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Identifying the drivers of asset quality review in Iranian banks

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Abstract

The purpose of this study was to examine a crucial issue in the Iranian banking industry: the assessment of asset quality. Previous studies have shown that a comprehensive model of asset quality review is still lacking. Only a few papers have systematically examined the factors affecting banks' asset quality. In addition, the key strategic drivers of Asset Quality Review (AQR) in Iranian banks were identify. A theoretical literature review, interviews with banking experts, fuzzy Delphi screening with 37 experts, and MICMAC software analysis of variable interrelationships were used. Findings revealed that the determinants of AQR fall into five categories: financial, credit, supervisory, macroeconomic, and institutional. In total, 53 sub-indicators were validated. Results showed that capital adequacy ratio, cost-to-income ratio, loan growth, non-performing loans, Collateral Valuation (CV), compliance, inflation and interest rates, as well as legal requirements and auditing, are the most significant strategic drivers in this domain.

Keywords:

Identification of drivers,
Asset quality review in
banks, Fuzzy Delphi
approach, Futures studies.



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1. Introduction

One of the prominent topics in accounting research is the examination of the quality of items that constitute financial statements (Dechow and Schrand, 2010). BS and IS have been consistently evaluated for quality, including in Iran, as the two primary financial statements. However, the degree of attention given to each is not balanced (Aminian, 2014). International studies show that IS goods have been assessed more for quality than BS items, particularly in terms of asset quality (Francis et al., 2004). This discrepancy is somewhat natural, as earnings are critical to decision-making by financial statement users. In Iran, the quality of BS items, especially assets, presents unique challenges, necessitating a focus on local, practical issues relevant to the economy and policymakers. Thus, Asset Quality Review (AQR) in Iranian banks, which are critical to the economy and often criticised, is crucial (Botshakan, 2018). Moreover, according to the World Bank (2025), conducting AQRs is essential for identifying banks suitable for restructuring and resolving structural weaknesses.

Efficiently mobilizing and allocating resources to promote sustainable economic growth is a basic role of every financial system (OECD, 2025). In 2025, the extra funds were channeled into productive investment through financial markets (365 Financial Analyst). Banks and capital markets primarily carry out this duty, and their actions have clear effects on the actual economy (Investopedia, 2025). The majority of Iran's financial transactions take place through banks because of the country's "bank-based system" (Aminian, 2014). The financial system is vital; understanding its state is essential. Laeven and Valencia (2013) and Peykani et al. (2025) found that AQRs have a crucial role in maintaining stable banks and avoiding crises. With sanctions limiting their access to external resources, Iran's banks must rely on their internal capabilities, making their resilience a matter of paramount importance. Problems with BS insolvency (the difference between assets and liabilities) and liquidity insolvency (the inability to meet withdrawal obligations) are also significant (Botshakan, 2018).

These flaws lead to a higher risk of credit losses, non-performing loans (NPLs), insolvency, insufficient cash, higher interbank rates, credit crunches, poor risk management, and insufficient capital. Some EU countries faced the same difficulties, but they fixed them by making fundamental changes that brought growth back. International experiences, such as the Comprehensive Assessment (CA) conducted by European central banks, provide Iran with useful insights (Zantheir and Kajiesfahani, 2018). CA means that central banks must carefully assess banks' financial health, ensure they are transparent about their finances, and ensure they have sufficient buffers against shocks. In Iran, stress testing is under-researched, so it mostly combines AQR and AQR (Botshakan, 2018).

According to a review of prior studies, AQR has received partial attention in the banking industry (Moore, 2019; Vo, 2018; Oberholzer, 2013; Swamy, 2017; Muneer et al., 2017; Ghaemi-Asl and Ghasemi-Nik, 2019; Shahcheraghi and Abolfathi, 2016; Seyed Shokri and Grossi, 2015; Aziznejad et al., 2019). However, a comprehensive model is lacking.

This work fills a crucial gap by creating a clear, evidence-based model that draws on theory, prior research, and expert opinions to identify the dimensions, components, and key indicators of AQR in Iranian banks and assess their relative relevance. The study's innovative contribution lies in its multidimensional approach, applying **Fuzzy Delphi (FD)** and futures studies to refine indicators and enhance scientific validity. To enhance the efficiency and security of Iran's financial sector, this framework promotes research on AQR and supports strategic decisions with evidence.

2. Theoretical foundations and literature review

2.1. Bank asset quality

Given the pivotal role of banks as one of the most important pillars of the financial and economic system, analyzing the nature of the monetary transmission mechanism in any economy is

incomplete without considering their role. According to Farzinvash and Heydari (2011), the 2008 financial crisis in Europe and the US demonstrated that a handful of large banks can trigger a worldwide recession.

Research shows that international banking has a long tradition of assessing banks' performance, complete with dedicated organizations and widely used methods. The CAMELS Rating System and the EAGLES Rating System are two methods that use a variety of factors to assess the stability and soundness of banks (Ghasempour et al., 2016).

One of the most important supervisory and regulatory frameworks for assessing financial institutions is the evaluation of five key characteristics, known as the CAMELS indicators (Shams Abadi and Karimkhani, 2011). The U.S. National Credit Union Administration introduced the CAMELS rating system in October 1987. It was introduced in October 1987 by the U.S. National Credit Union Administration (Seraj And Taheri, 2012).

Since daily decision-making on deposit fund allocation directly affects credit risk, the likelihood of default, and potential write-offs, it is among the most crucial banking processes. Banks can evaluate this facet of performance through asset quality, which is part of the CAMELS rating system.

The most important component of CAMELS is asset quality, which reflects the efficiency of bank management and directly impacts capital adequacy, income, and liquidity. To improve this indicator, banks must rely on stable and liquid assets in their portfolios and allocate adequate reserves to offset potential devaluations.

Since most of a bank's assets are loans, the quality of those assets is usually the same as the quality of those loans. This is usually done by identifying NPLs and determining what percentage of the entire portfolio they represent. Asset quality worsens as NPLs increase and recovery prospects decline. Currently, Iran's bank loans are categorized into four categories based on repayment delays: current, past due, doubtful, and non-performing.

2.1.1. Factors affecting bank asset quality

Research shows that factors influencing bank asset quality can be divided into two main groups: **internal (non-systematic)** and **external (systematic)**. Internal factors are controllable and related to the bank's own policies and operations, while external factors are beyond the bank's control and depend on a country's macroeconomic, political, and structural conditions.

2.1.1.1. Internal factors

Banks' internal rules and practices constitute the internal factors that affect asset quality.

- Weaknesses in assessing borrowers' creditworthiness and repayment capacity;
- Lack of skilled professionals to obtain and verify client information;
- Insufficient expertise and training of credit officers;
- Absence of a comprehensive credit information and centralized rating system;
- Reliance on outdated, traditional methods in loan appraisal and granting;
- Poor alignment of collateral with the borrower's credit capacity (quality of assets backing loans);
- Neglect of supervisory directives and non-compliance with banking regulations;
- Frequent managerial changes in bank branches (Shahcheraghi and Abolfathi, 2016).

Additionally, **bank-specific variables** significantly influence asset quality. These include bank size, structure of the banking market, lending interest rates, capital-to-assets ratio, deposits-to-assets ratio, loans-to-assets ratio, growth of total loans, and the share of joint revenues in total income.

2.1.1.2. External factors

The theoretical foundations suggest that macroeconomic variables, such as unemployment, inflation, GDP growth, market interest rates, and sanctions, play a significant role in shaping asset quality. (Mirzaei et al., 2016) Policy-related variables include changes in monetary and fiscal policy, regulatory reforms, and trade policy changes.

2.2. Empirical background

Numerous studies have been conducted on the quality of assets, NPLs, and banking system stability, which can be examined at both national and international levels. These studies identify a set of internal and external factors that significantly influence asset quality and bank performance.

In Iran, Seyed Shokri and Grossi (2015) showed that the growth of gross domestic product is associated with a decrease in the ratio of NPLs, while inflation has a negative effect on asset quality. Additionally, Shahcheraghi and Abolfathi (2016) examined internal and macroeconomic factors, such as the capital-to-asset ratio, return on assets, and loan growth, and found that they were strongly related to asset quality.

In the same vein, Hassas-Yeganeh et al. (2017) found that banks' financial distress is directly correlated with an increase in the ratio of nonperforming loans. Safarzadeh and Jafarimanesh (2019) demonstrated that the Central Bank of Iran's reserve model is not fully effective in managing banking risk and that forward-looking models can improve banking system stability. In a similar vein, Ghaemi-Asl and Ghasemi-Nik (2019) identified low-quality reserves as an important factor in the persistence of non-performing loans.

Pourkazemi et al. (2017) used neural networks to predict consumer default, and Kordmanjiri et al. (2020) used machine learning techniques to identify 10 significant determinants of banks' NPLs. These findings emphasize the importance of leveraging advanced analytical tools to improve asset quality.

At the international level, Laeven and Valencia (2013) concluded that larger banks are associated with higher systemic risk, whereas greater capitalization can mitigate this risk. Muneer et al. (2017) and Swamy (2017) showed that macroeconomic variables, such as GDP growth and exchange rates, directly affect asset quality, while inflation and operational costs negatively affect it.

Buch et al. (2017) highlighted that international banking policies can significantly influence asset quality and financial stability in other countries. In this context, Kozińska (2018) examined the effectiveness of tools such as “bad banks” and temporary banks for restructuring financial institutions, identifying bad banks as the most effective tool during banking crises. In addition to macroeconomic conditions, Vo (2018) noted that lending practices and collateral policies can play an important role in the emergence or prevention of banking crises.

In addition, the International Monetary Fund (2018) noted in its report that any structural reform in the banking system must include the immediate implementation of AQR programs by independent auditors. Abdul-Gafoor et al. (2018) showed that board members' independence and financial knowledge are associated with higher asset quality in corporate governance. Levels and Capel (2012) and Oberholzer (2013) also found that bank size, the types of assets it holds, the unemployment rate, and GDP growth are important factors affecting the quality of its assets.

In more recent studies, Moore (2019) confirmed the direct effect of asset quality on the profitability of bank branches. Finally, Kim et al. (2023) found, in their study of emerging markets, that in addition to macroeconomic conditions, factors such as bank size and capital structure play a crucial role in determining asset quality.

Overall, these studies indicate that bank asset quality is shaped by the interaction of

macroeconomic factors (inflation, economic growth, exchange rates, and unemployment) and bank institutional characteristics (size, capital structure, asset composition, and management quality). Additionally, neural networks and machine learning algorithms can play an important role in predicting default risk and improving asset quality.

2.3. Conceptual model of the research

Based on a review of the theoretical and empirical literature, the most important and frequently mentioned dimensions, variables, and factors influencing the AQR of banks were identified and categorized. The proposed conceptual model was refined and validated through an initial screening process using expert opinions and the **FD technique**.

As a result, the factors affecting banks' AQRs were classified into five main dimensions: **financial, credit (lending), supervisory, macroeconomic, and legal-institutional**. Sub-dimensions exist within each of these five main dimensions.

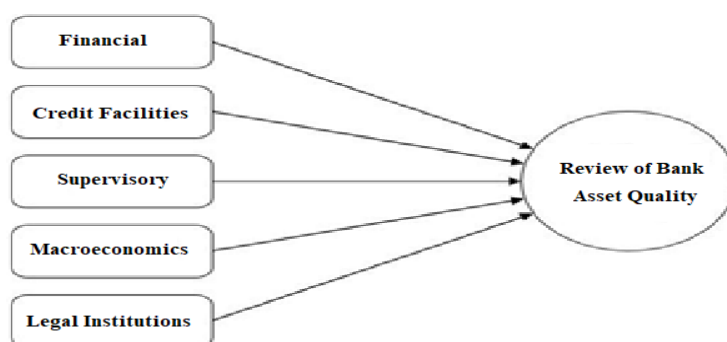


Figure 1. Conceptual model of the research

Figure 1 illustrates the conceptual model of this research. In addition, all indicators extracted from the theoretical foundations and expert interviews for each of the five independent variables in the conceptual model are presented and described in the table below. It is important to note that, according to this conceptual framework, the factors affecting banks' AQRs are categorized into the five key dimensions outlined above. The sub-dimensions that form these five main variables comprise **53 indicators in total**, all of which are presented in **Table 1**.

Table 1. Detailed conceptual model of the study: main and sub-dimensions affecting AQR of Banks

Main Dimension/Variable	Row	Indicator Code	Name of Sub-Indicator or Component
Financial	1	B1	Cost-to-income ratio
	2	B2	Bank size
	3	B3	Investment in shares of other companies
	4	B4	Receivables from the government sector
	5	B5	Deposit-to-capital ratio
	6	B6	Growth of bank stock value
	7	B7	Cost of maintaining the bank's fixed assets
	8	B8	Debt to the Central Bank
	9	B9	Bank's share of joint revenues to total bank revenues
	10	B10	Ratio of real estate to total assets
	11	B11	Capital adequacy ratio
Lending	12	T1	Growth in granted loans

	13	T2	Bank loan interest rate
	14	T3	Interbank loans
	15	T4	Loan-to-asset ratio
	16	T5	Non-performing loans
	17	T6	Directed loans to total loans
	18	T7	Non-performing loan ratio to total loans
	19	T8	Doubtful-to-collect loans
	20	T9	Re-installment and re-deferral of loans
	21	T10	Loan-to-deposit ratio
Supervisory	22	N1	Sufficient training for bank experts in risk management
	23	N2	Random audit by the bank's internal inspectors
	24	N3	Customer information review process
	25	N4	Valuation of collateral and guarantees obtained from the customer
	26	N5	Alignment of collateral and guarantees obtained from the customer with the amount of the granted loan
	27	N6	Recruitment and employment of expert personnel to obtain confidential customer information and verify information
	28	N7	Borrower creditworthiness and financial capability
	29	N8	Borrower's motivation for taking the loan
	30	N9	Periodic change of the bank's branch credit manager
	31	N10	Post-loan supervision (supervision of loan usage)
	32	N11	Periodic change of the bank's branch manager
	33	N12	Attention to issued circulars regarding loan granting
	34	N13	Having a comprehensive system for customer information and rating
Macroeconomic	35	E1	Financial crises
	36	E2	Issuance of high-interest participation papers and government treasury bills by the Central Bank
	37	E3	Difference between bank deposit interest rate and inflation rate
	38	E4	Recessionary conditions affecting businesses
	39	E5	Sanctions and severe exchange rate fluctuations
	40	E6	Volume of non-oil exports
	41	E7	Market interest rate
	42	E8	GDP growth rate
	43	E9	Unemployment rate
	44	E10	Inflation rate
Legal Institutions	45	G1	The role of the Securities and Exchange Organization in improving the transparency of bank financial statements
	46	G2	Drafting of executive guidelines by the Central Bank
	47	G3	Independent audit of bank financial statements by certified accountants
	48	G4	Amending the articles related to bankruptcy in the commercial law
	49	G5	Drafting a standard for loan loss provision by the Audit Organization
	50	G6	Establishment of a special court to handle non-performing loan cases above a certain amount
	51	G7	Mandatory submission of audited financial statements by corporate loan applicants by certified accountants
	52	G8	Drafting a standard for valuing bank assets by the Audit Organization
	53	G9	Central Bank's supervision over the correct implementation of issued guidelines

3. Research Methodology

This study is a **descriptive survey** with an **applied-developmental** orientation. Data collection in the first phase was conducted through a **researcher-developed questionnaire** consisting of 53 items. The things were first looked at qualitatively and then given a number using triangular fuzzy numbers. The questionnaire was constructed utilizing the preliminary conceptual model, informed by theoretical and empirical literature with first expert insights. Following the screening and

validation of all 53 sub-dimensions, a following questionnaire of 50 items was created to evaluate the validated sub-dimensions affecting the AQR of banks, utilizing a five-point Likert scale, and was subsequently disseminated to experts.

Although the overall approach of this study is quantitative, **FD technique** a qualitative method was initially employed to screen the conceptual framework. The qualitative expert judgments were then quantified. The research process involved reviewing theoretical foundations and previous studies. Then, the preliminary conceptual model was extracted and proposed. Using the FD technique, the preliminary model was evaluated and screened. Finally, the conceptual model was identified and finalized. Using MICMAC software, the most critical strategic drivers were determined, and the overall fit of the model was assessed. Finally, the research report was prepared based on the significance of the dimensions and drivers affecting AQR.

Members of the statistical population were recruited from ten separate Tehran-based banks and were all considered specialists or experts in their respective fields of accounting, economics, and management. Experts were chosen from six different locations: one from each bank's headquarters and three from each of the five branches. We selected experts based on their willingness to participate, the availability of adequate time, and the approval of security offices and senior management. The sampling was purposeful and convenience-based.

The ten selected banks were: **Bank Melli, Bank Keshavarzi, Bank Sarmayeh, Bank Tejarat, Bank Mellat, Bank Saderat, Bank Refah, Bank Pasargad, Bank Parsian, and Bank Qarz-al-Hasaneh Resalat.**

For the **fifth step** of the research process (identification of key drivers), a sample of **210 willing experts** was selected, as detailed in **Table 5** of the findings section. Table 2 presents 37 experts from the banking sector and academia in relevant fields selected for the third step (implementation of FD technique). The discrepancy in sample size is due to the fact that the two methodological methods are different and have different needs.

Table 2. Characteristics of selected experts for FD technique

Row	Selected Experts	Education Level	Work Experience	Number (Persons)
1	Central Bank Managers	Master's degree or higher	More than 20 years	4
2	Bank Branch Supervisors' Managers	Master's degree or higher	More than 20 years	9
3	Bank Branch Managers and Deputies	Master's degree or higher	More than 20 years	16
4	University Professors and Professional Consultants (in the fields of Finance, Banking, Accounting, Economics, and Management)	Master's and Ph.D.	More than 15 years	8
Total Number of Selected Experts (Available) for FD Technique				37

In the findings and analysis part, alongside the problem-solving process, are detailed the procedures and methods of implementation of the methodologies utilized in this study, including the FD approach and the identification of key drivers.

To enhance methodological transparency, additional clarification regarding expert selection and data collection procedures is provided. Three factors were used to pick the experts: (1) their willingness to engage in several Delphi rounds; (2) their expertise with asset quality assessment and regulatory frameworks; and (3) the length of time they had worked in banking, finance, or academia. Of the 45 experts who were first contacted, 37 gave valid responses, which means that about 82% of them responded. In order to reduce the possibility of bias, we made sure to include

participants from a variety of public, private, and specialized banks, as well as from diverse functional areas and managerial levels. Moreover, anonymity was maintained throughout the Delphi rounds to prevent dominance bias, and consensus reliability was assessed by examining the stability of defuzzified mean values between successive rounds ($\Delta \leq 0.2$), confirming an acceptable level of agreement among experts.

The expert group was purposefully crafted to incorporate academics with countrywide viewpoints, professionals from both public and private banks, and others to address concerns about representation. Many respondents had advisory or supervisory responsibilities that extended beyond multiple provinces and regional branches, even though most of them were situated in Tehran owing to accessibility and institutional limitations. That way, the views represented the varied operating realities of Iran's banking system as a whole, not just those in Tehran. However, we do recognize this as a contextual restriction; it points the way toward future research that can expand the analysis to include worldwide and regional banking settings.

4. Findings and analysis

In this section, the conceptual model derived from the literature review and expert interviews is first **screened through FD method** based on expert opinions. Following this stage, which ultimately leads to the **final conceptual model of the study**, a questionnaire was designed, and the dimensions and variables of the conceptual model were subsequently assessed and validated by identifying the **key drivers** using **MICMAC software**.

4.1. Implementation of FD process with multiple rounds

The iterative procedure that FD method takes requires a certain amount of time to reach a **saturation point and expert consensus**. After converting the qualitative or linguistic assessments of the expert panel into **triangular fuzzy numbers (L, M, U)** as presented in **Table 3** the fuzzy averages for each indicator were calculated. There are other ways to find these averages, and some research use the simple arithmetic mean.

In this study, the **linguistic terms** used by experts and their corresponding **quantitative and fuzzy equivalents** are first presented in **Table 3**.

Here is the English translation of the table you provided:

Table 3. Linguistic variables for survey and their corresponding quantitative and Fuzzy equivalents (Sevкли et al., 2012)

Linguistic Variable	Fuzzy Equivalent with Triangular Numbers
Extremely Low	(1, 2, 3)
Very Low	(2, 3, 4)
Low	(3, 4, 5)
Medium	(4, 5, 6)
High	(5, 6, 7)
Very High	(6, 7, 8)
Extremely High	(7, 8, 9)

For calculating the average opinions of experts and the corresponding triangular fuzzy numbers, various approaches and formulas have been proposed. In this study, one of the most reliable and widely used methods—namely, the geometric mean of each element—was applied to evaluate the indicators ($j=1,2,\dots,mj = 1,2,\dots,mj=1,2,\dots,m$) based on expert judgments ($i=1,2,\dots,ni = 1,2,\dots,ni=1,2,\dots,n$). Accordingly, the fuzzy mean for each indicator (L_j, M_j, U_j)(L_j, M_j, U_j)(L_j, M_j, U_j) is expressed as follows:

Equation (1)

$$\widetilde{a}_{ij} = (L_{ij}, M_{ij}, U_{ij}), i = 1, 2, \dots, n, j = 1, 2, \dots, m$$

Equation (2)

$$L_j = \left(\prod_{i=1}^n L_{ij} \right)^{\frac{1}{n}}$$

Equation (3)

$$M_j = \left(\prod_{i=1}^n M_{ij} \right)^{\frac{1}{n}}$$

Equation (4)

$$U_j = \left(\prod_{i=1}^n U_{ij} \right)^{\frac{1}{n}}$$

In the next step, using the defuzzification method below, the crisp value (A) of each indicator is calculated. If the crisp or defuzzified value (A)(A)(A) is greater than 7, the indicator is accepted and validated; otherwise, if the defuzzified value (A)(A)(A) is **less** than 7, the indicator is rejected and excluded from the list (Wu and Fang, 2011).

Equation (5)

$$A_j = \frac{L_j + 4M_j + U_j}{6}$$

In general, one approach to determining the termination of the Delphi process is to compare the mean or defuzzified values of the indicators between the first and second rounds. The process is considered saturated if the difference between the two rounds is less than the very small threshold of 0.2. Otherwise, a third round is conducted (Babajani et al., 2019).

The results of these computations are presented in Table 4.

Table 4. Results from implementing FD process in two different rounds

Indicator	Round 1			Round 2			Difference
	Fuzzy Mean	Defuzzified Value	Result	Fuzzy Mean	Defuzzified Value	Result	
1	(6.10, 7.20, 9.30)	7.37	Accepted	(5.30, 7.80, 8.80)	7.55	Accepted	0.18
2	(5.30, 7.80, 9.50)	7.67	Accepted	(6.70, 7.30, 9.60)	7.58	Accepted	0.09
3	(5.30, 7.00, 8.90)	7.03	Accepted	(5.40, 7.20, 9.13)	7.22	Accepted	0.19
4	(5.50, 8.00, 9.50)	7.83	Accepted	(5.60, 7.90, 8.81)	7.67	Accepted	0.16
5	(5.30, 7.10, 9.50)	7.20	Accepted	(5.30, 7.80, 8.80)	7.13	Accepted	0.07
6	(5.60, 7.30, 9.10)	7.32	Accepted	(5.60, 7.30, 9.40)	7.37	Accepted	0.05
7	(4.30, 5.90, 7.80)	7.95	Accepted	(5.30, 7.80, 8.80)	7.23	Accepted	0.18
8	(5.80, 8.30, 9.70)	8.12	Accepted	(6.01, 8.40, 9.50)	8.19	Accepted	0.07

9	(5.40, 7.00, 8.80)	7.03	Accepted	(5.90, 7.10, 8.40)	7.12	Accepted	0.09
10	(5.30, 5.50, 7.60)	7.82	Accepted	(5.43, 7.08, 9.60)	7.02	Accepted	0.14
11	(5.60, 8.09, 9.40)	7.89	Accepted	(5.40, 7.90, 9.30)	7.72	Accepted	0.17
12	(5.20, 7.09, 9.10)	7.11	Accepted	(6.50, 6.78, 8.97)	7.10	Accepted	0.01
13	(5.00, 7.50, 9.40)	7.40	Accepted	(6.10, 7.50, 8.80)	7.48	Accepted	0.08
14	(4.80, 6.99, 9.40)	7.03	Accepted	(5.40, 7.08, 9.60)	7.22	Accepted	0.19
15	(6.70, 7.08, 9.20)	7.37	Accepted	(5.09, 7.50, 9.20)	7.38	Accepted	0.01
16	(6.30, 7.60, 9.30)	7.67	Accepted	(6.90, 7.60, 8.20)	7.58	Accepted	0.09
17	(4.80, 7.30, 9.40)	7.23	Accepted	(5.20, 7.50, 9.00)	7.37	Accepted	0.14
18	(5.00, 7.50, 9.40)	7.40	Accepted	(5.80, 7.08, 9.60)	7.29	Accepted	0.11
19	(5.60, 8.10, 9.40)	7.90	Accepted	(5.60, 8.10, 9.21)	7.87	Accepted	0.03
20	(5.40, 7.80, 9.10)	7.62	Accepted	(6.30, 7.30, 9.10)	7.43	Accepted	0.19
21	(5.60, 7.08, 8.50)	7.07	Accepted	(5.40, 7.17, 8.89)	7.16	Accepted	0.09
22	(6.40, 7.00, 8.30)	7.12	Accepted	(5.91, 7.11, 9.50)	7.31	Accepted	0.19
23	(5.13, 6.99, 9.10)	7.03	Accepted	(5.60, 7.08, 8.76)	7.11	Accepted	0.08
24	(5.80, 7.10, 8.81)	7.17	Accepted	(5.55, 7.11, 8.90)	7.14	Accepted	0.03
25	(6.30, 8.09, 9.10)	7.96	Accepted	(6.70, 8.09, 9.75)	8.14	Accepted	0.18
26	(5.90, 7.81, 9.80)	7.82	Accepted	(5.40, 8.16, 9.30)	7.89	Accepted	0.07
27	(5.50, 6.68, 9.40)	7.06	Accepted	(4.60, 7.40, 8.91)	7.19	Accepted	0.13
28	(5.90, 7.43, 9.71)	7.56	Accepted	(5.08, 7.40, 9.30)	7.45	Accepted	0.11
29	(5.20, 7.61, 8.88)	7.42	Accepted	(6.00, 7.21, 9.31)	7.36	Accepted	0.06
30	(5.14, 7.01, 8.90)	7.01	Accepted	(5.01, 7.09, 9.01)	7.06	Accepted	0.05
31	(6.01, 7.86, 8.90)	7.73	Accepted	(5.98, 7.74, 8.61)	7.59	Accepted	0.14
32	(5.30, 6.87, 9.40)	7.03	Accepted	(4.60, 7.19, 8.99)	7.06	Accepted	0.03
33	(5.12, 7.17, 8.80)	7.10	Accepted	(6.01, 8.60, 9.70)	7.23	Accepted	0.13
34	(6.30, 8.80, 9.70)	8.53	Accepted	(6.20, 8.60, 9.70)	8.38	Accepted	0.15
35	(5.50, 6.90, 9.40)	7.08	Accepted	(6.14, 7.01, 8.98)	7.20	Accepted	0.12
36	(4.80, 7.30, 9.40)	7.23	Accepted	(5.30, 6.90, 9.39)	7.05	Accepted	0.18
37	(5.60, 7.20, 8.98)	7.23	Accepted	(5.10, 7.30, 9.20)	7.25	Accepted	0.02

38	(5.50, 7.89, 9.50)	7.76	Accepted	(5.10, 8.15, 9.10)	7.80	Accepted	0.04
39	(5.30, 8.30, 9.80)	8.05	Accepted	(6.10, 8.40, 9.70)	8.23	Accepted	0.18
40	(5.20, 7.09, 8.97)	7.09	Accepted	(5.20, 6.10, 8.20)	7.30	Accepted	0.19
41	(5.10, 7.05, 9.50)	7.13	Accepted	(4.90, 7.40, 8.90)	7.23	Accepted	0.10
42	(6.10, 8.60, 9.80)	8.38	Accepted	(5.80, 8.40, 9.80)	8.20	Accepted	0.18
43	(6.89, 7.08, 9.12)	7.39	Accepted	(5.60, 7.17, 9.30)	7.26	Accepted	0.13
44	(5.50, 7.23, 9.50)	7.32	Accepted	(4.60, 7.64, 8.90)	7.34	Accepted	0.02
45	(5.00, 7.50, 9.70)	7.45	Accepted	(6.19, 7.23, 8.98)	7.35	Accepted	0.10
46	(6.30, 7.98, 9.20)	7.90	Accepted	(4.90, 8.04, 9.60)	7.78	Accepted	0.12
47	(5.30, 7.10, 9.00)	7.12	Accepted	(5.10, 7.20, 9.30)	7.20	Accepted	0.08
48	(6.10, 6.80, 8.98)	7.05	Accepted	(6.60, 7.01, 8.78)	7.24	Accepted	0.19
49	(4.20, 7.30, 9.50)	7.15	Accepted	(5.60, 6.90, 8.90)	7.02	Accepted	0.13
50	(5.80, 6.90, 8.70)	7.02	Accepted	(5.60, 7.03, 8.91)	7.11	Accepted	0.09
51	(4.90, 7.40, 9.20)	7.28	Accepted	(5.20, 7.80, 8.40)	7.47	Accepted	0.19
52	(4.80, 7.30, 9.10)	7.18	Accepted	(4.80, 7.30, 8.08)	7.13	Accepted	0.06
53	(4.80, 8.30, 9.40)	7.90	Accepted	(6.01, 7.80, 9.06)	7.72	Accepted	0.18

Based on the results presented in the above table, among the 53 indicators, all were validated across the two rounds of FD process. In the second stage, using the expert-based questionnaire data, the **key drivers influencing AQR in Iranian banks** were identified. For this purpose, the **MICMAC software** was employed. In what follows, the dimensions are elaborated in detail.

4.2. Key drivers governing AQR in Iranian banks

4.2.1. Analysis of key drivers in financial indicators

Figure 2 shows that the factors “Capital Adequacy Ratio (B11),” “Deposits-to-Capital Ratio (B5),” and “Cost-to-Income Ratio (B1)” had the highest column values, indicating the greatest influence over other variables. These factors are categorized as **input (primary) variables**.

In other words, the most important feature of these variables is their **low susceptibility to external influence** combined with their **high level of influence on other factors**. This finding suggests that these variables play a crucial role in shaping and determining AQR processes within the financial dimension. Consequently, changes in these indicators can exert broad and significant impacts on other related factors. Therefore, **special attention to the management and optimization of these indicators** is essential for improving the soundness and sustainability of the banking system.

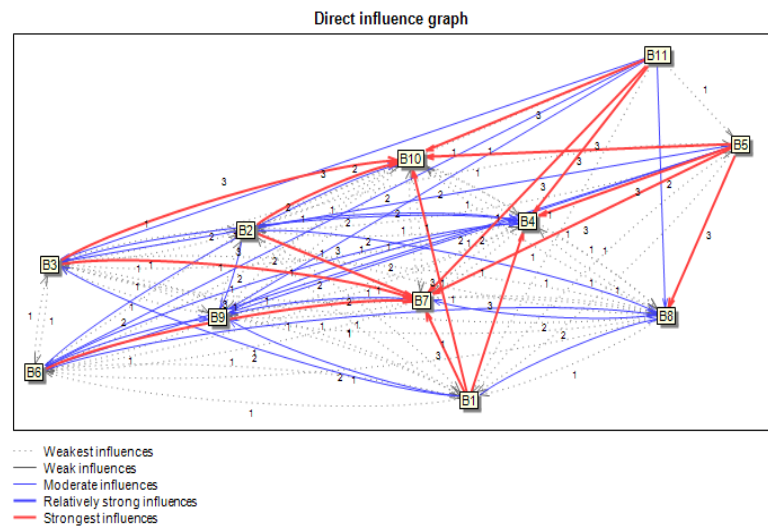


Figure 2. Map of direct relationships between variables (very weak to very strong effects)

Table 5. Net influence of financial drivers on AQR of Iranian banks

N°	Variable	Row Sum	Column Sum	Net Influence
1	B1	18	7	11+
2	B2	15	9	6+
3	B3	13	13	0
4	B4	7	20	13-
5	B5	20	3	17+
6	B6	14	11	3+
7	B7	6	24	18-
8	B8	9	16	7-
9	B9	10	15	5-
10	B10	7	21	14-
11	B11	20	0	20+
	Totals	139	139	-

4.2.2. Analysis of credit-related drivers in the review of asset quality in Iranian banks

The most important driving forces can be summarized as follows, according to the data in Figure 3. Out of the ten variables that were looked at for the credit dimension, "Growth of Granted Facilities (T1)," "NPLs (T5)," and "Loan-to-Asset Ratio (T4)" had the highest column values and the most significant effect on the other variables. These three variables are therefore considered main (input) variables.

This finding highlights the particular importance of these variables as decisive and key factors in managing and controlling the quality of banks' assets. Asset quality can be strengthened or undermined by changes in these indicators and can influence other related dimensions. Therefore, focusing on the optimization of these variables appears essential for enhancing the financial health of banks.

4.2.3. Analysis of supervisory drivers

According to Figure 4, the three main (input) variables that had the biggest impact on other variables were "Valuation of collaterals and guarantees obtained from customers (N4)," "Alignment of collaterals and guarantees with the amount of granted facilities (N5)," and "Eligibility and financial capability of loan applicants (N7)."

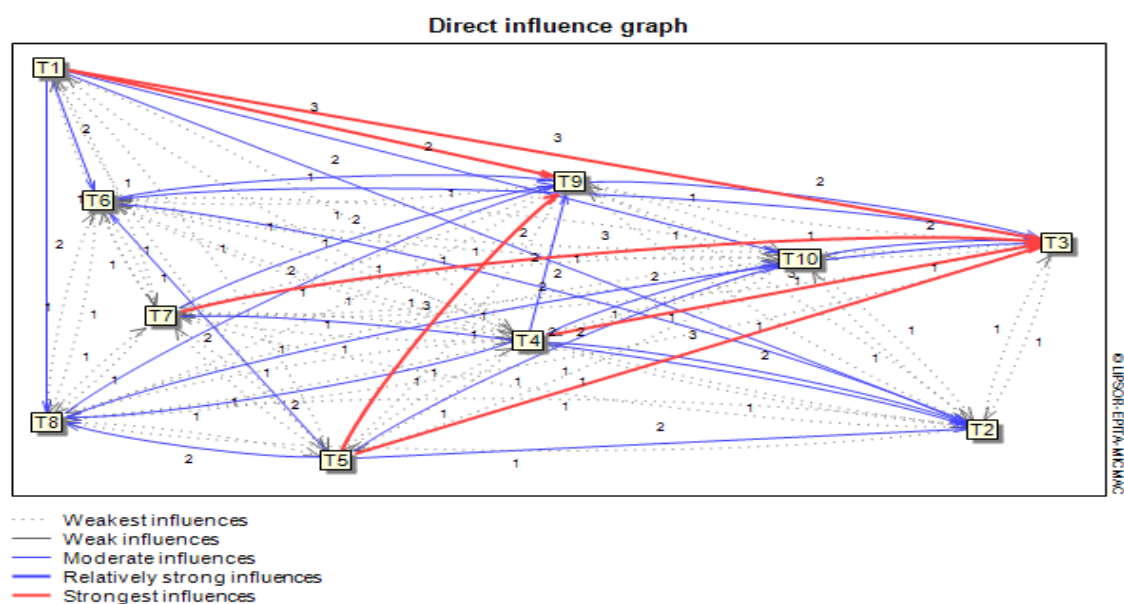


Figure 3. Map of direct relationships between variables (very weak to very strong effects)

Table 6. Net influence of lending drivers on AQR of Iranian banks ¹

N°	Variable	Row Sum	Column Sum	Net Influence
1	T1	17	3	14+
2	T2	7	14	7-
3	T3	6	21	15-
4	T4	15	7	8+
5	T5	17	6	11+
6	T6	10	11	1-
7	T7	13	9	4+
8	T8	10	12	2-
9	T9	8	17	9+
10	T10	9	12	3-
Totals		112	112	-

In other words, the most significant characteristic of these variables is their low susceptibility to influence while exerting a strong impact on others. This underscores the pivotal and decisive role of these factors in ensuring the soundness of the lending process and in controlling banks' credit risk. A thorough and accurate review of collaterals and guarantees, as well as a thorough evaluation of applicants' financial abilities, can greatly increase the quality of assets and lower the risks that come with giving out loans.

4.2.4. Analysis of macroeconomic drivers affecting AQR in Iranian banks

"Market interest rate (E7)," "inflation rate (E10)," and "the difference between bank deposit interest rate and inflation rate (E3)" are the three input variables that have the highest calculated column values and the greatest influence on other variables, according to Figure 5's results and the ten variables examined in the dimension of macroeconomic drivers. This highlights the significant importance of macroeconomic variables in determining the quality of banking assets, such that changes in the market interest rate, inflation rate, and the gap between deposit interest rates and inflation play a crucial role in shaping financial risks and the performance of banks. Proper management of these factors can greatly contribute to maintaining the stability and soundness of the banking system.

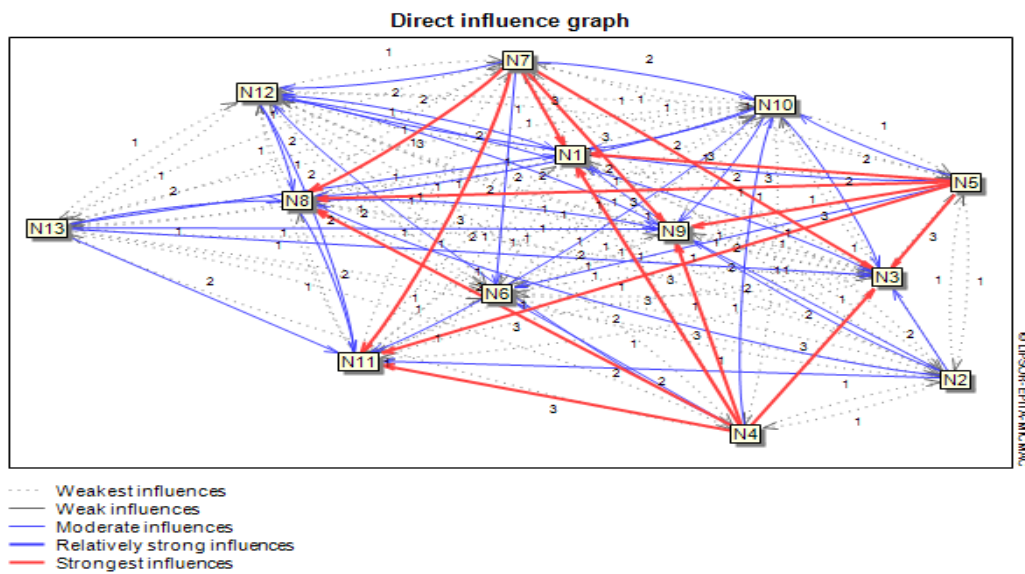


Figure 4. Map of direct relationships between variables (very weak to very strong effects)

Table 7. Net influence of supervisory drivers on AQR of Iranian banks

N°	Variable	Row Sum	Column Sum	Net Influence
1	N1	7	20	13-
2	N2	16	7	9+
3	N3	7	22	15-
4	N4	25	4	19+
5	N5	23	6	17+
6	N6	6	15	9-
7	N7	24	7	17+
8	N8	11	21	10-
9	N9	7	21	14-
10	N10	16	14	2+
11	N11	7	23	16-
12	N12	15	15	0
13	N13	17	6	11+
	Totals	181	181	-

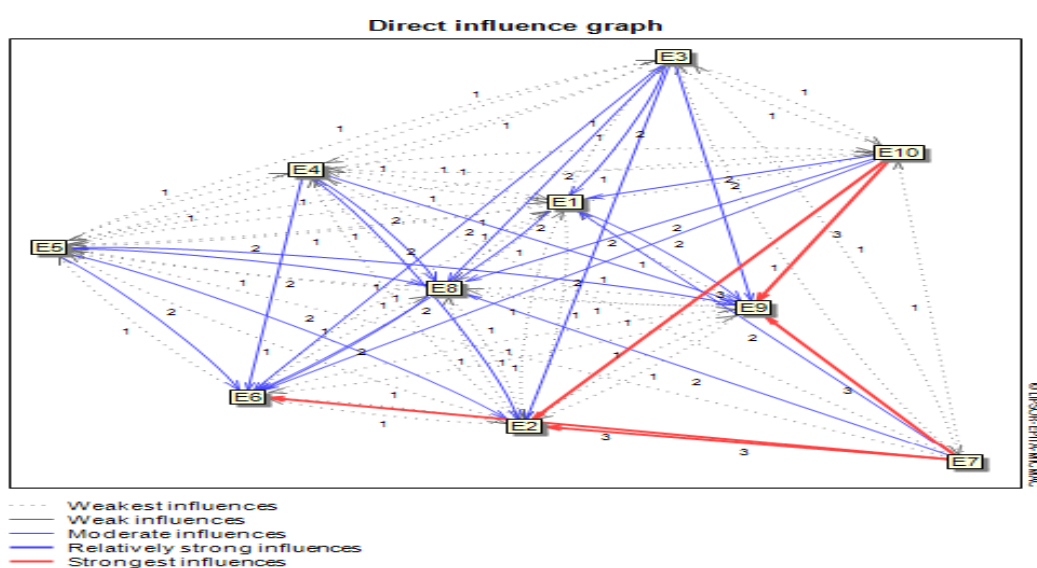


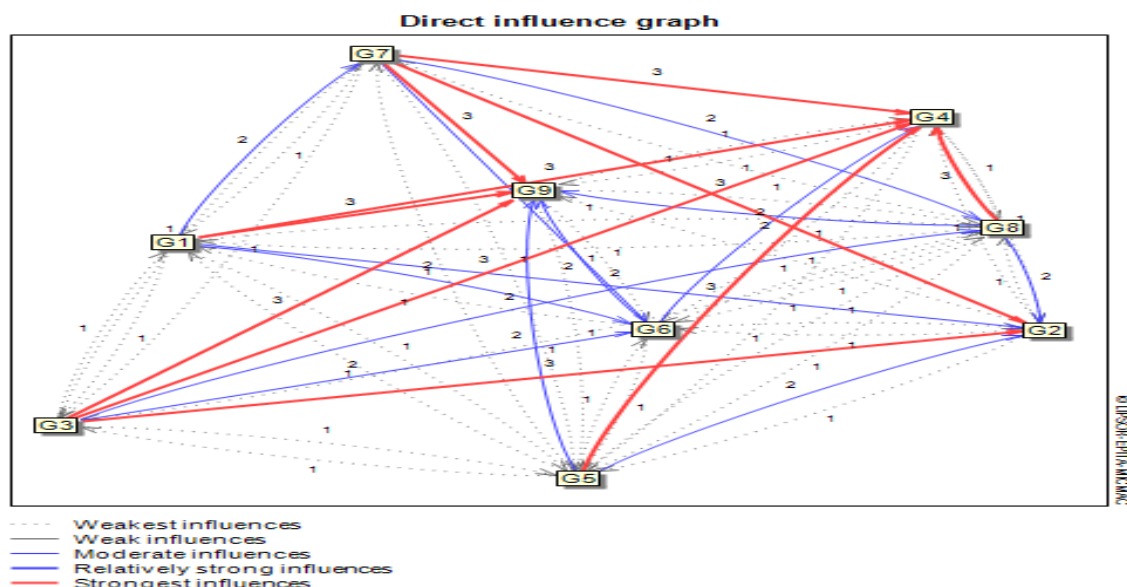
Figure 5. Map of direct relationships between variables (very weak to very strong effects)

Table . Net influence of macroeconomic drivers on AQR of Iranian banks

N°	Variable	Row Sum	Column Sum	Net Influence
1	E1	9	12	3-
2	E2	6	16	10-
3	E3	14	5	9+
4	E4	12	7	5+
5	E5	12	9	3+
6	E6	5	17	12-
7	E7	17	1	16+
8	E8	7	14	7-
9	E9	5	17	12-
10	E10	15	4	11+
	Totals	102	102	-

4.2.5. Analysis of regulatory institutional drivers affecting AQR in Iranian banks

Figure 6 shows the results of the study into the ten variables that affect AQR in Iranian banks. The factors that have the highest calculated column values and the most significant effects on other variables are "independent auditing of banks' financial statements by certified public accountants (G3)," "the requirement for legal entities applying for loans to submit audited financial statements by certified public accountants (G7)," and "the role of the Securities and Exchange Organization in enhancing the transparency of banks' financial statements (G1)." These are therefore called "key" variables. Therefore, they are considered input (key) variables. This shows how important legal oversight and financial transparency are for improving the quality of banks' assets. Independent audits, requiring the submission of audited financial statements, and the Securities and Exchange Organization's effective role in promoting transparency are all key parts of keeping the banking system safe and building trust among investors and other stakeholders.

**Figure 6.** Map of direct relationships between variables (very weak to very strong effects).

5. Conclusion, limitations, and future research

As previously stated, the main objective of this study was to identify the key drivers for reviewing asset quality in Iranian banks and to define the critical factors influencing this model. Interviews with banking industry professionals and academic banking specialists, along with a

survey of the theoretical literature (books, journals, etc.), formed the basis of this research's initial conceptual model. This model comprised 53 indicators or components affecting the quality of banking assets, which were categorized into five independent groups. A review of banks' asset quality at the national level is influenced by these five groups. The five main variables are: (1) Financial, (2) Credit Facilities, (3) Supervision, (4) Macroeconomic, and (5) Regulatory Institutions.

Table 9. Net influence of legal institutions drivers on AQR of Iranian banks

N°	Variable	Row Sum	Column Sum	Net Influence
1	G1	15	5	10+
2	G2	5	14	9-
3	G3	16	4	12+
4	G4	5	19	14-
5	G5	12	8	4+
6	G6	8	11	3-
7	G7	16	5	11+
8	G8	12	10	2+
9	G9	4	17	13-
Totals		93	93	-

In the next step, the 53 indicators affecting banking asset quality were evaluated and screened. To this end, the researchers applied the Delphi technique in a qualitative approach, seeking the opinions of experts. Subsequently, by employing a fuzzy approach with triangular numbers, the experts' views were quantified. We were able to reach theoretical saturation and unanimity after two rounds of participation from 37 available and interested experts. This part of the research confirmed that all 53 parameters were important in determining the national review of banks' asset quality.

In the next stage, after finalizing and refining the research model with expert input, a researcher-developed questionnaire was designed and distributed among a purposive accessible sample in order to collect the necessary data for conducting structural equation modeling. This process utilized software tools such as MICMAC to assess the overall fit of the conceptual model and to evaluate both the main and sub-indicators. The key objective of this phase was to determine whether the proposed model could adequately explain the factors influencing the review of banks' asset quality across the country, and whether it could fulfill the aims of both researchers and practitioners. This is why, prior to determining how well the models fit together, we officially and content-wise evaluated the research instruments' validity and reliability using expert opinions and software. The results, as reported in the preceding section, confirmed that the instruments possessed a high degree of validity and reliability, making the findings trustworthy.

Finally, the key drivers were identified through various indicators, showing that the five main variables affecting the review of banks' asset quality do not carry equal weight in terms of priority, importance, and impact. The order of priority and influence of these main variables in the review of banks' asset quality is as follows: (1) Supervisory factors, (2) Regulatory institutional factors, (3) Macroeconomic factors, (4) Credit facilities factors, and (5) Financial factors. This significant result can be observed in the radar chart presented in Figure 7.

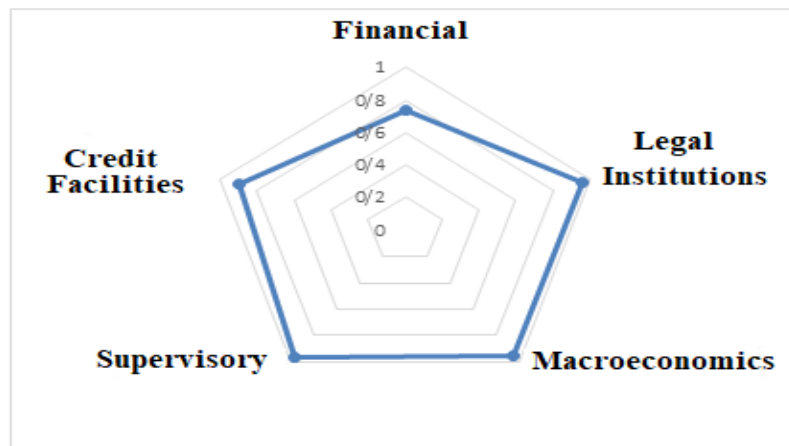


Figure 7. Prioritization of key variables affecting the review of bank asset quality from the perspective of path coefficients

If only one of the most important things that affects the examination of banks' asset quality at the national level had to be chosen, it would be the "supervisory" element. Based on its sub-indicators, it is important to focus on things like training staff in risk management, doing random internal audits, checking customer information, making sure that the CV is correct, making sure that the collateral matches the facilities that were given, hiring specialists to check customer data, checking the creditworthiness of applicants, checking the motivation of borrowers, periodically rotating credit and branch managers, monitoring after the loan is given, following loan-related rules, and setting up a complete customer information and credit rating system. Strengthening these indicators is vital for enhancing asset quality in the banking system.

The findings further showed that:

- In the financial dimension, the key indicators were "capital adequacy ratio (B11)," "deposit-to-capital ratio (B5)," and "cost-to-income ratio (B1)."
- In credit facilities, the most significant were "growth of facilities (T1)," "NPLs (T5)," and "loans-to-assets ratio (T4)."
- In supervisory drivers, the most impactful were "valuation of collateral (N4)," "alignment of collateral with facilities (N5)," and "creditworthiness of applicants (N7)."
- In macroeconomic drivers, the crucial ones were "market interest rate (E7)," "inflation (E10)," and "interest rate–inflation gap (E3)."
- In the regulatory dimension, the critical indicators were "independent auditing of financial statements (G3)," "submission of audited reports by legal entities (G7)," and "the role of the Securities and Exchange Organization in transparency (G1)."

Overall, the study aligns with works by Shahcheraghi and Abolfathi (2016), Hassas-Yeganeh et al. (2017), Swamy (2017), Levels and Capel (2012), Oberholzer (2013). Its novelty lies in the comprehensive set of variables and the two-stage qualitative–quantitative methodology, combining FD and structural equation modeling.

5.1. Research limitations

A major drawback of this study arises from its methodological emphasis: The research emphasized structural identification and qualitative modeling informed by expert consensus, utilizing Fuzzy Delphi and MICMAC analysis. So, the model's validation depends a lot on how well

the experts on the panel agree with the theory. We recognize that the lack of a thorough quantitative validation utilizing actual banking data, such as panel or time-series analysis, represents a constraint frequently encountered in preliminary structural modeling initiatives. The existing design does not have the resources or space to include such an empirical validation.

Future research could explore factors affecting AQR through qualitative methods, compare state-owned and private banks, apply multi-criteria decision-making for prioritization, employ machine learning for prediction, and examine the role of social and environmental sustainability factors in AQR. Given the limited studies on this subject in Iran, the validated model of this research can inform macro-level banking policies and serve as a reliable reference for future work.

It is essential that future studies use suitable econometric methods (such as GMM or Vector Autoregression) to test the experts' hypothesized causal relationships using real financial and macroeconomic time-series or panel data from Iranian banks. This will allow for a thorough quantitative validation of the identified structural model.

We also recognize that the present study utilizes a cross-sectional design centered on a certain time range. This method was used to make sure that collecting data from experts was possible and consistent. We do, however, fully understand how important it is to use dynamic modeling to show how asset quality changes over time, especially in light of Iran's changing economy. Consequently, forthcoming research ought to utilize longitudinal or time-series methodologies to track fluctuations in asset quality over time and evaluate the robustness of banks amongst diverse macroeconomic conditions.

Moreover, recent developments in the financial sector indicate that emerging technologies—such as financial technology (FinTech), artificial intelligence (AI), and digital banking—have begun to play a substantial role in determining the quality and performance of bank assets. These technologies can improve credit risk assessment, enhance real-time monitoring of loans, and reduce information asymmetry. Similarly, socio-environmental sustainability factors, including green lending policies and corporate social responsibility practices, are increasingly shaping asset quality in modern banking systems. Although these dimensions were not directly examined in the present model, they represent promising directions for extending the AQR framework in future research.

5.2. Practical implications

From a practical perspective, the findings of this study provide several actionable insights for policymakers and banking practitioners. Regulators like the Central Bank of Iran can use the major drivers that have been found to decide which areas of supervision to focus on first, notably those that have to do with CV, capital adequacy, and making sure that loans are in line with the borrower's ability to pay them back. Moreover, establishing an integrated information system for credit assessment and enhancing staff training in risk analysis can significantly strengthen the asset review process. Finally, adopting a periodic AQR framework—similar to international best practices—would enable Iranian banks to identify vulnerabilities early and improve overall financial resilience.

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