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Liquidity and asset turnover: A simple linear regression model for agricultural firms.

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***Abstract*--The objective of the article was to demonstrate the construction of a simple linear regression model of liquidity (dependent variable) with asset turnover for the agricultural sector. Also, to verify if the regression model works, taking into account that there must be a causal relationship, not only random, between the variables. The methodology had a quantitative approach of non-experimental design at a causal and longitudinal correlational level. For these purposes, simple linear regression was used to find a predictive model. This study had as population and sample all the companies of the Peruvian agricultural sector, listed in the Lima Stock Exchange. The result shows an acceptable goodness of fit. The standard error of the estimation is low, showing a better fit. The model is feasible, since there is a significant relationship between the variables. The regression model obtained is: Liquidity = 1.490 + 3.696 Asset turnover. The conclusion indicates that the regression model works because there is a causal relationship between the variables. For future research it is convenient to incorporate other economic sectors, a larger geographic space, or more analyzed periods. Different variables could be included to build a multiple regression model, logistic or structural equations.**

Keywords—Simple linear regression, liquidity, asset turnover, financing, agricultural enterprises.

I. INTRODUCTION (HEADING 1)

The problem to be addressed is to link through the development of asset turnover of companies in the agricultural sector that can influence the behavior of its liquidity, due to measurement problems more in line with reality and that can be easily used by entrepreneurs who invest in this activity or have a clearer reading for future investors. In this way, it is not just a matter of knowing that both variables are simply related, but of establishing the impact that the former may have on the latter. In this sense, there are initiatives of scientific regression studies to determine how the use of assets can be a factor that can affect profitability and have an effect on liquidity. However, these studies focused on determining which size of company is more convenient to optimize productivity. In other words, they did not delve into the sector or region, since the work carried out was done with heterogeneous companies. But, they are good attempts to study what is intended in this article, because despite multisectoral studies were made, productivity problems were found with high levels of indebtedness, as was the case of Czech companies, between 2000 and 2019 [1]. In agricultural entities, there are drawbacks to uninterrupted operational functions. For this purpose, efficient management of assets, related to biological ones comprising physiological procedures in flora and fauna, is required. Their inadequate management is linked to a slowdown in asset turnover and a decline in liquidity, almost in parallel. Therefore, it is necessary to improve models that help operational and financial management, especially in times of pandemics and geopolitical conflicts in countries such as Russia and Ukraine, suppliers of agricultural production and energy extraction, which has caused instability in the industrial sector, which is both supplier and consumer, increasing its prices due to the natural shortage of supply [2]. A prediction model has been developed that allows associating the use of assets with profitability, but not with liquidity itself, using a regression. But, it has been identified that the optimization of asset turnover management is related to leverage and returns in companies between 2010 and 2019, in Indian pharmaceutical companies [3].

This work is justified because there is a scientific vacuum in the literature, of concrete existence, on a simple linear regression model for agrarian companies of their liquidity that

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is explained by the rotation of their assets, in spite of the importance of this knowledge; because an appropriate management of their assets is of priority in this sector, given the obvious difficulties of nature, resources and infrastructure that can cause financial problems. In this context, there are regression studies, but not of the variables of this study, nor for the agricultural sector, such is the case of the establishment of a prediction model of bankruptcy in companies in the non-bank financial sector of the Indonesian Stock Exchange between 2015 and 2019. The aforementioned research studied corporate inabilities to comply with honoring their liabilities, with one factor being the turnover of their assets, which ultimately failed to predict bankruptcies [4]. A special and important case to obtain a regression model, such as the one proposed in this study, is to reduce the uncertainty of the investor about the stock shares to be acquired. This effort has been made with the stock market shares of industrial companies in Tehran, Iran. That is, not on agricultural companies, nor by obtaining a regression model that allows predicting the level of liquidity, according to the degree of asset turnover [5]. Likewise, entrepreneurs in the agricultural sector attach greater importance to liquidity because of the possible risk of defaulting on payments due to insolvency, hence the need for a digestible, useful and comprehensive model of how the management of their assets influences them. In this context, profitability is also important, which has been addressed by studies related to liquidity, but without considering asset turnover in general, non-agricultural companies that listed their shares in Bombay, India, between 2011 and 2018 [6].

The objective of the study is to demonstrate the construction of a simple linear regression model of liquidity (dependent variable) with asset turnover for the agricultural sector. Also, to verify if the regression model works, taking into account that there should be a causal relationship, not only random, between the liquidity and asset turnover variables. In short, the higher the asset turnover, the higher the dependent variable should increase.

There are studies that analyze both variables, but only as complementary data, highlighting rather productivity, for regression models. More importance is given to the optimization of asset turnover and thus demonstrating greater productive growth, as is the case of Czech food supply companies, from 2003 to 2017. It is important to note that there is still little research, with these variables, in the agricultural sector in developing countries such as Peru [7]. Other initiatives have investigated the financial market, but not agrarian, giving preponderance to profitability forecasting and not to the variables of this research, for certain U.S. companies between 1979 and 2017 [8]. In turn, liquidity such as asset turnover has been studied with regression models, but referred to the forecast of stock returns, showing that they do not influence those in this, as is the case of companies in an industry sector registered in the Indonesian stock market, between the years 2014-2018 [9]. Regression models of asset turnover have been performed to predict the value of companies' shares, but not of the liquidity ratio. It was concluded that it does influence that independent variable on the stock valuation of consumer industry corporations registered in the Indonesian stock market, corresponding to the financial statements from 2015 to 2017. In other words, the agricultural sector was not involved [10].

II. THEORETICAL FRAMEWORK

Changes in asset turnover are related to changes in liquidity. In agricultural companies, current and fixed assets should be considered in the above mentioned turnover, because if we only consider variations in the fixed assets, for example with a revaluation, the impact works in a negative or inverse way. This was demonstrated in sugar companies in Pakistan, when they were facing strong volatility in the sector and International Accounting Standard 16 had been adopted [11]. Between 2011 and 2019, solar energy was boosted in the field by increasing asset turnover and its liquidity, according to financial statements of companies in the sector, listed on the China Stock Exchange [12]. In theoretical issues, the performance of companies did not consider the effects of the pandemic, although in some countries they are already lifting restrictive health measures. However, when the panorama changed, some sectors were favored or at least had a differentiated treatment so that they would not be so affected, as is the case of agricultural companies in the world, since they are a priority source of food. Therefore, their global performance is being measured by their efficiency, effectiveness and financial adaptation, where liquidity plays an important role in honoring debts in order to maintain an important source of resources and support for unsound management in the rotation of their assets in integrated value chains [13]. Likewise, not everything is in favor. In Jordan, between 2010 and 2018, the connection between asset turnover and liquidity materially affected market prices. Prominent among these are the values of corporate shares, where those in the agricultural sector are [14]. As for financial performance, it has been shown that it is boosted when the asset turnover ratio increases liquidity, and stimulates sales to rise, leading to optimal profitability levels and higher equity capitalization options, in listed companies in Vietnam [15].

In terms of economic development, a green and sustainable future is desired in the world, where agriculture is present for the needs of innovation and energy consumption in the field of asset turnover. However, supply chain management also plays a key role in business development, especially in the area of liquidity, which has an impact on the financial sphere, as evidenced by Chinese companies listed on the Shanghai and Shenzhen stock exchanges between 2020 and 2019 [16]. Business competitiveness should be supported with greater robustness in digitization and automation, given the lack of financial resources in the agricultural sector. To this end, a number of financial ratios are used to measure these effects and, in this way, evaluate their performance, among which asset turnover stands out as a quantifying element of operational management activities that originate manageable levels of liquidity, and vice versa, giving rise to their correlation, particularly when taking into account the need to make new investments by implementing technological development, as was the case among Slovak firms, as shown by their financial statements in 2017 [17]. Currently, in the

financial system, the business credit risk of companies in the agricultural sector is assessed in terms of their liquidity coming from the contribution value of the asset turnover rate, as it provides an important indicator for the purpose of making financing decisions by the banking system. The latter is emphasized for Chinese listed companies [18]. Asset turnover is an index of corporate efficiency, which when combined with liquidity can measure its effectiveness, as evidenced by Malaysian listed companies between 2012 and 2014 [19]. The agricultural sector is sensitive to climatic, financial, investment, price, fertilizer, market and commodity fluctuations in global commodity exchanges, among others, in order to evaluate its performance. In this sense, financing goes parallel to its development. Therefore, there is a direct relationship between management, measured by asset turnover, to determine the appropriate level of surplus cash flow, measured by liquidity. This was tested with secondary source data extracted from the financial statements of Vietnamese companies, between 2009 and 2020 [20].

In order to apply research methods and techniques consistent with the data extracted from the financial statements of companies in the agricultural sector, the financial ratios of liquidity and asset turnover from the Lima Stock Exchange - BVL bulletin have been used, which establishes the following ratios [21]:

$$\text{Liquidity} = \frac{\text{Current Assets}}{\text{Current Liabilities}} \quad (1)$$

$$\text{Asset Turnover} = \frac{\text{Net Sales}}{\text{Total Assets}} \quad (2)$$

To perform the analysis of the liquidity variable, Equation (1) would be used and for the management variable, Equation (2) would be applied with data from public financial statements.

III. METHODOLOGY

The methodology had a quantitative approach of non-experimental design at a causal and longitudinal correlational level. For these purposes, simple linear regression was used to find a predictive model, since there are studies of the relationship between the variables liquidity and asset turnover, in a random manner and which are subject to correlational hypothesis testing. Therefore, the aim is to find a causal relationship that explains the behavior of liquidity as a function of asset turnover in the agricultural sector.

This study had as population and sample all the companies of the Peruvian agricultural sector, listed in the Lima Stock Exchange. They are 12. The liquidity and asset turnover variables were obtained from their 20 quarterly financial statements for the last 5 years, from the quarter ended September 2017 to June 2022. Obtaining 20 indicators for each of the two variables, giving a total of 40 ratios, for each of the 12 companies, so the total data analyzed added up to 480.

Consequently, the documentary analysis technique was applied for the simple linear regression model, with the variables of the companies indicated in Table N° 1, shown below, where all the companies of the agricultural sector are included.

TABLE I. AGRICULTURAL COMPANIES LISTED ON THE BVL

Agricultural companies	
1.	AGRICOLA CAYALTI
2.	Cartavio
3.	Casa Grande
4.	Chiquitoy
5.	Chucarapi - Pampa Blanca
6.	El Ingenio
7.	Emp. Agr. San Juan
8.	Emp. Agro. Pomalca
9.	Laredo
10.	Paramonga
11.	San Jacinto
12.	Sintuco

Table 1 was prepared based on Bulletins of the Lima Stock Exchange (BVL), as of June 2022.

IV. RESULTS

To materialize the results of the research, the dependent variable "y" has been considered liquidity. And, as independent variable "x", asset turnover.

TABLE II. SUMMARY OF THE MODEL

Model summary				
Model	R	R-squared	Adjusted R-squared	Standard error of the estimate
1	,657a	,432	,400	,29761
a.- Predictors: (Constant), Asset Turnover				

Table N° 2 shows the goodness of fit. The correlation coefficient, R = ,657 showing that the relationship between the variables is high [22]. The R-squared signals the proportionality of variance of the dependent variable that is explained by the independent variable. It is also called the coefficient of determination. In this case, it shows that 43.2% of the variation in liquidity is due to asset turnover of agricultural enterprises, which is acceptable. So is the adjusted R-squared, i.e. by lowering the R-squared by model refinement. And, the standard error of the estimation, i.e. the variability of the liquidity variable that is not explained by the regression line is low (,29761), showing a better fit.

TABLE III. ANOVA

ANOVA						
Model		Sum of squares	gl	Quadratic mean	F	Sig.
1	Regression	1,211	1	1,211	13,677	,002b
	Residual	1,594	18	,089		
	Total	2,806	19			
a. Dependent variable: Liquidity b. Predictors: (Constant), Asset Turnover						

From Table N° 3 it can be inferred that the model is feasible, since there is a significant relationship between the variables. With the F-statistic, it is shown that the critical degree, the p-value, is .002 (significant). Therefore, liquidity and asset turnover are related for the establishment of the linear regression model.

TABLE IV. COEFFICIENTS

Coefficients						
Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
		B	Error variance	Beta		
1	(Constant)	1,490	,151		9,836	,000
	Asset turnover	3,696	,999	,657	3,698	,002
a.- Dependent variable: Liquidity						

Table N° 4 shows the coefficients of the model. The constant indicates that the origin of the regression line is positive and the coefficient, asset turnover, indicates its slope. The latter reveals the increase in liquidity (3) for each unit change in asset turnover. So, the regression model is:

Where we obtained:

$$\text{Liquidity} = 1{,}490 + 3{,}696 \text{ Assets turnover} \quad (3)$$

V. DISCUSSION

In order to arrive at the regression model proposed, the data base with which the two variables were worked on is shown in Table N° 5. It represents the information of the quarterly ratios for the last 20 quarters. As of June 2022, the figures have slightly decreased, compared to those obtained as of September 2017. Obviously, the effect of the Covid-19 pandemic had an impact, especially in the quarter ending March 2021, just when simultaneously both indicators had their lowest levels reported in the last 5 years.

TABLE V. VARIABLES DATABASE

Period	Liquidity	Asset turnover
September-17	1.65	0.14
December-17	2.57	0.24
March-18	1.55	0.05
June-18	1.81	0.08
September-18	1.89	0.13
December-18	2.22	0.21
March-19	1.67	0.04
June-19	1.69	0.09
September-19	2.38	0.14
December-19	2.32	0.23
March-20	2.30	0.21
June-20	1.86	0.10
September-20	2.39	0.15
December-20	2.12	0.23
March-21	1.52	0.04
June-21	2.74	0.09
September-21	1.88	0.15
December-21	2.27	0.23
March-22	1.43	0.06
June-22	1.62	0.12

The model works for the conditions indicated in the model summary, in the ANOVA and in the coefficients. However, it should be noted that the evolution of liquidity must be appropriately controlled. Among these controls is the payment of taxes as for any company, not only agrarian, but also MYPES [23]. As expected, the number of problems in liquidity and asset turnover in microenterprises are greater than those of small companies, both Peruvian and Ecuadorian, for example, due to difficulties in staying in the market [24], since financial management goes hand in hand with competitiveness [25]. Therefore, this agricultural sector, being sensitive to climatic factors and having a high component of labor absorption and low capitalization, is not always in a position to have high liquidity. Since the rotation of its assets will depend on market prices, especially to place its products and generate sufficient profitability and liquidity [26].

In the last 5 years, the financial statements of agricultural companies, especially their statements of financial position and income statements, show that both variables decreased. The regression model obtained explains the existence of decisions having been made with reduced asset turnover and, as a consequence, lower liquidity [27]. To this end, business intelligence must continue to be applied. The first results of intelligent information management, in the context of Covid-19, are making it possible to enter foreign markets with agroexports, especially blueberries, strawberries and avocados [28]. However, it should be taken into account that asset turnover should be linked to a management system for collections and payments, with adequate matching, so as not to affect liquidity, which should be supported by policies and guidelines for credit monitoring of sales, in order to properly present their financial statements, from which data on both variables have been obtained and make it feasible for their analysis to be optimal [29]. In this sense, decision-making in asset turnover influences liquidity. The latter is strengthened by the improvement in the management of the former [30].

VI. Conclusions

The construction of a simple linear regression model of liquidity (dependent variable) with asset turnover for agricultural companies has been demonstrated. The regression model works because there is a relationship between the variables liquidity and asset turnover, but it is not only random to prove hypotheses, but rather causal. For, the higher the asset turnover, the more liquidity will increase. Pearson's correlation coefficient is strong. The R-squared, i.e. the proportion of data for which it is possible to predict liquidity as a function of asset turnover, is acceptable, including the adjusted R.

Furthermore, it is feasible to conclude a regression model from these two variables, as the ANOVA test indicates, according to the relationship analyzed. Likewise, the model constructed with the constant and the coefficient for asset turnover, by t Student, indicates that they are significant. So, liquidity = 1.49 + 3.70 times asset turnover, in the agricultural sector.

For future research, it is convenient to incorporate other economic sectors, or, failing that, a larger geographic space, or finally, more analyzed periods. Of course, different variables can be included to build a multiple regression, logistic or structural model.

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