau's contribution is almost insignificant.

3. Remittances: The model also considers financial flows. Remittances are a portion of income earned by a migrant worker that in some form flows back to the earners' community of origin, designating an essential part of the income of some developing

markets (Ratha 2017). The IMF sees remittance flows as a leading indicator of regional integration (Arizala et al. 2018, p. 22).

Remittances split the academic literature into two camps. One side argues that remittances substitute borrowing, while the other side contends that remittances and borrowing complement each other (Ambrosius and Cuecuecha 2014, pp. 26–27). Balima and Combes (2019) find that remittances reduce bond yield spreads in emerging markets. Thus, remittances' influence on sovereign borrowing and, in effect, *OSIN1* are studied from an OS perspective in the model.

Moreover, data for remittances in the WAEMU is interesting from another perspective. The pecuniary structure of people's finance in the WAEMU differs considerably from other regions in the world. First, estimates state that only 37% of the inhabitants possess a financial account, and only 22% own a commercial bank account, one of the lowest values worldwide (World Bank 2018).[14] Regular commercial bank exchanges by wiring money from A to B are relatively uncommon. Cash exchanges and mobile network carriers, which enable transactions through SIM cards and mobile phones, are more frequently used media of exchange (Demirguc-Kunt et al. 2018, pp. 20–22).

Secondly, the cost of money transfers in Sub-Saharan Africa ranges amongst the highest worldwide, posing a considerable obstacle to money transfers in general. Transfers within the WAEMU zone and partly to France are considerably more affordable (African Institute for Remittances 2018; World Bank 2013).

A further component regarding regional integration would have been intra-regional remittances flows and their impact on *OSIN*, especially since it could hold as a measurement criterion of the WAEMU on its self-declared goal of enabling economic integration.

The data for remittances is also retrieved from the BCEAO (2021) BOP report. Like in the latter cases, remittances are only provided in yearly sets. Thus, the same temporal disaggregation is applied to derive quarterly values. A graphical depiction of the data is in Figure 7.

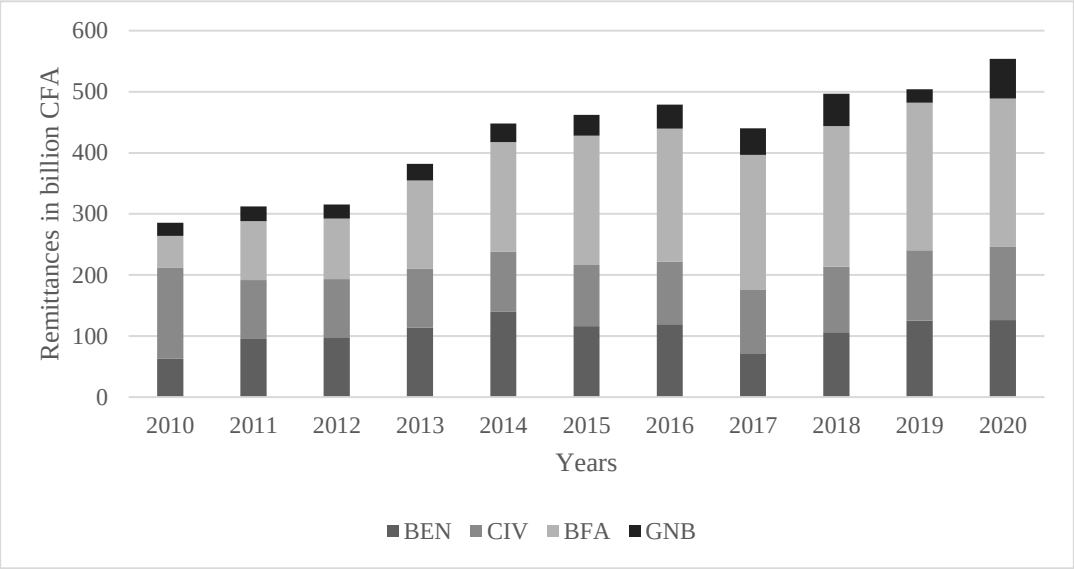
[14] The data is drawn from the Findex database of the World Bank (Demirguc-Kunt et al. 2018). A more thorough explanation, although with older data, is given by Guérineau and Jacolin (2014). The number of total financial accounts increased significantly by an average of 8% in 2011 to 18% in 2014 and 37% in 2017 (World Bank 2018).

Table 6: Summary statistics logged inward remittances

Variable	Observations	Mean	Standard deviation	Min	Max
L_Remittances	164	4.473	0.666	3.08	5.489

Source: Author's calculation based on BCEAO's (2021) edition 6 of the BOP.

Figure 7: Inward remittances of the panel countries 2010-2020



Source: Author's calculation based on BCEAO's (2021) edition 6 of the BOP.

Although not as consistent as GDP, total remittances have grown from CFA 1,400 billion in 2010 to approximately CFA 3,000 billion in 2020. Among the countries in the panel, Burkina Faso receives the most inward remittances exceeding Cote d'Ivoire. However, considering that remittance inflows were at approximately CFA 3,000 billion in 2020, and the panel members represent only CFA 550 billion, it becomes evident that the four members not included in the panel constitute the more prominent recipients in the union. In fact, Senegal and Mali are the biggest recipients of remittances. An interesting further side note is that remittances and intra-regional trade have been similar throughout the last decade when considering the reported total values (BCEAO 2021).

Fiscal and monetary indicators: The author focuses on the relationship between the biggest financial centers, i.e., the United States, due to its predominant role in financial markets with the United States Dollar (USD) and Europe due to its close political, economic, historical, and financial ties.

1. ECB-FED interest rate spread: The first international indicator is the interest rate spread between the Euro (EUR) and USD zone. The spread thus does not refer to the difference between the lending and deposit rate of commercial banks but to the

difference in short-term deposit rates between the two central banks. The rationale is the impact of the exogenous setting of interest rates, so-called spillover effects. Theory and empirical evidence argue that a change in interest rates in the occidental world directly influences the rest of the world, such as developing economies. If, for example, the USD interest rate increases, exchange rate gaps widen, making dollar-denominated debt, which many countries use to finance current account deficits, more challenging to manage (Ca' Zorzi et al. 2020).

Since Euros and CFA Francs are exchangeable at a fixed parity, it should be tested if either a widening or a tightening of the spread influences *OSIN1* in the region. The underlying question is, thus, if there is a correlation between the interest rate differences between Europe and the US in the WAEMU region.

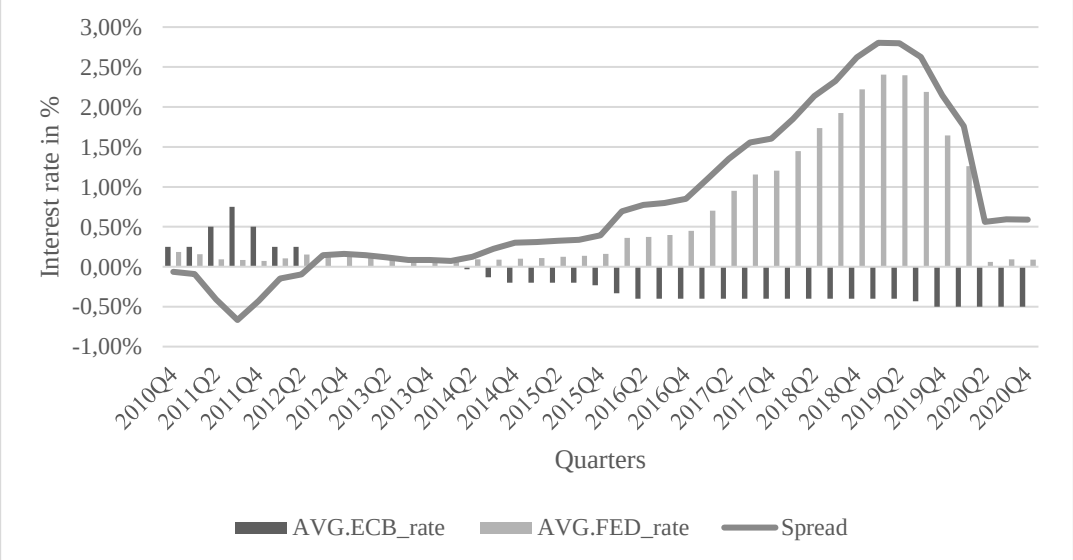
The data is drawn from the Deutsche Bundesbank (2021) for European Central Bank (ECB) data and the St. Louis FED (2021) for Federal Reserve (FED) interest rates. Pertinently, the data is available in monthly sets. Subsequently, data is summarized and averaged on a quarterly level. The spread is calculated by subtracting the averaged FED funds rate from the respective ECB deposit facility. Figure 8 illustrates the rates and resulting spreads graphically.

Table 7: Summary statistics interest rate spread

Variable	Observations	Mean	Standard deviation	Min	Max
Spread	164	0.00791	0.00964	-0.0067	0.02803

Source: Author's calculation based on Bundesbank (2021) and St. Louis FED (2021) data.

Figure 8: FED-ECB interest rate spread



Source: Author's calculation based on Bundesbank (2021) and St. Louis FED (2021) data.

The divergence between FED and ECB interest rate setting becomes visible through the plot. While in the aftermath of the global financial crisis, the ECB rates were higher than FED rates, the picture has changed. The FED tended to increase the rate between 2016 and 2020-Q1. The ECB moved in the opposite direction and gradually decreased its rate to -0.5%. Therefore, the spread widened until the end of 2019.

2. Euro-denominated debt in the WAEMU debt portfolio: This indicator looks at the total percentage of Euro-denominated debt in the debt portfolio of the WAEMU member countries. Panizza (2006, p. 34) argues that the CFA Franc can be seen as an SSC. However, inter alia, through the peg of the Euro to the XOF and its guaranteed convertibility at fixed parities, it is arguable that an NSC is existent simultaneously (Metzger 2008, pp. 2–3).

   The question is whether an increase in Euro-denominated debt goes hand in hand with a decrease in *OSIN1*, a contradiction when looking at the conception of *OSIN*. However, the WAEMU's setup and the convertibility guarantee make Euro debt arguably more manageable than debt denominated in another foreign currency.

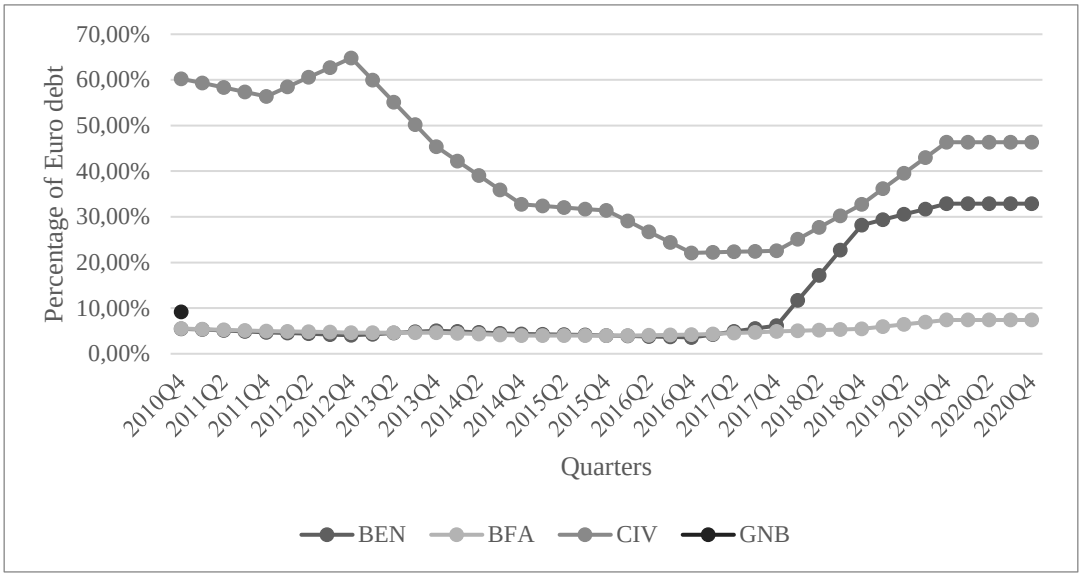
   The data for this indicator stems from the WB's (2020) IDS database. Unfortunately, the data only comes in yearly values. Thus, each quarter's currency composition percentages had to be replicated to fit the model. By assumption, those values are not static throughout the year due to changing down payments and potential new issuances. Thus, a linear development between years is assumed to derive quarterly values. Unfortunately, only values until 2019 were available. Therefore, as a further assumption and limitation, the end value of 2019 was replicated for the entirety of 2020. Lastly, Guinea-Bissau lacks consistent data between 2011 and 2020; therefore, no values exist.

Table 8: Summary statistics percentage of Euro-denominated debt

Variable	Observations	Mean	Standard deviation	Min	Max
Euro-Debt	124	0.19114	0.18722	0.03579	0.64818

Source: Author's calculation based on WB's (2020, 2021) IDS and GDDS datasets.

Figure 9: Percentage of WAEMU's Euro-denominated PPG debt



Source: Author's calculation based on WB's (2020, 2021) IDS and GDDS datasets.

The graph draws a relatively consistent picture of Euro-denominated debt in the WAEMU, in which Cote d'Ivoire is the country with the most Euro-denominated debt. There is a trough in the middle of the decade. However, Euro debt has re-bounded and increased since 2017 for all reporting countries.

3. Euro-Dollar exchange rate: Gadanecz et al. (2018) find that exchange rate volatilities have become increasingly crucial in sovereign borrowing. Moreover, opponents of the CFA argue that the fixed parity of the Euro and CFA and an ensuing overvaluation of the Franc vis-à-vis the Dollar and Euro perpetuate the WAEMU's economic problems (Pigeaud and Sylla 2019, pp. 153–158). Since the WAEMU pegs the CFA to the Euro, the point of interest would be if Euro-Dollar exchange rate fluctuations impact the development of *OSIN* in the WAEMU.

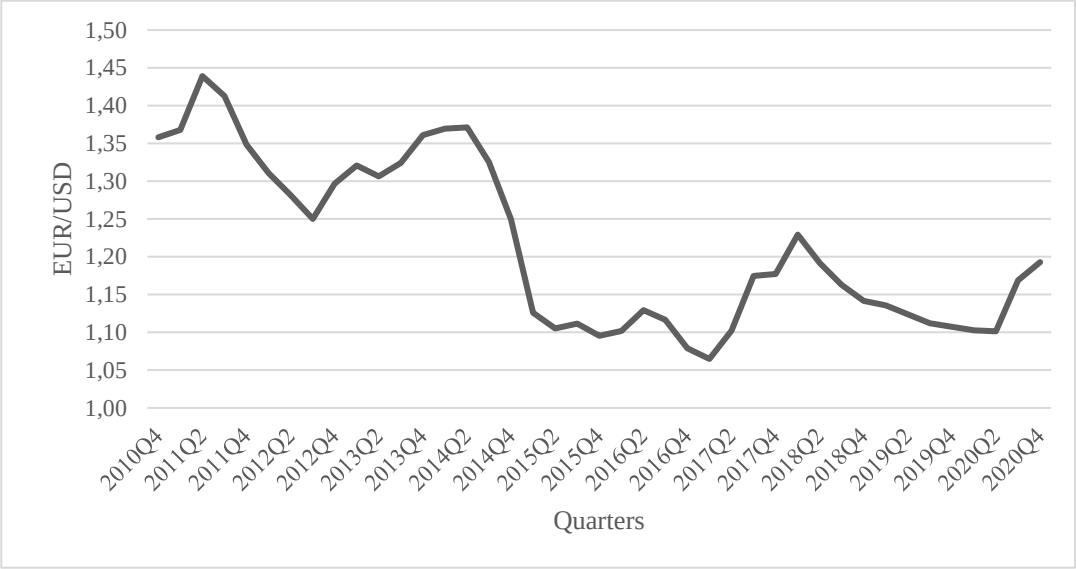
   The ECB (2021) publishes daily exchange rate quotas on its website with historical data in a retrievable format. The author summarized the rates on an averaged quarterly level and filtered for the required periods.

Table 9: Summary statistics EUR/USD average quarterly exchange rates

Variable	Observations	Mean	Standard deviation	Min	Max
EUR/USD	164	1.21578	0.10992	1.0648	1.43906

Source: Author's calculations based on ECB (2021) daily exchange rate data.

Figure 10: ECB - EUR/USD quarterly average exchange rates



Source: Author's illustration based on ECB (2021) daily exchange rate data.

The chart paints a picture of a relatively strong Euro against the USD, especially after the global financial crisis. Until the end of 2016, the rate decreased gradually with the aftermath and effects of the Greek debt crisis. With the onset of 2017, the Euro rebounded but decreased again between 2018 and mid-2020.

4.4. Results

The following section presents the results of the regression analysis. The findings should be presented consecutively in the same way the selection of indicators introduced them. Therefore, the results and case study part dedicate the two thematic distinctions of general economic and fiscal and monetary indicators, each a separate subchapter. The regression result for every indicator can be found individually in the appendix, both with and without control for country dummy variables and the respective tests.

4.4.1. Economic indicators

In general, the variables in this section underline the findings of Eichengreen et al. (2002). Indicators of economic size also represent, in the WAEMU's case, a determining factor for *OSIN*. However, this is only the case when controlling for country dummy variables. Otherwise, the variables show a mostly positive relationship with *OSIN1*. Nevertheless, the discussion beforehand explicated why the control for time-invariant dummies is imperative. Moreover, in this category, all tests indicated both heteroskedasticity and autocorrelation. Thus, HAC standard errors were applied in all cases.

GDP: GDP, for instance, shows a positive relationship with *OSIN1* without country dummies, implying that an increase in GDP goes in hand with an increase of *OSIN* in the region. This seems counterintuitive, considering the presented theory. However, when country dummy variables are introduced and controlled for, the coefficient for GDP changes its sign. A relationship Eichengreen et al. (2002, p. 31) proved in their cross-country analysis. Moreover, as described before, the model automatically ignored Guinea-Bissau's dummy due to collinearity with the others.

Table 10: OSIN1 and GDP

OSIN1	Coefficient	Robust std. err.	t	P>t	[95% conf.	interval]
L_GDP	-0.081	0.014	-5.750	0***	-0.110	-0.053
dummy_CIV	0.604	0.050	12.170	0***	0.505	0.703
dummy_BEN	0.558	0.033	16.710	0***	0.492	0.625
dummy_BFA	0.331	0.033	10.000	0***	0.265	0.396
dummy_GNB	0.000	(omitted)				
Constant	1.083	0.091	11.860	0***	0.901	1.264
var(e.osin1)	0.001	0.000			0.000	0.003

*** p<0.01, ** p<0.05, * p<0.1, std. err. = standard error, conf. interval = confidence interval
Source: Author's calculation in Stata.

The corresponding F-Value of 148 and the log pseudolikelihood indicate that the model containing country dummies describes the situation better than without dummies.

Intra-regional trade: shows a different relationship in terms of *OSIN1* than GDP. The model without country dummies indicates an insignificant positive beta, meaning that *OSIN1* would increase when intra-regional trade in the region increases. Nonetheless, when controlling for the countries' dummies, the picture changes. The coefficient alters its sign, and intra-regional trade negatively coincides with *OSIN*; however, intra-regional trade remains insignificant. Also, in this case, the F-Value and pseudolikelihood indicate the inclusion of dummies to predict better results. HAC standard errors were used since the previous tests indicated autocorrelation and heteroskedasticity. With robust standard errors, the relationship between *OSIN1* and intra-regional trade would have been significantly negatively correlated.

Table 11: OSIN1 and intra-regional trade

OSIN1	Coefficient	Robust std. err.	t	P>t	[95% conf.	interval]
L_IR-trade	-0.099	0.066	-1.510	0.136	-0.230	0.032
dummy_CIV	0.808	0.325	2.490	0.015**	0.162	1.453
dummy_BEN	0.451	0.206	2.190	0.031**	0.041	0.862
dummy_BFA	0.633	0.177	3.570	0.001***	0.281	0.985
dummy_GNB	0.000	(omitted)				
Constant	0.730	0.115	6.360	0***	0.502	0.959
var(e.osin1)	0.001	0.000			0.001	0.002

*** p<0.01, ** p<0.05, * p<0.1, std. err. = standard error, conf. interval = confidence interval
Source: Author's calculation in Stata.

Nevertheless, the F-statistic rejects the model at the one percent level. The low t-test statistic with HAC standard errors indicates the rejection of the beta coefficient and, thus, the hypothesis that intra-regional trade influences the time variance of *OSIN1*.

Remittances: For remittances, the story is again slightly different. Remittances seem to be statistically significant when running the regression without country dummies. Thus, an increase in inward remittances, an inflow of money into the region would mean an increase in *OSIN1*. A relationship that would undermine the assumption that remittances offset borrowing. However, when controlling for country dummies, the impact of remittances seems to become insignificant, while the beta remains positive.

Table 12: OSIN1 and remittances

OSIN1	Coefficient	Robust std. err.	t	P>t	[95% conf.	interval]
L_Remittances	0.028	0.070	0.400	0.693	-0.111	0.166
dummy_CIV	0.284	0.086	3.330	0.001***	0.115	0.454
dummy_BEN	0.108	0.081	1.330	0.188	-0.054	0.270
dummy_BFA	0.313	0.134	2.330	0.022**	0.047	0.579
dummy_GNB	0.000	(omitted)				
Constant	0.463	0.239	1.930	0.057*	-0.013	0.938
var(e.osin1)	0.001	0.000			0.001	0.002

*** p<0.01, ** p<0.05, * p<0.1, std. err. = standard error, conf. interval = confidence interval
Source: Author's calculation in Stata.

Moreover, the F-statistic rejects the model at a one percent level. Therefore, remittances seem not to have an influence. Nevertheless, other literature finds that remittances can benefit macroeconomic stabilization by reducing the reliance on foreign capital and the risk of current account reversals (Bugamelli and Paternò 2009, p. 24).

However, the derived assumptions should be generally taken with a grain of salt. The panel is short, and the data is relatively inconsistent. The long-term relationship between

remittances and *OSIN* could be investigated more thoroughly, containing a broader set of economies. Generally, this applies to all country-varying factors. Unfortunately, this is out of the scope of this paper and would be instead a subject for potential further research.

A further note should be made, considering the potential combined impact of the three indicators and their interdependence. The relation between intra-regional trade and GDP is apparent, but remittances might also support GDP growth substantially (Olayungbo and Quadri 2019). Therefore, it would be erroneous to assume independence of the indicators from each other and thus their influence on OS. Instead, a multicollinearity issue would persist if one would fit all three variables in the same model. The correlation matrix of the indicators supports this assumption.

Table 13: Correlation matrix of GDP, intra-regional trade, and remittances

	L_GDP	L_IR-Trade	L_Remittances
L_GDP	1.000		
L_IR-Trade	0.940	1.000	
L_Remittances	0.770	0.595	1.000

Source: Author's calculation in Stata.

By running a collinearity check in Stata, the variance inflation factor (VIF) mean of 12.65 and a condition number of 67.25 confirm the assumption. A value of under 10 in both instances would have indicated stability. However, as stated before, this is not surprising.

Table 14: Collinearity check of GDP, intra-regional trade, and remittances

Variable	VIF	SQRT VIF	Tolerance	R-Squared
L_GDP	20.97	4.58	0.0477	0.9523
L_IR-Trade	13.19	3.63	0.0758	0.9242
L_Remittances	3.79	1.95	0.2637	0.7363
Mean VIF	12.65			
Condition Number	67.246			

Source: Author's calculation in Stata.

This finding suggests that the three considered independent variables have a comparable impact on the dependent variable when used in the same model. According to the literature, economic size determines the existence of OS. The results seem to be generally in line with Eichengreen et al.'s (2002) findings in the case of dummy controlled time variation. Thus, it appears that positive economic growth coincides with short-term declines in *OSIN1*.

4.4.2. Fiscal and monetary indicators

The analysis of fiscal and monetary indicators reveals mixed results. Again, the introduction of country dummy variables and, thus, country-specific effects significantly change the relationships between dependent and independent variables. Again, HAC standard errors were utilized in all cases in this category.

ECB-FED interest rate spread: The beta coefficient suggests a steep negative relationship, with a coefficient of -4.45, indicating a decrease in *OSIN* when the spread increases. Recalling that the spread was constructed by subtracting the FED rate from the ECB rate, an increase in interest rates in the US, a decrease of interest rates in the EU, or both simultaneously suggest a decrease in *OSIN*. Nevertheless, the test statistics incline to show an insignificant negative influence of the interest rate spread in the WAEMU, with a t-test of -1.45 and an overall inferior F-test statistic of 0.15.

The coefficient remains negative when controlling for country dummies but decreases to -0.25. Nonetheless, the spread remains insignificant, visible in the t-statistics indicating the rejection of the alternative hypothesis. F-value and pseudolikelihood indicate that the model with country dummies performs better than those without. However, the F-statistic would still reject the model, i.e., the independent variables cannot reliably predict *OSIN1*.

Table 15: OSIN1 and the FED-ECB interest rate spread

OSIN1	Coefficient	Robust std. err.	t	P>t	[95% conf.	interval]
Spread	-0.249	0.160	-1.560	0.123	-0.567	0.069
dummy_CIV	0.314	0.003	109.010	0***	0.308	0.320
dummy_BEN	0.139	0.001	160.890	0***	0.137	0.141
dummy_BFA	0.363	0.002	158.540	0***	0.358	0.367
dummy_GNB	0.000	(omitted)				
Constant	0.564	0.004	136.080	0***	0.556	0.572
var(e.osin1)	0.001	0.001			0.001	0.003

*** p<0.01, ** p<0.05, * p<0.1, std. err. = standard error, conf. interval = confidence interval
Source: Author's calculation in Stata.

Hence, the impact of spillover effects on the time-variation of *OSIN* could not be established. Nevertheless, the findings indicate that a further check with a more extended time series containing more data points could be beneficial.

Euro-denominated debt: The graphical depiction showed that Euro debt became increasingly important in the last years for WAEMU countries of the panel. Nevertheless, it needs to be kept in mind that all values for 2020 are replicated values from the end of 2019. Interestingly, Euro-denominated debt is the only indicator for which the Hausman test suggests a random

effect model. However, the Tobit regression indicates no statistical significance when regressing without country dummies. The low t-statistics and F-value, show that the assumed model is not a good predictor of *OSIN*. Thus, the next model controls for country dummies, and the F-value increases significantly. The Euro-debt composition becomes statistically significant with a positive coefficient. Intriguingly, a second country dummy becomes perfectly collinear with the introduction of the debt component, and thus Stata drops it from the regression. However, according to the model, increasing Euro debt in the WAEMU's debt portfolios coincides with increasing *OSIN1*. Following the Hausman test and running a random-effects Tobit, the results remain positively correlated at statistically significant levels and similar magnitudes.

Table 16: OSIN1 and the percentage of Euro-dominated debt

OSIN1	Coefficient	Robust std. err.	t	P>t	[95% conf.	interval]
Euro_debt	0.124	0.043	2.880	0.005***	0.038	0.210
dummy_CIV	-0.092	0.013	-7.020	0***	-0.119	-0.066
dummy_BEN	-0.244	0.011	-22.380	0***	-0.266	-0.222
dummy_BFA	0.000	(omitted)				
dummy_GNB	0.000	(omitted)				
Constant	0.917	0.005	196.080	0***	0.908	0.927
var(e.osin1)	0.001	0.000			0.001	0.001

*** p<0.01, ** p<0.05, * p<0.1, std. err. = standard error, conf. interval = confidence interval
Source: Author's calculation in Stata.

Nevertheless, it was not verified whether the increase in Euro debt was a strategic move in the countries' planned new issuances. It is conceivable that Euro debt warrants an advantage over debt denominated in other currencies. As new debt is acquired, it might be, therefore, preferably taken up in Euros. Primarily, since foreign-denominated debt levels generally increased throughout the decade. This would make the model's underlying assumption a reductio ad absurdum due to reverse causality. Thus, for more robustness of the results, an extended time series or a check against the situation of CEMAC countries could be insightful.

Euro-Dollar exchange rate: According to the analysis and the resulting t-test statistics, the Euro-Dollar exchange rate seems to positively influence *OSIN1* in the WAEMU member countries at statistically significant levels. Therefore, the Euro exchange rate appreciation vis-à-vis the USD correlates with an increase in *OSIN1* in the WAEMU.

Table 17: OSIN1 and the EUR/USD exchange rate

OSIN1	Coefficient	Robust std. err.	t	P>t	[95% conf.	interval]
EUR/USD_forex	0.095	0.023	4.150	0***	0.049	0.140
dummy_CIV	0.309	0.002	140.980	0***	0.305	0.314
dummy_BEN	0.139	0.000	292.460	0***	0.138	0.139
dummy_BFA	0.362	0.001	337.690	0***	0.360	0.364
dummy_GNB	0.000	(omitted)				
Constant	0.451	0.026	17.670	0***	0.401	0.502
var(e.osin1)	0.001	0.000			0.000	0.003

*** p<0.01, ** p<0.05, * p<0.1, std. err. = standard error, conf. interval = confidence interval
Source: Author's calculation in Stata.

Two considerations are necessary. First, the literature suggests a significant influence of general exchange rate regimes on OS. It is argued that economies with a pegged exchange rate face higher *OSIN* values. Hence, further research might look again at a broader sample of countries with pegged rates and test their relation against the anchor currency and its influence on *OSIN* variations. Secondly, since the WAEMU itself pegs its currency against the Euro, reverse causality is likely, i.e., that exchange rate fluctuations influence *OSIN*. However, extrinsically *OSIN* might even be prevalent because of the peg. Eichengreen et al.'s (2007, p. 134) findings confirm that countries with fixed rates are more prone to suffer from OS. Unfortunately, control for this issue is not possible with the present dataset. Therefore, it cannot be generally ruled out that endogeneity is persistent.

4.5. Discussion and limitations

The results corroborate Eichengreen et al.'s (2002) findings that economic size mainly determines the magnitude of OS. An increase in GDP correlates with a decrease in *OSIN* when controlling for country-specific effects. Nevertheless, these results should be assessed cautiously. The methodological approach exposed some limitations already discussed partially in the previous chapter. The constraints are primarily due to the small number of observations. Explicitly, the panel size of four countries with partially missing points does not represent a sufficiently robust dataset against short-term phenomena.

Moreover, there is no question that the four countries in the panel can neither symbolically nor numerically represent the WAEMU holistically. They can only be seen as a proxy to some extent: the inherent problem grounds in the scarcity of available data in general. The same applies to the used PPG debt data.

Although data provision improved recently and yearly values are available for most of the used and considered variables from 2010 onwards, a time frame of ten or fewer years and

the same number of observations are too minor to determine reliable results. Furthermore, data holes in the reporting, like the case for Guinea-Bissau and the missing percentage of Euro-denominated debt in the WB's dataset, render analysis challenging. Hence, although existent, the first realization is that data provision needs consistency and the same or improved frequencies to enable further research. The good recent development hence needs to be carried on, and data lacks have to be avoided. Furthermore, data for more than just the four reporting countries is needed. The BCEAO database shows that data is already collected and reported on a regional level to the central bank. However, further reporting to international and development institutions is still insignificant and needs improvement. This mainly concerns comprehensive debt statistics of the member countries, which should ideally identify the general size of debt positions, their composition, maturities, and interest payments.

The resulting limitations are vast and, hopefully, show the importance of improved data reporting. Restraints arising for this paper are, for instance, that data had to be disaggregated to increase the number of observations. This is not an uncommon practice in economics. However, the method used, linear interpolation, was chosen due to its simplicity. It does not guarantee accuracy or correctness but is just a basic assumption. Thus, changing the disaggregation technique to a more sophisticated method like Chow-Lin or Denton might improve the accuracy. However, the construction of more sophisticated disaggregation techniques requires higher frequency data in the form of an index to derive the aimed-for variable (Eurostat 2013, pp. 145–149). Thus, a broader and more reliable data provision would increase analysis quality and accuracy while introducing possibilities for analyzing a broader range of problems.

Another solution to this issue is a higher frequency of official data. The BCEAO documented such efforts for the composition of GDP (BCEAO 2014). However, the data is not publicly available online. Thus, unreported data or data only pertained in official reporting and briefings, not available in databases is problematic.

The missing CFA entries in the BIS database constitute a further example. This might be why Eichengreen et al. (2002) and other authors excluded the impacted countries in their analysis. Consequently, the WB's QEDS database was used in this paper, which only lists public and publicly guaranteed debt. Though it is a reasonable assumption that private non-guaranteed debt is relatively insignificant, the question remains how significant its impact might be. Nevertheless, this case, again, demonstrates quite visibly the challenges of conducting any analysis and comparison without consistent, centralized data.

Consequentially, a third subject-related constraint arises, i.e., the impossibility of calculating *OSIN3*. That is unfortunate from several perspectives. Firstly, it could have been utilized as a robustness check against the *OSIN1* values. Secondly, *OSIN3* covers hedged positions and, therefore, reflects the phenomenon more appropriately than *OSIN1*. Thirdly, *OSIN3* indicates the impact of bilateral development institutions and their influence on the phenomena of OS. Actual numbers could have yielded insights into bilateral development institutions' support of developing economies to diminish OS. As a result, an analysis of these values might have yielded better, more reliable insights.

Lastly, the paper worked against the assumption of the little explanatory power of time variance in *OSIN* values, as shown by Hausman and Panizza (2003, p. 969). Instead, the analysis leveraged the dataset's panel structure and examined indicators' influences on the region's time variance. The inherent reasons were the scarcity of available data and an interest in understanding the reasonable magnitude of the variance of *OSIN* in the last decade. Arguably, however, the time variance of *OSIN* can be more profoundly investigated when performing analysis against countries with more significant jumps in their most recent *OSIN* values, such as China or India. Those countries also yield the advantage that more indicators are available for analysis, inter alia *OSIN3*.

In the case of the WAEMU, the *OSIN1* values indicate an increase from 2015 onwards until early 2019, whereafter, a slight drop settled in. The increase was possibly driven by persisting budget deficits, the extension of government guarantees on state-owned enterprises, and a lacking debt surveillance framework identifying residuals, thus fiscal factors (International Monetary Fund 2019, pp. 8–9). Going forward, it is expectable that *OSIN* levels will increase again in the face of the COVID-19 crisis. The IMF (2021, pp. 3–14) already predicted sharp growth drops in the prior positive outlooks. In juxtaposition, the generally increased need for government expenditure to cushion COVID-19 impacts can lead to a foreseeable increase in the need for debt.

5. Conclusion

The paper derived the focal theory of OS from the literature, which pinpoints the inability of countries to indebt themselves in their own currency as a central issue. This effect, and the resulting net debtor status, hamper growth and development. Deriving from the finding that economic size constitutes the determining factor for the existence of OS, new regionalism theories identified economic cooperation and integration schemes, like SSCs and NSCs, as an option to overcome systemic issues like OS. However, these concepts recognize that

NSCs, but especially SSCs, are most likely insufficient to experience complete relief from OS, although they can constitute practical means for financial and monetary stabilization.

Then, the theory was applied to the WAEMU, identifying the region as a combination of an SSC and NSC. The SSC component comprises the monetary union between the member states, and the NSC constituent includes the ongoing ligatures with France and the peg to the Euro. The paper showed that OS exists in the WAEMU, reinforcing Panizza's conjecture that smaller SSCs, such as the CFA, do not entail a sufficient dimension to overcome OS. Moreover, it affirmed the assumption that OS is generally relevant in the West African CFA countries. Lastly, it underlines prior research findings arguing that regional integration and cooperation might increase cohesiveness and economic potential amongst members but is far from being the single means to overcome OS.

Subsequently, using Tobit regressions, an econometric model examined the influence on *OSIN1* in the region in a case-study-like setup, using variables of interest arising from prior literature and critique of the CFA opponents. The selected independent variables were separated into two categories first, general economic indicators, such as GDP, intra-regional trade, and inward remittances. The second cohort included the Euro-USD exchange rate, the spread between ECB and FED interest rates, and the percentage of Euro-denominated debt in the WAEMU countries' PPG debt portfolio. The data was organized in a panel structure.

The results delivered mixed outcomes. Cursorily considered, and when not controlling for time-invariant country dummies, the indicators of GDP, intra-regional trade, and remittances correlated positively with OS at mostly statistically insignificant levels. However, when controlling for country specificities, the findings of Eichengreen et al. (2002) were confirmed. A statistically significant negative relationship was verified in the WAEMU's case for GDP. However, for remittances and intra-regional trade, this influence could not be shown. Therefore, it appears that in the WAEMU, positive economic growth coincides with short-term decreases in *OSIN1* values.

Fiscal and monetary factors, such as the percentage of Euro-denominated debt in the total debt portfolio, appear to impact *OSIN* in the WAEMU. The results for the influence of the Euro-USD exchange rate are significant with country dummies. The increase of Euro-denominated debt and the Euro appreciation vis-à-vis the Dollar correlate with short-term increases of *OSIN1* in the region. Only the spread between US and European interest rates showed an insignificant relationship. However, the influence of these indicators remains somewhat opaque. Unfortunately, the dataset is too narrow to determine reliable and

generalizable results. In general, the results of the analysis are to be interpreted carefully. This is inter alia due to the interpolation of quarterly values, the unbalanced panel, unavailability of data and other member countries, and possible endogeneity. These constraints make generalizable assumptions from the model tricky.

Although the model and its analysis delivered mixed results, this paper proved the existence of OS in the WAEMU. Moreover, it exposed a potential impetus for further research. Time-varying factors might not fully explain the existence of OS. However, countries like the BRICS have recently shown significant fluctuations in their OSIN values. Thus, further research could investigate influences and derive potential reasons. Besides, the work demonstrated the crucial persisting issue of analyzing countries and data outside the general data dissemination systems of large multilateral institutions and economies. The dearth of available data constrained the model and its conception materially. This proves once more that data is vital to analyze and understand economic problems.

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Appendix

Table 18: WAEMU OSIN1 values per country and quarter

data.date	BEN.OSIN1	BFA.OSIN1	CIV.OSIN1	GNB.OSIN1
2010Q2			0.9633	
2010Q3			0.9632	
2010Q4			0.9638	
2011Q1			0.9637	
2011Q2			0.9654	
2011Q3			0.9568	
2011Q4			0.9495	
2012Q1			0.9495	
2012Q2			0.9461	
2012Q3			0.9423	
2012Q4			0.8388	
2013Q1			0.8392	
2013Q2			0.8283	
2013Q3			0.8318	
2013Q4		0.9437	0.8236	
2014Q1		0.9419	0.8243	
2014Q2		0.9412	0.8086	
2014Q3		0.9426	0.8330	
2014Q4		0.9278	0.8286	
2015Q1		0.9326	0.8536	
2015Q2		0.9322	0.8468	
2015Q3		0.9325	0.8465	
2015Q4		0.9325	0.8555	
2016Q1		0.9312	0.8489	
2016Q2		0.9326	0.8506	
2016Q3		0.9314	0.8507	
2016Q4		0.9354	0.8548	
2017Q1	0.7246	0.9345	0.8571	
2017Q2	0.6861	0.9312	0.8703	
2017Q3	0.6833	0.9300	0.8696	
2017Q4	0.6826	0.9280	0.8592	
2018Q1	0.6842	0.9300	0.8836	
2018Q2	0.6899	0.9329	0.8881	
2018Q3	0.7388	0.9341	0.8818	
2018Q4	0.7696	0.9209	0.8845	
2019Q1	0.6758	0.9215	0.8869	0.5613
2019Q2	0.6777	0.9222	0.8865	0.5633
2019Q3	0.6914	0.9254	0.8921	0.5597
2019Q4	0.6910	0.9228	0.8919	0.5457
2020Q1	0.6794	0.8930	0.8940	
2020Q2		0.8713	0.8537	
2020Q3		0.8703	0.8616	
2020Q4		0.8590	0.8501	

Source: Author's calculation based on the World Bank's (2021) QEDS_GDDS databank.

Table 19: OLS country dummies for R-squared

Linear regression				Number of obs	=	87
				F(3, 83)	=	1695.84
				Prob > F	=	0***
				R-squared	=	0.8895
				Root MSE	=	0.03518

OSIN1	Coefficient	Robust std. err.	t	P>t	[95% conf.	interval]
dummy_CIV	0.318	0.008	40.370	0***	0.303	0.334
dummy_BFA	0.366	0.005	67.920	0***	0.355	0.377
dummy_BEN	0.141	0.009	16.490	0***	0.124	0.157
dummy_GNB	0.000	(omitted)				
Constant	0.558	0.004	157.470	0***	0.550	0.565

*** p<0.01, ** p<0.05, * p<0.1, std. err. = standard error, conf. interval = confidence interval, obs = observation

Source: Author's calculation in Stata.

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