Macrothink Institute™

Business and Economic Research
ISSN 2162-4860
2024, Vol. 14, No. 1

The Effect of Policy Uncertainty on Money Demand in CEMAC Countries

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Received: December 17, 2023 Accepted: February 6, 2024 Published: February 21, 2024

doi:10.5296/ber.v14i1.21533 URL: https://doi.org/10.5296/ber.v14i1.21533

Abstract

The aim of this paper is to investigate the long run effect of policy uncertainty on money demand for Central African Economic and Monetary Community (CEMAC) countries over the period 1985-2017. We consider a more inclusive measure of policy uncertainty that encompass uncertainty related to economic and political events. Our measure of policy uncertainty is taken from the World Uncertainty Index (WUI) developed by the Policy Uncertainty Group. To estimate the money demand function, we employs panel data estimators that address issues of cross-sectional dependence and parameter heterogeneity. The estimates establish evidence of the long-run relationship between money demand and its determinants. It appears that the demand for domestic money increases with real income meanwhile decreases with the inflation rate. And so, the opportunity cost of holding money is reflected in the rate of inflation. The results associated to the exchange rate show that currency substitution does not hold in the long-run for the sample considered. The most important result is that policy uncertainty has an adverse long-term effect on money demand for CEMAC countries. Our results are robust to alternative panel estimation approaches. Thus, increased uncertainty leads people to hold less cash, while decreased uncertainty leads them to hold more cash.

Keywords: Money demand, Policy uncertainty, Cross-section dependence, Heterogeneity, CEMAC

JEL Classification: E41; C33

1. Introduction

The issue of money demand and its main determinants continues to attract keen interest among policy makers and researchers. The rationale for this interest is linked to the important role that the stability of money demand plays for monetary policy. Thus, understanding the money demand function is useful for the construction of macroeconomic models and the formulation of monetary policies suitable for developed and developing countries.

In most developing countries, monetary policy strategies pay particular attention to monitoring and evaluating changes in monetary aggregates with a view to the ultimate objective of monetary stability and in turn a stable money demand function (Bahmani-Oskooee et al., 2020). This is reflected, for instance, in the matching of the banking system's refinancing forecasts with those of growth, inflation and the funding of governments'external deficit. In this regard, an analysis of the demand for money typical of developing countries is fundamental to define appropriate monetary policy actions.

According to Laidler (1999), the relevance of monetary policies depends on a well-specified money demand function and an appropriate modelling of the relationship between money demand and its determinants. Theories of money demand have placed importance on factors such as real income, interest rate, inflation rate and exchange rate (Keynes, 1936; Baumol, 1952; Tobin 1956; Mundell 1963) (Note 1). Some researchers have even highlighted that the major determinants are real income and the interest rate (Bahmani-Oskooee et al., 2015). However, one of the notable factors that is considered in contemporary analysis of the money demand function is uncertainty (Choi and Oh 2003; Atta-Mensah, 2004; Bahmani-Oskooee et al., 2015). If the latter helps to explain the demand for money in studies carried out for developed countries, its involvement remains rare in studies relating to developing countries.

Ahir, Bloom, and Furceri (2018) observed that over the past decade, developing countries have experienced a higher average level of uncertainty than developed countries. Strictly speaking, uncertainty is a diffuse concept that characterizes the feeling or perception of economic agents (consumers, businesses or political decision-makers) about what might or might not happen in the future. Uncertainty exists when the economic agent does not have sufficient control over the situation in which he makes his decisions. The causes and consequences of policy uncertainty are multiple and diverse. From a broader perspective, policy uncertainty is linked to both macroeconomic (e.g. GDP growth, financial and economic crisis) and microeconomic (e.g. business investment and household consumer consumption decisions) phenomena and other events such as elections, political crises, geopolitical tensions, wars, natural disasters, epidemics and climate change (see Duca and Saving 2018). In times of increasing uncertainty, businesses postpone investment and hiring decisions and consumers refrain from spending, all of which can have harmful effects on economic activities. Uncertainty also affects the public's decision on the demand for money, which can lead economic actors to hold more cash and less other assets, or vice versa (Note 2).

Otherwise, facts about economic history relate that the failure of the US Federal Reserve to achieve a given level of inflation in 1979 following the introduction of control of monetary aggregates to the detriment of fixed interest rates gave rise to a serious controversy over the quantity theory of money and the stability of the money demand function. According to the quantity theory of money, stability in the velocity of money circulation is essential to observe any change in the level of output or prices following an increase in the money supply. Friedman (1984) attributes this failure of the inflation targeting policy to the fact that the Fed failed to stabilize and predict the evolution of its monetary aggregates. He maintains that the high volatility of the growth of monetary aggregates has increased monetary uncertainty which in turn causes greater demand for money.

On the other hand, the last two decades have seen the emergence of both theoretical and empirical literature on the money demand function including various measures of uncertainty. Based on a theoretical model, Choi and Oh (2003) demonstrated that output uncertainty affects the demand for money given that people hold less money when the expected inflation rate is high, whereas the demand for cash increases if people believe that uncertainty may lead to job losses. Following Friedman's postulate in 1984, many empirical studies have examined the impact of different types of uncertainty on money demand (e.g. Brüggemann and Nautz 1997; Choi and Oh 2003; Bahmani-Oskooee, Xi and Wang 2012; Bahmani-Oskooee et al. 2015; Ivanovsky and Churchill, 2019). However, they have produced mixed results, depending on the data, methodology, period, countries or uncertainty measures considered. For example, Brüggemann and Nautz (1997) showed that monetary uncertainty negatively affects the demand for money in Germany. The empirical results of Choi and Oh (2003) revealed that monetary uncertainty increases the demand for money in the United States. Furthermore, the literature is rich in other relevant contributions that have estimated the effect of uncertainty on the demand for money. To just mention few, we have, Hall and Noble (1987), Bahmani-Oskooee et al., (2012), Bahmani-Oskooee et al., (2013), Özdemir and Saygılı (2013), Bahmani-Oskooee and Kones (2014), Bahmani-Oskooee et al., (2015), Bahmani-Oskooee et al., (2016), Bahmani-Oskooee and Maki-Nayeri (2018a,b,c; 2020a, b), Gan (2019), Bahmani-Oskooee and Arize (2020), Hossain and Arwatchanakarn (2020), Mera et al., (2020), Ongan and Gocer (2021), Murad et al., (2021), and Akbar (2023).

A common feature of the studies listed above is that very few of them have examined money demand for developing countries and particularly African countries by incorporating measures of uncertainty. The exceptions are Bahmani-Oskooee and Arize (2020) and Bahmani-Oskooee and Kones (2014) for 21 and 13 African countries, respectively. Unfortunately, these studies do not cover most of the countries in the Central African region belonging to the Central African Economic and Monetary Community (CEMAC). Based on this observation, we believe that the field of investigation on this subject remains open and requires rigorous attention. CEMAC is an economic area made up of six member countries: Cameroon, the Central African Republic, Chad, Gabon and Equatorial Guinea. It is also a monetary union whose monetary policy conducted by its central bank aims to promote monetary stability by monitoring monetary aggregates and credit to the economy with the aim of maintaining an annual inflation rate below 3%. Like most developing economies,

those in CEMAC also face increased persistence of uncertainty – the 2008 global financial crisis and the current COVID-19 pandemic teach us this rightly. Policy uncertainty can contribute to strong divergences in the transmission of common policies and limit the effectiveness of monetary policy. In this regard, Bernanke (1983), Bloom (2009) and Aastveit et al., (2013) mention that periods of high uncertainty undermine the effectiveness of monetary policy. Given the crucial role that money demand plays in the final objectives of monetary policy, it is necessary to incorporate uncertainty in the specification and estimation of the money demand function in the specific context of CEMAC. Some studies have attempted to explain the demand for money based on its traditional determinants on samples often including CEMAC countries (Salisu et al., 2013; Talabong, 2012; Bahmani-Oskooee and Gelan, 2009). This study goes further by adding a measure of policy uncertainty to the modelling of the money demand function for CEMAC.

In this paper, we examine the effect of policy uncertainty on money demand for CEMAC countries. By explicitly including the measure of policy uncertainty alongside the conventional determinants (income, interest rate, inflation rate and exchange rate) of money demand, we estimate the long-run money demand function over the period 1985-2017. Unlike previous studies that use different types of indicators to capture uncertainty (e.g. output volatility, inflation uncertainty, exchange rate volatility, monetary uncertainty, etc.), we use the recent and more comprehensive measure of uncertainty developed by Ahir et al. (2018), namely the World Uncertainty Index (WUI). The WUI encompasses uncertainty related to economic and political events linked to short- and long-term concerns. Bearing in mind that cross-sectional correlation due to local spillover effects or unobserved common shocks occurs in CEMAC countries and that countries respond heterogeneously, our study also uses panel approaches of time series allowing cross-sectional dependence and heterogeneity between panel members. There is no doubt that the results of this study could provide central banks with relevant information to define their monetary policy.

This paper is structured as follows. Section 2 proposes the literature review. Section 3 describes the data and methodology. Section 3 presents the empirical results. Section 4 provides a conclusion.

2. Literature Review

This section presents a literature review of recent studies on the effects of uncertainty on money demand. As mentioned earlier (Section 1), several studies have shown the benefit of introducing a measure of uncertainty into the specification of the money function. We therefore explore studies based on country-specific data as well as panel data. For instance, focusing on country-specific evidence, Nusair et al. (2024) use monthly data for Canada, Japan, the United Kingdom, and the United States to estimate the function of money demand. They identify asymmetries in the effects of uncertainty across countries, suggesting that the impact on money demand differs depending on whether the economic policy uncertainty increases or decreases. Bissoondeeal et al. (2023) analyse in the context of three economies (the UK, US and Euro zone) the influence of the uncertainty on money demand. Applying a cointegrated VAR approach, they establish that Brexit uncertainty and Covid-19 affect the

money demand in the UK and the Euro area. In the setting of the Markov switching VAR model, they reveal that the effect of uncertainty on money demand seems to be greater in times of high uncertainty. Choudhry (2023) finds for the UK that uncertainty is indispensable for the stability of the money demand function and negatively affects the M0 and M3 aggregates. Khan et al. (2023) study the impact of different forms of uncertainty (economic uncertainty, stock market uncertainty and monetary uncertainty) on the demand for money in India using quarterly data for the period 2003-2019. The results indicate that all three forms of uncertainty are long-term determinants of money demand. The authors sustain that in situations of heightened economic, monetary and stock market uncertainties, people demand more money to protect themselves against a future financial crisis. Conversely, using monthly data from January 2003 to April 2018 for India, Murad et al. (2021) find that economic policy uncertainty is a short-run phenomenon whose effects on money demand encourage public to hold more cash. For a developing economy such as Pakistan, Abkar (2023) uses Bayesian statistical inference and finds that inflation uncertainty is a determinant of money demand. The results highlight that increased inflation uncertainty directly affects the precautionary and transaction motives of money demand. For China, Bahmani-Oskooee and Aftab (2022) provide statistical evidence of the role of policy uncertainty in the public's increased preference for cash. Bahmani-Oskooee and Arize (2020) adopt the linear and nonlinear ARDL approaches to prove that monetary uncertainty has greater long-term effects than output uncertainty on the money demand for 13 African nations. Bahmani-Oskooee and Maki-Nayeri (2020) assess the asymmetric effect of policy uncertainty on money demand in the UK and find that increases and decreases in uncertainty lead people to demand more money in the long-run. In the case of New Zealand, Hossain and Arwatchanakarn (2020) find evidence of a decreasing relationship between economic uncertainty and narrow money demand. Ivanosvki and Churchill (2019) find that the effects of the uncertainty on money demand in Australia are negative and positive in the short and long-term, respectively.

Some recent contributions also use panel data approaches to explain the link between money demand and uncertainty. For example, Mera et al. (2020) study the relationship between money demand and its determinants for eight Central and Eastern European Countries (CEEEs) between 2008Q1 and 2017Q1 using panel data methods that account for both endogeneity and common shocks. They find that perceived uncertainty, as reflected by the economic sentiment indicator, has a significant impact on money demand. They conclude that the precautionary motive is behind the increase in money demand. Gan (2019) estimates an augmented money demand function by applying the panel error correction technique on a sample comprising four developed and seven developing countries over the period 1995Q1 to 2016Q4. His results highlight the existence of a long-run decreasing relationship between real narrow money demand and economic uncertainty.

3. Data and Empirical Strategy

3.1 Data Description

Our empirical analysis is based on data available from 1985 to 2017 for five CEMAC countries (Cameroon, Central African Republic, Chad, Congo and Gabon). Due to lack of

data, we did not include Equatorial Guinea in our sample. The database of our study was built around the following variables. The real quantity of M2 monetary aggregate (real broad money - where the nominal money stock is deflated by GDP deflator) taken from World Development Indicator (WDI) database. The measure of policy uncertainty is taken from the Policy Uncertainty Group's World Uncertainty Index (WUI) (Note 3). For a given year, our "political uncertainty" variable is calculated as the average of the quarterly WUI data. We also include the income measured by real GDP (constant 2010 US$) and the inflation rate proxied by consumer price index (2010 = 100) taken from WDI. The interest rate is measured with the deposit interest rate from WDI and IMF (Note 4). The real effective exchange rates are from database developed by Darvas (2012a). Except for the policy uncertainty variable, all others are expressed in logarithm form. Supplementary information on variables and data sources are provided in the Appendix.

3.2 Empirical Model

Traditionally, the long-run money demand function includes a scale variable (economic activity - real income), the opportunity cost of holding money (inflation rate and/or interest rate) and exchange rates. In the context of the CEMAC region, we formulate an augmented form of the long-run money demand function by adding a measure of uncertainty. Moreover, we adopt a panel data model that allow for parameter heterogeneity and unobserved common factors in the money demand function. The model is specified as follows:

$$m_{it} = \beta_{1i} gdp_{it} + \beta_{2i} ir_{it} + \beta_{3i} p_{it} + \beta_{4i} ex_{it} + \beta_{5i} pu_{it} + \alpha_i + \vartheta_i f_t + \varepsilon_{it} \quad (1)$$

where m_{it} is the M2 monetary aggregate ; gdp_{it} is real GDP; ir_{it} is the interest rate; p is the inflation rate; ex_{it} is the real effective exchange rate; and pu_{it} is policy uncertainty . The parameter α_i stands for unobserved country-specific factors. f_t refers to the unobserved common factors with country-specific factor loadings ϑ_i. ε_{it} represents the error terms. The subscripts *i* and *t* denote country and year, respectively.

Concerning the effect of explanatory variables in Equation (1), we expect an estimate of β_1 to be positive, while β_2 and β_3 for interest rate and inflation rate, respectively, are expected to be negative. The value of β_4 could be negative or positive, dictated by the extent of the two contradictory effects arising from the depreciation: the substitution effect and the wealth effect (Arango and Nadiri 1981). The value of β_5 could be positive or negative, this allows us to assess how assets are allocated during times of uncertainty.

We estimate the parameters of equation (1) using econometric techniques for heterogeneous panel data models in a common factor framework. For this purpose, we employ the common correlated effect mean group (CCEMG) approach by Pesaran (2006) and the augmented mean group (AMG) approach proposed by Eberhardt and Bond (2009) and Eberhardt and Teal (2011). The main difference between these two approaches lies in how unobserved common factors are considered and estimated. In the case of the CCEMG specification, common factors are viewed as nuisance parameters. In the CCEMG estimation, to account for cross-sectional dependence, the cross-sectional averages of regressors and the dependent variable are added to the set of explanatory variables. Pesaran (2006) shows that the cross-sectional averages account for the unobserved common factors f_t. The CCEMG allows the estimation of the individual coefficients β_i (parameter heterogeneity) and computes the average coefficient, "CCEMG estimator", as follows: $\hat{\beta}_{CCEMG} = N^{-1}\sum_{i=1}^{N}\beta_i$, (see Pesaran (2006) for more details). On the other hand, Eberhardt and Bond (2009) develop the AMG estimator in the context of parameter heterogeneity and unobserved correlation between countries. Unlike to the CCEMG, the AMG considers the unobserved common factors as a common dynamic process that can be estimated. The AMG approach proceeds in three steps to derive the AMG estimator from the average of the individual estimated coefficients $\hat{\beta}_{AMG} = N^{-1}\sum_{i=1}^{N}\beta_i$ (see Eberhardt and Bond (2009) and Eberhardt and Teal (2011) for more details).

4. Empirical Results

The starting point of our empirically strategy for testing the long-run money demand is to check whether cross-sectional dependence exits across statistical units. To achieve this task, we apply the cross-sectional dependence test (CD test) of Pesaran (2004). Table 1 displays the outcomes of the CD test for each variable. The outcomes demonstrate that test statistics vigorously reject the null hypothesis of no cross-sectional dependence at the 1% significance level for all the variables examined. Hence, these outcomes support evidence of panel cross-member correlation, which means that there is interdependence between the CEMAC countries. This type of correlation may arise from common shocks on a global scale with heterogeneous effects across countries or from local spillover effects between countries or regions.

Furthermore, it is critical to recall that each of these countries has its own characteristics and ignoring this – or assuming homogeneity across countries, could lead to inconsistent and imprecise estimates. In this circumstance, econometric theory in panel data suggests to apply formal tests to assess the conjecture of homogeneous coefficients across units. Then, we apply the slope homogeneity test and robust in presence of a cross-sectional dependence developed by Pesaran and Yamagata (2008). In Table 1, the H_0 hypothesis of homogeneity of

the slope parameters at the 1% significance level, confirming heterogeneity across CEMAC countries. Having detected cross sectional dependence and heterogeneity across countries, the next step consists in determining the integrated properties of variables.

Table 1. Cross-sectional dependence and homogeneous tests

Pesaran (2004) cross-section dependence (CD) test				
Variables	test statistic	*p*-value	avg ρ	avg $\|\rho\|$
M	14.76	0.000	0.813	0.813
gdp	14.42	0.000	0.794	0.794
ir	13.81	0.000	0.76	0.76
P	17.68	0.000	0.973	0.973
ex	16.58	0.000	0.913	0.913
pu	3.28	0.001	0.181	0.197
Pesaran and Yamagata (2008) slope homogeneity test				
$\tilde{\Delta}$	10.582	0.000		
$\tilde{\Delta}_{adj}$	11.921	0.000		
Under the null hypothesis of crosssection independence CD ~ N(0,1).				

We use the panel unit roots test of Pesaran (2007), the cross-sectional augmented IPS (CIPS) test. The CIPS test allows heterogeneity and cross-sectional dependence in the panel. The results of CIPS test with and without trend provided in Table 2 are supportive of the null hypothesis that all variables in Equation (1) are I(1).

Table 2. Pesaran (2007) panel unit root test results

Variables				
	Level		First difference	
	Constant	Constant and trend	Constant	Constant and trend
m	-1.714	-2.349	-3.004***	-3.223**
gdp	-2.795***	-2.398	-3.506***	-3.631***
ir	-1.982	-2.416	-3.497***	-3.562***
p	-0.853	-1.154	-3.586***	-4.267***
ex	-2.377*	-2.654	-3.698***	-4.381***
pu	-1.853	-2.191	-4.128***	-4.175***

***,** and * denotes significance at 1%, 5% and 10% level, respectively.

Given that real broad money and its determinants are integrated variables, the question now is whether there is a long-term relationship between them. To do so, we employ error-correction-based panel cointegration tests of Westerlund (2007). Westerlund (2007) proposes four panel cointegration tests (G_τ, G_α, P_τ and P_α) that provide flexibility and allow heterogeneity in the specification of the long-run and short-run components of the error

correction model (ECM). To account for the presence of common factors (i.e. cross-sectional dependence) affecting the cross-sectional units, Westerlund (2007) recommends to proceed with the bootstrap procedure. The two panel statistics (P_{τ}, and P_{α}) test the alternative hypothesis that the whole panel is cointegrated, while the group statistics (G_{τ} and G_{α}) test the alternative hypothesis that at least one cross-section is cointegrated. Table 3 provides the results of the Westerlund (2007) tests for H0 that the panel is not cointegrated. Based on these results, the null hypothesis is not rejected by the group test statistics (G_{τ} and G_{α}). In contrast, the panel test statistics (P_{τ} and P_{α} at levels of 10% and 5%, respectively) reject the null hypothesis, providing evidence of cointegration for the entire panel. In addition, we test for cointegration between money demand and its determinants using the residual-based heterogeneous panel cointegration tests proposed by Pedroni (1999, 2004). This approach makes it possible to test the hypothesis H0 of absence of cointegration using a dynamic panel model, which admits heterogeneity between the members of the panel.

Table 3. Westerlund (2007) group and panel cointegration tests

Statistic	Value	*Z*-value	Robust *p*-value
G_{τ}	-2.668	0.052	0.130
G_{α}	-9.768	1.413	0.130
P_{τ}	-5.875	0.526	0.040
P_{α}	-10.504	0.218	0.040

Robust *p*-value are obtained from the bootstrap approach (100 replications)

To control for cross-sectional dependence on the Pedroni cointegration test, we use the time-demeaned variables (see Levin, Lin, and Chu, 2002). Table 4 displays the results of panel co-integration by Pedroni (1999, 2004) based on seven test statistics categorised as "within dimension tests" and "between dimension tests". The majority of the test statistics, specifically five out of the seven, reject the null hypothesis of no cointegration. Therefore, confirming the existence of a long-term equilibrium relationship between the demand for money and its determinants in CEMAC countries.

Table 4. Pedroni (1999,2004) Panel Cointegration tests

Within dimension test statistics		Between dimension test statistics	
Panel *v*-statistic	-2.632***	Group *q*-statistic	1.299*
Panel *q*-statistic	0.906	Group PP-statistic	-1.689**
Panel PP-statistic	-1.381*	Group ADF-statistic	-1.641*
Panel ADF-statistic	-1.272		

***,** and * denotes significance at 1%, 5% and 10% level, respectively, implying the rejection of the Null hypothesis of no cointegration.

Table 5 presents long-term panel estimates derived from the application of panel time-series

models featuring heterogeneous slopes. The income elasticity estimates of CCEMG found in Column (1) of Table 5 are significant and positive, indicating that a 1% change in income generates a roughly 0.62% increase in the demand for money. Instead, the estimates reveal that inflation rate, interest rate, exchange rate and policy uncertainty have no effects on the demand for money. Further, the CCEMG estimator is simply an average of common country effects; in this case, it ignores the effects of common and exogenous factors which differ from one individual to another in the panel. Indeed, the CCEMG estimator gives efficient estimates of the slope but does not address the problem of the spatial error process (Eberhardt and Teal 2010). Given these concerns, we implement the AMG estimator, the results of which are reported in Column (2) of Table 5. As before, the income elasticity exhibits the expected significant and positive coefficient. The behaviour of interest rate remains unchanged. In contrast with the above CCEMG estimates, inflation rate elasticity appears negative and statistically significant. The real effective exchange rate is shown to exert insignificant impact on the demand for money.

Beside the effects of the traditional determinants of money demand, it is also important to know how uncertainty affects money demand in order to propose adequate monetary policy strategies. The empirical outcomes show that the impact of policy uncertainty on money is statistically negative. Thus, in the CEMAC, increased uncertainty tends to reduce money demand.

For the sake of completeness, and as a robustness check of our findings, we use the panel cointegration estimator of Pedroni (2001), namely, Panel-Dynamic Ordinary Least Squares (PDOLS) estimator. This estimator is known to be super-consistent in terms of cointegration and credible even when certain regressors are omitted. Further, PDOLS addresses issues of endogeneity and heterogeneity of individuals in the relationship between money demand and its determinants.

Table 5. Long-run heterogeneous panel estimates

Independent variables	(1)	(2)
	CCEMG	AMG
gdp	0.621**	0.525**
	(0.251)	(0.268)
ir	-0.113	0.005
	(0.202)	-(0.160)
p	-0.055	-0.532**
	(0.693)	(0.208)
ex	0.244	-0.027
	(0.612)	(0.192)
pu	-0.222	-0.218**
	(0.182)	(0.087)
Constant	-1.614	11.919**
	(7.858)	(5.913)
RMSE(sigma)	0.0612	0.0747
Observations	165	165
Countries	5	5

***,** and * denotes significance at 1%, 5% and 10% level, respectively. Standard errors are in parenthesis. CCEMG: Pesaran (2006) common correlated effects mean group estimator; AMG: Eberhardt and Teal (2010) augmented mean group estimator.

As recommended in Levin, Lin, and Chu (2002) to control the effect of cross-sectional dependence, our robustness analysis uses data that have been demeaned over the cross-sectional dimension. Therefore, Table 6 reports a significant positive income elasticity as well as a significant negative coefficient of policy uncertainty that align with the above findings, despite the inflation rate, interest rate, and exchange rate not achieving statistical significance.

At this stage of the analysis, it is useful to discuss the results by comparing them with the findings of the literature. Our results regarding the positive effects of real income on money demand suggest that people hold more money in the long-run as the level of income increases in CEMAC. These outcomes are in line with Abkar (2023) for Pakistan, Bahmani-Oskooee and Arize (2020) for some African countries including Cameroon, Mera et al. (2020) for the Central and Eastern European Countries (CEECs). The significant long-term negative effects of the inflation rate indicate that the opportunity cost of holding money only passes-through the inflation level in the CEMAC area. This is especially true since the interest rate has no significant long-term effect on the money demand. Accordingly, the result is consistent with some studies on the estimation of money demand for African countries (e.g. Bahmani-Oskooee and Gelan, 2009). The result also agree with the argument of Crockett and Evans (1980) that it is appropriate to assess the opportunity cost of holding money using the

inflation rate in developing countries and interest rate in developed countries. The absence of a significant effect of the exchange rate allow us to state that currency substitution does not hold in the long-run for CEMAC countries. Although this finding contrast with those of Salisu et al. (2013) for Central Africa, it is line with those of Bahmani-Oskooee and Gelan, (2009) and Murad et al. (2021) for India.

Table 6. PDOLS long-run estimates

Independent variables	PDOLS (unweighted mean, demeaned data)	PDOLS (weighted mean, demeaned data)
gdp	0.674***	0.595***
	(0.110)	(0.078)
ir	0.015	-0.006
	(0.045)	(0.021)
p	-0.231	0.039
	(0.264)	(0.220)
ex	0.177	0.187
	(0.345)	(0.283)
pu	-0.585**	-0.411***
	(0.263)	(0.195)
Adj-R^2	0.978	0.977
Observations	157	157
Countries	5	5

'Demeaned data' means that the data has been demeaned over the cross-sectional dimension. "Unweighted mean" indicates the simple average of the country-specific DOLS estimates. 'Weighted mean' signifies that the individual beta coefficients are weighted by the size of their standard errors. ***,** and * denotes significance at 1%, 5% and 10% level, respectively. Standard errors are in parenthesis.

Our study mainly focuses on the role of uncertainty in understanding the demand for money. The main finding highlights the negative long-term effect of policy uncertainty on money demand. This means that in the long-run, increasing uncertainty leads people to hold less cash or decreasing uncertainty leads people to hold more cash. What could explain this fact? This result reflects that even when uncertainty decreases, people's distrust of uncertainty persists. Such an attitude would encourage people to hold more cash in anticipation of a resurgence of uncertainty in the future. Although our results are in line with Bahmani-Oskooee and Maki-Nayeri (2018a) and Bahmani-Oskooee and Arize (2020) for some African countries, they contrast with those of Ivanovski and Churchill (2019) and Abkar (2023) who find positive long-run effect of uncertainty on money demand.

The current study has some limitations that merit to be addressed in terms of future prospects. It would be interesting to distinguish the behaviour of money demand resulting from a period of increased uncertainty from that of a period of decreasing uncertainty. This would make it

possible to detect the asymmetric or non-linear effect of uncertainty on money demand in CEMAC.

5. Conclusion

The money demand analysis remains a vivid debate among academics and policymakers as monetary policy strategies rely on the formulation of the money demand function and the choice of its determinants. Most recent studies have included indicators of uncertainty alongside the traditional determinants of money demand. However, this study aims to estimate the long-term money demand function for the Central African Economic and Monetary Community (CEMAC) during the period spanning 1985 to 2017. Unlike previous literature that relied on monetary and output uncertainties, we employ a more inclusive measure of policy uncertainty, the World Uncertainty Index (WUI). This indicator of policy uncertainty encompasses uncertainty related to economic and political developments. It covers both short and long-term concerns. After carrying out a battery of diagnostic tests on the model variables, the empirical analysis applies a heterogeneous panel approach which takes into account unobserved common shocks and country heterogeneity, namely the CCEMG and AMG estimators. The results reveal evidence of a long-run relationship between money demand and its determinants. As shown by the long-run estimates, the findings suggest that the demand for real money increases with higher real income and decreases with a rise in the price level. Most importantly, policy uncertainty appears to be a key driver of money demand in CEMAC. The study highlights the negative long-term effects of policy uncertainty on the demand for money in CEMAC area. Increased uncertainty leads people to hold less cash, while decreased uncertainty leads them to hold more cash. These findings are also robust when applying alternative long-run panel estimation approach, PDOLS. Moreover, the results of this research may guide the monetary policy strategy formulation of the central bank of CEMAC member states.

Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Informed consent

Obtained.

Ethics approval

The Publication Ethics Committee of the Macrothink Institute.

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

Provenance and peer review

Not commissioned; externally double-blind peer reviewed.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

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Notes

Note 1. See also Arango and Nadiri (1981), Domowitz and Elbadawi (1987).

Note 2. According to Keynes (1936), individuals hold cash for reasons such as evading potential capital losses (demand for speculative money), safeguarding themselves against an uncertain future (demand for precautionary money) and spending (demand for transaction

money).

Note 3. For more detail see https://www.policyuncertainty.com/wui_quarterly.html

Note 4. Given that we are using a broader monetary aggregate, which includes interest-bearing deposits, it would be interesting to consider a long-term interest rate. However, due to the unavailability of data, we opt for the deposit rate as a proxy for the interest rate.

Appendix

Table A.1. Definition and source of variables

Variables	Designations	Definitions	Sources
m	Real broad money	Nominal broad money divided by GDP deflator	WDI
gdp	Real GDP	Gross domestic Product, (constant 2010 US$)	WDI
ir	Interest rate	Deposit interest rate (%)	WDI and IFS-IMF
p	Inflation-price level	Consumer price index (2010 = 100)	WDI
ex	Exchange rates	Real effective exchange rates (Updated version)	Darvas (2012)
Pu	Policy uncertainty	World Uncertainty index annual (as average of quaterly data)	WUI

WDI : World Development Indicators ; IFS: International Financial Statistitics; IMF: Inetrnational Monetary Fund; WUI:World Uncertainty Index

Table A.2. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
m	165	22.25	0.952	20.522	24.191
gdp	165	22.72	0.943	20.967	24.318
ir	165	1.623	0.696	.896	6.774
p	165	4.308	0.349	3.568	4.98
ex	165	4.724	0.227	4.26	5.317
pu	165	0.107	0.113	0	0.588

Table A.3. Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) *m*	1					
(2) *gdp*	0.960	1	(2) *gdp*			
(3) *ir*	-0.158	-0.110	1			
(4) *p*	0.279	0.261	-0.534	1		
(5) *ex*	-0.109	-0.163	0.379	-0.544	1	
(6) *pu*	-0.142	-0.142	-0.260	0.270	-0.234	1