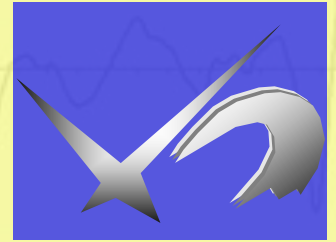
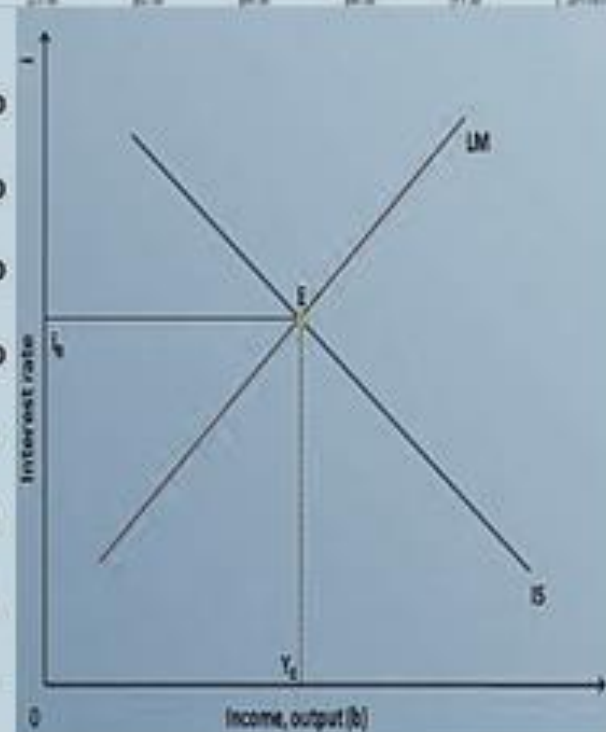


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ORGANISATIONS OVERSEEING THROUGH THE AUDIT COMMITTEE

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Abstract: *The article addresses the main responsibilities of audit committees within organizations, starting from the need for knowledge and understanding of the organization by all members of the audit committee, which must consider both internal factors and external factors. Among internal factors, the organization's internal control system is one of the key elements in the financial reporting process, the concern of maintaining an appropriate control environment. Audit committee members should ensure that management gives the organization a "bon ton", "leading tone", developing an organizational culture that promotes the attitude of compliance and internal control findings and conclusions which help to provide default quality of financial reporting. Good practice issues of Anglo-Saxon and internal control assessment tools for organizations are presented further. Particular attention is paid to risk management and specifically the risk of fraud by the media appetite for such issues can easily affect the organization's brand. The second part of the article discusses the influences of financial failures of recent decades on corporate governance system of organizations in the Anglo-Saxon environment. Particular attention is paid to how the audit committees, these "living consciences" of organizations have adapted their roles and behavior to capture, monitor and influence the overall management culture of organizations.*

Keywords: management, organization, fraud, internal auditors, internal control, external auditors, audit committee

JEL Classification: M42, M48, M49

1. ROLES AND RESPONSIBILITIES WITHIN THE ORGANIZATION

A major concern of the audit committee is the need for a better knowledge of the company and its business to fulfill its oversight role, which includes the consideration of the internal control, of the fraud risks and of the financial statements risks.

The knowledge of the company / organization by the members of the audit committee should take into account several internal factors, including business area, the risk types faced by the company in the current competitive trends, the major customers and suppliers, the regulatory requirements and the technology affecting its business. Also, it must be taken into consideration a number of external factors on business knowledge, the financial reporting process and the work of the auditors.

The company may be involved in unique transaction of its business type, in sophisticated and complex or derivative transactions, in the form of purchase and sale of goods, in order to meet a specific objective reporting and an economic objective.

Consequently, it is required that audit committee members should understand the company's objectives in terms of transactions and how the investors requirements are satisfied in terms of economic substance.

The internal control is one of the key elements of the effective financial reporting process and it consists in maintaining a proper control environment. The control environment sets the tone of the organization and contributes to the awareness of staff on the role of internal control. Meanwhile, the control environment is the foundation for all other components of internal control, providing discipline and contributes to the culture of minimizing the loss through fraud and errors risks.

The members of the audit committee must have a good knowledge on the controls' environmental quality of the organization. The Audit Committee should assess whether the management provides a "good tone" to the higher levels of the organization and if they develop a culture that promotes an attitude of respect for the internal control conclusions and also for the high quality financial reporting.

The appreciation of the control environment will be also achieved by analyzing the organizations' code of ethics. The organization should adopt and enforce written codes of ethics for at least its priority areas, to maintain a strong ethics climate and achieve efficient communication channels to protect against fraudulent financial reporting. Therefore, the audit committee will proceed with the analysis and with the periodic operational procedures of management and financial reporting system verification.

The audit committee should understand the organization's internal control system to determine its suitability to assess smooth and efficient, which includes an understanding of any findings or recommendations of the internal auditors.

An effective internal control includes processes and procedures, which among others, are designed to:

- Promote a control environment and corporate attitude to support appropriate business practices;
- Identify and to address financial risk areas currently;
- Ensure that the organization's assets are protected in a prudent and efficient manner in terms of costs;
- Ensure that only authorized transactions are recorded;
- To minimize the risk of fraud.

In the USA, from 1977 the Law of external corrupt practices is the base for public companies, managers and employees where they are subject to sanctions if they do not have an adequate internal control and accounting records correct.

The law has clearly contributed to the awareness of the company's Board members who appreciated more an effective internal control and the audit committee in overseeing the internal control.

The audit committee should understand the effects that may occur as a result of major changes in the organization, especially through layoffs, restructurings, mergers and others and pay attention to changes to be made on reorganizing the internal control system after these events. For this purpose, the audit committee should expect regular information from internal auditors and external auditors regarding the internal control system.

For these reasons the Board of directors and the audit committee must have a clear understanding of the concept of internal control system in order for the internal control to support the organization in achieving its objectives.

The COSO control framework defines internal control as a process established by the board of directors, management or other personnel of a company designed to provide reasonable assurance regarding: the effectiveness and efficiency of operations, reliability of financial reporting and compliance with applicable laws and regulations .

Based on this definition, the internal control system consists of the following five interconnected components:

- *The control environment* sets the tone of the organization, influencing the control awareness by the staff. It represents the foundation for all other components of internal control, providing discipline and structure;
- *The risk assessment* is the identifying and analyzing relevant risks on the objectives of the company, providing a basis for the risk management;
- *The control activities* represent the policies and procedures that assist in ensuring that management directives are complied with;
- *The information and communication* systems support the identification, the capture and sharing the information that allow people to fulfill their responsibilities;
- *Monitoring* is a process that assesses the quality of internal control performance over time.

In practice, the members of the audit committee are not in a position to determine that the system of internal control over financial reporting works properly and therefore it must rely on other people. In this sense, they will address a number of questions to the management that is directly responsible for the organization and operation of internal control, and will require independent opinions to the internal auditors and external auditors. In order to set correct opinions, the audit committee shall, together with the auditors, evaluate the control system of the organization, including a contact with IT service and security, and to ensure so that significant organization risks are mastered through the undertaken control activities.

The practitioners recommend audit committee members to give time and a special interest for the discussions with managers and auditors in terms of understanding the functioning of the internal control system. Furthermore, it is recommended that the audit committee should set appropriate expectations from the management and the internal auditors regarding the need for the committee to have quality information on internal control, with emphasis on the control environment and forms of control, or lack of it, on financial reporting, including controls over the organization's information systems.

The way to take charge of the main tasks of internal control that the audit committee is recommended to watch could be obtained through a questionnaire which should include at least the following:

NC	QUESTIONS	YES	NO	Comment
1.	The adequacy level of the control character			
2.	The effectiveness of the internal control in the financial reporting process			
3.	Comparing the control system of the organization with generally accepted auditing standards			
4.	Significant improvements of the internal control recommended by the auditors			
5.	Corrective action and taken measures, adequate segregation of duties, checking the existence of persons who initiate and approve transactions			
6.	Analyzing the organization's code of ethics			
7.	The existence of a system whereby the employees can report the organization, under the principle of confidentiality, suspicions of fraud			
8.	The way the Internet is used and the communication in the organization			

9.	Assessing the adequacy of control activities by the management, including security, confidentiality and reliability of the information within the organization			
10.	The existence of an appropriate business continuity plan in case of unforeseen disruptions, and whether this plan has been tested			
11.	The evaluation of the internal auditors procedures and external auditors, including assessing the adequacy of information systems, policies and procedures			
12.	The access to the use of the information technology			
13.	The coverage degree of any evidence of fraud procedures by the external auditors			
14.	The analysis of the internal auditors and external auditors findings on the effectiveness of the control environment of the organization			
15.	The existence of proper controls over the approval and monitoring of special transactions			

Understanding the fraud risk must receive special attention from the audit committee considering the media's appetite for such subjects easily affect the organization's brand.

Therefore, the audit committee must have an answer to the question: *What is fraudulent financial reporting for the organization and how this risk can be attenuated?*

Fraudulent financial reporting implies incorrect statements, misrepresentations or omissions on the existence of property transactions in the financial statements to mislead users of the financial statements. In practice, it is often difficult to determine the management intention, to distinguish between genuine mistakes and fraudulent financial reporting and thus it is impossible to determine the degree of non-compliance of financial statement with generally accepted accounting principles.

The audit committee is not responsible for fraud detection, but can play a decisive role in identifying signals of fraudulent financial reporting. The audit committee should assess the risk of fraudulent financial reporting that occurs after the pressures that are put on management, on internal and external factors, such as rewarding senior executives, underperforming, forecast issued earlier etc.

In practice, the members of the audit committee should try to understand any situation that may create discomfort and always keep an acceptable level of skepticism on all management initiatives.

In the overseeing activity, the audit committee must take into consideration the company's compliance with laws and regulations affecting the financial statements. In addition to the information obtained from the discussions with the managers and auditors, based on checklists and questionnaires requested, they receive updated information from the management by reporting to regulatory bodies and to the Board of Directors on legal and

compliance issues that may have an impact on financial statements and that may affect the company's compliance policies or financial stability and profitability.

The "Blue Ribbon" committee Report on the effectiveness of the audit committee, sponsored by the **Stock Exchange** in New York and the **National Association of Corporations Directors (NACD)** has developed a practical guide on the work of the audit committees (ratio NACD), that is recommending them to assess the tone of the organization - "tone of the top", ensuring the loyalty of directors and employees regarding legal compliance and ethics within the company, through written policies.

NACD report further suggests the audit committee to obtain information on the establishment and maintenance, by the management, of a process meant to ensure compliance with laws, regulations and relevant policies.

The Audit Committee may meet with the board of directors to ensure that legal compliance and ethical standards are observed. At the same time, they can request reports from the internal auditors.

The issues concerning the organizational risks, is meant for the board of directors, which can create a separate risk committee or delegate such responsibilities to the audit committee.

The audit committee may be involved in the risk management by supporting the adoption of a system of effective risk management and risk control, or by acting as a catalyst to ensure that the full range of risks management oversees the company's risks.

Ernst & Young Audit Committee presents a detailed list of the risk factors that should be considered by the audit committee:

- Lack of policies regarding values and standards of conduct of the company and the lack of the codes of conduct;
- Lack of adequate attention granting an internal control system, including the effects of the information systems processes;
- The existence of an aggressive financial targets and expectations from the operating personnel;
- The selection of the estimates and the aggressive accounting principles;
- The attempts from the management to reduce the audit purposes (directly, for example by limiting the access to people or information, or indirectly, through unneeded fees or constraints regarding the audit duration) or imposing unreasonable deadlines;
- Lack of the accounting, financial and information personnel competence, or lack of adequate training in rapport with the complexity of the company's business;
- Lack of clear management lines and the existence of contractual arrangements without a goal for the organization;
- Lack of adequate authorization and approval for the transactions;
- Rapid growth in profitability, especially compared with those of other companies in the same industry;
- Changes in the operating environment of the company;
- Inability to generate cash flows while there are reported earnings and the growth;
- Assets, liabilities, income and expenses based on significant estimates that involve uncertainty or subjective judgments;
- Significant transactions, unusual, extremely complex or innovative businesses, especially those that occur at the end of the financial period, which have a determining effect on the financial statements.
- An extraordinary volume of deliveries shortly before the end of the financial year;
- The perception of adverse effect on significant transactions such as combining business, a planned debt or the awards a contract, if poor financial results are reported;

- Significant transactions between third parties that are not part of the ordinary course of business or other entity being audited by the same firm.

When the audit committee was delegated responsibilities for the issues of the organization risks, they should receive periodic updates from the management, including the ones regarded to: the key organizational risks, the company's Internet and the strategies on e-commerce, its infrastructure system, the measures to be taken to protect human and intellectual capital, etc.

In the light of the new trends such as globalization and the growing need among investors about the future of their investments, the audit committees should be informed on events that could affect the company's financial statements and on the way the auditors should respond to these events. In addition, the audit committee may consider the problems that may arise in areas such as security, confidentiality, the reliability of internal and external systems and processes; disclosure of strategic information, non-financial or regarding the performance measurement; the compliance with the contractual obligations.

The audit committee, the board of directors, the management, and the internal and external auditors are "actors" who have each an important role in the company's financial reporting and the frequent communication between them it is essential for the proper functioning of the financial reporting process.

A good practice to clarify the role of each of these "actors" and their specific lines of communication is *the regular meeting of key members of each of these groups to discuss roles, responsibilities and expectations of each group*, and subsequent, documenting the meetings conclusions. So:

- *The management* is responsible for organizing the risk management system of internal control and financial reporting activities.
- *The internal auditors* are responsible for assessing the functioning of the internal control system, risk management and the effectiveness of the identification and notification of deficiencies, irregularities and malfunctions by the responsible parties.
- *The external auditors* are responsible for auditing and certification of the reliability of public company financial statements, assessing the internal control system and the degree of implementation of audit procedures.
- *The Audit Committee* is responsible for overseeing the participants in the financial reporting process and reporting to the board of directors.
- *The board of directors*, lastly, is responsible for overseeing corporate performance on behalf of the shareholders.

The audit committee should have the ability to access internal and external resources, if they need to fulfill its responsibilities, including maintaining a legal adviser. In addition, the audit committee has the authority to conduct its own investigation.

The external auditors work directly with the management in the audit process and frequently interact with them when providing non-audit services. However, the audit committee, the board of directors and the representatives of the shareholders are actually the customers of the external auditors.

In the USA, the SEC requires all companies to provide a report of the audit committee in the management financial statement reporting *to disclose their status and the audit committee member's activities*. Specifically, the rules of the SEC requires companies to disclose the identity of each member of the audit committee and the manner of their appointment and to declare the number of committee meetings of the last fiscal year, if the committee reviewed the external auditors services of non-audit and the compliance of the incompatibilities and describe briefly the functions carried out by the committee.

Therefore, the company should consider a model of disclosure regarding the audit committee information and the audit committee charter, as follows:

The company has an audit committee composed of independent directors. The information on the functions performed by the Committee, the membership and the number of meetings in the last fiscal year is set into the "report to the audit committee" included in the delegation statement of the year. The audit committee is working after the committee charter, written and approved by the board of directors.

In addition, the company is required to submit annually written information to the NYSE, attesting the independence, the knowledge of financial language and expertise of the audit committee members in financial management. The statement must also certify the annual mandatory verification of the audit committee charter.

2. THE AUDIT COMMITTEE RESPONSIBILITIES DEVELOPMENT THE IN THE LAST DECADES

The financial scandals from the recent decades have brought a shadow on the functioning of the corporate governance within organizations. In particular, the collapse of ENRON in the USA created a crisis on confidence in the financial reporting system.

The publicity and the political implications that followed the collapse of ENRON and the controversies regarding possible future solutions aimed at the auditing profession, the relations between internal and external auditors with their clients and at the same time, the role of the audit committee. In particular, the controversy focused on the status of the audit committees, which are in a difficult situation, but this perspective has contributed to the approach of the role of independent auditors and accordingly the scope of the provided services / offered by them.

In the literature they have made several recommendations that focused on the following areas:

- *The prohibitions or restrictions on non-audit services to public customers;*
- *Restrictions on consulting services on the financial reporting;*
- *Further restrictions on outsourcing the internal audit;*
- *Banning the design and the implementation of the IT services.*

However, the (private) organizations require non audit services, mainly services relating to, for example, audit fees and taxes, provided by the independent auditors, or the outsourcing of some internal audit activities. At the same time, the organizations cannot be compelled to proceed with the rotation of audit firms and of the personnel that provides services for them.

The "ENRON" lesson, beside the criticisms given to the audit committee determined the companies to have major concerns regarding the reliability, control and liability of the financial reporting process to ensure transparency, comparability, consistency and quality. For these reasons, we believe that current and future members of audit committees must develop its own responsibilities for establishing useful guides and guidance to fulfill those responsibilities and to understand the expectations of their organizations.

The Audit Committee plays a critical role in overseeing the integrity and quality of the financial reporting, the effectiveness of the internal control, risks assessment and mitigation affecting the financial statements and monitoring of legal and ethical compliance of the company because it affects the performance, the financial statements and the independency of the auditors.

"The audit committees should be proactive, not just reactive, to ensure the quality and integrity of the corporate financial reporting. Critically, it is felt the need to improve

the interaction between the members of the audit committee, the management and the external auditors."

The collapse of the ENRON and the WorldCom in USA helped the renewal of the focus on the role of the audit committee regarding the quality of the financial reporting, the effectiveness of the internal audit process, the auditor independence and the corporate governance efficiency.

Most of the issues that have attracted the media attention after the ENRON "lesson" were related to:

- *the general complexity of the operations, the organizational structure and the possibility that the audit committee would not receive appropriate and timely information in order to ask the right questions about accounting policies and financial statements of the organization;*
- *The economic substance of the transactions with third parties and complete character of the disclosures about such transactions;*
- *The purpose of unusual transactions as well as the benefits or obligations of the financial results;*
- *Codes of ethics and corporate policies on conflict of interest, leading to the company's executive management involvement in contractual relations with third parties.*

Clearly there is a growth on the requirements from the audit committee on the oversight of the responsibilities within the organization, which tends to become a real challenge.

The audit committees must overlook the employment of qualified members, independent, responsible and to maintain strong connections and communication lines with the management, with the internal and external auditors in order to provide the Board that additional insurance they expect on the adequacy and effectiveness of accounting, financial reporting and internal control organization.

The report of the New York Stock Exchange, issued in February 1999, reveals that the members of the audit committee should be independent and have certain qualities on the recognition of the importance of their responsibilities, knowledge of financial language and devotion to carry out these responsibilities. Also, the audit committee relationships and communication with the external auditors, the internal auditors and the management should have a critical nature and provide recommendations on good practice in the field.

In 2000, in USA, *the Financial Instruments and Transferable Securities (SEC)* Commission's new rules were designed to improve the disclosures on the structure and practices of the audit committees and to increase reliability and trust of the organizations financial statements. In this sense, the SEC rules requested:

- *The intermediary financial statements should be audited by external auditors;*
- *The management / trustees statements must include a report of the audit committee;*
- *The organizations should reveal in the management statements whether there is a functioning audit committee charter and to attach a copy of it at least once every 3 years;*
- *The organizations should reveal in the management statements information regarding the independence of audit committee members.*

In the same period, *the rules of the New York Stock Exchange and the National Association of Securities Agencies (NASD)* altered the requirements for audit committees to strengthen their independence and qualification with provisions that:

- *Defined the independence of the auditors more rigid than in the past;*
- *Demanded the audit committees to be composed of at least 3 members and to be composed entirely of independent directors with financial language knowledge and to contain at least one director with expertise in accounting or financial management;*

- Asked companies to adopt a written charter for the Audit Committee with specific committee responsibilities, including those related to the independence and accountability of the external auditors;
- Required external auditors to discuss their independence with the audit committee.

In addition to these actions, the *Treadway Commission (COSO)* requested an analysis of the USA public companies, which materialized in the „*Fraudulently financial reporting in the 1989-1997 period* "document issued in 1999. All these reports with many others formed the resources useful for the practice improvement of the audit committee effectiveness.

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* bill amending and supplementing Law no. 672/2002 on public internal audit

APPLIED SCGM(1,1)_c MODEL AND WEIGHTED MARKOV CHAIN FOR EXCHANGE RATE RATIOS

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Abstract: *The importance of predicting the fluctuations of exchange rate ratios is noticeable. In relation to markov model and grey system theory, using a single gene system cloud grey SCGM(1,1)_c model to adjust the development trend of time series, its error index is randomly fluctuated. Markov chain model is appropriate to forecasting of a random dynamic system, choosing weighted markov chain to predict the error index. We applied a weighted markov SCGM(1,1)_c model for predicting the U.S. Dollar /Euro, U.S. Dollar/Japan Yen, U.S. Dollar/Swiss franc and U.S. Dollar/Trade –Weighted Index. The forecasting results are reliable and show that the weighted markov SCGM(1,1)_c model has high prediction precision.*

Keyword: Weighted Markov Chain, SCGM(1,1)_c Model, Exchange Rate Ratios

Introduction

Economic system is complicated and can be defined by deterministic or random models. Forecasting the currency exchange rates is essential for the global economy and financial markets. Analyzing and predicting the movements of exchange rates attach much attention from policy makers now days. The market expectations about the economic and policies and activities are demonstrated by the exchange rates. 11 member states of European and Union make Euro as their currency in 1999. Japanese Yen is the third most commercial currency and Swiss Franc is ranked among five most notable currency of the word. Trade – Weighted Index is a weighted average of exchange rates of the dollar against the currencies of a group of U.S. trading partners. The fluctuations of U.S. Dollar tuese currencies (Figure 1, 2) are a vital issue of macroeconomic analysis. In spite of its significant, predicting the exchange rates have been a dispute for market analyzers.

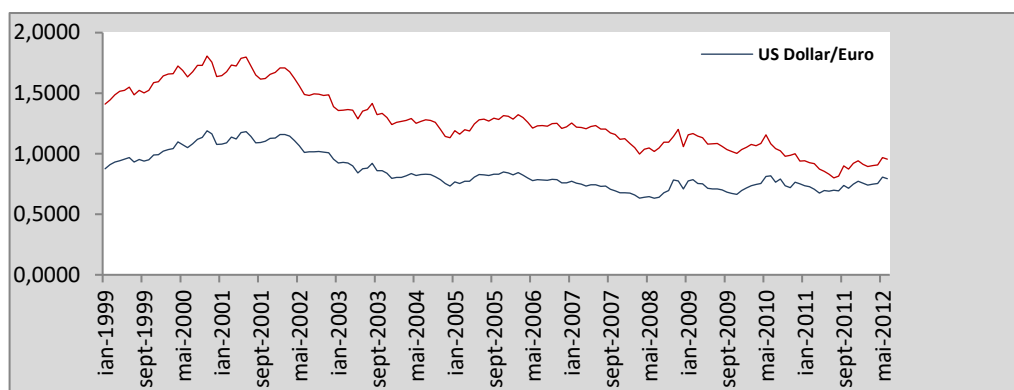


Figure 1. Exchange Rates US Dollar/Euro and US Dollar/Swiss Franc

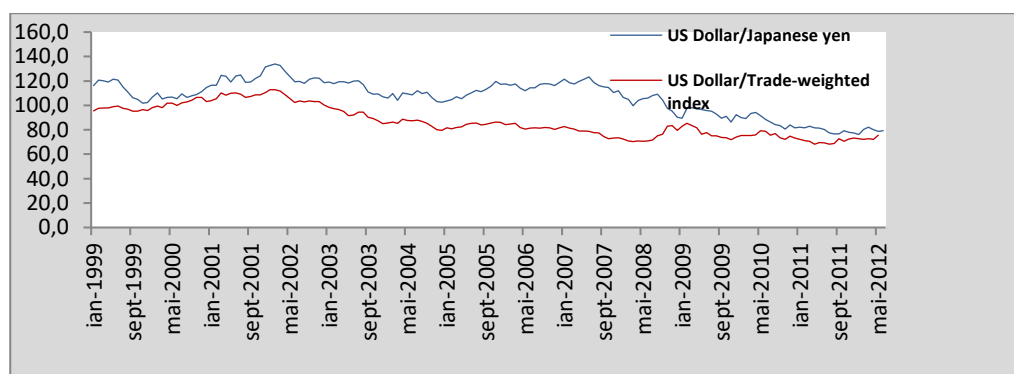


Figure 2. Exchange Rates US Dollar/Japan Yen and US Dollar/Trade Weighted Index

By using different methods exchange rate data have been analyzed in literature. Bianca and et al (2012) suggested an econometric model for the weekly changes in Euro/Dollar rate. Fenz and spritzer (2004) compared the precision of vector autoregressive and vector error correlation models in predicting the Euro/Dollar and Japanese Yen. Huang and et al (2011) proposed a way to exchange rate volatility forecasting by quintile regression. Dunis and et al (2012) studied the application of a neural network in predicting the Euro/Dollar exchange rate. Liu and et al (1994) applied a full, mixed and Bayesian vector autoregressive model for the U.S. Dollar /Yen, U.S. Dollar/Canadian Dollar and U.S. Dollar/Deutsch Mark exchange rates. Yuan(2011) applied multi-state markov switching model with smoothing techniques for an exchange rate forecasting model with smoothing techniques for an exchange rate forecasting. Hanians and Curtis (2008) analyzed the daily data of Dollar/Euro time Series models with chaos theory. Clements and Lan (2006) applied a Monte Carlo simulation for forecasting exchange rates. Alson (2010) used Johannes and stock-Watson procedures to estimates the cointegrating relationship between the real exchange rate and productivity. Andreou and Zombanakis (2006) proposed intelligence methods for forecasting Euro/Dollar and Japanese Yen. Yao and et al (1996) compared neural network model with ARMA model for forecasting GBP, DEM, JPY, CHF, AUD/Dollar exchange rate. Philip and et al (2011) proposed artificial neural network for forecasting foreign exchange rate. Kurita (2012) applied ARCH time series models for examine the dynamics of Yen – Dollar exchange rate Mc Grey and et al(2012) studied the Euro ,Swiss, Franc and Yen against the Dollar exchange rates by using factor analyzing . Pacelli (2012) compare artificial neural network, ARCH, and GARCH model to predict the daily exchange rates Euro/Dollar.

The system with incomplete unknown construction, properties and parameters is called a grey system. This system has grey appearance with complexity property and multiple solutions. Since there is always some unpredictability in real life, every system can be

regarded as a grey system. Grey model could be considered as a powerful approximation for deriving system dynamic information with only a limited amount of data. The advantage of the grey system theory is its applications with poor information uncertainty and any distribution in small samples. System analysis, modeling, data processing, prediction, control and decision making are the fields which covered by grey theory. the grey system theory has been extensively and satisfactorily applied to different systems such as energy ([15] [16] [17] [18]), Economic and Financial([19][20][33][21][30][34]), Business ([31]), Geology ([22]), Transportation ([23]), Engineering([24][25]),Hydrological ([26]), Social ([32]), Agricultural ([27][28]) and Medical ([29]) systems.

This paper is established on the Grey Theory, which combines the advantages of Markov Chain and SCGM(1,1)c model. By using the Weighted Markov SCGM(1,1)c model we predict the ratios of currency exchange rates as U.S. Dollar/Euro, Japanese Yen, Swiss Franc and Trade-Weighted Index.

Mathematical Models

Let $X^{(0)}$ as the initial time series as follow:

$$X^{(0)} = \{X^{(0)}(1), X^{(0)}(2), \dots, X^{(0)}(n)\} \quad (1)$$

Indispensable transform of $X^{(0)}$ is

$$\bar{X}^{(1)}(k) = \sum_{m=2}^k \bar{X}^{(0)}(m), (k = 2, 3, \dots, n) \quad (2)$$

Where

$$\bar{X}^{(1)}(k+1) = \frac{X^{(0)}(k+1) + X^{(0)}(k)}{2} \quad (3)$$

This can be represented as

$$\bar{X}^{(1)} = \{\bar{X}^{(1)}(2), \bar{X}^{(1)}(3), \dots, \bar{X}^{(1)}(n)\} \quad (4)$$

By assuming a discrete exponential function of non-homogenous $f_r(k) = be^{a(k-1)} - c$ and time series $\{\bar{X}^{(1)}(k)\}$ is a well –being trend relationship, the system cloud grey SCGM(1,1)c is

$$\frac{dX^{(1)}(k)}{dk} = aX^{(1)}(k) + U, (k \geq 2) \quad (5)$$

The response function is as follow:

$$\hat{X}^{(1)}(k) = \left(\hat{X}^{(1)}(k) + \frac{U}{a} \right) e^{ak} - \frac{U}{a} \quad (6)$$

Where

$$a = \ln \frac{\sum_{k=3}^n \bar{X}^{(0)}(k-1)\bar{X}^{(0)}(k)}{\sum_{k=3}^n (\bar{X}^{(0)}(k-1))^2} \quad (7)$$

$$b = [(n-1) \sum_{k=2}^n e^{2a(k-1)} - (\sum_{k=2}^n e^{a(k-1)})^2]^{-1} \cdot [(n-1) \sum_{k=2}^n e^{a(k-1)} \bar{X}^{(1)}(k) - (\sum_{k=2}^n e^{a(k-1)}) (\sum_{k=2}^n \bar{X}^{(1)}(k))] \quad (8)$$

$$c = \frac{1}{n-1} [(\sum_{k=2}^n e^{a(k-1)})b - \sum_{k=2}^n \bar{X}^{(1)}(k)] \quad (9)$$

$$U = ac \quad (10)$$

$$\hat{X}^{(1)}(1) = b - c \quad (11)$$

Replacing $\hat{X}^{(1)}(k)$ yields the system cloud grey SCGM(1,1)c as

$$\hat{X}^{(0)}(k) = \frac{2b(1-e^{-a})}{(1+e^{-a})} \cdot e^{a(k-1)} \quad (12)$$

The deviation degree between the raw data and fit value is obtained by the grey precision index as

$$Y(k) = \frac{X^{(0)}(k)}{\hat{X}^{(0)}(k)} \quad (13)$$

The range of $Y(k)$ is identified as a non-stationary random process, therefore markov processes are applied to evaluate the fluctuation rule of grey precision to enhance the prediction precision of SCGM(1,1)c model, moreover, the weighted markov chain forecasting model can assure a more precise forecasting result when the data is random fluctuating dynamic process.

The most conventional stochastic models for dynamic system are markov models. A markov process $\{X(t), t \geq 0\}$ satisfies the markov property as follows:

$$P\{X_t \leq i | X_{t_n} = i_n, \dots, X_{t_1} = i_1, X_{t_0} = i_0\} = P\{X_t \leq i | X_{t_n} = i_n\} \\ \forall t, t_n, \dots, t_1, t_0$$

$$\text{such that } t > t_n > \dots > t_1 > t_0 \quad (14)$$

Weighted grey markov SCGM(1,1)c model employs weighted markov chain to identify state transition regularity and applies grey theory to show the variation trend of time series data, hence accuracy of high volatile time series data is improved.

Any state of $Y(k)$ is state as

$$S_i \in [\otimes_{1i}, \otimes_{2i}], i = 1, 2, \dots, m \quad (15)$$

Where the lower and upper bounds of the i th state are i th $\otimes_{1i} = Y(k) + A_i$, $\otimes_{2i} = Y(k) + B_i$ respectively, S_i is the i th state, A_i and B_i are considered as constant.

The transition probability is

$$p_{ij}^w = \frac{N_{ij}^{(w)}}{N_i}, i, j = 1, 2, \dots, m \quad (16)$$

Where $N_{ij}^{(w)}$ is the number of transitions from state S_i to state S_j through w steps in $Y(k)$ index. So the $m \times m$ step matrix of state transition probability is obtained as

$$P^{(w)} = \begin{pmatrix} p_{11}^{(w)} & p_{12}^{(w)} & \dots & p_{1m}^{(w)} \\ p_{21}^{(w)} & p_{22}^{(w)} & \dots & p_{2m}^{(w)} \\ \vdots & \vdots & \ddots & \vdots \\ p_{m1}^{(w)} & p_{m2}^{(w)} & \dots & p_{mm}^{(w)} \end{pmatrix} \quad (17)$$

Compute the w order autocorrelation coefficient of data and normalize the outcomes as the weighted coefficients of markov model:

$$r_w = \frac{\sum_{l=1}^{n-w} (Y(l) - \bar{Y})(Y(l+w) - \bar{Y})}{\sum_{l=1}^n (Y(l) - \bar{Y})^2} \quad (18)$$

$$\theta_w = \frac{|r_w|}{\sum_{w=1}^m |r_w|} \quad (19)$$

Where m is the maximum order by prediction inquiry, commonly take $|r_w| \geq 0.3$.

Combining the initial state S_i as the corresponding state of grey precision index in the foregoing one year with the row vector of its corresponding transition probability matrix results in state transition probability vector in the year as

$$P_i^{(w)} = (p_{i1}^{(w)}, p_{i2}^{(w)}, \dots, p_{im}^{(w)}), i \in E \quad (20)$$

The m -order weighted state transition probability matrix is obtained as follows:

$$\begin{pmatrix} p_{\alpha 1}^{(w)} & p_{\alpha 2}^{(w)} & \dots & p_{\alpha m}^{(w)} \\ p_{\beta 1}^{(w)} & p_{\beta 2}^{(w)} & \dots & p_{\beta m}^{(w)} \\ \vdots & \vdots & \ddots & \vdots \\ p_{\gamma 1}^{(w)} & p_{\gamma 2}^{(w)} & \dots & p_{\gamma m}^{(w)} \end{pmatrix} \quad \alpha, \beta, \gamma \in S, \alpha, \beta, \gamma \leq m \quad (21)$$

Therefore state transition probability of grey precision index to forecasted year is

$$P_i = \sum_{w=1}^m \theta_w \cdot P_i^{(w)}, i \in S \quad (22)$$

The forecasted state of grey precision index by weighted markov chain is $\max\{P_i, i \in S\}$.

Calculate the predicted value $\hat{Y}(n+1)$ using linear interpolation:

$$\hat{Y}(n+1) = \otimes_{1i} \times \frac{P_{i-1}}{P_{i-1}+P_{i+1}} + \otimes_{2i} \times \frac{P_{i+1}}{P_{i-1}+P_{i+1}} \quad (23)$$

Finally the predicted value in the $(n+1)th$ year is

$$\tilde{X}^{(0)}(n+1) = \hat{Y}(n+1) \cdot \hat{X}^{(0)}(n+1) \quad (24)$$

For evaluating the prediction precision of the model the mean absolute percentage error (MAPE) is applied as

$$MAPE = \frac{1}{n} \sum_{k=1}^n \left| \frac{X^{(0)}(k) - \tilde{X}^{(0)}(k)}{X^{(0)}(k)} \right| 100\% \quad (25)$$

Applications

Economic systems can be modeled by stochastic models. This paper applies the weighted markov SCGM(1,1)c model to monthly fluctuations of U.S. Dollar against Euro, Japanese Yen, Swiss Franc and trade-weighted index. To formulated system cloud grey SCGM(1,1)c model, monthly data of U.S. Dollar/Euro, Japanese Yen, Swiss Franc and trade weighted index are used from January 2010 to respectively march 2012 may 2012, may 2012 and April 2012. The data are listed in table 1.

Table 1.Data

Date	U.S. Dollar / Euro	U.S. Dollar / Japanese Yen	U.S. Dollar / Swiss Franc	U.S. Dollar / Trade weighted index
Jan.2010	0.7178	89.9	1.054	75.2
Feb.2010	0.7361	89.3	1.077	75.4
March 2010	0.7454	93.4	1.066	75.4
April 2010	0.7551	94.1	1.084	75.9
May 2010	0.8129	91.5	1.156	79.2
June 2010	0.8188	88.5	1.082	78.9
July 2010	0.7655	86.4	1.042	75.5
Aug. 2010	0.7909	84.2	1.024	76.8
Sep.2010	0.7366	83.4	0.978	72.1
Oct.2010	0.7201	80.6	0.978	74.8
Nov.2010	0.7639	84.1	1.001	73.2
Dec.2010	0.7524	81.5	0.938	72.1
Jan. 2011	0.7350	52.1	0.942	71.2
Feb.2011	0.7269	81.7	0.927	70.5
March2011	0.7073	82.8	0.918	68.2
April 2011	0.6738	81.6	0.873	69.5
May 2011	0.6954	81.4	0.854	69.2
June 2011	0.6895	80.4	0.931	68.3
July 2011	0.6996	77.5	0.800	68.9
Aug. 2011	0.6929	76.6	0.816	72.8
Sep.2011	0.7374	76.6	0.899	70.5
Oct.2011	0.7147	79.2	0.874	72.4
Nov.2011	0.7500	77.9	0.920	73.3

Dec.2011	0.7727	77.5	0.941	72.6
Jan. 2012	0.7580	76.2	0.914	72.1
Feb.2012	0.7416	80.4	0.894	72.4
March 2012	0.7487	82.0	0.902	72.3
April 2012	*	80.1	0.907	*
May 2012	*	78.8	0.969	*

We get:

U.S. Dollar /Euro: $\hat{X}^{(0)}(k) = 0.7427 e^{a(k-1)}$
 $a = -0.000949$, $b = -782.449347$

U.S. Dollar /Japanese Yen: $\hat{X}^{(0)}(k) = 87.3956 e^{a(k-1)}$
 $a = -0.004792$, $b = -18237.8586$

U.S. Dollar /Swiss Franc: $\hat{X}^{(0)}(k) = 1.0079 e^{a(k-1)}$
 $a = -0.005561$, $b = -181.253478$

U.S. Dollar /Trade Weighted Index: $\hat{X}^{(0)}(k) = 73.7541 e^{a(k-1)}$
 $a = -0.00161$, $b = -45810.03114$

We calculate the grey precision indices (Table 2) with equation (13) which show the trend of exchange rate ratios.

Table 2. Grey precision indices for exchange rate ratios

Date	Jan2010	Feb2010	March2010	Ap.2010	May2010	June2010	July2010	Aug.2010	Sep.2010	Oct.2010	Nov.2010	Dec.2010
U.S.Dollar /Euro	0.96647	0.99205	1.00554	1.01959	1.09868	1.1077	1.03658	1.07199	0.99934	0.97788	1.03835	1.02369
U.S.Dollar /Japanese Yen	1.029	1.027	1.079	1.092	1.067	1.037	1.017	0.996	0.992	0.963	1.01	0.983
U.S.Dollar /Swiss Franc	1.046	1.074	1.069	1.093	1.173	1.104	1.069	1.056	1.014	1.029	1.050	0.989
U.S.Dollar /Trade Weighted Index	1.020	1.024	1.026	1.034	1.081	1.078	1.034	1.053	1.009	0.992	1.031	1.010
Date	Jan2011	Feb2011	March2011	Ap.2011	May2011	June2011	July2011	Aug.2011	Sep.2011	Oct.2011	Nov.2011	Dec.2011
U.S.Dollar /Euro	1.00096	0.99087	0.96507	0.92024	0.95064	0.94992	0.9582	0.94992	1.01189	0.98167	1.03113	1.06335
U.S.Dollar /Japanese Yen	0.995	0.995	1.013	1.003	1.006	0.998	0.967	0.96	0.965	1.002	0.99	0.99
U.S.Dollar /Swiss Franc	0.999	0.989	0.984	0.941	0.926	0.906	0.877	0.900	0.997	0.974	1.031	1.061
U.S.Dollar /Trade Weighted Index	0.997	0.986	0.978	0.947	0.987	0.964	0.953	0.963	1.019	0.989	1.017	1.031
Date	Jan2012	Feb2012	March2012	Ap.2012	May2012	June2012	July2012	Aug.2012	Sep.2012	Oct.2012	Nov.2012	Dec.2012
U.S.Dollar /Euro	1.04411	1.02249	1.03326									
U.S.Dollar /Japanese Yen	0.978	1.037	1.063	1.043	1.031							
U.S.Dollar /Swiss Franc	1.037	1.019	1.034	1.046	1.123							
U.S.Dollar /Trade Weighted Index	1.023	1.018	1.028	1.024								

Applying the weighted markov chain, we partition the grey precision indices to states with equal ranges (Table 3).

Table 3.States partition in grey precision index of SCGM(1,1)c

U.S.Dollar/Euro	E1:0.9202-0.9515 E2:0.9515-0.9827 E3:0.9827-1.0140 E4:1.0140-1.0452 E5:1.0452-1.0765 E6:1.0765-1.1077	U.S. Dollar /Japanese Yen	E1:0.96-0.982 E2:0.982-1.004 E3:1.004-1.026 E4:1.026-1.048 E5:1.048-1.07 E6:1.07-1.092
U.S. Dollar /Swiss Franc	E1:0.877-0.926 E2:0.926-0.976 E3:0.976-1.025 E4:1.025-1.074 E5:1.074-1.123 E6:1.123-1.173	U.S. Dollar /Trade Weighted Index	E1:0.974-0.969 E2:0.969-0.992 E3:0.992-1.014 E4:1.014-1.036 E5:1.036-1.058 E6:1.058-1.081

Next calculate all order autocorrelation coefficients of grey precision indices. Autocorrelation curves are shown in figure 3-6.

It is understood that for U.S.Dollar /Euro, Japanese Yen, Swiss Franc and Trade Weighted Index 1,2,3 , 1,2 ,1,2,3,4 and 1,2,3 order autocorrelation coefficients, respectively are satisfied in the conditional $|r_w| \geq 0.3$.

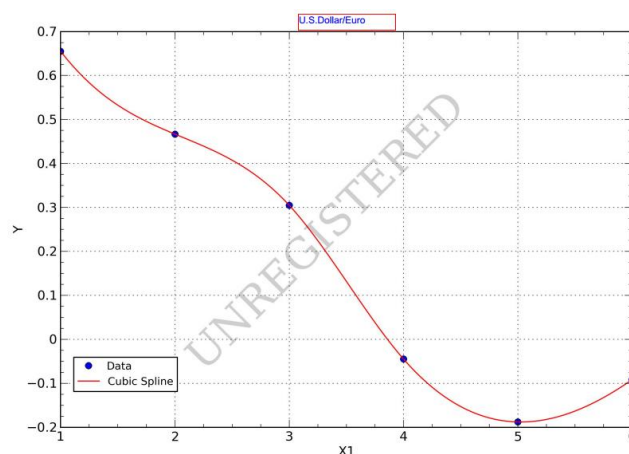


Figure 3.Autocorrelation Curves

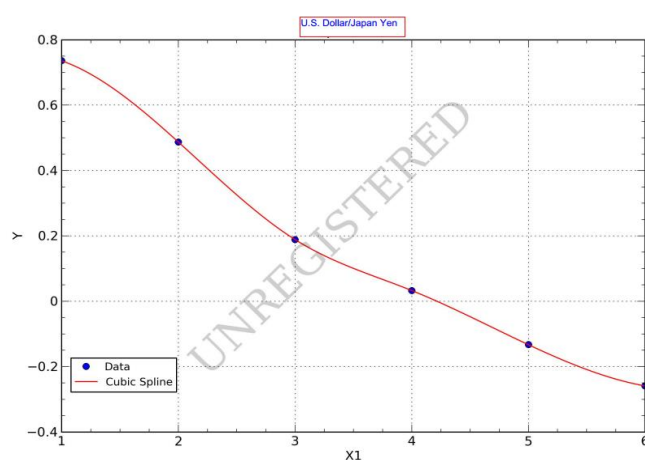


Figure 4.Autocorrelation Curves

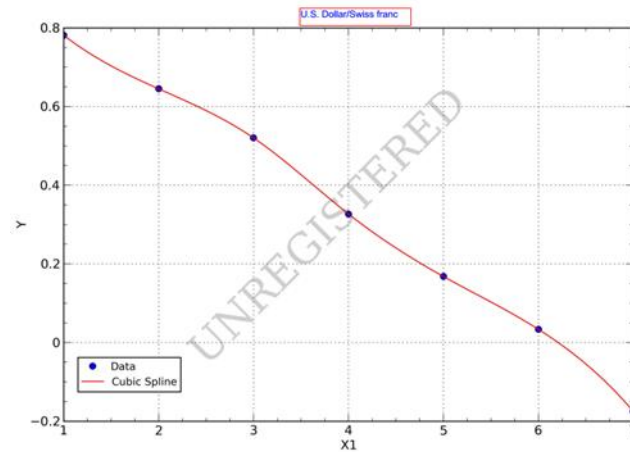


Figure 5. Autocorrelation Curves

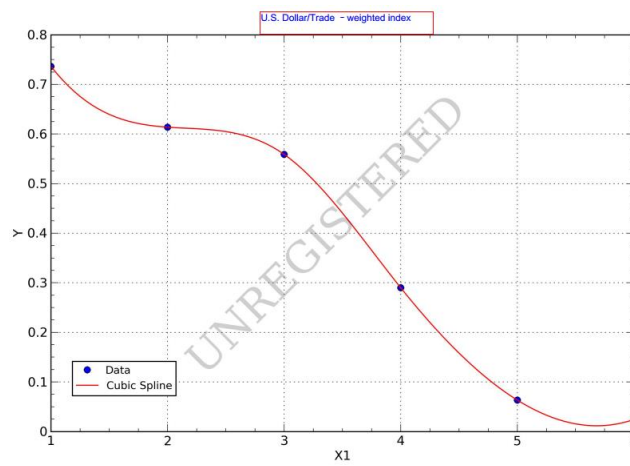


Figure 6 .Autocorrelation Curves

The results of calculating the maximum –order weighted state transition probability of markov chain, normalized autocorrelation coefficients, weighted values θ : of markov chain and weighted markov chain prediction probability P : for every exchange rate ratio are shown in table 4

Table 4. Markov chain prediction probability P

Exchange rate ratio	state	E1	E2	E3	E4	E5	E6	r_{ω}	θ_{ω}
U.S.Dollar /Euro	$P_4^{(1)}$	0	0	0.1428571	0.42857	0.28571	0.1428571	0.65510	0.46
	$P_4^{(2)}$	0.166667	0.17143	0.2632653	0.2898	0.4082	0.0680272	0.466697	0.33
	$P_4^{(3)}$	0.055556	0.17092	0.2494461	0.33358	0.07522	0.1152851	0.304744	0.21
	P_i	0.06666687	0.0924651	0.204975496	0.362828	0.1606934	0.112373113		
U.S.Dollar /Japanese Yen	$P_4^{(1)}$	0.5	0.33	0	0.17	0	0	0.7375	0.39836
	$P_4^{(2)}$	0	0	0	0.5	0.25	0.25	0.4871155445	0.601605
	P_i	0.00825	0.1985445	0	0.3014605	0.09959	0.09959		
U.S.Dollar /Swiss Franc	$P_5^{(1)}$	0	0	0	0	1	0	0.781187	0.343649
	$P_4^{(2)}$	0	0	0.182727	0.304545	0.512727	0	0.645032	0.283753
	$P_4^{(3)}$	0.038959	0.0689	0.231166	0.403328	0.217433	0.04	0.520253	0.228862
	$P_3^{(4)}$	0.163966	0.0733	0.252986	0.350645	0.126218	0.04	0.326744	0.143736
	P_i	0.0674015	0.447401	0.194351699	0.30464311	0.36615168	0.025096		
U.S. Dollar /Trade Weighted Index	$P_4^{(1)}$	0	0.083333333	0.083333333	0.666666667	0.083333333	0.083333333	0.73603	0.38563
	$P_4^{(2)}$	0.0277778	0.10466667	0.180555556	0.534722221	0.055555556	0.097222222	0.61373	0.321551
	$P_4^{(3)}$	0.0569444	0.124421296	0.190393519	0.490509259	0.044560185	0.093171296	0.55889	0.292819
	P_i	0.0256064	0.102063649	0.145944493	0.572657563	0.063047847	0.090680062		

From the $\max P_i$ for each of the exchange rate ratios it is concluded that the state of grey precision index of SCGM(1,1)c model for U.S. Dollar/Euro in April 2012 is mostly state of E4 , for U.S. Dollar / Swiss Franc in June 2012 is state of E5 and for U.S. Dollar / Trade Weighted Index in May 2012 is state of E4 . By considering the neighboring states of these probable states and with formula (23), we get:

U.S. Dollar/Euro: $\hat{Y}(\text{April } 2012) = 1.02771$

U.S. Dollar/Japanese Yen: $\hat{Y}(\text{June } 2012) = 1.048$

U.S. Dollar/Swiss Franc: $\hat{Y}(\text{June } 2012) = 1.07799$

U.S. Dollar/Trade Weighted Index: $\hat{Y}(\text{May } 2012) = 1.0207$

Finally by formula (24) a prediction value of weighted markov SCGM(1,1)c model for each of exchange rate ratios are calculated (Table 5) . By computing the MSE we find that the predicted values are very close to the actual values.

Forecasting results and their precisions for exchange rate ratios

Table 5.Forecasting results and their precisions for exchange rate ratios

U.S.Dollar/Euro (April 2012)	Predicted Value	Actual Value	Precision	U.S.Dollar /Japanese Yen	Predicted Value	Actual Value	Precision
	0.74397	0.7547	98.58%		79.71	79.4	99.61%
U.S.Dollar/Swiss Franc(June 2012)	0.9247	0.954	96.96%	U.S.Dollar / Trade Weighted Index	71.966	75.6	95%

The forecasting results of a weighted markov SCGM(1,1)c model are reasonable and reliable. Applying this model can achieve a higher precision and a better image.

Conclusions

Forecasting the fluctuation of exchange rate ratios is crucial for all countries. This paper has evaluated the application of weighted markov SCGM(1,1)c model in forecasting the monthly exchange rate ratios as U.S. Dollar/ Euro, Japanese Yen, Swiss Franc and trade weighted index. This model combines the advantages of weighted markov chain and grey system theory. According to the forecasting results we concluded that the prediction error for April 2012 U.S. Dollar /Euro is 1.42%, for June 2012 U.S. Dollar / Japanese Yen is 39% for June 2012 U.S. Dollar/Swiss Franc is 3.04% and for May 2012 U.S. Dollar / Trade Weighted Index is 5%. We can confirm that this model gives a reliable prediction result.

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DETERMINANTS OF LOANS AND ADVANCES EXTENDED BY MICROFINANCE BANKS IN NIGERIA

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Abstract: *In consideration of the roles of microfinance banks (MFBs) in poverty reduction, employment generation and overall development of an economy, particularly a less developed economy, the paper employs the methodology of ARDL-based Bounds test approach to co-integration and error correction analysis to investigate the determinants of loans and advances extended by microfinance banks in Nigeria using data spanning the period from 1992 to 2013. The empirical evidence indicates that the major determinants of the amount of loans and advances extended by MFBs are deposits, shareholders' fund, liquidity ratio and inflation. Customers' deposits positively affect MFBs' loans and advances in the short-run and long-run, though the long run effect is not significant. Shareholders' fund also positively affects MFBs' loans and advances in the short-run and long-run. Inflation and liquidity ratio negatively affect the amount of loans and advances extended by the MFBs. Measures recommended by the paper to boost the supply of loans and advances by the MFBs to enhance their contributions to economic growth and development of Nigeria include mobilization of more deposits, expansion of shareholders' base and fund and, credit risk management by the MFBs, setting the liquidity ratio by the Central Bank at levels that will not over-contract the ability of MFBs to extend loans and advances to microenterprises and, control of inflation by the relevant authorities.*

Keywords: Microfinance Bank, employment, financial markets

JEL Classification codes: G21, J21, D53

1. Introduction

Microfinance institutions, particularly, microfinance banks (MFBs) play crucial role in the development of the less developed economies. They provide loans and advances and other financial services within the ambit of their operations to their clients which include low income earners, low income households, the un-banked and un-served people such as women, physically challenged, youth, micro-entrepreneurs, informal sector operators, subsistence farmers in rural and urban areas thus actively participating in reduction of unemployment and job creation which ultimately engender improvement in living standards, reduction in poverty rates and enhancement of economic growth (Central Bank of Nigeria, 2013). The main objective of microfinance institutions is to expand access to credit by micro entrepreneurs who may not have access to credit facilities provided by the larger commercial and industrial banks. Thus they exist to provide financial services to the "grassroot" segment of the economy. These views were supported by Morduch (1999), who noted that provision of financial services to low income households can help in poverty alleviation and fundamental transformation of social and economic structures. In all, it could be said that MFBs play very

crucial role in the promotion of financial inclusion which is an important ingredient for economic growth and development (Umar, 2011).

Modern microfinance banking dates back to the mid-1970s in rural Bangladesh when Dr Muhammad Yunus, Professor of Economics at the Chittagong University established the Grameen Bank Project (literally translated as “Village Bank”) in the midst of a famine, to assist the rural poor (PlaNet Finance Group, 2015). Microfinance banks came on the scene of Nigeria’s financial system following the formulation of the National Microfinance Policy in the month of December 2005 as part of the reforms initiated by the former governor of the Central Bank of Nigeria (CBN). The policy was meant to deepen access of micro entrepreneur to financial services to finance their businesses and contribute to accelerating the growth of the economy. It was formulated as a result of the observed weaknesses of the erstwhile community banks caused by poor management, weak capital base, weak internal control, absence of deposit insurance schemes, etc. Thus in December 2006, all existing community banks were directed to transform to Microfinance banks.

In a circular dated August 11, 2011, the Central Bank of Nigeria established new minimum paid-up capital requirements for the three categories of MFBs in the country. The minimum paid-up capital for Unit Microfinance Banks which are only authorised to operate in one location was set at N20 Million; that of State Microfinance Banks which are authorized to operate within a State or the Federal Capital Territory (FCT) and open branches/cash centres therein, was set at N100 million; while the minimum paid-up capital for National MFBs which are authorized to operate in more than one state of the country and the FCT, was set at N2 billion. This was to ensure the soundness of the microfinance banking subsector to expand the capacities of the MFBs to lend to small and micro-entrepreneurs, thus making them contribute meaningfully to reduction of unemployment, eradication of poverty and acceleration of economic growth.

However, though the amount of loans and advances extended by Microfinance Banks in Nigeria have trended upwards, rising from N16,450.2 million in 2006 when the then community banks converted to MFBs following the directive issued by the CBN the previous year (2005), to N94,055.6 million in 2013 (CBN, 2013), yet the number of poor people (particularly the so-called “poorest of the poor” who are supposed to be the major beneficiaries of financial services offered by the MFBs) who are unable to access the loan facilities has been regrettably high. This suggests *inter alia* that the MFBs are constrained in their ability to lend, and that a major objective of government’s policy on Microfinance Banking in the country has not been fully achieved.

Acha (2012) identified several opportunities for the microfinance sector to explore. These include the growing entrepreneurial awareness, large unbanked rural area and high population of poor people. Exploring these opportunities invariably requires adequate channeling of funds (loans and advances) to meet the financial needs of micro-entrepreneurs. The ability of the MFBs to extend loans and advances is affected by multiplicity of factors ranging from the macroeconomic factors such as inflation, exchange rate, government expenditure, etc., to the bank-specific factors such as shareholders fund, deposit size, liquidity ratio, number of MFBs, etc. Known previous studies tended to investigate the determinants of MFBs loan repayment/loan payment defaults, or the contributions of MFBs to poverty reduction, economic growth and development or to discuss the problems and prospects of microfinance banking in Nigeria (Oke and Agbonlahor, 2007; Rotich, Lagat and Kogel, 2015). As far as we know, (to the best of our knowledge), apart from the study by Awoyemi and Jabar (2014) which examined the effect of commercial banks prime lending rate on the performance of microfinance banks in Nigeria in the 1992-2011 sample period using correlation analysis, wherein it was found that high prime lending rate of commercial banks is associated with increase in the total assets of MFBs, and decrease in MFB loans and

advances, and that of Rai and Rai (2012) which investigated the factors affecting financial sustainability in India and Bangladesh and suggested that capital-asset ratio, operating expenses/loan portfolio and portfolio at risk are the major factors affecting the sustainability of microfinance institutions, no study has yet investigated comprehensively, the determinants of loans and advances extended by the MFBs in Nigeria and indeed in Africa. The current study intends to undertake this task. The research question addressed by the paper is: What are the determinants of the amount of loans and advances extended by the MFBs in Nigeria? The objective of this paper therefore is to investigate the determinants of the amount of loans and advances extended by microfinance banks' in Nigeria with a view to recommending measures to enhance the supply.

2. Methodology

2.1. The Model and Estimation Techniques

Following the work of Aigheyisi and Oaikhenan (2014) which specified a model to investigate the determinants of commercial banks' loans and advances to the private sector in Nigeria, we specify our model to investigate the determinants of microfinance banks loans and advances in Nigeria in its functional form as:

$$\text{MFBLA} = f(\text{MFBDEP}, \text{MFBSHF}, \text{MFBLR}, \text{INF}) \quad (1)$$

Where MFBLA = Microfinance banks loans and advances

MFBDEP = Microfinance banks deposits

MFBSHF = MFBs' Shareholders funds

MFBLR = Liquidity Ratio

INF = Inflation, measured as annual percentage change in consumer price index

Equation 1 hypothesises that the amount of loans and advances extended by MFBs in Nigeria is affected by the size of customers' deposits, shareholders' funds, the liquidity ratio and inflation.

The method of cointegration and error correction mechanism (ECM) shall be employed for the investigations. The choice of this methodology is informed by the need to investigate the dynamic relationships between the exogenous variables and microfinance banks' loans and advances and to investigate the long-run effects of the selected explanatory variables on the amount of loans and advances extended by the MFBs in Nigeria. The methodology involves three steps namely the stationarity test (also referred to as the unit root test), the cointegration test (to determine the existence or otherwise of long run cointegrating relationships among the variables); and if the variables are found to be cointegrated, the short run dynamic relationship between the dependent variable and the explanatory variables shall be represented with an error correction model. Thus estimation of the error correction and long-run models is the last step in the methodology.

The Augmented Dickey Fuller (ADF) test is adopted to test for unit root. It entails estimating the regression equation (Gujarati, 2004):

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^m (\alpha_i \Delta Y_{t-i}) + \varepsilon_t. \quad (2)$$

(Y represents each variable series, t represents the time or trend variable and ε_t is a white noise error term. $\Delta Y_t = Y_t - Y_{t-1}$, $\Delta Y_{t-1} = Y_{t-1} - Y_{t-2}$, etc), and using the critical tau (τ) value to test the null hypothesis that $\delta = 0$ (i.e. there is unit root in the series or, the series is non stationary), against the alternative hypothesis that $\delta < 0$ (i.e. absence of unit root in the

series or the series is stationary). Rejecting the null hypothesis at a chosen level of significance (1%, 5% or 10%), implies that the series is stationary.

On the presumption that the variables may be of mixed order of integration, the ARDL-Bounds test approach to cointegration advanced by Pesaran and Smith (1999) and Pesaran, Shin and Smith (2001) which is the appropriate method to test for level relationship between variables that are mixed order of integration shall be employed to test for cointegration (long-run) relationship between the dependent variable and the explanatory variables.

The Bounds test approach to cointegration involves specifying a conditional VECM of interest in the form:

$$\begin{aligned} \Delta \text{LMFBLA}_t = & a_0 + \lambda_1 \text{LMFBLA}_{t-1} + \lambda_2 \text{LMFBDEP}_{t-1} + \lambda_3 \text{LMFBSHF}_{t-1} + \lambda_4 \text{LMFBLR}_{t-1} \\ & + \lambda_5 \text{LINF}_{t-1} + \\ & \sum_{j=0}^{n1} (\phi_j \Delta \text{LMFBDEP}_{t-j}) + \sum_{i=0}^{m1} (\theta_i \Delta \text{LMFBSHF}_{t-i}) + \sum_{x=0}^{p1} (\psi_x \Delta \text{LMFBLR}_{t-x}) + \\ & \sum_{r=0}^{q1} (\partial_r \Delta \text{LINF}_{t-r}) + \varphi G + e \end{aligned} \quad (2)$$

Where G is the error correction term, and e is white noise error term. The model is estimated with the OLS estimation technique to test for the joint significance of the coefficients of the lagged levels of variables using the F-statistic test. Thus the null hypothesis: $\lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = \lambda_6$ is tested against the alternative hypothesis: $\lambda_1 \neq \lambda_2 \neq \lambda_3 \neq \lambda_4 \neq \lambda_5 \neq \lambda_6$. The computed F-statistic is compared with two critical values (lower bound and upper bound critical values) at a chosen level of statistical significance. If the F-statistic is greater than the upper bound critical value, it can be inferred that level relationship exists between the dependent variable and the explanatory variables; this is to say they are cointegrated. F-statistic less than the lower bound critical value indicates no cointegration, while F-statistic between the lower and the upper bounds' critical values is inconclusive.

The error correction model is specified as:

$$\begin{aligned} \Delta \text{LMFBLA}_t = & a_0 + a_1 \Delta \text{LMFBLA}_{t-1} + \sum_{i=0}^m (\beta_i \Delta \text{LMFBDEP}_{t-i}) + \sum_{j=0}^n (\chi_j \Delta \text{LMFBSHF}_{t-j}) + \\ & \sum_{k=0}^p (\partial_k \Delta \text{LMFBLR}_{t-k}) + \sum_{u=0}^b (\psi_u \Delta \text{LINF}_{t-u}) + \Omega \text{ECT}_{t-1} + \xi_t \end{aligned} \quad (3)$$

The variables are as previously defined. L represents natural logarithm. The *a priori* expectations are $(\beta_i, \chi_j) > 0$, $(\partial_k, \psi_u) < 0$. m, n, p, b are optimal number of lags of the respective variables. The coefficient of ECT (Ω) is expected to be negatively signed, and statistically significant for it to play the role of error correction in the model. The negative sign is also an indication that the variables are cointegrated. The absolute value of the coefficient of ECT measures the speed of adjustment to equilibrium in the event of short-run deviations therefrom.

The associated long-run equation is specified as:

$$\text{LMFBLA}_t = \beta_0 + \beta_1 \text{LMFBDEP}_t + \beta_2 \text{LMFBSHF}_t + \beta_3 \text{LMFBLR}_t + \beta_4 \text{LINF}_t + \mu_t$$

The *a priori* expectations are $(\beta_1, \beta_2) > 0$; $(\beta_3, \beta_4) < 0$.

Annual time series data covering the period from 1992 to 2013 were utilised for the analysis. The data were sourced from the Central Bank of Nigeria Statistical Bulletin (2013). The choice of the scope (1992-2013) is informed by the fact that available data on community/microfinance banks in Nigeria begins from 1992 as this is actually the year

community banking which later metamorphose into microfinance banking was formally introduced into Nigeria's financial system by Community Banks Decree No. 46 of 1992.

2.2. Discussion of Expected Results (Theoretical Justification of *a priori* Expectations)

Deposit Size and MFB Loans and Advances

Customers' deposits with banking financial institutions are their largest source of funds (Simpson, 2015) and the major determinant of the size of their loans and advances. Deposits represent a liability to the banks, and with this liability, an asset is created through lending, and for the MFBs part of the profits generated by micro-entrepreneurs from the ventures for which the loans were acquired are usually re-deposited with them. Thus it is often said that *lending creates its own deposit*. All things being equal, the larger the amount of deposits a banking financial institution (including MFBs) has, the larger is its capacity to lend. Thus, the amount of loans and advances extended by the MFBs is presumed to be directly proportional to the size of their deposit liabilities.

Shareholders' Funds and MFBS' Loans and Advances

The shareholders fund is the investment made by the owners of the MFB in it. In other words, it is an indicator of the shareholders' ownership interest or stake in the business. It is an important component of banks' capital, and helps to prevent banks from going insolvent (not being able to pay their debts). Other things being equal, financial institutions with large shareholders' fund are seen as strong and safe banks with large capacity to finance huge projects, ensure safety of customers' deposits (where there are deposit insurance schemes) and resist negative external shocks. The guaranteed safety enhances their attractiveness to depositors, and this leads to increase in their deposits thereby expanding their capacity to lend, *ceteris paribus*. Thus shareholders funds are predicted to be positively related to the size of MFBs loans and advances.

Liquidity Ratio and MFB Loans and Advances

The central bank uses the liquidity ratio as an instrument of monetary policy to influence money supply and control inflation by regulating the ability of banking financial institutions to lend. The liquidity ratio is a percentage of banks' liquid assets that they are expected to hold as reserves or maintain (in some liquid form particularly gold and approved government securities) in order to maintain their liquidity and solvency, before lending to the public. The ratio is raised if the central bank wishes to contract banks' capacities to lend, and it is lowered if it wishes to expand their lending capacities. Thus an inverse relationship is hypothesized to exist between liquidity ratio and MFB loans and advances.

Inflation and MFBs' Loans and Advances

Increase in inflation is associated with decrease in MFBs loans and advances. This results from the fact that inflation engenders a rise in transaction demand for money as a result of the decline in the value of money it causes. This is to say inflation reduces the value of money, and this in turn, other things being equal, triggers increased withdrawals by depositors from their deposits at the banks to facilitate purchases. Furthermore, inflation and inflation expectation reduce the desire to hold money in form of cash or bank deposit and triggers the desire to increase investment in financial assets (such as bonds, stock, treasury bills, gold etc) to hedge against inflation which could erode the value (or purchasing power) of money. The decrease in customers deposit in the financial institutions occasioned by inflation-induced withdrawals impels the institutions to charge higher interest on their loans

and advances. Thus increase in inflation causes a rise in the nominal interest charged by banks on loans. This is explained by the *fisher's equation*. The increase in interest rate resulting from the decline in the deposit base of the banks engendered by inflation culminates in decrease in the amount of loans and advances demanded by borrowers and extended by the MFBs. Thus inflation is hypothesized to be inversely related to MFB loans and advances.

3. Empirical Results and Discussions

3.1. Unit Root and Cointegration Test Results

We begin the analysis with the unit root test to determine whether or not the variables are stationary. The test for stationarity is conducted with the Augmented Dickey Fuller test. The results are presented in Table 1.

Table 1. ADF Tests for Unit Root in Variables (Regressions include an intercept and a linear trend).

Variables	Order of Integration	ADF Test Statistics	Critical ADF Value (5%)
LMFBLA	I(0)	-4.3668	-3.6450
LMFBDEP	I(0)	-4.3632	-3.6450
LMFBSHF	I(1)	-5.8798	-3.6584
LMFBLR	I(1)	-4.2649	-3.6584
LINF	I(1)	-6..8525	-3.6584

The unit root test results show that the variables are of mixed order of integration. While the logs of MFB loan and advances and deposit variables are stationary at levels (that is integrated of order zero), logs of MFB shareholders' fund, liquidity ratio and inflation variables are stationary at their first differences (that is they are integrated of order 1). The mixed order of integration of the variables justifies the suitability and choice of the ARDL-based Bounds test for cointegration. The result of the cointegration test is presented in Table 2.

Table 2. ARDL Bounds Test for Cointegration

ARDL Bounds Test
Date: 12/03/15 Time: 13:22
Sample: 2 22

Included observations: 21

Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	3.090635	4

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.2	3.09
5%	2.56	3.49
2.5%	2.88	3.87
1%	3.29	4.37

The ARDL Bounds test shows that the computed F-statistics is (narrowly) greater than the upper bound at the 10% level of significance. Thus the null hypothesis of no long-run relationship is rejected at the 10% significance level. This implies that equilibrium (long-run) relationship exists between MFB loans and advances and the explanatory variables. According to the Granger Representation Theorem, cointegration of variables suggests that

the short-run relationship between them can be represented with an error correction model. The estimated error correction model as well as the long-run parameters is shown in Table 3.

3.2. Estimated Error Correction and Long-run Models

The results of estimation of the error correction and long-run models are presented in Table 3.

Table 3. Estimated Error Correction and Long-run Models

ARDL Cointegrating And Long Run Form

Dependent Variable: LOG(MFBLA)

Selected Model: ARDL(1, 1, 1, 0, 1)

Date: 12/03/15 Time: 13:20

Sample: 1 22

Included observations: 21

Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(MFBDEP)	0.605686	0.217397	2.786089	0.0165
DLOG(MFBSHF)	0.451936	0.189615	2.383447	0.0345
DLOG(MFBLR)	-0.101653	0.170920	-0.594740	0.5631
D(INF)	-0.004883	0.002686	-1.818136	0.0941
CointEq(-1)	-0.928314	0.256100	-3.624815	0.0035
Cointeq = LOG(MFBLA) - (0.2751*LOG(MFBDEP) + 0.7835*LOG(MFBSHF) - 0.4779*LOG(MFBLR) - 0.0715*LOG(INF) + 1.6960)				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(MFBDEP)	0.275078	0.359141	0.765932	0.4585
LOG(MFBSHF)	0.783523	0.319167	2.454897	0.0303
LOG(MFBLR)	-0.477917	0.156807	-3.047803	0.0101
LOG(INF)	-0.071547	0.049148	-1.455750	0.1711
C	1.695970	0.906738	1.870409	0.0860

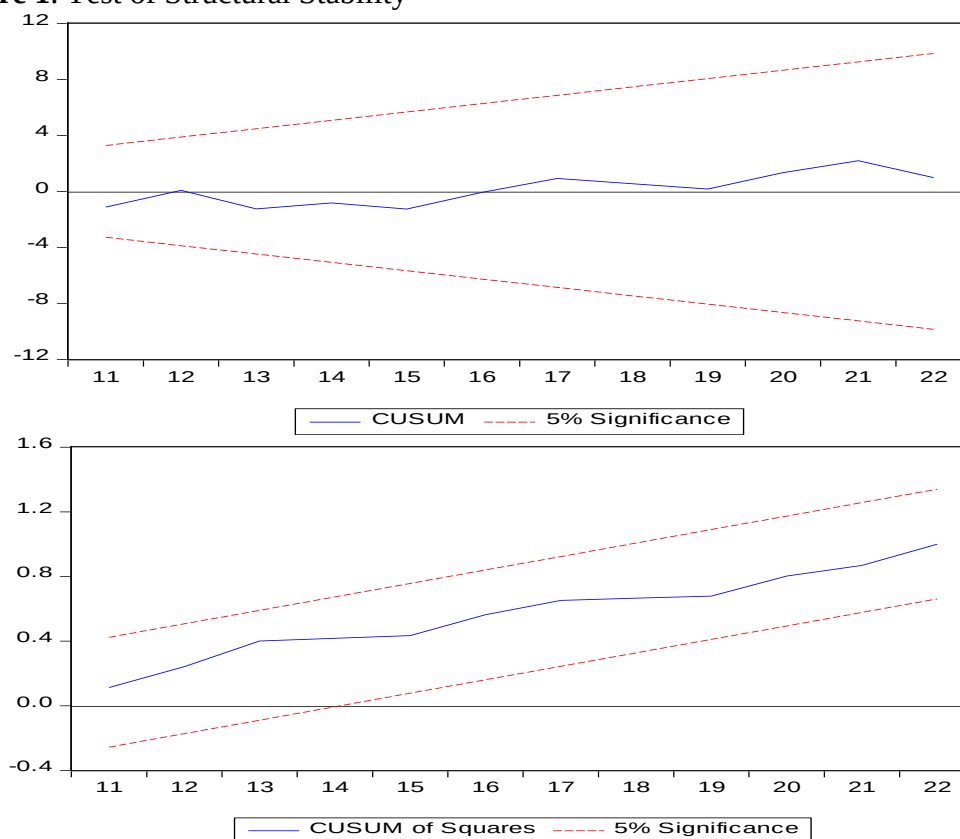
The results show that the signs on all the variables (in both ECM and long-run models) conform to *a priori* expectations. Microfinance banks' deposits positively influence the amount of loans and advances extended. The impact as indicated by the t-ratio and associated probability is significant even at the 2% level. The coefficient indicates that a 10% increase in the size of MFBs deposit is associated with 6.1% rise in the amount of loans and advances extended by the banks. The size of MFBs shareholders' fund also positively influence the amount of loans and advances extended by the MFBs. The influence as indicated by the t-ratio and associated probability is significant at the 5% level. The coefficient indicates that a 10% rise in the size of shareholders fund is associated with 4.5% increase in the amount of loans and advances extended by the MFBs. Liquidity ratio and inflation rate are, as expected, inversely related to MFBs loans and advances in the short-run, though the coefficient of liquidity ratio is not statistically significant as indicated by t-ratio. This suggests that the short-run effect of increase in liquidity ratio on the amount of loans and advances the MFBs can extend is not significant. Inflation adversely affects the amount of loans and advances extended by the MFBs. The effect is significant at the 10% level. The error correction coefficient [cointeq(-1)] has the correct (negative) sign, and is highly statistically significant

even at the 1% level. This is further evidence that the dependent variable and explanatory variables are indeed cointegrated. The absolute value of the coefficient indicates a very speed of adjustment to equilibrium in the event of short run deviation there from. Specifically, 96% of disequilibrium is offset by short-run adjustment annually to maintain the equilibrium (long-run) position.

The signs on the coefficients of the explanatory variables in the long-run model conform to *a priori* expectations. However, deposit variable is not statistically significant at any of the conventional levels. Shareholders' fund retains its statistical significance in the long-run model as the t-ratio indicates that the variable is significant at the 5% level. The coefficient indicates that 10% sustained increase in MFBs shareholders' fund is associated with 7.8% rise in the amount of loans and advances extended by the MFBs. Liquidity ratio is inversely related to MFB loans and advances in the long-run. The relationship is significant at the 1% level. A 10% permanent or sustained increase in the liquidity ratio is associated with 4.7% decrease in MFB loans and advances. The long-run effect of inflation on the amount of loans and advances extended by MFBs is not statistically significant.

The test of the structural stability of the model involving the plots of cumulative sum of recursive residuals and cumulative sum of squares recursive residual (Figure 1) indicates that the model is structurally stable. Thus the model can be relied upon for policy.

Figure 1. Test of Structural Stability



4. Conclusion and Recommendations

In consideration of the role of microfinance institutions in the promotion of financial inclusion, employment creation and eradication of poverty in the quest for economic growth and development in less developed countries, the paper examined the factors affecting the supply of loans and advance by microfinance banks in Nigeria in the period 1992 to 2013. It

found that the major determinants of the amount of loans and advances extended by MFBs are deposit size, shareholders' fund, liquidity ratio and inflation. Deposits positively affected MFBs loans and advances in the long and short run, though the long run effect was not statistically significant. The short-run and long-run effects of shareholders' funds on the amount of loans and advances extended by the MFBs were positive and significant. Liquidity ratio negatively affected MFBs' loans and advances in the short-run and long-run, however the short run effect was not statistically significant, but the long-run effect was significant. The short-run effect of inflation on the amount of loans and advances extended by MFBs loans and advances was negative and significant, while the long-run effect was not statistically significant.

In light of the empirical evidence, we proffer the following recommendations to enhance the supply of loans and advances by the MFBs.

- I. Considering that customers' deposits were observed to be positively and significantly related to loans and advances extended by the MFBs, there is need for the MFBs to channel more effort towards deposit mobilisation in order to expand their deposit base. This could be achieved by development of new, innovative and attractive financial products or services as well as engagement of well trained and motivated sales force (marketers). This also entails establishment of MFBs branches in areas where they are few or where they do not yet exist, particularly the core rural areas.
- II. The importance of the shareholders' fund to the development of MFBs is reflected in its positive short-run and long-run effects on amount of loans and advances extended by the MFBs. This suggests the need for MFBs to take steps towards expanding their shareholder's funds. MFB may also consider the option of getting listed on the stock exchange (for those MFBs which have met the listing requirements of the Securities and exchange Commission, but are not yet listed), and then offering their shares to the public for subscription. MFBs not listed on the stock exchange which have not met the requirements for listing can also expand their shareholders' base by offering their shares through private placement to high profile and institutional investors taking care not to violate any of the extant rules and regulations. However, in doing this, the MFBs must take steps to safeguard the investment of its shareholders by putting measures in place to minimise or reduce the chances of loans turning 'bad' as this may deplete the shareholders' fund, leading to loss of shareholders' value. The regulatory authority should also consider setting up shareholders protection fund as had been done in Europe
- III. There is need for the Central Bank to set the liquidity ratio at levels that will not over-contract the ability of MFBs to extend loans and advances to microenterprises which rely heavily on loans from the MFBs.
- IV. Considering that inflation is negatively related to the amount of loans and advances extended by the MFBs, there is need for the government to make use of appropriate policies (monetary policy, fiscal policy, etc.) to control inflation so as to minimize or reduce its effect.
- V. Inasmuch as extending credit to micro-entrepreneurs is very much desirable, the MFBs should set up appropriate credit risk management mechanism to minimize risks such as loan repayment defaults associated with lending to "high risk" borrowers.

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ELECTRONIC COMMERCE. PAYMENT INSTRUMENTS

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Abstract: *In a "traditional" sense, electronic commerce means using in network value-added applications such as electronic transfer of documents (EDI), the fax communication, barcodes, file transfer and email.*

The extraordinary growth of interconnectivity of computers in Internet in all segments of society has led to a growing obvious trend for companies to use these networks in the area of a new type of trade, e-commerce Internet, to call - besides the old services mentioned - new ones.

For example, the possibility to make purchases over the network by reviewing electronic catalogs "online" on the web or catalogs "offline" on CD-ROM and paying via credit cards or electronic purses.

For others, Internet commerce is a business relationship through networking menus between suppliers and customers, as an alternative communication for "traditional" by fax or EDI dedicated communications lines on networks with added value. Eventually, another form of Internet commerce involves transferring documents - from pro forma contracts or orders, to pictures or voice recordings.

Keywords: data interchange, electronic commerce, electronic money;

Jel codes: A12, F02, F53, G23, G35;

1. Introduction

Electronic Data Interchange (EDI) appeared in the 60s and can be considered the ancestor of electronic commerce. EDI offers companies the opportunity to exchange business documents in a standard form, using electronic means for processing and transmitting them. At the same time banks use dedicated networks for Electronic Funds Transfer (EFT).

Lately, as the availability of Internet is increasing, electronic commerce has captured the interest of individual consumers and companies of all sizes and interests. Moreover, with the advanced technologies now available, it is more and more talking of the Digital Economy (DE). The basic idea is that through e-commerce one can achieve the exchange of ideas, goods, knowledge, beyond simply buying / selling of products and services. E-commerce technologies can be used to run a business using the Internet for communication, Intranet or other computer networks.

The concept of virtual value is very important because it offers the possibility of digital information in the usual processes occurring in running business activities. One of the main goals of e-commerce strategies is to identify and encourage users of information via Internet, giving them the necessary support. Electronic commerce offers the ability to run a business in a flexible manner that can benefit from the various opportunities as they arise.

But bear in mind that introducing electronic commerce in a business requires some changes in the structuring, development and tracking of activities. Using multimedia techniques or adaptation facilitates the inclusion of details of disclosure forms processed. Presentation of information takes on importance as large as the content. The Internet allows

two-way exchange of information, without limits of time and space.

2. Internet payment systems based on bank cards

2.1 SET Standard

Many purchases of goods and services via the Internet are being paid by ordinary bank card (Visa, MasterCard, etc.). But such transactions on cards contain confidential information and personal information of clients, information that may be intercepted during transmission over the Internet. Without special software, any person who monitors traffic on the network can read the content of such confidential data and can use them later. It is necessary to develop specific standards of payment systems, to coordinate the parties involved in the transfer legitimate and proper use of security measures.

In 1996, MasterCard and Visa have agreed to strengthen their standards of electronic payments into one, called SET (Secure Electronic Transaction). SET protocol aims seven security objectives in e-commerce:

1. To ensure confidentiality payment instructions and application information that are transmitted with payment information;
2. Ensure the integrity of all data transmitted;
3. To provide the buyer's identification and that is a lawful user of a mark card;
4. Provide seller's identification and that it accepts card transactions in relation to a financial institution acquiring;
5. To use the best security methods to protect the parties involved in trade;
6. To be a protocol that does not depend on the security mechanisms of transport and does not prevent their use;
7. To facilitate and encourage interoperability between software providers and the network;

These requirements are accomplished by the following characteristics of this specification:

❖ **Confidentiality of information** - to facilitate and encourage E-commerce using credit cards, card holders is necessary to ensure that your payment information is secure. Therefore, the buyer's account and payment information must be secure when passing the network, preventing interception of account numbers and expiration dates by unauthorized persons. SET message encryption ensures confidentiality of information.

❖ **Data Integrity** - This specification ensures that the content does not alter their messages during transmission over the network. Payment information sent by the buyer to the seller to request for information, personal data and payment instructions. If any of this information is changed, the transaction will not be done correctly. SET protocol uses digital signature for data integrity.

❖ **Authentication buyer** - seller needs a check from his client stating that it is a lawful user of a valid account number. A mechanism that connects the cardholder and account number will specifically reduce the incidence of fraud and therefore the total cost of the payment process. SET uses digital signatures and certificates to authenticate its buyer.

❖ **Authentication seller** - This specification means to ensure the client that the provider has a relationship with a financial institution, allowing it to accept credit cards. SET uses digital signatures and certificates to authenticate its seller.

❖ **Interoperability** - SET protocol shall be applicable for a variety of hardware platforms and software. Any buyer must be able to communicate with its software with every seller. For interoperability, SET uses specific message formats and protocols.

E- buying - In a typical scenario of e-commerce, the shopping process are:

1. The buyer can look for goods and services having more possibilities:

- ✓ Use a browser to view online catalogs of Web page of the seller;
- ✓ Consult an additional catalog that resides on a CDROM;
- ✓ Consult a catalog on paper.

1. The purchaser chooses the goods he wishes to buy.

2. The buyer sees a list of goods, including their price and total price with all taxes. This list must be provided electronically server software seller or the purchase of electronic client computer. Sometimes price negotiation is accepted.

3. The buyer chooses the means of payment. Consider it chose as payment credit card (the card).

4. The buyer sends the seller a request with payment instructions. In this specification, application and payment instructions are digitally signed by buyers who possess certificates.

5. The seller requests payment authorization from his client from its financial institution.

6. The seller sends acknowledgment.

7. The seller sends the goods or services covered by the application meets.

8. The seller requests payment of goods and services from the purchaser's financial institution.

Cryptography in SET - To ensure payment security, SET uses RSA key pair to create digital signatures and secrecy. Therefore, every participant in the transaction process has two pairs of asymmetric keys: a pair of "exchange" keys - used in encryption and decryption - and a pair "signature" for creating and verifying digital signatures. Note that the role of key "signature" is reversed in the digital signature where the private key is used for encryption (signing), and the public is used to decrypt (signature verification).

Authentication is reinforced by the use of certificates. Before a B recipient to receive a digitally signed message by a transmitter A, he wants to be sure that it has the public key of A and not someone who was recommended as A network. An alternative would be that the receiver B to receive public key directly from A through a secure communication channel. In most cases, however, this solution can not be practiced. Secure key transmission is performed by a "trusted third party" called Certificate Authority (CA) that it assures B that A is the owner of the public key in his possession. Certificate Authority certificate provides that link a person's name and a public key. User A has AC's identity information. The CA creates a message with his name and public key of it. This message, called certificate is digitally signed by the Certificate Authority. It contains information identifying the owner and a copy of the public key (exchange or signature). SET Participants will also have two certificates for two pairs of keys: certified "signature" and certified "parts". The certificates are created and signed simultaneously by AC.

SET protocol introduces a new application of digital signatures, namely the concept of dual signature. Consider the following scenario: B seller sends to A buyer a bid and an authorization to his bank to transfer the money, if it accepts the offer. But B wants the bank not to see terms of the offer, nor its buyer account information. In addition, B wants to make a

connection between supply and transfer, so the money will be transferred only if it accepts the offer to. However he realizes both digital signing messages in a single operation creates dual signature. A dual signature is generated by calculating summaries of both messages and concatenating the two summaries. The result obtained is calculated in turn, a summary and, finally, the latter summary is encrypted with the private key to sign the transmitter. It has included summary message for any of the other two recipients to validate the signature dual. A recipient of any message may verify the authenticity by generating its summary, summary concatenating other message, and calculate summary concatenation. If the new summary dual decrypted signature matches, the recipient can be sure of the authenticity of the message.

If A accepts B's offer, he send a message indicating the bank and its acceptance of the offer including the abstract. The bank can verify the authenticity of transfer authorization for B and ensure that consent is for the same offer by using summary authorization that he received from B and A's summary of the offer presented to validate the signature dual. Thus, the bank can check the authenticity of the offer, but can not see the terms of the offer.

In the SET protocol, dual signature is used to make the connection between a control message sent to the seller and payment instructions containing account information sent to the purchaser. When the seller sent a request for authorization purchaser includes payment instructions received from the buyer control and summary information. The purchaser uses the summary received from the seller and calculates summary payment instructions to verify the signature dual.

Currently, more e-commerce products implements the SET, which gives Internet security card payments through cryptographic means.

2.2 CyberCash

Founded in August 1994, the company Cybercash Inc. US, in April 1995 proposes a mechanism secure payment transactions with cards based on your own server and providing customer service sellers. Using Server provides the ability Cybercash immediately trace and control of transactions. On the other hand, the passage through the server makes the system slower and dependent on the response time thereof. This makes Cybercash less comfortable and more expensive, especially for small cash payment transactions. But public key encryption ensures high levels of security.

Cybercash implements a protection system that performs credit cards used in the Internet. The company - which provides software for both sellers and buyers - operates a gateway between the Internet and the networks of major companies bidding authorization cards. Buyer start by downloading specific software wallet that supports the encryption and transaction processing. Just like a physical wallet that can hold several different bank cards, wallet buyer's software can be used by the customer to register multiple cards, which will subsequently make payments. A similar software provides same thing to the seller.

Messages are encrypted using a symmetric algorithm (DES) with 56-bit key randomly generated, closed in the message encryption with public key of the receiver. Public key encryption system used is RSA, with a length of 1024 bits. Cybercash public key is stored in the wallet and the software vendor. When you register the software wallet cards that will make the payments, the buyer will generate its own public key pair - the private key. Then the key to the public will be submitted to Cybercash, which will record in a database. Although all participants in the system (buyers, sellers and Cybercash) have their own public and private key pairs, only Cybercash knows public keys of all. As a result, the company can exchange information securely with any buyer or seller, but also communicate clearly with each other. Cybercash returns as his task to authenticate all signatures with public keys it holds safely.

When making a purchase, the desired product is selected through a Web browser. The server wallet buyer sends the seller a payment request message clearly, cryptographically signed purchase and request that describes which types of cards are accepted for payment. Wallet software displays a window that allows the buyer to approve the acquisition and the amount and select the card you will pay.

A message is sent back to the seller for payment including a description of the transaction encrypted and digitally signed by the buyer and the card number used. The seller sends the message further payment gateway Cybercash with his own description of the transaction, encrypted and digitally signed. Cybercash decrypts and compares the two messages and check the two signatures. If things are OK, he grants the request by sending a specific vendor to its software. Then confirm payment wallet software seller to the buyer.

Cybercash operate its own gateway as an agent of the seller's bank. Therefore, he must be trusted to decrypt messages and transfer them to networks permit conventional banks.

As the information is encrypted with the public key of Cybercash known to the software operating system, the seller can not see which card number used by the buyer, eliminating the risk reuse this card to other unauthorized purchases.

Recently, the company expanded Cybercash initial payment system based on secure transmission cards with other facilities for electronic money payment: Secure Cash / Check and Secure Check and CyberCoin used for lower values. Also closely with Cybercash at University of Southern California have developed two similar systems: NetCash for small cash payments based on electronic money and NetCheque, a system based on electronic checks.

3. Online paying systems for electronic money

3.1 Ecash

ECash is an example of the electronic payment system that uses e-mail or Web site for implementing a virtual wallet concept. It was developed by the company DigiCash Co. from the Netherlands, founded by the famous researcher of cryptographic systems, David Chaum. The first demonstration of the system was made in 1994 at the first Conference WWW via a weblink between Geneva and Amsterdam. It was subsequently implemented by US banks (Bank of Missouri Mark Twain), Finland and other countries. It is the first entirely software solution for electronic payments.

ECash is a completely anonymous payment system, which uses numerical bank accounts and blind signatures technique. Transactions are between buyer and seller, who must have accounts at the same bank. Purchasers must notify the bank about that wish to transfer money from their accounts in the usual so-called Mint ECash account. At any time, the buyer can interact remotely, through his computer with Mint account and using a soft client can withdraw funds from here on his computer disc. The format of these funds is electronic - 0 and 1 suite of cryptographic protection. As a result, the disc purchaser becomes a veritable "electronic wallet". Then you can execute payments between individuals or by companies through these ECash.

Principle of operation ECash - ECash is private: although the bank keeps a record of each and every deposit withdrawals ECash Mint is impossible for the bank to establish further use of ECash. This property is due to the use of public key criptosisteme RSA with a key length of 768 bits. Besides anonymity payments ECash also provides non-repudiation, meaning that property which allows the resolution of any dispute between buyer and seller on the recognition of payments. Also, by checking the database of the bank, it is prevented from spending any of ECash double.

Like real money (banknotes, coins), electronic money ECash can be withdrawn from accounts or store to be traded. Also, as in the case of physical money, a person may transfer possession of ECash account to another person. But unlike conventional money when a customer pays another client, electronic bank plays a seemingly modest but essential.

ECash is a software solution on-line payments, which consists of the interaction of three entities:

- bank, issuing the coins, validates the currencies and exchange real currency for ECash;
- buyers who have a bank account, which can hold coins or they can submit ECash ECash coins;
- sellers who accept ECash currencies in exchange for goods or services.

ECash is implemented using RSA public key cryptography. Each user has his own key pair (public - and private E - D). It requires special software for managing ECash:

- Customer program called electronic wallet (cyberwallet);
- ECash a special program for the seller.

Withdrawal ECash coins from the bank - Software cyber customer's wallet calculates how many digital coins and what values are needed to meet the demand for payment. Then the program generates random serial numbers for these coins. These numbers are large enough (100 decimal digits) that is a low probability that someone else generate the same values. These serial numbers are then made "anonymous", with the aid of blind signatures. This is done by multiplying them by random factor. Money "anonymous" are then packed into a message with the private key to digitally sign the client's public key figures of the bank and then sent electronically to the bank.

When the bank receives the message, it verifies the signature. Then withdrawn amount can be debited from the customer who signed the application. Bank signed electronic key currencies to private and returns them to the client, encrypted with the public key of it.

By using blind signature, it prevents bank coins can recognize as coming from a particular account. Instead the bank to create electronic coins "white", a user's computer (in our example Dan) is the one who creates randomly coins. Then hide these coins, each in a special digital envelope, and send them over all the bank. Bank withdraws every reception dollar account validation Dan and builds digital currency as a "stamp" on the envelope that Dan just sent. Such envelope "stamped" is returned to Dan. When Dan's computer will remove the envelope, it get a digital currency as wished, but validated stamped. But because the bank has not seen the coin hidden in the envelope, it will not be able to tell when you receive a payment, from whom it derives - ie who owns the money.

After the client receives the money Anonymous sign the bank decrypts the message and cancel anonymity money by dividing the random factor. Digital currency, to be withdrawn from his account in the bank Dan will be stored on his computer's hard drive.

ECash spending coins - When Dan has ECash on its disk, can buy something from the store Vlad. Receiving a request for payment from Vlad Dan approve it by pressing the "Yes" in the window. ECash will choose its program of his wallet (disk) suitable electronic currencies to form the total payment. After this it'll erase those coins and send them over the network to store Vlad. When Vlad's program received the coins, the bank will send them automatically. Then wait until they are accepted or rejected before sending goods purchased by Dan.

Cyberwallet launches the client and Web client software. With the latter sailing until it finds a virtual store on the network. ECash client software works with server and Web client. A shop is nothing more than an HTML document with URLs representing article with products for sale. To buy a product, the customer selects a URL representing the article.

The purchase is made in the following steps:

1. Web client user sends a message HTTP request URL of the Web server vendor. URL will call a CGI program (Common Gateway Interface).
2. The CGI program is called ECash software vendor. It will send details of the selected item in the URL. Locating computer buyer will be sent through a server variable from the ECash software vendor.
3. The software seller will contact the buyer's wallet program via a TCP / IP, demanding payment.
4. When the wallet from client receives the request, he will ask the buyer whether to accept payment. If so, send the seller just necessary electronic currencies. They will be encrypted with the public key of the seller:

ESELLER (Coins)

If the coins are not available to exactly satisfy the request for payment, it sends a refusal to the seller.

5. When the seller receives currencies, decrypts them with his private key; then has to verify their validity and possible double spending. For this, he contacts the bank and will be sent a message consisting of coins, key signed by the seller and then encrypted with the public key of the bank:

EBANK (DSELLER (Coins))

6. The bank decrypts the message with his private key and then validates money by checking the serial numbers with those recorded in the database as having already spent. If the the series seller sent are found in the database, it means that money is invalidated, they already spent. But if they are not in the database and sign right bank are key to private money call validate. Their value credited to the seller's account, money is destroyed and the series they are stored in the database. The software notifies the seller's bank deposit about the successful conclusion.
7. Returns a message-receipt signed electronically by software buyer's wallet.
8. A confirmation message is then sent from the Web server wallet.
9. Submit information to the Web server Web client of the buyer.

3.2 NetCash

NetCash is another example of electronic payment system type online. It was created at the Information Science Institute at the University of Southern California. Although the system does not ensures total anonymity as ECash payments (money can be identified), NetCash offers other means to ensure a certain degree of anonimate payments. The system relies on multiple servers distributed coins, which can be exchanged for electronic checks (including NetCheque) electronic money.

NetCash system consists of following entities:

- buyers,
- sellers,
- coin serveres (CS).

An organization that wishes to manage a currency server must obtain permission from a central authority for certification. Currency server will generate an RSA key pair, public and

private. The public key is then certified by the signature of the central certification authority. The certificate contains an identifier (ID), currency server name, public key of the server currency, issuance and expiry dates, all signed by the central authority:

D_{central authority} (ID, Name-CS, E_{CS} , Release day, Expiration date)

Electronic coins issued by the server CS consist of the following:

- ☐ Name CS;
- ☐ network address of CS;
- ☐ Expiration date;
- ☐ serial number;
- ☐ value.

The money is then signed with CS server private key:

D_{CS} (Name-CS, Address-network-CS , Expiration date, Serial number, Value)

CS series keeps track of all money released. In this case, the validity and double spending can be checked whenever you make a purchase or exchange check. When the determination is made of money are spent, their series are deleted from the database of CS and money are replaced by other series. An electronic check can be changed to an CS with electronic money.

To ensure anonymity payments, CS is not authorized to save the people and their network addresses which they issue electronic money. The holder of such coins can then go to any other CS to swap them with other coins issued by that CS

In this transaction the buyer remains anonymous because the seller wants to know only the network address where the buyer acts. NetCash make the assumption that any buyer can obtain the public key of the seller and the latter has the public key of CS.

Purchase transaction using NetCash is made in 4 steps:

1) The buyer sends currencies electronically within message payment service ID to purchase (S-Id), a secret key generated only for that transaction (K_{BUYER}) and a public key session (E_{SELLER}), all encrypted with the public key of the seller . The secret key K will be used by the seller to establish an encrypted channel with the buyer. The public key is then used to verify payment requests coming from that customer.

E_{SELLER} (Coins, K_{BUYER}, E_{BUYER} , S-Id)

2) The seller must verify the validity of electronic currencies received. To do this, it will send CS to swap them with other electronic currency or with a check. The seller generates a new symmetric session key secret K_{SELLER} to be sent with money to CS. The whole message is encrypted with the public key of the server:

E_{CS} (Coins, K_{SELLER}, Kind of transaction)

3) The server verifies that the money CS are invalid, referring to the data base. A ban is valid if its serial number appears in the database. CS seller new currency will return a check or electronic, encrypted with the secret key session of the seller:

K_{SELLER} (New coins).

4) Receiving new money (or check) the seller is satisfied that it was properly paid by the buyer. Now he will return this confirmation, signed with his private key and secret key encrypted session with the buyer:

K_{BUYER} (D_{SELLER}(Sum, Id-transaction, date).

Advantages of using NetCash are scalability and security. He is scalable since it can install multiple CS. Security is ensured by its cryptographic protocols. But unlike the ECash system NetCash is completely anonymous. It is difficult - but not impossible - for MS to keep records about who is issued coins and from which receive money back. The ability to use multiple servers CS increase the anonymity of payments.

4. Micro-payment systems

As we have seen so far, there are a number of protocols for e-commerce payment transactions "big", \$ 5, 10 USD and more. The cost per transaction is typically a few cents plus a percentage of the vehicle. When these costs are applied to transactions with low values (50 cents or less), the cost becomes significant in the total price of the transaction. Therefore, to actually get a minimum price for certain goods and services "cheap" to be bought, new protocols will be used.

There are a number of online services that promote newspapers, magazines, reference work and others, all of which are cheap if individual items are sold separately. The advantage of buying individual items may be cheap services more attractive to casual users of the Internet. A user who does not like the idea of opening an account ten dollars a publications editor unknown, may be willing to spend a few cents to buy an interesting article at first. An application "cheap" is to pay frequent visits to Internet sites.

As a concept and experimental projects, micro-payments scheme addresses the need of the existence of a simple, inexpensive, able to support the economic paying very small few dollars, cents and even fractions of cents. We will examine some proposals of this type of electronic payment systems.

4.1.MilliCent

Millicent is a simple and secure protocol for Internet electronic commerce. It was created to support commercial transactions involving costs lower than one cent. It is a protocol based on a decentralized validation of electronic money sellers servers without additional communication, expensive encryption or separate processing.

Millicent key innovation is to introduce the use of cooperating brokers and scrip's. Brokers, (those who sell scrip sites) are in charge of account management, billing, maintenance and establishment of functional connections with sellers accounts. Scrip-digital currency is specific to each vendor individually. Vendors have to validate the local SCIP site to prevent theft, such as for example double spending from customers.

A piece of scrip representing a client account that was established with the seller. At any time, the seller has to solve the scrip's (accounts) with the most recent clients. Account balance is updated scrip's value. When the customer makes a purchase with scrip, your shopping cost is deducted from the total scrip and the value remaining scrip new form (with a new value / balance account), which is returned as change. When the customer has completed several transactions, it can "charge" remaining scrip's value (close the account).

Brokers, serving as interim accounts between customers and sellers. Customers enter into a long term relationship with broker-ii, in roughly the same way as it would make a deal with a bank, credit card company or ISP (Internet Service Provider). Brokers, buy and sell scrip sites belonging to vendors as a service to customers and vendors. Scrip of servers cooperating brokers have a common currency for clients (used to purchase Scrip's sellers) and sellers (to return the unused money scrip).

Millicent reduces costs in several ways:

- The cost of communication is reduced by checking local scrip site, the site of the seller; This eliminates communication costs (which are absent), costs for IT equipment that would give sufficient computing power for a normal progress of a large number of transactions; also no need for centralized servers, protocols expensive etc.

- Cryptographic costs are reduced as there is no need strong cryptographic scheme and expensive to very low values which are traded. It requires a cost that does not exceed the scrip site itself.

- Account costs are reduced by using cooperating brokers who handle accounts and invoices. Customers establish accounts with a broker; broker sets its own account with the seller. This separation reduces the total number of accounts by removing all client-vendor combinations.

The security and confidence model - Millicent security model is based on the assumption that the currency "scrip" is used for small payments. Ordinary people and the business deals with different currencies depending on their value; the same happens in the case of bills, small bills are treated differently when the big bills. Like when a man buys a candy from a vending machine and does not require a receipt, he does not need any receipt when buying an item using the scrip. If a person does not want to pay for something, give up and will get back the amount involved. If this amount (currency) will be lost, he or she will be very upset. It is assumed that a user will have, at one time, just a few dollars in scrip. It follows that it is not profitable to steal a scrip.

Millicent trusted model is based on an asymmetric relationship of trust composed of three entities - customer, broker and seller. Brokers, are believed to be more reliable than the sellers, and ultimately, customers. It tends to broker them to financial institutions powerful, large and well known (such as Visa, MasterCard, or banks) or a large Internet service provider or online services (such as CompuServe, NETCOM, or AOL). Is expected to be many sellers, covering a wide spectrum of activities and also a large number of customers and the trust relationships be like in the real world.

Three factors make fraud broker-building in micro-payments unprofitable:

- Customer and vendor programs can independently analyze the script and maintain account balance, so any broker fraud can be detected;
- Clients do not have, at one time, many Scripts - so the broker will have to commit more fraudulent transactions to earn any revenue, and this makes it easier to spot;
- Cooperating brokers reputation is important for attracting clients and a broker can quickly lose that reputation if there are problems in transactions of its customers. The fact of having many active customers is more valuable than stealing scrip broker accounts.

Fraud seller is not to deliver the good or service for a valid scrip. If this happens, the customer will complain to his broker, and the broker will waive a vendor that has caused many complaints. This act means a coercive mechanism because vendors need her broker to facilitate their doing business with Millicent.

As a result, the protocol is reinforced Millicent customers to prevent fraud (falsification and double spending) and indirectly promotes fraud detection cooperating brokers and sellers.

Millicent security of transactions include the following:

- All transactions are protected, each transaction requires that the customer knows the password associated script. The protocol will never send a password in clear text, so it eliminates the risk that someone pulling the "ear" is listening to

something useful. No scrip unit can not be reused. Each application is signed with a password, so there is no way to intercept and reuse a scrip.

- Low-value transactions limited amount of fraud: small transactions require a cheap security; It is not cost effective use of computational resources to steal expensive scrip Cheap. In addition, illegal use of scrip's several illegal actions to raise more money, make more likely the thief detection.
- Fraud is detectable and possibly locate: detection is done when the client does not get the desired good or returned to the customer when the balance is not correct. If a customer is cheating, then the seller only lose the cost scrip detectable false. If the seller is cheating the customer will report the issue to the broker. When the broker receives complaints from several customers against a seller can locate who provokes fraud and will cancel all agreements with the seller. If cheating broker, the seller will receive scrip fake more customers, all related to one broker.

Interaction between Client and Dealer Broker - The following steps for a full session Millicent, including the purchase by the seller's broker scrip are:

- The initial step only happens one time per session. The client makes a secure connection with your broker to obtain a scrip from the broker. The client asks a broker scrip from, for example at the beginning of the day. Broker scrip return the original and secret associate broker.
- The second step happens every time the client does not scrip for a seller. He contacts the broker using the broker's scrip which he owns in step 1, asking the seller to buy a scrip.
- The third step occurs only if the broker should contact the seller to buy the scrip. If the broker does not already scrip from the vendor, she buys. A scrip will ask the seller and he did it returns associated with secrecy.
- In the fourth step broker scrip provide the vendor to the customer. Broker scrip client returns to the seller and the rest (the broker scrip).
- In the fifth step the customer, using scrip site, make a purchase from the seller. It returns the rest (the scrip of the seller) to the customer.

Millicent typical in a transaction when the customer has already scrip seller directly using it to make a purchase. Here there are no additional or interaction with a message broker.

4.2.CyberCoin

Micropayment system CyberCoin Internet payments can be done in small amounts from a few cents to \$ 10, covering an area the system using credit cards is not economical. Web vendors who sell services and products at very low prices and immediately want to deliver that cargo, need a method of payment microprocessor cards different, but comparable with cash payments being carried out and in stores. CyberCoin service from Cybercash was launched in September 1996 as a first micro-payment system on the Internet. Consumers can already use existing accounts in banks to transfer values in the software's own electronic wallet. Another possibility is to load funds directly from a credit card through a transaction with such ordinary means. In both cases, real money banks remain in custody.

Once wallet is "filled" with money, consumers can start making micro-payments from Web sites that are registered and have a program called Cybercash CashRegister. This software also supports, and payments by credit cards (VISA, MasterCard, American Express and Discover) and electronic checks PayNow.

From a user perspective, CyberCoin protocol works like an Internet browser; URL must be chosen - get the HTML command. The trader presents HTML page to address

payment (payment URL) along with the price. User not only have to select that URL to purchase particular goods or services.

CyberCoin service is implemented using a concept known as CyberCoin session. A session meets one primary function: initiating a transient sub-account under wallet account for every amount that is spent or collected. A session can resemble a checkbook containing n checks. Each "check" can be used only once. The session ends when all checks were consumed or they have expired. A check can be used only for a single payment or storage.

The runtime session protocol CyberCoin achieved optimal processing speed and reduced cost by encrypting messages with DES cipher. Initiation is an exchange of a randomly generated keys and transported (tires) in a message encrypted with RSA-768 bits. Each "check" payment transaction DES uses a single key. So by breaking the key after the session can not get any profit because it is no longer used to encrypt other messages.

5. Conclusion

Electronic commerce in its true sense has a much greater impact on business development and compress fact, not only new acquisitions, but all activities that support the objectives of marketing a company, including and advertising, sales and market research, payments, activities after-sale services, relationships with customers and others.

This new type of trade has boosted demand for new but appropriate payment methods. Under the new concept of "global village" (global village), development of commercial activities between participants situated at great geographical distances from each other can not be conceived without the use of electronic payment systems. These new means of payment allow transfers convenient, safe and fast money between business partners. Also, replacement of banknotes and coins (current traditional forms of cash) through what we call electronic money lead, besides reducing the cost of issuing and maintaining the movement of cash and an increase flexibility and security of payment systems.

In the field of electronic means of payment, investigations are underway. Well there are many systems currently being tested, others have barely been researched and analyzed. It is normal caution and safety are the key words of these efforts. This paper has presented some popular electronic payment systems, grouped into four categories:

- ❖ bankcard systems,
- ❖ online systems,
- ❖ micro payments
- ❖ electronic checks.

Payment systems are only a part of the huge gear driven by big players on the Internet. A successful business in the field of web means much more than implementing the "correct" from a technical standpoint these systems. To assert yourself and maintain best be mobilized resources you have. We tried to follow this in case studies: that the human factor remains above all other things in this area - the machines. The virtual world of the Internet is not actually one impersonal, behind every e-commerce site there is the "merchant" who try to sell the product. Its business success depends on knowing how to lure customers to its goods, to convince them to buy and, most importantly, to persuade them to return back to his shop.

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THE DEVELOPMENT OF THE INFORMATION SOCIETY DURING THE ECONOMIC CRISIS

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Abstract: *In order to have a successful economy based on knowledge, countries need to act simultaneously in the system of education, innovation and the exchange of information and communications technology infrastructure. Education is of paramount importance in the society of knowledge, as a source of jurisdiction, as the Foundation for the development of new knowledge and innovation, and as an engine for socio-economic development. Education is therefore a critical requirement in the establishment of knowledge societies, which may foster the development, growth, and prosperity. It represents not only the means through which individuals become skilled participants in society and economy, but is also a key factor in the expansion of the use of ICT*

Keyword: *information society, quality education, research, development, innovation*

Investment in education is needed because economic and social development, development of education appear as requirements of the overall progress of the society. Long-term higher education contribute to the economic development of a country, stimulates growth and raise the standard of living of the population. However, quality education requires considerable investment in people, research, programs, and technology schools. It is not by chance that precisely the countries that know to invest in their education to broaden access to training and to improve educational standards have obtained, over time, the most spectacular and long-lasting economic growth, the effects of the whole quality of life healthy populations.

Any economy is based on a flexible system of education. This system starts with basic education, which provides the Foundation for continuous learning, then secondary and tertiary which develop the basic skills (including technical skills) and encourages creativity, extending it to the system of learning throughout life (from childhood to retirement). Investing in human capital is the key to innovation and economic growth. The increasing number of producers and users of knowledge lead to the increasing the number of jobs and the living standards of developing countries. The problem that faced and still face the educational system in Romania is chronic under-financing. Another negative factor was the fact that the primary education system (primary, secondary and upper secondary) suffered numerous changes, in a relatively short time, so that the negative effects of these sudden changes were felt at the level of higher education.

According to the article 117 of the National Education Law mission of University education system is "to generate and to transfer knowledge to society through:

- a) initial and continuing training at university level, with the purpose of personal development;
- b) scientific research, development, innovation and technology transfer through individual and collective creation in the field of Engineering Sciences, Sciences, arts and letters, by ensuring performance and physical and sports development, and dissemination and exploitation of results ".

In the field of education, Romania has set the objectives of the Europe 2020 strategy, the European Council of Spring 2010: 11.3% the percentage of early school leaving and abandonment 26,7% share of tertiary graduates.

Table 1- Early school leaving rate's forecasted evolution

An	2013	2014	2015	2016	2017	2018	2019	2020
Indicator	14,8%	14,3%	13,8%	13,3%	12,8%	12,3%	11,8%	11,3%

Source: European Comission, Europe Strategy 2020, 2010

The most tangible result of the education system is the integration of graduates in the labour market. Workers with higher education are the key point in both the private and public sectors. According to Eurostat data, in 2011, the budget for education was equivalent to 4.1% of GDP, and the budget for 2012 anticipated a percentage of around 4%. In 2013, the percentage lies somewhere close to 4.2%. For comparison, the average in the EU is only 5.3%, Bulgaria (3.6%) and Slovakia (4%) falling under the us in 2011. Denmark lies in the top with Cyprus with 7.8% 7.2%, and Sweden with 6.8%. In Poland, the percentage was 5.5%, Hungary 5.2% and 4.9% in the Czech Republic. Analyzing bloom between 1995-2013 budget educational sector has never surpassed the equivalent of 4.5% of GDP.

Romania was confronted constantly with an underfinanced education. For example, although, according to the law on education, the Government had to spend at least 4 percent of GDP for education, in 2000 it was allocated only 2,9% of GDP, down from 3.4 percent in 1999, the lowest level among the candidate Member States. The comparative approach, are found, for example, that while public expenditure on education as a percentage of GDP in Romania were 3,37% (1999), 3.51% (2002) and 3.48% (2005), in Poland, former Communist bloc State, were recorded in the following percentages: 4,79% (1999), 5,41% (2002) and 5.47% (2005).¹ At the same time, in terms of expenditure on the training of professional employers continue to be seen as they were in Romania to 41 euros in 1995, raising to 86 euros in 2005, while in Poland they have increased from 97 euros (1995) from 171 euros (2005). Participation in continuous professional training courses in Romania has registered a rate of 8% in 1999 and by 17% in 2005, and 16% in Poland in 1999, and by 21%. The trend of participation cause us to believe that a growing proportion of employees in most of the candidate States from the former Communist bloc have been trying to catch up with the level of participation in the old EU Member States. However, the level of participation in continuous professional training in Romania have the remain very low compared to the EU average and in the next period.

The share of public expenditures for education in GDP and in total government expenditure is influenced by the importance of investment in education in the assessment of the human development index. A key indicator of performance demonstration of characteristic using high technology sectors is represented by C&D for expenditures in GDP. Although the Lisbon strategy it had proposed reaching a percentage of 3% of GDP for C&D ambition has not been achieved and became one of the five objectives of the EU 2020 strategy.

Thus, among the EU Member States the indicator exceeded the level of 3% of GDP in Finland (3,87%), Sweden (3.42%) and Denmark (3.06%), very close to the 3% objective is Germany (2,82%) and Austria (2.76%), and with values less than 2% in France (2.26%) and

¹ Source: Eurostat.

Slovenia (2.11%).Romania was the last place with 0,47%, with a further seven countries in southern and Eastern Europe, which have reported a lower level of 1% of GDP for C&D. Companies are C&D expenses allocated by business sector was 1.23 percent of GDP in the EU-27 compared with 2.70% in Japan and 2.02% in the United States the relative importance of research and development expenditure in the Government sector and in higher education was in much similar in the EU-27, Japan and United States.

Table 2 - R&D expenses by activity sector, 2005 and 2010.

	Business enterprises		Government		Abroad	
	2005	2010	2005	2010	2005	2010
EU-27 (1)	54.1	54.1	34.5	34.9	9.0	8.4
Euro area (1)	56.1	55.7	35.4	35.4	7.0	7.0
Belgium (1)	59.7	58.6	24.7	25.3	12.4	12.1
Bulgaria (1)	27.8	30.2	63.9	60.5	7.6	8.4
Czech Republic	53.2	48.9	40.9	39.9	4.9	10.4
Denmark (2)	59.5	60.3	27.6	27.7	10.1	8.8
Germany (1)	67.6	66.1	28.4	29.7	3.7	3.8
Estonia	38.5	43.4	43.5	44.3	17.1	11.5
Ireland (1)	57.4	51.2	32.0	31.3	8.6	15.6
Greece	31.1	.	46.8	.	19.0	.
Spain (1)	46.3	43.4	43.0	47.1	5.7	.
France	51.9	51.0	38.6	39.7	7.5	7.3
Italy (1)	39.7	44.2	50.7	42.1	8.0	9.4
Cyprus (1)	16.8	15.7	67.0	69.0	10.9	12.1
Latvia	34.3	38.8	46.0	26.4	18.5	33.4
Lithuania	20.8	24.1	62.7	47.5	10.5	20.0
Luxembourg	79.7	65.9	16.6	29.7	3.6	4.3
Hungary	39.4	47.4	49.4	39.3	10.7	12.4
Malta	46.8	51.5	25.9	30.5	26.9	18.0
Netherlands (1)	46.3	45.1	38.8	40.9	12.0	10.8
Austria	45.6	44.3	35.9	38.9	18.0	16.4
Poland	33.4	24.4	57.7	60.9	5.7	11.8
Portugal (1)	36.3	44.0	55.2	45.3	4.7	4.1
Romania	37.2	32.3	53.5	54.4	5.3	11.1
Slovenia (3)	54.8	58.4	37.2	35.3	7.3	6.0
Slovakia	36.6	35.1	57.0	49.6	6.0	14.7
Finland (4)	66.9	66.1	25.7	25.7	6.3	6.9
Sweden (1)(5)	63.9	58.8	24.5	27.5	8.1	10.4
United Kingdom	42.1	45.1	32.7	32.1	19.3	16.4
Iceland (1)	48.0	48.5	40.5	41.4	11.2	9.9
Norway (1)	46.8	43.6	43.6	46.8	8.1	8.2
Switzerland (6)	.	68.2	.	22.8	.	6.0
Croatia	34.3	38.8	58.1	49.2	2.6	9.9
Turkey (1)(7)	43.3	41.0	50.1	34.0	0.8	1.1
Japan (3)(6)	76.1	78.2	16.8	15.6	0.3	0.4
United States (6)	64.3	67.3	30.2	27.1	.	.

(1) 2009 instead of 2010.

(2) Break in series, 2007.

(3) Break in series, 2008.

(4) Break in series, abroad, 2005.

(5) Break in series, 2005.

(6) 2008 instead of 2010.

(7) Break in series, business enterprises and government, 2008.

Source: Eurostat (online data code: tsc00031), OECD

A scroll through the data in table 2 for the EU Member States shows that countries with a relatively high proportion of spending on business enterprise for C D- & namely, Finland, Sweden, Denmark, Austria and Germany have also reported relatively high levels of expenditure for C&D. and, in these countries, less than Germany, but additionally allocate significant funds to the Netherlands for C&D of

învățământul activity. C&D activity of the governmental sector, as a percentage of GDP is more intensively supported in Germany, Slovenia, France and Finland.

Regarding the number of researchers in the EU it is found their growth in recent years. In the year 2010 the number of researchers was about 1560000 compared with 2000 registering an increase of 40% (table 2).

Table 3: Researchers/equivalent – full time by institutional sector, in 2010

	Total	Business enterprise sector		Government sector		Higher education sector	
	(1 000 FTE)	(1 000 FTE)	(% of total)	(1 000 FTE)	(% of total)	(1 000 FTE)	(% of total)
EU-27	1.564,8	708,3	45	198,6	13	640,3	41
Euro area	1.086,8	532,0	49	149,2	14	392,6	36
Belgium	38,2	17,6	46	3,0	8	17,3	45
Bulgaria	10,9	1,5	14	5,8	53	3,6	33
Czech Republic	29,2	12,7	43	6,2	21	10,1	35
Denmark	35,3	21,5	61	1,1	3	12,5	35
Germany	327,5	187,0	57	50,9	16	89,6	27
Estonia	4,1	1,3	31	0,5	13	2,2	54
Ireland	14,4	7,9	55	0,4	3	6,1	42
Greece	21,0	6,3	30	2,2	10	12,4	59
(2) Spain	134,7	45,4	34	24,4	18	64,6	48
(3) France	234,2	133,5	57	28,7	12	68,7	29
Italy	105,8	41,7	39	16,7	16	43,5	41
Cyprus	0,9	0,2	21	0,1	11	0,5	59
Latvia	3,8	0,6	16	0,6	15	2,6	69
Lithuania	8,4	1,2	15	1,5	18	5,7	68
Luxembourg	2,5	1,4	54	0,7	26	0,5	20
Hungary	21,3	10,3	48	5,0	24	6,0	28
Malta	0,6	0,3	57	0,0	5	0,2	38
Netherlands	52,1	24,9	48	7,0	13	20,2	39
Austria	35,9	22,4	62	1,6	4	11,7	32
Poland	64,5	11,7	18	13,6	21	39,2	61
Portugal	45,9	10,4	23	2,5	6	28,8	63
Romania	19,8	5,9	30	5,6	28	8,2	42
Slovenia	7,7	3,4	44	2,0	26	2,3	29
Slovakia	15,2	1,9	13	3,0	20	10,2	67
Finland	41,4	22,9	55	4,6	11	13,5	33
Sweden	49,3	30,4	62	1,9	4	17,0	34
UK	235,4	80,6	34	8,1	3	142,7	61
(3) Iceland	2,9	1,1	39	0,5	19	1,1	39
Norway	26,5	12,6	47	4,5	17	9,5	36
Switzerland	25,1	10,3	41	0,5	2	14,3	57
(4) Croatia	7,1	1,3	18	2,1	30	3,7	52
(3) Turkey	57,8	21,0	36	5,7	10	31,0	54
Japan (4)	656,7	492,8	75	32,1	5	123,5	19
USA (2)	1.412,6	1.130,5	80	:	:	:	:

(1) Sum of percentages is not 100 because of estimations and exclusion of data regarding non-profit private sector

(2) 2007.

(3) 2009.

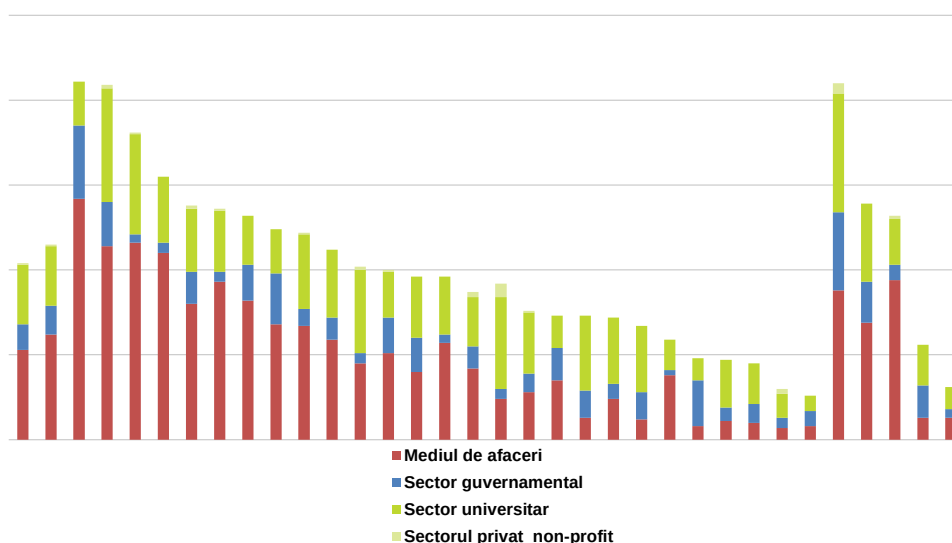
(4) 2008.

Source: Eurostat (online data code: tsc00004), OECD

The analysis of the institutional sector personnel in the EU-27 C&D reveals the concentration of researchers in the business sector (45%) and in the higher education sector

(41%), and the governmental sector is concentrated in 13% of the total number of researchers (Figure 1.)

Figure 1- Personnel in R&D by institutional sector



In Austria, Sweden and Denmark C&D mostly air force personnel is garrisoned in business environment businesses, while in Bulgaria, more than 50% of the staff working in the governmental sector C&D. More than two-thirds of all researchers working in Latvia, Lithuania and Slovakia were employed in the higher education sector, and more than half of the total number of researchers worked in the higher education sector in Portugal, Poland, United Kingdom, Greece (2007), Cyprus and Estonia.

Human resources in science and technology is a very skilled population. Of the total number of persons who have been engaged in 2011 in the field of science and technology was 33,2%. Between 2008 and 2010 as its share grew by 0.9%. Personnel employed in science and technology is represented by the graduates of undergraduate studies, has a tertiary education.

Conclusions

Education and investing in education must be key components in order to ensure a genuine long-term human development. Education in general and investing in education, in particular must be redefined so as to focus on the abilities that individuals are able to develop them along the entire lifetimes in the context of the knowledge economy. Knowledge, creativity and innovation are key factors in a long-term sustainable development. Knowledge society pleads for diversity and cultural pluralism that can be facilitated by the environment mostly digital prefigured the new economy. Investing in human capital, in general, and the investment in education in particular, intend to invest in these three key components to define the core competencies: knowledge, skills and abilities. Evaluation of the development of the global information society carried out every year by the World Economic Forum shows that in 2010 Europe was one of the world's regions with the highest development to ICT and information society, as expressed through the Network Readiness Index. With regard to the comparison with other areas, overall EU 27 incident captured him saying to a score lower than the US and East Asia in terms of the information society dimension, but also in the C&D and innovation (a critical determinant of economic growth and competitiveness), but individual performances of the most developed European countries (Sweden, Finland, the Netherlands) are better than those of the U.S. and East Asia.

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