



## Scheme of Recent Advances in the Field of Accounting and Economics: Application of Macro Accounting Theory in Economic Forecasting

Vahid Bekhradi Nasab, Ehsan Kamali<sup>\*</sup>, Khadije Ebrahimi Kahrizsangi

*Department of Accounting, Najafabad Branch, Islamic Azad University, Najafabad, Iran*

### Abstract

Macro accounting introduces the cost stickiness behavior of all companies as aggregate cost stickiness. This theory states that since the periods of aggregate cost stickiness are more likely to be reserved for resources by companies facing with fall in sales (declining sales), periods of this sequence are associated with low unemployment. Every certain unemployment rate creates a certain increase in wages because wage costs represent General, administrative and sales costs. Based on this, the present study has applied macro accounting information to forecast the unemployment rate. The statistical population of this study includes all companies listed on the TSE. Macro accounting emphasizes economists' view of seasonal accounting. Therefore, data collection every quarter, and observations include 44 times (2008: Q1-2018: Q4). The method of model VAR. Also, to study the forecast's accuracy, the methods of the mean absolute value of error, mean of square error, and criterion of the average percentage of the absolute value of error have been used. Evidence suggests that aggregate cost stickiness forecast changes in the unemployment rate in the future. Reducing the cost stickiness by 1% reduces the unemployment rate by 0/34% in the next quarter. Another result of the research is the accuracy of the regression pattern's forecast in the short term.

**Keywords:** Macroaccounting, Cost Behavior, Aggregate Cost Stickiness, Unemployment Rate Forecast, Vector Auto Regression.

<sup>\*</sup>*Corresponding Author:* Department of Accounting, Email: [Ehsankamali\\_Acc@yahoo.com](mailto:Ehsankamali_Acc@yahoo.com)



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## 1. Introduction

Employment and unemployment are among the most important issues that must be considered to create a prosperous society—because the first condition for economic growth and development of any society is job creation. As a result, the unemployment rate is one of the most important economic indicators. Forecasting the unemployment rate is one of the most important tasks that policymakers deal with. The rise in unemployment is often considered a part of the statistics center and government's concerns and monetary and financial policies. However, it is difficult to forecast unemployment accurately.

Additionally, the press has continuously criticized the accuracy of the Statistics Center's forecasts for making policy decisions. Therefore, its forecast has been at the center of researchers' attention in recent years. Numerous macroeconomic researchers have forecast the unemployment rate using information such as the price of gold, oil, and other components. However, a severe wave of accounting research under the heading of macro accounting seeks to use accounting information and data in the financial statements to forecast economic indicators. For example, researchers such as Fildes and Stekler (2002) and Stekler (2007) call for research, exploration, and synthesis of additional information sets in macroeconomic forecasting models. The proposal of Aloi & Hoefele (2019), Rouxelin et al. (2019), and Goldena et al. (2020) to include additional information in macroeconomic forecasting models, study the behavior of costs in the macro accounting literature under the heading of cost stickiness to The title is a new aspect of unemployment forecasting. The subject of this research is conducted by Aloi & Hoefele (2019) and Rouxelin et al. (2019), growing research in the field of macro accounting and the study of cost behavior under the title of cost stickiness by Anderson et al. (2003). A growing body of literature in accounting, beginning with Anderson et al. (2003), studies cost stickiness. Costs are considered sticky if "[they] increase more when activity rises than they decrease when activity falls by an equivalent amount." Cost stickiness captures the asymmetry in managers' decision to commit resources when facing uncertain future activity levels and resource adjustment costs (Banker and Byzalov 2014).

Previous research has shown that if the volume of activity (demand and sales) of the company changes, managers' decisions about adjusting resources are not made symmetrically; therefore, adjusting resources is asymmetric. Consequently, costs do not behave symmetrically. Asymmetric behavior of costs means a different response of costs to changes in activity (sales) in terms of fall and increased sales. In other words, if the direction of change in the level of activity (sales) affects the cost response, the cost behavior becomes asymmetric. Now, suppose the cost response to the increase in activity level be more severe and faster than the cost response to the activity level decrease. In that case, this behavior is called cost stickiness. If the cost behavior is the opposite, i.e., the cost response to the decrease in activity level, it is more severe and faster than the cost response. To increase the level of activity, the term anti-stick cost is used. In companies, costs are considered sticky if they "increase more when activity increases than when activity decreases by an equivalent amount." Cost stickiness causes asymmetry in managers' decisions to perform resources when not facing uncertain future activity levels and resource adjustment costs (Banker and Byzalov, 2014). Estimating cost behavior concerning the activity level, regardless of cost behavior (cost stickiness), is misleading. Macro accounting in management accounting, by identifying and Forecasting how costs will behave in relation to changes in activity level or income level, can perform its management task well. In the study of cost behavior, it is possible to forecast how management incentives to achieve the zero earning pattern will affect wage costs (Dierynck et al., 2012).

Speed of changes in wages costs compared to changes in company activities, it is important that users view their financial statements, From the traditional and symmetrical form of changing costs in exchange for changing activities, There is a gap and the existence of an alternative model in the behavior of costs has become apparent to everyone. The human resources parameter is considered as one of the important factors in management decisions. Increasing the cost of wages versus increasing activities will be faster than reducing wages to reduce activities. This asymmetric cost behavior stems from the fact that management is cautious about conserving the resources used. In addition, management may have entered into contracts that would be costly for the company to breach. Reducing or eliminating costs such as wages costs by firing employees or changing their working hours also needs to be addressed more carefully because employees' dismissal causes the company to lose credibility in the labor market.

Managers manage earnings to bring reported earnings closer to the target earning level, avoid the loss, report the company's situation optimally from the point of view of future profitability, and align the reported earning with the forecast of earning analysts. In this regard, and given zero earning reporting (avoiding loss reporting), managers are more willing to eliminate wage costs when sales decrease and are very willing to limit wage costs increases when sales increase. As a result, it is expected that there will be incentives to achieve the zero earning pattern to compensate for the factors that lead to asymmetric cost behavior. Hence, companies that succeed in achieving the zero earning pattern provide a symmetrical model of wage costs compared to other companies because they spend fewer resources in response to increased sales and save fewer resources in response to declining sales (Dierynck et al., 2012).

In cost stickiness analysis, the focus is on operating costs (cost of goods sold and general and administrative costs). Labor costs or salaries or wages are the main components of this category of costs for most companies. The starting point for the present study is Okun Law (1963), which examines the relationship between GDP and the unemployment rate changes. As periods of Aggregate cost stickiness are more likely to be reserved by companies facing declining sales, periods of this sequence are expected to be associated with relatively low unemployment. Research shows that the stickiness of sales, general and administrative costs in the period after the decline in sales is reversed, and the decline in sales in two consecutive periods reduces the stickiness of the cost of goods sold and sales, general and administrative costs in the period They become second, and the greater the amount of assets, the higher the stickiness of the cost of goods sold and the higher the cost of sales, public and administrative. But there is no evidence of study duration, economic growth, and the number of employees, employment, and unemployment rates with cost stickiness (Anderson et al.,2003). Anderson et al. (2003) empirically document that sales costs, public and administrative, are cohesive. Anderson et al. (2003) document empirically that SG&A costs behave in a sticky manner: costs increase by 0/55% when sales increase by 1% but decrease by only 0/35% when sales decline by 1%. The researchers ascribe this effect to deliberate managerial decisions about committed resources when there is uncertainty about future demand for their firms' products. Proportionality and symmetry between costs and activities emphasize that a 1% increase will follow a 1% increase in activity in cost. A 1% decrease in activity will be accompanied by a 1% decrease in cost (Calleja et al., 2006).

In contrast, asymmetric cost behavior models assume that managers affect resource adjustment and, consequently, asymmetric cost behavior. Costs represent the consumption of resources, and resources are provided for various activities. Because activities take place to produce goods and services, resources are learned on-demand

from demand, and therefore costs do not follow real demand (Anderson and Lanen, 2007). Such behavior of cost is called "cost asymmetry". Subramaniam & Weiidenmier (2003) confirmed the asymmetric behavior of costs and showed that total expenditures increase by 0/93% for a 1% increase in revenues. But only a 0/85% decrease in revenue versus a 1% decrease in revenue. Also, the research of Dirink et al. (2012) confirms that a 1% increase in income leads to an increase of 0/60% in wage costs, and a 1% decrease in income is associated with a 0/34% decrease in wage costs. Anderson et al. (2005) showed that wage costs respond to declining activity faster than increasing activity. Anderson et al. (2005) provided evidence that managers tend to delay operating costs when demand decreases. At the same time, they are accelerating the elimination of wage costs. These results reflect that managers make different adjustments to different cost groups when making rational decisions to eliminate costs and clear the gap between wage and other costs in different circumstances. Studies by Anderson et al. (2003) and Subramaniam & Weiidenmier (2003) confirm this concept and show the relationship between asymmetric cost behavior with assets, the number of employees, length of the study period, length of sales decline, and economic growth. The intensity of the cost response to the increase in the volume of activity and demand is different from its reaction to the decrease in activity volume. In other words, the change in demand (decrease or decrease in activity level) is a determining factor in the rate of change in costs in response to that change, and the rate of decrease in costs in the event of a decrease in sales is less than in the case of an increase. Costs increase when sales increase but do not decrease as much when sales decrease. The macro accounting theory states that the reaction and behavior of costs forecast the unemployment rate.

The difference between developing countries' economic environment and developed countries has explained the need for the present study related to macro accounting in Iran as a developing country. Also, regarding the importance and necessity of research, it can be said that this study contributes to several streams of theoretical literature. First, it helps with cost accounting literature on sticky expenses. In other words, this is the first study that uses cost stickiness as a forecaster of the real business cycle and thus links cost stickiness to macroeconomic variables. Because the evidence in the present study shows that cost stickiness helps to forecast future unemployment rates. Thus, the growing literature in accounting is expanded to examine the aggregate earning of companies in Forecasting real business cycles. Second, the present study contributes to the macroeconomic literature in Forecasting the unemployment rate. Because the evidence in the present study showed that cost stickiness improves the ability to forecast the unemployment rate. Besides, the results suggest some professional macroeconomic producers at least partially ignore that cost stickiness. Finally, this research contributes to the literature on the cost cycle and production prices. Carlton & Perloff (2005) and Nekarda & Ramey (2013) state that experimental findings have been mixed to date. While most studies prove immobility or metamorphosis, there is a large literature on procedural anticipated real marginal cost. This study studies aggregate cost stickiness, which is available for a long series at a relatively high frequency. This measure places asymmetry in cost behavior about adjustment costs. Findings indicate that unemployment increases or decreases (unemployment changes), anti-unemployment cost stickiness (inverse relationship). Management uses different approaches to adjusting wage costs. Reducing the number of employees or changing their working hours is one thing that the manager can consider in making decisions. Dismissing employees imposes various costs on companies, including paying for redundancies, losing employee morale, and losing credit in the job market. As a result, corporate executives who report high earning, as defined by this study, are less likely to fire their employees when they are down. Given the cost of completion, it is expected that high-

earning companies will change the number of employees asymmetrically in response to changes in activity levels. They increase the number of employees when the activity rate increases. This increase is more than the decrease in the number of employees when the activity level decreases. Managers of high-earning companies are more likely to reduce their working hours instead of firing employees when they face reducing activity. Therefore, the working hours per employee when the activity level decreases, more than it increases following the increase in the company's activity level. In periods of increased activity, high-earning companies respond to the need for labor by hiring new employees instead of increasing each employee's working hours (Chen et al., 2012,2013). In contrast, corporate executives who avoid reporting losses are less concerned about costs such as losing employee morale and losing credit in the job market. Therefore, they are more likely to take measures such as firing employees to reduce their costs. The managers of low-earning companies symmetrically adjust both the number of employees and their working hours in response to activity level changes (Dierynck et al., 2012).

In Iran, professional forecasters provide an important source of macroeconomic forecast data, which is done quarterly. Forecasters are anonymous and come from a wide range of industries (including finance, investment banking, commercial banking, payment services, hedge funds, mutual funds, financial service providers, and asset management associations) and non-financial (Such as manufacturers, universities, forecasting companies, investment consultants, research companies and consulting firms) that are selected. This review is typically posted at the end of each calendar quarter's first quarter (for the last quarter). Forecasters are usually asked to forecast 32 economic variables for the current quarter to the next three periods. Forecast summaries are usually published by the middle of next month. Forecasters use a combination of mathematical, statistical, and subjective estimates when making their forecasts that reflect the forecaster's personal and professional judgment. Mathematical models include those seeking statistical patterns in particular time-series characteristics of the variables of interest and those of a structural nature that uses links among several macroeconomic variables capturing different economic sectors. One such relationship is the empirically documented association between output growth and unemployment changes (Okun 1963; commonly referred to as Okun's Law). The feasibility study of macroeconomic forecasting indicators using the power of forecasting accounting information is a fundamental issue. Numerous solutions and ideas have been presented in recent years through numerous research in macro accounting. For example, Nallareddy & Ogneva (2017), Nallareddy & Ogneva (2015) In two different studies, Konchitchki & Patatoukas (2014) and Konchitchki & Patatoukas (2014), In two different studies, Nallareddy & Sadkay (2016) and Hann et al. (2017), Aggregate accounting earnings, Nallareddy & Ogneva (2017), Aggregate stock returns, Konchitchki & Patatoukas (2014) In different researches as well as researches Zambrana (2017), Aggregate profitability rate (or Financial and tax incentives affecting the profitability ratio), Abdalla (2016), Aggregate Book-to-Market rate, Do & Nabar (2018), Laurion & Patatoukas (2016), Crawley (2015), Aggregate accounting conservatism, Aloi & Hoefele (2019) and Rouxelin et al. (2018), Aggregate Cost Stickiness and Nallareddy & Ogneva (2017), growth of labor employment in companies In the field of macro accounting to forecasting macroeconomic indicators.

An important issue in the macro accounting literature and has not yet been answered is why the relationships between accounting and economic information are not used to forecast macroeconomic indicators. They have also not been considered in previous research. The present study is to what extent the figures in the financial statements such as cost stickiness as an accounting output can forecast the unemployment rate. In other

words, does cost stickiness in unemployment forecasting models improve the performance of the unemployment rate forecast? In fact, by measuring the variable parameter approach over time (Vector auto regression) from aggregate cost stickiness for all companies, the concept of sticky costs is projected. In the research, the theoretical foundations, research method, findings, discussion, and conclusion are stated.

## 2. Theoretical principles and hypotheses development

Keynes (1963) argues that wages are down due to structural factors such as trade union contracts and minimum wage laws. When aggregate demand for goods and services is declining, production units react to declining sales, declining production, and layoffs, not to wages. According to Keynes (1963), prices are sticking down. An unemployed person wants to work for a normal wage, but there is no job for him. Unemployment is caused by price and wage stickiness and increases and decreases during business cycles. On the other hand, in wage stickiness and recession, producers are forced to reduce their employment because lower prices reduce producers' incomes. If wages remain stable, producers' costs will also remain constant (or sometimes increase). In this way, their profitability is reduced. On the other hand, with lower prices and no reduction in nominal wages and real wages, producers' employment level decreases. Classics believe that unemployment does not occur without wage and price stickiness, and while ignoring seasonal unemployment, unemployment is more or less equal to natural unemployment. Keynes (1963) believes that, First, there is unemployment due to the stickiness of wages and prices, which is an undeniable fact. Second, due to the monetary illusion in a recession, unemployment can be higher than normal, and there may be some periodic unemployment.

In economics Science, Okun Law (1963) is an empirically observed relationship between unemployment and production losses in a country. The Gap Version states that for every 1% increase in the unemployment rate, a country's GDP is reduced by almost more than 2% relative to its potential GDP. The "difference version" describes the relationship between quarterly changes in unemployment and seasonal changes in real GDP. In the original statement of the Okun Law (1963), a 2% increase in output equals a 1% decrease in the periodic unemployment rate, a 5% increase in labor force participation, a 5% increase in each employee's working hours, and a 1% increase in output per working hour (Labor productivity). Okun Law (1963) states that an increase of one unit in the periodic unemployment rate is associated with two percentage points of negative GDP growth. The relationship varies depending on the country and the period examined and decided by the companies' managers. Managers' decisions direct changes in costs at the same time as changes in the volume of activities. Managers may knowingly reduce costs when they are unsure about future demand, and this reduction will not be proportional to the reduction in activity volume. This asymmetric behavior is also present in wages costs, one of the most important components of a company's costs. Wage cost changes must be very prudent. Managers' motivation is one of the most important factors influencing the behavior of this cost. According to Okun Law (1963), unemployment changes increase as corporate activity volume decreases, and production increases. Labor costs and wages are the main components of sales, general and administrative costs in operating costs (cost of goods sold, and general and administrative costs). Sales costs, general and administrative, are sticky (Anderson et al., 2003). By increasing sales by 0/55%, sales costs, general and administrative, increase by 1%. But if sales decrease by 0/35%, sales, general and administrative costs will decrease by only 1%. Researchers link the forecast of unemployment rates using aggregate cost stickiness to deliberate management decisions about committed

resources when there is uncertainty about future demand for corporate products.

Contradictory theories have been put together for relatively long periods in both economics and accounting, but empirically these theories have not been applied to macroeconomics in practice. The field of accounting has not been able to present its data and knowledge in the framework of a parent theory or a general theory and a broader intellectual framework. Macro accounting has emerged in late 2019 to develop many small and large theories in its context and become a mother theory under the theory of macro accounting. As a branch of the social sciences, accounting is responsible for explaining, explaining, and guiding economic behaviors. This knowledge field requires a scientific theory or a set of scientific theories to forecast and interpret the phenomena and events in it. Forecast and interpretation that is theoretically based on a logical truth and practically based on objective phenomena. Accounting thinkers have made great efforts over the past few decades to build accounting theories. Despite the progress made, unfortunately, this field of knowledge has not adequately explained and forecast the existing phenomena in the economic and financial field. In many cases, this inability has manifested itself in the fact that economic forecasts have always been flawed. One of the reasons for the accounting discipline's inability to present accounting information is its reliance on grammatical theories.

Prior to 1970, theorizing in accounting was rejected due to the lack of comprehensive and sufficient theories. With the knowledge of economic and financial theories, the attempt to theorize in accounting took a new direction. After 1970, empiricism and a focus on the more systematic use of empirical evidence became prevalent. Efforts to use accounting information in economic forecasting continued from the 1970s until the final decades of 2019, when macro accounting emerged. After much positive accounting research, accounting data's importance became more prominent during these years. Macro accounting based on objective observations states that macroeconomic variables can be forecast based on accounting information. In this case, accounting information's role and position are emphasized more than before, and accounting information becomes retrospective to prospective. The argument in this approach is based on inductive logic. This approach starts by observing and measuring the desired phenomena and ends with their conclusion and generalization. One of the arguments put forward in macro accounting is forecasting the unemployment rate using aggregate cost stickiness (accounting information). Unfortunately, forecasters did not include aggregate cost adherence information in their forecasts when forecasting unemployment. The cost stickiness of employing companies reveals two main types of information that can help forecast future unemployment. In the first stage, the degree of cost stickiness indicates the magnitude of the adjusted cost, including dismissal and hiring costs, common in the employer's legal and operational environment. Second, the degree of cost stickiness reflects management expectations about the product's future state and the labor market. When cost aggregation is more cumulative, companies retain employees even if sales decline. Therefore, unemployment is not expected to increase or even decrease in the coming quarters. unemployment is expected to rise in the short term if, on the other hand, companies show a desire to lay off employees when sales decline. So the stickiness of aggregate costs with changes in the unemployment rate in the next quarter is negative. In other words, the high level of cost stickiness as macro accounting information is associated with the subsequent decline in the macro-level unemployment rate. Based on this, the research hypothesis is as follows.

**Hypothesis:** aggregate cost stickiness forecasts future unemployment rate changes.

### 3. Research Methodology

The research methodology, the type of research, hypotheses, statistical population,

data collection, and research method has been studied.

### 3.1. Research type

The present study is developmental research in terms of results. In terms of the implementation process, it is a quantitative study, and in terms of research purpose, it is a descriptive study. It is a quantitative study in terms of the implementation process and a descriptive study in terms of research purpose. In terms of implementation, it is inductive research, and in terms of the time dimension, it is longitudinal research. It is analytical in terms of causal method and practical in terms of purpose. The data collection method is library and statistics. Information related to the research model's variables is extracted as a seasonal time series from the Codal site and the Statistics Center of Iran. The econometric tools used in the Eviews software research and the estimation method used, the Johansen & Juselius method and the time domain of the research, the time interval of 2008-2018, and the research's spatial realm are also Iran.

### 3.2. Data collection

The data required to collect accounting information is the Codal website, and the economic information is the website of the Central Bank of the Islamic Republic of Iran. In other words, the information on the aggregate cost stickiness using the interim financial statements of companies listed in the Tehran Stock Exchange during the period 2008-2018 and the unemployment rate using the data of the first quarter of 2008 to the fourth quarter of 2018 (2008: Q1- 2018: Q4) has been collected.

### 3.3. Statistical population

The statistical population of this research includes all companies listed on the Tehran Stock Exchange. Data collection was done seasonally. Concerning the fact that on 25 July 2007, stock exchange publishers were obliged to submit financial statements in the form of audited periods, the research period has started since 2008. Under paragraph 4, article 7 of the Guidelines for Exchange Publishers in Presenting Audited Financial Statements, listed publishers are required to prepare and disclose financial statements within the audited six-month periods. As a result, due to the data's seasonality and the models' fit in a time series, the observations reach 44 times (2008: Q1 to 2018: Q4).

### 3.4. Vector Autoregression (VAR) Model from Stock and Watson (2001)

Next, we run a vector autoregression (VAR) model, a generalization of a single-variable time-series autoregression (AR) model. The unemployment rate is modeled as a function of other variables in the system and their lags and lags, allowing for analysis of the effects of shocks on one or more variables in the system (e.g., Sims 1980a, 1980b; Blanchard and Watson 1986). We build on Stock and Watson (2001). They estimate a VAR model in which the evolution of the unemployment rate follows Taylor's (1993) rule, which stipulates how much the central bank should change the nominal interest rate in response to changes in inflation, output, or other economic conditions. The SW model substitutes growth in output for growth in unemployment, based on Okun's Law. We add our main variable of interest (aggregate cost stickiness) to their system. Additionally, we estimate the following recursive VAR system:

$$AZ_t = \phi Z_{t-k} + \varepsilon_t$$

Where  $Z_t = (Inf_t, UR_t, IR_t, CostStickiness_t)$  is a vector of variables that includes (in this order) inflation (Inf), unemployment rate (UR), federal funds rate (IR), and cost stickiness (CostStickiness).

In this research, the SVAR model has been used instead of the VAR model for the forecast. In this model, the unemployment rate is a function of Aggregate cost



stickiness. Accordingly, the SVAR model is specified in Equation (2).

Equation (2):  

$$ChUR_t = \alpha_1 + \alpha_2 AggregateCostStickiness_{t-1} + \varepsilon_t$$

$$AggregateCostStickiness_t = \alpha_2 k_{-1} + \eta_t$$

ChUR<sub>t+k</sub> is an Unemployment rate change in the t + k period, CostStickiness<sub>t</sub> is a Cost Stickiness in period t, and  $\varepsilon_{t+k}$  is Random sentences. In this Equation, the coefficient  $\alpha_2$  is the VAR coefficient.  $\alpha_2 = (\alpha_{1k}, \text{vec}(\alpha_{1k,1}), \dots, (\alpha_{1k,k}))$ .

**3.5. Research variables**

The measurement of variables is in Table (1) presented.

**Table 1: Definitions of variables**

Variable	Rol in model	Definition
ChUR	Dependent variable	Equation (1): $ChUR_t = \frac{UR_t - UR_{t-1}}{UR_{t-1}}$
Cost Stickiness model	-	Estimated coefficients obtained from running the following ordinary least squares regression cross-sectionally each quarter t using Compustat quarterly data for quarters q in Equation (2): $\text{Log} \left[ \frac{(COGS + SG\&A)_{iq}}{(COGS + SG\&A)_{iq-4}} \right]$ $= \beta_0 + \beta_1 \text{Log} \left[ \frac{SALES_{iq}}{SALES_{iq-4}} \right] + \beta_2 I\_Decrease_{it}$ $\times \text{Log} \left[ \frac{SALES_{iq}}{SALES_{iq-4}} \right] + \varepsilon_{it}$
Aggregate Cost Stickiness	Independent variable	$\beta_2$ coefficient estimates $\times -1$ , normalized by subtracting its sample mean and dividing by standard deviation in Equation (3): $\frac{[\beta_2 \text{ Coefficient Estimates} \times (-1)] - \text{Sample Mean}}{\text{Standard Deviat}}$

Dependent variable

**ChUR:** According to investment demand theory, it is possible to forecast the unemployment rate using the Aggregate Cost Stickiness. The Statistics Center of Iran measures the unemployment rate in the census system with different criteria. The unemployment rate of the population of ten years and more in the whole country (by seasons) is the most important unemployment measure. The unemployment rate, according to the definition of the Statistics Center of Iran, is the ratio of unemployed or job seekers to the population of working age, which is expressed as a percentage. This index measures the part of the labor force that has not been engaged in any activity during the research period that has lost its previous job or is looking for work. In the present study, changes in this rate have been used as a dependent variable.

**3.5.1. Independent variable**

**Aggregate Cost Stickiness:** According to investment demand and investment consumption theories, it is possible to forecast the unemployment rate using the Aggregate Cost Stickiness. The trend of Aggregate Cost Stickiness in the company, Signal provides a valuable signal of the declining trend of the company's earnings and the company's earning, an important signal of the future state of the economy to the

capital market. Therefore, as accounting information, a company's expenses and stickiness transmit comprehensive, complete, and important information from the financial statements (income statement) to the market. First, cost stickiness has been measured following the studies of Aloi & Hoefele (2019), Rouxelin et al. (2019), and Goldena et al. (2020) as described in Equation (2). Equation (2) with ordinary least squares regression and Cross-sectionally for each chapter. In equation (2) COGS, cost of goods sold, SG&A, selling, general and administrative expenses, SALES, Sales revenue and I\_Decrease, The sales reduction Dummy variable is assigned the one if the quarterly changes in sales are smaller (sales reported in the current quarter compared to the previous four quarters) and otherwise the zero .

#### 4. The results

The research findings are presented in two parts time variable over a short time and time-variable over a long time.

##### 4.1. Descriptive Statistics

Table (2) reports descriptive statistics for the research variables used in the analysis.

**Table 2:** Descriptive Statistics

Variables	Mean	Median	Max.	Min.	SD
Unemployment rate	0.11	0.11	0.14	0.09	0.01
$\Delta$ Unemployment rate	-0.003	0.008	0.24	-0.19	0.09
$\beta_1$ Coefficient Estimates	0.6	0.5	0.88	0.49	0.05
B2 Coefficient Estimates	-0.12	-0.11	-0.1	-0.26	0.1
Aggregate Cost Stickiness	2.84	2.89	4.76	-1.03	1.03

The maximum unemployment rate is 0/14 and is related to the 1389Q4, and the minimum unemployment rate is 0/09 and is related to the 1387Q3 and the 1393Q2. For the variable of changes in the unemployment rate, the maximum is 0/24, and the minimum is -0/19, which are related to the 1387Q4 and the 1387Q1, respectively. The estimated coefficients  $\beta_1$  and  $\beta_2$  of the cross-sectional Aggregate Cost Stickiness have a mean of 0/6 and -0/12. Therefore, for every 1% increase in sales revenue, companies show an average increase of 0/6% in their operating costs. At the same time, only 0/39% (0/11% -0/5%) costs are reduced for every 1% decrease in sales revenue. The normal measurement of cost stickiness in a given quarter (specified quarter) is between -0/03 and 4/76.

##### 4.2. Augmented Dicky Fuller Test (Stationary)

In this step, the static status of the variables is checked. In this study, the Augmented Dickie-Fuller test was used. The results of this study are presented in Table (3).

**Table 3:** Augmented Dicky Fuller results

Variables	Prob				1st difference			
	t-Statistic	Test critical values			t-Statistic	Test critical values		
		99%	95%	90%		99%	95%	90%
$\Delta$ Unemployment rate	-10.06	-	-	-2.6	-5.14	-	-	-
		3.59	2.93			2.63	1.95	1.65
Aggregate Cost Stickiness	1.44	-3.6	-	-2.6	-3.46	-	-	-
			2.93			2.62	1.94	1.61

Table (3) shows the mana unemployment rate and cost stickiness with a mana differentiation step.

### 4.3. Determine the optimal interrupt

determining the optimal interrupt, the criteria of the likelihood ratio (LR), Akaike (AIC), Bayesian Schwartz (SC), and Hannan Quinn (HQ) tests were used according to Table (4).

**Table 4:** Determine the optimal interrupt

interrupt	LR	AIC	SC	HQ
0	NA	-1.96	-1.9	-1.95
1	4.75	-2.06	-1.93	-2.01
2	0.87	-2.03	-1.87	-1.97
3	5.06	-2.13	-1.92	-2.05
4	5.37	-2.24	-1.98	-2.15

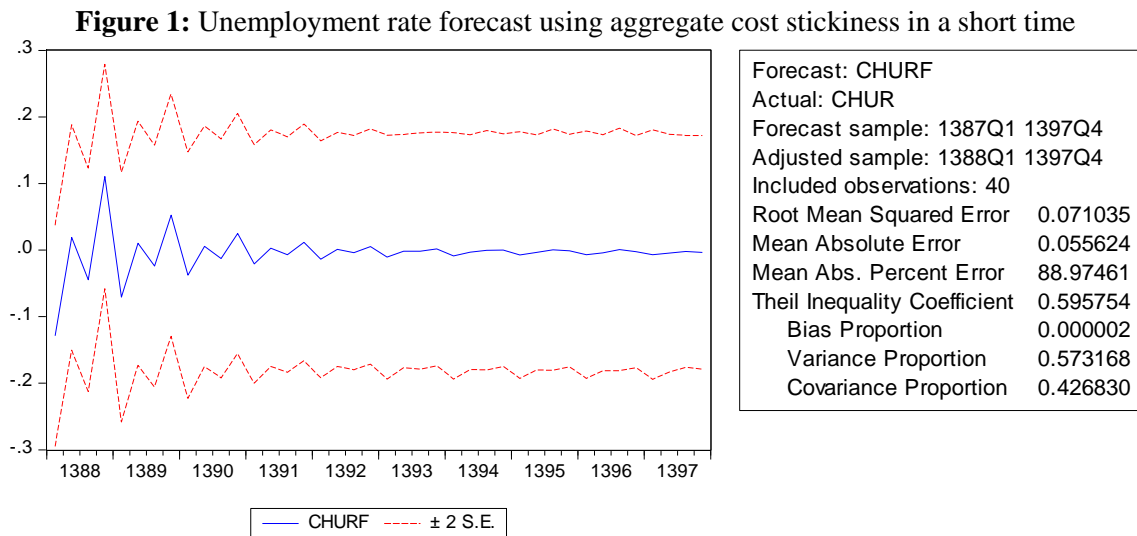
According to Table (4), the Bayesian Schwartz criterion (observations less than 100) indicates the existence of 4 interruptions in the time-varying model. Accordingly, the time-varying model fits the description of Equation (7).

Equation (7):

$$CHUR = -0.26 * CHUR_{t-1} - 0.19 * CHUR_{t-2} - 0.15 * CHUR_{t-3} + 0.34 * CHUR_{t-4} + 0.001 * COSTSTICKINESS - 0.003$$

### Unemployment rate forecasting using aggregate cost stickiness based on time variables over a short period

The trend of unemployment rate forecasting using aggregate cost stickiness over a short period is presented in Figure (1).



Unemployment rate forecasting trend using aggregate cost stickiness over a short period with two high and low standard deviations indicates the unemployment rate forecast accurately.

### Performance of Unemployment Rate Forecast Using Aggregate Cost Stickiness Based on Time Variables over Short-Term Time

In this section, the unemployment rate amounts are compared with the forecast of the unemployment rate using the aggregate cost stickiness over a short period in Table (4).

**Table 4:** Unemployment Rate Amounts and Unemployment Rate Forecasts Using Aggregate Cost Stickiness in the Short-Term

Time	Unemployment Rate	Unemployment Rate Forecasts Using Aggregate Cost Stickiness	Time	Unemployment Rate	Unemployment Rate Forecasts Using Aggregate Cost Stickiness
1387Q1	-0.19	Lag1(NA)	1392Q3	-0.009	-0.003
1387Q2	0.05	Lag2(NA)	1392Q4	0.01	0.01
1387Q3	-0.07	Lag3(NA)	1393Q1	0.01	0.01
1387Q4	0.24	Lag4(NA)	1393Q2	-0.12	-0.11
1388Q1	-0.12	-0.12	1393Q3	0.09	0.01
1388Q2	0.01	0.01	1393Q4	-0.08	0.01
1388Q3	0	0	1394Q1	-0.06	-0.08
1388Q4	0.19	0.11	1394Q2	0.009	0.003
1389Q1	-0.04	-0.07	1394Q3	-0.01	-0.01
1389Q2	0.007	0.01	1394Q4	0.09	0.01
1389Q3	-0.12	-0.12	1395Q1	0.03	0.07
1389Q4	0.05	0.17	1395Q2	0.03	0.03
1390Q1	-0.18	-0.03	1395Q3	-0.03	-0.03
1390Q2	-0.1	-0.05	1395Q4	0.01	0.09
1390Q3	0.05	0.01	1396Q1	0.007	0.006
1390Q4	0.16	0.12	1396Q2	-0.07	-0.04
1391Q1	-0.1	-0.02	1396Q3	0.016	0.015
1391Q2	-0.04	-0.02	1396Q4	0.01	0.02
1391Q3	-0.1	-0.06	1397Q1	0	0
1391Q4	0.09	0.01	1397Q2	0.008	0.008
1392Q1	-0.16	-0.11	1397Q3	-0.04	-0.04
1392Q2	-0.01	0.09	1397Q4	0.03	0.03

The evidence in Table (4) shows that the time-varying model can forecast the unemployment rate using aggregate cost stickiness in observations in a short time.

#### 4.4. Convergence test

the purpose of estimating the time-varying model is to determine the number of long-term relationships in the model. The pattern contains a variable, and therefore a long-term relationship is possible. Testing this problem, according to Johansen's method, effect statistics, and maximum eigenvalue was used, the results of which are presented in Table (5).

**Table 5:** Convergence test results in the unemployment rate forecasting model

Hypothesis0	opposite Hypothesis	Effect statistics	Critical value	Maximum eigenvalue statistics	p-value
R=0	R>0	32.36	4.12	0.54	0.0000

Both the effect statistic and the maximum eigenvalue confirm a minimum long-term relationship at the 95% confidence level in the model. According to the results of Table (5), according to which both the effect statistic and the maximum eigenvalue confirm the existence of a long-run relationship in the unemployment rate forecast model, a

long-run relationship is estimated under the Johansen model.

**Estimation of Johansen model**

Johansen's model shows long-term relationships and helps a lot in policymaking. Johansen test is used to investigate the co-integration relationship between variables.

**Table 6:** Results of Johansen's Cointegration Test

Statistics	No intercept& No Trend	intercept& No Trend	intercept& No Trend	intercept& Trend	intercept& Trend
Effect statistics	1	1	1	1	1
Maximum eigenvalue statistics	1	1	1	1	1

The Johansen co-integration test results from the constrained to the non-constrained state are presented in Table (6). The results confirm the existence of at least 1 co-integration vector.

**structural constraints**

According to the convergence order test results, the long-run relationship is related to Forecasting the unemployment rate in the most constrained state as described in Equation (8) and the output of the results as described in Table (7).

Equation (8)

$$ChUR_t + k = \alpha_1 k AggregateCostStickiness_t + \epsilon_t + k$$

**Table 7:** Results of Johansen model estimation related to the unemployment rate forecast

Variable	Coefficient	T-statistic
Cost stickiness	-0.34	-2.47

The results show that in the long run, the aggregate cost stickiness can forecast the unemployment rate. In this model, the significant relationship between aggregate cost stickiness and unemployment rate means that their coefficients are reliable at a 1% error level. These results also show a direct relationship between the aggregate cost stickiness and the unemployment rate in the long run.

**Unemployment rate forecasting using aggregate cost stickiness based on time variables over a long period**

The trend of unemployment rate forecasting using aggregate cost stickiness over a long period is presented in Figure (1).

**Performance of Unemployment Rate Forecast Using Aggregate Cost Stickiness Based on Time Variables over Long-Term Time**

In this section, the unemployment rate amounts are compared with the forecast of the unemployment rate using the aggregate cost stickiness over a long period in Table (4).

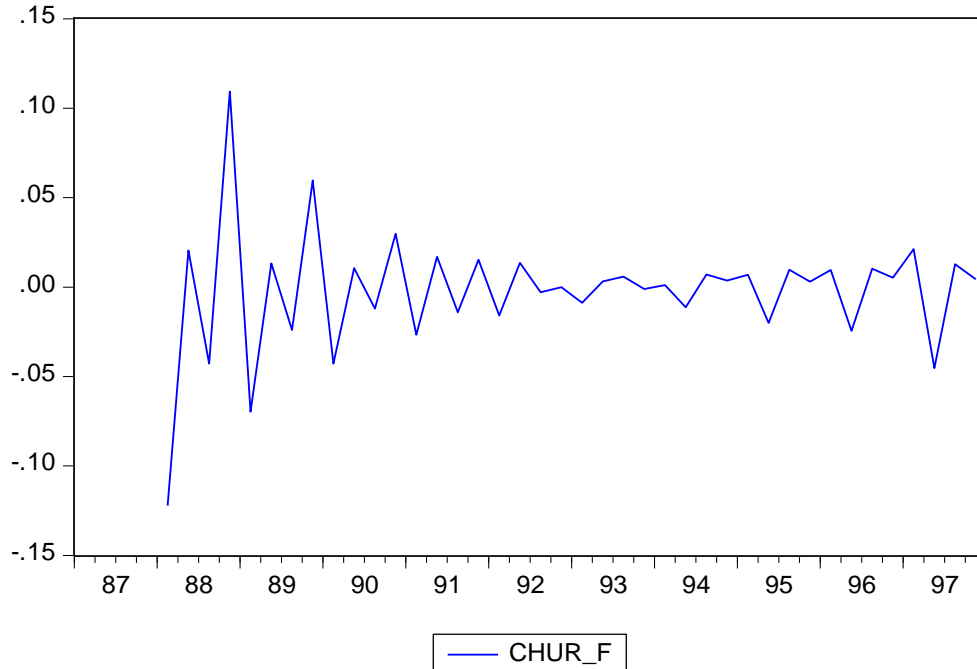
The evidence in Table (6) shows that in the long run, the time-varying model has the ability to forecast the unemployment rate using aggregate cost stickiness in observations.

**4.5. Research Hypothesis**

The research hypothesis examines the forecast of changes in the unemployment rate using aggregate cost stickiness.

Assessing the forecast power of the time-varying model and comparing it in the short and long term in Table (9) indicates the difference in the accuracy of this model's forecast for the aggregate cost stickiness. As shown in Table (9), the short-term time-varying model has the least error in Forecasting the unemployment rate.

**Figure 1:** Unemployment rate forecast using aggregate cost stickiness in a long time



**Table 4:** Unemployment Rate Amounts and Unemployment Rate Forecasts Using Aggregate Cost Stickiness in the long-Term

Time	Unemployment Rate	Unemployment Rate Forecasts Using Aggregate Cost Stickiness	Time	Unemployment Rate	Unemployment Rate Forecasts Using Aggregate Cost Stickiness
1387Q1	-0.19	Lag1(NA)	1392Q3	-0.009	-0.002
1387Q2	0.05	Lag2(NA)	1392Q4	0.01	0.01
1387Q3	-0.07	Lag3(NA)	1393Q1	0.01	0.01
1387Q4	0.24	Lag4(NA)	1393Q2	-0.12	-0.12
1388Q1	-0.12	-0.12	1393Q3	0.09	0.09
1388Q2	0.01	0.02	1393Q4	-0.08	0.001
1388Q3	0	0	1394Q1	-0.06	-0.01
1388Q4	0.19	0.19	1394Q2	0.009	-0.008
1389Q1	-0.04	-0.06	1394Q3	-0.01	-0.01
1389Q2	0.007	0.006	1394Q4	0.09	0.09
1389Q3	-0.12	-0.12	1395Q1	0.03	0.06
1389Q4	0.05	0.05	1395Q2	0.03	0.02
1390Q1	-0.18	-0.18	1395Q3	-0.03	-0.009
1390Q2	-0.1	-0.1	1395Q4	0.01	0.003
1390Q3	0.05	0.05	1396Q1	0.007	0.009
1390Q4	0.16	0.16	1396Q2	-0.07	-0.06
1391Q1	-0.1	-0.1	1396Q3	0.016	0.015
1391Q2	-0.04	-0.04	1396Q4	0.01	0.005

1391Q3	-0.1	-0.1	1397Q1	0	0.02
1391Q4	0.09	0.01	1397Q2	0.008	0.04
1392Q1	-0.16	-0.01	1397Q3	-0.04	-0.01
1392Q2	-0.01	-0.01	1397Q4	0.03	0.004

**Table 9:** Accuracy of unemployment rate forecast

Model	VAR- Short term	VAR- Long term
MSE	0.071035	0.070817
MAE	0.055624	0.0566711
MAPE	77.97461	1454.225
Theil	0.595754	0.585917

The findings show that cost stickiness leads to the forecast of unemployment over time series. In other words, cost stickiness can help improve the performance of the future unemployment rate model. Table (9) shows that reducing unemployment by 1% will reduce the unemployment rate by 0/34% in the next quarter. The results also showed that the time-varying model has the least error in Forecasting the unemployment rate in the short run. As a result, it can be said that the aggregate cost stickiness forecast changes in the unemployment rate in the future.

## 5. Conclusion

In the present study, an attempt was made to highlight the importance of macro accounting. Macro accounting emphasizes the use of accounting information in economic forecasting. The present study showed that accounting information contains information about the unemployment rate as an economic indicator, which confirms the value of accounting information as a qualitative feature. Looking at the macroeconomic structure of each country and the different markets in each economy, it can be seen that one of the most basic markets in any economy is capital markets. The stock market is one of the capital market components and is a function of it as part of the economy. In developing countries, the economy's impact is deeper than in developed countries due to the stock market's impact and the lack of attention to the figures published in the capital market. In the present study, the relationship between the aggregate cost stickiness and macro unemployment rates was examined, and the focus is on Forecasting changes in unemployment rates. Due to this fact, forecasting changes in the unemployment rate is one of the most complex and important macroeconomic policymakers' tasks. Cost stickiness influences companies' decisions about hiring employees, retaining employees, terminating work, firing, resigning, and cost stickiness, reflecting future unemployment rates. The results of the present study contribute to the growing literature in macro accounting. Findings show that in the designed model, the aggregate costs stickiness is an indicator of effectiveness in Forecasting the unemployment rate. Cost stickiness reflects the level of adjusted costs associated with the workforce that meet the company's expectations and the manager of future activities. The main reasons for changing the decisions of capital market participants lie in the adjustment costs of companies.

Because of the Estimation of the aggregate cost stickiness model, the evidence showed that managers refrain from adjusting costs because they do not adjust costs during these periods and maintain the company's financial resources, experiencing declining sales sticky periods. Subsequently, the forecast model results showed that the country is associated with low unemployment during periods of this sequence. In the observed observations, including all companies listed in the Tehran Stock Exchange, resources are equipped only to produce goods and services. The amount of resource supply depends not only on the current level of demand but also on future production

and sales expectations. Adjusting resources entails costs for the company. Adjustment costs at the level of microeconomics and listed companies are a signal to the macroeconomy. Because when demand declines, managers face the costs of maintaining unused resources on the one hand and the costs of adjusting resources on the other. They consciously strike a balance between these two types of costs and only reduce resources if it is in the company's best interest as a whole. If the company's resources are kept above the required level, costs will be imposed on the company. Cost adjustment periods increase future unemployment. Adjustment costs will also be imposed on the company if resources are reduced. These costs include selling the company's assets, paying compensation to dismissed employees, and penalties for contract breaches. In addition to direct financial costs, there are also indirect costs such as demoralization or residual labor loyalty. In addition, adjustment costs include the cost of adding resources if demand increases again. Such as the cost of purchasing assets, the cost of recruiting and training new employees, and the cost of negotiating future contracts.

Certainly, the unemployment rate will rise with the payment of compensation to the fired employees. The fines resulted from the contracts' violation and the overflow of the unemployed labor force to society. Even if managers expect a temporary reduction in demand (activity), the costs of reducing resources and increasing them again are likely to outweigh the costs of temporarily maintaining additional resources. In this case, managers may prefer to bear the cost of maintaining additional resources to avoid higher adjustment costs. Therefore, cost stickiness at the micro-level reduces representation problems and capital intensity, and contributes to the manager's goals, such as maximizing the company's value in the long run. At the macro level that has not been considered so far, The aggregate cost stickiness helps forecast the unemployment rate. Because the results showed that stickiness is more likely to be reserved by companies facing declining sales during periods of aggregate cost, periods of this sequence are associated with low unemployment. The results of the present study are consistent with the researches of Aloï & Hoefele (2019), Rouxelin et al. (2019), and Goldena et al. (2020).

So far, the theoretical literature has not examined the power of Forecasting cost stickiness for macroeconomics. The present study is one of the first studies that seek to forecast macroeconomic indicators using accounting information. Accordingly, the present study and similar research in macro accounting will confront accounting and economics thinkers with the idea to look at accounting information from the perspective of macroeconomics under macro accounting. Predictors of macroeconomic indicators are very interested in Forecasting macroeconomic indicators with the least error. Therefore, the way forecast can forecast macroeconomic indicators is crucial. In the present study, integrating a new set of information on the behavior of public, administrative, and sales costs in the forecasting model adds to the literature on the unemployment rate forecast in macroeconomics and macro accounting. General, administrative, and sales costs, can be a good starting point for analyzing the future state of economic statistics at the country's macro level, such as the unemployment rate. For example, when the public, office, and sales costs are on the rise, it tells the company's story of aggregate periods. High aggregate periods increase the total number of employees working in these companies. With the downward trend in public, administrative and sales costs and consequently the decline in profits between shareholders and employees of the company as stakeholders, the business unit's demand and the people overshadow this event. Because cost stickiness is negatively related to the future unemployment rate over the forecast horizon of the fourth quarter of the year, which improves the forecast performance well. According to consumer demand theory, increasing the upward trend



of public, office, and sales costs and reducing companies' profits is equal to reducing consumption. For this reason, the unemployment rate continues to rise to the extent that the reduction of public, administrative, and sales costs reduces the trend of the general level of demand and consumption. Therefore, it is recommended to forecasters to pay attention to the accounting information of listed companies, which play an important role in Forecasting macroeconomic indicators.

Advancing this new field, studies called macro accounting. It is necessary for the future for accounting thinkers to explore other variables and the efficiency of accounting information that can send timely signals of the future state of the economy to the market. Some suggestions are as follows.

1. Assessing the accuracy of the unemployment rate forecast using accounting earning and aggregate accounting earning.

2. Assessing the accuracy of the unemployment rate forecast using accounting earning and aggregate accounting earning and The ratio of stock market value to the book value of stocks aggregate.

Stock publishers are required to prepare and disclose only the financial statements between the audited 6 month periods. Therefore, the present study's main limitation is using some unaudited quarterly financial statements of companies listed on the Tehran Stock Exchange.

Using the time series model in forecasting, especially with higher intervals, requires historical information for several periods. The more information available, the more reliable the results of the format model estimate. Due to interim financial statements in data collection, access to information before 2008 was impossible. Therefore, in order to spread the results, it is necessary to consider this important issue.

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