

Analysis of Gas Sales Receivables in the National Iranian Gas Company: An Emphasis on the Optimization of Receivables Liquidation Methods

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ABSTRACT

Designing incentive mechanisms for increasing the speed of liquidity of receivables is one of the leading options for streamlining domestic resources in the field of oil and gas financing. The main objective of this research is to investigate and optimize the liquidity methods for gas sales receivables in line with the requirements of the National Iranian Gas Company (NIGC). After a deep review of literature, we extract methods and legal platforms for receivables liquidation methods. The current research is an applied and descriptive-analytical research respectively in terms of its purpose and methodology. The data analysis is a combination of quantitative and qualitative methods and the data required for this study, including the amounts and duration of deferred receivables by different categories of the subscribers of NIGC during 2012 to 2018. Subsequently, in order to visualize the data in the form of heat tables, Microsoft's Business Intelligence software is utilized to understand the process of the creation and settlement of receivables, to cluster receivables by the different categories of subscription, and, finally, to reveal the subscriber behavior patterns in disbursements. Finally, using theoretical foundations and experts' opinions, a set of optimal methods has been recommended to accelerate the process of collecting current receivables, depending on the behavior of different groups of subscribers. Based on the results of the interviews, NIGC should apply information technology (IT)-based methods, incentive policies, and deterrent (punitive) strategies to accelerate the liquidation of receivables in household and commercial subscription. The empirical findings of the research on the behavior of industrial and power plant subscribers are different, and the main methods used in this section are receivable-based financing arrangements such as debt discounting, factoring, as well as offset contracting. We provide some policy implications in this context.

1. Introduction

After income generation, collection of receivables is one of the most important functions of a business unit. Providing methods for managing the liquidity of accounts receivable is an essential tool for reducing the liquidity risk in each company. The risk of collecting receivables cannot be completely eliminated, nor can it be reduced to a large extent; however, it

can be decreased to a reasonable extent without jeopardizing the commercial success and long-term business economic objectives (Ljubic & Mance, 2019). The management of accounts receivable includes all the actions, procedures, and policies that provide the tools to balance the attraction of customers through interesting credit policies and minimize the risk of delayed disbursements by untrustworthy buyers (Michalski, 2012). Optimizing the receivables liquidity methods while

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mitigating corporate credit risk, helps corporate executives make money by investing in appropriate growth opportunities and value-adding projects, and it is also a fundamental method of financing (asset-backed financing).

Financing is the most important problem which NIGC faces. Considering the significant contribution of NIGC from the sale of natural gas to the economy of the country, it is necessary to determine the mechanisms for facilitating and accelerating the financing of projects in this area. The intensification of economic sanctions in recent years has doubled the importance of using internal and domestic financial resources. In this context, a set of financing methods for the collection of receivables is one of the options for the management of NIGC to stream the domestic resources in the field of financing. The collection of receivables can provide a significant amount of funds for NIGC. This issue in the field of the current receivables may be solved through the design of incentive mechanisms to increase the speed of liquidity and, consequently, raise the cash flow. In the area of dishonored (long-term) receivables, this threat should be turned into an opportunity to use asset-backed financing methods; both of these categories require analyzing the position of receivables. Therefore, the analysis of the status of receivables, the examination and localization of the appropriate methods for the requirements of NIGC in order to liquidate the claims, and studying the feasibility of implementation according to their legal nature will be the main objectives of this study. Considering the importance of the role of NIGC and corresponding subsidiaries in the development and prosperity of Iranian gas reserves, the present study can provide useful and effective methods for the liquidity of receivables; identify liquidity deviations, sediments, and gaps; and address one of the most important challenges NIGC faces, namely the lack of financial resources for capital expenditures and day-to-day operations.

Nowadays, after several years of operation, the figures regarding NIGC receivables from subscribers indicate that, over the past few years, part of the company's claims (due to the lack of timely payment by subscribers) have interrupted and caused many operating and capital allocation problems in the field. There are several methods available for finance, each of which is used in a specific circumstance. Therefore, it is necessary to identify the methods used to manage the collection of receivables for liquidity and financing. Then, among the considered solutions, those which are appropriate for the business environment and the requirements of NIGC are supposed to be used. The main objectives of this research are as follows:

- Analyzing the status of natural gas sales receivables in NIGC;
- Investigating the subscribers' gas consumption and payment patterns;
- Determining incentive (punitive) mechanisms and financing

strategies for the collection of receivables in accordance with the requirements of NIGC.

Achieving these objectives involves calculating the lost profits resulting from the increase in volume and the period of the uncollected claims as a result of applying the current receipt methods, which study the legal obstacles and bottlenecks to increasing the speed of cash collection through the receivables. Liquidation of receivables from household, industrial, commercial, and power plant subscribers is a prerequisite for the implementation of gas projects in cities and villages and even for the payment of the current monthly operation by provincial gas companies, and it has been emphasized many times at the annual meeting of NIGC by the managers. It also accounts for the most important indicator of the increase or decrease in the approved budget headings in the current, developmental, educational, and research levels of provincial gas companies. As the receivables of the distribution gas companies are increasing in terms of the period of collection and cumulative amounts, it will become a crisis for NIGC in the not too distant future. Failure to follow up and collect delayed receivables could cause NIGC operation and its affiliated companies to encounter financial distress, thereby disrupting gas supplied by the distribution gas companies. This paper is organized as follows. The second and third parts are devoted to the review of literature and methodology respectively. The fourth section of the paper discusses the empirical findings on receivables analysis. Finally, conclusions and policy implications are presented in the fifth section.

2. Literature Review and Theoretical Foundations

The lack of liquidity (collection) of claims arising from the provision of goods and services is not limited to NIGC, and other companies active in providing utility services (such as electricity, water, and telephone) also suffer from such a problem. In this regard, to accelerate the liquidity of deferred claims, the Telecommunication Company of Iran put an incentive-punitive program on the agenda in 2017. In this program, subscribers which paid their most recent bills by the end of December 2017 could receive gifts from one week to one month free of charge within the network. One of the punitive policies of this plan is the denial of subscribers' rights and the legal prosecution of receivables. Among other main deterrent methods used by Telecommunication Company, we can refer to the sending of formal notifications via short message service (SMS). In this way, the company informs customers by sending an email in a friendly tune so that they pay their debts. One of the other ways Telecommunication company is currently applying to the process of collecting subscribers' down payments is the outsourcing of the process of collecting

current receivables through bidding. Moreover, given that the company does not have enough power to impose a punishment for the disbursement of some governmental agencies, it uses “offsetting” methods in these cases.

One of the ways to track and collect claims in regional electricity companies is the introduction of online payment systems and mobile power apps. By installing and activating the app, the distribution company may not send a bill for the subscribers. Using this method, many savings have been made in printing and distributing bills. Further, by automatically sending the bill to the subscribers’ mobile or system, immediately after issuing a bill, they can pay it through the system. Using this method, problems such as the loss of bills will be solved. In addition to innovation in payment methods, according to the Electricity Sales Act approved by the Ministry of Energy, the subscribers are required to pay their bills by the deadline specified in the electricity bill, and, in the case of dishonoring the bill, if the amount of the deferred debt exceeds a certain amount, the subscribers will be subject to a warning and eventually a power outage (as a punitive policy).

Regarding the legal platforms and barriers to the use of incentive-punitive methods for the liquidation of receivables, it should be noted that the majority of the current laws and regulations and upstream documents such as the fifth development plan (Chapter 15, Article 121, Paragraph C), the Subsidies Act, consumer protection law, etc. have contributed to subscribers’ encouragement or punishment for energy saving in the public services, i.e. water, electricity, telephony, and gas. Considering that the use of incentive-punitive methods relates to the relationship between the debtor and the creditor, using civil law articles, such as Article 277 of the Civil Code, it is possible to interpret that the use of incentive and punitive methods is allowed under this circumstance if a due date or deadline has been predetermined for the receivables. Nevertheless, the Ministry of Energy and the Ministry of Communications have developed regulations, procedures, and instructions which focus on defining and enforcing the rules governing corporate relationships with split applicants and electricity subscribers. The laws and regulations of electricity sales (approved by the Ministry of Energy), Supplementary Electricity Tariffs (approved by the Ministry of Energy), and the like developed by the Ministry of Energy, Investment and Regulatory Office of Energy, Water, and Electricity Market are among the legal grounds for encouraging and deterrent policies which can be used to liquidate receivables; meanwhile, applying these regulations has been approved by the Energy Commission of the Parliament. Since these regulations are not in contrast to the provisions of customary laws and regulations, they are enforceable and legally valid. As mentioned above, it can be concluded that using incentive and punitive methods for the liquidation of receivables from the sales of public services such

as gas, electricity, water, and telephony is not legally prohibited.

2.1. Receivables-based Financing Methods

Investment strategy, which is evaluating and investing in projects or assets in order to maximize returns and firm value, is one of the important issues of strategic financial managers. In this way, companies can use internal or external sources of finance; therefore, financing is the art and science of the provision and management of cash, with the aim of investing, profitability, reducing risk, and meeting the economic and social needs (Jahankhani & Kanani, 2005). Corporate financing provides innovative financing solutions through the re-engineering of custom tools and securities tailored to customers’ needs. In this type of financing, the company’s financial liabilities are reflected in the balance sheet, and the assets of the company will be the source of repayment. This type of financing is mainly based on both debt financing and asset-backed financing (Ross et al., 2002). Factoring is one of the dominant methods for asset financing and is an important source of external financing for small- and medium-sized business enterprises (Bakhtiari and Darzi, 2014). The International Factors Chain (2014) defines factoring contract as a continuous contract between the factor and the seller of goods and credit services, whereby the factor must purchase accounts receivable for cash payments and more accurately record sales, track administrative affairs regarding accounts receivable, and eventually collect receivables. Unlike other types of financing and lending based on assets, in the factoring, only accounts receivable are used to finance, and funds are provided through the sale, that is, the ownership of accounts receivable is transferred. However, in collateral financing, the collateral is not limited to accounts receivable, but the inventory of completed goods and fixed assets of the firm can also be used as collateral for financing (Ernest & Young, 2009). Firms that use factoring services in fact outsource the tasks associated with crediting and collecting their claims, and this can help facilitate faster growth. In developed financial markets, major factoring transactions are conducted on the basis of non-reference to the seller (without guarantee) although the accounts they are pledged to be prudent are eligible for referrals. In emerging markets, where the information and credit status of firms is not transparent, major factoring deals are made with seller’s guarantee (Ernest & Young, 2009). In factoring, unlike other methods, the asset is traded, that is, its ownership is transferred, and this is especially important in relation to the economies that have no clear business rules (Klapper, 2005).

In addition to factoring, debt-discounting is one of the tools used in the Islamic banking system to finance the needs of manufacturing, commercial, and service units. Debt-discounting is a contract by which a third party buys an account receivable for less than a nominal (par) value in cash from the



seller. In Iran, in order to use the maximum capacity of Islamic banking and on the basis of the duties set forth in Article 98 of the law of the fifth development plan, the contract for the mortgage of debt (common in the banking system) was added to the third chapter of the Islamic banking law without any fluctuations, and the Council of Money and Credit approved and then communicated its executive version No. 1128 on August 25, 2010. Banks can mortgage (discount) debts under the issue of long-term bonds and documents for the purpose of creating facilities for all sectors of the economy. In addition to bank-based debt discounting, there is another type of market-based discounting instrument in Iran called "Debt Discounting Sukuk." In accordance with the guideline on the issuance of Debt Discounting, these securities are denominated and bearer bonds for the purchase of long-term receivables by legal institutional. These securities are tradable on stock exchanges or in over-the-counter markets.

Main & Smith (1992) investigated the optimal methods for receivables liquidation. They believe that structured financing based on receivables and factoring are the most important methods for the liquidation of receivables in American companies. Using cross-sectional data, they have shown that the size, range, and level of focus and the credit status of debtors are the most important factors which should be considered in structured financing or factoring. Samer & Wilson (2000) investigated the relationship between credit management and decision making in factoring using a group of 655 British firms. Their results indicated that the use of factoring and receivable-backed financing depends on the structure of the company's products, market characteristics and conditions, and the priorities and preferences of the factor. They also showed that, in recent decades, the use of receivable-backed financing has been growing among British firms. The results of this study were confirmed by Punk and Chen (2001). Klapper (2005) concluded that, in the area of receivable-based financing, factoring is a dominant source of asset-backed financing and an important source of organizational financing. In fact, organizations which use factoring services, outsource the responsibilities associated with crediting and collecting their claims, and this can facilitate processes as well as a faster growth. In this context, Ernest & Young (2009) also focused on legal considerations in the use of factoring and showed that, in the developed financial markets, major factoring transactions come without guarantee.

In Iran, Soroush et al. (2003) studied the collection of electricity receivables from the viewpoint of management organization in forms of the current method of meter readings of subscribers, how the bank functions in collecting charges, the size of the province, the distribution of the population, and the problems associated with governmental and military organs and heavy industrial complexes. Their results indicate that the method of meter readings of subscribers, the size of the provinces, and

the distribution of the population are among the factors which increase the time required for collecting receivables, while the bank's performance does not cause many problems. Nafchi (2010) has conducted a study to investigate the reasons for dishonoring the account receivables of electricity distribution subscribers in Isfahan electricity company and indicated that individual, environmental, and organizational factors have a significant effect on the time required for collecting the receivables of the electricity distribution company in Isfahan province. Shamsdalini et al. (2012) investigated the relationship between the reduction of the billing period (as the independent variable) and the time needed for collecting receivables (as the dependent variable) in Qom province gas company as one of the subsidiaries of NIGC. After collecting the required data, household and commercial customers were selected as the test groups and the industrial customers who did not change the course was chosen as the control groups. In their research, data analysis was carried out in the stages before and after the change of the billing period. Their results indicated the inefficiency of the policy of reducing the billing period and the absence of a relationship between the reduction of the subscribers' billing period and a decline in the time required to collect receivables. Nabavi et al. (2014) aimed to describe the relationship between the collections of claims and the behavior of the researched subscribers in the Ilam Gas Company. They indicated that there is a positive and significant relationship among the economic and social situation of the people, the company's actions regarding the collection of receivables, and the satisfaction of the people about the work of the departments with the timely collection of receivables. Dianty & Barzegar (2015) conducted a research on managing the risk of accounts receivable. They believed that any risk management model cannot be replaced with an appropriate economic and legal system for collecting receivables, and the implementation of reforms in the law of the economic systems is a prerequisite for solving the problems of receivables collection. In the current work, a native model is developed to predict the credibility of the claims of some selected Iranian companies, which can reduce the risk of collecting their receivables and knowingly take a calculated risk in certain specific circumstances.

3. Methodology and Design

According to the order of NIGC and providing the necessary support in this regard, the present research is applied in terms of the purpose, and its results should be used to accelerate the liquidity of gas sales receivables. In terms of the nature and methodology, this research can also be categorized as a descriptive-analytical study, which has been surveyed in the light of using expert opinions in the formulation of questions and suggestions. The strategy of this research is a case study,

and the method of data analysis is a mixture of quantitative and qualitative techniques, so the quantitative methods are used in the section of receivables analysis. The multi methods are also applicable to the identification of the subscriber's behavior pattern and to the proposed methods of receivables liquidation and asset-backed financing. In terms of reasoning, the current work can also be regarded as an inductive research. The statistical population includes all the gas distribution companies as the subsidiaries of NIGC, and the sample is selected using an enumeration method. All the information and financial reports related to the time and amounts of gas sales receivables are extracted from the financial statements of the provincial gas companies from 2012 to 2018. The reason for choosing this period is that the major receivables have been deferred during this time. Secondary information relating to literature is collected using archival methods and resources such as books, journals, dissertations, online databases, etc. The primary data required for this study, including the time required to collect receivables and the amounts of deferred receivables from different categories of users (subscribers) for each of the provincial gas companies during the research period consist of more than two billion records and are extracted from the subscribers and financial systems of NIGC. We need such information to discover the payment patterns of different subscribers and to calculate profit loss arising from the deferring payments.

After collecting data and information on the time and amounts of gas sales receivables in NIGC, the data model is formed in Microsoft Excel software. Subsequently, in order to

visualize the data in the form of heat tables, Microsoft Business Intelligence software is utilized to understand the process of creating and settlement of receivables. Moreover, we conducted a semi-structured interview with NIGC managers and industry experts. The reason for choosing this type of structure for interview is the wide range of proposed receivables liquidation methods and differences in respondents' views and approaches. Using theoretical foundations and experts' opinions, a set of optimal methods has been proposed to accelerate the process of collecting current receivables and the use of receivable-backed financing methods, depending on the behavior of different groups of users in relation to sales receivables to provide a basis for designing financing methods based on the collection of receivables in line with the requirements of the business environment of NIGC.

4. Empirical Findings

According to the classification of the subscribers of NIGC, the nature of the subscription (privilege), and the type of consumption (as the basis of grouping), four groups of subscribers, including commercial, household, industrial, and power plants sectors can be distinguished. The field of education, the public sector (public trade), private business, municipalities, sports facilities, etc. can be classified as the commercial subscribers. Households and religious sites can be considered as one of the most important household subscribers. Among the most important subscribers of the industrial group are refineries, petrochemicals, cement factories, aluminum and copper manufacturers, steel manufacturers, ceramic tiles manufacturers, etc., which are divided into large industrial sectors and small- and medium-sized industrial sectors for ease of analysis. Regarding the power plants, we mainly deal with two groups of subscribers, namely public and private, which use gas to generate electricity. Since receivables (claims) are considered as permanent (balance sheet) accounts, the balance of this account at any given date represents the total accumulated receivables since the creation of this account. Table 1 presents the general status of NIGC receivables based on the groups of natural gas subscribers on March 30, 2018 (the latest system

Table 1- General position of NIGC receivables across groups of subscribers by the end of 2018.

Subscribers	Accumulated receivables (Million Iranian Rials)	Percentage
Commercial Sectors	10,811,758	18.6
Households	15,750,629	27.0
Large Industrial Sectors	20,873,406	38.8
Small- and Medium-sized Industrial Sectors	5,644,653	9.7
Power Plants	5,158,772	8.9
Grand Total	58,239,218	100

Table 2 -Heat table of general position of NIGC receivables across various clusters by the end of 2018.

Cluster	Commercial Sectors	Households	Large Industrial Sectors	Small and Medium Industrial Sectors	Power Plants	Grand Total
Four	1.17%	1.88%	0.69%	0.35%	0.16%	4.25%
One	7.19%	7.32%	27.27%	3.87%	3.65%	49.31%
Three	3.90%	5.81%	2.07%	1.55%	1.27%	14.60%
Two	6.30%	12.03%	5.82%	3.92%	3.77%	31.84%
Grand Total	18.56%	27.04%	35.84%	9.69%	8.86%	100.00%



log file).

As can be seen in Table 1, the total receivables for the gas sold on March 30, 2018 was 58,239,218 million Iranian Rials, the bulk of which, 35.8% of the total, is related to industrial customers in major industries, namely petrochemicals, steel manufacturers, refineries, cement factories, aluminum and copper manufacturers. Following the industrial subscribers, households (27%), commercial sectors (18.6%), small and medium enterprises (9.7%), and power plants (8.9%) are devoted to NIGC accounts receivable respectively. Most of the receivables from the industrial subscribers is allocated to petrochemicals, steel manufacturers, and then refineries. The above pattern in how to calculate the share of each subscriber group from the deferred receivables does not apply to the receivables of all provincial gas companies. For example, in Tehran Gas Company, due to the high density of population and a small plant space, the shares of household, commercial, and industrial subscribers are almost equal, while power plant subscribers are left with lower receivables (calculated by the authors). These differences should also be considered in planning for the liquidation of deferred receivables; therefore, in order to provide a more realistic picture, the amount of receivables should be provided separately by each provincial gas company.

Given the multiplicity of gas companies, it is difficult to analyze receivables individually, so to overcome this problem, clustering of provincial gas companies is beneficial. In this work, provincial gas companies were firstly classified in four groups according to the average gas sales (in Iranian Rials) from 2012 to 2018. Clustering of provincial gas companies is very helpful in analyzing the receivables based on the average gas sales. Generally, the first, second, third, and fourth clusters, which are different in the number of companies, have contributed the highest total gas sales during the study respectively. Table 2 tabulates the general status of NIGC receivables at the end of 2018, classified into the above clusters. In preparing this table and tables related to clustering, a template for the preparation of heat tables has been used to indicate the focus points and help manage the collection based on management by exception. As it is seen in Table 2, the main aggregation of receivables lies in the first cluster and in the group of major industrial

subscribers. Household, commercial, small- and medium-sized industrial subscribers, and then the power plants constitute the following ranks. There is a reasonable link between the sales volume of natural gas and the deferred receivables, and the overall ranking of clusters is the same based on sales and receivables. In the second cluster, which accounts for 31.84% of receivables, the major part of the accumulation lies in the households, commercial sectors, major industries, small and medium enterprises, and finally power plants respectively. This fact is also true for the third and fourth clusters. Subsequently, receivables in each of the clusters are presented separately for the provincial gas companies and subscribers.

Table 3 lists the balance of receivables of provincial gas companies in terms of consumption groups (subscribers) in the first cluster. In the first cluster, the aggregation point is located in the major industrial subscribers of Bushehr province, the majority of which are refineries and petrochemicals, followed by power plants, commercial sectors, households, and small and medium enterprises. After Bushehr provincial gas company, gas distribution companies in Tehran and Isfahan provinces have the highest focus points with 27.51% and 22.03% of receivables in the first cluster (not the total NIGC receivables) respectively. In Tehran province, the pattern of receivables is very different from that of the other provinces of this cluster, and the commercial and household subscribers account for a significant part of Tehran Gas Company receivables.

Table 4 represents the balances of receivables in provincial gas companies by consumer groups (subscribers) in the second cluster. In general, the major points in the accumulation of receivables in 2018 for the provincial gas companies located in the second cluster are households, commercial sectors, and then major industries. Nonetheless, the major part of receivables in the second cluster in 2018 is allocated to the large industrial subscribers of Markazi province and then to the household sector of the East Azarbaijan, Mazandaran, Khorasan Razavi, and Guilan provinces. Subsequently, Fars (major industrial subscribers), Mazandaran (household subscribers), Guilan (household subscribers), Khorasan Razavi (household subscribers), and Alborz (household subscribers) have the highest rates of deferred receivables during 2018 respectively.

Table 5 describes the general status of receivables in 2018

Table 3 -Heat table of general position of NIGC receivables across various clusters by the end of 2018.

Cluster	Commercial Sectors	Households	Large Industrial Sectors	Small and Medium Industrial Sectors	Power Plants	Grand Total
Four	0.04%	0.03%	28.86%	0.01%	0.84%	29.78%
One	2.11%	3.30%	11.57%	3.04%	2.01%	22.03%
Three	0.59%	1.50%	14.19%	2.47%	1.93%	20.68%
Two	11.84%	10.03%	0.67%	2.34%	2.64%	27.51%
Grand Total	14.58%	14.85%	55.30%	7.85%	7.41%	100.00%

by the group of subscribers and the provincial gas companies classified in the third cluster. According to Table 5, in the third cluster, the main accumulation of receivables happens in the household sector. The provincial gas companies of Hamedan (household subscribers), Kermanshah (household subscribers), Zanjan (household subscribers), and North Khorasan (major industries) have contributed to the receivables. As it is seen, in the third cluster, similar to the second cluster, most of the accumulation points are in the household and then commercial segments. Major industries, small and medium enterprises, and power plants are ranked next in terms of accumulation rates.

Finally, we can summarize the general status of receivables in the fourth cluster of provincial gas companies in Table 6. Generally, the distribution of gas sales receivables in 2018 among the subscribers of the fourth cluster is the same as that of the second and third clusters. In fact, the main accumulation of the receivables also lies in the household, commercial, large

industries, small- and medium-sized industries, and then power plants segments respectively. According to Table 6, the majority of the accumulation points in the fourth cluster lie in the household and then commercial segments in Lorestan province. Kohgiluyeh and Boyer Ahmad provincial gas company, with a share of 21.24% of the receivables, is the second largest contributor after Lorestan province.

By comparing the general status of the receivables across the clusters, it can be seen that the pattern of establishment, settlement, and accumulation of gas sales receivables is the same for provincial gas companies categorized in the second to fourth clusters and follows the same trend in 2018, while this pattern is completely different for the provincial gas companies listed in the first cluster.

In addition to separating the group of subscribers and provincial gas companies, the decomposition of NIGC receivables over the years can also provide more useful

Table 4-Heat table of general position of NIGC receivables across the second cluster by the end of 2018.

Cluster	Commercial Sectors	Households	Large Industrial Sectors	Small and Medium Industrial Sectors	Power Plants	Grand Total
Alborz	1.64%	3.99%	0.31%	0.49%	1.29%	7.72%
East Azerbaijan,	2.64%	2.96%	0.17%	0.40%	0.63%	6.79%
West Azerbaijan,	4.31%	6.95%	0.68%	1.26%	0.98%	14.19%
Fars	1.60%	2.50%	4.01%	0.96%	1.21%	10.28%
Guilan	2.16%	4.34%	0.69%	0.92%	1.55%	9.67%
Hormozgan	0.07%	0.02%	2.76%	0.43%	2.32%	5.60%
Kerman	1.27%	2.38%	0.32%	0.78%	0.89%	5.64%
Khorasan, Razavi	2.21%	4.39%	0.68%	0.94%	0.70%	8.93%
Markazi	1.77%	2.47%	8.08%	1.87%	0.90%	15.10%
Mazandaran	1.45%	6.17%	0.33%	1.38%	0.46%	9.79%
Yazd	0.64%	1.61%	0.23%	2.89%	0.91%	6.28%
Grand Total	19.80%	37.77%	18.27%	12.32%	11.84%	100.00%

Table 5-Heat table of general position of NIGC receivables across the third cluster by the end of 2018.

Cluster	Commercial Sectors	Households	Large Industrial Sectors	Small and Medium Industrial Sectors	Power Plants	Grand Total
Alborz	3.26%	4.26%	0.10%	0.68%	0.78%	9.08%
East Azerbaijan,	1.79%	1.52%	0.03%	0.56%	1.10%	5.01%
West Azerbaijan,	1.71%	3.58%	0.31%	1.60%	0.32%	7.52%
Fars	5.38%	9.24%	2.36%	1.68%	0.89%	19.55%
Guilan	3.91%	8.98%	4.44%	0.94%	0.82%	19.08%
Hormozgan	1.75%	1.78%	4.59%	0.50%	0.53%	9.15%
Kerman	2.72%	3.23%	0.77%	0.19%	0.44%	7.36%
Khorasan, Razavi	1.85%	2.14%	0.07%	1.97%	3.33%	9.35%
Markazi	1.38%	1.53%	0.31%	0.61%	0.26%	4.09%
Mazandaran	2.96%	3.55%	1.18%	1.87%	0.26%	9.81%
Yazd	26.71%	39.81%	14.16%	10.60%	8.73%	100.00%
Grand Total	19.80%	37.77%	18.27%	12.32%	11.84%	100.00%



information on the trend analysis of each of the payment patterns of subscribers. According to Table 7, during the research years, the receivables from commercial subscribers grew up from 2.54% before 2016 to 8.69% in 2018. The above view is also true for household customers, which shows similarity between the two models; however, a significant leap (about 700%) is seen in the receivables from household subscribers in 2018. The delinquent receivables of large industrial subscribers in 2016 were lower than those of household and commercial subscribers, but the trend has risen sharply from 0.66% to about 30% in 2017 and 2018. The comparison of the receivables of the industrial customers (both large industries and small and medium enterprises) shows that the rising trend has been maintained in 2018. In the power plant sector, the status of receivables is slightly different; in fact, its formation began in 2016, and, after a significant decline in 2017, it experienced a slight increase in 2018.

Differences in the upward trend in receivables across different groups of subscribers can be attributed to factors such as the difference in the pricing mechanisms of gas sold to each group, the price fluctuations in different years, the difference in the manner and timing of billing and recording, and other factors. In order to compare and analyze the behavioral pattern of subscribers in disbursements and receivables accumulation during the research years, it is necessary to redesign and take the previous steps (taken in 2018) in 2017.

Table 8 presents the overall status of NIGC receivables across

subscriber groups by the end of 2017. As can be noted, total NIGC receivables on March 30, 2017 amounted to 83,302,248 million Iranian Rials, the bulk of which (about 41% of the total amount) is related to subscribers in major industries (refineries, petrochemicals, cement, steel, and aluminum and copper). Subsequently, household subscribers (29.7%), commercial subscribers (15.2%), small and medium enterprises (9.7%), and power plants (4.4%) are ranked respectively in terms of receivables volume by the end of 2017. The major part of the receivables is assigned to petrochemical industrial customers, followed by steel manufacturer and refineries respectively.

order to provide a more realistic picture of the overall status of the receivables with respect to the subscriber and each provincial gas company, we summarize the results in the four clusters. The model proposed for clustering provincial gas companies in the year 2018 is also applied to this section. Table 9 presents the status of NIGC receivables by the end of 2017, classified according to the above clusters. The most of the accumulation of NIGC receivables in 2017, as in 2018, lies in the first cluster and in the group of large industries, households, commercial sectors, small and medium industries, and then power plants. According to Table 9, there is a reasonable relationship between the amount of gas sold and the deferred receivables, and the ranks of clusters based on sales and receivables are the same. In the second cluster, which accounts for 31% of claims, receivables are mainly due from households, large industries, commercial sectors, small and

Table 6 -Heat table of general position of NIGC receivables across the fourth cluster by the end of 2018.

Cluster	Commercial Sectors	Households	Large Industrial Sectors	Small and Medium Industrial Sectors	Power Plants	Grand Total
Chahar Mahaal and Bakhtiari	3.69%	6.10%	1.91%	0.46%	0.00%	12.16%
Ilam	1.63%	3.16%	2.86%	0.33%	0.00%	7.99%
Khorasan, South	1.73%	1.32%	0.69%	1.31%	1.59%	6.65%
Kohgiluyeh and Boyer-Ahmad	9.50%	9.76%	0.80%	1.19%	0.00%	21.24%
Lorestan	10.93%	23.79%	9.92%	4.98%	0.20%	49.83%
Sistan and Baluchestan	0.03%	0.15%	0.00%	0.00%	1.94%	2.13%
Grand Total	27.52%	44.30%	16.19%	8.27%	3.73%	100.00%

Table 7 -Time trend of NIGC receivables at the end of 2018 for each subscriber group.

Category	Before 2016	2016	2017	2018	Grand Total
Commercial Sectors	2.54%	2.82%	4.51%	8.69%	18.56%
Households	0.73%	1.26%	3.79%	21.26%	27.04%
Power Plants	0.00%	6.60%	1.01%	1.25%	8.86%
Large Industrial Sectors	0.66%	1.66%	4.12%	29.40%	35.84%
Small and Medium Industrial Sectors	0.18%	0.45%	1.11%	7.95%	9.69%
Grand Total	4.11%	12.80%	14.54%	68.56%	100.00%

medium industries, and finally power plants. This pattern is also true in the third cluster, but in the fourth cluster, after household subscribers, the main focus point is in the group of commercial subscribers and then large industries.

As we can see in Table 10, in the first cluster, the focus point of receivables is located in the large industrial subscribers of Bushehr province, mainly in refineries and petrochemicals, followed by power plants, households, commercial sectors, and small- and medium-sized industries respectively. After Bushehr provincial gas company, gas distribution companies in Isfahan, Tehran, and Khuzestan provinces are left with the highest receivables (respectively 26.19, 24.24, and 18.46% of receivables). The pattern of the formation of receivables of Tehran province is greatly different than that of the other provinces of this cluster, and household and commercial subscribers constitute a significant part of the receivables; small and medium enterprises and power plants are ranked next.

consumption groups (subscribers) in the second cluster. On the whole, the major accumulation points of the receivables in the second cluster in 2017 lie in the household segment, major

industries, and then commercial subscribers. In this cluster, power plants also constitute the least amount of the receivables in 2017. The major part of gas sales receivables in the second cluster in 2017 is allocated to the household subscribers of the East Azarbaijan province gas company, the major industries in Fars province, the household segments of Alborz and Mazandaran gas companies, and the major industrial subscribers of Markazi province.

According to Table 12, in the third cluster, most of the accumulation of the receivables lie in the household subscribers, major industries, commercial subscribers, small and medium industries, and power plants respectively. In this cluster, 24.41% of the receivables from the third cluster in 2017, most of which are receivables from major industrial subscribers, belongs to Qom province gas company. The provincial gas companies of Kermanshah and Hamedan with 16.64% and 16.18% of the receivables in 2017 are ranked next. In this cluster, with the exception of the provincial gas companies of North Khorasan, Qom, and Qazvin, the receivables of the provincial gas companies are concentrated in the household sector in 2017. In this regard, the provincial gas companies of Hamedan (household subscribers) and Kermanshah (household subscribers) do not perform well in the collecting of receivables from household subscribers.

Table 13 tabulates NIGC receivables in 2017 for the group of subscribers in the fourth cluster. In general, the distribution of the receivables among the subscribers of the fourth cluster in 2017 reveals that the main aggregation of the receivables in 2017 lies in households, commercial sectors, large industries, small and medium enterprises, and power plants respectively. According to Table 13, the majority of the accumulation points in the fourth cluster are related to the household and

Table 8- General position of NIGC receivables across subscriber groups by the end of 2017.

Subscribers	Grand Total (Million Iranian Rials)	Percentage
Commercial Sectors	12,678,525	15.2
Households	24,716,187	29.7
Large Industrial Sectors	34,101,639	40.9
Small and Medium Industrial Sectors	8,115,093	9.7
Power Plants	3,690,804	4.4
Grand Total	83,302,248	100

Table 9 -Heat table of general position of NIGC receivables across the clusters by the end of 2017.

Cluster	Commercial Sectors	Households	Large Industrial Sectors	Small and Medium Industrial Sectors	Power Plants	Grand Total
Four	0.91%	1.88%	0.49%	0.29%	0.09%	3.66%
One	5.61%	8.29%	30.03%	3.59%	1.44%	48.95%
Three	3.32%	6.54%	3.78%	1.91%	0.83%	16.39%
Two	5.38%	12.96%	6.64%	3.95%	2.07%	31.00%
Grand Total	15.22%	29.67%	40.94%	9.74%	4.43%	100.00%

Table 10 -Heat table of general position of NIGC receivables across the first cluster by the end of 2017.

Cluster	Commercial Sectors	Households	Large Industrial Sectors	Small and Medium Industrial Sectors	Power Plants	Grand Total
Bushehr	0.07%	0.10%	30.56%	0.01%	0.36%	31.10%
Isfahan	1.81%	3.71%	16.98%	2.84%	0.85%	26.19%
Khuzestan	0.58%	2.04%	12.87%	2.21%	0.76%	18.46%
Tehran	9.00%	11.09%	0.93%	2.26%	0.96%	24.24%
Grand Total	11.45%	16.94%	61.34%	7.33%	2.93%	100.00%



commercial subscribers of Lorestan province. The commercial and household subscribers of Kohgiluyeh and Boyer Ahmad provincial gas company receives 20.72% of the receivables in the fourth cluster, as the second most significant portion of the receivables. By comparing total NIGC receivables across the four clusters, it can be seen that the pattern of creation, settlement, and accumulation of the receivables among provincial gas companies located in the second and third clusters is the same in 2017, while it is completely different from that of the provincial gas companies located in the first and fourth clusters.

As outlined in Table 14, the receivables from commercial subscribers grew up from about 1.14% before 2015 to 8.73% in 2017. The above trend is also true for household customers, showing the similarity of the two patterns, with the only difference being that in the year 2017 the household receivables have increased around twelvefold. In the case of large industrial

subscribers, delinquent receivables in 2016 and previous years are lower than those of commercial and household subscribers, but during 2016 and 2017, the trend was steadily rising to 35.8%, which is worth reflecting. In the aggregate, most of NIGC receivables are due from large industrial subscribers, and this part has grown significantly and dramatically over the years. In the case of household and commercial subscribers, the general trend of growth in receivables is also increasing. In the meantime, the share of industrial subscribers in 2017 faced a very significant increase (shock), while such a shock cannot be found among the other subscriber groups.

Table 15 compares the position of the receivables at the end of the fiscal year of 2017 and 2018 in each group of the receivables classified according to subscriber groups. Accordingly, the gas sales receivables in all the subscriber groups decline in 2018 compared to 2017, with the exception of power plant subscribers. As it is seen, the receivables

Table 11 - Heat table of general position of NIGC receivables across the second cluster by the end of 2017.

Cluster	Commercial Sectors	Households	Large Industrial Sectors	Small and Medium Industrial Sectors	Power Plants	Grand Total
Alborz	1.46%	6.23%	0.36%	0.56%	0.51%	9.12%
East Azerbaijan,	1.75%	3.11%	0.21%	0.32%	0.36%	5.75%
West Azerbaijan,	3.54%	7.87%	0.89%	1.36%	0.45%	14.12%
Fars	1.36%	3.11%	7.39%	0.98%	1.11%	13.95%
Guilan	2.03%	3.88%	0.67%	0.93%	0.64%	8.15%
Hormozgan	0.05%	0.02%	3.43%	0.66%	0.80%	4.97%
Kerman	1.49%	3.00%	1.61%	1.14%	0.59%	7.82%
Khorasan, Razavi	2.40%	3.60%	0.66%	1.20%	0.77%	8.62%
Markazi	1.64%	2.99%	5.91%	1.88%	0.49%	12.90%
Mazandaran	1.15%	6.20%	0.20%	1.26%	0.48%	9.29%
Yazd	0.47%	1.78%	0.10%	2.46%	0.50%	5.31%
Grand Total	17.36%	41.80%	21.41%	12.75%	6.69%	100.00%

Table 12 - Heat table of general position of NIGC receivables across the third cluster by the end of 2017.

Cluster	Commercial Sectors	Households	Large Industrial Sectors	Small and Medium Industrial Sectors	Power Plants	Grand Total
Ardabil	2.23%	4.43%	0.28%	0.54%	0.39%	7.87%
Qom	3.10%	5.66%	11.18%	3.55%	0.92%	24.41%
Golestan	1.28%	3.16%	0.30%	1.19%	0.35%	6.29%
Hamadan	3.87%	8.92%	1.71%	1.23%	0.45%	16.18%
Kermanshah	2.84%	8.48%	4.10%	0.76%	0.48%	16.64%
Khorasan, North	1.23%	1.08%	3.77%	0.43%	0.42%	6.93%
Kurdistan	1.66%	2.47%	0.66%	0.20%	0.31%	5.29%
Qazvin	1.38%	1.70%	0.06%	1.81%	1.27%	6.22%
Semnan	0.82%	1.29%	0.14%	0.70%	0.25%	3.20%
Zanjan	1.86%	2.72%	0.87%	1.27%	0.23%	6.96%
Grand Total	20.27%	39.91%	23.07%	11.68%	5.07%	100.00%

from industrial subscribers (the large industries) experience a decrease of 38.79% in 2018 compared to the previous year, and the next highest reduction in the receivables from 2017 to 2018 is assigned to household (36.27%), small- and medium-sized industries (30.44%), and commercial (14.72%) subscribers respectively.

The calculation of the lost profit caused by the dishonor of the receivables is a quantitative statement of effective and efficient decisions regarding the collection of the receivables in NIGC. In addition, given the potential use of corrective methods and compulsory tricks as a part of the program in order to accelerate the liquidity of the receivables, the calculation of lost profits of NIGC can at least help NIGC to quantitatively determine and justify the amount of penalties (for instance, the penalty should be at least equal to the lost profits), or prevent the loss of profits by applying some incentive policies and granting discounts. Therefore, it is necessary to calculate the lost profits raising from the lack of timely receivables liquidation. To this end, considering the time value of money and the amount of receivables due from the subscribers of provincial gas companies, the lost profit (money opportunity cost) is estimated in accordance with Table 16. Thus, we extracted the corresponding risk-free interest rate from Iran Central Bank website in each year and multiplied it by the reciprocal amount of the differed receivables at the end of financial years. Considering the common banking interest rates, NIGC lost profit caused by the dishonor of the receivables from households, industrial sectors, commercial sectors, and power plants is estimated to be at least 15,713,715 million

Iranian Rials from 2015 to 2018. The significance of the profit value shows to what extent accelerating the collection of the receivables is important and necessary for NIGC and how the timely management and settlement of the receivables could be able to solve liquidity problems and provide financial resources required for the development of future plans of the company. This profit amount can also be considered by executives and policy makers because it quantitatively reflects the financial consequences of the dishonors of receivables for managers and policy-makers in financial terms. For example, at least the penalty for the delay in payment should be equal to the amount of the profit lost by such a delay.

In the previous sections, the status of NIGC receivables was analyzed in terms of subscriber groups and provincial gas companies, and the financial results of the increase in volume of the receivables and the delay in collecting receivables were calculated in terms of profit lost. The results indicate that use of appropriate methods to accelerate receivables liquidation have a significant effect on the liquidity needed by NIGC to develop upstream and downstream projects. Furthermore, the review of literature and theoretical concepts revealed that the use of incentive and punitive policies and methods to increase the speed of receivables collection as well as receivable-based financing methods have been allowed by the governing laws and regulations approved by the Energy Commission of the Parliament. Following the investigation of receivables management techniques, including incentive mechanisms and receivables financing mechanisms, a semi-structured interview was arranged with several managers (financial management

Table 13 - Heat table of general position of NIGC receivables across the fourth cluster by the end of 2017.

Cluster	Commercial Sectors	Households	Large Industrial Sectors	Small and Medium Industrial Sectors	Power Plants	Grand Total
Chahar Mahaal and Bakhtiari	3.22%	6.01%	1.26%	0.87%	0.00%	11.34%
Ilam	1.66%	3.64%	3.50%	0.23%	0.00%	9.03%
Khorasan, South	1.66%	1.80%	0.54%	1.51%	1.40%	6.90%
Kohgiluyeh and Boyer-Ahmad	10.30%	8.90%	0.45%	1.07%	0.00%	20.72%
Lorestan	7.96%	30.87%	7.69%	4.26%	0.07%	50.86%
Sistan and Baluchestan	0.05%	0.12%	0.00%	0.00%	0.97%	1.15%
Grand Total	24.85%	51.34%	13.44%	7.93%	2.44%	100.00%

Table 14 -Time trend of NIGC receivables at the end of 2017 for each subscriber group.

Category	Before 2015	2015	2016	2017	Grand Total
Commercial Sectors	1.14%	2.12%	3.23%	8.73%	15.22%
Households	0.58%	1.25%	2.84%	25.01%	29.67%
Power Plants	0.00%	0.00%	3.25%	1.18%	4.43%
Large Industrial Sectors	0.71%	1.23%	3.21%	35.80%	40.94%
Small and Medium Industrial Sectors	0.17%	0.29%	0.76%	8.52%	9.74%
Grand Total	2.59%	4.88%	13.29%	79.23%	100.00%



department, department of management and consolidation planning, and the coordination management of gas supply affairs) of NIGC to customize the identified methods in accordance with the contingents of NIGC.

The energy sales system and tariffs are of particular complexity and are one of the most sophisticated models in Iran. Moreover, the sensitivity to subscribers is not the same in the income system of NIGC, and different classes of subscribers have different roles. Obviously, any proposed methods for the liquidation of receivables or receivable-based financing should also be different in proportion to the type of subscriber, patterns of consumption, and patterns of methods. In cases where there is a legal ban on the use of any of the proposed methods, the relevant directors at NIGC must inform energy policymakers (such as the company board of directors, the Ministry of Oil, and the Energy Commission of the Parliament) of the lost profits incurred due to the increased delay in collecting gas sales receivables in order to make necessary amendments to the laws and regulations. On the contrary, if the use of any of the proposed methods is not legally prohibited, the acceleration of the receivables collection process involves in-house policies made by the managing body, i.e. board of directors, of NIGC regarding the climatic pattern in gas pricing.

According to the results of the interviews with the managers of NIGC and with the experts in this field, the managers and planners of NIGC may use one or more of the following methods in order to accelerate the liquidation of current receivables (commercial and household subscribers) in the short and medium term:

1. IT-based methods: such as billing in the shortest possible time; examples are simultaneous billing with the meter readings to get faster access to funds and designing and using web-based systems, including the web or mobile applications for easier and faster access to bill information and ease of payment.
2. Incentive policies: such as granting a creditable reward to subscribers (household and commercial) who receive and pay their bills online through the system, which saves on billing costs in the current methods (the average cost of issuing bills and sending it for each subscriber is about 50,000 Iranian Rials), and giving incentives can be linked to the profit lost by dishonor

of receivables. Providing a good discount on payments in line with the rate of liquidity sleeping is another way to accelerate the liquidation of the receivables in household and commercial sectors.

3. Punitive policies: such as financial penalties for the delay in subscribers' payment, especially commercial customers; first, the authorized payout period should be equal to the average NIGC collection period, and, second, the financial penalty is at least equal to the time value of money (lost profits).

Due to the interconnection patterns of consumption and payment methods among the industrial sector and power plant subscribers, it is possible to propose methods to accelerate the liquidation of the receivables as follows. A part of the proposed methods in this area is the incentive and punitive tools provided for the household and commercial sectors. In addition, in power plants and large industries, the exchange agreement on the sale of the product (offsetting agreements) is also applicable. This is recommended for power plant subscribers, the products and goods of which can more easily be sold through NIGC negotiations with other companies at a national or international level. Given that such an operation by NIGC is directly in violation of its article of association, a third party will be liable for the collection of receivables on behalf of NIGC. Using this method involves long-term planning and negotiation with third parties, which should be included in the future programs of NIGC managers and policy-makers.

According to the findings of the interviews, the following are the applicable methods for the collection of the receivables from power plants and industrial sectors:

1. Use of debt discounting and factoring: Fortunately, in recent years, the legal and infrastructural framework for this issue has also been provided broadly, and the banking system is required to grant the necessary facilities for the activities of NIGC as one of the pillars of the country's economic development; in this context, banks can buy receivables from NIGC. The law on the debt discounting in the banking network also stipulates that with the implementation of the terms of this agreement in the national bank network, the liquidity problems of many production, service, and commercial enterprises such as NIGC are hopefully solved. Therefore, a contract to discount debt in

Table 15 - Comparison of NIGC receivables between 2017 and 2018.

Category	Sum of Receivables in 2017 (million Iranian Rials)	Sum of Receivables in 2018 (million Iranian Rials)	Difference	Ranking
Commercial Sectors	12,678,525.37	10,811,757.99	-14.72%	4
Households	24,716,186.50	15,750,628.59	-36.27%	2
Large Industrial Sectors	34,101,639.21	20,873,406.08	-38.79%	1
Small and Medium Industrial Sectors	8,115,093.21	5,644,653.46	-30.44%	3
Power Plants	3,690,803.75	5,158,772.20	39.77%	5
Grand Total	83,302,248.04	58,239,218.33	-30.09%	

the banking sector can be considered as one of the methods for the liquidation of NIGC receivables from power plants and industrial sectors. Debt discounting may also appear in the form of factoring. The factoring is often accompanied by short-term receivables with a maturity less than one year. Factoring is an outsourced financing method by which the seller, i.e. NIGC, contracts out accounts receivable from power plants and industrial subscribers in the form of a contract to an internal or international factor; as a result, the factor manages the collection process with or without NIGC guarantee. Since the factoring institutions have a high level of expertise and accountability in collecting receivables, they will consider the credit risk of debtors. If the underlying accounts receivable, namely, power plants and industrial subscribers, are large and credible companies, it would be useful for NIGC to finance based on the disposition of the receivables of power plants and industrial subscribers.

2. Issuance of debt discounting bonds in the capital market: Another solution proposed in order to provide the working capital and liquidity required by the provincial gas companies is

using the capacity of NIGC. In the previous section, provincial gas companies were explained, and it was observed that the amount of receivables is significant in four sectors of power plants, industries, households, and commercial subscribers in provincial gas companies. This amount is itself a potential capacity for a company, which has not been ignored by the Islamic finance instrument designers. Considering the theoretical foundations of determining the level of credit, receivables aging schedules, and the determination of the liquidation of receivables, a part of NIGC receivables during the studied years (especially 2018) can be used as a basis for the issuance of debt discount bonds. Regarding the significant volume of the receivables of the company, if only 10% of the company receivables is of an acceptable credit rate for issuing bonds, as an initial estimate and the first package of bonds, an amount of 7630 billion Iranian Rials will be provided through these bonds, which will be used in both NIGC working capital and banking loan repayments.

In order to summarize the methods suggested for accelerating the liquidation of receivables based on the patterns and methods of payment for households, commercial sector, industries, and power plants, we can provide a matrix, as described in Figure 1, in which the optimal methods for the liquidation of NIGC receivables are summarized in terms of time and volume.

As displayed in this matrix, the volume and maturity of receivables can be considered as two appropriate measures for assessing and analyzing receivables and proposing optimal methods for liquidation or using the capacity for financing. In general, the bottom half of the matrix in Figure 1 contains appropriate mechanisms for accelerating the rate

Table 16 - Lost profits of NIGC caused by dishonor of the receivables

Year ended at:	Receivables (Million Iranian Rials)	Lost profits until March 2018
March 2015	2,394,316	2,570,538
March 2016	7,452,326	5,425,293
March 2017	8,466,548	3,725,281
March 2018	39,926,028	3,992,603
Grand Total	58,239,218	15,713,715

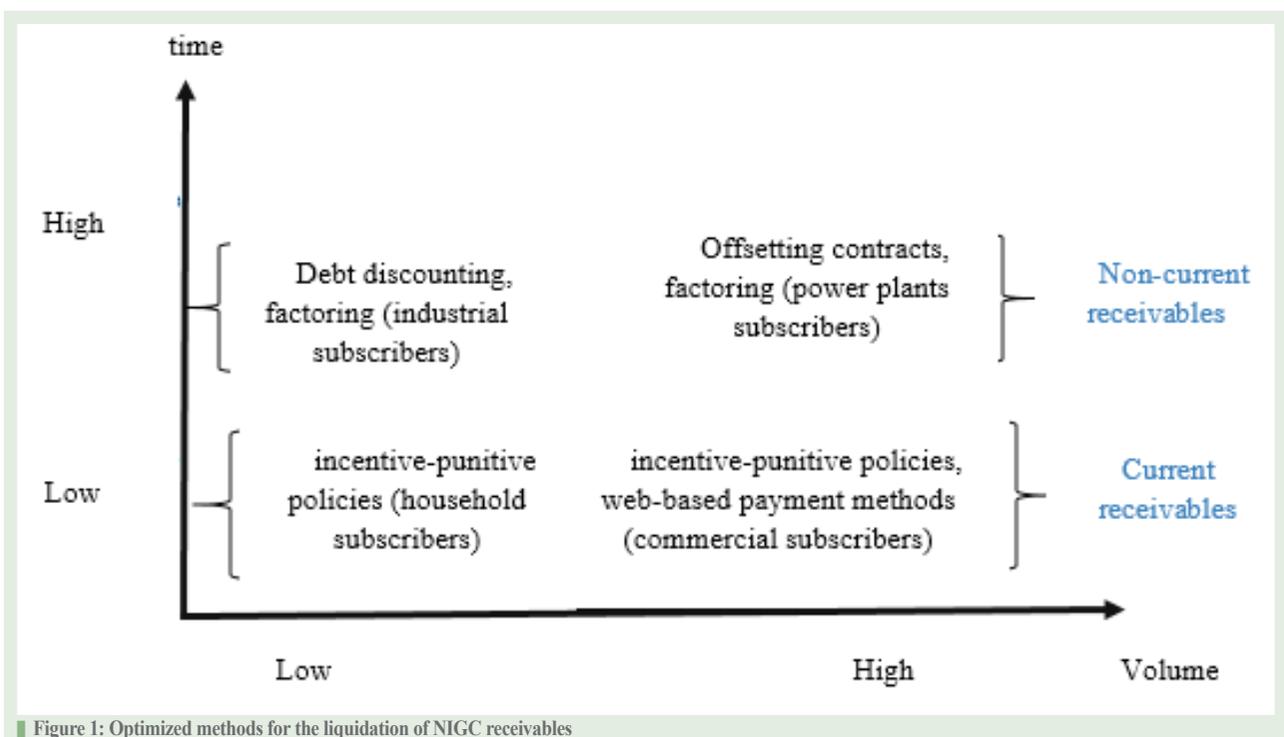


Figure 1: Optimized methods for the liquidation of NIGC receivables



of the liquidation of receivables, which is mainly related to the company's current accounts. More precisely, this section can be linked to the liquidation guidelines for receivables in the commercial and household sectors. The upper half of the matrix also indicates the potential use of NIGC receivables for financing processes. This section can also be related to the results of how to apply receivables as a collateral to financing (provision of working capital) in the industrial sectors and power plants. The common characteristics of the receivables from power plants and industrial subscribers is being overwhelmingly time consuming, which makes the use of financing techniques suitable for this group of receivables. As illustrated, the most expeditious method of accelerating the liquidation of the receivables of groups with low maturity and a small volume (households) is to use incentive-punitive policies as the main focused point of the current study. For long-term and high-volume receivables (such as power plants) factoring and offsetting contracts are recommended the discussion of which is out of the scope of the current paper. Using any of the above methods is not recommended in absolute terms, and it is better to adapt a combination of methods regarding the conditions and requirements of NIGC; for example, considering financial penalties for the delays of power plants will increase the effectiveness of collection process.

5. Conclusions & Remarks

The main objective of this study is to propose incentive mechanisms for the collection of receivables in accordance with the requirements of NIGC to meet a part of its financial needs. To this end, first, NIGC receivables are analyzed in four clusters of provincial gas companies which are classified according to average gas sales during 2012 to 2018. The maximum amount of receivables belongs to the first cluster (the highest ratio of receivables to sales). Also, the analysis of NIGC receivables reveals that a significant portion of the claims belongs to industrial subscribers (mainly refineries and petrochemicals). Following industrial subscribers, household sectors, commercial subscribers, and power plants account for the largest share of receivables; a reasonable relationship between gas sales and deferred receivables is also seen. We clustered provincial gas companies based on average natural gas sales. The analysis of the data show a sharp increase in receivables from commercial, industrial, and household subscribers with some modifications. In the power plant sector, the status of receivables is slightly different, and, after a significant decline in 2017, it experienced a slight increase in 2018. Then, we organized a semi-structured interview with several managers of NIGC to customize the liquidation methods in accordance with the contingents of NIGC. Based on the interview results, NIGC should employ IT-based

methods, incentive policies, and deterrent (punitive) strategies to accelerate the liquidation of receivables in household and commercial sectors. According to the empirical findings, the behavior of industrial subscribers and power plants are different from that of household and commercial sectors, and the main methods used for industrial sectors and power plants are receivable-based financing arrangements such as debt discounting, factoring, as well as offset contracting. In the present proceeding of NIGC, the allocation of funds to provincial gas companies is tied to the ability of the companies to collect receivables. It seems that as long as appropriate methods (whether incentive or punitive) are not used for the collection of the receivables, continuing the current procedure will exert double pressure on the management of provincial gas companies. In this regard, given that the financial department of provincial gas companies and NIGC discloses financial information only at the end of the financial period and do not feel obliged to prepare interim reports, this information gap must be filled. Therefore, the following liquidation methods are recommended to NIGC governing bodies:

- Analyzing the receivables patterns and the consumption behavior of subscribers in shorter periods (monthly), using policies such receivables dashboards.
- Designation and development of accounts receivable module in current information systems (use of business intelligence system) to accelerate the planning and formulation of appropriate receivables and to extract the methods and patterns of consumption and payments.
- Setting up a web-based system to integrate current systems, which analyze receivables transactions. Having a specific receiver in the parent company, designing receivables management analysis system, increasing the level of information disclosure in management reports, and quantifying the consequences of each of the motivational approaches are other methods to accelerate the collection of receivables.
- Billing subscribers at the time of the meter reading, using smart meters, employing web-based platforms (such as mobile and web apps), issuing electronic bills, and providing the necessary infrastructure in this area.
 - Using incentive methods to encourage well-off subscribers, as well as imposing fines on commercial, household, and industrial subscribers for delays in payments at the time of entering into contracts,

Finally, top managers and executives, consolidation departments, credit department, legal affairs and contract departments, and other bodies responsible at NIGC should accelerate and facilitate the liquidation of receivables through using methods such as factoring, debt discounting, offsetting, etc., should obtain the necessary permissions from relevant authorities in this field, and should negotiate with companies which are involved in factoring operations at the national

or international levels. In the current work, the evaluation and the legal, infrastructural, and cultural feasibility of the implementation of the proposed methods, as well as their effects on the trend of receivables, were not considered and should be studied in the future.

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