Bank Financing for Small and Medium-sized Enterprises in CEMAC zone

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Abstract : *This paper develops and analyzes bank financing system for Small and Medium-sized Enterprises (SMEs) in CEMAC zone. The dynamic conditions of making decisions for assets to loans were presented. The model was implemented in python which show that many banks in CEMAC zone has low risk on financing SMEs apart from Guinea. It is possible therefore for Bank structure to adjust bank liabilities to give assets as much as possible to some SMEs, particularly the case of small enterprises.*

Keywords: Small and Medium-sized Enterprises; Liabilities; Risk.

1. Introduction

Worldwide, and particularly in CEMAC zone, small and medium sized enterprises (SMEs) contribute greatly to the economies of countries of CEMAC zone. Over the past few decades, topics related to SMEs have dominated the agenda of researchers, practitioners, and policymarkers in CEMAC countries. Due to the significant economic contributions of SMEs, this sector has earned increasing attention. In developing economies, SME sector plays a fundamental role in promoting economic prosperity through its significant contributions to income creation, the absortion of labour, and the alleviation of poverty (Roman, 2011, Nguyen, 2009). According to the Organization of Economic Co-operation and Development (OECD, 2004), SMEs contributed about 70 percent to employment and more than 55 percent to Gross

Domestic Product (GDP) in high-income economies. In middle income economies, the corresponding figures were 95 percent and 70 percent, and in low economies the statistic were 70 percent and 60 percent for employment and GDP respectively.

In addition SMEs create additional exporting opportunities and increase possibilities for generating innovation. Other positive aspects associated with SMEs within an economy include the fostering of entrepreneurship. SMEs have been also the focus of research in a number of ereas including financing (Berger and Udell, 2006), innovation (Rammer, 2008) and management (Hutchinson, 2008). A common finding is that access to finance is crucial for SMEs'survival, growth, and development. There is no doubt that access to finance is of importance for the ongoing and sustainable growth of this key sector through its role in facilitating the creation of new businesses and nurturing the innovation process as well as promoting the growth and development of existing business, which in turn boost national economic growth in development (as measured by income per capita) and financial development (as measured by the ratio of private credit to GDP), on one hand and the level of SME financing on the other.

Numerous extant studies address the access of SMEs to finance, bank finance particularly, as a dynamic factor of an enabling and productive economic environment, especially in developing countries where efficient equity markets and robust regulatory infrastructures are almost absent. In evidence, both the international finance Cooperation (IFC) and the World Bank rank economies according to the ease of doing business, which in turn is a reflective of the ease of access to finance increasing SMEs'acces to finance will lead to increasing the growth of SMEs which will have a direct effect on GDP growth given increased output, value-added, and profits. A recent World Bank report titled _finance for all_ particularly highlights the relationship between the increased access of SMEs to finance and GDP growth (World Bank, 2008, p.63). In respect to the order to sustain the substantial contributions of SMEs to aggregate economic growth, it is of critical importance to study SME financing generally, and bank finance in particular.

The aim of this paper is to obtain an informed understanding of the status of bank financing for SME in CEMAC zone. We will start by identifying used by SMEs at a start-up state, and then observing factors affect in bank engagement with SMEs, examining the factors that bank considers when making decisions regarding business loans to SMEs. Investigating what factors determine SMEs access to finance and finally determining the constraints faced by SMEs in accessing bank finance and factors perceived by the Bank as obstacles to it serving the SME sectors.

2. Small and Medium-Sized Entreprises Review

2.1 Definition and review

The definitions of SMEs are many and varied, changing from country to country and between the different sources reporting statistics on SMEs. Some of the commonly used benchmarks are the number of employees, net assets, sales, and investment. However, the most common definitional basis is employment. Nevertheless, even when the number of employees is the adopted criterion, there is variation in defining the upper and lower size limit of the SME' labour force. This is necessary when separating SMEs from other private enterprises and in

identifying their unique characteristics and challenges. While there is broad acknowledgement of the role of the SME sector internationally, defining SMEs remains a challenging task. In fact, there is no one generally agreed definition for "small and medium-sized enterprises" applicable in all countries. For instance, the IFC SME Country Indicator examines the formally registered small and medium-sized enterprises in 132 economies, out of which 12 have no exact definition for what constitute an SME, and 26 economies have more than one SME definition in place (Kushnir,2006). In fact, in some cases there are several definitions used within the same country due to the diverse characteristics of these enterprises in each sector in each economy. Some economies also distinguish between different types of SMEs. For example, China distinguishes between town and village enterprises, while in Singapore the definition of local SMEs differs from that of foreign SMEs (Harvie and Lee, 2002).

According to the Organization for Economic Cooperation and Development (OECD,2004), not only do the characteristics of SMEs reflect the economic patterns of a country but they also mirror the social and cultural dimensions of that country. These unique patterns are noticeably reflected within several definitions of SMEs adopted in different countries and regions. Whereas the number of employees is referred to as the distinctive criterion for SMEs in some countries, others use other criteria such as invested capital. A combination of a number of different criteria is also common. Adopted in 2003, and entering into force in 2005, the definition of the European

Commission (EC) for SMEs states that a small enterprise is one that has a headcount of less than 50 and a turnover or balance sheet total figures of not more than €10 million. A medium-sized enterprise is defined as the one which has a maximum headcount of 250 and a turnover of no more than €50 million or a balance sheet total statistic of no more than €43 million (European Commission, 2009). It can be observed that while turnover and statistics of balance sheet are part of this definition, the employment size is still the overriding factor (O'Reagan and Ghobadian, 2004).

Keasey and Watson (1993) argued that SMEs have different functions and are of various natures and types which lead to the situation where no single definition can be universally applicable to all SMEs. The absence of a common and generally accepted definition of SMEs can be ascribed to the diversity and richness of the characteristics of SMEs in addition to the political strategies and economic conditions in each country (OECD, 2004). Curran and Blackburn (2001) indicated that SMEs operate almost in each sector of the economy and, therefore, no standardized definitions apply to them across all sectors. Moreover, Harvie and Lee (2002) added that definitions of SMEs vary widely between countries because each economy and each sector in any country, experience differing phases of social and economic development.

Acknowledging the existence of differences in defining SMEs, Bridge, O'Neill and Cromie (1998) stressed that any definition of SMEs should possess, at least, two of the following. First, the management of the firm is independent and the managers are usually the owners. Second, an individual or a small group provides capital and ownership. Third, the firm mainly operates locally, however, its markets do not have to be local. Finally, when compared with the largest businesses in its industry the number of employees, sales volumes or other size measures must be small. The dearth of a formal definition of SMEs has resulted in different approaches to be adopted by governments, international organisations and national statistical institutions/bureaus in order to distinguish SMEs from other enterprises. These approaches can be either qualitative approaches or quantitative approaches. The qualitative approach depends on descriptive criteria such as small-scale decentralization and flat organisational hierarchy (Brytting,1991) whereas in the latter "the quantitative approach" the focus is on quantitative measures such as the number of employees, sales volumes, assets value and the level of investment (Lee and McGuiggan, 2008). In some cases, nonetheless, both measures are combined together.

Therefore, it can be said that in general SMEs are companies/entities whose characteristics satisfy certain qualitative criteria and/or do not exceed certain quantitative limits.

The qualitative methods for defining SMEs tend to focus on particular characteristics of SMEs that is inherent in their nature. According to Intarakumnerd, Chairatana and Tangchitpiboon (2002) the most common qualitative aspects used to define SMEs include its geographical scale or operations, degree of independence, and the type of management. In fact, some researchers argue that the use qualitative definitions which could better create the premises for harmonization and comparability of financial reporting of SMES is preferable (Buculescu, 2013). Such definitions based on qualitative criteria are also known as economic definitions.

Endorsing the qualitative approach Keasey and Watson (1993) criticised the quantitative-based definitions. They argued that if some firms are classified as small or medium according to their assets or sales turnover measurements in a certain sector, the same firms might be found to be belonging to large firms in another sector if the number of employees was taken as a measure of size. In an effort to prevent such problems and confusion in defining and measuring SMEs, Bolton Committee Report (1971) attempted to produce a qualitative definition for SMEs. The report recommended that three economic criteria are to be met for a firm to be classified as SME: (i) the firm has to have a relatively small market share, (ii) the firm is fully owned or partly ownermanaged; and (iii) the firm is independent in the sense of not constituting part of a larger firm. In line with Bolton Committee Report Keasey and Watson (1993) emphasised that a firm will be considered as SME if it satisfies special qualitative characteristics. They explained that an SME should be legally independent, run and managed by its ownermanager, and has relatively a small share of the market. In the same vein, Trewin (2001) maintained that when defining SMEs some management and organizational characteristics should be taken into account. These characteristics include: independent ownership and operations; close control by owner-managers who also contribute most, if not all, the operating capital; and principal decision-making by the owner-managers. In addition, the aforementioned report adopted some limits under the quantitative definitions that applied to different sectors of the economy. Three criteria of quantitative nature were employed. These criteria are; turnover, the number of employees, and the number of vehicles used in the firm. As such, retailing, wholesaling, the motor trades, and miscellaneous enterprises were defined by the turnover criterion. Enterprises operating in manufacturing, construction, and mining were defined according to the employment criterion, and transportation enterprises were defined based on the number of owned vehicles. Other researches such as Wynarczyk (1993) suggested other qualitative approaches to define SMEs. For example, the author stated that uncertainty, innovation, and evolution are three qualitative criteria that distinguish SMEs from large firms and can be used to define them. On the other hand, while maintained the key advantage of the qualitative approach in terms of its strong theoretical base Brooksbank (1991) argued that there are many practical problems surrounding its application/implementation as qualitative criteria are not always accessible as is the case for the quantitative information. Then, it can be said that while the economic definition was originally suggested to overcome the deficiencies and problems associated with the quantitative definition, in fact, in practice terms the latter is used more often because it is more practical and arguably less costly.

2.2 Quantitative approach

According to this approach, which is also known as the "statistical approach" criteria of quantitative nature are used to define SMEs. As such, the size of the firm is determined based on some selected quantitative criteria. In fact, quantitative-based definitions

of SMEs are the most popular ones used by researchers as well as policy makers. Work by Senderovitz (2009) concluded that in general all the official definitions of SMEs are quantitative in nature. In addition, Brooksbank (1991) believed that what fundamentally advantages the quantitative approach is its practicability since criteria such as the number of employees, sales, and turnover are readily accessible and unambiguous. The Bolton Committee Report (1971) realized that when defining SMEs the quantitative measures are important and should not be ignored. Hence, the report has suggested quantitative definitions for certain sectors and switched from qualitative approach into quantitative one. The reason behind this can be attributed to the fact that definitions that are based on quantitative measures are believed to be very simple and objective (Curran and Blackburn, 2001). In general, however, in terms of practice there are no standard criteria based on which SMEs can be defined in statistical terms. Some researchers (e. g. Harvie and Lee, 2002; Curran and Blackburn, 2001; Harper, 1984) identified alternative types of quantitative measures to define SMEs such as: value of capital, turnover, labour intensity, sales

volume, production capability, financial turnover, and some technical measures. Nonetheless, traditionally, the number of employees is the most common standard in determining the size of the firm (Ayyagari, Beck and Demirgüç-Kunt, 2007).

2.3 Role of SMEs

Almost in all countries, developed and developing as well as those in transition, the significant contributions to the socio-economic made by SMEs have been widely recognized. Their positive effects can be supported numerically in a number of areas including; generation and distribution of income (Beck, Demirgüç-Kunt and Levine, 2005; Kuratko, 2005), absorption of labor and curbing unemployment (Abor and Biekpe, 2007; Daniels, 1999; Glancey, 1998) and alleviation of poverty (Green, Kirkpatrick and Murinde, 2000). Moreover, some industries particularly in the sector of services have been predominated by SMEs. Computer software, marketing, and human resources development are cases in point (OECD, 2000). As a result, SMEs have been the focus of policies and programs that aim to achieve sustainable development goals in advanced and emerging economies as well as developing ones regardless of any differences in the economic systems adopted in those countries. Since the 1970s, SMEs have been widely researched primarily as a job creation tool. Tolentino (1995) attributed the potential economic and social benefits of SMEs to their ability to: (i) create jobs at low cost of capital; (ii) positively contribute to the Gross Domestic Product (GDP); (iii) create opportunities for employing appropriate technology; (iv) improve forward and backward links between different sectors; (v) provide support to large-scale enterprises; (vi) expand a pool of skilled and semi-skilled workers; (vii) provide an opportunity to expand the entrepreneurial base; (viii) provide the required flexibility to adapt to market failures; (ix) enter into market niches which are not profitable for larger enterprises; (x) contribute to development policies that are more oriented towards decentralization and rural development; and (xi) support governments' efforts to alleviate the negative aftermath of structural adjustment programs. It has been acknowledged that SMEs have enabled large number of people to engage in the economic and social mainstream of society (Korcsmáros, Takacs and Dowers, 2003). By providing job opportunities for millions of people particularly in rural areas SMEs have had the potential to promote economic growth and prosperity as well as reducing the income inequality gap. By so doing, SMEs have become the key to achieve high development levels and increasing the growth rate of many economies worldwide. Many studies conducted in

different parts of the world have documented the dual crucial role of SMEs in employment creation and generating of income. For example, Ayyagari, Beck and Demirgüç-Kunt (2003) conducted a rich detailed study aiming at investigating the relation between SMEs sector and

both growth and poverty alleviation by using a broad cross-country data base. They found that in high-income countries enterprises with less than 250 workers contributed about 70 percent to employment and more than 55 percent to GDP, while in the group of low-income countries, contributions made by such projects was approximately 30 percent in job creation and 15 percent to GDP. With regard to the middle-income countries, however, the figures were 55 percent, 35 percent for employment and GDP respectively. In the United States, in 1995, just over 99 percent of all employers in the private sector was represented by SMEs (OECD, 2000). In 1997, this figure expanded by 5 percent, while the increase in the number of total employer firms was 2.2 percent. In addition, Audretsch (2000) analysed of the differences between the static role of SMEs and their dynamic role in the American economy during a five-year period of time 1990-1995 in terms of employment taking in consideration the emergence of new firms (births) the exit of others (deaths), and the rise of labour force in existing firms (expansions) as well as any reductions (contractions). His results showed that of approximately 13 percent increase in the employment rate the share of SMEs was considerably greater than that of large corporations. He Also found that firms with less than twenty employees provided nearly one-third of the jobs created by new firms. He added that employment resulted from the start-ups of new SMEs over the given period soared by 144.69 percent. A later paper by Edmiston (2007) reported that from 1990 to 2003, small firms (less than 20 employees) accounted for 80 percent of the net new jobs created in the US economy. Medium firms (20 to 499 employees) accounted for 13.2 percent of the net new jobs, while large firms (500 or more employees) accounted only for 7.3 percent. As

for their contribution to the creation of wealth in the country, Kuratko (2005) reported that of up to $440 million saved by SMEs in 1987 above 75 percent of those funds collected in the USA.

Likewise, Canadian SMEs have been participating significantly in the local economic progress. According to Ravi (2011) in 2009, more than 99 percent of the existing business establishments in the Canadian economy were SMEs. These firms have employed 64 percent of private sector employees in the country. Canadian SMEs contribution to the GDP had increased from 26 percent in the year 2000 to nearly 30 percent during 2008. Likewise, in the European Union (EU) SMEs has been the main source of employment creation over the last decades. In 2005, there were almost 20 million enterprises active within the European member states the overwhelming majority of these (99.8 percent) were SMEs with less than 250 employees (Schmiemann, 2008). Spence and Perrini (2009) referred to the fact that of the six million new job opportunities generated between 1998 and 2004 in the EU-27 countries, five million were created by SMEs.

In Spain, in the nineties an average of 38.5 percent of the new employment opportunities were created by SMEs (less than 200 employees) compared with only 13 percent existed in large firms (more than 200) (Trouve *et al*., 2001). Additionally, Trouve *et al*. (2001) demonstrated that recently established enterprises account on average for a 15 percent higher proportion of total job creation than other enterprises. Another example is that of the German SMEs segment which is the employer of about 72.6 percent of the labour force in Germany (Kadiri, 2012). Since Bolton Report was published in 1971, SMEs have been the target of nationwide development policies in the UK. Consequently, numerous schemes and national programs have been implemented in order to improve the economy performance. It is estimated that there were 3.7 million active businesses in UK, of these, small businesses accounted for over 99 percent and a further 25,000 were of medium size (Chen *et al*., 2006). The figures indicate that these businesses employ over ten million people, a figure that amounts to over 40 per cent of private sector employment, and they collectively turn over £1,287 billion, accounting for over 40 per cent of the private sector total (Hann, 2012). In the neighbouring country of Ireland, similarly, 98 percent of all employment opportunities attributed to firms having less than 50 workers

(Carey and Flynn, 2005). Emerged mainly as a result of the privatization process as well as restructuring and downsizing of large state-owned enterprises SOEs, SMEs sector in Eastern European countries seems to be smaller and younger than its counterparts in the most advanced economies in the continent. Nevertheless, it is the most vibrant sector which has been credited to assist these economies to prosper. Collecting data from 15 countries composing a sample of 97,107 firms, Klapper, Sarria-Allende and Sulla (2002) studied the behaviour of SMEs in the private sector in the region. They found that SMEs were responsible for generating more than 50 percent of gross employment opportunities. They also noted some stark differences between countries in the sample in terms of the number of firms and the participation of these firms in total employment. For example, 71 percent of the total employment in the Estonian economy was attributed to SMEs sector whereas the figure was only 8 percent in Russia. The explanation given by the authors was that this may be due to either differences in the size of population and the level of development across countries or a bias in the data since the sample confined to the formal sector excluding the informal one which may be larger in some countries. The salient example that can be cited to emphasize the crucial role and speedy development of SMEs is that of Asia-Pacific economies. Numbering hundreds of thousands and constituting more than 90 percent of all non-agriculture firms SMEs in the region hire a substantial portion of the domestic workforce ranging from 75 percent to more than 90 percent and responsible for 30 percent of direct exports and 10 percent of foreign direct investment (Wattanapruttipaisan, 2003). In Singapore, for instance, SMEs account for more than 90 percent of all enterprises in manufacturing, commercial, and services sectors providing half of the employment opportunities in the country and contributing about a third of the total value-added. In Taiwan, nearly 98 percent of the total enterprises are SMEs with a share equals to 70 percent of the total employment making 48 percent of total exports for the country's economy (Shariff and Peou, 2008). As in (Tambunan, 2007) irrespective of the agricultural sector, Indonesian SMEs dominate about 90 percent of all establishment firms contributing the same percentage to the total employment. In Australia, at the end of June 2011 SMEs comprised 99.7 percent of all trading businesses in the country (Clark *et al.*, 2012). They contributed 57.1 percent to the GDP and 70 percent to private sector employment (Clark *et al.*, 2012). In the same vein, in China and Japan SMEs have had the greatest contribution to the economic prosperity undergoing in both nations. In China, over the period of time 1978-1996 the Chinese SMEs were the employer of nearly 230 million of the local force labour (Shi and Li, 2006) and contributed up to 58.5 percent of GDP, 50 percent of tax revenues. Chen (2006) gave more detailed figures. He cited that of all registered corporations the percentage presented by SMEs exceeded 99 percent at the end of 2001 when they were the largest employment opportunities provider with 85 percent in the industrial sectors, 90 percent in the retailing industry, and over 65 percent in the construction industry. In Japan, approximately 78 percent of the total jobs provided in the country are generated by SMEs (Korcsmáros, Takacs and Dowers, 2003). Moreover, in Tokyo alone 99.5 percent of all factories have less than 300 employees employing around 74 percent of the capital city's workforce (Kadiri, 2012).

2.4 Problems of SMEs

Despite the critical importance of SMEs that has been discussed earlier, they continue to experience significant problems and constraints which lead to their contributions to fall short of expectations. According to Coad (2007), the growth of SMEs is a particularly unpredictable phenomenon. Entry rates of new firms are high; nonetheless, a large number of new entrants firms can be expected to disappear within a few years. Bartelsman, Scarpetta and Schivardi (2005) analysed the post-entry performance of new firms in seven OECD countries. They found

that about 20-40 percent of entering firms fail within the first two years while only about 40-50 percent survives beyond the seventh year. According to the authors, one of the reasons they do not survive is that they face several obstacles and challenges over time. The difficulties SMEs encounter are not identical to those faced by large firms. Although each country' economy is different from others it has been recognized that SMEs, in general, are confronted by the same problems. It is documented that most of these problems are said to be due to the characteristics of SMEs as being very risky and have high levels of uncertainty or to those of their owner-managers and their attitude towards remain independence. Problems and difficulties facing SMEs can be managerial, financial, and technological. SMEs also face problems relating the regulatory environment and marketing. Among these problems and difficulties, the availability and cost of capital is the most common and the most important. Finance is essential for SMEs to grow, expand, and prosper. As such, not surprisingly, the lack of access to finance can cripple SMEs growth prospects. Unlike large companies which are able to raise finance from many different sources, SMEs rely much more heavily on debt financing especially loans from banks for their short-term and long-term needs and have little or no access to other sources of funding. Kihimbo, Ayako and Omoka (2012) argued that because of SMEs inability to pledge the required collateral financial institutions, especially banks, view these firms as very high in risk. Therefore, in most cases, they are unwilling to finance them, or alternatively, SMEs will need to pay significantly higher interest rates than large enterprises on loans of the same type and maturity. In addition, in such cases, the tendency of asymmetry information to exist between SMEs' owner-managers and the potential external investors or lenders is a major contributing factor to this problem. The difficulties SMEs face can be considered internal if they are caused by the ownermanagers themselves. The over involvement of SMEs' owner-managers and their lack of financial and managerial knowledge can disadvantage their firms. This situation makes SMEs weak and unattractive to deal with not only from the point of view of finance providers but also from those of both raw materials suppliers as well as services providers. As a result, many SMEs may have to decrease their volume of production or reduce its quality because of lack in supply of raw materials (Tambunan, 2000) which, in turn, may affect their market share. Bruch and Hiemenz (1984) argued that supply of raw materials for SMEs is often unstable in quantity, quality, and price because of lack of infrastructure in transportation and communication more relevant to SMEs especially in the early stages of their lifecycle. In addition, the literature on SMEs argues that owner-managers' managerial weaknesses contribute to frequent business failure. Such weaknesses have been identified in a number of key areas such as; strategic planning (Wang, Walker and Redmond, 2007), marketing (Percy, Visvanathan and Watson, 2010), human resources management (Bacon *et al.*, 1996), use of information technology (Kiveu and Ofafa, 2013), and business networking (Franco and Haase, 2010). Regulation requirements imposed by governments have an important impact as a constraint on SMEs. Such a problem creates more barriers for SMEs in start-up stage and the following early growth stages. Regulatory and procedural requirements entail business costs which must be incurred by potential entrants including initial financial outlay. It is argued that such regulatory requirements can become prohibitive in terms of costs and this might deter potential entrepreneurs or drive them to the informal sector (Djankov *et al.,* 2002). Consequently, this can impede SMEs' ability to grow and positively contribute to the economy. A study by Desai, Gompers and Lerner (2003) found a negative correlation between firm entry and the number of start-up procedures. Furthermore, Klapper, Laeven and Rajan (2004) reached a conclusion that entry regulation requirements hamper firm entry even more in industries with naturally high rate of entry. Lee (2001) believes that SMEs with high levels of technological sophistication can be expected to grow rapidly. However, the level of technological capabilities represents a real growth challenge for SMEs especially in developing countries. In spite of the global technological advancements, SMEs are still hindered by their lack of technological

implementation (Arinaitwe, 2006). Without technology, SMEs will find it difficult to compete or grow. In a similar vein, it was found that inability to adopt technology impede SMEs from fully reaching their potential (Romijn, 2001). SMEs also encounter important challenges in the area of marketing. Research by Smit (as cited in Cant, 2012) showed that many SMEs failed because of lack of understanding of the relevance and importance of marketing for their businesses. The study by Brink, Cant and Ligthelm (2003) identified some marketing issues which impact on the survival and growth of SMEs. These issues include poor location, insufficient marketing, inability to conduct marketing research, poor products or service, misreading the market, poor service, and misreading customer trends and needs. There are more problems facing firms in SMEs sector include; the lack of technology, the lack of skilled workers, production functions, inadequate infrastructure, and the problems in the export market relating to the lack of information about international trading practices. Each one of these problems has a relation with the previous problems in one way or another.

The role played by SMEs in the economy has been proved to be the catalyst in the development process in most nations. However, because each country has reached a particular stage of development and each country has its own social, political, and cultural background there is no consensus on SMEs definition nor is there a single uniformly accepted definition that can be applied worldwide. Definitions of SMEs differ from one country to another and even from one institution to another in the same country according to the approach adopted whether it is of quantitative or qualitative nature though the most commonly used yardstick is the number of employees. In practice, however, a mix of both qualitative and quantitative criteria is frequently used. Due to their flexibility in absorbing labor, widely spread distribution, innovative capacity, and profitability the importance of SMEs in the socio-economic development is well documented. Almost in all countries SMEs have the share of lion in terms of the number of firms in the economy. They greatly contribute to the economic and social development in areas such as creation of employment, more equitable distribution of income, and hence poverty alleviation. SMEs have some general characteristics distinguishing them from large companies; yet, they offer complimentary services to the large companies and act as the seedbed for the development of entrepreneurial skills. SMEs face many difficulties hampering their growth. These problems can be related to external and internal factors. Regarding external factors, there are a number of obstacles constraining their growth such as the availability and cost of capital and government regulations. In terms of internal factors, there are also important constrains hindering their growth, for instance, poor management and financial competences, shortage of skilled labor and raw materials, gaps in information and knowledge. In the Libyan context, SMEs have been recently receiving more attention due to their vital role in the current transformation of the national economy. As a result, a number of initiatives and national programs have been launched in order to promote entrepreneurial culture and provide the suitable environment for a thriving SMEs sector. However, the value added, contribution, growth, and performance of SMEs has been considerably low. The reason is that Libyan private sector in general and SMEs in particular lack business expertise and face problems of economies of scale and poor managerial, financial, and marketing capabilities not to mention the problem of finance.

3. Methodology

SMEs are a vital part of the development process and their contribution in terms of production, employment and income in both industrialized and developing countries is widely

recognized. Limited access to the financial resources required to start survive and grow is one of the problems faced by SMEs, which represent a heterogeneous group of companies with different needs depending on their stage of development. An environment conductive to business development and growth includes a sound structured finance. This sector includes intermediary institutions providing financial services in the United States. Unfortunately, in Central Africa, the sector is not yet developed, although macroeconomics reforms and restructuring in recent years, there have been some salutary changes in the banking sector.

In this paragraph we will focus on how to restructure the financing sector to allow development of SMEs?

Recognizing the challenges facing the financial sector in African countries, the World Bank has drawn up a specific adjustment programme in order to restructure this ailing sector of African countries. He recapitalized ailing financial institutions and brought interest rates in line with conditions market given that many of the loans- including lines of credit and loans offered by foreign donors to the whole licensing systems for new financial institutions, further encourage competition between financial institutions and change the operating rules of some of the state-controlled institutions to operate at the grassroots basis.

The structural adjustment measures advocated by the World Bank could only lead to a difficult transposition period, as credit controls and rising interest rates have created problems and barriers for loan-dependent business. Due to fluctuations in foreign exchange rates, it has been more difficult to services foreign loans and the costs of materials and equipment imports have recovered strongly, which has caused a stir in the inflation and interest rates. The liberalization of the trade has created situations where the products of local SMEs could not compete with the inexpensive imported goods. All these problems have meant serious difficulties for SMEs in the sector. Many of which have ceased operations in African countries since the beginning of the structural adjustment. Less dependent on imported equipment, less exposed to foreign competition and fluctuations.

Our data collection will be based on a case study, observation, review of data from different databases, report of the World Bank (WB), the International Monetary Fund (IMF). There would be a rigorous collection of data to ensure consistency in our results, as this will allow an appropriate understanding of our research topic and questions addressed.

Then we will turn our attention to one of the possible approaches to bank modeling as a dynamic system, which can be called hybrid. The main tasks which the model developed must solve are the analysis and management of liquidity and stress testing of a bank. In addition, it can be used for optimization of assets profile. Aggregation of elements of balance sheet can be varied

according to the objectives of modeling and principles developing of state variables vector. We will use the following simplified schematic (Tab. 1). Fixed assets of bank we will ignore, taking into account only financial flows. Obviously, balance sheet equation takes place:

balance sheet equation takes place:
$$A = S+B+Q+X=Y+C+M=L, \qquad (1)$$

where equity (capital) of a bank C is a balancing variable. For detailed modelling of credit risks, loans issued can be divided by categories of the debtors having various reliabilities. Division of deposits on time and demand is necessary for calculation of instant liquidity. It is ignored in considered below version of the model for simplicity. The main difficulty in modelling of assets and liabilities dynamics is concerned with necessity taking into account terms of loans and deposits. Due to these the state variables must depend on two parameters - current time (t) and current "age" (τ) or the remained term to maturity (T-τ). That is why dynamics of the issued loans can be described by following transport equation:

$$\frac{\partial x}{\partial t} + \frac{\partial x}{\partial \tau} = u(t,\tau), \qquad (2)$$

In addition, $X(t) = \int_0^T x(t,\tau)\,d\tau$ represent the total amount loans issued,

$$X^*(t) = \int_0^T x(t,\tau)\,e^{-\delta\tau} d\tau$$

Represent the value of loans, T-term of loans.
Movement of time deposits is described similarly:

$$\frac{\partial y}{\partial t} + \frac{\partial y}{\partial \tau} = v(t,\tau), \qquad (3)$$

$Y(t) = \int_0^T y(t,\tau)\,d\tau$

represent the total of time deposits,

$$Y^*(t) = \int_0^T y(t,\tau)\,e^{-\delta\tau} d\tau$$

Represent value of time deposits, T-term of deposits

Variables $u(t,\tau)$ and $v(t,\tau)$ denote the flows of issued loans (temporary outflow of financial resources of bank) and deposits (temporary inflow) distributed by time taking into account amortization (interest payment or installment credits). Accordingly, total inputs of loans $U(t)$ and deposits $V(t)$ (or its present values $U^*(t)$ and $V^*(t)$) is described as:

$$U(t) = \int_0^T u(t,\tau)d\tau, \quad U^*(t) = \int_0^T u(t,\tau)\,e^{-\delta\tau}d\tau$$

$$V(t) = \int_0^T v(t,\tau)d\tau, \quad V^*(t) = \int_0^T v(t,\tau)\,e^{-\delta\tau}d\tau$$

Solutions of equation (2) and (3) can be represented as follow:

$$x(t,\tau) = \int_0^t u(\xi,\tau - t + \xi)d\xi + \psi(\tau - t)$$

$$y(t,\tau) = \int_0^t v(\xi,\tau - t + \xi)d\xi + \varphi(\tau - t)$$

Where $\psi(\tau - t)$ and $\varphi(\tau - t)$ are initial distributions of loans and deposits by "age", or may be
obtained by use corresponding equations with finite differences.

Dynamics of reserves (S) and equity (C) is described by the equations including stochastic members which consider random nature of change in value of shares and possible loans losses:

$$dS = [U(t) - V(t) + \theta_X X - \theta_Y Y + \theta_B B - \theta_M M - Z(t)]dt + \mu Q dt + \sigma Q dW_t - x_t dJ_t$$

$$dC = [\theta_X X - \theta_Y Y + \theta_B B - \theta_M M - Z(t)]dt + \mu Q dt + \sigma Q dW_t - x_t dJ_t$$

where *dWt* – increment of Wiener stochastic process, *dJt* – increment of compound Poisson process with exponential distributed size of jumps (loan losses), *Z(t)* – operation expenses and payment for dividends; $x_T(t)$ – repayment of a loans in maturity date, θ_X, θ_Y, θ_B, θ_M accordingly interest on loans, deposits, bonds income, cost of credits; μ - average portfolio return of trading securities, σ- volatility of securities portfolio. Investments in liquid assets - shares *Q(t)* and bonds *B(t)* can be considered as some parameters of management and to be calculated, proceeding from structure of assets chosen or planned by bank taking into account loan demand. Similarly, the volume of received loans *M(t)* can be select depending on bank`s requirement in financial resources. It is necessary to add the equations of dynamics of duration to the equations of movement of assets and liabilities to model liquidity risk taking into account change of interest rates.

If we consider the r-th annual rate of funds that SMEs received for an asset $x(t,\tau)$ is defined by:

$$D_x = T - \frac{1}{X^*(t)} \int_0^T \tau.x(t,\tau)e^{-\delta\tau}\, d\tau$$

Where **δ** = *ln(1+r)*.

Similarly, duration of another financial flows y(t,τ), u(t,τ), v(t,τ) are calculated. It is possible to show that dynamics of duration is described by any of presented below the equations which is chosen according to liquidity research tasks.

$$\frac{dD_x}{dt} = \left[D_u(t)\frac{U^*(t)}{X^*(t)} - 1\right] - \lambda(t)D_x - \delta D_x$$

$$\frac{dD_x}{dt} = [D_u(t) - D_x]\frac{U^*(t)}{X^*(t)} - \left[1 - D_x\frac{x_T(t)}{X^*(t)}\right] - \delta D_x$$

Thus
$$\frac{dD_x}{dt} = \lambda(t)[D_u(t) - D_x] - \left[1 - D_x\frac{x_T(t)}{X^*(t)}\right] - \delta D_x$$

Model (2-3) has been transformed to system of difference equations and realized as computer program (see Alekseev, 2011). The user independently chooses one of two operating modes of the program: calculation in case of predefined planning horizon, or calculation with possible correction of parameters, setting physical speed of calculation. The program is interactive as the user can change values of some key parameters in the process of calculation, without interrupting its work. As key parameters are chosen: a fraction of cash invested in various kinds of assets, revenues (interest rates), a duration of demand deposits, credit demand, inflow of deposits, crediting scenarios (distribution of loans by time). Dynamics of inflows and outflows of cashes; diagram of change of durations of assets and liabilities; distributions of loans and deposits, and also input flow by time are displayed on the screen of computer. A stress-testing is provided in the program. The user can choose the period of stress-testing and such stresses-scenarios as decrease in inflow of deposits, decrease in duration of deposits (the scenario of outflow of deposits); decrease in accessible volume of attracted funds on the interbank market.

4. Simulations and results

The following figures are simulation obtained from python showing the evolution of loan attribution for SMEs in CEMAC zone.
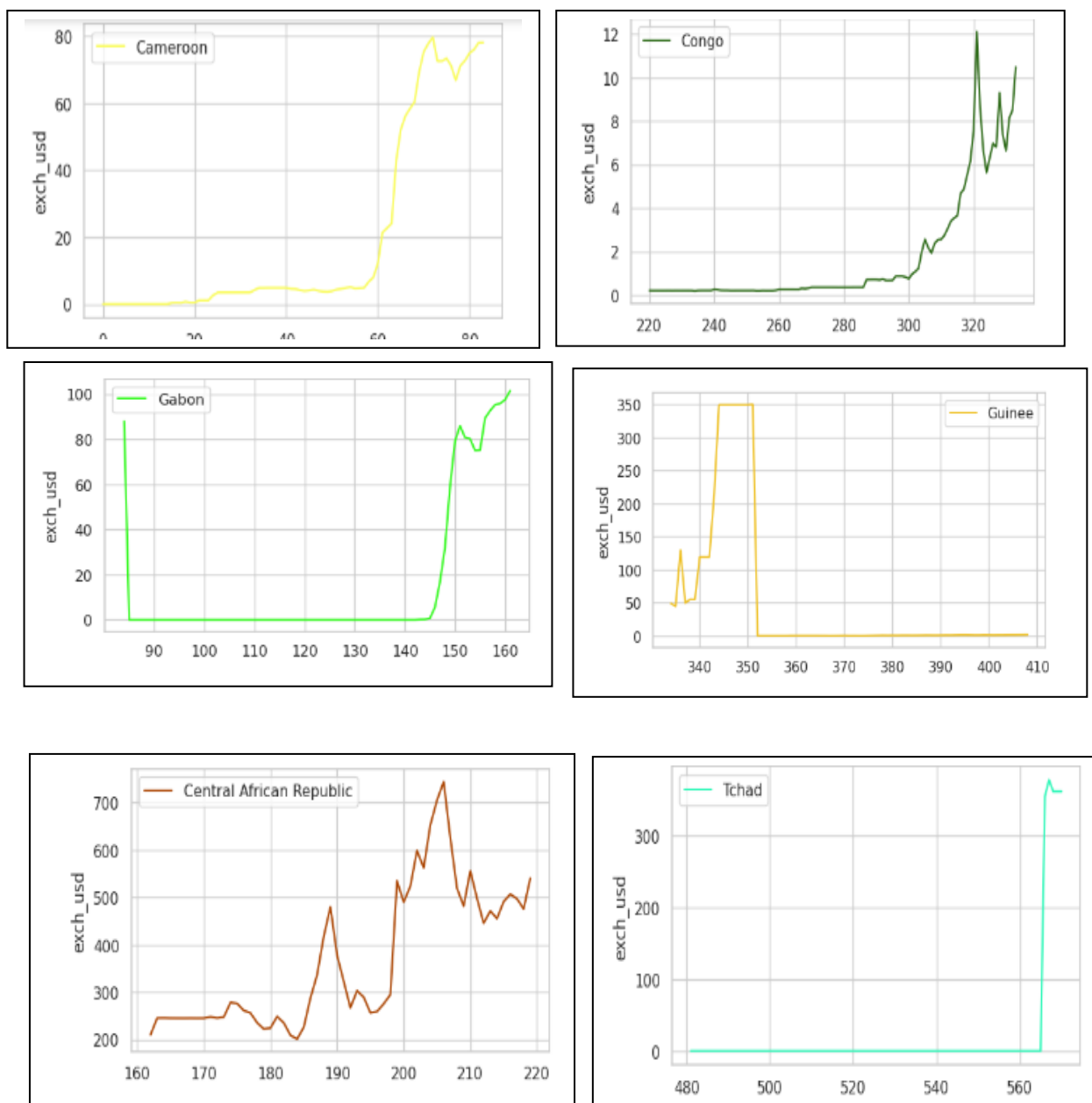
Figure 1: Simulation of Paiement rate for SMEs in CEMAC zone

The dynamics of asset and liability portfolio system on bank is described by only four equations for total loans issued and deposits on cash flows of interest rate, cash reserved and equity. The model of internal activity of a bank, with $R_t = 15\%$ Shows that banks in CEMAC zone expect high interest on loans as the repayment rate gradually increase with time as we can see in the simulation figures.

It is necessary to develop a modelling approach as part of decision support system for asset and liability management in commercial banks. However, availability of data to researcher in studying financial sectors is necessary and parameters of some special cases need no assumptions. The research can be extended by incorporating the fixed asset component of assets and stability of liquidity. SMEs should also develop sponsorship in order to increase their

loans credibility from bank financing. For instance, by looking at the case of broli, he can find more sponsors to increase the value of their product therefore increasing also the bank financing system for their expansion. As shown by simulations, only Guinea which the percentage of giving loans to and SME decrease over time and this can be explained by the fact that population rate is very low and also lack of equity. We have also a lack of financial information on the part of these SMEs. Societe General bank system provide assistance to Guinea by supporting Guinea economy, this bank system has built a relationship of trust with 106,000 local and international clients by offering them a wide range of products and a variety of innovative needs.

We can conclude that in central Africa Guinea has the best strategy of octroying loans to SMEs and also many SMEs are more working with their own budget first before looking for help. The other countries of central Africa can adopt this strategy too and that will considerably reduce the rate of poverty in CEMAC zone.

Regarding again into simulations, one can observe that the bank financing system has increase the rate in Chad recent years. This is also showing that Chad has experienced development recently in term of enterprises even in term of jobs opportunities. This can also be justified by the presence of durability and consistent project inside different SME. The Agence Française de Development has also played an important role in the economy of Chad. There also been technical assistance to SMEs in Ndjamena, specifically. Communication support: development message and promotion activities. Inside many PME in Djamena there has been design of a computerized monitoring and evaluation system. SMEs have received advices to achieve a sustainable economic model, so this can also be an argument that explain the huge growth of bank financing system in Chad. The banking system that has impact the most in SMEs in Chad was Societe General; it has been providing daily support to its customers in carrying out their projects. This banking system has offered assistance of 327,978,500 XAF of emergency loans to small and medium sized enterprises affected by the economics consequences caused by COVID-19.

Others countries of Central Africa as Gabon, Cameroon and Congo have experienced increases in financial assistance for SMEs. For the case of Cameroon, one can explain it by many reasons and among them we have personal relationship between SMEs and banks. The level of Human capital also influence on it.

5. Conclusion

Our study of bank financing system for small and medium sized enterprises in CEMAC zone was based on the data given the financial transaction from banks to companies in CEMAC zone. We have come to an observation that globally loans have increased. This is due to the fact that many SMEs in Central Africa built partnerships with different finances supports. And

therefore, increased their probability to get credit to make the enterprise work. Also, other reasons are infrastructures support and durability and consistent of projects of companies. Meanwhile, some countries like Guinea and Gabon are experimented decrease in the financial support from the bank to their companies. Population rate is very low and also lack of equity. We have also a lack of financial information on the part of these SMEs.

As a policy recommendation since the factor that influence the most bank financing system for SMEs is the lack of partnership with banks and financial companies. We shall recommend that SMEs should built relationship with partners and mostly with banks so that when of the needs of finance for the growth of the enterprises they shall obtain a positive answer from banks.

Also, SMEs must create connections with other companies that are marketing different product so that it will benefit then in term of innovation and in term of productivity. For instance, a company A may produce milk. And this Company don't partnership with company B which is growing cows, it would make it. So as for milk to be produce we need cows as well as it is benefic and even more profitable for A to create partnership with B in order to go forward.

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