Journal of Money and Economy
Vol. 17, No. 2, Spring 2022
pp. 161-182
DOI: 10.29252/jme.17.2.161

Original Research Article

The Impact of "CAMEL Composite Index" on Income Diversification: A Case Study of the Iranian Banking System

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Received: 01 Feb 2022 Approved: 29 Nov 2022

Investigating banks' status has always been a concern to its management and regulatory decisions, which can be carried out by means of income diversification and CAMEL composite. The importance of income diversification is to decline the operation risk. The soundness of banking is also another essential component in the banking industry that can be evaluated by CAMEL. This article's two primary goals are computing CAMEL composite index and investigating the relationship between income diversification and banking soundness, using CAMEL composite index within the financial statements of 16 Iranian banks between the years 2010 to 2017. This study applied an exploratory factor analysis (EFA) to compute the CAMEL composite calculated by arithmetic mean in the previous studies. In addition, the Herfindahl-Hirschman index (HHI) has been used to calculate income diversification. The generalized method of moments (GMM) panel model has been utilized to study the relationship between variables. The result of EFA confirms two factors: financial ability and financial performance. The result of GMM panel model shows a positive and significant relationship between financial ability and financial performance on income diversification.

Keywords: Income Diversification, CAMEL Composite, Exploratory Factor Analysis, Bank Industry.
JEL Classification*:* C23, C33, D61, G21

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[DOI: 10.52547/jme.17.2.161]

1 Introduction

Due to their role in the country's economy and their presence in the capital market as an industry with a significant value share, banks' status has always been considered by researchers in finance and economics. This has led to research on the relationship between important variables in this industry, including risk and performance. These studies can be considered a follow-up to the survey conducted by Modigliani and Miller (1958), which leads to the creation of a proper perspective for practitioners and regulators.

One of the influential components in the banking industry is risks, which are divided into three general categories, including credit risk, market risk, and operational risk. Credit risk relates to the non-repayment of the principles and interest of facilities. The market risk is the impact of fluctuations in market factors such as exchange rates, interest rates, and price fluctuations of a bank's shares on the bank's asset value. Operational risk is the risk related to direct or indirect losses due to insufficient or incorrect processes within the organization, individuals, systems, or events outside the organization (Erfanian, 2007).

Among the risks mentioned above, the credit risk as a manageable risk with a major impact on the performance and return of the bank has received more attention since 1974 with the presentation of the model for calculating this risk by Merton. (Jelodar Mamaghani et al. 2017). Since then, numerous studies have been conducted to identify the factors affecting credit risk and the impact of credit risk on other banking components, including profitability and return criteria. One of the methods to reduce the risk is to increase diversification (Duho et al., 2020).

Diversification in the banking industry has different types, such as income diversification, diversification in the geographical scope of the activity, diversification in the sector of the activity, and the like. Today, income diversification is one of the requirements for compliance with World Bank standards (Rasoulof, 2012).

The global financial crisis of 2007-2008 demonstrated that excessive risk-taking by banks could undermine the vital economic functions they perform (Sotoudeh Mollashahi et al., 2020); therefore, various regulators monitor banks' soundness every year. According to this monitoring, regulatory laws are reviewed and amended. To monitor the bank's status, five CAMEL indices are usually used, which neither can provide a unified picture of the bank's soundness nor can the calculation of these five CAMEL indices provide the possibility of comparing the overall status of banks. Therefore, some

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[DOI: 10.52547/jme.17.2.161]

researchers calculate an arithmetic mean of the rankings obtained to provide an overall ranking, such as Prasad and Ravinderb (2012) and Reddy and Prasad (2011), ignoring the gap between the bank's performance in each index. One of the aims of the present study is to solve this problem and provide a way to achieve a unit criterion to measure the bank's soundness.

In the previous studies, researchers calculated the CAMEL ratio and investigated its relationship with banking performance variables. These studies used one ratio or more for each part of the CAMEL; hence, at least five ratios could not show a unit picture of bank soundness. Five CAMEL ratios used as bank soundness variables reduced the degree of freedom. In addition, a few studies investigated the relationship between CAMEL (as bank soundness), income diversification (as bank performance), and bank operation risks.

Investigating the status of the banking industry can be done by examining the relationships between the influential components of this industry. The present study pursues this goal by examining the relationship between income diversification and the CAMEL Composite Index in the banking industry. This study also pursues other sub-objectives such as calculating the CAMEL composite index and presenting a new method to provide an overview of the soundness status of the banks based on the Exploratory Factor Analysis (EFA), which is an innovation compared to the previous studies. The results can help senior banking executives and policymakers in the banking sector make the right decisions. Furthermore, presenting a method for calculating the CAMEL composite index can greatly help policymakers and observers in this field.

2 Literature

Studying critical issues, such as risk and performance (return), can be considered a continuation of Modigliani and Miller's study (1958), in which the theoretical concepts about the structure of capital in terms of capital cost, leverage, uncertainty, profitability and valuation of securities has been provided. Their paper has become the theoretical basis of many subsequent studies that examined a wide range of theoretical issues and empirical aspects. Berger and Di Patti (2006) can be mentioned among the conducted studies. They argued that strategic options influence capital structure.

One of the strategic options is the issue of diversification, which was proposed by Turkmen and Yigit (2012). They stated that banks could use a diversification strategy to improve performance and reduce risks. Jouida (2018) noted that the diversification strategy would allow risk management

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and make another potential for profitability. In fact, in recent years, with the reduction in interest rates, banks have been looking for new income sources, which have led to an improvement in their performance (Mehrabanpour et al., 2017). Based on a theoretical point of view, banks can benefit from economies of scale as they expand their income channel. In addition to providing lending services, they can also improve their performance by providing other financial services and using their customers' information (Farhang et al., 2016).

On the other hand, income diversification in the banking industry can be divided into different types according to the historical developments of this industry. Different types of income diversification include diversification in the economic sector, diversification in the geographical area, and diversification in income sources (Kiweu, 2012). To explain the income diversification of the economic sector, we can refer to specialized banks whose activities are limited to a specific industry. They know their business environment well, but they cannot prevent transferring the relevant risks to the banks.

Therefore, diversification in the economic sector can reduce the bank's risks. Geographical diversification is related to the bank either choosing to operate only in a specific geographical area or is only allowed to operate in a particular area. If for any reason, including comparative advantages, the area's economy depends on a particular activity, the risk of this type of bank will increase. Restrictions on activity in a specific geographical area are mainly concerned with licenses at international levels. Another type of diversification in the banking industry is income diversification. The main activity of the banks is to attract deposits and provide facilities, the income of which is called interest income.

In the past, interest income was the primary source of the bank's income. Still, developments in this industry have made income diversification a necessity, which today has several justifications, including reducing the risk and increasing efficiency. Diversification in bank's income increases their profitability, which is accompanied by an increase in their market value (Ebrahimi et al., 2016). Therefore, the undeniable impact of income diversification on the bank's performance needs to be emphasized.

Similar to other companies, bank's performance can be examined through different criteria such as return (return on assets and return on equity); however, there are also other criteria such as capital adequacy, asset quality, quality management and liquidity to consider for the banks. These criteria, accompanied by profitability referred to as efficiency, are considered as CAMEL index. In fact, to examine the banks performance, it is quite common

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to use CAMEL indices. The CAMEL indices were completed over time and according to the evolution of the banking industry in order to monitor this financial institution, which is briefly explained below.

Supervision of banks has always been one of the concerns of economic supervisory systems, including the central banks. The reason is the spread of problems and crises created in the monetary sector to the real sectors of the economy, consequently the possible creation of economic crises. Banking developments since 1960 and the introduction of new financial instruments have exacerbated the possibility of financial crises and raised concerns among banking regulators. The industrialized countries have set up a Basel Committee on Banking Supervision to address this. The Basel council of banking supervision is a global committee structured to create norms for banking regulation (Pirahmadi et al., 2019). Under the Basel Accord, the rules on the risk-weighted legal capital of 8% were enforced. In this agreement, the assets and sub-items of the banks were evaluated in proportion to their risk.

These rules had some shortages, including a lack of attention to the operational risk of the securities issuer companies. The Basel Committee provided a complete classification of assets to solve such issues. In addition, the committee paid attention to the quality of risk management and other important issues, including the disclosure of more details about credit limits, reserves, capital, banking managers, and efficiency. Their achievement was approved in 2004 as the Basel Committee 2 and its implementation time was considered at the beginning of 2008 (Mishkin, 2007). In the crisis of 2008, the Basel Committee released a new version called Basel 3. In this package, the committee improved risk management and increased the level of bank transparency. Basel 3 was released in December 2010 and the edited version was released in June 2011.

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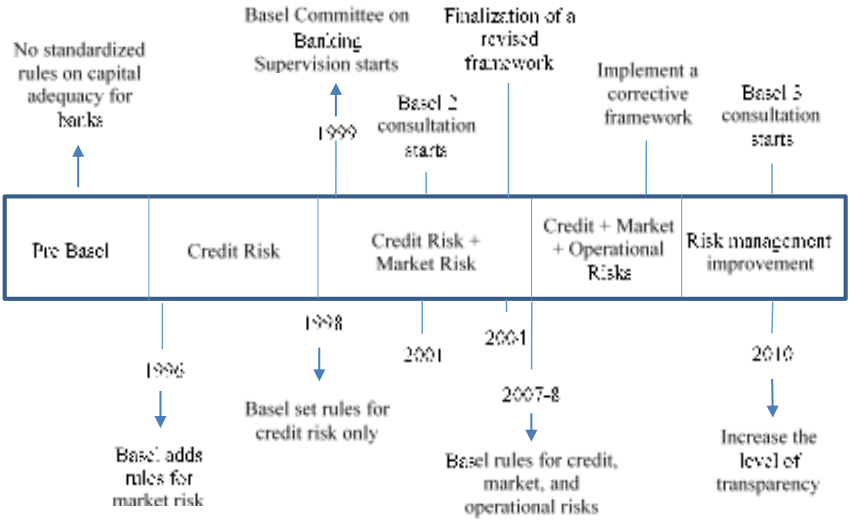

Figure 1. Basel evolution
Source: Research Findings

Coinciding with the Basel Accord (1988), the International Bank for Reconstruction and Development (IBRD) and the Basel Committee on Banking Supervision called for the use of CAMEL indices. The word CAMEL, which is used as the specific name of an index, is a word composed of the initials of the words capital, assets, management, earnings, and liquidity. Economic development in the last decade has led to the evolution of the CAMEL index, in the latest version of which sensitivity was added and its name changed to CAMELS. Winarso and Park (2020) considered the CAMEL index to measure the soundness and performance of the banking sector.

This paper will examine the relationship between income diversification and CAMEL Composite Index. Income diversification is defined as a strategy (Turkmen and Yigit, 2012) that leads to risk reduction and a higher performance of the banking sector. This article seeks to present a new method for calculating the CAMEL composite index according to the size of each of its five indices. In addition, it aims to examine income diversification using a complete measure of performance (CAMEL composite index). However, this can be considered as a continuation of the studies of Chiorazzo et al. (2008), Moudud-Ul-Huq (2017), and Nguyen et al. (2020), who have studied income diversification and some CAMEL criteria. It is worth mentioning that this

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study seeks to consider the causal relationship between income diversification and CAMEL composite index, which has been less considered in studies on income diversification and performance.

3 Empirical Studies

This section investigates related studies, including the literature on income diversification and the CAMEL index. Studies on income diversification can be divided into two groups. The first group includes studies in which the impact of income diversification on other variables related to bank performance is measured. Gurbuz et al. (2013), Meslier et al. (2014), Brighi and Venturelli (2014), Ismail et al. (2015), Ebrahimi et al. (2016), Noori Abkenar et al. (2017), Wang (2017), Jouida (2018), Abuzayed et al. (2018) and Brahmana et al. (2018) can be cited.

Table 1
Investigation the effect of income diversification on other variables

authors	**Investigation**	**result**
Gurbuz et al. (2013)	investigate the effect of diversification, asset, equity, growth, loans, interest, etc. on risk-adjusted return on asset and equity by dynamic panel data (GMM)	income diversification increases risk-adjusted financial performance
Brighi and Venturelli (2014)	investigate the effect of diversification on ROA, risk-adjusted ROA, and Z-score by a panel data model	Diversification increases bank profitability on a risk-adjusted basis
Meslier et al. (2014)	investigate the effect of income diversification on bank performance	A shift towards non-interest activities increases bank profits
Ismail et al. (2015)	investigate the effect of Income diversification, Size, Equity ratio, Loans ratio, and Growth (Annual Growth rate of assets)on ROA by a panel data model	A positive impact of income diversification on a bank's performance
Ebrahimi et al. (2016)	investigate the effect of diversification and other control variables such as size, equity to asset ratio, the cost to revenue ratio, and ROA on bank performance with Tobin's Q by a panel data model	A positive effect of diversification and ROA on bank performance
Noori Abkenar et al. (2017)	investigate the effect of diversification, size, the cost to revenue ratio, and ROA on bank performance with Tobin's Q by a panel data model	income diversification has a significant impact on bank performance
Wang (2017)	investigate the effect of the economic cycle, income diversification, size, NPL, and ROA on Capital buffer by dynamic panel data (GMM)	banks' income diversification has a negative correlation with macroeconomic fluctuations

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Jouida (2018)	investigate the relationship between diversification, capital structure, and profitability by panel vector autoregression model (PVAR)	inverse bidirectional causal relation of profitability with leverage and diversification
Abuzayed et al. (2018)	investigate the effect of Diversification measures, Bank Specific variables, and Macroeconomic and Governance Variables on bank stability measure by accounting and market base by a two-step system GMM estimation approach	income or asset diversification does not enhance bank stability
Brahmana et al. (2018)	investigate the effect of capital adequacy ratio, loans to deposit ratio, non-performing loans, and diversification on performance by a panel data model	income diversification increases the bank's performance

Source: Research Findings

The second group of studies on income diversification is related to the studies in which the factors affecting income diversification are examined, among which we can mention Nguyen et al. (2016), Hou et al. (2018), and Meng et al. (2018) studies.

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Table 2
Investigation of the effect of other variables on income diversification

authors	Investigation	result
Hahm (2008)	investigate the effect of bank-specific variables and macroeconomic variables on diversification by a panel data model	Asset lag, equity-to-asset ratio lag, non-current facility ratio lag, profitability lag, and cost-to-earnings ratio lag have a positive and significant impact on income diversification and facility ratio lag and the net profit margin ratio lag have a negative and significant impact on the income diversification.
Nguyen et al. (2016)	investigate the relationship between income diversification using the ratio of ***non-interest income to total income as income diversification*** with other variables, including the interest rate margin, market power, size, efficiency, and equity by a panel data model	that banks with more market power in terms of deposits and facilities earn more income from non-interest sources
Hou et al. (2018)	investigate the relationship between income diversification, size, profitability, ownership, economic growth, inflation, and unemployment by the panel vector autoregression model (PVAR)	An increase in the degree of bank diversification between traditional bank activities generating net interest income and non-traditional bank activities generating non-interest income reduces bank liquidity creation
Meng et al. (2018)	investigate the effect of production cost, equity, leverage, market share, interest rate margin, interest rate uncertainty, inflation rate, and asset share for GDP ***on income diversification*** by panel data models (LS and GMM)	A higher ratio of bank assets to GDP and lower interest rate margins leads to a higher level of income diversification
Duho et al. (2020)	investigate the effect of bank stability, credit risk, Liquidity, Size, and Network on income diversification by panel data models (LS and GMM)	The risk profile and risk portfolio of banks affect their diversification strategy. Banks that are faced with high insolvency risk and liquidity risk tend to diversify, while banks that are faced with low credit risk tend to diversify

Source: Research Findings

Studies on CAMEL indices can also be divided into two general groups. In the first group, CAMEL indices are used to evaluate and rank a country's banks or a region. First, the CAMEL ratios are calculated and then the rank of each bank in each index and the overall rank of CAMEL for each bank is calculated based on the arithmetic mean which the problem of using this method has been explained previously above. Among the studies conducted

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in this group, we can mention the study of Reddy and Prasad (2011), Prasad and Ravinderb (2012), Dodoev (2018), Ferrouhi (2014), Altan et al. (2014), Hadriche (2015), Susanti and Daryanto (2017), Wahyuni, Y. (2020).

The second group of studies examines the relationship between the CAMEL indices or their resulting rank and other explanatory variables, such as Al Zaidanin (2020).

Table 3
Investigation of the effect of CAMEL ratios on other variables

authors	**investigation**	**result**
Aftab et al. (2015)	investigate the effect of CAMEL ratios on a bank's profitability	They found that profitability in private banks is directly related to asset quality and management quality and inversely related to capital adequacy and liquidity
Fatahi et al. (2017)	investigate the effect of CAMEL ratios on profitability and soundness by a panel data model	capital adequacy values higher than the threshold of 23.1% have a positive and significant impact on the profitability of commercial banks and values below the threshold have a negative and significant impact on the bank's profitability
Ramezani et al. (2017)	investigate the effect of 17 CAMEL ratios on Iranian banks' soundness by a panel data model	The ratio of the operating profit to operating expenses, the ratio of return on capital, the ratio of facility income to total bank incomes, the ratio of deposit retention, and fluctuating debt ratio, with a power of 75.2%, could assess the banks' soundness.
Landjang and Tasik (2018)	investigate the effect of CAMEL ratios on market share (deposits share and loans share) by a panel data model	private banks should decrease the NPL ratio to increase their market share
Al Zaidanin (2020)	investigate the effect of 13 CAMEL ratios on banks' performance (ROA and ROE) by panel data model	commercial banks can improve their profitability by concentrating on main activities, managing their capital adequacy efficiently, maintaining a high-quality level of lending policy, and utilizing the total assets
Ping and Kusairi (2020)	investigate the effect of CAMEL ratios on the bank performance (ROA) by a panel data model	capital adequacy and earning quality had a positive impact on bank performance and conversely, asset quality, management efficiency, and liquidity have a negative effect on banks' performance
Nguyen et al. (2020)	investigate the effect of CAMEL ratios on banks' performance (ROA and ROE) and ***Marginal interest income as income diversification*** by a panel data model	capital adequacy, asset quality, liquidity, and management efficiency affect the performance

Source: Research Findings

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However, among all the studies reviewed, the following studies are the most relevant to the subject under investigation in this paper. These studies have examined income diversification as a dependent variable and many CAMEL indices. Thus,

Nguyen et al. (2020) investigated the impact of the CAMEL ratio on Marginal interest income (NIM) calculated by the net income from interest to Average assets ratio as an income diversification proxy. Results showed capital adequacy, asset quality, liquidity, and management efficiency affected NIM. Hou et al. (2018) can also be mentioned as they examined the relationship between the calculated indices for the diversification of the banks' income sources with variables such as size, profitability, ownership, economic growth, inflation and unemployment. They used two variables of profitability and size. Profitability is similar to the quality index of profitability, while size is similar to the index of asset management.

This study is similar to those that have examined the effects of the factors on income diversification. The difference between this study and what has been done in the past is that the soundness impact of the banking sector is measured using the CAMEL Composite Index on income diversification. Hence, this research presents a single picture of the banking sector's soundness.

4 Methodology and Model Estimation

This study seeks to calculate the income diversification and CAMEL composite index in the Iranian banking industry and examine the type of their relationship. The sample examined in this study consists of 16 Iranian banks, including the Mellat, Karafarin, Refah, Iran Zamin, Sina, Export Development, Tose'e Ta'avon, Saman, Maskan, Tejarat, Ansar, Tourism, Saderat, Pasargad, Keshavarzi and Bank of Industry and mine between the years 2011 to 2017. These banks were selected due to the publication of their basic financial statements during the period under review. So banks that did not publish their financial statements are not included in the sample.

To achieve the purposes of the present study, at first the income diversification based on Meng et al study (2018) was calculated. Then the exploratory factor analysis was applied to calculate the CAMEL composite index. Finally, the dynamic panel model (GMM) was used to determine the direction and size of the impact of the CAMEL composite index and control variables on income diversification based on Nguyen et al. (2020).

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4.1 Income Diversification

To quantify income diversification, indices such as income share and the Herfindahl-Hirschman index are often used. These indices show the degree of concentration of income sources that can convert them to income diversification by [1- concentrate index]. The simplest measure of income diversification which uses the income share is described in equation (1) used by Meslier et al. (2014).

$$\mathrm{DiN} = 1 - \mathrm{NII} = 1 - [\frac{\text{non-interest income}}{\text{income}}] \quad (1)$$

Another criterion used to quantify income diversification is equation (2), which has been used in different studies such as Meng et al. (2018), Ismail et al. (2015), and Gurbuz et al. (2013) studies.

$$\mathrm{DiH} = 1 - \mathrm{HHI} = 1 - [(\frac{interest\ income}{oprational\ income})^2 + \left(\frac{non-interest\ income}{oprational\ income}\right)^2] \quad (2)$$

At first, according to Meng et al. (2018), both of the above equations are calculated. Then to choose one of the indices of income diversification, the central indicators and the distribution of each have been examined, the results of which have been presented in Table (4).

Table 4
Descriptive statistics of income diversification criteria

Descriptive static	Income Diversification	
	DiH (Based on HHI)	DiN (Based on income ratio)
Mean	0.386	0.554
Median	0.418	0.603
Maximum	0.519	0.974
Minimum	0.050	0.044
Std. Dev.	0.114	0.233
Skewness	-1.252	-0.232
Kurtosis	3.704	2.113
Jarque-Bera	30.740	4.546
Probability	0.000	0.102
Observations	112	112

Source: Research Findings

Examining the descriptive statistics of the two-income diversification indices reveals significant points, including the mean and standard deviation. DiH has a lower standard deviation and mean and lower coefficient of

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variation. Therefore, DiH is used as an income diversification index in this study.

4.2 CAMEL Composite Index and Exploratory Factor Analysis

For many years, the CAMEL index has been used as a criterion for assessing the soundness of the banking sector. To provide a unit rank and measure of the bank's soundness, the arithmetic average of the ratings obtained from each index was calculated. This method suffers a drawback as the distance between the bank's performance in each index is ignored and all banks are ranked with a distance of one unit from each other. The exploratory factor analysis method has been used in this study to create a CAMEL composite index to solve this problem.

Galeton established the foundations of factor analysis, and then Pierson was the first who proposed a method for factor analysis based on a multidimensional geometric space. Finally, in 1904, Spearman introduced the mathematical models of this method (Abdolmaleki et al., 2015). Factor analysis is a statistical method whose practical purpose is to provide a set of variables in terms of a smaller number of hypothetical variables.

Factor analysis is based on the assumption that the observed variables are a linear combination of more basic hypothetical variables (Abdolmaleki et al., 2015). In short, factor analysis is a method of examining how variables are linearly related to a smaller number of unobserved factors. This method is highly dependent on the correlation between the variables. According to the correlation matrix and the degree of this correlation, the data matrix, which has enormous dimensions is converted into a matrix with smaller dimensions, and can be used as a new matrix for subsequent studies (Schreiber, 2021).

In the factor analysis literature, the parameters used to form the linear function of variables are called "Loading Factors". The communality of a variable is a part of its variance expressed by common factors. If X_i is the observed variables (CAMEL indices) and F_1 and F_2 are the two effective factors, the matrix expressed as equation (6) (Schreiber, 2021).

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$$\begin{bmatrix} X_1 \\ X_2 \\ X_3 \\ X_4 \\ X_5 \end{bmatrix}_{5\times1} = \begin{bmatrix} \lambda_{11} & \lambda_{12} \\ \lambda_{21} & \lambda_{22} \\ \lambda_{31} & \lambda_{32} \\ \lambda_{41} & \lambda_{42} \\ \lambda_{51} & \lambda_{52} \end{bmatrix}_{5\times2} \begin{bmatrix} F_1 \\ F_2 \end{bmatrix}_{2\times1} + \begin{bmatrix} e_1 \\ e_2 \\ e_3 \\ e_4 \\ e_5 \end{bmatrix}_{5\times1} \quad (3)$$

The advantage of using this method to obtain the CAMEL composite index is that the calculated values for each of the five CAMEL indices are used instead of their rank, so one of the problems of the CAMEL arithmetic mean index which is based on inattention to the distance of each bank in each index from other banks would be solved.

In this paper, to obtain the CAMEL Composite Index, first, the CAMEL Indices were calculated, including the capital adequacy (ratio of equity to total assets), asset quality index (non-performing loans to total assets), management quality (the ratio of total deposits to total assets), liquidity index (cash balance to total deposits) and profitability index (calculated by geometric average of ROA and ROE according to study of Hadriche (2015)). To obtain the CAMEL composite index from the five CAMEL indices, it needed to be ensured that the calculated indices have a sufficient correlation in an attempt to discover the common factor. Therefore, the Bartletts or Kaiser Test has been used, the results of which are described in Table (5).

Table 5
Variable correlation test using the factor analysis

factor test	**Criteria**		
Bartlett	Chi-square	Degrees of freedom	p-value
	33.199	10	0.0000
Kaiser	0.556		

Source: Research Findings

The values obtained from Bartlett and Kaiser Tests indicate that factor analysis can be used to obtain the CAMEL composite index. The value obtained for the Kaiser test was 0.556, which made it possible to use factor analysis. However, according to the literature on factor analysis, the values of statistics between 0.5-0.7 indicate that the result interpretation needs caution. The next step is to determine the number of factors, which is possible by referring to the specific values calculated for each factor.

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Table 6
Factor analysis results.

Factor	Eigenvalue	Difference	Proportion	Cumulative
$Factor_1$	1.57	0.46	0.31	0.31
$Factor_2$	1.10	0.13	0.22	0.53
$Factor_3$	0.97	0.23	0.19	0.73
$Factor_4$	0.74	0.13	0.15	0.88
$Factor_5$	0.61	.	0.12	1.00

Source: Research Findings

According to the factor analysis results, it clearly can be seen that the use of factor 1 and factor 2 with an eigenvalue greater than one along with a proportion of 53.4% as a factor was sufficient. The share of each variable in explaining the variance of factor 1 and factor 2 is described in Table (7).

Table 7
Variance of each factor variable

Variable	$Factor_1$	$Factor_2$
Capital	-0.7549	-0.061
Assets	0.2425	0.7547
Management	0.702	0.2926
Earnings	0.5341	-0.6094
Liquidity	-0.4009	0.2718

Source: Research Findings

Table (7) shows the share of variance for each variable, but factor rotation needed to be used to match the detected factors with the variables further. Factor rotation caused no change in the number of factors, but the share of the variance of the variables was affected by this action, which is presented in Table (8).

Table 8
Each variable variance after rotation

Variable	$Factor_1$	$Factor_2$
Capital	-0.6918	0.308
Assets	0.5744	0.5463
Management	0.7564	-0.0794
Earnings	0.177	-0.7908
Liquidity	-0.2217	0.4306

Source: Research Findings

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Considering the share of the variance of the variables achieved two factors. Factor 1 has the highest dependency on the capital adequacy index and the management quality index was called the Financial Ability Index. Factor 2, which is the most dependent on the index of profitability, liquidity, and quality of assets, was called the Financial Performance Index. In other words, Financial Ability Index and Financial Performance Index, Calculated by Exploratory Factor Analysis (EFA), could reduce the number of the CAMEL ratios from five to two indexes; Thus, one of the study goals was achieved.

4.3 Relationship determination between income diversification and CAMEL Composite Index

This study investigates the impact of the CAMEL composite index on income diversification according to the study goals and based on Nguyen et al. (2020) and Meng et al. (2018). Nguyen et al. (2020) have investigated the impact of CAMEL ratios on Marginal interest income. Marginal interest income was a concentrated index, yet this study used diversification calculated by [1 - concentrate index], and two control variables were added. Therefore, based on this article's methodology, equation (4) has been specified as aligned with the objectives of the present study:

$$\mathrm{DiH_{it}} = \beta_0 + \beta_1 \mathrm{DiH_{it-1}} + \beta_2\ \mathrm{FA_{it}} + \beta_3\ \mathrm{FP_{it}} + \beta_4\ \mathrm{NPL_{it}} + \beta_5\ \mathrm{SIZE_{it}} + \mu_i + \mathrm{e_{it}} \quad (4)$$

In equation (4), $\mathrm{DiH_{it}}$ is the income diversification, $\mathrm{FA_{it}}$ is the financial ability index, $\mathrm{FP_{it}}$ is the financial performance index, $\mathrm{NPL_{it}}$ is the ratio of non-performing loans and $\mathrm{SIZE_{it}}$ is the logarithm of total assets. Based on the theoretical foundations, it is expected that the financial ability index and financial performance index, which are obtained from the five CAMEL indicators and show the soundness of the banking sector, would have a positive impact on income diversification. It should be noted that income diversification is a managerial decision and under the conditions of improving the performance or financial ability of the banks, managers would decide to diversify income to maintain or improve these items.

It is also expected that non-performing loans will have a negative impact on income diversification (Nguyen et al., 2016). The reason for the negative impact of non-performing loans on income diversification is the reduction of resources and the bank's commitment to the deposits. Large banks could have the financial and intellectual capital to develop the expertise and capability of their human capital to carry out more business lines. Contrariwise, smaller

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have the operational flexibility to adapt their operations to changing environments in the industry at a low cost. There is a possibility of a negative or a positive relationship between size and income diversification (Duho et al., 2020).

The model estimation results presented in equation (4), using the dynamic panel data by Arellano and Bover method, are estimated as described in equation (5).

$$\mathrm{DiH_{it}} = 0.71 + 0.69\ \mathrm{DiH_{it-1}} + 0.07\ \mathrm{FA_{it}} + 0.02\ \mathrm{FP_{it}} - 0.47\ \mathrm{NPL_{it}} - 0.1\ \mathrm{SIZE_{it}} \quad (5)$$

t: (3.08) (2.73) (2.89) (6.36) (-2.45) (-2.48)

$$R^2 = 0.57 \quad , \quad \mathrm{Sargan-Stat} = 9.24 \quad , \quad \mathrm{p-value\ of\ Sargan} = 0.99$$

The estimated model determination coefficient was equal to 0.57, and the Sargan statistic of the model was found to be 9.24 with a probability value of 0.99, which indicates the independence of instrumental variables with the disturbance component. In other words, not rejecting the null hypothesis related to Sargan Statistics indicates the validity of instrumental variables.

Based on the coefficients and t statistics presented in equation (5), it was determined that the financial ability index (FA) and financial performance index (FP) had a positive and significant impact on income diversification. In other words, increasing the soundness of the bank measured by the CAMEL index led to an increase in income diversification. An increase in income diversification means the interest and non-interest income had an equivalent share of the total income causing the credit and operating risks to be reduced. The ratio of non-performing loans had a significant negative impact on income diversification, the negative coefficient of which was in line with theoretical expectations. The reason for the negative impact of non-performing loans on income diversification is the reduction of resources and the bank's commitment to the deposits. The negative impact of the ratio of non-performing loans on income diversification confirms the negative impact of credit risk on income diversification, which can be due to the reduction of available resources to the bank. The impact of the size on income diversification was negative and significant. An increase in the banks' assets leads to higher growth in loans and interest income compared to non-interest income. Asset growth reduces income diversification. The main reason for this can be the high margin of loan income gained compared to the non-interest income margin.

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5 Conclusions and Suggestions

The present study aims to investigate the relationship between income diversification and CAMEL Composite Index. Therefore, by introducing the indices used for quantification, income diversification was calculated based on HHI.

In the next step, CAMEL composite index was studied. First, six ratios were calculated for the five CAMEL indices obtained by using the exploratory factor analysis (EFA) of two factors. Factor 1, which had the highest dependence on the capital adequacy index and management quality index, was called the bank's financial ability index. Factor 2, which had the highest dependence on the profitability, liquidity, and asset quality index, was named the bank's financial performance index. According to study goals, EFA can reduce the CAMEL ratios and variables from five to two factors: financial ability and financial performance.

To reach the other study goal set, the relationship between financial ability and financial performance, as CAMEL composite index and income diversification, was investigated. To achieve this, a dynamic panel model was estimated with the dependent variable of income diversification and the explanatory variables of financial ability index and financial performance index, and control variables, including the non-performing loans ratio and the bank's size. The results indicated a positive and significant relationship between the financial ability index and financial performance index with income diversification, which emphasizes the impact of banking soundness on income diversification. This means that the better the bank status is in terms of CAMEL indices or bank soundness, the more diverse income sources and the bank's credit risk will be distributed.

Improving the bank's soundness requires the bank's management to create income diversification to maintain or promote such a trend. To increase income diversification and reduce the credit risk of the country's banking industry, legislation needs to be enacted to control other CAMEL indices with specified ratios and amounts, in addition to the requirement to comply with capital adequacy, which is one of the five CAMEL indices.

Considering the components of the financial ability index, i.e., the capital adequacy and quality of management (from CAMEL indicators), a particular focus on improving these two groups of indicators is essential. Improving the bank managers' appointments using adequate supervision over their actions, along with paying attention to capital adequacy in accordance with the standards of the Central Bank, should have a higher priority in the country's banking decision-making system.

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The results show the impact of size on income diversification was negative and significant, indicating the bank's preference to allocate new sources to loans to reach interest income. The main reason for this can be the high margin of loan income gained compared to the non-interest income margin. The structure of Iranian banks causes this type of allocation.

As mentioned, this article supports the diversity of income in the country's banking system. For this purpose, it is necessary to focus on the factors that affect the banking structure examined in this study. In the discussion about banking health indicators (CAMEL), it is necessary to have enough focus on its areas and to take the necessary measures to improve them. One of these measures is the use of modern standard asset-liability management methods (ALM) to optimize balance sheet items, including credit portfolios and investment portfolios. In reducing non-performing loans, it is recommended to focus on new credit rating methods and ranking of private and corporate clients to have a positive effect on revenue diversity.

However, regarding the size of banks and the size of the debts, a very practical proposal cannot be proposed; because in the field of decision-making, there are many people involved, including the government (in relation to state-owned and privatized banks), the senior managers of the banking system and also the shareholders.

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