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Identifying the relationship between the uncertainty of economic policies and the lack of transparency of banks' income in Iran

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Abstract

The purpose of this study is to investigate the relationship between the lack of transparency of banks' income and the uncertainty of economic policies. The statistical population of the research is all banks and banks and credit institutions active in Iran. The research sample includes all the banks admitted to the Tehran Stock Exchange, which were members since 2010 and includes a total of 12 banks. The time period of the research is 2011 to 2021. In the statistical analysis of the research, first the descriptive analysis of the data was done, and then the reliability and distribution of the data were evaluated by performing the stationarity test and the normality test (Jarek-Bera) to estimate the models. In the next step, Limer and Hausman's F test was used to determine the data structure and estimation method. Then it was determined whether the model is linear or non-linear by using Wald's test, and finally, by using the GMM method, the effects of economic policy uncertainty on the lack of transparency of banks' income have been investigated. The results of the research showed that the uncertainty of economic policies depending on the size of banks can have a different effect on the lack of transparency of banks' income. Based on the evidence presented in the research, the relationship between economic uncertainty and lack of income transparency in the investigated banks is negative and significant. Also, the results show that regardless of the level of capital adequacy, the increase in economic uncertainty leads to a decrease in the level of income opacity of banks; However, the intensity of EPU effect on the lack of income transparency in banks with a lower capital adequacy level is greater in terms of absolute value than in banks with a higher capital adequacy level.

Keywords: non-transparency of banks' income, uncertainty of economic policies, GMM method
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1 Introduction

Today, banking is one of the most important economic sectors. By organizing and directing receipts and payments, banks and financial and credit institutions facilitate trade and commerce and expand markets and economic growth and prosperity. Banks and credit institutions, by equipping savings and directing them towards productive and commercial

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enterprises, firstly transform stagnant and possibly destructive economic capital into productive factors and secondly, other production factors, especially human capital, which are unemployed due to lack of capital or with They work at low productivity, leading to full employment with high productivity. The banking system, as the implementation tools of monetary policies, is the executor of the government's economic decisions to realize the goals of economic development and growth programs. In addition, with the contraction and expansion of bank credits and directing funds from one sector to another, apart from economic stabilization at the macro level, they also regulate economic sectors [8]. On the other hand, evidence has shown that poor banking performance can lead to a financial crisis. The financial crisis of 2007 was first of all accompanied by a severe financial shock that undermined the performance of the real economy. The US housing bubble and sector deterioration quickly spread to real sectors of the economy. The credit channel played an important role in spreading the financial shock in the banking and non-financial sectors. This channel included two sub-channels, which were differentiated by Bernanke and Gertler [4] into two (1) balance sheet channels and (2) bank loan channels [11]. As a result, good banking policies positively help the country's economy, and on the contrary, weak banking policies can be harmful to the economy.

There is growing evidence that banks are "black boxes". On the one hand, lack of transparency is an inherent component of banks' business, and on the other hand, poor transparency creates uncertainties in the level of risk of their assets. In the conditions of high economic uncertainty, the impact of the economic policy shock in the banking sector is less predictable; Therefore, policymaking in the banking sector is more prone to error. After the recent financial crisis, policymakers around the world promoted new laws and institutions to reduce the transparency of the financial system [**?**]. Reducing the transparency of bank income is the first step to make the policy making process more transparent. In addition, increasing the level of disclosure helps to design appropriate policy, identify growing risks and take actions that investors and customers around the world demand [7]. The lack of transparency of income is an inherent problem that makes it difficult for outsiders (investors) to recognize and evaluate the activities and resources of banks. In other words, since banks are more opaque than the non-banking sector, the lack of transparency in earnings can cause investors to be uncertain about the value of banks and weaken market discipline. In addition, the Basel III banking regulatory reforms place great importance on transparency and disclosure in Banking industry around the world [22]. One of the indicators that affects the lack of transparency of banks is economic policy uncertainty (EPU). The study of the effects of economic policy uncertainty on financial systems, especially on the activities of the banking system, has been an emerging field in the recent literature. Uncertainty in economic policy reflects the fact that economic policy may change in the next period, and this affects macro and micro level activities. Political uncertainty has important economic consequences; Because the content and timing of policy changes can affect current and future performance. Although there is a lot of evidence that shows that policy uncertainty can affect the investment decisions of companies; However, few studies have focused on explaining the effects of policy uncertainty on the quality of financial reporting, and only in recent years have some researchers investigated this issue [23].

EPU is positively related to income opacity for two reasons. First, opportunities for management to distort earnings are greater during periods of high EPU; Because EPU increases the information asymmetry between management and external stakeholders, it makes it more difficult for investors and creditors to assess the existence and extent of hidden "bad news". To the extent that investors and creditors are unable to see the real economic conditions, bank managers are likely to refrain from publishing unfavorable news. Second, management's incentives and opportunities to distort earnings are also greater in periods of high EPU, because EPU increases the volatility of firms' earnings and cash flow, and as a result, flexible managers have to manage bank profits. Furthermore, to the extent that investors and creditors can easily obtain information about economic policies from the media or financial analysts, managers may be motivated to improve corporate transparency to reduce their stakeholders' anxiety in times of high uncertainty. These counterarguments show that the relationship between EPU and bank income opacity is debatable and worth empirical analysis [22].

For two reasons, this study focuses on analyzing the consequences of EPU in financial reporting behavior in the banking sector. First, the banking industry was one of the sectors that was severely damaged during and after the financial crisis, and many economic policies were implemented directly with the aim of stabilizing and regulating the banking industry; Therefore, EPU can have a significant impact on the banking industry. Second, prior literature suggests that managerial incentives to distort financial reporting may lead to bank crises and bankruptcies [**?**]. Given that many of these policies targeted the financial sector and significantly increased EPU, they likely had a significant impact not only on operating and investment decisions, but also on financial reporting decisions of companies in this sector. Although many studies have examined the implications of EPU for output, investment, and employment at the macroeconomic level and for investment at the firm level, there is limited research on the implications of EPU for financial reporting behavior. The present study contributes to the expansion of the existing literature in various ways. First, previous studies on EPU mainly focus on developed and emerging economies, especially the United States,

and empirical studies on developing economies are few. The effect of EPU depends on the size of the stock market, economic strength and structure of the country [5]. As a result, the effect of EPU and the lack of transparency of bank income in Iran as a developing and oil-rich economy may be different from other countries because Iran's political and economic system is completely different; Therefore, this study contributes to increasing the theoretical literature and empirical evidence of banking and EPU. Second, the banking structures of developed countries, especially the Iranian economy, are more vulnerable to changes in uncertainty; Therefore, it is valuable to investigate the effect of EPU on the country's banking sector in Iran's economy [6]. Third, in this study, in addition to the economic policy uncertainty index developed by Baker et al [3]. The return volatility of the total stock price index has been used. Fourth, since the uncertainty of economic policies may not affect the lack of transparency of banks' income in a linear way, the existence of a non-linear relationship between these two variables is also evaluated by statistical tests, and if such a relationship exists, the non-linear relationship between these two variables in the form of the regression model will be estimated.

Economic policies, in general, the set of measures and ideas of the government to achieve the desired goals that it (the government) considers to be in line with its duties are called "economic policies". There is no clear consensus in the division of government policies. Government policies are usually divided into 5 or more types. Policies: 1- Financial 2- Monetary 3- Revenue 4- Foreign trade 5- Currency policies and other policies such as: loan policy, social policy, expansionary, contractionary financial policy, stabilization policy, etc. can be mentioned. Governments They should adjust their economic policies in order to ensure compatibility between economic policies and economic development. However, the policy adjustment process is always associated with unpredictability, lack of transparency and ambiguity, which leads to an increase in the degree of policy uncertainty. will be Existing studies have shown that policy uncertainty has different effects on macroeconomics, capital markets, and corporate behavior and exerts different and multi-level effects on participants, such as policy uncertainty and asset pricing, and investment decisions of companies, Commercial banks, as an important part of the financial system, are inevitably affected by economic policies and transmit these effects. Therefore, the uncertainty of policies as an effective variable on the participants in economic activities affects the lending behavior of commercial banks.

According to the existing theories and literature, policy uncertainty affects the scale of bank credit in two ways, one is a direct effect on the bank's own behavior and the other is an indirect effect of the bank through the effect of the firm's behavior. The results of previous studies on the relationship between income opacity and EPU have had different results. There are two groups of literature on the effect of EPU on income opacity. The first line of research argues that EPU is negatively related to income opacity. This research states that managers may have an opportunity to increase corporate transparency to minimize their stakeholders' concerns during periods of high policy uncertainty [13]. Managers respond to an increase in EPU by reducing income opacity to balance the information asymmetry created by EPU. However, increased disclosure only partially offsets the information asymmetry created by EPU [15].

In times of high EPU, outsiders may seek information from external sources regarding policy uncertainty. On the other hand, outsiders can get information about economic policies from financial analysts and various media; Therefore, the manager decides to improve transparency and reduce anxiety among stakeholders. In another spectrum, the findings of some studies show that uncertainty about economic policies contributes to greater lack of transparency. In this research, it is mainly emphasized that when the EPU is at a high level, the chances of management to distort earnings are higher; Because EPU increases the information asymmetry between management and external shareholders and makes it more difficult for creditors and investors to operate. Based on the degree to which creditors and investors cannot identify the true cause of economic conditions, managers are more likely to suppress unfavorable news; Otherwise, it will have a detrimental effect on their interests. Economic policy uncertainty is positively related to income opacity. Operating cash flows and earnings volatility increase as EPU rises, making it more difficult for external stakeholders to intercept earnings management [13]. Kim and Yasuda [14] investigate the effects of economic policy uncertainty on earnings management in Japan and find that EPU is negatively related to earnings management, indicating that managers have an incentive to reduce earnings management when EPU increases. Tran et al. [22] investigated the effect of economic policy uncertainty on banks' business activities using a large sample of US banks from 2000 to 2017 and concluded that small and medium-sized banks increase their non-interest income when EPU increases. While big banks do not have such a function. Sabouri and Karimpour [20] investigate the effect of economic policy uncertainty on bank stability using panel data at the bank level from 2005 to 2019. Their findings show that EPU reduces bank stability, but this effect varies by bank and market structure. In addition, using the threshold estimation method, they show that in countries with higher institutional quality than the threshold level, the adverse effect of policy uncertainty on bank stability is reduced; While lower banking competition amplifies the adverse effect. Moreover, EPU negatively affects bank stability in all sample countries, regardless of countries' level of development and income.

Ng et al [17] examine how economic policy uncertainty affects loan losses. They show that when policy uncertainty is higher, banks build more loan loss provisions. Using a sample of US bank holding companies from the first quarter of 2000 to the fourth quarter of 2015, Tran [21] documents a decrease in bank dividend payments as well as share repurchases due to increased prudential behavior during periods of high uncertainty. According to the findings of this research, banks increase their dividends in times of crisis more than normal times, and this effect is strengthened in banks that are exposed to higher agency problems and lower franchise value. Nguyen et al [18] examine the effects of economic policy uncertainty at the domestic and global levels on the growth of total bank credit. Empirical analysis has been done through the side factors of supply and demand in the growth of bank credit in 22 economies during the period of 2001-2015. This study uses different measures of EPU and uses panel-corrected standard errors (PCSE) and generalized least squares (FGLS) methods. The three main findings of this research are as follows. First, a higher level of EPU has a negative effect on the growth of bank credit. Second, a positive change in EPU seems to have favorable effects on the growth of bank credit. Third, the effects of EPU in emerging economies are negative and somewhat stronger than in advanced economies. Sabouri and Karimpour [20], by examining 90 stock companies during the years 2015 to 2019 and using the panel data method, concluded that economic policy uncertainty has a positive and significant effect on the financial leverage and capital structure of stock companies; To be more precise, increasing economic policy uncertainty by 10.79 leads to an increase in capital structure by 5.20. Najarian and Raiti [16] considering the commercial banks and stock exchange companies of Tehran in the time period from 2012 to 2017, the uncertainty of economic policies and its effect on the lack of profit transparency have been investigated. According to their results, the certainty of economic policies has a positive and significant effect on the lack of transparency of bank profit in banks admitted to the Tehran Stock Exchange. The sample of the study is heterogeneous and includes both banks and some other companies, and in this sense, its results may be somewhat biased. Also, in this study, policy uncertainty is calculated based on the inflation rate. Ghezelbash and Kaviani [19] investigate the effect of economic policy uncertainty on the pricing of banking facilities using the Garch method and bank stock market fluctuations. For this purpose, they analyze 14 banks during the years 2011 to 2018 using the panel data method. The findings of the researchers showed that economic policy uncertainty has a negative effect on the pricing of bank facilities. Hijazi et al. [10] investigates the effect of economic factors on profit opacity by examining the data of all manufacturing companies of Tehran Stock Exchange during the years 1998 to 2007. Their results showed that at the 95% confidence level, economic growth has a positive and significant effect on profit opacity.

2 Research method

According to the nature of the data, panel data technique has been used in this research. The method of data analysis is that the linearity of the model is tested first. If the linearity test of the model is confirmed, the GMM model is used to investigate the relationship between the uncertainty of economic policy and the lack of transparency of income. Arellano and Bond's (1991) two-stage GMM system estimator can overcome the endogeneity problem and provides unbiased estimates even in the presence of measurement error. In addition, this model provides consistency estimates with minimal statistical assumptions [1, 2]. Therefore, we use the GMM two-stage system model estimator because it is robust to address concerns of endogeneity, autocorrelation, and unobserved heterogeneity. Following the study of Desalegn and Zhou [7] and based on the above information, the following regression equation is used to estimate the effect of economic policy uncertainty (EPU) and other control variables (Controls) on the lack of transparency of banks' income (Opacity): In order to measure the lack of income transparency, the following model has been specified:

$$\text{Opacity}_{it} = \beta_0 + \beta_1 \text{Opacity}_{i,t-1} + \beta_2 EPU_{i,t} + \beta_n \text{Control} + \gamma_t + \varepsilon_{it}. \tag{2.1}$$

Opacity is the lack of transparency of bank income and EPU is the uncertainty of economic policy. Control variables include bank size, changes in granted facilities, capital adequacy, non-current facilities, changes in asset returns, inflation rate, economic growth, bank financial strength and unemployment rate. ε is the random term and γ is the time constant effect. In addition, to include the financial strength of banks, equation (2.1) is expanded as follows:

$$\text{Opacity}_{it} = \beta_0 + \beta_1 \text{Opacity}_{i,t-1} + \beta_2 EPU_{i,t} + \beta_n \text{Control} + \alpha_m FSI_{i,t} + \alpha_z EPU.FSI_{i,t} + \gamma_t + \varepsilon_{it}, \tag{2.2}$$

where FS represents the financial strength of the bank and $FS * EPU$ is the cross effect of the financial strength of the bank and EPU.

3 Measuring economic policy uncertainty

In this research, two indicators have been used to measure the uncertainty of economic policy. The first index is the index developed by Baker et al [3]. This index is obtained by textual analysis of articles related to politics in the media. This index has been widely accepted in financial and economic literature. By finding articles related to economic policy uncertainty in each month and dividing the number of these articles by the total number of articles published in that month, the EPU index is made monthly. Arithmetic mean is used to convert monthly data to annual data to match other annual variables. In this study, the articles of three newspapers Duniya Ekhtaz, Kayhan and Jam were used to make this index. The reason for choosing these newspapers is that, first of all, these newspapers were among the best-selling newspapers in the last few years and had high ranks in the ranking of newspapers. Also, the archive of the articles of these three newspapers during the years 2011 to 2020 is available. To measure the index of economic uncertainty, the contents of each of these newspapers are examined and if keywords are used in them according to the table below, they are used in the calculation of the index.

Table 1: Key words to estimate the uncertainty index of Iran's economic policy

Criteria	**Related keywords**
Economy	Economy, economy, finance
uncertainty	Uncertainty, uncertainty, volatility, instability, instability, unpredictability
politics	Politics, policy, government, regulations, laws

Also, in order to ensure the stability of the results, following Ghezelbash and Kaviani [9] stock market yield fluctuations are used as the second indicator of economic policy uncertainty, and in their study, stock market yield fluctuations are calculated as a time series by the Garch model.

4 Measuring the lack of income transparency

Following Jiang et al [12], and Tran et al [21], discretionary loan loss provisioning (DLLP) has been used as a measure of bank income opacity. LLPs are very important accruals to measure the performance of banks. They are a measure of loan losses and reflect information asymmetry. Because the amounts announced are based on the managers' judgment. Jiang et al [12] believe that LLP is the most important component through which banks monitor profit and capital. Several papers provide proxies for financial statement quality by predicting the LLP model and calculating the difference between actual and expected LLP values. In these studies, the absolute values of the residuals of the LLP fitting model were used as a measure of the "abnormal" accrual items of LLP, which is also known as discretionary LLP. A higher (absolute) value of discretionary LLP indicates greater caution by bank management, which reduces the ability of external investors to accurately assess the firm's performance and valuation. Following the research of Tran et al [21], and Jin et al [13], the following model is used to estimate LLP:

$$\mathrm{LLP}_{it} = \alpha_0 + \beta_1 \mathrm{CHNPL}_{i,t+1} + \beta_2 \mathrm{NPL}_{it} + \beta_3 \mathrm{CHNPL}_{i,t-1} + \beta_5 \mathrm{SIZE}_{i,t-1} + \beta_6 \mathrm{CHLOAN}_{it} + \beta_7 \mathrm{GDPG}_{i,t} + \beta_8 \mathrm{CHUR}_{i,t} + \varepsilon_{it}$$

where LLP_{it} represents the facility's loss reserves adjusted based on total initial assets (divided by assets at the beginning of the period), NPL_{it} and $\mathrm{CHNPL}_{i,t+1}$ and $\mathrm{CHNPL}_{i,t-1}$ are non-current facilities in period $t, t+1$ and $t-1$. CHLOAN represents the difference between interest rate of facility and deposit. $\mathrm{SIZE}_{i,t-1}$ is the logarithm of total assets at the beginning of the period, $\mathrm{GDPG}_{i,t}$ represents GDP growth. $\mathrm{CHUR}_{i,t}$ is the change in unemployment rate and ε_{it} is the regression residual. The statistical population of the research is all banks and banks and credit institutions active in Iran. Due to the fact that the financial information of all banks in the country is not available, the research sample includes all the banks in the Tehran Stock Exchange that were members of it since 2013 and a total of 12 banks (Ansar, Mellat, Parsian, Iranzmin, Postbank, Saderat, Tejarat, karafarin, eghtesad novin , Sina, Day and Pasargad). The time period of the research is 2020 to 2021.

Investigating the change process of variables can provide valuable information for analyzing the behavior of variables. In this regard, in this section, the trend of the main research variables will be analyzed.

The economic uncertainty index is calculated based on the textual analysis of related articles and presented in Figure 1. For a more detailed analysis, the value of the index in 2015 has been considered equal to 1 as the base year. As can be seen in the graph, during the period under review, based on the newspaper texts of three newspapers, duniya eghtesad, kayhan, and jamejam, the level of economic uncertainty in 2018 was higher than other years (6.5 times that of 2015). The reason for the high level of economic uncertainty in 2018 can be found in the increasing

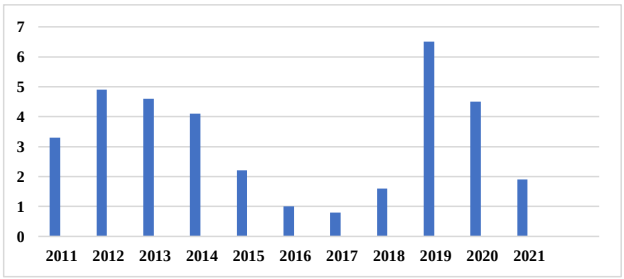

Figure 1: The trend of the economic uncertainty index based on the textual analysis of articles related to *it*-percentage

intensity of international sanctions and the spread of Corona in Iran. Also, the level of economic uncertainty index in 2016 was lower than other years.

Figure 2 depicts the average index of income opacity of the surveyed banks during the years 1390 to 1400. As can be seen in the graph, in terms of average lack of income transparency during the period under review, Sarmayeh Bank ranks first, followed by Tourism, Day and Pasargad banks. Saman, Parsian and Sina banks also have a lower level of income opacity compared to other banks included in the research during the period under review.

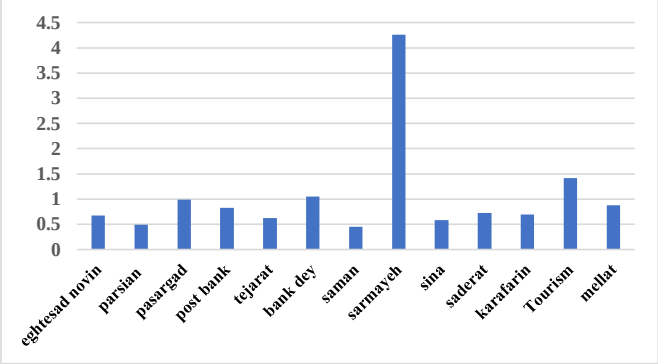

Figure 2: The average lack of transparency of the investigated banks' income during the years 2011 to 2021

5 Descriptive analysis

In this section, descriptive statistics are calculated to better understand the research variables. The results of the descriptive analysis of the variables are presented in Table 12. The average index of lack of transparency of income during the period under review is 0.010 and its standard deviation is 0.017. The maximum and minimum of this index are 0.138 and zero, respectively. The average index of economic uncertainty during the studied period is equal to 3.222 and its standard deviation is 1.856. The maximum and minimum of this index are 6.499 and 0.844, respectively. The average size of the bank during the investigated period is equal to 8.524 and its standard deviation is 0.569. The maximum and minimum of this index are 9.873 and 6.952, respectively. The average variable of change in the facilities granted by banks during the period under review is equal to 0.169 and its standard deviation is 0.197. The maximum and minimum of this index are 1.029 and negative 0.668, respectively. The average variable of capital adequacy of banks during the investigated period is equal to 1.899 and its standard deviation is 22.79. The maximum and minimum of this index are 24.2 and minus 173, respectively. The average variable of banks' non-current facilities during the period under review is equal to 0.673 and its standard deviation is 3.021. The maximum and minimum of this index are 24.397 and 0.006, respectively. The variable average of the change in the yield of banks' assets during the period under review is negative 0.005 and its standard deviation is 0.067. The maximum and minimum of this index are 0.319 and negative 0.596, respectively.

The variable average of the inflation rate during the period under review is 27.7% and its standard deviation is 14.3%. The maximum and minimum of this index are 47.9 and 9 percent, respectively. The variable average of the economic growth rate during the period under review is 1.8% and its standard deviation is 5.2%. The maximum and

Table 2: Descriptive analysis of research variables

symbol	Concept	Average	Middle	Maximum	At least	standard deviation
OPACITY	Lack of income transparency	**0.010**	**0.006**	**0.138**	**0.000**	**0.017**
EPU	Uncertainty index	**3.222**	**3.149**	**6.499**	**0.844**	**1.856**
SIZE	Bank size	**8.524**	**8.482**	**9.873**	**6.952**	**0.569**
CHLOAN	Change in granted facilities	**0.169**	**0.143**	**1.029**	**-0.668**	**0.197**
TIER1	Capital adequacy	**1.899**	**6.73**	**24.2**	**-173**	**22.79**
NPL	Non-current facilities	**0.673**	**0.11**	**24.397**	**0.006**	**3.021**
CHROA	Change in return on assets	**-0.005**	**-0.001**	**0.319**	**-0.596**	**0.067**
INFLATION	Inflation	**27.713**	**31.1**	**47.1**	**9.00**	**14.335**
GDP	Economic Growth	**1.77**	**3.4**	**12.5**	**6.5**	**5.236**
FSI	Financial strength of the bank	**0.553**	**0.571**	**1.000**	**0.000**	**0.131**
UNEMP	The unemployment rate	**11.006**	**11.000**	**12.4**	**9.000**	**1.049**

Source: Research findings

minimum of this index are 12.5% and minus 6.5%, respectively. The average variable of the bank's financial strength during the period under review is 0.553% and its standard deviation is 0.131%. The maximum and minimum of this index are 1.00 and zero, respectively. The variable average of the unemployment rate during the period under review is 11% and its standard deviation is 1.049%. The maximum and minimum of this index are 12.4 and 9 percent, respectively.

5.1 Stationary and normality test of variables

Considering that the use of non-stationary variables may lead to misleading and wrong estimates, it is necessary to check the stationarity of the variables before estimating the research models. There are various tests to check the stationarity of variables. In this research, due to the small dimension of time, Lin, Levin and Chu tests were used to check the stationarity of variables. The results of this test are presented in Table 3.

Table 3: Static test results

	Lin, Levin and Chu test statistic	Significance level	Result
Lack of income transparency	-5.614	0.000	static
Uncertainty index	-8.637	0.000	Static
Bank size	-3.478	0.000	Static
Change in granted facilities	-6.578	0.000	Static
Capital adequacy	-2.64	0.004	Static
Non-current facilities	-8.641	0.000	Static
Change in return on assets	-10.48	0.000	Static
Inflation	-2.292	0.011	Static
Economic Growth	-8.872	0.000	Static
Financial strength of the bank	-9.611	0.000	Static
The unemployment rate	-2.116	0.017	Static

Source: Research findings

As can be seen in Table 3, at the 95% confidence level, the null hypothesis of the stationarity test (based on the unit root in the variables) was rejected for all research variables, and as a result, based on the results of the Lin-Levin and Chu test, all the variables were stationary at the 95% confidence level. are.

Table 4: Jarak's statistics, crookedness and Significance level

Concept	crookedness	Elongation	Jarek statistics	Significance level
Lack of income transparency	5.392	36.310	7304.200	0.000
Uncertainty index	0.217	1.7	10.171	0.006
Bank size	-0.108	2.854	0.370	0.831
Change in granted facilities	0.547	8.84	191.20	0.000
Capital adequacy	-5.4	36.909	6859.9	0.000
Non-current facilities	6.375	44.501	10209.8	0.000
Change in return on assets	-4.372	51.243	13021.0	0.000
Inflation	-0.059	1.456	12.990	0.002
Economic Growth	0.212	2.815	1.162	0.559
Financial strength of the bank	-1.431	9.295	259.052	0.000
The unemployment rate	-0.266	1.849	8.718	0.013

Source: Research findings

Based on the evidence presented in Table 4, it can be seen that according to Jarak's statistics, the distribution of bank size and economic growth variables is normal at the 95% confidence level, and the distribution of other research variables is abnormal.

6 Estimation of research models

Before estimating the research model, it is necessary to check whether the data has a pooling or panel data structure. For this purpose, Limer's F test is used. Also, the Hausman test is used to identify the estimation approach (fixed or random effect).

In Table 5, the results of the F test of Limer and Hausman in the research model are presented. Based on the results presented in Table 5, in the research model, the null hypothesis of Limer's F test regarding the redundancy of fixed effects is rejected, and as a result, the model should be estimated based on panel data methods. Also, considering the rejection of the null hypothesis of the Hausman test, the fixed effect model is more suitable for estimating the panel data model.

Table 5: The results of Leimer and Hausman's F test

	Test statistics	**The significance level of F**	**Result**
Limer's F test	2.225	0.015	Data panel model
Hausman test	24.588	0.000	Fixed effect

Source: Research findings

Since economic uncertainty may have a linear or non-linear effect on the lack of income transparency, in this section the linearity test is first performed and if the linearity is confirmed, the regression relationships are estimated using the GMM method, and otherwise, the model is used. A threshold will be used to estimate the model. The results of the linearity test of the model are presented in Table 6.

Table 6: Linearity test results

	Test statistics	**The significance level of F**	**Result**
test VALID	0.132	1.516	Linear mode

Source: Research findings

As can be seen in Table 6, at the confidence level of 95%, the null hypothesis of the Wald test that nonlinear effects in the model are meaningless is not rejected; As a result, it seems that economic uncertainty does not affect the lack of transparency of income in a non-linear way during the investigated period, and the model should be estimated linearly.

The results of estimating the regression model using the generalized moments method (GMM) are presented in Table 7. Before interpreting the results, it is necessary to ensure the accuracy of the model estimation. In the GMM model, Sargan and autocorrelation tests should be used to evaluate the specification of the model. Sargan's test is used to evaluate the validity of the tools used in the model (to solve the endogeneity problem). The zero assumption of this test is that the tools used have the necessary validity; If the significance level of Sargan's statistic is more than 0.05, the validity of the tools used is not rejected at the confidence level of 95%. As can be seen in Table 7, the significance level of Sargan's statistic is 0.150; Therefore, the tools used in the research model have sufficient validity.

The second test to ensure the exact specification of the GMM model is autocorrelation tests. In the GMM model, the first-order autocorrelation must be statistically significant; But there is no second-order autocorrelation in the model. As seen in Table 7, the significance level of AR(1) is equal to 0.000; Therefore, there is first-order autocorrelation in the research model at an acceptable confidence level. Also, since the significance level of AR(2) in the estimation model is equal to 0.244; It can be concluded that there is no strong evidence of second-order autocorrelation in the estimated model.

As can be seen in Table 7, at the 90% confidence level, the lack of income transparency has a positive and significant effect on the level of income lack of transparency of banks in the current period; This means that if the level of income transparency of banks is high in the previous year, it is expected that the level of lack of income transparency will increase this year as well; In other words, lack of income transparency is a variable with long-term memory. At the 95% confidence level, the uncertainty of economic policies has a negative and significant effect on the level of income opacity of banks; This means that as the level of economic uncertainty increases, the level of lack of transparency of

Table 7: Regression model estimation results (dependent variable: lack of income transparency)

Significance level	T **statistic**	**standard deviation**	**The regression coefficient**	
0.0893	1.7148	0.1715	0.2941	Lack of income transparency
0.0492	-1.9901	0.0061	-0.0122	Uncertainty index
0.3608	0.9178	0.0078	0.0071	Bank size
0.8417	0.2002	0.0011	0.0002	Change in granted facilities
0.0378	-2.1042	0.0001	-0.0002	Capital adequacy
0.0592	-1.9076	0.0165	-0.0316	Non-current facilities
0.6211	0.4957	0.0278	0.0138	Change in return on assets
0.2682	-1.113	0.009	-0.0101	Inflation
0.374	-0.8928	0.0023	-0.002	Economic Growth
0.4185	-0.8123	0.0252	-0.0205	Financial strength of the bank
0.0015	-3.2648	0.0265	-0.0866	The unemployment rate
0.054	1.9488	0.0111	0.0216	Lack of income transparency
Significance level =0.150			**Amare Sargan = 45.899**	
Significance level AR(1)=0.000			**AR(1)= -4.220**	
Significance level AR(1)=0.244			**AR(2)= -1.165**	

Source: Research findings

banks' income decreases. According to the evidence presented in Table 7, the size of the banks has no significant effect on the level of income opacity of the banks; Because the calculated T statistic for this index is not significant even at the 90% confidence level (significance level greater than 0.1). At the confidence level of 95%, banks' non-current facilities do not have a significant effect on the level of income opacity of banks; This means that, based on statistical evidence, the change in the level of non-current claims of banks during the period under review has not affected the level of income opacity of banks.

At the confidence level of 95%, banks' capital adequacy has a negative and significant effect on the level of income opacity of banks; This means that with the increase in the level of banks' capital adequacy, the level of their income lack of transparency decreases; Therefore, it can be expected that by improving the level of compliance with the rules of the Wing Committee regarding capital adequacy, the income transparency of banks will improve. At the confidence level of 90%, the inflation rate has a negative and significant effect on the level of income opacity of banks; This means that with the increase in the level of prices in Iran's economy, the level of lack of transparency of banks' income has decreased; In other words, it seems that banks had higher income transparency during the inflationary periods of Iran's economy. The change in asset yield does not have a significant effect on the level of income opacity of banks; This means that the level of income opacity in the investigated banks has not been affected by the increase or decrease in the level of return on bank assets compared to the previous period. The change in granted facilities does not have a significant effect on the level of income opacity of banks; This means that with the change in the level of granted facilities compared to the previous period, the level of income opacity in the investigated banks has not been affected.

Based on the obtained evidence, the change in the unemployment rate does not have a significant effect on the level of income opacity of banks; This means that the level of income opacity in the investigated banks has not been affected by the increase or decrease in the unemployment rate compared to the previous period. Based on the obtained evidence, economic growth does not have a significant effect on the level of income opacity of banks; This means that with the change in economic growth, the level of income opacity in the investigated banks has not been affected. At the confidence level of 95%, the financial strength of banks has a negative and significant effect on the level of lack of transparency of banks' income; This means that with the increase in the level of financial strength of the investigated banks, the level of lack of transparency of the banks' income has decreased; In other words, it seems that banks with higher financial strength have higher income transparency than other banks. Also, at the confidence level of 90%, the simultaneous effect of banks' financial strength and economic uncertainty has a positive and significant effect on the level of banks' income opacity; This means that if economic uncertainty increases in the economy, banks with a higher level of financial strength than other banks will have a greater incentive for lack of income transparency.

One of the criteria that may affect the research results is the simultaneous effect of capital adequacy and economic uncertainty. In order to investigate this issue, in Table 8, the research model has been re-estimated by considering the simultaneous effect of capital adequacy and economic uncertainty. As can be seen in Table 8, the results of the model with the simultaneous effect of economic uncertainty and the capital adequacy index are largely similar to Table 7; with the difference that in Table 8, the effect of economic uncertainty index and capital adequacy index is positive and significant; It means that in the conditions of increasing economic uncertainty, banks with higher capital adequacy level have more lack of income transparency. Also, in the evidence presented in table 8, contrary to table 7, the effect of change in asset yield on the lack of transparency of banks' income is negative and significant at the confidence level of 95%, which shows that considering the simultaneous effect of economic uncertainty and capital adequacy index leads

to the significance of the effect of change. In the yield of assets, the lack of transparency of banks' income has been discussed. Sargan's statistic, the first and second order autocorrelation coefficient in the estimated model in Table 8 also indicates the optimal specification of the model.

Table 8: Model estimation results (dependent variable: lack of income transparency) considering the simultaneous effect of capital adequacy and uncertainty

Significance level	T **statistic**	**standard deviation**	**The regression coefficient**	
0.0083	2.6927	0.1268	0.3415	Lack of income transparency
0.0086	-2.6559	0.0044	-0.0117	Uncertainty index
0.2769	1.093	0.0065	0.0071	Bank size
0.6716	0.4252	0.0009	0.0004	Change in granted facilities
0.000	-5.0592	0.0002	-0.0008	Capital adequacy
0.0044	-2.9113	0.014	- 0.0408	Non-current facilities
0.0031	-3.0337	0.0284	- 0.0863	Change in return on assets
0.2803	-1.0853	0.0076	-0.0082	Inflation
0.3733	-0.8942	0.0019	-0.0017	Economic Growth
0.8938	0.1339	0.0218	0.0029	Financial strength of the bank
0.0085	-2.6638	0.0242	-0.0644	The unemployment rate
0.0078	2.5503	0.0077	0.0197	Lack of income transparency
0.0000	4.4303	0.00002	0.0001	Lack of income transparency
Significance level =0.128			Amare Sargan = **45.741**	
Significance level AR(1)=0.000			**AR(1)= -4.212**	
Significance level AR(1)=0.179			**AR(2)=-1.343**	

Source: Research findings

Another thing that may affect the results of the research is the integration of data from large and small banks. It is possible that if big banks are separated from smaller banks, the research results will change a lot. For this purpose, based on the value of the assets, Eghtesad Novin, Saman, Mellat, Pasargad, Saderat, Tejarat banks are considered as large banks, and D, Tourism, Entrepreneur, Parsian, Post Bank, Kapital, and Sina banks are considered as small banks, and the research model for Both datasets are re-estimated. Tables 9 and 10 show the estimation results of the research model for large and small banks.

Table 9: Estimation results of the research model (dependent variable: lack of income transparency) for large banks

Significance level	T **statistic**	**standard deviation**	**The regression coefficient**	
0.0267	3.1056	0.1508	0.4682	Lack of income transparency
0.0274	-3.0821	0.0008	-0.0026	Uncertainty index
0.1757	-1.5768	0.0016	-0.0025	Bank size
0.7196	0.38	0.0047	0.0018	Change in granted facilities
0.4905	0.7438	0.0002	0.0002	Capital adequacy
0.9264	-0.0971	0.0053	-0.0005	Non-current facilities
0.6058	-0.5503	0.0206	-0.0113	Change in return on assets
0.0009	6.9788	0.0017	0.0121	Inflation
0.106	1.9696	0.0005	0.001	Economic Growth
0.0619	-2.3963	0.0062	-0.0149	Financial strength of the bank
0.0099	-4.0472	0.0045	-0.0184	The unemployment rate
0.0268	-3.1013	0.0017	-0.0051	Lack of income transparency
0.0963	-2.0443	0.00003	-0.0001	Lack of income transparency
Significance level =0.447			Amare Sargan = 27.312	
Significance level AR(1)=0.004			AR(1)=- 2.856	
Significance level AR(1)=0.337			AR(2)= -0.960	

Source: Research findings

As can be seen in Table 9, in the group of large banks, at the 95% confidence level, the variables of income uncertainty, uncertainty of economic policies, changes in granted facilities, financial strength and the simultaneous effect of the index of uncertainty and financial strength have an effect on the lack of transparency of banks; Also, the variables of economic growth and the simultaneous effect of uncertainty index and capital adequacy at the 90% confidence level have a significant effect on the lack of transparency of banks' income. The variables of bank size, change in non-current facilities, capital adequacy, inflation rate, change in return on assets and change in unemployment rate also have no significant effect on the lack of transparency of income of large banks.

As can be seen in Table 10, in the group of small banks at the 95% confidence level, bank size, capital adequacy, inflation rate, change in asset yield and the simultaneous effect of the uncertainty index and capital adequacy have an effect on the lack of transparency of banks; Also, the variables of income lack of transparency at the 90% confidence level have a significant effect on the lack of income transparency of banks. The variables of uncertainty index, change in non-current facilities, change in granted facilities, economic growth, financial power, change in unemployment rate

Table 10: Estimation results of the research model (dependent variable: lack of income transparency) for smaller banks

Significance level	T **statistic**	**standard deviation**	**The regression coefficient**	
0.0875	1.743	0.1723	0.3003	Lack of income transparency
0.7153	-0.3668	0.0091	-0.0033	Uncertainty index
0.0058	2.8844	0.0101	0.029	Bank size
0.1037	1.6576	0.0011	0.0019	Change in granted facilities
0.0001	- 4.2784	0.0002	-0.0008	Capital adequacy
0.0002	-4.0572	0.0207	-0.0841	Non-current facilities
0.0008	-3.5794	0.0326	-0.1167	Change in return on assets
0.4323	-0.7916	0.0091	-0.0072	Inflation
0.4298	-0.7959	0.003	-0.0024	Economic Growth
0.7647	-0.310	0.0375	-0.0113	Financial strength of the bank
0.8656	-0.1701	0.0335	-0.0057	The unemployment rate
0.7448	-0.3273	0.0158	-0.0052	Lack of income transparency
0.0003	3.9152	0.00003	0.0001	Lack of income transparency
Significance level =0.182			Amare Sargan =36.827	
Significance level AR(1)=0.001			AR(1)=-3.217	
Significance level AR(1)=0.289			AR(2)=-01.190	

Source: Research findings

and the simultaneous effect of uncertainty index and financial power do not have a significant effect on the lack of transparency of small banks' income.
In Table 11, the coefficients of research variables in large and small banks are compared with each other.

Table 11: Comparison of coefficients of variables in large banks and smaller banks

Bigger banks Smaller banks		**Smaller banks**		
Significance level	The regression coefficient	Significance level	The regression coefficient	
0.0267	0.4682	0.0875**	0.3003***	Interruption of income transparency
0.0274	-0.0026**	0.7153	-0.0033	Uncertainty index
0.1757	-0.0025	0.0058	0.029***	Bank size
0.7196	0.0018	0.1037	0.0019	Change in non-current facilities
0.4905	0.0002	0.0001	-0.0008***	Capital adequacy
0.9264	-0.0005	0.0002	-0.0841***	Inflation
0.6058	-0.0113	0.0008	-0.1167***	Change in return on assets
0.0009	0.0121***	0.4323	-0.0072	Change in granted facilities
0.106	0.001	0.4298	-0.0024	Changes in the unemployment rate
0.0379	-0.0149**	0.7647	-0.0113	Economic Growth
0.0099	-0.0184***	0.8656	-0.0057	affordability
0.0268	-0.0051**	0.7448	-0.0052	Uncertainty index* financial ability
0.0963	-0.0001*	0.0003	0.0001***	Uncertainty index* capital adequacy

Source: Research findings

As can be seen in Table 11, the uncertainty of economic policies according to the size of banks can have a different effect on the income transparency of banks. In banks that are relatively small in terms of asset value, the effect of uncertainty of economic policies on the lack of transparency of banks' income is not statistically significant; However, the effect of this variable is negative and significant in larger banks. Based on the evidence presented in Table 11, bank size can have a different effect on the income transparency of banks. In banks that are relatively large in terms of asset value, the effect of bank size on the lack of transparency of banks' income is not statistically significant; However, the effect of this variable is positive and significant in smaller banks. Based on the evidence presented in Table 11, capital adequacy according to the size of banks can have a different effect on the income transparency of banks. In banks that are relatively large in terms of asset value, the effect of capital adequacy on the lack of transparency of banks' income is not statistically significant; However, the effect of this variable is negative and significant in smaller banks. Based on the evidence presented in Table 11, the inflation rate according to the size of the banks can have a different effect on the income transparency of the banks. In banks that are relatively large in terms of asset value, the effect of the inflation rate on the lack of transparency of banks' income is not statistically significant; However, the effect of this variable is negative and significant in smaller banks. Based on the evidence presented in Table 11, the change in the return on assets according to the size of the banks can have a different effect on the income transparency of the banks. In banks that are relatively large in terms of asset value, the effect of change in asset yield on the lack of transparency of banks' income is not statistically significant; However, the effect of this variable is negative and significant in smaller banks. Based on the evidence presented in Table 11, the change in the granted facilities according to the size of the banks can have a different effect on the income transparency of the banks. In banks that are relatively small in terms of asset value, the effect of the change in granted facilities on the lack of transparency of banks' income is not statistically significant; However, the effect of this variable is positive and significant in larger banks. Based

on the evidence presented in Table 11, economic growth according to the size of banks can have a different effect on the income transparency of banks. In banks that are relatively small in terms of asset value, the effect of economic growth on the lack of transparency of banks' income is not statistically significant; However, the effect of this variable is negative and significant in larger banks. Based on the evidence presented in Table 11, the financial strength index according to the size of banks can have a different effect on the income transparency of banks. In banks that are relatively small in terms of asset value, the effect of the financial strength index on the lack of transparency of banks' income is not statistically significant; However, the effect of this variable is negative and significant in larger banks. Based on the evidence presented in Table 11, the simultaneous effect of the uncertainty index and financial strength according to the size of the banks can have a different effect on the income transparency of the banks. In banks that are relatively small in terms of asset value, the simultaneous effect of the uncertainty index and financial strength on the lack of transparency of banks' income is not statistically significant; However, the effect of this variable is negative and significant in larger banks.

6.1 Examining research hypotheses

Two hypotheses have been proposed in this research, and we will evaluate each of these hypotheses in the following.

• EPU has a positive and significant relationship with the lack of transparency of bank income.

Based on the evidence presented in the research, the relationship between economic uncertainty and lack of income transparency in the investigated banks is negative and significant. This means that with the increase in economic uncertainty during the period under review, the transparency of banks' income has increased; Therefore, the first research hypothesis is rejected at the 95% confidence level. This result is consistent with the findings of Nagar et al. [15] and Yuan et al [23] On the other hand, the research results are inconsistent with the findings of Jin et al [13].

This statistical evidence shows that bank managers respond to EPU by reducing income uncertainty in order to show a positive outlook and build trust in conditions of high policy uncertainty. Because EPU is complex and unpredictable in nature, it confuses market participants and policy makers. In high EPU conditions, investors, lenders, and other market participants actively seek information from the media and other external sources; Therefore, under conditions of high EPU, bank managers tend to present a good financial image of banks to investors. Reducing the transparency of bank income protects the bank's credit and increases its competitive advantage, reveals risks and opportunities. The lack of transparency in income leads investors to make inappropriate decisions that are detrimental to the bank and the national economy, and managers may lose their trust in the absence of transparency. Since the lack of profit transparency can lead to misinformation, misunderstanding and mistrust, banking regulation reforms, especially in the Basel III framework, emphasize disclosure and transparency in the banking industry; Therefore, for this reason, it is possible that the banking sector of Iran reduces the lack of transparency of income in times of high EPU. However, the findings of the study with the results of Jiang et al. [12] is contradictory. For the following reasons, the results of this research are different from the aforementioned studies conducted in developed countries. First, Iran's economic and political system is different from developed countries. Second, the intervention of the Iranian government in the financial market is inevitable. Third, most of the assets of the banking sector in Iran are directly and indirectly controlled by the government.

• The relationship between policy uncertainty and lack of income transparency is less for banks with higher capital adequacy ratio.

In order to test this hypothesis and considering the number of observations, we divide the sample into two parts: in the first sample, the capital adequacy index is less than 7 and the volume of observations in this sample is equal to 68 observations. In the second sample, the capital adequacy index is less than 7 and the volume of observations in this sample is equal to 48 observations. Then the regression model of the research is estimated separately for both samples. The results of this analysis are presented in Table 12.

Based on the evidence presented in Table 12, at the 95% confidence level, the economic uncertainty index in both sample groups (banks with lower and higher capital adequacy levels) has a negative and significant effect on the income opacity index of banks; This means that regardless of the level of capital adequacy, the increase in economic uncertainty leads to a decrease in the level of income opacity of banks; However, the severity of EPU's impact on income opacity in banks with lower capital adequacy level is greater in terms of absolute value than banks with higher capital adequacy level; Therefore, the second hypothesis of the research is confirmed. This issue could be due to the fact that the central bank and regulatory bodies are more sensitive to financial events in banks with lower capital adequacy levels and the level of supervision of the central bank and other regulatory bodies is more intense in these banks.

Table 12: Comparison of variable coefficients in banks with lower and higher capital adequacy levels

Capital adequacy greater than 7		**Capital adequacy of less than 7**		
Significance level	The regression coefficient	Significance level	The regression coefficient	
0.0234	0.3516**	0.0813	0.3295*	Interruption of income transparency
0.0216	-0.0112**	0.0167	-0.0520**	Uncertainty index
0.2764	0.0001	0.1045	0.0205	Bank size
0.5394	0.0005	0.4795	0.0003	Change in non-current facilities
0.3282	-0.0062	0.0231	-0.0009**	Capital adequacy
0.8254	-0.0525	0.4521	-0.0648	Inflation
0.5125	-0.0764	0.1385	-0.0894	Change in return on assets
0.0109	-0.0096**	0.0125	-0.0073**	Change in granted facilities
0.1584	0.0032	0.1471	-0.0049	Changes in the unemployment rate
0.0419	-0.0925**	0.6484	-0.0173	Economic Growth
0.0061	0.0974***	0.1645	-0.0384	affordability
0.0123	0.0051**	0.5249	-0.0080	Uncertainty index* financial ability
0.1163	-0.0011	0.0712	0.0002*	Uncertainty index* capital adequacy

Source: Research findings

7 Conclusions and suggestions

This chapter was devoted to the analysis of research data. For this purpose, by analyzing the trends and calculating the descriptive statistics, a general understanding of the research variables was obtained. Next, stationarity, normality, Limer and Hausman F tests were performed and it was found that the research data has a panel data structure and should be estimated using the panel data technique. Then, the linearity of the model was confirmed by performing the Wald test, and finally, different research models were estimated using the GMM method. The results of the research showed that the uncertainty of economic policies depending on the size of banks can have a different effect on the lack of transparency of banks' income.

Based on the evidence presented in the research, the relationship between economic uncertainty and lack of income transparency in the investigated banks is negative and significant. This means that with the increase in economic uncertainty during the period under review, the income transparency of banks has increased. This statistical evidence shows that bank managers respond to EPU by reducing income uncertainty in order to show a positive outlook and build trust in conditions of high policy uncertainty. Since the lack of profit transparency can lead to misinformation, misunderstanding and mistrust, banking regulation reforms, especially in the Basel III framework, emphasize disclosure and transparency in the banking industry; Therefore, for this reason, it is possible that the banking sector of Iran reduces the lack of transparency of income in times of high EPU. Also, based on the findings of the research, at the 95% confidence level, the economic uncertainty index in both sample groups (banks with lower and higher capital adequacy levels) has a negative and significant effect on the income opacity index of banks; This means that regardless of the level of capital adequacy, the increase in economic uncertainty leads to a decrease in the level of income opacity of banks. This issue could be due to the fact that the central bank and regulatory bodies are more sensitive to financial events in banks with lower capital adequacy levels and the level of supervision of the central bank and other regulatory bodies is more intense in these banks.

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