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Highlights

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Discovering Thoughts, Inventing Future

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Dynamic Money Doctors under Cumulative Prospect Theory

By Liurui Deng, Lan Yang & Bolin Ma
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Abstract- We investigate the interaction between investors and portfolio managers under cumulative prospect theory. We model trust in the manager and the relative anxiety about investing in a risky asset in an original way. Moreover, we study how trust and anxiety affect the manager's fee and the portfolios of cumulative prospect theory investors.

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Moreover, our research differs from traditional CPT work through an improved value function that accurately characterizes the reduction in anxiety suffered by the CPT investors from bearing risk when assisted by the portfolio managers' help relative to when they lack such assistance.

Keywords: money doctor, money manager, cumulative prospect theory (CPT), CPT-investor, value function, objective function, optimal fees.

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Our results differ in several respects from those obtained when using on classical preferences. First, the optimal fees are not symmetric. Specially, the dominant managers obtain higher fees than subordinate managers regardless of changes in risk of risky assets (a risky asset) and changes in the dispersion of trust in the population. Another difference is that these fees are not proportional to expected returns. In particular, the optimal fees increase nonlinearly as risk of risky assets (a risky asset) increases and the dispersion of trust in the population increases.

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I. Introduction

Evidence indicates that investors feel overly anxious or nervous when they invest in risky assets without assistance because investors have little financial knowledge and related information. Hence, they are willing to hire money managers or advisors to help them invest. Managers may have indispensable knowledge concerning how to diversify investments or even how to earn a premium. Additionally, money managers provide investors with peace of mind.

Many researchers are interested in similar problems. In this section, we cite the essential literature on incentives for money managers. Chevalier and Ellison, using semiparametric modeling, report that the shape of the flow-performance relationship creates incentives for fund managers to raise or reduce the riskiness of a fund and that these incentives depend on the fund's year-to-date return (see Judith and Ellison, 1997). By examining the labor market for mutual fund managers, they find that "termination" is more performance-sensitive for younger managers (see Judith and Ellison, 1999). They also identify possible implicit incentives created by the termination-performance relationship. The shape of the termination-performance relationship may give younger managers an incentive to avoid unsystematic risk. Inderst and Ottaviani focus on distorted incentives to sell financial products, distortions that arise not only from actual kickbacks but also from the difficulty of incentivizing salesmen to sell the appropriate products (see Roman and Ottaviani, 2009, 2012a,b). Guerrieri and Kondor demonstrate that performance generates a "reputational premium" that influences investors' decisions to hire or fire money managers (Veronica and Kondor, 2012). Hackethal, Inderst, and Meyer find that retail investors who report a heavy reliance on their advisors' recommendations have a substantially higher trading volume and

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purchase a higher fraction of investment products that their advisors were incentivized to sell (promoted products)-see Hackethal et al. 2012. Gennaioli, Shleifer and Vishny focus on the incentives of the money management organization itself when its clients' choices are mediated by trust (see Gennaioli et al., 2015).

These researches rely on Expected utility theory (EUT)(see Neummann and Morgenstern, 1944). However, substantial experimental and empirical evidence reveals that EUT is incompatible with human observed behavior in reality. Demonstrated violations of EUT are as follows.

1) EUT makes the underlying assumption that decision-makers are rational and uniformly risk averse. But, empirical evidence shows that investors' risk attitude often changes.

Specially, Kahneman and Tversky did a experiment to observe changes of personal risk attitude. The first choice is between a sure gain of \$240 and a 25% chance to gain \$1,000. The second choice is between a sure loss of \$750 and a 75% chance to lose \$1,000. For the first choice, 84% of respondents chose a sure gain of \$240, which is consistent with risk aversion. For second choice, 87% of respondents chose a 75% chance to lose \$1,000, which is consistent with risk seeking. This experiment indicates that people exhibit risk aversion in gains and exhibit risk seeking in losses.

2) EUT generally uses the level of wealth, not changes in wealth. However, in the previous experiment, we find that personal risk attitude changes in the domains of gains and losses. So, we can show that gains and losses seems to be what people care about, rather than the level wealth.

To prove our point of view, we consider the following problem. Decision 1: Assume yourself richer by \$300 than you are today. Then, choose between a sure gain of \$100 and a 50% chance to gain 200; Decision 2: Assume yourself richer by \$500 than you are today. Then choose between a sure loss of \$100 and a 50% chance to lose \$200. In both cases, the decision is between \$400 with certainty and a prospect with a 50% chance of \$500 and a %50 chance of \$300. Yet, 72% of respondents chose a sure gain of \$100 in Decision 1 and 64% chose a 50% chance to lose \$200 Decision 2. The choice of many indicates risk aversion for Decision 1, but risk seeking for Decision 2. This problem shows that risk attitude is not same across gains and losses, implying that it is the change in wealth, rather than the level, that matters to people. People evaluate an outcome based on the gain and loss from a reference point, usually taken to be current wealth. Notice that in this problem the two decisions assume different starting wealth positions.EUT cannot incorporate the reference point.

3) Researcher also notice that persons seemed to feel a loss more strongly than gain of equivalent absolute value. But, EUT doesn't involve it.

To more clearly explain our point of view, we consider the following problem. What value of x would make you indifferent between a sure gain of 0 and the prospect which is a 50% chance to gain x and a 50% chance to lose \$25? The average of response in this experiment was \$61. That is, for a fair gamble, when the loss is \$25, the typical person requires a gain of \$61 to be indifferent between accepting or rejective the gamble. It is quite clear that people are quite averse to a loss. Loss aversion is the term that describes the observation that, for most people, losses loom larger than gain.

4)EUT cannot explain why a person might buy a lottery ticket and insurance. In fact, overweighting of small probability and subjective probability lead to this behavior.

For example, choose between a 0.1% chance to gain \$5,000 and a sure gain of \$5. Even though the expected value of the two case are equal (\$5) as we almost certainly have observe, many people prefer the former to the latter, consistent with risk seeking, Such a choice is

indicative of risk seeking in the domain of gains. Earlier we observed another instance of risk seeking, but this is was in domain of losses. It seems that risk seeking can also occur in the domain of gains as well. Now, we consider another choice. Choose between a 0.1% chance to lose $5,000 and a sure loss of $5. In this case many people choose the latter, consisent with risk aversion. But this implies risk aversion in the negative domain. In sum, while we normally have risk aversion in the positive domain, when there is a quite low probability of a payoff this generally shifts to risk seeking. On the other hand, while we normally have risk seeking in the negative domain, when there is a quite low probability of a loss this generally shifts to risk aversion. This is what Kahneman and Tversky characterized as the fourfold pattern of risk attitudes. This pattern suggests risk aversion for gains and risk seeking for losses when the outcome probability is high, and risk seeking for gains and risk aversion for losses when the outcome probability is low. In onw study, they found that 92%(22 out of 25) of subjects displayed the full patters.

To explain the above violations of EUT and more accurately characterize personal behaviors, Kahneman and Tverskyb propose prospect theory(PT) and cumulative prospect theory (CPT)-see Kahneman and Tversky, 1992a and 1992b.

When we research the interaction between investors and managers, we find investors' behavior also deviates from the predictions of EUT. So, in this article, we apply CPT-investors rather than risk averse investors in the traditional sense. That is, we adopt a cumulative prospect theory (CPT) approach to the investor's preferences. In a original way, we model the investor's trust in the manager and associated anxiety from investing in a risky asset to determine a CPT investor's optimal portfolio and a manager's optimal fees.

The novelty of our contribution relative to Gennaioli et al.(2015) and other works using classical preferences is that we rely on cumulative prospect theory rather than the classical mean-variance framework. Gennaioli, Shleifer and Vishny (2015) assume that all investors are rational. Hence, they develop a model relying on the mean-variance framework, which is certainly the most well-known investment decision rule. However, all of our investors are CPT investors, namely, these investors' behavior coincides with cumulative prospect theory. Specifically, we employ a value function for CPT investors, while Gennaioli, Shleifer and Vishny (2015)use a classical utility function. In the value function of our CPT investors, we consider the gain relative to a reference wealth level, i.e., the benchmark wealth. However, Gennaioli et al. (2015)use absolute wealth in the investors' utility function. Moreover, to accurately characterize a CPT investor's psychology, we combine probability distortions with the value functions to measure the CPT investors' satisfaction, while Gennaioli, Shleifer and Vishny (2015)use only a simple probability and the investors' utility functions to measure investor satisfaction. In other words, Gennaioli et al.(2015) only employ the expected utility functions to measure investor satisfaction. The value function and probability distortions are the key contributions of cumulative prospect theory and allow our CPT model to outperform traditional theory in real financial markets.

Another innovation is that we focus on the dynamic portfolio selection but not the static portfolio choices. Gennaioli et al. only discuss the managers' optimal fees when the investors invest in the risky asset in a single period. However, we explore the managers' optimal fees and the investor's portfolio selection under multi-period setting. Moreover, based on the subgame perfect investment strategies, we obtain the CPT investor's optimal portfolio in multi-period.

In their analysis of multiple financial products, Gennaioli et al. (2015)only consider two risky assets, while we study two or more such assets. Moreover, their research relies on the assumption that the two risky assets are uncorrelated, an assumption that we need not make.

There are two main differences between our results and those based on classical preferences. First, in our results, the optimal fees are not symmetric. In particular, the dominant managers obtain a higher fee than do subordinate managers regardless of the changes in risk of risky assets (a risky asset) and the changes in the dispersion of trust in the population. Another difference is that, in our work, these fees are not proportional to expected returns. Moreover, the optimal fees decline nonlinearly as risk of risky assets (a risky asset) decreases and the dispersion of trust in the population decreases.

Except for our application of CPT in money doctor, CPT is applied extensively in the contexts of optimal investment strategy and optimal insurance contracts.

Regarding optimal investment strategy, in a continuous-time setting, Jin and Zhou (2008) formulate a general behavioral portfolio selection model using Kahneman and Tversky's CPT. In a discrete-time setting, Bernard and Ghossoub (2009) consider how a CPT investor chooses his/her optimal portfolio in a single-period model with one risky and one riskless asset. In the same vein, He and Zhou (2011a,b) address and formulate the general well-posedness issue and investigate the case in which the reference point is not the risk-free return. Pirvu and Schulze (2012) extend this work to a multi-asset context. To the best of our knowledge, Shi et al. (2014) are the first to consider the CPT allocation problem in a multi-period framework. Deng and Pirvu investigate optimal portfolio selection with one risk-free asset and one risky asset in a multi-period setting under CPT (see Deng and Pirvu, 2015). Compared with Shi et al's study, their novelty is that the optimal strategies are time inconsistent due to the time-changing benchmark.

Regarding optimal insurance contracts, there are fewer results (and those that exist are less sophisticated) than in the context of optimal portfolio choice. From the insured's perspective, Dhiab investigates the demand for insurance under CPT (see Dhiab, 2015). From the insurer's perspective, Bernard et al. explore the optimal insurance policy for an insurer with a linear cost function (see Bernard et al., 2015). Based on Bernard et al.'s work, Deng identifies the optimal insurance policy for the more general insurer cost functions, addressing both linear and nonlinear cost functions (see Deng, 2015).

Although CPT is more practical than traditional models, it is not more widely used than traditional theory. As noted above, CPT is applied primarily to address problems related to optimal investment strategy and optimal insurance contracts. To the best of our knowledge, for many other other problems related to CPT, in particular the optimal fees that managers charge under CPT, there are no existing studies. This lack of research is certainly not because this problem is unimportant or uninteresting; rather, we believe, this lack of research is because addressing such problems using CPT is considerably more complicated than doing so using the traditional decision optimization.

In extant CPT research, researchers only consider the value function of a CPT investor who invests in a risky asset without assistance. Moreover, they focus solely on the optimal portfolio for the investor. However, we are interested in investors' interaction with portfolio managers and thus develop a value function for a CPT investor investing in risky assets with the assistance of a portfolio manager, not on his own. Our models accurately characterize and reflect the reduced anxiety experienced by CPT investors when bearing risk with the assistance of a trusted portfolio manager. Moreover, we determine not only the investor's optimal portfolio but also the money managers' optimal fees. However, our original models pose an enormous computational challenge, as the traditional method is not suitable for our new problem. To overcome these computational difficulties, we use rigorous derivation to obtain the implicit solutions. Then, we employ an effective software tool and obtain approximately explicit solutions.

The remainder of this paper is organized as follows. In Section 2, we discuss a basic setting. In section 3, we attain the CPT investor's optimal portfolio in multi-period under CPT. In section 4, we investigate managers' total profits. In section 5, we determine the optimal fees charged by money managers. Section 6 contains the numerical analysis. In Section 7, we compare our results with those of Gennaioli et al. and explain our results from an economic perspective. The paper concludes with an Appendix containing the proofs.

II. The Basic Setup

In this paper, we analyze the dynamic optimal strategies. We consider a financial market in which the CPT-investor can invest in one risk-free asset and one risky asset. The investing horizon is $[0, T]$, where T is a finite deterministic constant. The time of investment t takes on discrete values $(t = 0, 1, ..., T-1)$. Moreover r_t denotes the return of the risk-free asset from the time t to the time $t+1$, and x_t denotes the return of the risky asset from the time t to the time $t+1$. We assume that a CPT-investor i has wealth $W_{i,t}$ at the time t and invest the amount $v_{i,t}$ in the risky asset and all of remaining wealth $W_{i,t} - v_{i,t}$ in the risk-free asset. The investor's wealth $W_{i,t+1}$ at time $t+1$ is given by the equation

$$W_{i,t+1} = (1+r_t)(W_{i,t} - v_{i,t}) + (1+x_t)v_{i,t} = (1+r_t)W_{i,t} + y_t v_{i,t}. \tag{2.1}$$

Here $y_t = x_t - r_t$ is a random variable and represents the excess return on the risky asset over the risk-free asset from the time t to the time $t+1$. The excess return $\{y_t\}_{\{t=0,1,...,T-1\}}$ is an adapted stochastic process defined over the probability space $(\Omega, \mathcal{F}_t, \mathcal{F}, P)$. The information set at the beginning of period t is denoted as $\mathcal{F}_t = \sigma(y_0, y_1, ..., y_{t-1})$. Besides, assume the variance of the excess return is σ^2 and the expected value of the excess return is μ.

A CPT-invest doesn't feel anxious when he invests in the risk-free asset. However, the CPT-investor feels anxious and nervous when he invests in the risky asset. The reason is that the CPT-invest should not only have professional knowledge and relevant information but also spend much time and energy on the analysis of portfolio in order to attain a satisfied return of the risky asset. But it is very difficult for an average CPT-investor to do these. Thus, the CPT-investor is willing to invest in the risky asset on a trusted and experienced wealth manager rather than on his own. In a pure mathematical sense, this assumption is not very strict, but it clearly presents the foundation and background of our research and makes the practical meanings of our result more explicit. As the viewpoint of Gennaioli, Shieifer and Vishny, a money manager plays a similar role in the financial market to a doctor. In particular, almost of investors do not know how to invest expect for the investment in a risk-free asset, so they want to seek some financial advice from a trusted and experienced manager. It is like that almost of patients have little idea of how to be treated but some simple and safe treatments, thus they prefer to seek some medical advice from an expert and trusted doctor. The present article discusses the similar problem that CPT-investors invest in a risk asset on a trusted money manager but not on their own. Actually, the relationship between the CPT-investors and the money managers in our research is also like the relationship between the patients and the doctors.

Each of the manager who the CPT-investor i can choose is denoted by j. In general, $j = 1, 2, 3, ...$ The CPT-investor delegates his wealth management to the portfolio manager who this investor most trusts. We add the element of trust to the traditional value function of a CPT-investor. Denoted by $\tau_{i,j} \in [0, 1]$ the investor i's level of trust on the money manager j. The higher $\tau_{i,j}$ represents that the investor puts more trust in the manager j and the investor i suffers less anxiety when he invests his wealth in a risky asset with the manager j. The fee rate charged by money manager j is denoted by f_j. Let $a_{i,j} = a\tau_{i,j}$, where a is a nonnegative constant. Indeed, $a_{i,j}$ is the measure of the CPT-investor i's

anxiety when he hires the manager j. a represents the measure of the CPT-investor i's anxiety when he hires the most trusted manager. The idea will be specially formalize in the next section.

In this paper, we only consider a simple case in which the CPT-investor hires one of two managers, A or B. So, in the section 2.3, we directly set $j = A$ and $j = B$. We suppose that half of the CPT-investors trust the manager A more than the manager B. These investors are denoted by A-trusting investors. Similarly, there are half of the CPT-investors trusting the manager B more than the manager A, who are called B-trusting investors. The anxiety which an A-investor suffers when he invests in the risky asset on the manager A equals a. To similar, the anxiety suffered by a B-investor for bearing risky with the manager B's financial advice is also a. It can differ from different CPT-investors how much they trust one manager over the other. Particularly, in the population of CPT-investors τ_i satisfies uniformly distributed on $[1-\theta, 1]$ for both A-trusting investors and B-trusting investors, where parameter $\theta \in [0, 1]$ captures the dispersion of trust in the population. The lower is θ, the less investors trust one manager more than the other. When $\theta = 0$, the investor trusts one manager as much as the other. This dispersion in trust level makes the money managers gain respect of the CPT-investors who trust these managers more. And, these managers can charge the optimal and positive fees even in a competitive financial market. The trust is permanent and does not depend on the change of returns.

Simply speaking, we consider the following the optimal problems. Two managers A and B decide the optimal fees at the time t ($t = 0, 1, ..., T-1$) in order to attract the CPT-investors and gain most total profits in competition at the time T. From the CPT-investors' standpoint, at the time t, the investors choose the optimal portfolio in order to maximize their own objective function at the time T.

III. The Model

a) The Benchmarked Wealth

Let $R_t^k = \prod_{j=t}^{k-1}(1+r_j)(0 \le t \le T-1, 1 \le k \le T)$, with $k \ge t$ be the value of 1 dollar (in the portfolio at time t) at time k. If the initial time is t, we let the benchmark be $R_t^k W_{i,t}$ at the time k (this is the amount at time k of W_t invested in the risk free asset at time t). The benchmarked wealth at time $t+1$, given initial time t is

$$\overline{W}_{i,t}^{t+1} = R_t^{t+1} W_{i,t} + y_t v_{i,t} - R_t^{t+1} W_{i,t} = y_t v_{i,t}. \tag{3.1}$$

Given the initial time t the benchmarked wealth at time $t+2$ is

$$\overline{W}_{i,t}^{t+2} = R_{t+1}^{t+2} W_{i,t+1} + y_{t+1} v_{i,t+1} - R_t^{t+2} W_{i,t} = R_{t+1}^{t+2} y_t v_{i,t} + y_{t+1} v_{i,t+1}. \tag{3.2}$$

Generally, we let the initial time be t (t=0,1,2,...,T-1). We can characterize the benchmarked wealth at the end of the investment horizon by the following Proposition.

Proposition 3.1. *(See Deng and Pirvu (2015)) If the initial time is t ($t = 0, 1, 2, ..., T-1$), then the benchmarked wealth at T is:*

$$\overline{W}_{i,t}^{T} = R_{t+1}^{T} v_{i,t} y_t + R_{t+2}^{T} v_{i,t+1} y_{t+1} + ... + R_{T-1}^{T} v_{i,T-2} y_{T-2} + v_{i,T-1} y_{T-1}. \tag{3.3}$$

b) The CPT Risk Criterion

Before we define the value function and the objective function of a CPT-investor, we introduce two indispensable and classical definitions.

Definition 3.1. (see Tversky and Kahneman (1992a) and Tversky and Kahneman (1992b))The value function u is defined as follows:

$$u(x) = \begin{cases} u^+(x) & \text{if } x \geq 0\ , \\ -u^-(-x) & \text{if } x < 0, \end{cases}$$

where $u^+ : \overline{\mathbb{R}}^+ \to \overline{\mathbb{R}}^+$ and $u^- : \overline{\mathbb{R}}^+ \to \overline{\mathbb{R}}^+$ satisfy:
(i) $u(0) = u^+(0) = u^-(0) = 0$;
(ii)$u^+(+\infty) = u^-(+\infty) = +\infty$;
(iii)$u^+(x) = x^\alpha$, with $0 < \alpha < 1$ and $x \geq 0$;
(iv)$u^-(x) = \beta x^\alpha$, with $\beta > 1$ and $x \geq 0$.

Definition 3.2. Let $F_W(\cdot)$ be the cumulative distribution function (CDF) of a random variable W. We define the two probability weight functions (distortions) $T^+ : [0,1] \to [0,1]$ and $T^- : [0,1] \to [0,1]$ as follows:

$$T^+(F_W(x)) = \frac{F_W^\gamma(x)}{(F_W^\gamma(x) + (1 - F_W^\gamma(x))^\gamma)^{1/\gamma}}, \quad \text{with} \quad 0.28 < \gamma < 1$$

$$T^-(F_W(x)) = \frac{F_W^\delta(x)}{(F_W^\delta(x) + (1 - F_W^\delta(x))^\delta)^{1/\delta}}, \quad \text{with} \quad 0.28 < \delta < 1.$$

When the CPT investor is risk averse, he feels less anxious and nervous about bearing the risk when he has the assistance of a trusted and experienced money manager. The CPT investor is only risk averse when the benchmark wealth is nonnegative, i.e., $x \geq 0$. When $x < 0$, the CPT investor is risk seeking. Thus, we only need to modify value function u^+ and can leave value function u^- unchanged.

Definition 3.3. When investor i chooses manager j to invest wealth in the risky asset, if τ_i is uniformly distributed on $[1-\theta, 1]$, we definite the value function of a CPT investor as follows:

$$\begin{aligned} & u_{i,j}(\overline{W}_{i,t}^T, a_{i,j}) \qquad (3.4) \\ = & \begin{cases} u_{i,j}^+(\overline{W}_{i,t}^T) = u^+(\overline{W}_{i,t}^T - f_j + \frac{a\tau_{i,j}}{\sigma^2}) = (\overline{W}_{i,t}^T - f_j + \frac{a\tau_{i,j}}{\sigma^2})^\alpha & \overline{W}_{i,t}^T \geq 0, \\ u_{i,j}^-(-\overline{W}_{i,t}^T) = -u^-(-(\overline{W}_{i,t}^T - f_j + \frac{a\tau_{i,j}}{\sigma^2})) = -\beta(-\overline{W}_{i,t}^T + f_j - \frac{a\tau_{i,j}}{\sigma^2})^\alpha & \overline{W}_{i,t}^T < 0. \end{cases} \end{aligned}$$

It is worth stressing that $a_{i,j}$ has a different meaning from that used by Gennaioli et al. In our model, $a_{i,j}$ is the measure of CPT investor i's trust when he hires manager j. In particular, a represents a measure of CPT investor i's anxiety when he hires his most trusted manager. However, in Gennaioli et al.'s model, $a_{i,j}$ is the measure of CPT investor i's anxiety when he hires manager j:

$$u_{i,j}(c) = E(c) - \frac{a_{i,j}}{2} Var(c)$$

This different meaning is attributable to different reference levels. In our model, $a_{i,j}$, as a measure of trust, makes the value function of a risk-averse investor without a manager's help, W_i^α, increase to that of a risk-averse investor with a manager's help, $(W_i - f_j + \frac{a\tau_{i,j}}{\sigma^2})^\alpha$. In other words, we take the value function of a risk-averse investor without a manager's help, W_i^α, as a reference level. In Gennaioli et al.'s model, $a_{i,j}$, as a measure of anxiety, makes the value function of a risk-neutral investor $E(c)$ decrease to that of a risk-averse investor, $E(c) - \frac{a_{i,j}}{2} Var(c)$. In other words, they take the value function of a risk-neutral investor, $E(c)$, as a reference level. If we examine the value function of a risk-averse investor

without a manager's help, $E(c) - Var(c)$, as a reference in Gennaioli et al.'s model, we find that $1 - \frac{a_{i,j}}{2}$ has a similar meaning to that of our $a_{i,j}$. That is, in Gennaioli et al.'s model, the measure of trust is $1 - \frac{a_{i,j}}{2}$.

Here, trust $(\tau_{i,j}/a_{i,j})$ relates to the advertisements for money manager j, money manager j's services for investor i, investor i's investment experience, and investor i's educational background, among others. However, trust does not depend on the riskiness of risky assets. Therefore, when manager j invests in riskier projects, investor i's level of trust in manager j remains the same. This assumption is consistent with that of Gennaioli et al.

We assume that the anxiety suffered by CPT investor i for bearing the risk with the assistance of any manager j is less than it would be if he were to invest on his own, even if manager j is not CPT investor i's most trusted manager. That is, we suppose that

$$\frac{a\tau_{i,j}}{\sigma^2} - f_j \geq 0. \tag{3.5}$$

To clearly explain our model, we introduce the subjective risk premium as Davies and Satchell involved (see Davies and Satchell , 2004). Denote the probability of a gain by p. The subjective premium, λ, is defined as

$$\begin{aligned} u_{i,j}(E_s(\overline{W}_{i,t}^T) - \lambda) &= (1-p)E[u_{i,j}^-(\overline{W}_{i,t}^T)m^-(\overline{W}_{i,t}^T)|\overline{W}_{i,t}^T < 0] \\ &+ pE[u_{i,j}^+(\overline{W}_{i,t}^T)m^-(\overline{W}_{i,t}^T)|\overline{W}_{i,t}^T > 0], \end{aligned} \tag{3.6}$$

where

$$\begin{aligned} m^+(\overline{W}_{i,t}^T) &= (T^+)'(F_{\overline{W}_{i,t}^T}(x)), \\ m^-(\overline{W}_{i,t}^T) &= (T^-)'(F_{\overline{W}_{i,t}^T}(x)), \\ E_s(\overline{W}_{i,t}^T) &= \int_0^{+\infty} x(T^+)'(F_{\overline{W}_{i,t}^T}(x))dx \\ &+ \int_{-\infty}^0 x(T^-)'(F_{\overline{W}_{i,t}^T}(x))dx \end{aligned}$$

and $E[\cdot]$ is a expected value in a traditional sense.

We compare a subjective risk premium for no manager's help with that for a manager's help. Denote the former by λ_0 and latter by λ.

Proposition 3.2. *When CPT investor i is risk averse, that is, $\lambda > 0$. CPT investor i face a gamble with outcomes distributed according a random benchmarked wealth. Then, the manager's help can reduce his anxiety, that is, $\lambda < \lambda_0$.*

We prove this in Appendix A.

Let

$$\begin{aligned} G1 &= (u_{i,j}^-)'(0)m^-(-\pi), \\ H1 &= \frac{1}{2}\big((u_{i,j}^-)''(0)m^-(-\pi) + (u_{i,j}^-)'(0)(m^-)'(-\pi)\big), \\ G2 &= (u_{i,j}^+)'(0)m^-(-\pi), \\ H2 &= \frac{1}{2}\big((u_{i,j}^+)''(0)m^-(-\pi) + (u_{i,j}^+)'(0)(m^-)'(-\pi)\big), \\ G3 &= (u_{i,j}^+)'(\pi)m^+(0) + u_{i,j}^+(\pi)(m^+0)'(0), \end{aligned}$$

$$\begin{aligned} H3 &= \frac{1}{2}\big((u_{i,j}^{+})''(\pi)m^{+}(0) + 2(u_{i,j}^{+})'(\pi)(m^{+})'(0) + u_{i,j}^{+}(\pi)(m^{+})''(0)\big), \\ I &= u_{i,j}^{+}(\pi)m^{+}(0). \end{aligned} \tag{3.7}$$

We can obtain the following proposition about risk premiums.

Proposition 3.3. *If* $E_s(\overline{W}_{i,t}^{T}) \geq 0$, $E(\overline{W}_{i,t}^{T}) \geq 0$ *and*

$$\frac{G1}{u'_{i,j}(0)} > 0, \frac{H1}{u'_{i,j}(0)} < 0, \frac{G2}{u'_{i,j}(0)} < 0, \frac{H2}{u'_{i,j}(0)} < 0, \frac{I}{u'_{i,j}(0)} < 0, \frac{G3}{u'_{i,j}(0)} < 0, \frac{H3}{u'_{i,j}(0)} < 0,$$

then the objective risk premium is positive, that is, CPT investor i is locally risk aversion. Moreover, the subjective risk premium is positive, $\lambda > 0$*, that is, he believes himself to be risk aversion.*

We prove this in Appendix B.

Definition 3.4. Define the objective function of the CPT-investor at the time t, denoted by $U(\overline{W}_{i,t}^{T}, f_j)$, as:

$$U(\overline{W}_{i,t}^{T}, f_j) = \int_0^{+\infty} T^{+}(1 - F_{\overline{W}_{i,t}^{T}}(x))du_{i,j}^{+}(x) + \int_{-\infty}^{0} T^{-}(F_{\overline{W}_{i,t}^{T}}(x))du_{i,j}^{-}(-x) \tag{3.8}$$

where $\overline{W}_{i,t}^{T}$ is the benchmark wealth. $U(\overline{W}_{i,t}^{T}, f_j)$ is a sum of two Choguet integrals (see Choquet (1953) and Chateauneuf et al. (2000)). It is well-defined when

$$\alpha < 2\min(\delta, \gamma).$$

c) Characterization of the Optimal Portfolio Choices

In this section we formulate the CPT investor objective. Since the benchmark at the end of investment horizon is $R_t^T W_{i,t}$, it is changing with respect to t. This makes optimal strategies time inconsistent. Due to this predicament we consider sub game perfect strategies which are formally defined below.

We first consider the optimal problem on the time period $[T-1, T]$. At the time $T-1$, we discuss the optimal problem

$$\begin{aligned} &(P1): \\ &\sup_{v_{i,T-1}\in\mathbb{R}^{+}} U(\overline{W}_{i,T-1}^{T}(v_{i,T-1}), f_j) \\ =\ &\sup_{v_{i,T-1}\in\mathbb{R}^{+}} \Big[\int_0^{+\infty} T(1 - F_{\overline{W}_{i,T-1}^{T}}(x))du_{i,j}^{+}(x) + \int_{-\infty}^{0} T^{-}(F_{\overline{W}_{i,T-1}^{T}}(x))du_{i,j}^{-}(-x)\Big]. \end{aligned} \tag{3.9}$$

And, we can obtain the optimal solution of $(P1)$

$$\begin{aligned} v_{i,T-1}^{*} &= arg \max_{v_{i,T-1}\in\mathbb{R}^{+}} U(\overline{W}_{i,T-1}^{T}(v_{T-1}), f_j) \\ &= arg \max_{v_{i,T-1}\in\mathbb{R}^{+}} \Big[\int_0^{+\infty} T(1 - F_{\overline{W}_{i,T-1}^{T}}(x))du_{i,j}^{+}(x) + \int_{-\infty}^{0} T^{-}(F_{\overline{W}_{i,T-1}^{T}}(x))du_{i,j}^{-}(-x)\Big]. \end{aligned} \tag{3.10}$$

Applying policy iteration to the more general time period $[t,T]$ $(t=0,1,...,T-1)$, we seek the subgame perfect investment strategies

$$V_{i,t}=\begin{cases} v^*_{i,k} & \text{k=t+1,t+2,...,T-1,}\\ v_{i,k} & 0,\text{k=t,}\end{cases}$$

for an arbitrary $\mathcal{F}_t$-adapted control $v_{i,t}$.

At the time t, we consider the optimal problem

$$\begin{aligned}(Pn)\quad &:\\ &\max_{V_{i,t}} U(\overline{W}^T_{i,t},f_j)\\ =\quad &\max_{V_{i,t}}\Big[\int_0^{+\infty} T(1-F_{\overline{W}^T_{i,t}}(x))du^+_{i,j}(x)+\int_{-\infty}^0 T^-(F_{\overline{W}^T_{i,t}}(x))du^-_{i,j}(-x)\Big].\end{aligned}\tag{3.11}$$

And, we have the optimal solution of (Pn)

$$\begin{aligned}&V^*_{i,t}\\ =\quad &(v^*_{i,t},v^*_{i,2},...,v^*_{i,T-1})\\ =\quad &arg\max_{V_{i,t}} U(\overline{W}^T_{i,t},f_j)\\ =\quad &arg\max_{V_{i,t}}\Big[\int_0^{+\infty} T(1-F_{\overline{W}^T_{i,t}}(x))du^+_{i,j}(x)+\int_{-\infty}^0 T^-(F_{\overline{W}^T_{i,t}}(x))du^-_{i,j}(-x)\Big].\end{aligned}\tag{3.12}$$

The optimal time consistent strategy is $V^*_{i,0}=(v^*_{i,0},v^*_{i,1},...,v^*_{i,T})$.

d) The Portfolio Optimization

We get a important result for the optimal fees of managers.

Theorem 3.4. *Given that $V_{i,t}>0$ (no short-selling), the subgame perfect CPT-investment strategy is given by $V^*_{i,0}=(v^*_0,v^*_1,...,v^*_T)$, where*

$$v^*_{i,t}=\begin{cases} k^*_{i,t}(\frac{a\tau_{i,j}}{\sigma^2}-f_j)W_{i,t} & W_{i,t}\geq 0\\ \bar{k}^*_{i,t}(\frac{a\tau_{i,j}}{\sigma^2}-f_j)W_{i,t} & W_{i,t}<0\end{cases}\tag{3.13}$$

where

$$k^*_{i,t}=arg\max_{z\geq 0} G_{i,t}(z),$$

$$\bar{k}^*_{i,t}=arg\max_{z<0} L_{i,t}(z)$$

$$\begin{aligned}G_{i,t}(z)\quad =\quad &E[(1+r_t+zy_t)^\alpha A_{i,t+1}I_{1+r_t+zy_t\geq 0}\\ -\quad &(-1-r_t-zy_t)^\alpha B_{i,t+1}I_{1+r_t+zy_t<0}\Big|\mathcal{F}_{T-2}]\quad (t=0,1,...,T-2),\end{aligned}$$

$$\begin{aligned}L_{i,t}(z)\quad =\quad &E[(-1-r_t-zy_t)^\alpha A_{i,t+1}I_{1+r_t+zy_t\leq 0}\\ -\quad &(1+r_t+zy_t)^\alpha B_{i,t+1}I_{1+r_t+zy_t>0}\Big|\mathcal{F}_t]\quad (t=0,1,...,T-2),\end{aligned}$$

$$G_{i,T-1}(z)\quad =\quad \int_0^{+\infty} T^+(1-F_{y_{T-1}}(y))\alpha(zy+\frac{1}{W_{i,T\ \ 1}})^{\alpha-1}zdy$$

$$
\begin{aligned}
& - \int_{-\infty}^{0} T^{-}(F_{y_{T-1}}(y))\lambda\alpha(-zy)^{\alpha-1}zdy, \\
L_{i,T-1}(z) &= \int_{0}^{+\infty} T^{+}(1-F_{y_{T-1}}(y))\alpha(-zy+\frac{1}{W_{i,T-1}})^{\alpha-1}zdy \\
& - \int_{-\infty}^{0} T^{-}(F_{y_{T-1}}(y))\lambda\alpha(zy)^{\alpha-1}zdy,
\end{aligned}
$$

$$A_{i,t} = \max_{z\geq 0} G_{i,t}(z), \quad (t = 0, 1, ...T-1)$$

$$B_{i,t} = -\max_{z<0} L_{i,t}(z) \quad (t = 0, 1, ...T-1).$$

We prove this in Appendix C.

IV. The Objective

Here, we only consider two managers, A and B. If investor i has greater trust in manager A than in manager B, then $\tau_{i,A} = 1$. $\tau_{i,B}$ is uniformly distributed on $[1-\theta, 1]$, where the parameter $\theta \in [0, 1]$ captures the dispersion of trust in the population. Here, we call investor i an A-trusting investor. Analogously, there are other investors called B-trusting investors, who trust manager B more than manager A. In the following section, we will discuss the total profit of manager A.

We first discuss the total profit of manager A when $f_A \geq f_B$.

If

$$\max_{v_{i,t}\in\mathbb{R}} U(\overline{W}_{i,t}^{T}, f_A) \geq \max_{v_{i,t}\in\mathbb{R}} U(\overline{W}_{i,t}^{T}, f_B),$$

investor i prefers manager A to manager B.

Similar to the results in Deng (2015), we have

$$
\begin{aligned}
& (\frac{a\tau_{i,A}}{\sigma^2} - f_A)^{\alpha}(W_{i,t}^{\alpha}A_{i,t}I_{W_t\geq 0} - (\frac{a\tau_{i,j}}{\sigma^2} - f_j)^{\alpha}(-W_{i,t})^{\alpha}B_{i,t}I_{W_t<0}) \\
\geq\ & (\frac{a\tau_{i,B}}{\sigma^2} - f_B)^{\alpha}(W_{i,t}^{\alpha}A_{i,t}I_{W_t\geq 0} - (\frac{a\tau_{i,j}}{\sigma^2} - f_j)^{\alpha}(-W_{i,t})^{\alpha}B_{i,t}I_{W_t<0}).
\end{aligned}
$$

Thus,

$$\frac{a}{\sigma^2}(\tau_{i,A} - \tau_{i,B}) \geq (f_A - f_B). \tag{4.1}$$

Note that the right-hand side of (4.1) is not less than 0. For B-trusting investors, the left-hand side of (4.1) is less than 0. Thus, (4.1) does not hold. That is, none of the B-trusting investors will choose manager A.

For an A-trusting investor, if

$$\tau_{i,B} \leq 1 - \frac{\sigma^2}{a}(f_A - f_B),$$

the A-trusting investor prefers manager B. Namely, although manager A charges a higher fee than manager B, some A-trusting investors have so little trust in manager B that they prefer manager A, regardless of manager A's higher fee.

Hence, when $f_A \geq f_B$, given Theorem 3.4, we can state that the manager A obtains total profit

$$f_A(\frac{a}{\sigma^2}-f_A)W_{i,t}(k^*_{i,t}I_{W_{i,t}\geq 0}+\bar{k}^*_{i,t}I_{W_{i,t}<0})\int_{\max[1-\theta,\frac{\sigma^2}{a}f_B]}^{\max[1-\theta,\frac{\sigma^2}{a}f_B,1-\frac{\sigma^2}{a}(f_A-f_B)]}\frac{1}{2\theta}d\tau_{i,B}$$

$$= f_A(\frac{a}{\sigma^2}-f_A)W_{i,t}(k^*_{i,t}I_{W_{i,t}\geq 0}+\bar{k}^*_{i,t}I_{W_{i,t}<0})\int_{\max[1-\theta,\frac{\sigma^2}{a}f_B]}^{\max[1-\theta,1-\frac{\sigma^2}{a}(f_A-f_B)]}\frac{1}{2\theta}d\tau_{i,B}.$$

In fact, we can demonstrate that $1-\theta \geq \frac{\sigma^2}{a}f_B$. Otherwise, there would be some paradoxical results. Specifically, when $1-\theta < \frac{\sigma^2}{a}f_B$, if there exits any $\tau_{i,B} \in [1-\theta, \frac{\sigma^2}{a}f_B]$, then this is inconsistent with equation (3.5). If no $\tau_{i,B}$ satisfies $\tau_{i,B} \in [1-\theta, \frac{\sigma^2}{a}f_B]$, namely, any $\tau_{i,B} \in [\frac{\sigma^2}{a}f_B, 1]$, this contradicts the assumption that $\tau_{i,B}$ is uniformly distributed on $[1-\theta, 1]$. Thus, $1-\theta \geq \frac{\sigma^2}{a}f_B$ is reasonable.

Moreover, if

$$\max_{v_{i,t}\in\mathbb{R}} U(\overline{W}^T_{i,t}, f_B) \geq \max_{v_{i,t}\in\mathbb{R}} U(\overline{W}^T_{i,t}, f_A),$$

namely,

$$\frac{a}{\sigma^2}(\tau_{i,B}-\tau_{i,A}) \geq (f_B-f_A), \tag{4.2}$$

the investor i prefers manager B to manager A.

Since $\tau_{i,A}-\tau_{i,B} \in [-\theta, \theta]$, equation (4.2) indicates that

$$\frac{\sigma^2}{a}(f_B-f_A) \geq -\theta.$$

Otherwise, the equation (4.2) will always hold and the CPT-investor i will always prefer the manager B. Then, manager A earns zero profit. Manager A could reduce his fee and make positive profits.

When $f_A \geq f_B$, manager A's total profit $U_{f_A}(f_A, f_B)$ is rewritten as

$$U_A(f_A, f_B) = f_A(\frac{a}{\sigma^2}-f_A)W_{i,t}(k^*_{i,t}I_{W_{i,t}\geq 0}+\bar{k}^*_{i,t}I_{W_{i,t}<0})\int_{1-\theta}^{1-\frac{\sigma^2}{a}(f_A-f_B)}\frac{1}{2\theta}d\tau_{i,B}.$$

Subsequently, we consider $f_A < f_B$.

If

$$\max_{v_{i,t}\in\mathbb{R}} U(\overline{W}^T_{i,t}, f_A) \geq \max_{v_{i,t}\in\mathbb{R}} U(\overline{W}^T_{i,t}, f_B),$$

investor i prefers manager A to manager B.

From

$$\begin{aligned} & (\frac{a\tau_{i,A}}{\sigma^2}-f_A)^\alpha(W^\alpha_{i,t}A_{i,t}I_{W_t\geq 0}-(-W_{i,t})^\alpha B_{i,t}I_{W_t<0}) \\ \geq\ & (\frac{a\tau_{i,B}}{\sigma^2}-f_B)^\alpha(W^\alpha_{i,t}A_{i,t}I_{W_t\geq 0}-(-W_{i,t})^\alpha B_{i,t}I_{W_t<0}). \end{aligned}$$

we can demonstrate that

$$\frac{a}{\sigma^2}(\tau_{i,A}-\tau_{i,B}) \geq (f_A-f_B). \tag{4.3}$$

If investor i is an A-trusting investor, as mentioned above, $\tau_{i,A} = 1$. Hence, $\tau_{i,A} - \tau_{i,B} \geq 0$. Since the right-hand of (4.3) is less than 0, (4.1) always holds. Therefore, all A-trusting investors prefer manager A.

For a B-trusting investor and when $\tau_{i,B} = 1$, if

$$\tau_{i,A} \geq 1 + \frac{\sigma^2}{a}(f_A - f_B),$$

a B-trusting investor will choose manager A, as he hopes to pay less in management fees.

Therefore, when $f_B > f_A$, manager A's total profit is

$$f_A W_{i,t}(k^*_{i,t} I_{W_{i,t}\geq 0} + \bar{k}^*_{i,t} I_{W_{i,t}<0})[\frac{1}{2}(\frac{a}{\sigma^2} - f_A) + \int_{\max[1-\theta, 1+\frac{\sigma^2}{a}(f_A - f_B)]}^{1} (\frac{a\tau_{i,A}}{\sigma^2} - f_A)\frac{1}{2\theta} d\tau_{i,A}]. \tag{4.4}$$

From equation (4.3), we have that

$$\frac{\sigma^2}{a}(f_A - f_B) \geq -\theta.$$

That is,

$$\max[1 - \theta, 1 + \frac{\sigma^2}{a}(f_A - f_B)] = 1 + \frac{\sigma^2}{a}(f_A - f_B).$$

Therefore, when $f_B > f_A$, manager A's total profit $U_{f_A}(f_A, f_B)$ is

$$\begin{aligned} & U_A(f_A, f_B) \\ = \; & f_A W_{i,t}(k^*_{i,t} I_{W_{i,t}\geq 0} + \bar{k}^*_{i,t} I_{W_{i,t}<0})[\frac{1}{2}(\frac{a}{\sigma^2} - f_A) + \int_{1+\frac{\sigma^2}{a}(f_A - f_B)}^{1} (\frac{a\tau_{i,A}}{\sigma^2} - f_A)\frac{1}{2\theta} d\tau_{i,A}]. \end{aligned} \tag{4.5}$$

As for the above results, we can obtain the manager A's total profits $U_A(f_A, f_B)$ by

$$\begin{aligned} & U_A(f_A, f_B) \\ = \; & \begin{cases} f_A(\frac{a}{\sigma^2} - f_A) W_{i,t}(k^*_{i,t} I_{W_{i,t}\geq 0} + \bar{k}^*_{i,t} I_{W_{i,t}<0}) \int_{1-\theta}^{1-\frac{\sigma^2}{a}(f_A - f_B)} \frac{1}{2\theta} d\tau_{i,B}. & \text{if } f_A \geq f_B \text{ ,} \\ f_A W_{i,t}(k^*_{i,t} I_{W_{i,t}\geq 0} + \bar{k}^*_{i,t} I_{W_{i,t}<0}) & \\ \cdot[\frac{1}{2}(\frac{a}{\sigma^2} - f_A) + \int_{1+\frac{\sigma^2}{a}(f_A - f_B)}^{1} (\frac{a\tau_{i,A}}{\sigma^2} - f_A)\frac{1}{2\theta} d\tau_{i,A}]. & \text{if } f_A < f_B. \end{cases} \end{aligned} \tag{4.6}$$

Similarly, the total profit $U_B(f_A, f_B)$ of manager B is given by

$$\begin{aligned} & U_B(f_A, f_B) \\ = \; & \begin{cases} f_B(\frac{a}{\sigma^2} - f_B) W_{i,t}(k^*_{i,t} I_{W_{i,t}\geq 0} + \bar{k}^*_{i,t} I_{W_{i,t}<0}) \int_{1-\theta}^{1-\frac{\sigma^2}{a}(f_B - f_A)} \frac{1}{2\theta} d\tau_{i,A}. & \text{if } f_B > f_A \text{ ,} \\ f_B W_{i,t}(k^*_{i,t} I_{W_{i,t}\geq 0} + \bar{k}^*_{i,t} I_{W_{i,t}<0}) & \\ \cdot[\frac{1}{2}(\frac{a}{\sigma^2} - f_B) + \int_{1+\frac{\sigma^2}{a}(f_B - f_A)}^{1} (\frac{a\tau_{i,B}}{\sigma^2} - f_B)\frac{1}{2\theta} d\tau_{i,B}]. & \text{if } f_B \leq f_A. \end{cases} \end{aligned} \tag{4.7}$$

The above results lead us directly to the key theorem below.

Theorem 4.1. *Suppose that $\tau_{i,B}$ is uniformly distributed on $[1-\theta, 1]$, where the parameter $\theta \in [0, 1]$ captures the dispersion of trust in the population. If the managers provide a service for the investors, all of whom behave according to CPT, namely, all are CPT investors, we can characterize manager A's the total profit $U_A(f_A, f_B)$ by*

$$U_A(f_A, f_B) \tag{4.8}$$

$$= \begin{cases} f_A(\frac{a}{\sigma^2} - f_A)W_{i,t}(k^*_{i,t}I_{W_{i,t}\geq 0} + \bar{k}^*_{i,t}I_{W_{i,t}<0})\frac{1}{2\theta}(\theta - \frac{\sigma^2}{a}(f_A - f_B)) & \text{if } f_A \geq f_B \ , \\ f_A W_{i,t}(k^*_{i,t}I_{W_{i,t}\geq 0} + \bar{k}^*_{i,t}I_{W_{i,t}<0}) & \\ \cdot[\frac{1}{2}(\frac{a}{\sigma^2} - f_A) + \frac{1}{4\theta}(2 - \frac{\sigma^2}{a}f_B - \frac{\sigma^2}{a}f_A)(f_B - f_A)] & \text{if } f_A < f_B, \end{cases}$$

and manager B's total profit $U_B(f_A, f_B)$ *by*

$$U_B(f_A, f_B) \tag{4.9}$$

$$= \begin{cases} f_B(\frac{a}{\sigma^2} - f_B)W_{i,t}(k^*_{i,t}I_{W_{i,t}\geq 0} + \bar{k}^*_{i,t}I_{W_{i,t}<0})\frac{1}{2\theta}(\theta - \frac{\sigma^2}{a}(f_B - f_A)) & \text{if } f_B > f_A \ , \\ f_B W_{i,t}(k^*_{i,t}I_{W_{i,t}\geq 0} + \bar{k}^*_{i,t}I_{W_{i,t}<0}) & \\ \cdot[\frac{1}{2}(\frac{a}{\sigma^2} - f_B) + \frac{1}{4\theta}(2 - \frac{\sigma^2}{a}f_A - \frac{\sigma^2}{a}f_B)(f_A - f_B)] & \text{if } f_B \leq f_A,. \end{cases} \tag{4.10}$$

V. The Results

This section identifies the optimal fees in two different cases, one in which the dominant manager is manager A and the other in which the dominant manager is manager B.

Proposition 5.1. *We set*

$$f^*_A = arg\max_{f_A} U_A(f_A, f_B)$$

and

$$f^*_B = arg\max_{f_B} U_B(f^*_A, f_B).$$

If manager A is in a dominant position and manger B is in a subordinate position in the financial market, then $f_A \geq f_B$. *Furthermore, the implicitly optimal solutions of* f^*_A *and* f^*_B *satisfy*

$$f^*_A = \frac{2x - 1 + 2\theta - \sqrt{(2x - 1 + 2\theta)^2 - 4(x - 1 + \theta)}}{2\sigma^2/a} \tag{5.1}$$

and

$$f^*_B = \frac{2\theta + 2 - x - \sqrt{(2\theta + 2 - x)^2 - 4(\theta + \frac{1}{2}(1 - x^2))}}{2\sigma^2/a}, \tag{5.2}$$

where

$$x = 1 - \frac{\sigma^2}{a}(f^*_A - f^*_B).$$

The approximately and explicitly optimal solutions of f^*_A *and* f^*_B *are as follows*

$$f^*_A = C + D\frac{a}{\sigma^2} \tag{5.3}$$

and

$$f^*_B = E + F\frac{a}{\sigma^2}, \tag{5.4}$$

where

$$C = 2\theta + 2(2\theta + 1)^{1/2} - 1 > 0, \tag{5.5}$$

$$D = \frac{1}{2}[8(\theta-1)(2\theta+1)^{1/2} + 4\theta^2 + 3], \tag{5.6}$$

$$E = \frac{1}{2}(4\theta - 2 + 4(2\theta+1)^{1/2}) > 0 \tag{5.7}$$

and

$$F = \frac{1}{2}((8\theta-6)(2\theta+1)^{1/2} + 4\theta^2+). \tag{5.8}$$

If manager B is in a dominant position and manger A is in a subordinate position in the financial market, we obtain the symmetrical results.

The proof of this proposition is seen in Appendix D.

It is valuable to notice that the result coincides with the static result (see Deng (2015)). Here, we must stress that Gennaioli et al.'s f_A and f_B are the rates of fees while our f_A and f_B are the amounts of fees. To more clearly compare our results with those of Gennaioli et al., we calculate the rates of fees in our model and attain the following proposition.

Proposition 5.2. *Let the rates of fees be*

$$F_A = \frac{f_A}{W_i} \quad \text{and} \quad F_B = \frac{f_B}{W_i}. \tag{5.9}$$

In addition, set

$$F_A^* = arg\max_{F_A} U_A(F_A, F_B^*)$$

and

$$F_B^* = arg\max_{F_B} U_B(F_A^*, F_B).$$

If manager A is in a dominant position and manager B is in a subordinate position in the financial market, then

$$F_A^* = -\frac{1}{\hat{k}\xi} + \frac{1}{\hat{k}\xi(1 - C\frac{\sigma^2}{a}) + D} \tag{5.10}$$

and

$$F_B^* = -\frac{1}{\hat{k}\xi} + \frac{1}{\hat{k}\xi(1 - E\frac{\sigma^2}{a}) + F}. \tag{5.11}$$

Conversely, if manager B is in a dominant position and manager A is in a subordinate position in the financial market, then

$$F_B^* = -\frac{1}{\hat{k}\xi} + \frac{1}{\hat{k}\xi(1 - C\frac{\sigma^2}{a}) + D} \tag{5.12}$$

and

$$F_A^* = -\frac{1}{\hat{k}\xi} + \frac{1}{\hat{k}\xi(1 - E\frac{\sigma^2}{a}) + F}. \tag{5.13}$$

Moreover, both F_A^* and F_B^* are increasing functions of σ^2. That is, a riskier asset commands higher rates of fees, such that managers are willing to take on market risk.

The proof of this proposition is provided in Appendix E.

Although managers serve CPT investors rather than risk-averse investors in the classical theory, they also charge higher rates for riskier assets. This mechanism is consistent with that of Gennaioli et al.

Remark 5.1. Proposition 5.2 indicates that the rates of net fees are higher for riskier assets. We find that the rates of gross fees are also higher for riskier assets. Given that GF_j is the amount of the gross fee, we can obtain the rate of the gross fee, GF_j, as follows:

$$\begin{aligned} GF_j &= \frac{\frac{a\tau_{i,j}}{\sigma^2} + f_j}{W_i} \\ &= -\frac{1}{\hat{k}\xi} + \frac{2}{\hat{k}\xi}\frac{1}{1 + D - C\frac{\sigma^2}{a\tau_{i,j}}}. \end{aligned} \tag{5.14}$$

Hence,

$$\frac{\partial GF_j}{\partial \sigma^2} = \frac{2}{\hat{k}\xi}\frac{C}{a\tau_{i,j}}(1 + D - \frac{C\sigma^2}{a\tau_{i,j}})^{-2} > 0. \tag{5.15}$$

Therefore, GF_j is an increasing function of σ^2. That is, the rate of the gross fee is also higher for riskier assets.

From above results, we find that the optimal fees obtained for the dominant managers are not very satisfactory because the optimal solutions are implicit, not explicit. This shortcoming is always a major obstacle to the application of CPT. To nullify this disadvantage, we use an effective software program to obtain the above approximately explicit solution. However, the explicit solution is so complicated that we cannot clearly analyze the relationship between the managers' optimal fees and the various parameters. Therefore, we will describe this relationship using numerical analysis.

VI. Numerical Analysis

In this section, under the assumption that all of the investors are CPT investors served by either manager A or B, we focus primarily on the optimal problem for multiple stocks. The single-stock problem is similar to the multiple-stock problem, except that $\hat{\sigma}$ is replaced with σ. We assume that manager A is in the dominant position in and the manager B is in the subordinate position. We examine how the parameter $\frac{\hat{\sigma}^2}{a}$ affects the strategies of managers A and B.

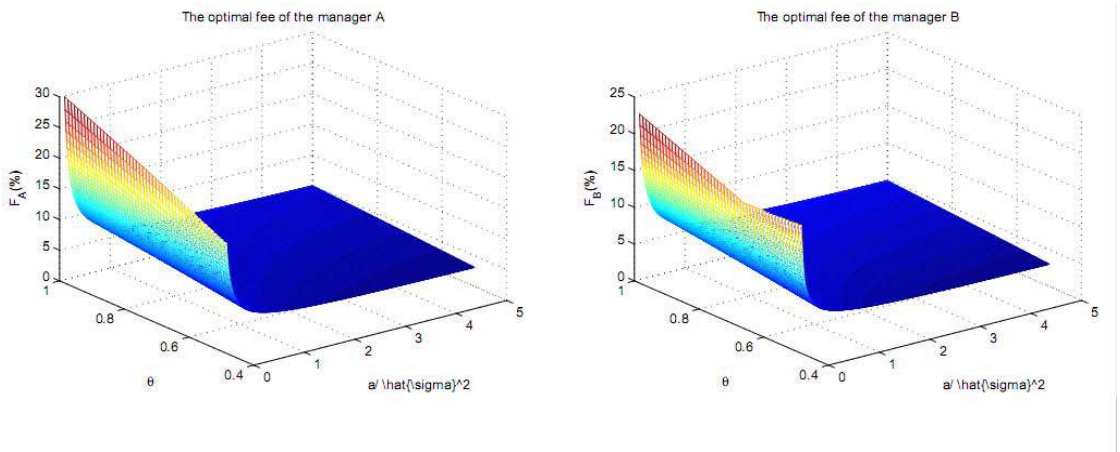

Figure 1: The optimal fees of the manager A and the manager B

Figure 1 illustrates three principle findings. i) Both the manager in the dominant position and the manager in the subordinate position charge lower fees when the parameter $\frac{a}{\hat{\sigma}^2}$ increases. When $\frac{a}{\hat{\sigma}^2}$ increases from 0 to 5.0, manager A's fee declines to 5% from 30% while manager B's fee declines to 5% from 25%. When increasing the parameter $\frac{a}{\hat{\sigma}^2}$, the decrease in the index $\hat{\sigma}^2$ reflects the less risks associated with the portfolio of the risky assets. Hence, from the managers' perspective, manager A (who is in the dominant position) only need lower rates of fees to take risk. Manager B (who is in the subordinate position) has to reduce his fees to compete with manager A and earn a profit. ii) Manager A (who, again, is in a dominant position) charges a higher fee than the subordinate manager B. The highest fee charged by manger A is approximately 30%, while the highest fee charged by manger B is approximately 25%. iii) The parameter θ slightly affects the optimal fees. For fixed $\frac{a}{\hat{\sigma}^2} = 5.0$, when θ increases by 1.0 from 0.5, manager A's fee increases from 5.0 to approximately 9.0 whereas manager B's fee increases to 8.0 from 5.0.

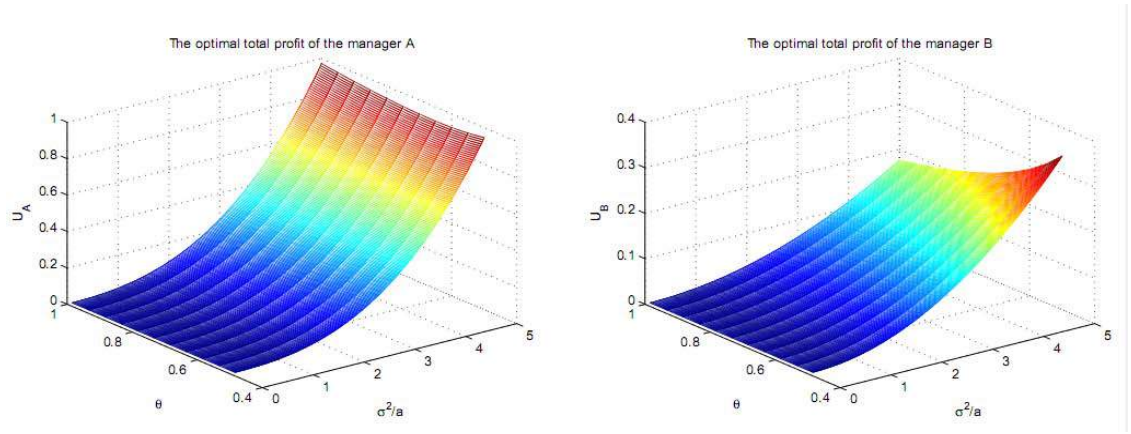

Figure 2: The optimal total pro_ts of the manager A and the manager B

Figure 2 also reveals three principle findings. i) The total profits of the manager in the dominant position and the manager in the subordinate position both increase in parameter $\frac{\hat{\sigma}^2}{a}$ increases. For fixed $\theta = 0.5$, when $\frac{\hat{\sigma}^2}{a}$ increases from 0 to 5.0, manager A's total profit increases to 0.98 from 0 while manager B's total profit increases to 0.34 from 0. Note that when $\frac{\hat{\sigma}^2}{a} = 0$, the total profits of manager A and manager B are both 0. This reason is that $\frac{\hat{\sigma}^2}{a} = 0$ means the risk associated with the portfolio of risky assets is quite small, and thus, CPT investors prefer to invest on their own instead of with money managers. Note further that when relating the fees to the total profits, total profits increase when the fees decline. This signifies that a strategy of reducing fees would be effective in the financial market. Although the managers charge lower fees when $\frac{\hat{\sigma}^2}{a}$ increases, the total profits increase because lower fees attract more CPT investors. ii) Manager A (who is in a dominant position) obtains more total profits than the manger in the subordinate position. For fixed $\theta = 0.5$, the largest total profit for manger A is approximately 0.98 while the largest total profit for manger B is approximately 0.34. iii) The parameter θ has a greater influence on manager B's total profit than on manager A's total profit. For fixed $\frac{\hat{\sigma}^2}{a} = 5.0$, when θ increases by 1.0 from 0.5, manager B's total profit falls from 0.34 to approximately 0.18 whereas manager A's total profit declines from 0.98 to 0.95.

VII. Conclusion

This article obtains some subtle and delicate results. Our results have both similarities to and differences from those of Gennaioli, Shieifer and Vishny.

We analyze different investors from those considered by Gennaioli, Shieifer and Vishny, but we obtain some results similar to theirs. We also find that a CPT investor is willing to invest in a risky asset with the manager whom he trusts most. A CPT investor prefers to accept the higher fee that this manager charges to retain him. Even when money managers compete on fees, these fees do not decline to equal costs and substantial market segmentation remains. Indeed, we obtain a result similar to Gennaioli, Shieifer and Vishny's that a CPT investor will accept higher fees from his most trusted manager when this investor invests in more risky asset.

There are two main differences between our optimal strategies and those based on classical preferences.

First, the optimal fees are not symmetric in our case. Specially, the dominant managers obtain a higher fee than do subordinate managers, regardless of changes in risk $\hat{\sigma}^2$ (or σ^2) and the parameter θ. This result demonstrates that a higher fee does not directly lead to reduced competition (at least from the perspective of CPT) and causes the dominant manager to obtain more total profit. From an economic perspective, the managers who are in the dominant position charge a higher fee than do subordinate managers to extract greater benefits. A manager in a subordinate position has to charge a lower fee than do dominant managers to survive and occupy market share in competition.

Another difference between our results and those based on classical preferences is that these fees are not proportional to expected returns. But, they are positively related, which is consistent with classical results. That is, a riskier asset commands higher rates of fees, so that managers are willing to take market risk.

Appendix

Appendix A: The Proof of Proposition 3.2

Proof. From the definition of a subjective risk premium, (3.6), it is easy to show that

$$\begin{aligned} u_{i,j}(E_s(\overline{W}_{i,t}^T) - \lambda_0) &= (1-p)E[u_{i,j}^-(\overline{W}_{i,t}^T)m^-(\overline{W}_{i,t}^T)|\overline{W}_{i,t}^T < 0] \\ &+ pE[u_{i,j}^+(\overline{W}_{i,t}^T)m^+(\overline{W}_{i,t}^T)|\overline{W}_{i,t}^T > 0], \end{aligned} \tag{8.1}$$

and

$$\begin{aligned} u_{i,j}(E_s(\overline{W}_{i,t}^T) - \lambda) &= (1-p)(E[u_{i,j}^+(\overline{W}_{i,t}^T + \pi)m^-(\overline{W}_{i,t}^T)| - \pi \leq \overline{W}_{i,t}^T < 0] \\ &+ E[u_{i,j}^-(\overline{W}_{i,t}^T + \pi)m^-(\overline{W}_{i,t}^T)|\overline{W}_{i,t}^T < -\pi]) \\ &+ pE[u_{i,j}^+(\overline{W}_{i,t}^T + \pi)m^+(\overline{W}_{i,t}^T)|\overline{W}_{i,t}^T > 0]. \end{aligned} \tag{8.2}$$

Because both of $u_{i,j}^+$ and $u_{i,j}^-$ are increasing functions, we have

$$\begin{aligned} &u_{i,j}^-(\overline{W}_{i,t}^T + \pi) > u_{i,j}^-(\overline{W}_{i,t}^T), \\ &u_{i,j}^+(\overline{W}_{i,t}^T + \pi) > 0 > u_{i,j}^-(\overline{W}_{i,t}^T), \\ &u_{i,j}^+(\overline{W}_{i,t}^T + \pi) > u_{i,j}^+(\overline{W}_{i,t}^T). \end{aligned}$$

Besides, from $m^+(\cdot) \geq 0$ and $m^-(\cdot) \geq 0$, we can show that

$$u^-_{i,j}(\overline{W}^T_{i,t} + \pi)m^-(\overline{W}^T_{i,t}) \geq u^-_{i,j}(\overline{W}^T_{i,t})m^-(\overline{W}^T_{i,t}),$$

$$u^+_{i,j}(\overline{W}^T_{i,t} + \pi)m^-(\overline{W}^T_{i,t}) \geq u^-_{i,j}(\overline{W}^T_{i,t})m^-(\overline{W}^T_{i,t}),$$

and

$$u^+_{i,j}(\overline{W}^T_{i,t} + \pi)m^+(\overline{W}^T_{i,t}) \geq u^+_{i,j}(\overline{W}^T_{i,t})m^+(\overline{W}^T_{i,t}).$$

Hence,

$$\begin{aligned} & (1-p)(E[u^+_{i,j}(\overline{W}^T_{i,t} + \pi)m^-(\overline{W}^T_{i,t})| - \pi \leq \overline{W}^T_{i,t} < 0] \\ + \quad & E[u^-_{i,j}(\overline{W}^T_{i,t} + \pi)m^-(\overline{W}^T_{i,t})|\overline{W}^T_{i,t} < -\pi]) \\ \geq \quad & (1-p)E[u^-_{i,j}(\overline{W}^T_{i,t})m^-(\overline{W}^T_{i,t})|\overline{W}^T_{i,t} < 0] + pE[u^+_{i,j}(\overline{W}^T_{i,t})m^+(\overline{W}^T_{i,t})|\overline{W}^T_{i,t} > 0]. \end{aligned} \tag{8.3}$$

That is,

$$u_{i,j}(E_s(\overline{W}^T_{i,t}) - \lambda) \geq u_{i,j}(E_s(\overline{W}^T_{i,t}) - \lambda_0). \tag{8.4}$$

Noticing $u_{i,j}$ is a increasing function, we believe that

$$\lambda \leq \lambda_0.$$

□

Appendix B: The Proof of Proposition 3.3

Proof. Taking a first order Taylor approximation around 0 on the left hand side of (8.2) yields

$$LHS = u_{i,j}(0) + u'_{i,j}(0)(E_s(\overline{W}^T_{i,t}) - \lambda). \tag{8.5}$$

And a second order approximation around $-\pi$ on the first two terms of the right hand side of (8.2) and a second order approximation around 0 on the last term of right hand side of (8.2) show

$$\begin{aligned} RHS \quad = \quad & (1-p)\Big((u^-_{i,j})'(0)m^-(-\pi)E[\overline{W}^T_{i,t} + \pi|\overline{W}^T_{i,t} < -\pi] \\ + \quad & \frac{1}{2}\big((u^-_{i,j})''(0)m^-(-\pi) + (u^-_{i,j})'(0)(m^-)'(-\pi)\big)E[(\overline{W}^T_{i,t} + \pi)^2|\overline{W}^T_{i,t} < -\pi]\Big) \\ + \quad & (1-p)\Big((u^+_{i,j})'(0)m^-(-\pi)E[\overline{W}^T_{i,t} + \pi| - \pi \leq \overline{W}^T_{i,t} < 0] \\ + \quad & \frac{1}{2}\big((u^+_{i,j})''(0)m^-(-\pi) + (u^+_{i,j})'(0)(m^-)'(-\pi)\big)E[(\overline{W}^T_{i,t} + \pi)^2| - \pi \leq \overline{W}^T_{i,t} < 0]\Big) \end{aligned}$$

$$
\begin{aligned}
&+ \quad p\Big(u^+_{i,j}(\pi)m^+(0) + \big((u^+_{i,j})'(\pi)m^+(0) + u^+_{i,j}(\pi)(m^+0)'(0)\big)E[\overline{W}^T_{i,t}|\overline{W}^T_{i,t} > 0] \\
&+ \quad \frac{1}{2}\big((u^+_{i,j})''(\pi)m^+(0) + 2(u^+_{i,j})'(\pi)(m^+)'(0) + u^+_{i,j}(\pi)(m^+)''(0)\big)E[(\overline{W}^T_{i,t})^2|\overline{W}^T_{i,t} > 0]\Big)
\end{aligned} \tag{8.6}
$$

To simply write, we let

$$
\begin{aligned}
G1 &= (u^-_{i,j})'(0)m^-(-\pi), \\
H1 &= \frac{1}{2}\big((u^-_{i,j})''(0)m^-(-\pi) + (u^-_{i,j})'(0)(m^-)'(-\pi)\big), \\
G2 &= (u^+_{i,j})'(0)m^-(-\pi), \\
H2 &= \frac{1}{2}\big((u^+_{i,j})''(0)m^-(-\pi) + (u^+_{i,j})'(0)(m^-)'(-\pi)\big), \\
G3 &= (u^+_{i,j})'(\pi)m^+(0) + u^+_{i,j}(\pi)(m^+0)'(0), \\
H3 &= \frac{1}{2}\big((u^+_{i,j})''(\pi)m^+(0) + 2(u^+_{i,j})'(\pi)(m^+)'(0) + u^+_{i,j}(\pi)(m^+)''(0)\big), \\
I &= u^+_{i,j}(\pi)m^+(0).
\end{aligned} \tag{8.7}
$$

Then, rewrite (8.8) as

$$
\begin{aligned}
RHS &= (1-p)\Big(G1 \cdot E[\overline{W}^T_{i,t} + \pi|\overline{W}^T_{i,t} < -\pi] + H1 \cdot E[(\overline{W}^T_{i,t} + \pi)^2|\overline{W}^T_{i,t} < -\pi]\Big) \\
&+ (1-p)\Big(G2 \cdot E[\overline{W}^T_{i,t} + \pi| - \pi \le \overline{W}^T_{i,t} < 0] + H2 \cdot E[(\overline{W}^T_{i,t} + \pi)^2| - \pi \le \overline{W}^T_{i,t} < 0]\Big) \\
&+ p\Big(I + G3 \cdot E[\overline{W}^T_{i,t}|\overline{W}^T_{i,t} > 0] + H3 \cdot E[(\overline{W}^T_{i,t})^2|\overline{W}^T_{i,t} > 0]\Big)
\end{aligned} \tag{8.8}
$$

Since $LHS \approx RHS$, we have

$$
\begin{aligned}
\lambda &= E_s(\overline{W}^T_{i,t}) - \frac{1}{u'_{i,j}(0)}RHS \\
&= E_s(\overline{W}^T_{i,t}) - (1-p)\Big(\frac{G1}{u'_{i,j}(0)} \cdot E[\overline{W}^T_{i,t} + \pi|\overline{W}^T_{i,t} < -\pi] + \frac{H1}{u'_{i,j}(0)} \cdot E[(\overline{W}^T_{i,t} + \pi)^2|\overline{W}^T_{i,t} < -\pi]\Big) \\
&- (1-p)\Big(\frac{G2}{u'_{i,j}(0)} \cdot E[\overline{W}^T_{i,t} + \pi| - \pi \le \overline{W}^T_{i,t} < 0] + \frac{H2}{u'_{i,j}(0)} \cdot E[(\overline{W}^T_{i,t} + \pi)^2| - \pi \le \overline{W}^T_{i,t} < 0]\Big) \\
&- p\Big(\frac{I}{u'_{i,j}(0)} + \frac{G3}{u'_{i,j}(0)} \cdot E[\overline{W}^T_{i,t}|\overline{W}^T_{i,t} > 0] + \frac{H3}{u'_{i,j}(0)} \cdot E[(\overline{W}^T_{i,t})^2|\overline{W}^T_{i,t} > 0]\Big).
\end{aligned}
$$

Thus, when $E_s(\overline{W}^T_{i,t}) \ge 0$ and

$$
\frac{G1}{u'_{i,j}(0)} > 0, \frac{H1}{u'_{i,j}(0)} < 0, \frac{G2}{u'_{i,j}(0)} < 0, \frac{H2}{u'_{i,j}(0)} < 0, \frac{I}{u'_{i,j}(0)} < 0, \frac{G3}{u'_{i,j}(0)} < 0, \frac{H3}{u'_{i,j}(0)} < 0,
$$

we have $\lambda > 0$.

Similarly, when $E(\overline{W}^T_{i,t}) \ge 0$ and

$$
\frac{G1}{u'_{i,j}(0)} > 0, \frac{H1}{u'_{i,j}(0)} < 0, \frac{G2}{u'_{i,j}(0)} < 0, \frac{H2}{u'_{i,j}(0)} < 0, \frac{I}{u'_{i,j}(0)} < 0, \frac{G3}{u'_{i,j}(0)} < 0, \frac{H3}{u'_{i,j}(0)} < 0,
$$

we can obtain the result that the objective risk premium is positive. □

Appendix C: The Proof of Theorem 3.4

Proof. Using the result in Deng (2015), we obtain that

$$\begin{aligned}&\max_{v_{i,T-1}\in\mathbb{R}} U(\overline{W}^T_{i,T-1}(v_{i,T-1}), f_j)\\ =\ & (\frac{a\tau_{i,j}}{\sigma^2}-f_j)^\alpha W^\alpha_{i,T-1}A_{T-1}I_{W_{i,T-1}\geq 0} - (\frac{a\tau_{i,j}}{\sigma^2}-f_j)^\alpha(-W_{i,T-1})^\alpha B_{i,T-1}I_{W_{i,T-1}<0},\end{aligned} \tag{8.9}$$

and

$$v^*_{i,T-1} = \begin{cases} k^*_{i,T-1}(\frac{a\tau_{i,j}}{\sigma^2}-f_j)W_{i,T-1} & W_{i,T-1}\geq 0\\ \bar{k}^*_{i,T-1}(\frac{a\tau_{i,j}}{\sigma^2}-f_j)W_{i,T-1} & W_{i,T-1}<0\end{cases} \tag{8.10}$$

We also hope to prove the similar result to equation (8.9), when t=0,1,...,T-2. That is

$$\begin{aligned}&\max_{V_{i,t}} U(\overline{W}^T_{i,t}(V_{i,t}), f_j)\\ =\ & (\frac{a\tau_{i,j}}{\sigma^2}-f_j)^\alpha W^\alpha_{i,t}A_{i,t}I_{W_t\geq 0} - (\frac{a\tau_{i,j}}{\sigma^2}-f_j)^\alpha(-W_{i,t})^\alpha B_{i,t}I_{W_t<0},\end{aligned} \tag{8.11}$$

We use mathematical induction to prove this proposition. Equation (8.9) shows that equation (8.11) holds at the time T-1. We suppose the conclusion holds at the time $t+1$. Namely,

$$\begin{aligned}&\max_{V_{i,t+1}} U(\overline{W}^T_{i,t+1}, f_j)\\ =\ & (\frac{a\tau_{i,j}}{\sigma^2}-f_j)^\alpha W^\alpha_{i,t+1}A_{i,t+1}I_{W_{i,t+1}\geq 0} - (\frac{a\tau_{i,j}}{\sigma^2}-f_j)^\alpha(-W_{i,t+1})^\alpha B_{i,t+1}I_{W_{i,t+1}<0}.\end{aligned} \tag{8.12}$$

We use iterated conditioning to prove that

$$\begin{aligned}&\max_{V_{i,t}} U(\overline{W}^T_{i,t}, f_j)\\ =\ & \max_{v_{i,t}} E_t[\max_{V_{i,t+1}} U(\overline{W}^T_{i,t+1}, f_j)]\\ =\ & \max_{v_{i,t}} E[(\frac{a\tau_{i,j}}{\sigma^2}-f_j)^\alpha W^\alpha_{i,t+1}A_{i,t+1}I_{W_{t+1}\geq 0}\\ -\ & (\frac{a\tau_{i,j}}{\sigma^2}-f_j)^\alpha(-W_{i,t+1})^\alpha B_{i,t+1}I_{W_{t+1}<0}\Big|\mathcal{F}_t].\end{aligned} \tag{8.13}$$

Let

$$v_t = W_{i,t}k_{i,t}.$$

Since

$$W_{i,t+1} = (1+r_t)W_{i,t} + v_{i,t}y_t,$$

when $W_{i,t} \geq 0$, it is easy to show that

$$\begin{aligned}
&\max_{V_{i,t}} U(\overline{W}^T_{i,t}, f_j) \\
=\ & (\frac{a\tau_{i,j}}{\sigma^2} - f_j)^\alpha W^\alpha_{i,t} \max_{k_{i,t}\geq 0} E[(1 + r_t + k_{i,t}y_t)^\alpha A_{i,t+1} I_{1+r_t+k_{i,t}y_t \geq 0} \\
-\ & (-1 - r_t - k_{i,t}y_t)^\alpha B_{i,t+1} I_{1+r_t+k_{i,t}y_t<0} \Big| \mathcal{F}_t] \\
=\ & (\frac{a\tau_{i,j}}{\sigma^2} - f_j)^\alpha W^\alpha_{i,t} \max_{k_{i,t}\geq 0} G_{i,t}(k_{i,t}) \\
=\ & (\frac{a\tau_{i,j}}{\sigma^2} - f_j)^\alpha W^\alpha_{i,t} A_{i,t}.
\end{aligned} \tag{8.14}$$

Similarly, when $W_{i,t} < 0$, we get that

$$\begin{aligned}
&\max_{V_{i,t}} U(\overline{W}^T_{i,t}, f_j) \\
=\ & (\frac{a\tau_{i,j}}{\sigma^2} - f_j)^\alpha (-W_{i,t})^\alpha \max_{\bar{k}_{i,t}<0} E[(-1 - r_{T-2} - \bar{k}_{i,t}y_t)^\alpha A_{i,t+1} I_{1+r_t+\bar{k}_{i,t}y_t \leq 0} \\
-\ & (1 + r_t + \bar{k}_{i,t}y_t)^\alpha B_{i,t+1} I_{1+r_t+\bar{k}_{i,t}y_t>0} \Big| \mathcal{F}_t] \\
=\ & (\frac{a\tau_{i,j}}{\sigma^2} - f_j)^\alpha (-W_{i,t})^\alpha \max_{\bar{k}_{i,t}<0} L_{i,t}(\bar{k}_{i,t}) \\
=\ & (\frac{a\tau_{i,j}}{\sigma^2} - f_j)^\alpha (-W_{i,t})^\alpha (-B_{i,t}).
\end{aligned} \tag{8.15}$$

Therefore,

$$\begin{aligned}
&\max_{V_{i,t}} U(\overline{W}^T_{i,t}(V_{i,t}), f_j) \\
=\ & (\frac{a\tau_{i,j}}{\sigma^2} - f_j)^\alpha W^\alpha_{i,t} A_{i,t} I_{W_t \geq 0} - (\frac{a\tau_{i,j}}{\sigma^2} - f_j)^\alpha (-W_{i,t})^\alpha B_{i,t} I_{W_t<0},
\end{aligned} \tag{8.16}$$

From this key result, it is easy to get the conclusion of Theorem 3.4 □

Appendix D: The proof of Proposition 5.1

Proof. Equation (4.1) identifies

$$\frac{\sigma^2}{a}(f_A - f_B) \in [-\theta, \theta].$$

Otherwise only one manager makes zero profits. This manager could cut his fee and make some positive profits as well. This condition alone implies that when $\theta = 0$, the unique equilibrium features $f^*_A = f^*_B = 0$. So, we only need to discuss $\theta > 0$.

Let

$$x = 1 - \frac{\sigma^2}{a}(f_A - f_B).$$

Now, we first consider $f_A \geq f_B$. From Theorem 4.1, we can propose that

$$U_A(f_A, f_B) = f_A(\frac{a}{\sigma^2} - f_A) W_{i,t}(k^*_{i,t} I_{W_{i,t}\geq 0} + \bar{k}^*_{i,t} I_{W_{i,t}<0}) \frac{x - 1 + \theta}{2\theta}$$

and

$$U_B(f_A, f_B) = f_B W_{i,t}(k^*_{i,t} I_{W_{i,t}\geq 0} + \bar{k}^*_{i,t} I_{W_{i,t}<0})[\frac{1}{2}(\frac{a}{\sigma^2} - f_B) + \frac{1}{\theta}(1 + x - \frac{2\sigma^2}{a} f_B)\frac{a}{\sigma^2}(1-x)].$$

Set

$$\frac{\partial U_A}{\partial f_A} = 0$$

and

$$\frac{\partial U_B}{\partial f_B} = 0$$

We obtain

$$f_A = \frac{2x - 1 + 2\theta \pm \sqrt{(2x-1+2\theta)^2 - 4(x-1+\theta)}}{2\sigma^2/a}. \tag{8.17}$$

and

$$f_B = \frac{2\theta + 2 - x \pm \sqrt{(2\theta+2-x)^2 - 4(\theta + \frac{1}{2}(1-x^2))}}{2\sigma^2/a}. \tag{8.18}$$

Write

$$f_{A,1} = \frac{2x - 1 + 2\theta - \sqrt{(2x-1+2\theta)^2 - 4(x-1+\theta)}}{2\sigma^2/a},$$

$$f_{A,2} = \frac{2x - 1 + 2\theta + \sqrt{(2x-1+2\theta)^2 - 4(x-1+\theta)}}{2\sigma^2/a},$$

$$f_{B,1} = \frac{2\theta + 2 - x - \sqrt{(2\theta+2-x)^2 - 4(\theta + \frac{1}{2}(1-x^2))}}{2\sigma^2/a}$$

and

$$f_{B,2} = \frac{2\theta + 2 - x + \sqrt{(2\theta+2-x)^2 - 4(\theta + \frac{1}{2}(1-x^2))}}{2\sigma^2/a}.$$

Because

$$\frac{\partial^2 U_A}{\partial f_A^2}(f_{A,1}) < 0, \quad \frac{\partial^2 U_A}{\partial f_A^2}(f_{A,2}) > 0, \quad \frac{\partial^2 U_B}{\partial f_B^2}(f_{B,1}) < 0 \text{and} \frac{\partial^2 U_B}{\partial f_B^2}(f_{B,2}) > 0.$$

$f_{A,1}$ and $f_{B,1}$ are separately the value locally maximizing U_A and U_B.
Moreover,

$$U_A(f_{A,1}) \geq \max\{U_A(0), U_A(\frac{a}{\sigma^2})\}$$

and

$$U_B(f_{B,1}) \geq \max\{U_B(0), U_B(\frac{a}{\sigma^2})\}.$$

Therefore, $f_{A,1}$ and $f_{B,1}$ are respectively the value locally maximizing U_A and U_B. Furthermore,

$$U_A(f_{A,1}) \geq U_B(f_{B,1}),$$

so if the manager A is in dominant position in the financial market, he prefers to charge higher fee f_A than the fee f_B of the manager B, in order to gain the more total profit U_A than the total profit U_B of the manager B. This is the conclusion of Proposition 5.1. Through the useful soft, such as Matlab and Mathmatic, we can attain the approximately and explicitly optimal solutions of f_A and f_B as the equation (5.8) and the equation (5.4).

Symmetrically, when the manager B is in a dominant position and the manger A is in a subordinate position in the financial market, we attain the similar results.

□

Appendix E: The proof of Proposition 5.2

Proof. Given the definition of the rate of fees, we have

$$F_A = \frac{f_A}{W_i} \tag{8.19}$$

and

$$F_B = \frac{f_B}{W_i}. \tag{8.20}$$

Because $W_i = v_i\xi = k(\frac{a\tau_{i,j}}{\sigma^2} - f_j)\xi$, we easily obtain the following:

$$\begin{aligned}
F_A^* &= \frac{f_A^*}{v_i\xi} \\
&= \frac{f_A^*}{\hat{k}(\frac{a}{\sigma^2} - f_A^*)\xi} \\
&= \frac{f_A^* - \frac{a}{\sigma^2} + \frac{a}{\sigma^2}}{\hat{k}(\frac{a}{\sigma^2} - f_A^*)\xi} \\
&= -\frac{1}{\hat{k}\xi} + \frac{\frac{a}{\sigma^2}}{\hat{k}(\frac{a}{\sigma^2} - f_A^*)\xi} \\
&= -\frac{1}{\hat{k}\xi} + \frac{\frac{a}{\sigma^2}}{\hat{k}(\frac{a}{\sigma^2} - (C + D\frac{a}{\sigma^2}))\xi} \\
&= -\frac{1}{\hat{k}\xi} + \frac{1}{\hat{k}(1 - C\frac{\sigma^2}{a} - D)\xi}.
\end{aligned}$$

Therefore, we have

$$\frac{\partial F_A^*}{\partial \sigma^2} = \frac{1}{\hat{k}\xi}\frac{C}{a}(1 - \frac{C\sigma^2}{a} - D)^{-2} > 0. \tag{8.21}$$

F_A^* is thus an increasing function of σ^2.

Similarly, we have

$$F_B^* = -\frac{1}{\hat{k}\xi} + \frac{1}{\hat{k}(1 - E\frac{\sigma^2}{a} - F)\xi}$$

and

$$\frac{\partial F_B^*}{\partial \sigma^2} = \frac{1}{\hat{k}\xi}\frac{E}{a}(1 - \frac{E\sigma^2}{a} - F)^{-2} > 0. \tag{8.22}$$

Therefore, F_B^* is also an increasing function of σ^2. □

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Conditions Monétaires Et Croissance Économique En Zone Cemac

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Abstract- The objective of this study is to track the monetary policy stance in CEMAC zone with GDP as target variable using a real size. The construction of reel monetary condition index use heterogeneous macropanels VAR approach with individual specification proposed par Fabio and al (2013). The inter-individual cointégration test confirm the long term relationship between GDP, real short run interest rate, real effective exchange rate and credit to economy making possible the combination of those instruments to forecast growth. But the result of intraindividual cointegration remains lukewarm compromising the possibility to combine the instruments above-mentioned in a single synthetic indicator for each country in CEMAC zone. The estimation of model parameters has been done through pooled mean group in Blackburn and Fran (2007) way. The construction of real ICM uses Canada Bank approach. One finds that real ICM is determined mainly by real effective exchange rate, then credit to economy and lastly the real short run interest rate. The construction of ICM must be included among the large range of indicators used by central bank to forecast growth in CEMAC zone.

Keywords: monetary policy, reel monetary condition index, heterogeneous macropanels, cointegration.

GJMBR-C Classification: JEL Code: E42

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Conditions Monétaires Et Croissance Économique En Zone Cemac

Waofo Deffo Alain Leberre

Resume- L'objectif de cette étude est de retracer la trajectoire empruntée par la politique monétaires en zone CEMAC avec pour variable de référence le PIB sur la période 1990-2017, au moyen des grandeurs réelles. La construction de l'indice des conditions monétaires (ICM) réel est adossée à un modèle macro économétrique de type VAR en macropanels hétérogène à spécification individuelle inspiré des travaux de Fabio et al (2013). Le test de cointégration interindividuelle valide la relation d'équilibre de long terme entre le PIB, le taux d'intérêt réel de court terme, le taux de change effectif réel et le crédit à l'économie pour les pays de la zone CEMAC rendant ainsi possible la combinaison de ces instruments pour prévoir la croissance. Mais, les résultats de la cointégration intra individuelle restent mitigés compromettant la possibilité de combiner les instruments sus évoqués en un seul indicateur synthétique pour chaque pays de la CEMAC. L'estimation des paramètres du modèle s'est faite par le pooled mean group à la manière de Blackburn et Franc (2007). La construction de l'ICM réel utilise l'approche de la banque du Canada. On obtient que les conditions monétaires réelles en zone CEMAC sont déterminées en grande partie par le change effectif réel, puis le crédit à l'économie et en fin le taux d'intérêt réel de court terme. Il est possible de prévoir la croissance à partir d'un indice conditions monétaires réelles.

Motsclés: politique monétaire, indice des conditions monétaires réelles, macropanels hétérogènes, cointegration.

Abstract- The objective of this study is to track the monetary policy stance in CEMAC zone with GDP as target variable using a real size. The construction of reel monetary condition index use heterogeneous macropanels VAR approach with individual specification proposed par Fabio and al (2013). The inter-individual cointégration test confirm the long term relationship between GDP, real short run interest rate, real effective exchange rate and credit to economy making possible the combination of those instruments to forecast growth. But the result of intraindividual cointegration remains lukewarm compromising the possibility to combine the instruments above-mentioned in a single synthetic indicator for each country in CEMAC zone. The estimation of model parameters has been done through pooled mean group in Blackburn and Fran (2007) way. The construction of real ICM uses Canada Bank approach. One finds that real ICM is determined mainly by real effective exchange rate, then credit to economy and lastly the real short run interest rate. The construction of ICM must be included among the large range of indicators used by central bank to forecast growth in CEMAC zone.

Keywords: monetary policy, reel monetary condition index, heterogeneous macropanels, cointegration.

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I. Introduction

La Zone CEMAC a été en proie à la menace d'une crise de liquidité des banques de second rang qui à faillit de peu être à l'origine d'une crise systémique du fait d'une contraction des dépôts bancaires et d'un alourdissement de la dette intérieure des ETATS membres qui ont vu leur recette d'exportation chuter. Les prévisions de croissance ont plaidé en faveur d'une récession économique dans un contexte d'insécurité et de chute des cours des produits de base notamment le prix du baril du pétrole dont la contribution au PIB varie entre 25% et 85% selon les pays. Face à une telle situation, la Banque des États de l'Afrique Centrale a mené une stratégie de baisse anticipée du taux directeur et des réserves obligatoires pour prévenir un ralentissement de l'activité économique du à une crise de liquidité. Ceci renouvelle le débat sur la neutralité monétaire qui a laissé place aujourd'hui à la sensibilité permanente ou transitoire de la sphère réelle aux impulsions monétaires.

Cette démarche proactive oblige la Banque des États de l'Afrique Centrale à devoir maitriser le rythme et l'incidence de ses actions sur l'activité économique; ce qui passe inéluctablement par une meilleure compréhension des mécanismes par lesquels les conditions monétaires[1] affectent l'activité économique. Notre contribution est de modéliser les canaux pertinents par lesquels les conditions monétaires ont affecté l'activité économique notamment la croissance du PIB réel afin de mieux orienter les efforts de la Banque des États de l'Afrique Centrale en matières de stratégie de politique monétaire, en mettant à leur disposition la hiérarchie des variables pertinentes par lesquelles les chocs sur les conditions monétaires se transmettent à la croissance du PIB. Nous utilisons un VAR bidimensionnel en macropanels hétérogène inspiré des travaux de Fabio et al (2013) avec les séries observées en grandeur réelle sur la période 1990 et 2017. Ce modèle est construit à partir des relations de long terme de la théorie économique et part du paradigme de l'école de la synthèse avec pour cadre analytique le schéma IS-LM. Nous présentons le cadre macroéconomique d'exercice de la politique monétaire de la BEAC, puis les investigations et la stratégie

[1] Ensemble des variables monétaires susceptibles d'influencer la demande globale et donc le niveau de l'activité économique.

empirique avant de chuter par les principaux résultats et recommandations.

II. Cadre Macroeconomique D'exercice de la Politique Monetaire en Zone Cemac

Dans le cas de la CEMAC, la politique monétaire est définie par la Banque des Etats de l'Afrique Centrale (BEAC). Son évolution peut être subdivisée en deux phases : la période précédant 1990, d'une part, la période post 1990, d'autre part.

Avant octobre 1990, les statuts de la BEAC ne définissent pas un objectif clair de la politique monétaire. Cependant, cette dernière vise globalement à mettre la monnaie et le crédit au service des Etats dans le but d'atteindre leur développement économique. Les instruments principalement utilisés par la BEAC sont alors les taux d'intérêt, les plafonds globaux de réescompte, les réserves obligatoires et le contrôle du crédit. Sur le plan théorique, la politique monétaire de la BEAC au cours de cette période est fondée sur les postulats de la répression financière à laquelle sont associés les noms de Mckinnon et Shaw. En effet, elle est caractérisée par la faiblesse des taux d'intérêt et l'allocation sectorielle du crédit. Selon Bekolo-Ebe (2001), elle vise le développement d'une économie de rente.

La politique monétaire de la BEAC a régulièrement soutenu l'activité économique jusqu'à l'effondrement des cours des produits de base en 1985-1986. La zone enregistre alors une détérioration considérable de sa situation monétaire et l'ampleur de la crise est telle que la stratégie monétaire de la BEAC s'avère inopérante, obligeant les pays membres à initier des réformes.

En effet, dès 1991, la BEAC a entrepris des réformes consistant à abandonner les mécanismes rigides au profit d'une politique plus souple caractérisée par l'institution de la Programmation Monétaire avec pour objectifs la stabilité monétaire, le renforcement du dispositif de surveillance bancaire marquée par la création de la Commission Bancaire de l'Afrique Centrale (COBAC) et la promotion d'un système financier intégré concrétisée par la création du Marché Monétaire en juillet 1994. Dès lors, le nouveau dispositif de régulation monétaire consacre l'abandon des instruments de contrôle direct et sélectif du crédit (taux privilégiés, plafonds de refinancement...). D'un point de vue théorique, la nouvelle politique monétaire de la banque centrale semble inspirée par deux postulats de la théorie monétariste : la stabilité des prix, en vue de garantir une évolution durable de l'économie le long de son sentier de croissance, d'une part ; la définition de l'inflation comme un phénomène exclusivement monétaire, d'autre part.

L'identification de l'ensemble des canaux pertinents de transmission de la politique monétaire au sein des pays de la CEMAC constitue un enjeu de politique économique dans la mesure où elle permet d'apprécier l'efficacité de cet instrument. Par ailleurs, cette question revêt un intérêt particulier compte tenu des réformes mises en œuvre par la Banque des États de l'Afrique Centrale à partir de 1991.

III. Investigations Empiriques

Durant les années 1990, les travaux empiriques ont relevé l'insuffisance du taux d'intérêt comme instrument ou indicateur de politique monétaire en économie ouverte. En effet, en raison de l'effet de l'inflation importée et de l'effet de la compétitivité, une variation donnée du taux de change peut avoir, qualitativement, le même effet sur l'activité et l'inflation qu'une variation (généralement plus faible) du taux d'intérêt. Ainsi, l'appréhension scrupuleuse de l'orientation courante de la politique monétaire ou, plus généralement, l'évaluation des conditions monétaires exigerait la prise en compte conjointe de l'évolution du taux d'intérêt et du taux de change. C'est la logique qui sous-tend la définition des Indicateurs de conjoncture à l'instar de l'indice des Conditions Monétaires (ICM), construits comme une combinaison pondérée de ces deux taux.

Le modèle trimestriel de la Banque de Suède, estime la déviation du PIB réel par rapport à son niveau potentiel en fonction des taux d'intérêt réels et de change retardés d'une période, du taux d'inflation et de deux retards sur la variable endogène. Le PIB potentiel est estimé en considérant son niveau tendanciel (Eika et al, 1996).

Verdelhan (1998) a construit un indice des conditions monétaires (ICM) qui synthétise les effets conjugués du taux de change et du taux d'intérêt sur la croissance dans la zone euro. La détermination économétrique par la méthode des Moindres Carrées Ordinaires des coefficients du taux d'intérêt réel et du taux de change effectif réel a été obtenue par estimation d'une équation de demande agrégée sur les données trimestrielles. Il trouve que la variation de la croissance est expliquée par les variations du taux d'intérêt et du taux de change. Le taux interbancaire réel à 3 mois a été retenu. Le ratio ICM a été évalué à 10:1.

Aubert (2003) propose un ICM qui synthétise deux variables : le taux d'intérêt réel et le taux de change réel en France. Il retient comme taux d'intérêt réel, la moyenne pondérée des taux à trois mois et à dix ans. A partir d'une simulation à l'aide du modèle macro économétrique de la Direction de la Prévision, il obtient pour des horizons allant de deux à cinq ans, un poids relatif du taux d'intérêt par rapport au taux de change compris entre 2:1 et 3:1.

Boumahdi (2002) a évalué les conditions monétaires au Maroc à l'aide d'un ICM. Le taux d'intérêt choisi est le taux des bons du Trésor à 6 mois déflaté par la variation de l'indice du coût de la vie. Il détermine le ratio d'ICM à partir d'une fonction de demande avec comme variable expliquée, la croissance annuelle du PIB en volume et comme variables explicatives, la variation annuelle du taux de change effectif réel et celle du taux d'intérêt réel. L'estimation faite par les moindres carrées ordinaires (MCO) a donné un ratio ICM pour le Maroc de 2,1:1.

Knedlik (2005) a estimé un indice des conditions monétaires pour l'Afrique du Sud afin d'éclairer les décideurs en matière de stratégie de politique monétaires. L'équation retenue pour estimer les poids relatifs du taux d'intérêt et du taux de change a utilisé comme variable explicative, l'output gap trimestriel. Le taux d'intérêt à 6 mois sur le marché monétaire a été retenu et le ratio d'ICM s'est établi à 1.9:1, largement inférieur au ratio obtenu par Wet à partir d'une équation de prix. Il conclue qu'en dépit du fait que l'estimation des paramètres satisfasse a priori les anticipations, l'indice des conditions monétaire fourni des résultats variables sur la même période d'étude. Il recommande cet indice comme devant faire partie des instruments d'analyse des autorités monétaires dans le processus de formulation de la politique monétaire en Afrique du Sud.

Wai-Chin Poon (2010) construit un indice des conditions monétaires augmenté sur le premier trimestre 1982 et le quatrième trimestre 2004 pour les Philippines en utilisant le test d'élan sur un modèle UECM. Les résultats mettent en évidence la cointégration entre le PIB réel et le taux d'intérêt de court terme, le taux de change et le crédit au secteur privé. Cependant le canal du prix des actifs est insignifiant pour la transmission monétaire. Les conditions monétaires durant la période d'étude reflètent la réaction de la Bangko Sentral ng Pilipinas's à la situation économique dominante ce qui signifie que l'indice des conditions monétaires augmenté permet de suivre le mouvement inverse de la croissance du PIB réel de façon raisonnable après 1990.

S. E. Khadhraouiy et I. Ghattassiz (2012) construisent un indicateur synthétique des conditions monétaires (ICM) en Tunisie à partir du taux de change et du taux d'intérêt réels. Les résultats obtenus mettent en évidence l'importance du taux de change réel dans l'orientation de la politique monétaire et son impact sur l'activité économique, le TMM ayant joué un rôle de moindre importance particulièrement avant 2006. Cependant, pour la période post révolution, le taux d'intérêt réel semble être plus pertinent dans son influence sur l'environnement économique, au détriment du taux de change réel.

M. Abubabkar et B. N. Yaaba (2013) analyse l'après reforme du marché financier au Nigeria en construisant un indice des conditions monétaires qui synthétise les effets conjugué du taux d'intérêt, du taux de change et du taux de croissance du crédit. Ils utilisent les données en séries temporelles dans un modèle à correction d'erreur. Selon les résultats obtenus, le taux d'intérêt a un poids plus élevé dans le PIB au Nigeria suivi par le taux de change et le crédit au secteur privé. Aussi, les conditions monétaires se sont resserrée entre le premier trimestre 1989 et le premier trimestre 1994 et le troisième trimestre 1993 a connu un régime monétaire particulièrement restrictif. Entre le troisième trimestre 2003 et le deuxième trimestre 2009, les conditions monétaires se sont assouplies au Nigeria du fait 'une augmentation du crédit domestique à l'économie. Mais avant, Olekah et Masha (2003) avaient déjà estimé un ratio ICM à 0.2:1 pour le Nigeria. Un ratio du même ordre a été évalué à 0.3:1 pour la Pologne (korhonen, 2002).

Dans le même ordre d'idée, *Yaaba (2013)* construit un indice des conditions monétaires aussi étendu pour le Nigeria sur la période allant du premier trimestre 2004 au second trimestre 2012. Cet indice inclue en sus du taux d'intérêt et du taux de change, le crédit et est construit suivant la même méthodologie que Abubabkar et Yaaba (2013). Mais les résultats obtenus diffèrent de ceux des M. Abubabkar et B. N. Yaaba (2013). En effet le taux de change s'avère être le canal dominant de la transmission monétaire suivi par le canal du crédit et en fin le canal du taux d'intérêt. Il conclue que l'indice des conditions monétaires est un indicateur d'information permettant de guider de façon adéquate la conduite de la politique monétaire au Nigeria.

Graeme (1998) examine la relation entre le taux de change et la structure du taux d'intérêt domestique lorsque la banque centrale choisie pour cible l'indice des conditions monétaires dans le contexte de la Nouvel Zélande. Il utilise un modèle d'évaluation du taux d'intérêt et du taux de change en situation des exigences aléatoire de la banque central lorsqu'elle utilise l'opération de « open market » pour garder l'indice des conditions monétaire dans une bande de flottement. Le modèle est applicable au Canada et en Nouvel Zelande où les banques centrales conduisent la politique monétaire dans le but d'atteindre le niveau désiré de l'indice des conditions monétaires. Le modèle est calibré pour la Nouvel Zelande et une investigation est faite sur les conséquences du mouvement du taux de change sur la courbe des rendements domestiques qui à son tour influence les prix des actifs. Le modèle démontre aussi la possibilité de gérer les risques associés au taux d'intérêt et au taux de change. Il trouve comme résultat que les variations du taux de change et celles du taux d'intérêt sont corrélées et cette corrélation est une fonction décroissante de la maturité. Par ailleurs la volatilité du taux d'intérêt est une fonction décroissante de la maturité.

L'étude de *Diarisso & Samba (1999)* sur la confection d'un ICM pour l'UEMOA a opté pour le calcul d'un ICM nominal, en s'inspirant de l'exemple de la Nouvelle Zélande de la Banque du Canada. Le modèle économétrique pour la détermination du ratio d'ICM a lié les variations annuelles du PIB à celles du taux d'intérêt du marché monétaire, du taux de change effectif réel et du taux d'inflation (mesuré par le déflateur du PIB). L'approche d'estimation retenue est celle de la cointégration et des modèles à correction d'erreur. Elle se démarque ainsi de celles utilisées par les banques centrales précitées, pour tenir compte des critiques faites, notamment par Eika et al. (1996) et Ericsson et al. (1998), relatives à l'inadéquation des méthodes traditionnelles d'estimation en présence de variables non stationnaires. Il trouve que l'impact relatif du taux de change par rapport au taux d'intérêt s'est situé à 14%, un taux proche de celui trouvé par Verdelhan (1998) pour l'Union européenne (11%). Par ailleurs, l'indice des conditions monétaires a connu des périodes d'assouplissement et d'affermissement qui ont correspondu, respectivement, à des phases de croissance et de récession économique.

Dembo (2012) a procédé à un réexamen du calcul de l'indice des conditions monétaires dans la zone UEMOA compte tenu des évolutions conceptuelles théorique et de l'évolution du marché monétaire de la zone. Il a opté pour le calcul d'un indice des conditions monétaire réel qui combine les évolutions du taux de change effectif réel et taux d'intérêt réel ; le taux d'intérêt interbancaire a été retenu comme le taux d'intérêt à court terme. Il obtient un ratio ICM à 1,125 qui est le poids relatif du taux d'intérêt par rapport au taux de change effectif. Ce ratio qui est inversement proportionnel au degré d'ouverture de l'économie est du même ordre de grandeur que celui obtenu dans les autres pays en développement et plus ouvert (entre 0.2 et 2) et inferieur à celui obtenu dans les pays développés et moins ouvert (entre 3 et 10).

Guichard (2000) analyse les différents canaux d'action de la politique monétaire et leur efficacité dans le contexte particulier du Japon à la fin des années quatre-vingt et au début des années 2000. Le point de vue défendu est que la politique monétaire, quelles que soient les actions mises en œuvre, ne peut plus grand chose pour la croissance japonaise. En effet, l'un des principaux canaux de transmission des stimulations monétaires à l'activité, le crédit bancaire, est toujours enrayé au début des années 2000. Les conséquences de près de dix ans de crise bancaire se font encore sentir très fortement. S'appuyant sur une analyse en panel, elle montre en particulier que les difficultés des banques les conduisent à rationner le crédit. La prise en compte du comportement des banques en matière d'offre de crédit apparaît alors nécessaire pour évaluer l'évolution des conditions monétaires japonaises. L'étude rappelle d'abord l'évolution des taux d'intérêt réels et du taux de change durant la crise japonaise et en particulier de 1998 à 2000. Elle détaille également les actions suggérées à la banque centrale pour enrayer leur hausse. Puis elle montre que la crise bancaire reste, *via* des mécanismes de *capital crunch,* l'explication première de l'inefficacité de la politique monétaire observée sur cette période. Elle propose en outre un nouvel indice des conditions de financement de l'économie prenant en compte explicitement le comportement des banques. Il s'agit exactement d'un indice des conditions bancaires et monétaire qui incorpore le rationnement du crédit représentant un canal pertinent de transmission monétaire.

P. Frochen (1996) construit des indicateurs pour cinq pays d'Europe, sur la période 1987-1995, avec des séries de taux de change effectif et de taux d'intérêt à court et à long terme exprimées en termes nominaux. Ces indicateurs font apparaître que la politique monétaire aurait eu une action stabilisatrice sur le niveau des prix comparable en France et en Allemagne, depuis 1990. Ces effets auraient cependant été relativement modérés en comparaison aux conséquences opposées du flottement monétaire sur l'économie du Royaume-Uni, de l'Italie et de l'Espagne, à partir de 1992. Il constate la même dissymétrie entre pays à monnaie forte et pays à monnaie faible lorsqu'il considère les effets de la politique monétaire sur la croissance réelle, lesquels sont cependant transitoires. Il propose des calculs en termes réels, mais faute d'avoir pu utiliser des pondérations adéquates, ils n'ont pour lui qu'une valeur indicative. Ils conduisent à des conclusions sensiblement différentes.

W. Peng et F. Leung (2005) présentent l'indice des conditions monétaires comme un instrument d'évaluation des conditions monétaires et financières d'une part et d'autre part comme ayant un impact significatif sur la stabilité monétaire et financière à Hong Kong et dans toute l'Asie. En raison du fait que le crédit bancaire soit un canal important de transmission monétaire, ils construisent un indice des conditions monétaires conventionnel permettant de capter les effets de la disponibilité du crédit bancaire. L'indice des conditions monétaires construit permet de mettre en relief les conditions monétaires favorables entre 2002 et 2003 reflétant la dépréciation du dollar, une politique de crédit accommodante ainsi qu'une faible déflation qui à réduit le taux d'intérêt réel qui ont contribué à booster la croissance économique. Cependant, les mesures macroéconomiques de restriction de l'offre de crédit et d'augmentation du taux d'intérêt en 2004 ont débouché sur un resserrement des conditions monétaires.

Brisne J. V. et al (2005) utilisent la théorie de la prévision conditionnelle pour construire un nouvel indice des conditions monétaires pour le Brésil qu'ils comparent à ceux construits à partir de la méthodologie suggérée par Bernanke et *Mihov (1998); Battini et Turnbull (2002).* Ils utilisent l'approche de *Sims and Zha*

(1999) et *Waggoner and* Zha (1999) pour construire et calculer un indice des conditions monétaires prenant en considération l'erreur Bayesienne. Ils appellent cet indicateur « indice des conditions monétaires conditionnelles (CMCI) » en utilisant alternativement le model autorégressif et le modèle prévisionnel. Le CMCI est la prévision de l'output gap conditionnée par la valeur observée du taux d'intérêt nominal et du taux de change réel. Ils montrent que l'indice des conditions monétaires conditionnelles (CMCI) mesure mieux la position de la politique monétaire du fait qu'il prend en considération l'endogéneité des variables analysées par rapport à l'indice des conditions monétaires développé par Battini et Turnbull (2002). Mais le CMCI présente des similarités avec l'indice des conditions monétaires construit par Bernanke et Mihov (BMCI), en dépit des différences conceptuelles, dans la chronologie de la position de la politique monétaire au Brésil. Le CMCI est donc la version lissée du BMCI du fait que l'impact du change sur la valeur observée du taux d'intérêt nominal a été compensé par une variation du taux de change réel au Brésil. Selon ces deux indicateurs, entre 2000 et 2005, la politique monétaire a été expansionniste à la veille des élections au Brésil.

Pei-Tha Gan et al (2008) cherchent à estimer le model optimal de la politique monétaire en fondant leur analyse sur le concept de l'indice des conditions monétaires pour relever le rôle important de la parité du taux d'intérêt en Malaisie. Ils estiment l'influence du taux d'intérêt et du taux de change sur l'output gap et leur poids qui en découle leur permet d'estimer l'indice des conditions monétaires optimal. Les résultats empiriques donnent un indice des conditions monétaires de 1.6 :1 pouvant être utilisé comme cible opérationnelle de la politique monétaire.

Bayangos. V (2000) construit un indice réel des conditions monétaires qui fournit une meilleure compréhension des canaux de transmission monétaires et un cadre d'implémentation de la politique monétaire aux Philippines. Son objectif est de capter l'impact des chocs de change et de taux d'intérêt sur la structure de l'économie afin d'évaluer la position de la politique monétaire. L'indice des conditions monétaires obtenu constitue une mesure digeste des conditions monétaires domestiques dans une économie de plus en plus libéralisée. L'estimation des poids des différentes composantes est adossée à une équation économétrique construit dans le cadre standard d'un modèle macroéconomique keynésienne en économie ouverte et utilise les séries temporelles. Il trouve un ratio ICM égale à 1 :1/9 soit 0.11 pour les Philippines. Ce résultat contredit la plupart des résultats qui trouvent le taux d'intérêt comme ayant une plus forte contribution aux activités économiques que le taux de change. Le taux de change réel dans le contexte des philippines devient un canal pertinent de transmission monétaire du fait du rôle qu'il joue en matière d'attraction des investissement direct à l'étranger dans un contexte de libéralisation progressive.

M. Petrovska et L. Georgievska (2014) construisent un indice alternatif de la position de la politique monétaire en Macédoine, en combinant différents instruments de la politique monétaire. Ils utilisent l'approche introduite par Bernanke et Mihov (1995, 1998) pour isoler les chocs de politique monétaire parmi tous les autres chocs de l'ensemble de la politique économique afin de voir leur impact sur la croissance réelle. Les estimations des paramètres se font au moyen d'un modèle SVAR sur les données mensuelles, dont le résidu qui capte la fonction de réaction de la banque centrale représente la vraie innovation en matière de politique monétaire. Bien plus ils mesurent le degré d'interdépendance entre les différent instruments de la politique monétaire contenu dans le résidu en développant un modèle structurel qui permet d'isoler la position non anticipée de la politique monétaire. Ils font le constat que la politique monétaire a été accommodante avant la crise en Macédoine; ce qui s'est traduit par une forte mobilisation de ses instruments, mais l'après crise a connu un durcissement de la politique monétaire. Ils concluent que l'indice des conditions monétaires obtenu est utile à la conduite de la politique monétaire et constitue un cadre analytique des impulsions monétaires sur l'économie. Ils pensent que la politique monétaire a joué un rôle stabilisateur pendant la période de surchauffe conjoncturel en Macédoine.

Battini et Thurmbull (2000) partent du constat selon lequel un indice des conditions monétaires n'avait pas encore été construit par la banque d'Angleterre, pour construire un indice alternatif des conditions monétaires pour ce pays. Pour ce faire, il commence d'abord par recenser les différents indices proposés par les organisations internationales pour effectuer une comparaison en termes de niveau de performance. Ils proposent donc un indice dont les poids des composantes sont estimés et simulés grâce à un modèle macro économétrique de petite échelle sur le quatrième trimestre 1984 et le troisième trimestre 1999. Son estimation apporte des innovations par rapport aux indices des conditions monétaires déjà construits et fournit des informations pertinentes sur le caractère restrictif ou expansionniste de la politique monétaire sur la période d'étude.

Benazic (2012) construit un indice des conditions monétaires pour la Croatie qui combine les effets du taux d'intérêt de court terme et le taux de change sur le niveau général des prix et la demande agrégée. Il estime les poids des différentes composantes de l'indice par la méthode de cointégration d'Engel-Granger. Les résultats obtenus suggèrent que la politique monétaire sur la période d'étude a été principalement expansionniste du fait des conditions monétaires accommodantes. Cependant

l'auteur pense que si la politique monétaire doit être basée sur l'indice des conditions monétaires, le nombre de ses instruments seront limités. Pour lui, les contraintes les plus importantes qui réduisent la possibilité de déterminer librement le taux d'intérêt domestique en Croatie sont la relative libre circulation internationale des capitaux entre la Croatie et les autre pays d'Europe et la nécessité de maintenir, de stabiliser le taux de change nominal dans un environnement économique hautement incertain.

Dans le cadre de la CEMAC aucun n'indice des conditions monétaires n'a été construit à notre connaissance. Il semble nous semble intéressant d'évaluer la pertinence d'un tel indicateur de conjoncture dans un régime de change fixe comme celui de la CEMAC.

IV. Strategies Empiriques

a) Modèle et source des données

i. Modèle théorique

Le modèle théorique est conçu dans le paradigme de l'école de la synthèse et consiste à estimer une courbe de la demande agrégée à partir du schéma IS-LM. Ce schéma est d'ailleurs une interprétation de la théorie keynésienne par Hicks (1937) puis par Hansen. On a donc la relation suivante :

$$\Delta y_{it} = h_0 + h_1 \Delta i_{it} + h_2 \Delta e_{it} + h_3 \Delta crd_{it} + \psi_{it} \quad h_1; h_2 \prec 0; h_3 \succ 0 \qquad (1)$$

Où y_{it} est le PIB réel du pays i à la date t calculé en faisant le ratio entre le PIB nominal au prix courant et l'indice des prix à la consommation ;

i_{it} est le taux d'intérêt réel de court terme du pays i à la date t ;

e_{it} est le taux d'intérêt effectif réel du pays i à la date t ;

crd_{it} est le crédit octroyé par le secteur financier du pays i à la date t.

ψ_{it} capte les autres facteurs qui influencent la demande globale du pays i à la date t.

Toutes les variables sont exprimées sous forme logarithmique en l'exception du taux d'intérêt effectif réel. En sus toutes ces variables sont des grandeurs réelles.

$h_0; h_1; h_2; h_3$ sont des paramètres devant autoriser le calcul du poids de l'indices des conditions monétaires (ICM).

Les tailles de $h_1; h_2$ et h_3 reflètent les effets relatifs du taux d'intérêt réel de court terme, du taux de change effectif réel et du crédit sur la demande globale. Ces paramètres sont utilisés pour construire un indice des conditions monétaires dans la zone CEMAC de la manière suivantes:

$$ICM_t = \alpha(i_t - i_0) + \beta(e_t - e_{\grave{a}}) + \delta(crd_t - crd_{\grave{a}}) + 100 \ , \alpha + \beta + \delta = 1 \qquad (2)$$

T est l'indice temporel et 0 la période de base, $\alpha = \frac{h_1}{h_1 + h_2 + h_3}$; $\beta = \frac{h_2}{h_1 + h_2 + h_3}$; $\delta = \frac{h_3}{h_1 + h_2 + h_3}$

Le taux d'intérêt réel de court terme apparait dans l'indice en point de pourcentage tandis que le taux de change effectif réel apparait dans l'indice avec pour valeur 100 pour l'année de base. L'ICM est calculé avec des données annuelles sur la période 1990 jusqu'à 2017. La détermination de l'année de base doit tenir compte d'un minimum de neutralité. Une augmentation de L'ICM traduit un durcissement des conditions monétaires et dont une politique monétaire restrictive, tandis que une baisse de l'ICM signifie un assouplissement des conditions monétaires c'est-à-dire une politique monétaire accommodante. L'augmentation de l'ICM peut être due à une augmentation du taux d'intérêt domestique réel de court terme qui induit un accroissement des flux de capitaux entrants et par conséquent une appréciation du taux de changes effectif réel domestique. L'appréciation du taux de change effectif réel altère la compétitivité et crée un déficit dans les comptes courants qui, à son tour, réduit l'entrée des devises et dont la liquidité bancaire sapant ainsi la capacité d'offre de crédit des établissements bancaires. Toute chose qui exerce un effet dépressif sur la demande globale et vice versa.

ii. Modèle empirique

L'analyse des messages des évaluations empiriques emprunte un modèle VAR bidimensionnel en macropanels hétérogène à spécification individuelle, empiré des travaux de Fabio et al (2013) qui se présente de la manière suivante :

$$Z_{it} = A_{0i}(t) + A_i(l) Z_{it-1} + \Psi_{it} \qquad (3)$$

Z_{it} est la matrice des variables dépendantes du pays i à la date t.

Z_{it-1} est la matrice des variables explicatives classées des plus endogènes au moins endogènes. On fait

l'hypothèse que la contribution de Z_{it-j} à Z_{it} diminue au fur et à mesure que j augmente.

$A_{0i}(t)$ et $A_i(l)$ sont les matrices des paramètres devant être estimés qui dépendent des pays de la CEMAC.

Ψ_{it} est la matrice des résidus stochastiques et est constitué de G×1 vecteurs des perturbations aléatoires.

Ce modèle pose globalement l'hypothèse d'endogéneité de toutes les variables et d'interdépendance admettant ainsi que les chocs de forme réduite sont corrélés entre tous les pays par effet de spill over. On fait également l'hypothèse que les coefficients du VAR et la variance des chocs n'intègrent pas la dynamique temporelle c'est-à-dire qu'ils sont constants. En fait, en construisant un VAR en panel avec spécification individuelle, on fixe la dimension temporelle. Étant donné que cette dimension temporelle (28 ans) est largement supérieure à la dimension individuelle (6 pays), on peut suspecter une hétérogénéité dynamique entre les variables et deux principaux estimateurs sont présentés par la littérature comme étant les mieux adaptés : l'estimateur pooled et l'estimateur mean group (MG). L'estimateur mean group consiste à estimer le modèle VAR de chaque pays de façon séparée et de faire la moyenne des résultats obtenu à travers les pays. Cet estimateur est plus efficace sous l'hypothèse de l'hétérogénéité dynamique dans la mesure où il fourni des estimations pertinentes des effets moyens des chocs. L'estimateur pooled est efficace sous l'hypothèse de l'homogénéité dynamique. Cet estimateur est moins efficace sous l'hypothèse d'hétérogénéité dynamique du faite de la corrélation des régresseurs avec les termes d'erreur. En considérant la dimension temporelle et individuelle de l'échantillon, on retient le MG et PMG puis qu'on ne peut pas savoir à priori l'estimateur le plus efficace entre les deux. Le test d'Hausman permet d'opérer le choix du meilleur estimateur (Blackburn et Franc, 2007).

b) Techniques d'estimation

Nous appliquons à ce modèle les techniques d'estimation des macropanels hétérogènes (Markus, 2011) à la manière de Fabio et al (2013). Ceci étant, il convient de choisir de prime à bord le nombre optimal de retard. Ce choix s'opère à partir d'un ensemble de critères d'information tels que : le critère d'erreur finale de prévision (FPE) ; le critère d'information de Akaike (AIC); le critère d'information de Schwarz (SC) et le critère d'information d'Hannan-Quinn (HQ). Chaque critère d'information sélectionne le retard optimal pour chaque variable explicative.

L'hypothèse implicite qui est faite pour l'estimation des modèles est celle selon laquelle les coefficients des variables sont homogènes pour tous les individus du panel. Un test qui permet de vérifier cette hypothèse est le "poolability-test" basé sur les statistiques de Fisher, qui permet de déceler si pour une régression donnée, les individus du panel ont des paramètres similaires pour chaque variable (hypothèse nulle du test).

La nécessité d'analyser le mode de transmission des chocs entre les différents pays Africains membre de la zone CEMAC au moyen des données annuelles nous amène à analyser les interdépendances entre les individus qui peuvent être statiques ou dynamiques. Il s'agit d'analyser la moyenne des coefficients de corrélation entre les variables ou les résidus et la part de la variation expliquée par les deux premières composantes. Plusieurs tests permettent d'identifier la dépendance transversale entre les individus du panel. Les plus connus sont : le test de Pesaran (2004); le test Moscone et Tosetti (2009) et le test de Jensen & Schmitt (2011).

Pour les macropanels, on peut présumer la non stationnarité des variables à niveau qu'il convient de vérifier (Markus ; 2011). Ceci dit, la littérature présente trois générations de test de racine unitaire. Les tests de premières générations [Levin et Lin (1992), Pesaran et Shin (1997), Maddala et Wu (1999), Breitung (2000), Hadri (2000), Harris et Tzavalis (1999)], qui posent l'hypothèse d'indépendance individuelle. Les tests de seconde génération [Pesaran (2007), Pesaran ; Smith et Yamagata (2009)] qui posent l'hypothèse d'interdépendance individuelle et les tests de troisième génération qui considèrent la possibilité de rupture structurelle en panel à l'instar de celui de Im, Lee et Tieslau (2002).

Le test de cointégration sur modèle VAR en données de panel exige quelques précisions conceptuelles. L'hypothèse nulle est-elle la cointégration ou la non cointégration ? Utilise t-on la méthode paramétrique ou non paramétrique pour l'ajustement de la corrélation sérielle des résidus ? Combien d'hétérogénéités admet-on entre pays ? Quels traitements statistiques retient-on si on adopte le test d'hétérogénéité ? Ceci dit deux approches sont possibles : la première consiste à exécuter la régression, collecter les résidus et faire un test de stationnarité. Ici le test de stationnarité est fondé sur le test des résidus. La deuxième approche consiste à construire un modèle à correction d'erreur et vérifier si le terme d'erreur corrigé est significatif. Ici le test de cointégration est fondé sur le test à correction d'erreur et nous retenons à ce titre le test de Westerlun (2007).

V. Presentation des Resultats

a) Diagnostic des propriétés statistiques des variables

A l'observation des paramètres de dispersion (annexe 1a), il apparait que le coefficient de variation des séries du Produit Intérieur Brut est de $0.057 < 0.15$; ce qui signifie que la distribution est concentrées pour

les six pays entre 1990 et 2017. Il en est de même pour les séries de changes effectifs réels qui ont pour coefficient de variation de 0.04 < 0.15. Par contre les observations sur le taux d'intérêt réel de court terme sont plutôt dispersées (CV=0.83>0.15). On peut en dire autant pour la distribution des crédits à l'économie dont le coefficient de variation est de 0.95>0.15.

La structure de corrélation entre les variables (annexe 1b) nous apprend qu'il n'y a pas de risque de multicolinéarité; puisqu'aucun coefficient de corrélation n'est supérieur à 0.5.

Le nombre de retard optimal est d'un an pour tous les critères d'information (AIC, HQ, FPE, SBIC) puis qu'il obtient le score le plus élevé (annexe 2).

Le pool ability test (annexe 3) montre que les effets fixes ne sont pas significatifs au seuil de 5% (Prob > F = 0.0971) ; ce qui signifie qu'il s'agit d'un panel hétérogène. Les séries considérées dans l'analyse sont donc influencées par des spécificités individuelles propres à chaque pays de la CEMAC au moins à court terme.

Le test de dépendance transversale (annexe 4) montre que sous l'hypothèse nulle d'indépendance individuelle, les pays de la CEMAC sont interdépendants pour toutes les séries considérées au seuil de 5% ; ce qui suppose le rejet de l'hypothèse nulle. Autrement dit, du fait des critères de surveillance multilatérale et l'harmonisation des politiques monétaires, les politiques de taux d'intérêt ; de taux de change et de crédit s'influencent mutuellement pour tous les pays de la CEMAC en dépit de leurs spécificités structurelles.

Le caractère hétérogène du panel et l'interdépendance transversale permet de conclure qu'on ne peut pas utiliser un même modèle pour tester la présence d'une racine autoregressive pour tous les individus du panel. On utilise donc un test de deuxième génération pour station ariser les variables notamment celui de Pesaran (2007) qui exclu la possibilité de rupture structurelle. Les résultats sont présentés en annexe 4. La statistique appelée CIPS pour Cross-Sectionaly Augmented IPS est la moyenne des statistiques individuelles. On précise ici que T= 27 comprise entre 20 et 30 et la dimension individuelle est N= 6 inferieure à 10. On peut donc utiliser la statistique non tronquée tabulée par Pesaran (2007) et reportée dans à la colonne droite du tableau. (annexe 5) pour un risque de la première espèce de 5%. On rejette l'hypothèse nulle de racine unitaire si la statistique CIPS (N; T) est inférieure à la valeur tabulée ($\overline{CADF}$). On remarque qu'au seuil de 5%, on ne peut pas rejeter l'hypothèse nulle de présence de racine unitaire pour la variable PIB à niveau ; mais cette hypothèse est rejetée en différence première. Le logarithme de PIB réel est intégrée d'ordre 1 (I[1]). Le taux d'intérêt réel de court terme, le taux de change effectif réel et le crédit au secteur privé sont stationnaires à niveau et en différence au seuil de 5% ; c'est-à-dire intégrées d'ordre 0 (I[0]).

Les résultats du test de cointégration de Westerlun (2007) présentés en annexe 6 nous renseignent que la combinaison linéaire des observations sur le PIB réel, le taux d'intérêt réel de court terme, le taux de change et le crédit à l'économie est stationnaire pour l'ensemble du panel (cointégration inter individuelle) au regard des deux dernières statistiques du tableau (Pt et Pa). En ce qui concerne la cointégration intra individuelle (Gt et Ga), il est difficile de se prononcer puis que la première statistique rejette l'hypothèse de cointégration tandis que la deuxième statistique la confirme. Ceci signifie dans le cadre de cette étude qu'il est possible de combiner le taux d'intérêt réel de court terme, le taux de change effectif réel et le crédit à l' économie en un seul indicateur synthétique pour contrôler la croissance réelle dans la zone CEMAC, mais qu''il est difficile pour chaque pays de le faire individuellement à moins de tester si la combinaison linéaire de ces observations cause conjointement la croissance dans la zone CEMAC ; ce qui n'est pas l'objectif de ce travail .

b) Estimation des coefficients du modèle

Étant donné que les coefficients des variables ne sont pas identiques pour tous les individus du panel et que la combinaison linéaire de toutes les variable est stationnaire à long terme pour tous les pays du panel, nous utilisons l'estimateur pooled mean group (pmg) qui suppose qu'à long terme les pays de la CEMAC ont un minimum d'effet commun du fait des efforts d'intégration régionale et qu'à court terme ces pays se distinguent par leurs différences structurelles. Dans ces conditions la pente de l'hétérogénéité est statique.

L'estimateur pooled mean group égalise la dynamique de court terme des séries intégrées en différence à la tendance de long terme de ces mêmes séries cointégrées à niveau. Ceci contraint les élasticités de long terme des variables explicatives à s'égaliser entre les individus du panel.

Dans le tableau présenté ci-dessous, on a deux équations à savoir une équation de court terme et une équation de long terme. On constate que la vitesse d'ajustement du modèle de court terme est positive (string = 0.8) et non significative au seuil de 5% (Prob = 1.99 > 0.05). La qualité d'ajustement du modèle de court terme n'est donc pas bonne du fait d'un possible biais d'ajustement temporel. Le signe positif de ce coefficient est justifié par le fait que, bien que les séries combinées du produit intérieur brut, du taux d'intérêt, du change effectif réel et du crédit convergent à long terme vers leurs valeurs d'équilibre pour tous les pays de la CEMAC, ce n'est pas le cas pour chaque pays de la CEMAC.

A court terme, une baisse du taux d'intérêt réel de court terme de 1 point de pourcentage augmente

significativement au seuil de 5% le PIB réel de 3 points de pourcentage après un an dans la zone CEMAC. En effet une baisse du taux d'intérêt réel de court terme justifiée par une forte contribution du taux nominal, a pour effet d'abaisser les coûts du crédit qui facilite le financement des besoins en fonds de roulement des entreprises et de consommation des ménages ; toute chose qui est favorable à la croissance dans un horizon d'un an . A la deuxième année, le taux d'intérêt réel de court terme évolue dans le même sens que le PIB réel. Ceci suppose que les fluctuations du taux d'intérêt réel sont justifiées par une modification des anticipations d'inflation des agents économiques de la CEMAC.

Or à travers l'effet Fisher, le canal du taux d'intérêt réel de court terme permet à l'inflation de jouer un rôle redistributif. Ainsi, une hausse du taux d'intérêt réel de court terme de 1 point de pourcentage, provoque un transfert de revenu des préteurs vers les débiteurs, de l'épargnant vers l'investisseur, réduit la valeur réelles de la dette publique non indexée et favorise un transfert de richesse des ménages vers les entreprises augmentant finalement les recettes fiscales. Toute chose qui, modifiant le fonctionnement des économies de la sous région, booste significativement la croissance de 1 point de pourcentage deux ans après. Au total, une baisse du taux d'intérêt réel augmente le PIB réel de 3 points de pourcentage un an après et le fait baisser de 1 point de pourcentage deux ans après en zone CEMAC.

Tableau 1: Estimation par le pooled mean group

string	tirct	-0.137
		(1.99)*
	tcer	1.258
		(3.29)**
	lncrd	0.773
		(5.79)**
SR	string	0.080
		(1.56)
	D.tirct	-0.030
		(2.42)*
	D2.tirct	0.010
		(2.10)*
	D.tcer	0.662
		(2.45)*
	D.lncrd	-0.140
		(2.45)*
	_cons	-1.076
		(1.56)
N		156

* p<0.05; ** p<0.01

A long terme, la variation du taux d'intérêt réel est essentiellement justifiée par une forte contribution du taux d'intérêt nominal. Ainsi, une baisse de 1 point de pourcentage du taux d'intérêt réel fait gagner à long terme 14 points de croissance aux économies de la sous région CEMAC.

A court terme, le change effectif réel influence positivement et significativement au seuil de 5% la croissance après un an. Une hausse du taux de change réel de 1 point de pourcentage, justifiée par un bon comportement de ses fondamentaux, a pour effet de faire croitre les économies de la CEMAC de 66 points de pourcentage un an après.

A long terme l'effet d'une innovation dans la structure du taux de change effectif réel sur la croissance est positif et significatif au seuil de 1%. Ainsi, une hausse de 1 point de pourcentage du change effectif réel augmente le PIB de 115,8 points de pourcentage. Donc à court terme comme à long terme la dynamique du taux de change effectif réel est justifiée par le bon comportement de ses fondamentaux.

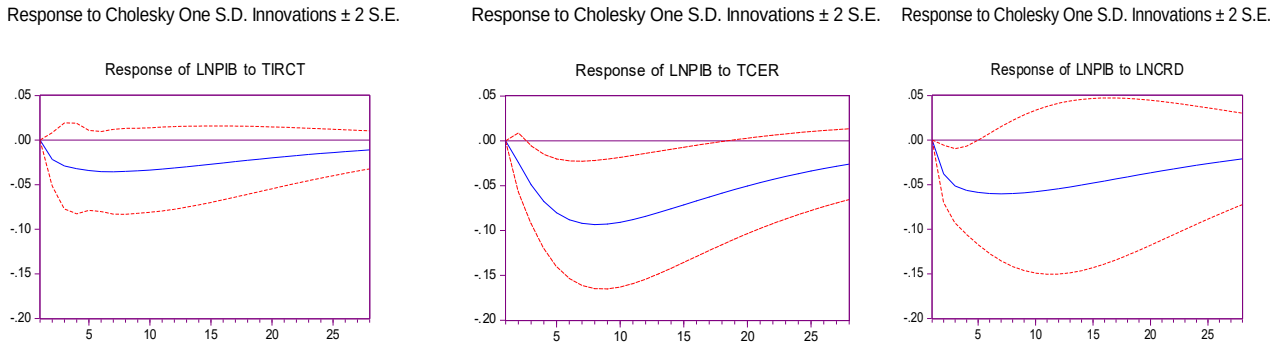
A court terme le crédit à l'économie affecte négativement et significativement la croissance. 1 dollar injecté à titre de crédit à l'économie par le secteur financier fait perdre 14 dollars de croissance en valeur un an après dans la zone CEMAC. Pourtant à long terme 1 dollar de crédit injecté fait gagner 77 dollars de croissance en valeur. Ceci s'explique par le fait qu'à court terme le crédit aux secteur privé finance la demande d'importation et crée un déficit commercial ralentissant la croissance, mais à long terme la part des biens d'équipement importés génère des retours sur

investissement en boostant les exportations permettant ainsi de relancer la croissance.

c) Réponses impulsionnelles et décomposition de la variance

i. *Réponses impulsionnelle*

Les figures ci-dessous permettent d'apprécier la réponse de la croissance économique à un choc sur le taux d'intérêt réel de court terme, le taux de change effectif réel et le crédit à l'économie au moyen d'un modèle vectoriel autorégressif non restrictif eu égard au caractère mitigé de la présence de la cointégration intraindividuelle.



Source: auteur à partir des données de la WDI, de la CNUCED et Eviews.

Figure 1: réponses du PIB à un choc sur les composantes des conditions monétaires

Les courbes situées aux extrémités sont les intervalles de confiance au seuil de 5%. On peut remarquer que les réponses de la croissance économique réelle à un choc spécifique sur le taux d'intérêt réel de court terme, le taux de change effectif réel et le crédit à l'économie sont globalement durables et négatives dans la zone CEMAC sur la période 1990-2017. L'amplitude du choc est plus forte lorsqu'il s'agit du taux de change effectif réel, elle est moyenne pour le crédit à l'économie et moins importante pour le taux d'intérêt réel de court terme comparativement aux séries précédentes. On remarque aussi que toutes les courbes changent de tendance à la septième année après quoi elles amorcent la phase ascendante pour s'estomper à long terme. Les effets sur la croissance économiques réelle, des chocs sur les conditions monétaires réelles sont donc plus explosifs à court terme et s'estompent à long terme confirmant à cet effet la sensibilité transitoire des grandeurs réelles (PIB) aux impulsions monétaires dans la zone CEMAC. Il reste à savoir comment la croissance économique réagit à un choc global sur les conditions monétaires réelles. Le graphique suivant nous en donne la réponse:

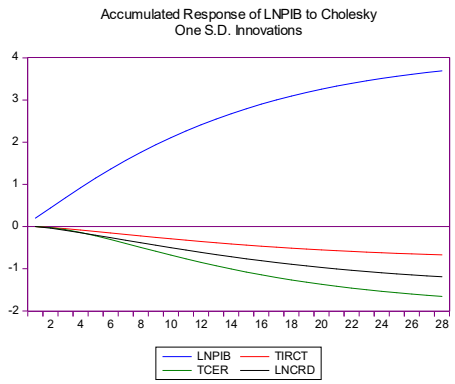


Figure 2: réponse du PIB à un choc sur les conditions monétaires réelles

La croissance réagit positivement et de manière durable à un choc global sur les conditions monétaires. Cette réaction d'ampleur moyenne ne s'estompe pas sur la période d'étude. La croissance économique réelle en zone CEMAC s'explique donc par une innovation conjointe dans la structure du taux d'intérêt réel court terme, du taux de change effectif réel et les variations du crédit à l'économie en zone CEMAC.

En annexe 7, on a la décomposition de la variance du PIB réel de Cholesky associé aux simulations de 100 répétitions de monte Carlo accumulées sur 10 années. On remarque que le taux de change effectif réel explique à 10,24% la variation de la croissance économique sur 10 ans. Par la suite le crédit à l'économie explique la variation de la croissance économique dans une proportion de 5,21% et le taux

d'intérêt réel de court terme explique les variations de la croissance à 1,75%. L'intensité des chocs de change est donc beaucoup plus forte que celles des chocs sur le crédit et le taux d'intérêt réel de court terme ; ce qui signifie que c'est le choc de change qui explique en grande partie la volatilité de la croissance dans la zone CEMAC.

d) Calcul des pondérations à affecter à l'ICM

Sur la base des estimations précédentes et en utilisant les artifices de calcul développés dans l'équation (2), nous obtenons l'indice des conditions monétaires réel suivantes :

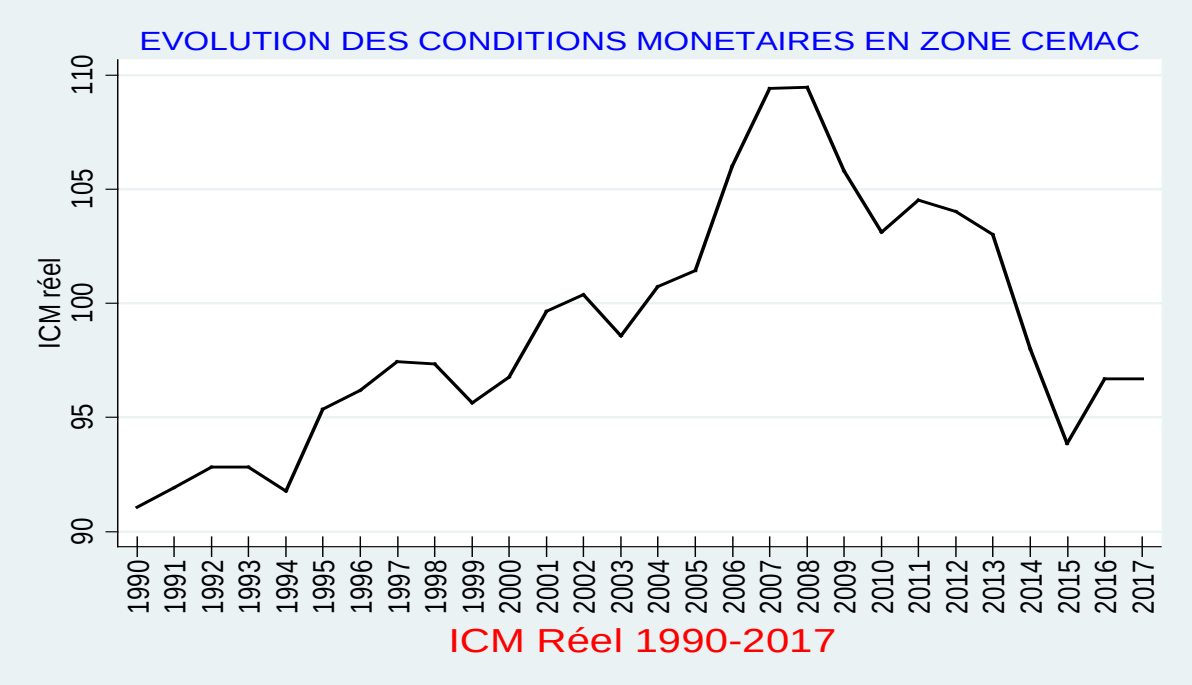
$$ICM_{rt} = (tirct_t - tirct_0) - 9{,}20.(tcer_t - tcer_0) - 5{,}65.(crd_t - crd_0) + 100 \quad (4)$$

Ce résultat montre que le PIB réel dans la zone CEMAC est en grande partie déterminé par le change effectif réel, suivi du crédit au secteur privé et enfin du taux d'intérêt réel de court terme. Ainsi, l'effet d'une augmentation de 1 point de pourcentage du taux d'intérêt effectif réel sur la croissance peut être contrebalancé par une baisse de 0,07 point de pourcentage du taux de change effectif réel et une augmentation de 0,07 point de pourcentage du crédit à l'économie. De la même manière une augmentation d'un point de pourcentage du taux de change effectif réel a le même effet sur les conditions monétaires qu'une baisse de 9,20 points de pourcentage du taux d'intérêt réel de court terme. Aussi, une baisse de 1 point de pourcentage du crédit au secteur privé a le même effet sur les conditions monétaires réelles qu'une augmentation de 5,65 points de pourcentage du taux d'intérêt réel de court terme.

Ces résultats sont similaires à ceux qui ont été trouvés au Nigeria (Yaaba, 2013), en Indonesie, Thailand, Malaisie et Singapoor (Wai-Ching, 2010). Cependant ils diffèrent des résultats de Sonia (2000); Kannan (2006) et Oriel (2011) qui ont calculé un indice des conditions monétaires dérivé de la demande global, accordant un poids plus important au taux d'intérêt réel par rapport au change effectif réel.

La figure ci-dessous présente l'évolution des conditions monétaire en zone CEMAC qui ressort des résultats obtenus dans l'équation (4). Il s'agit d'un indice des conditions monétaires calculé sur la base des grandeurs réelles encore appelé ICM réel.

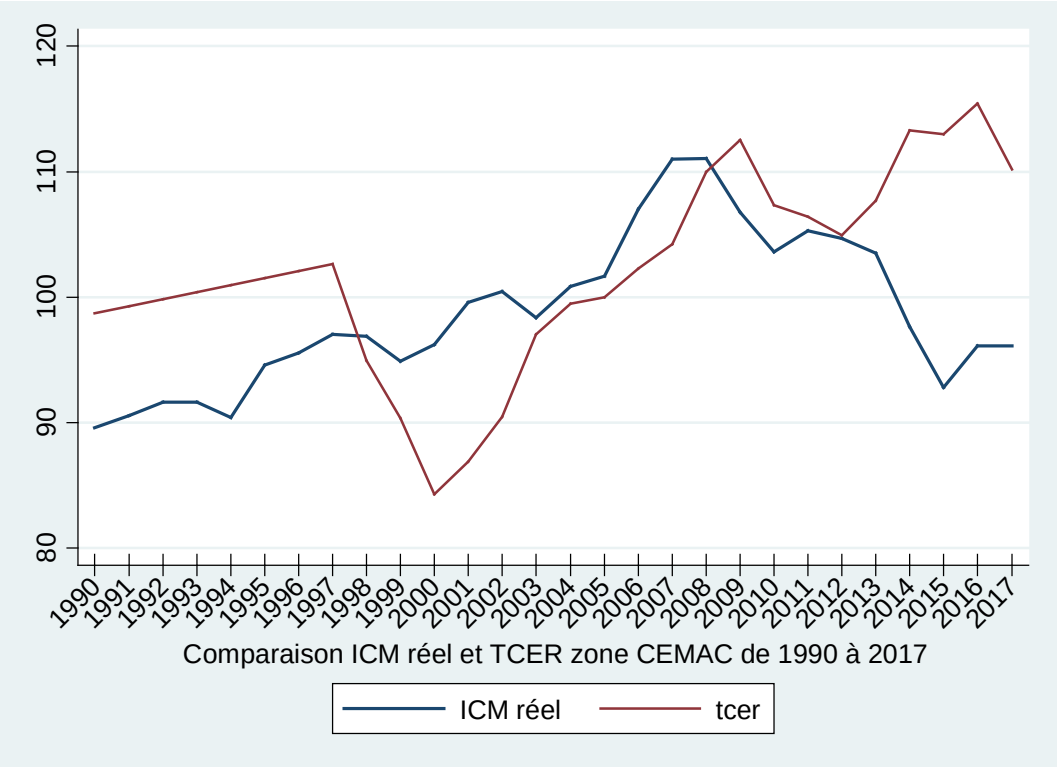
A l'observation de la figure 3 ci-dessous, on remarque en général qu'entre 1990 et 2008, les conditions monétaires réelles se seraient durcies dans la zone CEMAC et qu'à partir de 2008 jusqu'en 2017, les conditions monétaires réelles se seraient assouplies. Ce durcissement des conditions monétaires a pris de l'ampleur en 1994 qui correspond à la dévaluation du FCFA et puis en 2005 à la veille de la dépréciation du dollar face à l'euro.



Note : la construction de l'ICM réel utilise pour valeurs de référence les moyennes historiques du taux d'intérêt réel de court terme, du taux de change effectif réel et du crédit à l'économie sur la période 1990-2017.

Figure 3: Évolution des conditions monétaires

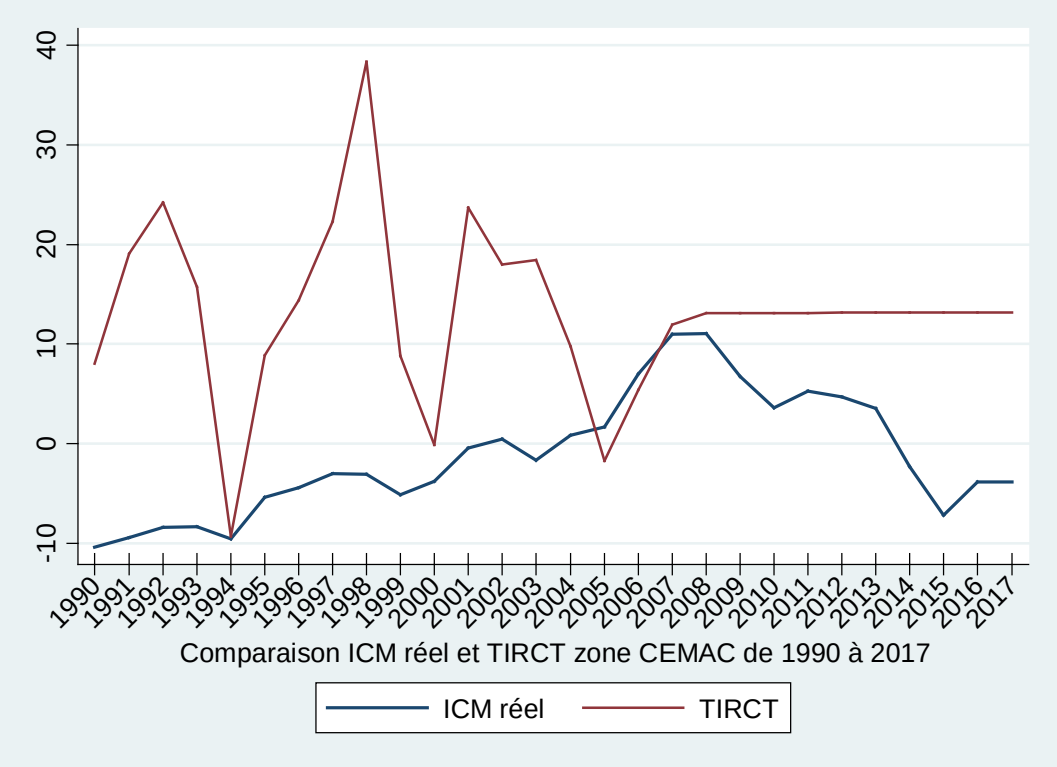
Cependant même si le change effectif réel a un poids plus important dans les conditions monétaires réelles en zone CEMAC, une comparaison des évolutions tendancielles de chaque composante des conditions monétaires à l'évolution des conditions monétaires permettrait de savoir laquelle des composante est la mieux reflétée tendanciellement dans l'indice des conditions monétaires sur la période d'étude. La figure ci-dessous met en comparaison les évolutions des conditions monétaires et les évolutions du change effectif réel.



Source: calcul de l'auteur sur la base du WDI, de la CNUCED et STATA 13.

Figure 4: Evolution de l'indice des conditions monétaires et du taux de change effectif réel en zone CEMAC.

On peut remarquer à partir de la figure 4 ci-dessus que les évolutions des conditions monétaires réelles reflètent à quelques exceptions près les évolutions du change effectif réel entre 1990 et 2012. Le resserrement des conditions monétaires entre 1990 et 2008, s'est expliqué par une forte contribution du taux de change effectif réel qui a augmenté tendanciellement de 1990 à 2017. Ceci justifie son poids obtenu des calculs précédents (9,20). A partir de 2012, l'augmentation tendancielle du taux de change effectif réel semble contrastée avec l'assouplissement des conditions monétaires réelles depuis 2008. On peut aussi s'interroger sur l'ampleur de la contribution tendancielle du taux d'intérêt réel de court terme aux conditions monétaires dans la zone CEMAC. La figure ci-dessous permet d'opérer la comparaison:

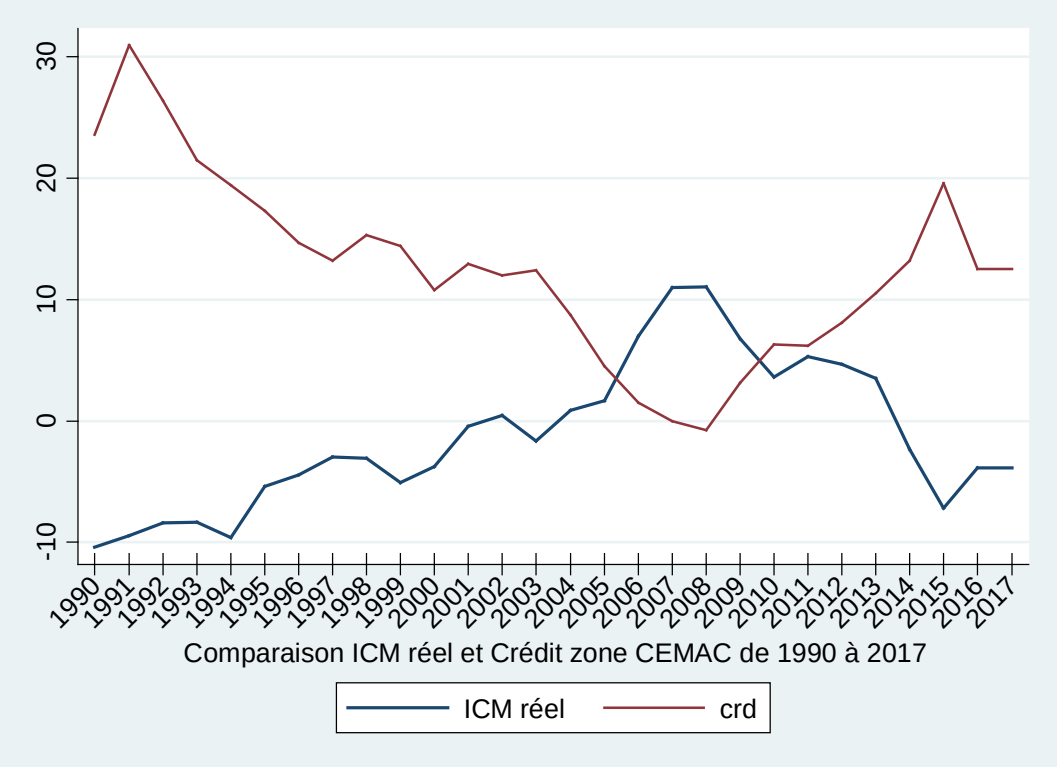


Source: calcul de l'auteur à partir des estimations et des données, de la WDI et STATA13

Figure 5: Evolution de l'indice des conditions monétaires et du taux d'intérêt réel de court terme.

La figure 5 ci-dessus nous renseigne que les évolutions du taux d'intérêt réel de court terme ont été reflétées par les conditions monétaires réelles, mais avec une ampleur beaucoup moins importante que dans le cas du taux de change effectif réel entre 1990 et 2008. On observe trois pics dans le mouvement du taux d'intérêt réel de court terme : celui de 1992 puis de 1997 et en fin celui de 2001. Chaque pic du mouvement du taux d'intérêt réel de court terme correspond à une situation euphorique dans les conditions monétaires dont l'ampleur de l'évolution est moins importante. En fait, l'effet des grandes fluctuations du taux d'intérêt réel de court terme sur les conditions monétaires est en grande partie contrebalancé par les mouvements de change effectif réel (9,20) et du crédit à l'économie (5,65). Par ailleurs l'année 1994, période de la dévaluation est aussi l'année pendant laquelle le taux d'intérêt réel de court terme a atteint son support le plus bas.

La figure 6 ci-dessous retrace les évolutions de l'indice des conditions monétaire et du crédit à l'économie en pourcentage du PIB.

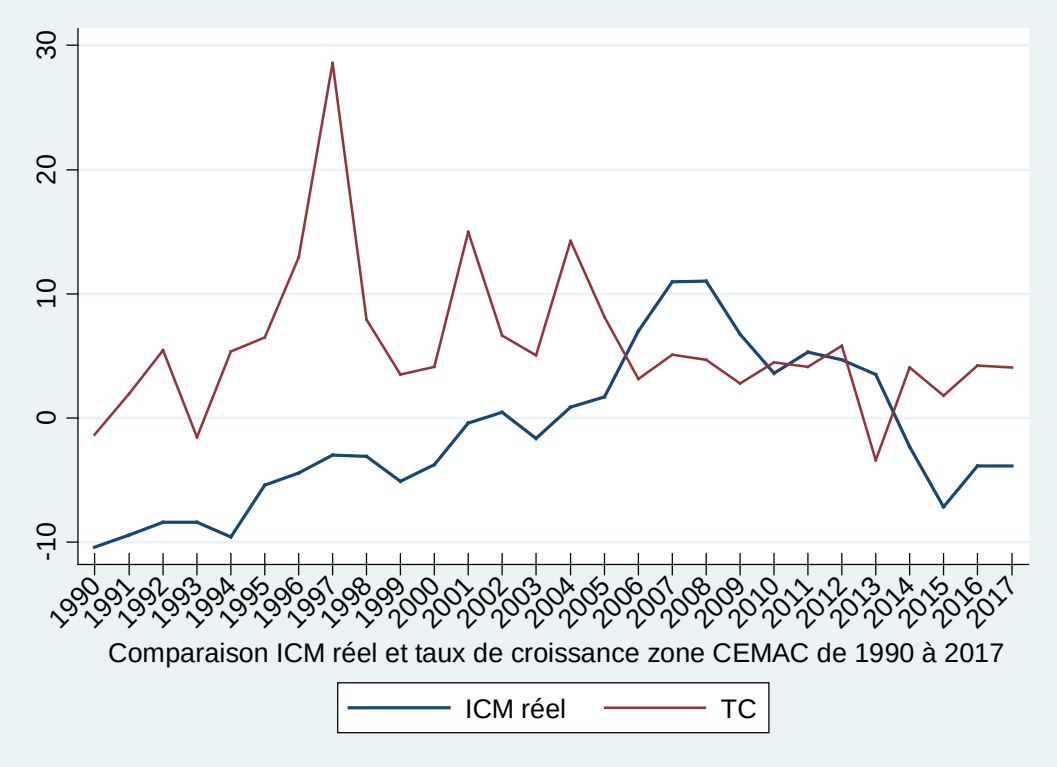


Source: calculs de l'auteur à partir des estimations, de la WDI et de STATA 13.

Figure 6: Evolutions des conditions monétaires et du crédit à l'économie.

Selon cette figure, les évolutions du crédit à l'économie en pourcentage du PIB ne sont reflétées avec une ampleur moins importante par les évolutions des conditions monétaires réelles qu'entre 1990 et 1994. Entre 1994 et 2017, les évolutions des conditions monétaires réelles se trouve quasiment aux antipodes des évolutions du crédit à l'économie qui décroit pendent le durcissement des conditions monétaires et croit pendent l'assouplissement des conditions monétaires réelles, atteignant son support le plus bas en 2008. Force est de constater ex aequo que le durcissement des conditions monétaires réelles est donc justifié par une baisse du crédit accordé à l'économie et son desserrement est imputable à une augmentation du crédit à l'économie en pourcentage du PIB.

La figure 7 ci-dessous compare les évolutions des conditions monétaires aux évolutions du taux de croissance du PIB en zone CEMAC.



Source: calculs de l'auteur à partir des estimations, de la WDI et de STATA 13.

Figure 7: Evolutions des conditions monétaires et du taux de croissance en zone CEMAC.

Cette figure nous renseigne que les périodes de durcissement des conditions monétaires ont cohabité avec une tendance haussière de la croissance économique de 1990 à 1996. Après 1996, la persistance du durcissement des conditions monétaires réelles cohabite avec une tendance baissière de la croissance. La croissance semble reprendre avec l'assouplissement des conditions monétaires réelles amorcée depuis 2008. Le niveau moyen de corrélation entre l'indice des conditions monétaires réelles et le aux de croissance économique est positif et se situe au tour de 0.038. Cette faible corrélation justifie le caractère perfectible de la politique monétaire. Le signe positif de la corrélation s'explique par l'objectif de stabilité poursuivi par la banque centrale. Le durcissement des conditions monétaires induit une détente des prix qui peut être favorable à la croissance.

Au final, la hausse du taux d'intérêt réel de court terme entre 1990 et 1992, puis entre 1994 et 1996, va provoquer un afflux des capitaux entrants qui va entrainer une appréciation du taux de change effectif réel entre 1990 et 1997 dont l'ampleur est amoindrie par la dévaluation de 1994. Tout ceci associé à une restriction de l'offre crédit à partir de 1991, dans le cadre de l'ajustement structurel, va durcir les conditions monétaires réelles en dépit de l'instauration de la programmation monétaire par la banque centrale. La chute du taux d'intérêt réel de court terme entre 1997 et 2000 occasionne une sortie des capitaux et donc une dépréciation du taux de change effectif réel entre 1997 et 2000. Mais les conditions monétaires réelles ne s'assouplissent pas du fait d'une restriction persistante de l'offre de crédit à l'économie. Entre 2000 et 2001, une nouvelle hausse du taux d'intérêt réel de court terme déclenche un afflux des capitaux entrants qui incite de nouveau une forte appréciation du taux de change effectif réel eu égard à l'entrée en vigneau de l'euro qui, associée à un rationnement de l'offre de crédit à l'économie, entretiennent le durcissement des conditions monétaires réelles. Une hausse additionnelle du taux d'intérêt réel de court terme entre 2005 et 2008 va entretenir une augmentation du taux de change effectif réel et donc un durcissement des conditions monétaires réelles ; mais l'augmentation de l'offre crédit à l'économie à partir de 2008 va assouplir les conditions monétaires réelles à partir de la même année jusqu'en 2017.

VI. Conclusions et Implications de Politiques Economiques

La présente étude a essayé autant que faire se peut de construire un indice des conditions monétaire réelles avec pour variable de référence le PIB réel. Il s'est agit d'un indice à trois composantes à savoir le taux d'intérêt réel de court terme, le taux de change effectif réel et le crédit à l'économie évalué en pourcentage du PIB.

Il en ressort que les phases de durcissement des conditions monétaires réelles ont cohabité avec une alternance des phases expansion et de récession économique en zone CEMAC, tandis que la phase d'assouplissement des conditions monétaires réelles s'est accompagné d'une expansion économique.

La contribution du change effectif réel est de 9,20 et celle du crédit à l'économie est de 5,65 comparativement au taux d'intérêt réel de court terme. En conséquence, les conditions monétaires réelles sont principalement déterminées par le change effectif réel que Verdelhan (1998) approxime au degré d'ouverture de l'économie.

Le crédit à l'économie semble avoir une influence tendanciellement significative sur les conditions monétaires réelles pour autant qu'il occupe la seconde place dans la hiérarchie des instruments. Une restriction de l'offre de crédit à l'économie semble durcir des conditions monétaires réelles tandis que qu'une augmentation de l'offre de crédit à l'économie semble assouplir les conditions monétaires réelles. Bien plus, l'adoucissement des conditions monétaires à partir de 2008 est essentiellement justifiée par une politique de crédit généreuse en vu de soutenir les grands projets mise en place par les Etats de la CEMAC.

Il est important pour la banque centrale d'intégrer l'indice des conditions monétaires dans la gamme des indicateurs déjà utilisés.

Il s'avère donc nécessaire d'accroitre les efforts de diversification de l'économie des pays de la zone CEMAC pour booster la croissance réelle. Par ailleurs, les pays doivent poursuivre les efforts de redéfinition de leurs politiques commerciales afin de réduire leurs dépendances commerciale vis-à-vis de l'extérieur parce que l'ouverture commerciale est en grande partie responsable de la volatilité de la croissance réelle en CEMAC.

Une maitrise des mouvements du change réel à travers ses fondamentaux permettrait d'accroitre l'attractivité territoriale des investissements directs à l'étranger.

Cependant le modèle dans le cadre de la présente étude ne prend pas en considération tous les autres déterminants de la demande globale. Par ailleurs, le modèle VAR en panel ne permet pas de tester la stabilité ou non des coefficients de l'ICM réel; lesquels sont d'ailleurs sensibles au modèle économétrique retenu dans l'analyse (Frochen, 2007).

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Annexes

Annexe 1: Statistique descriptive

1a) Caractéristiques de la distribution

Variable	Obs	Mean	Std. Dev.	Min	Max
lnpib	168	22.18906	1.269334	18.42872	24.19059
tirct	168	2.075453	1.720052	-3.95731	4.360212
tcer	168	4.591564	.1887539	3.995377	5.339441
lncrd	168	1.941835	1.852421	-3.83773	4.229311

Source: calcul de l'auteur sur la base de la WDI.

1b) Structure de corrélation entre les variables

	lnpib	tirct	tcer	lncrd
lnpib	1.0000			
tirct	0.0651	1.0000		
tcer	0.4418*	0.1293	1.0000	
lncrd	-0.3537*	0.1138	0.0364	1.0000

Source: calcul de l'auteur sur la base de la WDI.

Annexe 2: Choix du nombre de retard optimal

Sample: 1993 - 2017 Number of obs = 25

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-94.6429				.031433	-3.78008	-3.78008	-3.78008
1	-29.392	130.5	16	0.000	.000625*	-7.72015*	-7.50379*	-6.94007*
2	-19.4836	19.817	16	0.229	.001139	-7.23282	-6.8001	-5.67266
3	-4.76717	29.433*	16	0.021	.00173	-7.13013	-6.48105	-4.78989

Source: calcul de l'auteur sur la base de la WDI.

Annexe 3: Test de spécification du panel

F(3,153) = 12.87
corr(u_i, Xb) = 0.0411 Prob > F = 0.0000

D.lnpib	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
tirct						
D1.	-.0063377	.0070821	-0.89	0.372	-.020329	.0076535
tcer						
D1.	.6888132	.1653509	4.17	0.000	.3621476	1.015479
lncrd						
D1.	-.0903839	.0201578	-4.48	0.000	-.1302074	-.0505604
_cons	.0471889	.0155651	3.03	0.003	.0164387	.0779391

sigma_u | .05236409
sigma_e | .19708208
rho | .06593981 (fraction of variance due to u_i)

F test that all u_i=0: F(5, 153) = 1.90 Prob > F = 0.0971

Source: calcul de l'auteur sur la base de la WDI.

Annexe 4: Analyse de la dépendance transversale

Variable	CD-test	p-value	corr	abs(corr)
lnpib	18.60	0.000	0.908	0.908
tirct	8.94	0.000	0.436	0.461
tcer	8.83	0.000	0.431	0.431
lncrd	7.68	0.000	0.375	0.607

Source: calcul de l'auteur sur la base de la WDI.

Annexe 5: Analyse de la stationnarité

Variables	CIPS (28,6)	$\overline{CADF}$ (28,6)
PIB	-1.776	-2,33
Δ PIB	-5.536	-2,33
tirct	-4.126	-2,33
Δ tirct	-5.648	-2,33
tcer	-2.441	-2,33
Δ tcer	-4.289	-2,33
crd	-3.387	-2,33
Δ crd	-5.327	-2,33

Source: calcul de l'auteur sur la base de la WDI.

Annexe 6: Analyse de la cointégration

Statistic	Value	Z-value	P-value	Robust P-value
Gt	-0.740	2.319	0.990	1.000
Ga	-0.719	2.781	0.997	0.000
Pt	-2.686	0.412	0.660	0.000
Pa	-0.764	1.360	0.913	0.000

Source: calcul de l'auteur sur la base de la WDI.

Annexe 7: Décomposition de la variance du PIB

Period	S.E.	LNPIB	TIRCT	TCER	LNCRD
1	0.199835	100.0000	0.000000	0.000000	0.000000
		(0.00000)	(0.00000)	(0.00000)	(0.00000)
2	0.316836	97.52882	0.466359	0.577293	1.427527
		(1.88748)	(0.79033)	(0.99546)	(1.41713)
3	0.407194	94.95865	0.790757	1.792252	2.458340
		(3.16494)	(1.38634)	(1.89263)	(2.28598)
4	0.480376	92.57598	1.010657	3.266006	3.147353
		(4.23006)	(1.71691)	(2.83357)	(3.05867)
5	0.541590	90.39380	1.191034	4.763329	3.651834
		(5.13588)	(1.93017)	(3.74779)	(3.79200)
6	0.593615	88.43668	1.345104	6.160911	4.057310
		(5.95495)	(2.12133)	(4.60538)	(4.49678)
7	0.638149	86.71457	1.473043	7.410699	4.401686
		(6.70733)	(2.30017)	(5.38199)	(5.17360)
8	0.676427	85.21536	1.580396	8.502317	4.701927
		(7.39435)	(2.45075)	(6.07054)	(5.81666)
9	0.709402	83.91634	1.673393	9.441865	4.968400

		(8.01716)	(2.57741)	(6.67468)	(6.41819)
10	0.737815	82.79376	1.754917	10.24318	5.208142
		(8.58067)	(2.68986)	(7.20083)	(6.97616)

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The Analysis of Microfinance Institutions Efficiency by DEA Method: Case of MC^2 Network in Cameroon

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Abstract- The objective of this study is to measure the Microfinance institutions (MFI) efficiency levelsin Cameroon. We then apply the non-parametric method Data Envelopment Analysis (DEA) on a sample of 47 Microfinance institutions (MFI) belonging to the MC2 network. The DEA model permitted us to appraise the MFI efficiency levels. The DEA model therefore shows that the Cameroon MC2 network MFI are technically efficient taking in consideration the two types of return on scale. This study permit us to know the efficiency levels of MFI living in the same group.

Keywords: *DEA, efficiency, MFI, MC^2.*

GJMBR-C Classification: *JEL Code: F65*

The Analysis of Microfinance Institutions Efficiency by DEA Method: Case of MC^2 Network in Cameroon

Analyse de l'efficience des institutions de microfinancepar la méthode DEA: cas du réseau des mutuelles communautaires de croissance (MC^2) du Cameroun

Djontu Maurice Armand

Résumé- L'objectif de cette étude est de mesurer le niveau de l'efficience des Institutions de Microfinance (IMF) au Cameroun. Pour ce faire, nous avons appliqué sur un échantillon de 47 IMF appartenant au réseau des Mutuelles Communautaires de Croissance (MC²) la méthode non paramétrique Data Envelopment Analysis (DEA) pour calculer les différents scores d'efficience. Les résultats globaux du modèle DEA montrent que les institutions de microfinance du réseau des MC² sont techniquement efficientes quel que soit l'hypothèse de rendement d'échelle retenue. Cette étude nous permet de connaitre les niveaux de performance des IMF se trouvant au sein d'un même groupe.

Motsclés: DEA, efficience, IMF, MC^2.

Abstract- The objective of this study is to measure the Microfinance institutions (MFI) efficiency levelsin Cameroon. We then apply the non-parametric method Data Envelopment Analysis (DEA) on a sample of 47 Microfinance institutions (MFI) belonging to the MC² network. The DEA model permitted us to appraise the MFI efficiency levels. The DEA model therefore shows that the Cameroon MC² network MFI are technically efficient taking in consideration the two types of return on scale. This study permit us to know the efficiency levels of MFI living in the same group.

Keywords: DEA, efficiency, MFI, MC^2.

I. Introduction

Depuis l'avènement de la crise économique de la fin des années 80 et du début des années 90[1], le développement des services financiers apparait de plus en plus comme un facteur majeur de lutte contre la pauvreté (Mondjeli, 2013). Dans cet ordre d'idées et du fait de la pauvreté grandissante dans les pays en voie de développement (PVD), les entreprises de micro finance jouent un rôle prépondérant en permettant l'accès aux services financiers d'un plus grand nombre de personnes et en particulier la couche la plus pauvre. La micro finance est donc un moyen efficace d'éradication de la pauvreté monétaire et non monétaire. L'intérêt que suscite cette dernière, au niveau international, est encore plus compréhensible quand on considère la proximité entre les objectifs globaux de la microfinance et les axes majeurs des objectifs du millénaire pour le développement (OMD). C'est le cas, notamment, en ce qui concerne l'éradication de l'extrême pauvreté et le renforcement des capacités des femmes. Son importance dans l'atteinte des OMD est d'autant plus grande que la communauté internationale en a fait de l'année 2005 année internationale du microcrédit, suivi par le décernement du Prix Nobel de la paix 2006 au professeur Muhammad Yunus[2]. Cet essor du secteur de la micro finance sur le plan international s'est aussi manifesté au niveau du Cameroun.

Le secteur de la microfinance au Cameroun a connu une croissance exponentielle au point qu'au 31 décembre 2008 (COBAC, 2008), les ressources disponibles dans les IMF du Cameroun s'élèvent à près de 258 milliards de FCFA contre 41 milliards au 31 décembre 2003.Par ailleurs, en dépit de l'augmentation du volume des dépôts et du montant des crédits octroyés par les IMF, leur activité d'intermédiation connaît deux difficultés majeures. En premier lieu, la qualité de portefeuille des IMF s'est dégradée. Les créances douteuses représentent plus du quart des encours accordés à la clientèle en 2008. En second lieu, le secteur de la micro-finance a produit la même année un résultat déficitaire agrégé de 5,567 milliards de FCFA (COBAC, 2008). Les difficultés sus-énoncées mettent en avant la question de la rentabilité financière voire de la pérennité des IMF. Aussi, les taux d'intérêts pratiqués restent élevés. En effet, les taux débiteurs et créditeurs moyens sont respectivement 21% et 4% pour une marge d'intermédiation moyenne de 17% (Kobou et al, 2010; Mondjeli, 2013). La cherté des taux d'intérêts débiteurs conduit à l'exclusion d'une frange de la

[1] Qui ont apporté de profondes mutations dans l'environnement financier et l'ensemble des autres secteurs d'activités de l'économie camerounaise.

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[2] M. Muhammad Yunus est le fondateur de la Grameen Bank au Bangladesh (1976).

population cible originel des IMF créant ainsi un « *creditcrowdingeffect*[3] ». Nzongang et Kamdem (2013) montrent que, selon l'approche intermédiation, les scores d'efficience sont très faibles ; mais également une prépondérance des rendements d'échelle décroissants. Ceci suggère une gestion peu efficiente au niveau de la transformation des dépôts en crédits, ce qui rejoint l'idée de Kobou et al, (2010) du faible coefficient de transformation de l'épargne collectée en crédit. En somme, les institutions collectent efficacement les ressources mais sont moins efficaces dans l'octroi des crédits et l'atteinte des objectifs sociaux

Le constat qui se dégage de l'évolution de la micro finance au Cameroun est qu'en dépit de son émergence et de son relatif développement, la question d'efficience demeure cruciale. L'efficience d'une institution de micro-finance suppose que cette dernière utilise le minimum de ressources possible pour une production maximale (Nzongang et Kamdem, 2013). En effet, une IMF qui gère bien les ressources dont elle dispose pourrait facilement améliorer simultanément la qualité de son portefeuille[4] ainsi que celle de son résultat ; d'où notre intérêt à étudier les déterminants de l'efficience des institutions de micro finance au Cameroun. Cette problématique de l'efficience des IMF fait l'objet de productions scientifiques depuis un certain nombre d'année.

Les études relatives à l'efficience des institutions de micro finance ne sont pas très abondantes dans le contexte camerounais. Nous avons entre autres: L'étude de Monkam et al (2001) qui s'est intéressée à l'évaluation de la performance financière des IMF au Cameroun. Les auteurs montrent, à l'aide du calcul des ratios financiers, que les IMF sont financièrement viables.

Kobou et al (2010), quant à eux, s'intéressent à l'efficacité du financement des micros et petites entreprises dans la lutte contre la pauvreté. Ils montrent à travers leur analyse empirique que les IMF présentent un niveau moyen d'efficacité de 0.401 lorsque les rendements d'échelle sont constants et de 0.575 lorsque les rendements d'échelle sont variables; ce qui montre que les IMF sont moyennement efficaces.

Nzongang et al (2012) mesure l'efficacité financière et sociale des institutions de micro finance du réseau MC^2 par une approche DEA multi-modèles. Une année plus tard, Nzongang et Kamdem (2013) s'intéressent à la problématique de l'efficience des IMF du même réseau. Dans le premier cas, les résultats montrent sur la base de l'efficience technique qu'il n'y a pas antinomie entre performance financière et performance sociale, les deux se construisent conjointement. Par ailleurs, dans le second cas, les résultats montrent que ces institutions collectent efficacement les ressources mais sont moins efficaces dans l'octroi des crédits et l'atteinte des objectifs sociaux. De plus, l'approche DEA multi-étape permet aux gestionnaire des réseaux de mieux comprendre les composantes de la performance de leurs instituions.

Mondjeli (2013) mène une étude sur la rentabilité financière et sociale des institutions de microfinance au Cameroun. Il arrive à la conclusion selon laquelle les institutions de microfinance au Cameroun sont caractérisées par une diversité des niveaux d'efficacité et qu'un faible pourcentage des IMF arrive à concilier les deux objectifs. Il identifie tout de même quelques facteurs pouvant expliquer ces différents niveaux d'efficacité.

Ces études ont dans l'ensemble le mérite de prendre en compte dans l'analyse de l'efficience des IMF les facteurs financiers et sociaux. En plus celles de Kobou et al(2010), de Nzongang et al (2012), Nzongang et Kamdem (2013), Mondjeli (2013) s'intéressent aux IMF appartenant à un même réseau (homogène). Mais, cependant nous pouvons relever quelques manquements.

La première étude montre que les institutions étudiées sont hétérogènes ou proviennent d'origines diverses ; ce qui rend difficile la généralisation des résultats. De même, elle évalue uniquement la performance financière et s'inspire aussi des ratios financiers traditionnels. La troisième et la quatrième étude, bien qu'analysant les IMF d'un même réseau ne mettent pas en relief les facteurs explicatifs de l'efficience ou de l'inefficience. La deuxième et la cinquième étudient les institutions dont l'âge varie de 0 à n années pourtant nous nous intéressons à celles ayant plus de cinq années d'existence.

Ces insuffisances fondent le socle de notre étude dans laquelle notre contribution majeure est que nous allons effectuer une analyse de l'efficience globale des IMF du réseau. Ce qui nous permettra de faire ressortir la diversité des niveaux d'efficience des IMF du réseau dans l'ensemble. La question se trouvant au cœur de notre travail est: *quel est le degré d'efficience des institutions de micro-finance du réseau des MC^2 ?*

La suite de l'étude est organisée de la manière suivante. Le premier point fait une revue de la littérature sur la question. Le second point présente le cadre méthodologique de l'étude. Les résultats sont présentés et interprétés dans le troisième point. Nous finirons par la conclusion de l'étude et la proposition des recommandations.

II. Revue de la Littérature

Cette revue de la littérature porte dans un premier temps sur le cadre théorique, et dans un second temps sur les travaux empiriques mettant en exergue l'interaction entre la performance sociale et la

[3] Surliquidité des institutions de microfinance
[4] Toucher le maximum de pauvres

performance financière en vue de ressortir les niveaux d'efficience des IMF au Cameroun en.

a) Revue théorique de la littérature

Plusieurs théories économiques peuvent contribuer à élucider les performances de la microfinance du point de vue des parties prenantes («*stakeholders*»), c'est-à-dire des organisations de microfinance et des bénéficiaires de leurs services financiers. L'analyse des forces et faiblesses de ces théories se fondera surtout sur le postulat selon lequel une organisation n'est qualifiée d'efficace que s'il n'en existe aucune autre dans laquelle chaque personne obtiendrait en moyenne de meilleurs résultats pour tous les modes de fonctionnement envisageables (Milgrom & Roberts, 1997, p. 33).

Le principal objectif de ce point est de dégager, au travers de divers courants théoriques explicatifs des performances en microfinance, les principaux indicateurs susceptibles à l'évaluation de l'efficacité des organisations de microfinance du réseau MC[2].

On peut en effet observer plusieurs distorsions (dont le rationnement de crédit) entre le prêteur et l'emprunteur. Ces distorsions ont généralement pour cause l'asymétrie d'information et pour conséquence l'inefficace l'intermédiation financière. Dans la relation de crédit, l'information apparaît en effet asymétriquement distribuée. On concevra aisément que l'emprunteur dispose d'une meilleure information que le prêteur sur les paramètres qui vont déterminer la rentabilité effective du projet et ensuite en gouverner le partage des revenus (Lobez, 1997). Conscient de ce que la transaction risque d'avoir lieu dans les conditions désavantageuses pour lui, le prêteur peut être amené à rationner le crédit. Cette manière de procéder présuppose l'existence d'une inefficacité allocative, car le risque est discriminé par les prix (Stiglitz & Weiss, 1981).

Face à ce problème, la microfinance propose quelques mécanismes dits « novateurs » en vue préserver l'efficacité du financement.

La théorie de la répression financière propose une première approche de l'efficacité des organisations de microfinance comparées aux institutions financières classiques. Elle explicite pour cela la notion de l'efficacité productive, la persistance du rationnement de crédit en microfinance. Elle trouve son origine dans les travaux de McKinnon et Shaw (1973) et Gurley & Shaw (1956, 1960). La répression financière se manifeste par un certain nombre des mesures restrictives qu'imposent les pouvoirs publics à l'exercice de l'activité financière dans une économie. Ces restrictions consistent essentiellement: en la fixation administrative des taux d'intérêts, en la constitution des coefficients des réserves obligatoires, en la régulation de la concurrence, au contrôle des changes.

De ces différentes mesures de répression financière, la politique délibérée de bas taux d'intérêt pratiquée dans la plupart des pays en développement a fait l'objet des plus larges débats (Ary Tanimoune, 2003; Essombe, 1987; Germidis & ali, 1991; Joumady; 1999). Dans la plupart de ces pays, les gouvernements appliquent, souvent par l'entremise de la banque centrale, une politique de crédit sélective en faveur des secteurs dits prioritaires. Pour ce faire, ils fixent les taux d'intérêt débiteurs à un niveau bas et ce, pour l'ensemble de l'économie nationale. Au sens strict, la répression financière se manifeste donc par la fixation par les pouvoirs publics des taux d'intérêt en dessous du niveau d'équilibre. Envisagée sous l'angle des coûts, l'efficacité d'une IMF tient grosso modo à sa capacité à opérer un arbitrage entre risque et rentabilité, à couvrir en économie de marché, par le différentiel entre taux débiteur et taux créditeur (marge brute) les coûts de mobilisation de fonds, les coûts de gestion et de recouvrement des prêts ainsi que la prime de risque de l'intermédiaire financier sur les opérations de microcrédit (Mai Sale, 1997; Soulama, 2002, p. 43). Pour éviter que les IMF soient tentées de dissimuler leurs contre-performances en augmentant leurs taux d'intérêts débiteurs, ces taux peuvent être réglementés sous forme d'un seuil d'usure. Celui-ci est souvent fixé légèrement au-dessus des taux effectifs globaux des institutions réglementées.

Cette théorie est utilement complétée par celle des coûts de transaction qui enrichit l'analyse de l'efficacité productive et aborde des notions complémentaires telles les économies d'échelle. Pour justifier leur rôle de mécanisme de financement efficace en faveur des micro-entreprises, les IMF doivent occasionner un coût total inférieur à celui qu'implique le recours aux prêteurs individuels. Il est peu concevable qu'un système financier puisse être plus économe qu'un prêteur individuel en matière de coûts de transaction générés (Labie, 1999, p. 53). Il faut donc proposer des coûts financiers suffisamment inférieurs à ceux des prêteurs individuels afin de compenser le surcoût qui est engendré en coûts de transaction. Ainsi, l'efficacité productive des IMF, c'est-à-dire la profitabilité de leurs services financiers aux micro-entreprises sera prouvée. Il est à remarquer que l'accent n'est plus mis ici sur la nécessité d'imposer aux IMF un éventuel taux d'usure pour les inciter à plus d'efficacité, voire à la compétitivité. La théorie des coûts de transaction suggère plutôt l'adoption par les IMF d'un mode d'organisation leur permettant d'économiser sur ces coûts. Compte tenu de la forte spécificité des actifs en microfinance, certains modes d'organisation tels que l'internalisation des activités ou l'intégration verticale peuvent contribuer à réduire les coûts de transaction et donc à accroître l'efficacité productive des organisations de microfinance. Concrètement, on peut envisager de recourir aux fusions de certaines organisations de

microfinance en vue de réduire leurs coûts. Il peut aussi s'agir de l'absorption des organisations de microfinance par des banques classiques ou même de fusions entre ces deux types d'organisations.

Enfin, la théorie des droits de propriété, abordant le problème de divergence d'intérêts entre les différentes parties prenantes en microfinance, fournit la base d'appréciation de la viabilité sociale interne et externe des organisations sous l'optique de la bonne gouvernance et donc de l'efficacité allocative. Les droits de propriété doivent être bien définis, cessibles et protégés pour pouvoir assurer une allocation optimale des ressources. Dans le domaine de la microfinance, cette notion n'intervient que pour les organisations qui détiennent un capital propre. Certaines ONG, qui n'en disposent pas ne se prêtent donc pas au type d'analyse. Quant aux institutions dont le capital appartient aux membres ou adhérents (les coopératives d'épargne et de crédit ainsi que les tontines mutuelles), elles s'illustrent en termes d'altération des droits de propriété. En effet, dans ces organisations, la cessibilité des titres de propriété émis (parts sociales ou parts d'intérêts) n'est pas assurée alors que la protection ou l'exclusivité est atténuée. En réalité, il n'y a pas cessibilité, car un adhérent ne peut pas vendre librement son titre (part d'intérêt) sur un marché – équivalent d'une bourse de valeur - ou s'en défaire autrement que par le renoncement explicite auprès de l'organisation (COOPEC ou Tontines). Très souvent, Il s'agit du retrait du membre (et donc de ses parts d'intérêt) de l'organisation. Cette incomplétude des marchés ne permet pas aux adhérents de gérer au mieux leurs revenus sur une période donnée et de les placer, au prix du marché, en tenant compte de l'incertitude des événements. Par ailleurs, les coopératives, en tant que « propriété » des membres qui les constituent (et qui sont en même temps leurs clients), ont tendance à proposer à ces derniers des prix de vente (taux d'intérêt) inférieurs à ceux qui permettraient de maximiser le profit. Dans de telles circonstances, il n'est pas envisageable d'augmenter la valeur de la firme (évaluée aux prix donnés par le marché). Même si cela n'est pas l'objectif poursuivi par ces institutions, il s'ensuit que les intérêts individuels des membres seront mal servis, car les investissements et placements ne se feront plus selon les préférences et anticipations propres à chaque membre.

En microfinance, on peut envisager la concentration des droits de propriété comme piste de solution à ce problème. Dans les coopératives et les tontines mutuelles, les membres élus en assemblée générale sont des gestionnaires. A ce titre, ils détiennent les droits de contrôle résiduels et en tant que propriétaires de la structure mise en place (association ou coopérative), ils sont requérants des bénéfices résiduels. Ainsi, le fait que ces fonctions de gestionnaires et de propriétaires soient simultanément remplies par un même groupe de « stakeholders» (« ici les propriétaires »), le risque d'expropriation (de la richesse des propriétaires par les gestionnaires) dû aux conflits d'intérêt est atténué, pourvu que ce groupe des gestionnaires – propriétaires – clients n'abusent pas de leurs prérogatives en s'arrogeant le maximum d'avantages au détriment des autres « stakeholders». Dans la foulée, il en résulte une réduction des coûts directs d'agence ou des coûts de transaction. En définitive, la « bonne » gouvernance peut aider à éviter les inefficacités possibles aux IMF (quelle qu'en soit la forme juridique).

b) Revue empirique de la littérature

Du fait que les micros finances sont censées s'adapter aux réalités des localités où elles s'implantent, leurs difficultés vont variées dans leur nature d'une zone géographique à une autre. Ainsi, les IMF peuvent être efficientes ou non compte tenu des difficultés qu'elles rencontrent. Certains auteurs ont étudié l'efficience des IMF et ont abouti à des conclusions intéressantes. Nous avons entre autres Nzongang et al (2012) qui, dans leur étude sur l'efficacité financière et sociale des institutions de micro finance du réseau MC^2, trouvent que ces IMF sont en moyenne globalement efficientes sous les deux hypothèses à savoir le rendement d'échelle constant (REC) et le rendement d'échelle variable (REV). Une année plus tard, Nzongang et Kamdem (2013) aboutissent au même résultat dans leur étude sur la problématique de l'efficience des IMF du même réseau (MC^2). De ces résultats, nous pouvons formuler notre hypothèse principale comme suit:

Hypothèse: les institutions de micro-finance du réseau des mc^2 seraient techniquement efficientes dans l'ensemble quelle que soit l'hypothèse de rendement retenue.

III. Démarche Méthodologique

La méthodologie utilisée dans le cadre de cette étude comporte deux parties à savoir, dans un premier temps, l'échantillon de l'étude, la source des données et l'analyse descriptive ; puis dans un second temps, le cadre et la méthode d'analyse.

a) L'échantillon de l'étude, la source des données et l'analyse descriptive

Notre étude porte sur la population d'institutions de micro finance du réseau des MC^2 du Cameroun. La justification du choix de ce réseau est qu'il est l'un des plus importants réseaux de micro finance au Cameroun à côté des plus ancien que sont le réseau Cameroon Coopérative Credit Union League (CAMCCUL) et la Caise Villageoise d'Epargne et le Crédit Autogérées (CVECA). Le principal atout de ce réseau est que son étendue géographique est nationale et couvre aussi bien les zones urbaines que rurales. La répartition géographique de notre échantillon, qui suit la

configuration des IMF du réseau des MC², est représentée dans le tableau suivant:

Tableau 1: Répartition géographique des IMF de notre échantillon

RO	Ouest	Littoral	Centre	Sud	Est	Adamaoua	Extrême-Nord	Nord-Ouest	Sud-Ouest
Effectif	26	5	5	2	2	2	1	2	2
ZO	Zone Francophone						Zone Anglophone		
Effectif	43						4		

Source: auteur

Les données utilisées dans le cadre de cette recherche sont secondaires et elles proviennent de l'ADAF. Les données collectées sur les variables utilisées pour le calcul de l'efficience des MC² concernent l'exercice 2015.

Nous avons retenu 47 MC² du réseau ayant plus de 5 années de fonctionnement. Cette sélection garantit une certaine pérennité financière de l'IMF ainsi qu'une implantation sociale effective. Une synthèse des données utilisées, issues des états financiers de l'exercice 2015, est présentée dans le tableau 2.

Tableau 2: Synthèse des données utilisées, 47 IMF du réseau MC², exercice 2015

	Moyenne	Ecart-type	Minimum	Maximum
Inputs				
Capital (1000 FCFA)	36710261,3	25263271,2	2277728	135123870
Travail (1000FCFA)	7067650,28	8280364,23	2178095	86379125
Femme 1	523,6	297,86	102	1700
Chargesd'exploitation (1000Fcfa)	6030451,43	3666792,21	958610	18789333
Autres charges(1 000 FCFA)	636569,217	797779,911	95610	7925125
Produitsintermédiaires				
Dépôts (1000 FCFA)	137404212	163895299	10500000	810147100
Crédits (1000 FCFA)	104644778	125040495	1200000	620147100
Outputs				
Produitsd'exploitation (1000Fcfa)	43404371,6	32720007,8	7815125	171202276
Autres produits (1 000 FCFA)	10646824,3	8444175,71	958555	50202274
Clients (nombre)	1288,05	819,719167	253	4512
Femmes 2 (nombre)	1,39047619	1,08390164	0	6

Source: auteur

b) Cadre et la méthode d'analyse

Il s'agit ici de présenter la démarche et les outils utilisés pour appréhender les niveaux d'efficience des IMF.

Cadre méthodologique de la détermination des niveaux d'efficience des IMF au Cameroun

L'estimation des niveaux d'efficience des IMF est faite par la méthode DEA (Data Envelopment Analysis). En effet, l'efficience des IMF a été étudiée à de nombreuses reprises à l'aide de cette méthode. Deux principales approches sont généralement utilisées pour mesurer l'efficience d'une unité de production. Il s'agit de la méthode de l'efficacité productive basée sur la relation entre le principal et l'agent et la méthode de l'efficacité productive basée sur les frontières de production. Cette dernière approche qui nous intéresse ici se subdivise en deux grandes méthodes à savoir: la méthode paramétrique et la méthode non paramétrique.

La méthode paramétrique impose de connaître la forme fonctionnelle de la fonction de production. Or, la forme fonctionnelle de la fonction de production d'une IMF n'est pas à priori connue. Ainsi, nous retenons la méthode DEA dans la mesure où elle est généralement recommandée lorsque la forme fonctionnelle de l'entreprise n'est pas connue ou lorsque l'entreprise produit plusieurs outputs.

La méthode DEA, fondée sur la programmation linéaire, a pour objet d'identifier les fonctions de production empiriques. Elle a été développée pour la première fois par Charnes et al (1978) en se basant sur les travaux de Farell (1957). Leur approche connue sous

l'appellation de modèle CCR suppose que la fonction de production est à rendements constants et opte pour une orientation inputs. Elle a été prolongée par les travaux de Banker et al (1984) qui prend en compte les rendements d'échelle variables. La méthode DEA estime les niveaux d'efficacité d'une unité de production à partir de la fonction de distance. La fonction de distance, qui établit une relation entre la production observée et la production optimale (Shephard, 1970), est définie par l'équation suivante:

$$D_o(X_v, Y) = \min\{\lambda : \frac{y}{\lambda} \varepsilon E(X_v)\}$$

Où $D_o(X_v, Y)$ est la fonction de distance, X_v est le vecteur des inputs et y est le vecteur des outputs. Une IMF est dite efficiente si elle maximise sa production pour un niveau d'inputs donné c'est-à-dire, si son niveau d'efficience est égal à l'unité. Dans ce cas, la production réalisée est égale à la production optimale. Si le niveau d'efficacité est compris dans l'intervalle [0,1[, l'IMF est considérée comme inefficiente. Toutefois, l'IMF dont le score d'efficience se rapproche de l'unité est plus efficiente que celle dont le score d'efficience est plus éloigné de l'unité.

La spécification du modèle impose que l'on puisse sélectionner les inputs et les outputs. De ce fait nous nous sommes inspirés des travaux de certains auteurs tels que Yaron, Gutiérrez et al. (2005), Gutiérrez et al. (2006), Cornée (2006), Nzongang et al (2012); Nzongang et kamdem (2013) qui ont tous utilisé la méthode DEA pour la mesure de l'efficience des IMF.

Compte tenu de ces travaux antérieurs, nous avons au final dans le tableau ci-après les inputs et les outputs retenus pour notre recherche ainsi que les indicateurs de mesure.

Tableau 3: Inputs et outputs retenus dans notre recherche

Inputs (ressources)	Indicateurs de mesure	Outputs (produits)	Indicateurs de mesure
Capital	Fonds d'établissement	Crédits	Crédits brut aux clients
Travail	Charges de personnels	Femmes 2	Femmes au conseil d'ad*
Femmes 1	Adhésion femmes	Produits	Produits d'exploitation
Charges	Charges d'exploitation		

**administration Source: auteur*

IV. Résultats et Interprétation

Les résultats sont analysés à travers les niveaux d'efficience des IMF. Les scores d'efficience sont générés au moyen du logiciel DEAP. La restitution des résultats est faite sous les hypothèses de rendements d'échelle constants (REC) et de rendements d'échelle variables (REV). Le tableau 4 présenteles résultats des scores d'efficience par IMF tandis que le tableau 5présente le résumé des scores d'efficience technique de l'ensemble des IMF de notre étude.

Tableau 4: Scores d'efficience technique de l'ensemble des IMF

IMF	REC	REV	SCALE	TYPE
Baham	0.913	0.913	1.000	-
Manjo	0.673	0.695	0.968	Irs
Melong	0.701	0.705	0.995	Drs
Penka-Michel	0.411	0.472	0.870	Irs
Bandjoun	0.709	0.717	0.988	Drs
Bafia	0.688	1.000	0.688	Drs
Bamendjou	0.805	0.822	0.981	Irs
Bangou	0.515	0.765	0.673	Irs
TPD	0.514	0.769	0.668	Irs
Babouantou	0.881	0.900	0.979	Irs
Muyuka	1.000	1.000	1.000	-
Bayangam	0.548	0.815	0.672	Irs
Doumbouo	0.724	0.906	0.799	Irs
Bafou	0.774	0.846	0.915	Irs
Bandja	1.000	1.000	1.000	-
Batoufam	0.687	1.000	0.687	Irs
Ngaoundal	0.701	1.000	0.701	Irs
Bangangté	0.483	0.545	0.886	Irs
Bafoussam	0.950	0.958	0.992	Drs
Zamengoé	1.000	1.000	1.000	-
Djombé	1.000	1.000	1.000	-
Bali	1.000	1.000	1.000	-
Fongo-Tongo	1.000	1.000	1.000	-
Mbankomo	1.000	1.000	1.000	-

Kribi Campo	0.544	0.584	0.932	Drs
Loum	0.893	0.909	0.983	Drs
Batouri	1.000	1.000	1.000	-
Mamfé	1.000	1.000	1.000	-
Baleveng	0.662	0.807	0.820	Irs
Bafang	0.443	0.742	0.597	Irs
Foréké-Dschang	0.609	0.696	0.874	Irs
Babadjou	0.763	0.763	1.000	-
Baleng	0.934	0.939	0.995	Drs
Banka	1.000	1.000	1.000	-
Mbalmayo	1.000	1.000	1.000	-
Balengou	1.000	1.000	1.000	-
Bamendou	0.610	0.754	0.809	Irs
Foto	0.932	0.977	0.955	Irs
Njinikom	0.743	0.878	0.847	Irs
Niété	1.000	1.000	1.000	-
Batcham	1.000	1.000	1.000	-
Baré	0.632	0.951	0.665	Irs
Bertoua	0.683	0.730	0.935	Irs
Banyo	1.000	1.000	1.000	-
Mokolo	1.000	1.000	1.000	-
Makak	1.000	1.000	1.000	-
Bagang	0.676	0.770	0.877	Irs

Source: auteur

Ces différents scores peuvent être résumés comme suit dans un autre tableau présenté ci-dessous:

Tableau 5: Résumé des résultats DEA-Efficience technique-Modèle CCR et BCC- Echelle.

	Moyenne		Ecart-type		Minimum		Maximum
Rendement d'échelle constant- modèle CCR							
Globale	0.804		0.1408		0.411		1
Rendement d'échelle variable- modèle BCC							
Globale	0.879		0.1398		0.472		1
Echelle							
Globale	0.910		0.1069		0.597		1
Type de Rendement							
	Croissants		Constants		Décroissants		
	nombre	%	Nombre	%	nombre	%	
Globale	21	44.68	19	40.43	7	14.90	

Source: auteur

Globalement, l´efficience implique pour une entreprise que les moyens disponibles soient utilisés au mieux, et que les combinaisons productives optimales soient prises (Nzongang, 2011)[5]. Dans l'ensemble, les MC² de l'échantillon ont des performances moyennes de 80.40% et de 87.90% respectivement lorsque les hypothèses de rendements d'échelle constants et de rendements d'échelle variables sont avancées. Ce résultat suppose qu'en moyenne, sous l'hypothèse de rendement d'échelle constant, ces IMF auraient pu obtenir le même niveau d´output en réduisant de 19,60% (100% - 80,40%) la quantité d´inputs utilisés. Ces scores sont supérieurs à ceux trouvés par Kobou et al en 2010 sur les IMF du réseau CAMCCUL (40.10% et 57.50%) et inférieurs à ceux de Nzongang et Kamdem en 2013 sur les IMF du réseau MC² (87.55% et 91.79%). Notons cependant que ces valeurs moyennes dissimulent une grande divergence de scores au sein de l'échantillon. En effet, selon le modèle CCR, l'efficacité la plus faible est de 41.10% et de 47.20% selon le modèle BCC. Notons aussi que près de 51.06% et 59.57% des IMF de l'échantillon (MC²) respectivement en REC et en REV ont des performances supérieures à la moyenne qui est de 80.40% en REC et 87.90% en REV. Il est aussi important pour nous de noter que dans l'ensemble, 36.17% (17 IMF/ 47) et 42.55% (20 IMF/47) des IMF de l'échantillon ont réalisé des performances de 100% sur toute la période de l'étude respectivement sous l'hypothèse des

[5] Selon Nzongang (2011), les méthodes d´efficience permettent de distinguer l´efficience allocative et l´efficience technique. Les entreprises allocativement efficientes sont celles qui choisissent les combinaisons de facteur les moins coûteuses, et offrent les combinaisons de produits les plus rentables. Les entreprises techniquement efficientes

rendements d'échelle constants et l'hypothèse des rendements d'échelle variables.

Concernant les types de rendement, le tableau 5 nous montre que 44.68%, 40.43% et 14.90% d'IMF évoluent respectivement en rendements d'échelle croissants, constants et décroissants. Ces trois aspects de rendements d'échelle peuvent s'expliquer ainsi qu'il suit:

Dans le cas des rendements d'échelle croissants, nous constatons que la production de 21 IMF du réseau des MC² varie de façon plus importante que la variation des facteurs de production utilisés. La production d'une unité supplémentaire s'accompagne alors d'une baisse du coût unitaire, et la même quantité de facteurs permet de produire plus. On parle dans ce cas-là *« d'économie d'échelle »*. En ce qui concerne le cas des rendements d'échelle constants, 19 IMF du réseau ont une production qui varie dans la même proportion que celle des facteurs de production utilisés. Le coût reste lui aussi constant. Pour le cas des rendements d'échelle décroissants, nous avons 7 IMF dont la production varie de façon moins importante que la variation des facteurs de production utilisés. Ceci signifie que le coût marginal va en s'accroissant (plus on produit et plus il est coûteux de produire une unité supplémentaire) ou qu'il faut plus de facteurs pour produire une unité. Lorsque les rendements deviennent négatifs, on parle de *«gaspillage d'échelle» ou «déséconomie d'échelle».*

Les scores d'efficience ainsi obtenus et analysés, il est question à présent de procéder à la conclusion et aux recommandations qui découlent de l'étude.

V. Conclusion et Recommandations

Produite sur l'un des plus importants réseaux de micro finance au Cameroun, l'étude évalue les niveaux d'efficience des IMF en combinant à la fois l'aspect social (ciblage des pauvres) et l'aspect financier (pérennité financière). Les analyses montrent que les IMF du réseau des MC² sont caractérisées par une diversité des niveaux d'efficacité. Ces IMF présentent globalement un niveau d'efficience technique moyen de 80.40% et de 87.90% respectivement lorsque les hypothèses de rendements d'échelle constants et de rendements d'échelle variables sont avancées. Ceci nous pousse à dire qu'en moyenne, toutes les IMF de l'échantillon ont de bons résultats. Ces résultats rejoignent ceux de Nzongang et al (2012) et de Nzongang et Kamdem (2013). Il est aussi important pour nous de noter que dans l'ensemble, 36.17% (17 IMF/ 47) et 42.55% (20 IMF/47) des IMF de l'échantillon ont réalisé des performances de 100% sur toute la période de l'étude respectivement sous l'hypothèse des rendements d'échelle constants et l'hypothèse des rendements d'échelle variables.

La principale information que nous avons obtenue par DEA était les scores d'efficience relative. Ces scores nous ont permis de procéder à un classement des IMF selon qu'elles étaient efficientes ou non. Notre première recommandation serait de procéder à ce classement de façon régulière, par exemple, à chaque fin d'exercice. Utiliser sur des années successives, l'évolution des scores donnerait une idée des progrès enregistrés pour chaque IMF. Les managers doivent également appliquer la méthodologie DEA à l'ensemble du réseau afin d'avoir une vue globale de l'efficience des IMF le constituant. Les limites de cette étude, qui pourront constituer les pistes de recherches futures, sont liées au dynamisme de l'étude carcompte tenu des données disponibles, notre étude n'a été faite que sur la base des données de l'année 2009 ; pourtant une étude dynamique sur plusieurs années aurait été très riche d'enseignements. Nous avons aussi et surtout à la difficulté d'obtenir les informations sur les états financiers des institutions de microfinance.

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Factors Affecting Credit Card Use in Bangladesh

By Md. Mamunur-Rashid & Md. Imdadul Islam
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Abstract- The credit card industry in Bangladesh is seeing an increasing number of users for the past few years. This paper studies the reason behind the using behavior of customers of credit cards. The paper starts with a brief description credit card and how it developed worldwide and came to Bangladesh. It also discusses the current situation of the credit card industry in the country. After that some literary works were explored to get an idea on what studies have been done on this industry. These works guided the works done in this study. The latter part discusses the data collection and analysis to conduct the research. The paper used two types of analyses to study the credit card use in Bangladesh. Before that it tested the usability of the data collected and filtered. After that, it identified components like convenience, social status, attributes of the credit card and additional benefits provided as some key factors affecting the users' perception and using behavior. It also examines the effect of demographic variables on the using behavior of the customers of credit card. As a whole, the paper studied the using pattern of Bangladeshi customers regarding the continuity of using credit cards.

Keywords: *credit card, convenience, social status, using behavior, perception.*

GJMBR-C Classification: *JEL Code: F65*

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Factors Affecting Credit Card Use in Bangladesh

Md. Mamunur-Rashid [α] & Md. Imdadul Islam [σ]

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Chapter 1

I. Introduction

a) Background of the study

Technology has brought about revolutionary changes not only in the favor of checks but also in the favor of cash. This change is introduced as the E-money or Electric money. The first form of electric money was Debit Card. ANZ Grind lays Bank (now Standard Chartered) first started acquiring international card brands like MasterCard and Visa Card back in 1989 through a limited Merchant Network. It also became the first bank to issue MasterCard and Visa credit cards in this country on January 1, 1997. Nowadays, all major banks provide this invaluable service.

A credit card allows consumers to purchase products or services without cash and to pay for them at a later date. A credit card is not just a plastic card but the benefit it provides to the customer is doubtlessly outstanding. A credit card is a secured way of transaction and also it is very easy for the users. It almost became past when people used to carry a bulk amount of money to purchase any expensive things. To qualify for this type of credit, the consumer must open an account with a bank or company, which sponsors a card. They then receive a line of credit with a specified dollar amount. They can use the card to make purchases from participating merchants until they reach this credit limit.

In recent years banking industry in Bangladesh has been experiencing a dramatic growth. Use of credit card, a product of banks, is a relatively new phenomenon in Bangladesh, and its market has been growing rapidly with the increasing acceptability of plastic money in numerous outlets.

A credit card offers a lot of facilities to the users. The dual currency credit card has reduced the pain that we had to take before the innovation of credit card. It is a bit problematic to carry the loads of foreign currency while roaming abroad. The dual currency credit card allows the foreign currency part of the credit card will be connected to this entitlement, provided the necessary dollar endorsement had been made on the passport by own bank. Checking into good hotels also got lot easier than before as a credit card is generally required as a guarantee during stay at hotel.

Along with the good sides there are also some bad sides regarding uses of credit cards. First of all a thief can easily steal the credit card if we do not look an eye on it properly. If anyone steals it and we do not notice then he can use it anywhere he wants. Though there are ways to make the card disable for the stealer for which we have to inform it to that particular bank. Most of the banks keep a 24/7 service for managing credit card. Although there is a microchip embedded on the credit card that secures the transaction for a customer. But in the big shopping malls the agents who are expert in copying those pin numbers.

However, these are the things associated with using a credit card. Despite this research attempted to find out more from the user by following specific manner.

b) Research Question

- What are the main things that drive people to use credit cards?
- How convenient credit cards are for the users?

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- Does demographic factors (age, gender, occupation etc.) have any effect on the use of credit card in Bangladesh?

c) *Research Objectives*

- To find out the main reasons those attract people to use credit cards.
- To see how convenient using credit card from the perspective of Bangladesh.
- To find what are the main causes that drives people using cash rather than credit card.

d) *Limitations of the study*

- The corporate sectors are not always cooperative enough to disclose their information. For which we could not reach as much respondents as expected.
- Enough data could not be collected within given time-frame.

Chapter 2

II. Literature Review

There are few papers and publications regarding the credit card in Bangladesh. However, those are not enough. Various banks are offering different credit cards to the people having various facilities in Bangladesh. Still some people show negative attitudes toward the credit card like insurance policies.

Over the last couple of years, the number of credit card users have risen tremendously. The way in which the utilization of credit card has developed is exponential as opposed to straight in our nation and around the world (Furnham & Argyle, 1998). As a result, concerns are being raised that it could cause widespread financial difficulties and default among households who might struggle to keep up with their repayments (May, Tudela, & Young, 2005).

The credit card loan service is gaining popularity quickly in higher, middle and even lower class of the nation. The users of credit card feel safer and comfortable in carrying a single piece of plastic card rather than carrying a bundle of money with all the time (Huq, 2011). Bangladesh Bank Statistics shows the contemporary usage has risen and the advances made by the Islamic Banks, Private Banks, on December 2011, Foreign Banks along with State-owned Banks have summed Tk. 1,769.59 corers, and the number of credit cards has risen to to 5.51 lac (Bangladesh Bank, 2011). Farukh (2009) revealed that in December 2008 the number of credit card holders was 4.02 lac and the advances made by then credit card offering Banks were Tk. 489.51 corers. It is a very stern revelation though that the average number of credit card users has risen by about 46% every year from 2008 to the end of December 2011, however, the annual growth rate for advances rose for the same period by a seemingly unbelievable 120%, in comparison to the annual average growth rate between 2004 to 2008 was for local Banks 64.2% and Foreign Banks 20.4% giving an overall rate of 36.1% (Farukh, 2009). This is one of the most important stories swirling around the credit card industry worldwide right now that concerns debt (Andrew, 2014) (Bacchetta & Gerlach, 1997).

The worldwide data suggest that almost all individuals in the U.S. are habituated to making the indiscreet use of credit card that results in overwhelming debt. According to the latest statistics of the U.S. Census Bureau, 2010, U.S. citizens have over $886 billion in credit card debt and the figure is expected to rise to $1.177 trillion Americans are accrued by over $48 billion in new credit card debt, 424%more than what they incurred in 2010 and 577% more than what they incurred in 2009 (Matthews, 2012).

In the UK, approximately 24.5 million transactions worth $2.85 billion are spent on credit cards per day (www.creditaction.org.uk). Jaing(2006) has found that credit card use varied considerably with age of the consumers. It is very often considered that people at their young age are more impulsive and inexperienced and indulge more in adventurous activities than they are grown up. As a result, they fall victim to debt. The contemporary research base indicates that people having less income use credit card more than people having higher income and they run into financial difficulties and debt.

Farinha (2014) found that the debt burden ratio increases for lower income households but decreases from a higher level of income onwards. The extreme liberalization of the financial industry is linked to the increased availability of debt products and it helps to provide the money that fuels immediate consumption, a shift from deferred gratification, where one might have saved before purchasing a good Lury. It's conceivable to see the quality of this contention by and by when it is seen that credit card organizations make the facilities effortlessly and very accessible working with the rationality of pay-flex 'purchase now, pay later'. It is claimed that financial services industry is not simply meeting the demand for debt, but it is part of a process which is encouraging debt. This excessive liberalization of financial services and aggressive encouragement of uptake of credit facilities by the banks and other financial institutions may be attributed to a positive link between consumption behavior and credit growth (Bacchetta & Gerlach, 1997).

They (Bangladesh Bank, 2011) found that credit growth has a significant positive impact on consumption growth, and credit availability affects saving behavior. They also show that household debt ratio is negatively correlated with the saving rate, with the saving rate declining and the household debt ratio rising between 1975 and 2005. This is consistent with other studies which strongly suggest that there is

a positive link between consumption behavior and credit growth (Maki, 2000). The causative factor for the customer over-indebtedness due to credit card debt was primarily thought to be as a result of quick interest accumulation throughout the repayment period of the balance (Golmant & Ulrich, 2007). Furthermore, the other important element that has created a rise in over-indebtedness is the stickiness of credit card interest rates (Calem & Mester, 1995), which changes a little, though interest rates for other bank products rise or fall, and thereby the credit card operation earns a very high return in the banking industry at large, which is not at all a good news for the card users. The Federal Reserve's Survey of Consumer Finances (Soong 2008) claims that more than three out of every four American families now-a-days are in debt.

Chapter 3

III. Methodology

The main purpose of this chapter is to present the information to let the reader understand all the steps and processes taken to conduct the study. Both primary and secondary sources of information were used.

Primary data were collected from the credit card users in Bangladesh. This study covered students, job-holders, self-employed, military people, homemakers and retired persons for collecting information. There were 15 items in the questionnaire as independent variables. Sixty-nine credit card users were interviewed with the help of a structured questionnaire. A structured questionnaire within a 5-point scale was developed for the items affecting the credit card users. A five-point scale ranging from 1 to 5 with 1 indicating strongly disagree and 5 indicating strongly agree was used in the questionnaire. An online version of the question was prepared to reach more respondents. This study identified items or variables that affect the credit card users through literature review. A major part of the study was done with help of some existing papers and articles regarding this.

The study covers some reliability and appropriateness tests before the analyses. Along with Factor analysis, Stepwise Regression was used to analyze the data. Principal Component Analysis was conducted to identify the factors concerning the credit card users in Bangladesh. The analyses were done with the help of Microsoft excel and SPSS data analysis software.

Chapter 4

IV. Analyses

a) Reliability and Appropriateness tests

The data set went through some reliability test before being analyzed. The Cronbach's α was used to determine the extent of coherence among the variables. The standard cutoff rate for Cronbach's α is 0.60. Here, we have used a cutoff rate of 0.4, considering this region of the world. The values for the factors are:

Factors	Cronbach's α
Convenience	0.53
Special purpose use	0.4
Credit card attributes	0.56
Status	0.78

This indicates that the variables are perfect for using where 'Special purpose use' has the lowest value and 'Status' has the highest value.

The second reliability test was done to measure the appropriateness of the variables to be used for factor analysis.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.65
Bartlett's Test of Sphericity	Sig. 0.00

Here, the KMO value is 0.65 which by exceeding 0.60 (Hair et al., 2006) proves the factor analyses' usefulness to analyze the data. On the other hand, the Bartlett's Test of Sphericity shows a value less than 0.05 proving that the dataset is perfect for factor analysis. So, the variables in this dataset are enough correlated for the analysis.

b) Factor Analysis

The factor analysis was done to identify the principal components affecting the credit card use in Bangladesh. Each identified principal components represent some variables. The analysis was done through Principal Component Analysis (PCA) using varimax rotation. The KMO value and Bartlett's Test of Sphericity have already proved the appropriateness of the data. However, during the analysis some of the variables were loaded on multiple factors for which those variables have been removed from the data set. The variables were- Use of multiple credit cards, Difficulties arisen from using credit card and Control over expenditure. From the remaining data four

components were found with Eigen values more than 1 and the data used were 69.18% of the total variance which is proves the sample used were pretty good. The following figure shows the important values for the analysis.

Principal components and variables	Factor loading	Eigen value	% of variance
Component 1: Convenience		1.359	13.587
Using credit card is more convenient than using cash	0.857		
Using credit card is a simple process	0.798		
Paying with credit card is more safe than paying with cash	0.315		
Component 2: Special purpose use		1.034	10.345
I use credit card for specific purposes only	0.841		
It is necessary to carry a credit card with me while travelling overseas	0.653		
Component 3: Credit card attributes		2.649	26.486
The size of my credit card is comfortable for me to use	0.779		
The additional benefits (discounts for specific payments) from the credit card are very useful	0.667		
Customer service policy of the credit card providers is very helpful	0.492		
Component 4: Status		1.876	18.758
Using credit card makes one feel wealthy and well-respected	0.866		
Using credit card makes one feel classy	0.909		

From this factor analysis, the variables have been grouped based on their correlation. Each of the components represent the variables under them and the factor loading shows how accurately the principal components are working as representatives of the variables.

c) Step-wise Regression

A stepwise regression analysis was done using 'I often use credit card' as the dependent variable. In the first model, component 1 from factor analysis was used as the independent variable, where 'Paying with credit card is safer than paying with cash' is the predicting variable with a R^2 of 0.085.

The second model used both component 1 and component 2 as independent variables where the predicting variable turns out to be 'It is necessary to carry a credit card with me while travelling overseas'. The third model adds the 'Age' variable with the previous two components. The introduction of age did not bring any change as the predicting variable stays the same as it was at the second model.

The fourth model takes component 1, 2, 3 and 'Age' as independent variables and the predicting variables for this model are 3- 'Customer service policy of the credit card providers is very helpful', 'Age', and 'The size of my credit card is comfortable for me to use'. The fifth model takes 'Sex' of the respondents into account and the predicting variable does not change from the fourth model.

In the sixth model, component 4 is added and the predicting variables are changed into the following two- 'Customer service policy of the credit card providers is very helpful' and 'Using credit card makes one feel classy'. This proves the effect of component 4 on the use of credit card. In the seventh and eighth model 'Occupation' and 'Marital Status' of the respondents were added respectively and both the model shows the same predicting variables as it was shown in the sixth model.

Variables	R^2	β	Predicting variable
Dependent variable: I often use credit card			
Model 1: Independent variable: Component 1	0.085	0.292	Paying with credit card is safer than paying with cash
Model 2: Independent variable: Component 1 Component 2	0.098	0.313	It is necessary to carry a credit card with me while travelling overseas
Model 3: Independent variable: Component 1 Component 2 Age	0.098	0.313	It is necessary to carry a credit card with me while travelling overseas

Model 4: Independent variable: Component 1 Component 2 Age Component 3	0.105	0.324	Customer service policy of the credit card providers is very helpful
	0.172	0.329 0.258	'Customer service policy of the credit card providers is very helpful', and Age
	0.228	0.268 0.263 0.246	'Customer service policy of the credit card providers is very helpful', 'Age', and 'The size of my credit card is comfortable for me to use'
Model 5: Independent variable: Component 1 Component 2 Age Component 3 Sex	0.105	0.324	Customer service policy of the credit card providers is very helpful
	0.172	0.329 0.258	'Customer service policy of the credit card providers is very helpful', and Age
	0.228	0.268 0.263 0.246	'Customer service policy of the credit card providers is very helpful', 'Age', and 'The size of my credit card is comfortable for me to use'
Model 6: Independent variable: Component 1 Component 2 Age Component 3 Sex Component 4	0.105	0.324	'Customer service policy of the credit card providers is very helpful'
	0.191	0.301 - 0.293	'Customer service policy of the credit card providers is very helpful' and 'Using credit card makes one feel classy'
Model 7: Independent variable: Component 1 Component 2 Age Component 3 Sex Component 4 Occupation	0.105	0.324	'Customer service policy of the credit card providers is very helpful'
	0.191	0.301 - 0.293	'Customer service policy of the credit card providers is very helpful' and 'Using credit card makes one feel classy'
Model 8: Independent variable: Component 1 Component 2 Age Component 3 Sex Component 4 Occupation Marital Status	0.191	0.301 - 0.293	'Customer service policy of the credit card providers is very helpful' and 'Using credit card makes one feel classy'

Chapter 5

V. Discussion and Conclusion

The study has identified 4 major components affecting the use of credit card in Bangladesh. The components focus more on the general use of credit card rather than the features (interest rate, deposition amount etc.) of it. The study has looked into the continuity of using a credit card by an individual which led to factors like- Convenience, Special purpose use, Credit card attributes and Status. Based on reliability tests and factor analysis the initial data from the questionnaire were filtered. The regression was done to identify the effect of the 4 components and demographic variables on the regular use of credit card. The result shows that only the age of the respondents has a slight effect, the other demographic variables does not drive the behavior regarding the use of credit card. However, some of the variables under the 4 components have major impact on the using behavior of credit card. In this way, the two types of analysis answered the research questions of the research.

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Corporate Governance and Intellectual Capital on Financial Distress

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Abstract- This study is conducted to examine the effect of corporate governance and intellectual capital on financial distress. Corporate governance in this study refers to the measurement of the effectiveness of the board of commissioners developed by The Indonesian Institute for Corporate Directorship (IICD) whereas Intellectual capital is proxy by using efficiency human capital, structural capital, relational capital, and capital employed. The measurement of financial distress uses the Altman Z-Score Modification Model. This research used multiple linear regression. The population is wholesale and retail trade sub-sector companies listed on the Indonesia Stock Exchange (IDX)during 2015-2017. This study used 96 observational data for 3 years. The results show Corporate Governance, Relational Capital Efficiency (RCE), and Capital employed efficiency (CEE) does not affect financial distress. However, Human Capital Efficiency (HCE), and Structural Capital Efficiency (SCE) could be affects financial distress.

Keywords: *corporate governance, intellectual capital, financial distress.*

GJMBR-C Classification: *JEL Code: P45*

Strictly as per the compliance and regulations of:

Corporate Governance and Intellectual Capital on Financial Distress

Yenny Dwi Handayani [α], Diah Iskandar [σ] & Ewing Yuvisaibrani [ρ]

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Keywords: corporate governance, intellectual capital, financial distress.

I. Introduction

The purpose of establishing a company is to earn profits which will later be used to maintain the survival of the company. Along with the development of increasingly rapid economic activities, there is unavoidable competition among companies. Many ways can be taken by companies to have competitive advantages and one of which is to make product innovations produced so that it is not monotonous. The product produced must have different characteristics and specifications than competitors. Business threat cannot be avoided if the company cannot compete with other companies, the worst risk is bankruptcy. There are many factors causing the bankruptcy of a company, e.g., factors internal and external. One example of the internal factors is the difficulty of the company to pay off its obligations and losses experienced by the company. Financial distress is a sign that companies are in a state of bankruptcy (Rahayu, Suwendra, & Yulianthini, 2016).

Generally, bankruptcy in companies is caused by the inability to manage the business so that the company experiences a decrease in earning. When this condition cannot be overcome, the company will be in financial distress. One of the problems related to financial distress is the retail sector in Indonesia. Only a few retail outlets fell at the end of 2017, but the accumulation of the layered impact of the cessation of shop operations on the national economy can be problematic to account for in plain view. *Institute for Development of Economics and Finance*(INDEF)as quoted byAdhinegara, Huda, & Adha (2018)concerned that closing retail outlets could cause the contribution of the retail sector to economic growth to shrink. Based on data from the Indonesian Central Statistics Agency/Badan Pusat Statistik (2017), the retail sector provided a portion of around 13.03 percent of Gross Domestic Product (GDP) in the first semester of 2017 or became the fourth largest contributor after the processing, construction and information and communication industries.

The 7-Eleven's conditions deteriorated further proven by the increasing losses experienced by the company in 2015 in which 7-Eleven suffered a net loss of 54.7 billion Rupiah, in 2016 there was an increase in losses experienced by the company to 638.72 billion Rupiah. Signs of the 7-Eleven decline are becoming more apparent. During the first three months of 2017, ModernInternational. Tbk has suffered a net loss of 447.93 billion Rupiah. Not surprisingly, the company continues to make efficiencies by closing 30 outlets before making a final decision to stop the operations of all remaining outlets on June 30 (KataData.com, 2017).

For a company to be sustainable, companies can implement good corporate governance. *Corporate governance* as a form of good corporate management has an important element which consist of *Transparency*, *Accountability*, *Responsibility, Independency, and Fairness*(Muhammad, 2009). Implementation of good corporate governance will affect the costs and benefits obtained in the long term (Lukviarman, 2016). So, it is very important for companies to improve corporate governance implementation that the problems faced by companies related to poor financial conditions can be immediately known early.

In his research (Emirzon, 2006) states that corporate governance implementation in companies has an impact on performance improvements up to 30%, and companies will also avoid unfavorable conditions. Also, good corporate governance can improve the company's image in the eyes of the public, increase productivity, increase customer satisfaction and gain the

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trust of investors. The research conducted by Nuswandari (2009) states that companies with good governance will have more efficient operational performance. Effective and efficient management can reduce capital costs and also minimize risk. This action will produce high profitability. The study was not in line with the research conducted by Juniarti & Ellen (2013)stating that GCG scores were consistently unable to predict a company experiencing financial distress. GCG in a company is only a formality that is not supported by efficient performance.

Another way that can be used to minimize risk that involves financial distress is *intellectual capital*. The resources owned by the company are not only tangible assets in the form of land, buildings, machinery, raw materials, etc., but also include intangible assets called intellectual capital. When the source of the tangible assets is increasingly scarce and difficult to find, the management of the company must think of other ways to use intangible assets in the form of intellectual property.

Intellectual capital is an intangible *asset* which is believed to be able to help the sustainability of the company therefore, avoiding *financial distress*(Septivani & Agoes, 2014). Intellectual capital plays a significant role in creating added value for companies that will later improve the performance of companies to be able to provide a competitive advantage from a company. The intellectual capital mechanism in this study is *Human Capital Efficiency (HCE), Structural Capital Efficiency (SCE), Relational Capital Efficiency (RCE), and Capital Employed Efficiency (CEE)*. Human capital efficiency shows the ability of human resources to create value in the company, Structural Capital Efficiency (SCE) is a facility and infrastructure that supports employees to produce optimum performance, Relational Capital Efficiency (RCE) is a good relationship between companies and stakeholders, and Capital Employed Efficiency (CEE) is a calculation of efficiency of physical and financial capital.

Based on previous studies, Septivani & Agoes (2014) states that intellectual capital hurts financial distress. The company's performance will increase when intellectual capital is managed, so that the company avoids the risk of bankruptcy and is in a healthy condition. This is in line with the research of Ananto, Mustika, & Handayani (2017) stating that intellectual capital hurts financial distress. Its shows that managing of intellectual capital, financial distress in the company will decrease, whereas the poor management of intellectual capital will increase financial distress. This condition is due to the decrease in performance from human resources resulting in a decline in company performance. Continuous improvement should be fulfilled so that the company can avoid the risk of financial distress. Financial distress is the initial stage before the company goes bankrupt. On the other hand, the research conducted by Bakshani (2014) states that the component of intellectual capital is not the right predictor of predicting bankruptcy.

Based on the inconsistencies of the previous research, the researcher wants to reiterate the factors that influence financial distress, including corporate governance and intellectual capital. This study uses corporate governance variables that are proxied by the measurement index developed by IICD, whereas previous studies used more corporate governance mechanisms.

II. Literature Review and Hypotheses

a) Agency Theory

Agency theory is a theory that states the relationship between agents and principals where one party has more information than the other (Jensen & Meckling, 1976). There is imbalance information owned by the principal and agent. Information about companies is more owned by agents than principals, it will lead to information asymmetry. The opportunistic nature of the agent has a bad influence on the company. The amount of information an agent has will be used to commit fraudulent actions against the company, namely manipulating financial statements.

Jensen & Meckling (1976)states there are two ways to reduce the likelihood of agents acting adversely, including primary monitoring, and limiting the actions of the agent (bonding). Monitoring is an effective way to reduce an agent's opportunistic behavior, so that the conflict of interest between the agent and the principal decreases. Monitoring carried out is internal monitoring specifically the board of commissioners and the audit committee. Monitoring carried out can prevent companies from the risk of bankruptcy or financial distress.

b) Financial Distress

Financial distress is the stage of the decline in financial conditions that occurred before bankruptcy or liquidity. According to another definitions, financial distress is a situation where a company has difficulty fulfilling its responsibility, a situation in which a company's income cannot cover total costs and incur losses (Hery, 2017: 33). The condition of financial distress can occur in various companies and can be a sign/signal that the potential for bankruptcy may be happening(Dwijayanti, 2010).Thus, it can be concluded that financial distress is a sign of the company's inability to fulfill its responsibility.

c) Corporate Governance

The Organization for Economic Cooperation and Development (OECD, 1999) states that Corporate Governance is a system that brings together various elements of the organization (board of commissioners, managers, shareholders, and stakeholders) with rules

and procedures for decision making designed to achieve organizational goals.

Along with this concept, there are several insights to clarify corporate governance. According to Lukviarman, (2016a), the role of corporate governance becomes very important in empowering companies to be more competitive. The implementation of CG will be increasing the ability of companies to access international capital markets. Besides, it will also produce governance outcomes that are expected to increase competitiveness and company access to funding sources at the global level. Realization of governance outcomes is an increase in firm performance, so it is very clear that the optimal governance system in the company of course the company will avoid the risk of bankruptcy.

Corporate governance is a set of rules that regulate the relationship between various parties in the company concerning rights and obligations and to achievethe interests of shareholders in the long term which of course, takes into account the interests of all parties (Anggraini, 2013).

In this study Corporate Governance (CG) uses the commissioner effectiveness proxy released by the Indonesian Institute for Corporate Directorship (IICD). The characteristics of the board of commissioners are obtained from the information available in each company's annual report. The effectiveness of the board of commissioners consists of 21 questions which are grouped into 2 subcategories e.g. Qualification and Composition of the Board, and the Activities of the Board.

d) Intellectual Capital

Some researchers provide diverse definitions of intellectual capital. Thomas A. Stewart (1997)defines intellectual capital as the sum of everything in a company that can help a company to compete in the market, (including knowledge, information, experience, and intellectual property) that can be used to create prosperity.Brooking (1998) states that intellectual capital is a term given to a combination of intangible assets, intellectual property, employees, and infrastructure that allows companies to function. In the definition put forward by Brooking (1998) it is very clearly that intellectual capital is not just about human capital.Human capital is only one component of intellectual capital. Intellectual capital plays an important role in creating added value for companies that will improve firm performance to be able to provide competitive advantage (Ananto et al., 2017).

e) Corporate Governance and Financial Distress

The application of corporate governance in the company can reduce the emergence of agency problems between principle and agents so that it can reduce the incidence of the worst risk, namely the bankruptcy of the company (Hanifah & Purwanto, 2013). The principle of transparency and accountability in corporate governance certainly provides early supervision of the emergence of all types of fraud so that the company can avoid the risk of bankruptcy or financial distress.

Research conducted by Nuresa et al. (2013) states that corporate governance which is proxied with the knowledge of audit committees has a significant negative effect on financial distress. The existence of an audit committee that has the required competencies is expected to perform its role well in controlling and supervising the company's performance so that the number of companies experiencing financial distress can be reduced. Research conducted by Wang & Deng (2006), corporate governance hurts financial distress. The better the implementation of corporate governance in a company is, the lower the risk of bankruptcy or financial distress.

H1: Corporate Governance has a negative effect on Financial Distress

f) Human Capital Efficiency (HCE)and Financial Distress

Human Capital Efficiency (HCE) is a comparison of *value-added* (VA) with human capital. HCE shows how much VA is formed by expenditures incurred for labor. The company is said to be efficient if the HCE value is high, meaning that the company utilizes its human resources well. HCE is an added value of efficiency from human capital (HC) which includes human resources, knowledge, and skills possessed by employees. Employees will be motivated to give their best performance by providing compensation in the form of salaries and benefits, besides empowering human resources through training and developing, employees are also an effective way to improve company performance (Jeneo, 2013). Thatway, the possibility of financial distress will besligter.

Research on *intellectual capital* conducted by Septivani & Agoes (2014) states that intellectual capital hurts financial distress. Its means that the better and efficiency in the management of intellectual capital the better the performance of the company becomes, this avoids the risk of bankruptcy and the financial condition of the company in a healthy state.

H2: Human Capital Efficiency has a negative effect onFinancial Distress

g) Structural Capital Efficiency (SCE)and Financial Distress

Structural Capital Efficiency (SCE) is a contribution of structural capital (SC) in value creation. Structural capital is an infrastructure owned by a company to meet market needs, such as system technology, operating systems of companies, patents, trademarks, and training courses. Structural capital is a supporting tool for *human capital* in improving company

performance (Putra, Herawati, & Wahyuni, 2017). The higher the SCE is, the higher the contribution of SC will be in creating company value so that the company's performance will also increase which in turn will prevent the company from financial distress.

H3: Sructural Capital Efficency has a negative effect on Financial Distress

h) Relational Capital Efficiency (RCE)and Financial Distress

Relational Capital Efficiency (RCE) is an added value of the efficiency in using relational capital (RC). This element provides real value for the company. RC is a good relationship the company has with its partners which includes suppliers, customers, the government, and the community around the company (Fajarini & Firmansyah, 2012). The higher the RCE is, the higher the contribution of RC will be in creating company value and the less likely it is for the company to experience financial distress.

H4: Relational Capital Efficiency has a negative effect on Financial Distress

i) Capital Employed Efficiency (CEE)and Financial Distress

Capital Employed Efficiency (CEE) is an indicator for VA created by a unit of *physical capital*. CEE illustrates how much VA is generated from physical capital used. The opportunity to create innovation for the products produced will be more open if the company can manage its sources of equity funds well and efficiently. Pulić (2000), when company resources create innovations that can improve returns better than other companies, the company already has a competitive advantage. Better use of CE is part of the company's intellectual capital.

H5: Capital Employed Efficiency has a negative effect on Financial Distress

III. Research Methodology

This study used a sample of sub-sector wholesale and retail trade companies listed on the Indonesia Stock Exchange in 2015-2017, sampling using purposive sampling. The criteria used are as follows:

1) Wholesale and retail trade companies consistently make annual reports for the 2015-2017 period.
2) use a rupiah currency unit.
3) have complete data about the variables under study.

a) Measurement

The dependent variable in this study, *financial distress,* is a situation where a company has difficulty fulfilling its responsibility, a situation in which the company's income cannot cover the total costs and suffer losses (Hery, 2017: 33).

Financial distress can be measured using the Altman Z-Score model. The Altman Z-Score model used in this study is the Modified Altman Z-Score Model (1995).

$$Z'' = 6{,}56X1 + 3{,}26X2 + 6{,}72X3 + 1{,}05X4$$

Notes:
Z'' = Overall Index
X1 = Working Capital/Total Assets
X2 = Retained Earnings/Total Assets
X3= Earnings Before Interest and Taxes/Total Assets
X4 = Book Value of Equity/Total Liabilities

b) Corporate Governance

Corporate governance is a process and structure applied in running a company with the prime goal of increasing shareholder value in the long term while taking into account the interests of other *stakeholders*, measuring the practice of *Corporate Governance* (CG) in this study referring to the Board of Commissioners' effectiveness measurement conducted by *The Indonesian Institute for Corporate Directorship* (IICD). The characteristics of the board of commissioners come from information available in the *annual report* of each company.

The measurement of *Corporate Governance* (CG) in this study refers to the measurement of the effectiveness of the board of commissioners conducted by *The Indonesian Institute for Corporate Directorship* (IICD). To measure the effectiveness of the board of commissioners consists of 21 questions which are grouped into 2 categories, namely: *Board Qualification and Composition, Board Activities*.

Each question will consist of 3 ratings:
Good = value 3 if each criterion is met
Fair = value 2 if only a number of criteria are met
Poor = value 1 if no criteria are met

After obtaining a score for each question, the score for the board of commissioners is obtained by summing the total score for each characteristic then divided by the maximum score.

c) Intellectual Capital Measurement

i. *Human Capital Efficiency*

HCE is an indicator of efficiency in *human capital* added value. HCE is the ability of a company to produce the added value for every rupiah spent on human capital. This model begins with calculating. Value-added (VA) is the most objective indicator to assess business success and show the company's ability to create value (Poetri, 2015).Value Added is calculated by the following formula (Pulić, 2000).

$$VA = OUT - IN$$

Notes:

OUT: *Output* (total sales and other income)

IN: *Input* (Selling expense and other income than employee expense).

HCE is used to see how much spent on labor can be generated with funds. The formula for calculating it is (Pulić, 2008):

$$HCE = \frac{VA}{HC}$$

Notes:

VA: *Value added* (OUT – IN)

HC:Total employee expenses including training

ii. *Structure Capital Efficiency (SCE)*

SCE is an efficiency indicator of added value in structural capital (SC). SCE is used to measure the number of SCs needed to produce one rupiah from VA, an indication of how successful the SC is in value creation. SCE is calculated by the following formula(Pulić, 2000):

$$SCE = \frac{SC}{VA}$$

Notes:

VA: *Value added* (OUT – IN)

SC: VA – HU

iii. *Relational Capital Efficiency*

Relational Capital Efficiency (RCE) is a value-added efficiency in the use of relational capital. RCE is a good relationship between companies and different external stakeholders, including elements such as customers, distribution networks, business collaboration, franchise agreements, and so on (Suhardjanto and Wardhani, 2010). RCE is used to see how much value-added the company makes every one rupiah invested in marketing costs.

Relational Capital is proxied by marketing costs. RCE is calculated by the following formula (Ulum, 2017):

$$RCE = \frac{RC}{VA}$$

Notes:

VA: *Value added* (OUT – IN)

RC: Marketing expenses

iv. *Capital Employed Efficiency (CEE)*

CEE is an indicator of the efficiency of value added capital used. CEE shows how much company added value is generated from the capital used. The efficiency of the capital used can be obtained in the following ways (Pulić, 2000):

$$CEE = \frac{VA}{CE}$$

Notes:

VA: *Value added* (OUT – IN)

RC: Marketing expenses

IV. Results and Discussion

From the results of testing for normality with the *Kolmogorov Smirnov non-parametric* statistical test, it shows that the significant value is still below 0.05, meaning that the residual data are not normally distributed. To deal with abnormal data, the researchers discarded outlier data with a range of values above 3. There were 13 observation data outliers, after the data was removed then Kolmogorov Smirnov's non-parametric statistical test was done with a significance value of 0.088 so that the residual data can be distributed normally.

Table 1: Normality Test

		Unstandardized Residual
N		83
Normal Parameters	Mean	.0000000
	Std. Deviation	7.12519971
Most Extreme Differences	Absolute	.137
	Positive	.127
	Negative	-.137
Kolmogorov-Smirnov Z		1.250
Asymp. Sig. (2-tailed)		.088

Table 2: Fit Model Test

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4979.221	5	995.844	18.419	.000[b]
	Residual	4163.015	77	54.065		
	Total	9142.236	82			

a. *Dependent Variable: FD*
b. *Predictors: (Constant), CEE, HCE, INDEXSCG, SCE, RCE*

In the F Test, the hypothesis will be tested by looking at the level of significance. If the significance value is below 0.05 then the hypothesis is accepted. The table above shows that the significance level is 0,000 below 0.05. It means that the model in this study is fit and can be used to predict the *Financial Distress* variable.

a) Hypothesis Test

The t-test is used to determine whether there is an effect of each independent variable on the dependent variable. It tested by comparing the t-statistic with value t-table. The results of the t-test can be seen in the table below.

Table 3: Regresion Result

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	6.390	5.495		1.163	.249
INDEXSCG	-11.693	8.569	-.108	-1.365	.176
HCE	3.214	.393	.645	8.185	.000
SCE	-5.201	1.955	-.212	-2.660	.010
RCE	180.653	97.407	.163	1.855	.067
CEE	.000	.002	-.008	-.092	.927

a. *Dependent Variable: FD*

b) The Effect of Corporate Governance on Financial Distress

In this study, corporate governance does not affect financial distress. The implementation of good corporate governance in the company does not necessarily prevent the company from the risk of bankruptcy. Many factors can cause bankruptcy in a company, one of which is decreased competitiveness. Corporate governance in a company is only limited to fulfilling the existing rules so that it is unable to predict financial distress in the company. So, the theory stating that the governance outcomes are the performance improvements is not confirmed in this study.

The results of this study are in line with Ananto et al. (2017) stating that corporate governance proxied by using institutional ownership variables, a board of commissioners, a board of directors, a board of commissioner size and board of directors size has no effect on financial distress. However, the results of this study are contradict with Emirzon (2006) which states that corporate governance implementation in companies has an impact on performance improvements of up to 30% and companies will also avoid unfavorable conditions. Furthermore, good corporate governance can improve the company's image in the eyes of the public, increase productivity, increase customer satisfaction, and gain the trust of investors.

The existence of the audit committee is expected to reduce agency conflict so that the quality of financial reports submitted to interested parties will increase and can be trusted so that it helps increase the firm value(Nuryana & Dwi Asih Surjandari, 2019).

c) The effect of Human capital efficiency on financial distress

In this study, the intellectual capital proxied by using human capital efficiency has an affectfinancial distress.The element of human capital efficiency is very important in an organization, the most valuable company assets are the people in the company related to the knowledge, skills, and experience they represent. If the assets are managed exactly, it will improve the company's performance and will avoid the risk of financial distress. Competent human resources are meaningless to the company if they are not properly maintained and managed. It is this management of resources that result in competitive advantage and increases the added value of the company (Ulum, 2017).

This research is not in line with Bakshani (2014) stated that intellectual capital does not affect financial distress and the component of intellectual capital is not

the right predictor of predicting bankruptcy. Septivani & Agoes (2014) states that intellectual capital has a negative effect on financial distress. It means that the better and more efficient management of intellectual capital, the better the performance of the company, this avoids the risk of bankruptcy and the financial condition of the sample company in healthy.

d) The effect of Structural capital efficiency on financial distress

In this study, the *intellectual capital* proxied by using structural capital efficiency has an affect financial distress. Structural capital (SCE) consists of databases, organizational culture, information flows, and strategies run by the company. SCE is the quality of the company that is related to the internal work culture (not the individual quality of employees). When companies can be optimal in utilizing structural capital (SCE), the company's performance can increase. SCE is one of the main drivers for companies to maximize the potential of the company's management.

Astuti (2005) states that if a company can codify knowledge and develop structural capital, for example implementing and developing great ideas, having systems and procedures that support innovation, competitive advantage will be achieved. These advantages will relatively result in higher business performance.

This research is not in line with Bakshani (2014) which states that intellectual capital does not affect financial distress and the component of intellectual capital is not the right predictor of predicting bankruptcy.

e) The Effect of Relational Capital Efficiency on Financial Distress

In this study, the intellectual capital proxied by using relational capital efficiency does not affect financial distress. Relational capital is one of the main components of intellectual capital that describes organizational wealth from the customer aspect. RC refers to knowledge that is inherent in marketing channels and customer relationships where an organization develops it through a business path (Ulum, 2017). A good relationship with the customer does not guarantee that the company will avoid the risk of financial distress. The company will avoid financial distress when the products produced are acceptable to consumers and companies have competitive advantages compared to other companies.

This study is not in line with Pour et al. (2014) founded that intellectual capital has a positive and significant influence on bankruptcy. It means that the greater the efficiency of intellectual capital by the company is, the greater the possibility of bankruptcy will be. Bakshani (2014) stated that the component of intellectual capital is not the right predictor of predicting bankruptcy.

f) The Effect of Capital Efficiency Employed on Financial Distress

In this study, the intellectual capital proxied by using employed capital efficiency does not affect financial distress. Because the utilization of the existence of assets owned by the company does not affect the creation or failure of innovations that are an added value for the company to be able to increase the financial performance that triggers *financial distress*. The size of *capital employed efficiency* does not directly provide an indication that the company will be bankrupt. On the other hand, the research conducted by Bakshani (2014) states that the component of intellectual capital is not the right predictor of predicting bankruptcy. The results of this study are inversely proportional to the research conducted bySeptivani & Agoes (2014)stated that intellectual capital has a negative effect on financial distress. Its means that the better and more efficient management of intellectual capital, the better the performance of the company, so that it will avoid the risk of bankruptcy.

V. Conclusions and Suggestions

a) Conclusion

Based on the results of data analysis and discussion of the effect of Corporate governance and Intellectual Capital proxied in human capital efficiency, structural capital efficiency, relational capital efficiency, and capital employed efficiency on financial distress in 2015 to 2017 large-scale trade and wholesale goods sub-sector companies.

In this study, corporate governance does not affect financial distress. Good corporate governance does not guarantee that the company is in a stable financial condition. Financial distress in the company can occur when the company is not able to maintain the existence of its business activities.

Intelectual capital proxied by using Human capital efficiency has an affect financial distress. Human capital efficiency is very important in a company. When a company has competent resources, of course it will have an impact on improving company performance.

Intelectual capital proxied by using Structural capital efficiency has an affect financial distress. SCE is the quality of the company that is related to the internal work culture. When companies can be optimal in utilizing structural capital (SCE), the company's performance can increase.

Intelectual capital proxied by using Relational capital efficiency (RCE) does not affect financial distress. Good relations with customers do not guarantee the company is in a stable financial condition. When the products produced by the company can be accepted by the market, the risk of financial distress can be minimized

Intellectual Capital proxied by using Capital employed efficiency (CEE) does not affect financial distress, because most companies in Indonesia, the process of innovation carried out by R & D and advertising is largely financed by debt. So that it can lead to the inability of the company to pay for the loan.

b) Suggestions

Based on the results of research on the topic of financial distress, suggestions for future researchers. The next researcher can use other proxies to measure financial difficulty variables. Then, can adding other independent variables in explaining corporate governance such as the characteristics of audit committee members for example from expertise in industry and finance, financial supervision, and expertise in certain industries. The next researcher can also expand the object of research by using companies other than large trade sub-sectors of production and retail goods, because the more the number of samples will affect the more accurate the results.

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Analysis of the Factors Affecting Banking Profitability in Bangladesh

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Abstract- The banking sector of Bangladesh is one of the major contributors to the Bangladesh economy with the commercial sector playing a vital role in the financial sector. This paper investigates the impact of bank-specific variables on bank profitability in Bangladesh from 2011-2017. For this purpose, the data of 30 banks are collected. Correlation, regression analysis and time series analysis are done with the collected data of the 30 banks. ROA is taken as representatives of bank's profitability i.e. this is the dependent variables. Non-performing loans, Loan to Deposit Ratio, Equity to Asset ratio and Interest Expense to Income ratio are taken as independent variables to find out what are the effects of these variables on profitability. From the correlation analysis, we have found that if LDR, NIE-INC and EQUITTA increase, ROA also increases. Whereas, increase in NPL results in decrease of ROA. We established one regression model in terms of profitability, considering the other variables as independent variables. This paper also mentions the current banking condition of Bangladesh and how important banking sector is, for its economy.

Keywords: *major contributor, bank profitability, ROA, NPL.*

GJMBR-C Classification: *JEL Code: E50*

Strictly as per the compliance and regulations of:

Analysis of the Factors Affecting Banking Profitability in Bangladesh

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Abstract- The banking sector of Bangladesh is one of the major contributors to the Bangladesh economy with the commercial sector playing a vital role in the financial sector. This paper investigates the impact of bank-specific variables on bank profitability in Bangladesh from 2011-2017. For this purpose, the data of 30 banks are collected. Correlation, regression analysis and time series analysis are done with the collected data of the 30 banks. ROA is taken as representatives of bank's profitability i.e. this is the dependent variables. Non-performing loans, Loan to Deposit Ratio, Equity to Asset ratio and Interest Expense to Income ratio are taken as independent variables to find out what are the effects of these variables on profitability. From the correlation analysis, we have found that if LDR, NIE-INC and EQUITTA increase, ROA also increases. Whereas, increase in NPL results in decrease of ROA. We established one regression model in terms of profitability, considering the other variables as independent variables. This paper also mentions the current banking condition of Bangladesh and how important banking sector is, for its economy.

Keywords: major contributor, bank profitability, ROA, NPL.

I. Introduction

After the independence, only few banks existed in Bangladesh: 6 nationalized commercialized banks (NCB), 3 state-owned specialized banks and 9 foreign banks. But after the introduction of private banks in 1980, the banking industry of Bangladesh developed significantly. At present, in total, 63 scheduled and non-scheduled banks are operating in Bangladesh.

Banking industry is a vital source of socio-economic development in our country. It forms the core of the money market and facilitated flow of fund by mobilizing resources for productive investments which in turn contributes to economic development. The financial sector of Bangladesh is mostly dominated by banks. Banks are still considered the most reliable for depositing one's savings or surplus. Banking sector contributes to a good portion of the GDP of Bangladesh. The banking sector was booming rapidly until the financial crisis of 2010, when it faced a huge loss. At present, growth of the banking sector in Bangladesh have declined by 1.22 percentage in the outgoing fiscal year 2017-2018 amid series of scams in the banking sector with growing number of non-performing loans. The sector's contribution declined to 10.54 percent from 11.12 per cent in 2018. If the banking industry's performance declines, or if it fails to function properly, this may affect other sectors and ultimately, the whole economy. There may be an economic downfall. Banks give loans to other sectors, businesses, startups, etc. so that these borrowers can use the borrowed money to continue their production, create new business opportunities and thus contribute to the economy. If banks fail to lend to these deficit units, these opportunities to produce and manufacture may fail. So, it is important for the banks to function properly and grow at the same time.

In this paper, we will come to know the determinants of a bank's profitability, what are the factors that determine whether a bank will flourish or fail. By knowing these factors, we might be able to take decisions regarding the strength or condition or financial position of a bank from its balance sheet.

II. Literature Review

Many researches have been conducted on the topic-profitability determinants of banks or factors that affect bank profitability based on banking sectors of different countries. There are also many articles on the same based on banks in Bangladesh. The factors of these researches have been both bank-specific and macroeconomic.

Researchers S Gul, F Irshad, K Zaman (2011) conducted their research on top 15 commercial banks of Pakistan over the period 2005-2009. In their study, they found out that size, loan, deposits, INF and GDP have a positive relationship with ROA, while capital and market capitalization (MC) have a negative relationship with ROA. They also found that size, capital, loan, deposits and GDP have a negative relationship with NIM, while INF and MC have a positive relationship with NIM.

M.S. Saeed (2014) conducted a research on the impact of bank-specific, industry specific and macroeconomic variables on bank profitability of 73 commercial banks in UK before, during and after the financial crisis of 2008(2006-2012). This study concluded that bank size, capital ratio, loan, deposits, liquidity, and interest rate have positive impact on ROA

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and ROE while GDP and inflation rate have negative impact.

A Dietrich, G Wanzenried (2011) in their study, analyzed the bank-specific, industry specific and macroeconomic factors affecting bank profitability of 372 commercial banks in Switzerland over the period from 1999 to 2009. The results were similar to the other researches done on this topic.

Similar researches have been done all over the world such as A Anbar, D Alper (2011) in Turkey, F. Sufian (2009) in Malaysia, T Olweny, TM Shipho (2011) in Kenya, Sufian and Noor (2012) in India, Liu and Wilson (2010) in Japan, Jaleel and Peng(2015) in Pakistan and many more.

Researchers of Bangladesh have also contributed to this topic. Md. Saimum Hossain and Faruque Ahamed in their study, investigated only the bank-specific factors affecting banking profitability from 2012-2016 and concluded that the earnings indicators, capital strength, and industry impact have positive relationship with ROE but NPL has a negative relationship with ROE. TIN, OPEX, and CAP have a positive relationship with net interest margin (NIM)where as NII has negative relationship.

M.M. Rahaman and Sharmin Akhter (2015) studied the bank-specific factors on Islamic banks' profitability over the period 2009-2013 including 8 Islamic banks of Bangladesh. They found that bank-size and deposit have significant negative impact on the return on assets (ROA), while equity is found to have positive significant impact. Loan and expense management are found to be insignificant in affecting the profitability of the selected banks.

III. Methodology

a) *Regression:* We used the econometric regression model mentioned below to run our multiple regressions. Using the collected data in our regression model, we will get our results.

$$Y = \alpha + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \varepsilon$$

Here,

Y= dependent variable/profitability of the bank/ ROA/ ROE/NIM

A = intercept of the y-axis

B_n= coefficient of the respective variables

X1 = NPL

X2= EQUITTA

X3 = LDR

X_4= NIE-INC

b) *Correlation:* The correlation analysis is also done by using MS. Excel. The data of 30 banks over 7 years are given as input and the strength and direction of the dependent variables due to the change in independent variable is found out.

IV. Data Used

In this paper, we analyzed the factors affecting bank profitability by running correlation, regression and doing time series analysis.

The required data for the correlation analysis, regression analysis and time series analysis are collected from the annual report of 30 banks currently operating in Bangladesh over the time 2011-2017. The required financial ratios are computed to represent the variables used for the analysis.

For the analysis, the following variables are taken into account:

Variables	Measure	Proxy
Dependent Variables:		
Return on Asset (ROA)	Net profit after tax/Total asset	Profitability
Independent Variables:		
Non-Performing Loans (NPL)	NPL/Total Loans	Asset Quality
Equity to Total Asset (EQUITTA)	Total Equity/Total Asset	Capitalization
Loan to Deposit Ratio (LDR)	Total Loans/Total Deposit	Liquidity Risk Management
Net Interest Expenditure to Income (NIE-INC)	Ratio of Expenditure to income	Cost efficiency

a) *Dependent Variable: Profitability*

As the dependent variable of our study, we have chosen two different measures that represent profitability, which are Return on Asset (ROA) and Return on Equity (ROE).

ROA: ROA of a company indicates how profitable a company is relative to its total assets or how efficiently a bank manages its assets/resources to generate return.

b) *Independent Variable*

We have selected the following bank-specific independent variables as the potential determinants of the banks' profitability.

Asset Quality/Non-performing loans: Non-performing loans are the loans that the debtor did not pay back or did not make payment for a period of usually at least 90 days for commercial banking loans and 180 days for consumer loans. Here,

NPL represents the asset quality of a bank. NPLs hamper a bank's business. The lending capability of the bank reduces due to the increase in NPL. To offset these bad debts, banks need to create cushion funds from their income. All kinds of NPLs reduce the profitability of the banks and banks encounter problem of low capital base which badly affects the banking sector. NPL has become a matter of concern for the banks since the last decade. The NPL ratio was highest in 2013 with a rate of 7.2%. NPL is expected to have negative impact on ROA the profitability of the bank.

Capitalization/EQUITTA: Capitalization is a quantitative measurement of a bank's capital structure. A bank generally has two types of capital: i) actual capital and ii) regulatory capital. Actual capital consists of equity and long term debt. The actual capital of a bank is measured by as the ratio of equity to total assets and also known as capital ratio and capitalization (EQUITTA). This coefficient is expected to have positive effect on ROA.

Liquidity Risk Management/LDR: In our study, the liquidity of the banks is represented by LDR. LDR means the amount of loans a bank gives out compared to its total deposit at a certain time. If LDR is high, it means liquidity of the bank is low. Less liquidity means that the bank will face problems if unforeseen fund requirements arise. But if the bank is more liquid, it means that it is keeping idle funds which could have been used to generate return otherwise. Liquidity is expected to have a positive impact on ROA.

Cost efficiency/NIE-INC: Cost efficiency means how well a bank can minimize its cost and earn more return at the same time. This cost efficiency can be calculated by net interest expense to income ratio. The less the NIE-INC ratio, the more cost efficient the bank is. Cost efficiency is expected to have a positive impact on both ROA.

V. Findings and Analysis

To derive results on the factors that affect the banking profitability of Bangladesh we have performed three key analysis with our dependent and independent variables. That is

1) Correlation Analysis
2) Regression Analysis

a) Correlation Analysis

	ROA	*NPL*	*LDR*	*NIE-INC*	*EQUITTA*
ROA	1.00				
NPL	-0.89	1.00			
LDR	0.55	-0.65	1.00		
NIE-INC	0.26	-0.19	0.03	1.00	
EQUITTA	0.81	-0.70	0.46	0.17	1.00

The correlation Analysis table gives us an idea of the strength and direction of a linear relationship between the independent variable's that is the NPL, LDR NIE-INC & EQUITTA and movement of the dependent variable.

Interpretation of correlation analysis:

ROA: From the analysis, we found that the independent variables- LDR, NIE-INC and EQUITTA are positively related to ROA. It means that when these independent variables increase, the ROA also increases and when these variables decrease, the ROA decreases. LDR is moderately correlated, NIE-INC has a weak relation and EQUITTA is strongly correlated with ROA. Whereas, NPL is negatively correlated to ROA. ROA decreases with the increase in NPL. ROA has a strong negative linear relation with NPL.

b) Regression Analysis

Keeping in mind our two dependent variables we have conducted three regression analysis. The Model that we have used for our regression analysis is

$$Y = \alpha + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \varepsilon$$

Regression Analysis using ROA as measure of profitability:

Summary Output:

Regression Statistics	
Multiple R	0.930518119
R Square	0.86586397
Adjusted R Square	0.844402205
Standard Error	0.010440655
Observations	30

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	0.017591371	0.004397843	40.34449056	1.47E-10
Residual	25	0.002725182	0.000109007		
Total	29	0.020316553			

	Coefficiets	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.02	0.02	0.90	0.38	-0.03	0.07	-0.03	0.07
NPL	-0.28	0.05	-5.29	0.00	-0.39	-0.17	-0.39	-0.17
LDR	-0.01	0.02	-0.32	0.75	-0.05	0.04	-0.05	0.04
NIE-INC	0.01	0.01	1.11	0.28	-0.01	0.02	-0.01	0.02
EQUITA	0.05	0.01	3.45	0.00	0.02	0.08	0.02	0.08

Interpretation of the regression analysis: The first thing we are going to interpret is the overall regression accuracy. That can be done with R Square and Adjusted R square. The R square represents the percentage of variance of the output variable that is ROA is explained by the variables in the Input that is the dependent variables. Here we can see that the R-Square is 86.58%. Therefore, the 86.58% of the output variable is explained by the input variables.

The adjusted R-Square is more conservative than the R-Square. So, its value is always less than R-Square. Here, the value is 84.44%. Therefore, the overall regression accuracy can deemed to very high. Whenever a new variable will be added, it increases the predictive power of the overall regression analysis.

Next, we will evaluate if regression output is not by chance. This can be derived by the significance of F. The smaller the F the greater the probability that the output of the regression is not by chance. Here, the Significance F is 0.0000147. That is there is a 0.0000147 chance that the output of the regression is by chance. We can conclude that the regression is reliable since it has a very small Significance of F.

Next, we are going to look at the reliability of the regression lines co-efficient. This can be derived by looking at the P-Values. The smaller the P-Values the higher the chances are that the value of the co-efficient of the variables are not by chance.

Profitability in terms of ROA:

$$Y=0.02+(-0.28)*NPL+(-0.01)*LDR+0.01*NIE\text{-}INC+0.05*EQUITTA$$

VI. Conclusion

We have analyzed the key variables that affect the banking profitability of Bangladesh. We identified the variables that indicate the banking profitability & termed them as dependent variables. Then we identified the variables that are responsible for the changes in dependent variables and termed them as independent variables. The dependent variable is ROA. The independent variables are NPL, LDR, EQUITTA and NIE-INC.

We performed three analyses to develop a solid foundation for our results. These are Correlation Analysis and Regression Analysis.

With the help of our three analyses we have identified which variables increases the profitability of Banks & which variables reduce them.

We have reached the conclusion based on our time series analysis that the overall banking industry is not at a healthy stage & that all the key indicators of the industry are downward slopping.

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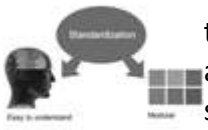

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Global Journals is in partnership with various universities, laboratories, and other institutions worldwide in the research domain. Authors are requested to disclose their source of funding during every stage of their research, such as making analysis, performing laboratory operations, computing data, and using institutional resources, from writing an article to its submission. This will also help authors to get reimbursements by requesting an open access publication letter from Global Journals and submitting to the respective funding source.

Preparing your Manuscript

Authors can submit papers and articles in an acceptable file format: MS Word (doc, docx), LaTeX (.tex, .zip or .rar including all of your files), Adobe PDF (.pdf), rich text format (.rtf), simple text document (.txt), Open Document Text (.odt), and Apple Pages (.pages). Our professional layout editors will format the entire paper according to our official guidelines. This is one of the highlights of publishing with Global Journals—authors should not be concerned about the formatting of their paper. Global Journals accepts articles and manuscripts in every major language, be it Spanish, Chinese, Japanese, Portuguese, Russian, French, German, Dutch, Italian, Greek, or any other national language, but the title, subtitle, and abstract should be in English. This will facilitate indexing and the pre-peer review process.

The following is the official style and template developed for publication of a research paper. Authors are not required to follow this style during the submission of the paper. It is just for reference purposes.

Manuscript Style Instruction (Optional)

- Microsoft Word Document Setting Instructions.
- Font type of all text should be Swis721 Lt BT.
- Page size: 8.27" x 11'", left margin: 0.65, right margin: 0.65, bottom margin: 0.75.
- Paper title should be in one column of font size 24.
- Author name in font size of 11 in one column.
- Abstract: font size 9 with the word "Abstract" in bold italics.
- Main text: font size 10 with two justified columns.
- Two columns with equal column width of 3.38 and spacing of 0.2.
- First character must be three lines drop-capped.
- The paragraph before spacing of 1 pt and after of 0 pt.
- Line spacing of 1 pt.
- Large images must be in one column.
- The names of first main headings (Heading 1) must be in Roman font, capital letters, and font size of 10.
- The names of second main headings (Heading 2) must not include numbers and must be in italics with a font size of 10.

Structure and Format of Manuscript

The recommended size of an original research paper is under 15,000 words and review papers under 7,000 words. Research articles should be less than 10,000 words. Research papers are usually longer than review papers. Review papers are reports of significant research (typically less than 7,000 words, including tables, figures, and references)

A research paper must include:

a) A title which should be relevant to the theme of the paper.
b) A summary, known as an abstract (less than 150 words), containing the major results and conclusions.
c) Up to 10 keywords that precisely identify the paper's subject, purpose, and focus.
d) An introduction, giving fundamental background objectives.
e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition, sources of information must be given, and numerical methods must be specified by reference.
f) Results which should be presented concisely by well-designed tables and figures.
g) Suitable statistical data should also be given.
h) All data must have been gathered with attention to numerical detail in the planning stage.

Design has been recognized to be essential to experiments for a considerable time, and the editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned unrefereed.

i) Discussion should cover implications and consequences and not just recapitulate the results; conclusions should also be summarized.
j) There should be brief acknowledgments.
k) There ought to be references in the conventional format. Global Journals recommends APA format.

Authors should carefully consider the preparation of papers to ensure that they communicate effectively. Papers are much more likely to be accepted if they are carefully designed and laid out, contain few or no errors, are summarizing, and follow instructions. They will also be published with much fewer delays than those that require much technical and editorial correction.

The Editorial Board reserves the right to make literary corrections and suggestions to improve brevity.

Format Structure

It is necessary that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.

All manuscripts submitted to Global Journals should include:

Title

The title page must carry an informative title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) where the work was carried out.

Author details

The full postal address of any related author(s) must be specified.

Abstract

The abstract is the foundation of the research paper. It should be clear and concise and must contain the objective of the paper and inferences drawn. It is advised to not include big mathematical equations or complicated jargon.

Many researchers searching for information online will use search engines such as Google, Yahoo or others. By optimizing your paper for search engines, you will amplify the chance of someone finding it. In turn, this will make it more likely to be viewed and cited in further works. Global Journals has compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Keywords

A major lynchpin of research work for the writing of research papers is the keyword search, which one will employ to find both library and internet resources. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining, and indexing.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy: planning of a list of possible keywords and phrases to try.

Choice of the main keywords is the first tool of writing a research paper. Research paper writing is an art. Keyword search should be as strategic as possible.

One should start brainstorming lists of potential keywords before even beginning searching. Think about the most important concepts related to research work. Ask, “What words would a source have to include to be truly valuable in a research paper?” Then consider synonyms for the important words.

It may take the discovery of only one important paper to steer in the right keyword direction because, in most databases, the keywords under which a research paper is abstracted are listed with the paper.

Numerical Methods

Numerical methods used should be transparent and, where appropriate, supported by references.

Abbreviations

Authors must list all the abbreviations used in the paper at the end of the paper or in a separate table before using them.

Formulas and equations

Authors are advised to submit any mathematical equation using either MathJax, KaTeX, or LaTeX, or in a very high-quality image.

Tables, Figures, and Figure Legends

Tables: Tables should be cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g., Table 4, a self-explanatory caption, and be on a separate sheet. Authors must submit tables in an editable format and not as images. References to these tables (if any) must be mentioned accurately.

Figures

Figures are supposed to be submitted as separate files. Always include a citation in the text for each figure using Arabic numbers, e.g., Fig. 4. Artwork must be submitted online in vector electronic form or by emailing it.

Preparation of Eletronic Figures for Publication

Although low-quality images are sufficient for review purposes, print publication requires high-quality images to prevent the final product being blurred or fuzzy. Submit (possibly by e-mail) EPS (line art) or TIFF (halftone/ photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Avoid using pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings). Please give the data for figures in black and white or submit a Color Work Agreement form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

For scanned images, the scanning resolution at final image size ought to be as follows to ensure good reproduction: line art: >650 dpi; halftones (including gel photographs): >350 dpi; figures containing both halftone and line images: >650 dpi.

Color charges: Authors are advised to pay the full cost for the reproduction of their color artwork. Hence, please note that if there is color artwork in your manuscript when it is accepted for publication, we would require you to complete and return a Color Work Agreement form before your paper can be published. Also, you can email your editor to remove the color fee after acceptance of the paper.

Tips for writing a good quality Management Research Paper

Techniques for writing a good quality management and business research paper:

1. Choosing the topic: In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

2. Think like evaluators: If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

3. Ask your guides: If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

4. Use of computer is recommended: As you are doing research in the field of management and business then this point is quite obvious. Use right software: Always use good quality software packages. If you are not capable of judging good software, then you can lose the quality of your paper unknowingly. There are various programs available to help you which you can get through the internet.

5. Use the internet for help: An excellent start for your paper is using Google. It is a wondrous search engine, where you can have your doubts resolved. You may also read some answers for the frequent question of how to write your research paper or find a model research paper. You can download books from the internet. If you have all the required books, place importance on reading, selecting, and analyzing the specified information. Then sketch out your research paper. Use big pictures: You may use encyclopedias like Wikipedia to get pictures with the best resolution. At Global Journals, you should strictly follow here.

6. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right? It is a good habit which helps to not lose your continuity. You should always use bookmarks while searching on the internet also, which will make your search easier.

7. Revise what you wrote: When you write anything, always read it, summarize it, and then finalize it.

8. Make every effort: Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

9. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

10. Use proper verb tense: Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

11. Pick a good study spot: Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. Use good grammar: Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.
Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

19. Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

20. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

21. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

22. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.

Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.

- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

The Administration Rules

Administration Rules to Be Strictly Followed before Submitting Your Research Paper to Global Journals Inc.

Please read the following rules and regulations carefully before submitting your research paper to Global Journals Inc. to avoid rejection.

Segment draft and final research paper: You have to strictly follow the template of a research paper, failing which your paper may get rejected. You are expected to write each part of the paper wholly on your own. The peer reviewers need to identify your own perspective of the concepts in your own terms. Please do not extract straight from any other source, and do not rephrase someone else's analysis. Do not allow anyone else to proofread your manuscript.

Written material: You may discuss this with your guides and key sources. Do not copy anyone else's paper, even if this is only imitation, otherwise it will be rejected on the grounds of plagiarism, which is illegal. Various methods to avoid plagiarism are strictly applied by us to every paper, and, if found guilty, you may be blacklisted, which could affect your career adversely. To guard yourself and others from possible illegal use, please do not permit anyone to use or even read your paper and file.

Criterion for Grading a Research Paper (Compilation) by Global Journals

Please note that following table is only a Grading of "Paper Compilation" and not on "Performed/Stated Research" whose grading solely depends on Individual Assigned Peer Reviewer and Editorial Board Member. These can be available only on request and after decision of Paper. This report will be the property of Global Journals.

Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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