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Investigating Effect of Development of Agricutural, Industrial, Service and Oil Revenue to ICOR of Agricultural Sector

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Abstract

In this study, considering the importance of incremental capital output ratio (ICOR) in agriculture Investment capital and self-sufficiency in this sector in order to grow and being influenced by the past and previous relationships strong agricultural sector productivity growth in other sectors of the economy, especially the effect of oil revenues, was trying to, long-term relationships as well as their adjustment process described by the Autoregressive-Distributed Lag model (ARDL) to investigate.The results also confirm the long-run relationship between the variables of the model show that oil revenues in appropriate path to growth agricultural productivity have beentoo much attention to the industry and imports of agricultural products decreased investment in agricultural productivity. However, the service sector growth by improving marketing activities and financing farmers to improve venture capital productivity in the agricultural sector operates. In the long run, adjusting the intersection, the model indicates improved productivity in the agricultural sector is of capital. Shown the necessary support to the agricultural sector in the short term.

Keywords:
Capital ratio production (ICOR), Agriculture, industry sector, service sector, , Oil revenues, Auto distributed lag model (ARDL)

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INTRODUCTION

Despite of importance and decisive role of capital in agriculture sector, investigating the investment process in Iran shows the agriculture share of generating capital has been lower than other sectors. (Central Bank, 1994; the Planning and Budget Organization, 1994,1995). Low investigation in this sector can be resulted from several factors such as the weak of political and economic power of its agents, time consuming outputs of agricultural designs and natural resources, high risk of investigation of privatesector, andorientation of supportive policies. In such condition, the importance of making appropriate decisions is revealed to encourage the private and public sectors to investigate in this sector. Since the resources of providing capital arelimited,determining the investment priority plays a main role. The rate of capitalreturn is one of standards which can be used to makea decision on investment in different economic sectors and determining its priority. The capital is considered as key factor in process of developing economy and it is very important as the mostlimited production factor in agriculture. According to past and previous relationships of this sector to other sectors (industry, services, and oil revenues) and economic activities, the investment in agriculture sector helps the growth of producing and employment in other sectors;moreover, it causes the growth of production and employment.

With considering the importance of Incremental Capital Output Ratio (ICOR) in agriculture to grow investment capital and self-sufficiency in this sector and being influenced by the past and previous relationships strong agricultural sector productivity growth in other sectors of the economy, especially the effect of oil revenues, the studytries to investigate long-term relationships as well as their adjustment process described through the Autoregressive-Distributed Lag model (ARDL) to investigate.

Profitability index isthe most effective factor in agriculture sector. To increase this index, it is necessary to plan correctly for price of agricultural products and its exporting and importing. Little effect of oil on investment in agricultural sector is the result from paltry portion of development fund of total development funds. However, investment in this sector has been lowerthan its optimal amount and there is potential possibility of capital intensity (attraction) in this sector, according to high efficiency of investment in this sector. To investigate the efficiency of investment, the index of 1Incremental capital output ratio is used that its formula is as follows:

ICOR: the total investment during a 1 period
Added value of the end of period - beginning of the period

This index shows how much investment is needed during a determined period to create an increase unit in added value on the average. Efficiency and output will be more in this sector however this index becomes low. This number usually is between 1.5 -2 for agricultural sector in developed country. This result is obtained that agricultural sector has not been successful in attracting investment and it has not been attended enough, toward other sectors by comparing the investmentportion ofIranian agricultural sector with some countries including Pakistan, Turkey, India, Indonesia and Malaysia.This inattentive occurs while efficiency of investment and capital profit of this sector has been more than other sectors and the value of finished product has been much more than capital cost. However, we can hope that this sector will develop in future by making an appropriate polices and performing requirements, in conformity with justifying economy for investment in this sector and high difference between potential and actual product of agricultural sector. (Amini and Falihi, 2010).

Following this chapter, performed foreign researches are reviewed in both fields. Zind (1999) has analyzed the relation some economic sector of countries which are the members of cooperating council of Persian Gulf, and the oil price fluctuations in an article named" fluctuations of oil price and economy of Persian Gulf: a dividend analysis". The Result used variance analysis to show sectors depended on government support and subsidy have been low growth in period of increasing oil revenue (like agriculture and industry) and their portion of GDP has been decreased, but other sectors depend on government (like services, trade and transportation) have a better growth and their portion of total

gross domestic product increase.

Also, the empirical studies show foreign earnings of exporting oil or any primarily material obtained from other business boom have left seriously negative effecton many of these countries in long term. (Devlin and Lewin, 2004). In economic literature, this phenomenon has been known as Dutch Disease. As a result of Dutch disease, the unequal growth of economic sectors has been seen. This unequal growth is in services benefit and in loss of industrial and agricultural sectors (or trade) and causes to weaken the economic power of country exporting the primarily goods.

El-Anshasy *et al.,* (2006) showed economic affiliation of Venezuela with oil price has increased and this increased affiliation has accompanied with lower growth of agricultural and non-oil industries. The results show that changes of oil price has a negative effect on efficiency of economic of Venezuela and this country suffers from " resource curse".

Lee *et al.*, (1992), Harrison and Burbridge (1983-1996), Mork, (1989) and Mory, (1993) have carried out researches in this field. In continue, we investigate the related studies in country.

The results of a paper (pier *et al.,* 2011) named "investigating the effect of fluctuation of oil exports on agricultural sectors in Iran" show that there is a long run relation between added value of agricultural sector and other mentioned variables and the effects of unstable index of oil exports on added value of agricultural sector has been negative and significant as a new variable inside of other variables.

Tavacoli and Moradi (1999) carried out a research named "investigating the effect of fluctuation of oil exports on low growth of country's economy 1959-1996". The results show that oil export fluctuation causes to decrease the products of industrial sector. But vulnerability of products of agricultural sector compared with industrial sector is lower. Gharavi Nakhjavani (2002) performed a research named "the role of oil revenues in providing investment resources of Iran". The results show that liquidity growth has had most effect on investment and industry and oil revenues have had most effect on investment in services sector. Also oil revenueand liquidity of thecountry have less effect on investment in the agricultural sector. However, the obtained results show oilrevenues have considerable affect on investment in both industrial sector and services forming about 70% of national product. Paseban (2004) has carried out research named " the effect of oil price fluctuation on production of agricultural sector in Iran (Dutch disease)". He has confirmed many hypothesis of Dutch disease in Iran accordance with obtained results from business boom of oil revenues resulting from increase in oil price. Using regression analysis and time series statistic 1971-2000, he shows oil price has negative effect on agricultural sector of Iran. On the other hand, his results show the effect of oil price shock on added value has decreased and removed during the time. The results from a research named"investigating the effect of exporting oil on added value of agricultural sector of Iran" (ZareMehrJardi *et al.,* 2012) show that thereis a long run relation between variables of added value of agricultural sector and other mentioned variables in the samplethat oil price has negative and significant effect on added value of agricultural sector. The coefficient of error correction (-0.71) withthe negative and significant sign shows the high rate the modification process. According to high capital return in this sector The results of a research named "determining the return rate of investment in agricultural sector" (Soltani, 2004) show that there is potential possibility of attracting investment to it. Thus, according to economic justification in agricultural sector, it can be hopeful that capital will be attracted in this sector; as a result the economy of country will grow by making appropriate policies and requirements.

The results of research named " investigating meta- analysis of investment and development" show that added value of services sector, investment of private sector in agriculture, investment of government in agriculture, added value of oil sector and development of information technology have direct effect on growth of agricultural sector. Also, added value of agricultural sector has had most effect on added value of all over the country. Also, the growth portion of agricultural sector has been sometimes higher than non agricultural sector. In other studies, the increase

of agricultural sector's role in economic growth of Iran has also been emphasized. Also other results of studies show economic growth increases about 0.13 % in lieu to 1% increase in added value of agricultural sector that it is lower than coefficient of elasticity of growth to added value of services sector. Also, performed evaluations show that there is one by one relation between investment in this sector and production of other sectors in lieu to 1% increase in investment portion of agricultural sector in all investment in it.

The results from a research named "agriculture and negative growth of investment" (Abdolahi, 2010) show that investment in the profitability of economy, agriculture, has been less than other sectors according to statistics and numbers. On such a way that investment in this sector leads to grow of other economic sectors which unfortunately are faced with inattention. Because, investigatingpast and previous relationships this sector with other shows that previous relation of this sector with other is weak, but its post relation with other is very strong. So, increase of investment in this sector will lead to grow other sectors becauseof its strong post relation with other sectors.

The results of a research named "investigating the mutual effect and dynamism of added value of economic sectors inIran during 1980-2004" (Tehranchian, 2002) show that the portion of agricultural sector has not been noticeable in national economy during 2002-2004. Low portion of agricultural sector in gross domestic product, employment, low coefficient of elasticity of gross domestic product toward the investment in this sector confirm this issue. It seems that low portion of investing in this sector compared with other sectors is cause of this issue. The results of a research (Emadzadeh and Daliri Cholabi, 2002) named"investigating mutual effect and dynamism of added value of economic sectors in Iran during 1980-2004) show Iranian economic sectors havecompletely been complementary of each other in Iran, and the growth of each sectors requires the growth of other sector. Also, these results have evaluated the strongest mutual relation between industrial sector and agricultural sector in such a way that the growth of agricultural sector causes the growth of industrial and services sectors in further period. This fact, also, is true for other sectors. Also, these results reveal the necessity of using balanced growth strategies among economic sectors in Iran, in such a way that growth of each economic sector requires the growth of other sector.

In this research, added value of each sector, especially oil revenues on ICOR of agricultural sector, has been studied. This study, also, investigates the relation of added values of each sector and their effect on ICOR of agricultural sector during1979-2001by using new methods of econometric in form of correlation and Autoregressive-Distributed Lag approach. In the research, according to performed studies and wide intersection of agricultural sector, available hypothesis are:

The growth of oil revenues has positive effect on decreasing the ratio of increasing capital to production of agricultural sector.

In recent years, the growth of industrial sector leads to increase in ratio of increasing capital to production in this sector by decreasing the portion of agricultural sector from national production.

The growth of services sector of national economy leads to increase of ratio of increasing capital to production in this sector by presenting facilities and growth of agricultural sector.

The growth of agricultural sector has been in the direction of decreasing the ratio of increasing capital to production of agricultural sector by increasing productivity of production.

Thus, the main question of this study is quality and evaluation of impressiveness of other economic sectors on the ration of increasing capital to production agricultural sector, according to impressionability of this sector with the growth of other economic sectors.

MATERIALS AND METHODES

Use of OLS method in empirical research is stable on this hypothesis that used time series variables are reliable. On the other hand, the prevailing views that many time series variables are not reliable in economy. (It is mentionable that a time series is reliable when it's mean, variance and covariance and as a result its correlation coefficient remains stable during the time). So, it is nesseceray that reliability or non relia-

bility of time series variable isassured before using them. Reliability tests are:

1- Reliability test based on correlogram and unit root test (Nofersti, 1999).

The unit root test is themost commontest is used to determe reliability a time series process. The unit root test for reliability is:

Dickey – Fuller Test (DF), Augmented Dickey – Fuller Test (ADF), Philips and Peron (Nofersti, 1999).

In this research, Dickey – Fuller Test (DF), Philips and Peron have been used to evaluate reliability of time series variables. The optimal lag is determined by Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (SBC) and Hannan – Quinn Information Criterion (HQC). It is mentionable that SBC suggests the lowest cost model among three above criteria, because it saves the numbers of lag, and this criterion is used for justifying, whenthe sample is small. AIC suggests more lags and HQC determines the lag between these twocriteria. (Nofersti,1999).

Although the reliability condition of time series variables or regression relation can be provided by making a difference, the special act cannot be done to maintain long run information related to the level of variables. Here, the co-integration method helps so that areal regression can be evaluated on the basis of time series variables (having a high Coefficient of determination R^2 (approximate 1 is the characteristic of false regression and low Durbin–Watson statistic about 0).

Co- integration concept is that two or more time series variables are related to each other on the basis of theoretical principle so that they form a balanced long run relation, though it is possible that they have a random process (non reliable), they follow each other during the time in such way that the difference among them is reliable. So, the Co- integration concept reminds the existence of a balanced long run relation that economic system moves by its intensity during the time. So, according to co-integration theory in modern econometric, it is necessary that the methods are used in estimating function having attended to reliability and co integration during the use of time series.

Auto - Regressive Distributed Lag (ARDL) method is used in this research. Contrary to Johansson -jolisous method, this is a method that all variable must be reliable of 1 degree in it. It is not necessary that the reliability of all variables become the same, and appropriate model can be onlychosen by determining appropriate lags. Microfit software provided for us this possibility that we can estimate the Autoregressive ARDL pattern (p, q1, q2,……qk) as follows:

$$Q(L, p)\, yt = \sum_{i=1}^{k} \beta_i(L, q_i) X_{it} + \delta' W_t + U_t$$

$$Q(L, p) = 1 - Q1\, L - Q2\, L2 - \ldots - QP\, LP$$

$$\beta_i(L, q_i) = 1 - \beta_{i1} L - \beta_{i2} L^2 - \beta_{iq} L^{qi}$$

Is for i= 1, 2, 3…., k. L is the lag operator (function), Wt. is the vector of definite variables (non-random) like width from origin point, process variable, virtual variables and/or external variables with fixed lags.

The number of optimal lags can be identified by the aid of Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (SBC), Hannan–Quinn Information Criterion (HQC) for each variables.

In the method of Autoregressive- wide lags, long run relation is evaluated during two stages. In first stage, the existence long run relation between variables of model is tested. If the sum of coefficient of variables with lags related to dependent variable is less than 1,dynamic model tends to long run balance. So, to test the co-integration, it is necessary that following hypothesis test is performed:

Lack of existence of co-integration (non-existence of long run relation):

$$H0 : \sum_{i=1}^{P} \alpha_i - 1 \geq 0$$

Existence of co-integration (existence of long run relation):

$$H1 : \sum_{i=1}^{P} \alpha_i - 1 < 0$$

The quantity t statistic needed for performing above test is calculated as follows:

$$t = \frac{\sum_{i=1}^{P} \alpha_i - 1}{\sum_{i=1}^{P} S_{\widehat{\alpha_i}}}$$

Sai is the standard deviation of coefficients of dependent variable lags.

It is mentionable that the amount of t statistic obtained from this relation is compared with Banerjee, Doolado, and Master -presented seri-

ous (crisis) amount of t statistic. And, inthe intended reliable level, the existence of long run relation among variables which is the base of using error correction model can be evaluated.

Additionally, Microfit software presentserror correction model (ECM) accordance with a selected model. For extracting the error correction model based on ARDL (p,q1,q2,….,qk), variables Yt,Wt,Xkt,…X1t are considered on lags amounts and their first difference. And error correction model is obtained by following relation:

$$\Delta yt = -\varphi (L, P)\, ECt\text{-}1 + \sum_{i=1}^{k} \beta_{i0} \Delta X_{it} + \delta \Delta Wt - \sum_{j=1}^{p-1} \varphi^{*}_{j} \Delta Y_{t-j} - \sum_{i=1}^{k} \sum_{j=1}^{q_{t-1}} \beta^{*}_{ij} \Delta X_{i,t-j} + U_t$$

Above equations evaluated by the method of OLS and performed necessary tests, determinethe short run dynamic structure of the model. In the error correction model, coefficient of ECt-1 shows that balance speed attends to long run balance. This coefficient shows how much of non balanced dependent variable (Yt) is corrected in current time. It is expected that this coefficient always is negative and between 0, -1.

Data needed in this study include: added value of industrial, services, agricultural sectors and oil revenues, ICOR of agricultural sector which are gathered in form of raw data of time series for 1358-1390 from Iranian central bank. Then, mentioned statistic is analyzed by using Microfit software and ARDl model.

Data analysis:

As mentioned, to trust the estimated coefficient obtained from OLS method, dynamism of variables are confirmed by dynamic tests. In this research, generalized Dickey – Fuller Test (DF) and Philips and Peron are used by AIC,SBC, HQC to determine the length of optimal lags. Dynamism of variables is tested for relation of width from origin along with process. If variables are in the non- dynamic level, they are tested by making logarithm of next levels. Results related to dynamism of variables are shown in table 1.

As the obtained results of generated Dickey – Fuller and Philips and Peron tests show, all variables became dynamic in level I(0), I(1) by making logarithm, so, according to whatever mentioned before, ARDL model can be used for evaluating parameters.

According to evaluation method, ARDL form is as follows for this research:

$$ICOR = \alpha_0 + \sum_{i=1}^{n} \alpha_i LAGRI_{t-j} + \sum_{i=0}^{n} \beta_{1J} LIND_{t-j} + \sum_{I=0}^{n} \beta_2 LSERV_{t-j} + \sum_{j=0}^{n} \beta_3 LOIL_{t-j} + Ut$$

The number of optimal lags can be determined by one of AIC for each Autoregressive variables. Dynamism model for investigated period is presented by HGC and SBC:

ARDL (2, 2, 1, 2, 1)

The result of evaluating above equation by the ARDL method is presented in table 2.

As the obtained results showed, the increasing ratio to production in agricultural sector is related to lags obtained from this variable in the previous time, as it can improve this ration for future. The reason of this relation can result from the productivity and production management effect on its process in future.

Also, the growth of agricultural sector along with improving revenue levels and strengthen the motivation of production in this sector help the investment and return of products in this sector, and it helps to decrease this ratio in short run, according to expectation.

Table 1: Summary results of Unit Root Tests in level form: Dickey-Fuller and Phillips/Perron Test

Variables (in log)	Without trend and Intercept			With Trend and Intercept		
	Lag selection	Aug. Dickey Fulle	Phillips Perron	Variables (in log)	Lag selection	Aug. Dickey Fulle
Log (AGRI)t	1	-3.172*	-6.124*	1	-3.2914**	-4.234*
Log (IND)t	0	-2.521**	-4.631***	1	-4.3622*	5.841***
Log (SERV)t	1	-2.651*	-6.235*	0	-3.6517**	3.327**
Log (OIL)t	1	-3.235**	-7.461***	1	5.252*	-4.261**
(ICOR)t	0	-2.761***	-7.246**	0	-2.235**	-6.314**

*p<0.1 **p<0.05 ***p<0.01

Table 2: Results of the pattern of short-term productivity of the agricultural sector

variable		Coefficient	Standard deviation	t-value
C	Intercept	248.5***	42.48	5.848
ICOR (-1)	The increasing proportion of capital to production with a lag	-0.773***	0.141	-5.451
ICOR (-2)	The increasing proportion of capital to production with with two lags	-1.084***	0.205	-5.288
LAGRI	Log of value added agriculture	-0.176	0.125	-1.401
LAGRI (-1)	Log of value added agriculture with a lag	-0.210***	0.017	-2.939
LAGRI(-2)	Log of value added agriculture with two lag	-0.876**	0.426	-2.054
LIND	Log of value added industry	0.117**	0.057	2.051
LIND (-1)	Log of value added industry with a lag	0.443*	0.255	-1.831
LOIL	Log of oil revenues	-0.276**	0.074	3.727
LOIL (-1)	Log of oil revenues with a lag	0.282***	0.057	4.877
LOIL (-2)	Log of oil revenues, with two lags	0.241***	0.078	3.091
LSERV	Logarithm of Service	-.353***	0.140	-2.518
LSERV (-1)	Logarithm of Service with a lag	-0.74***	0.180	-2.628
	F= 20.72**			R2 = 0.78

*p<0.1 **p<0.05 ***p<0.01

Meanwhile, industrial sector shows the positive and significant effect on this coefficient in agriculturalsector, it is said that it results from extreme attention to industrial sector and attracting experts and better technology. But this variable with a lag hashelped todecrease the ratio of increasing capital to production and increase in return by the aid of entering its specialized and industrial equipment to activities of agricultural sector, but it is mentionable that this effect is not significant in sort run. Also, the increase of oil revenues with its 1 and 2 lags in short run leads to increase in coefficient of ratio of increasing capital to production that it can be attributed to enter oil revenues to other economic sectors including industry, increase in importing volume of agricultural products, and as a result negative effect on production of agricultural sector. Servicessector would help to increase in capital return in this sector by presenting facilities to agricultural sector and appropriate relation with this sector in the direction of services sector. In the meanwhile, high R^2 of model shows that 78% of changes of ratio of increasing capital to production in agricultural sector have been explained by mentioned explanatory variables. Also, F statistic has obtained equal to 20.72 implying explanatory power of model. So, assumption of non- existence successive correlation, correct functional form, normality and non-existence of unharmonious variance in this model are conformed in table 3. According to presented results, estimated model has correct statistical condition.

Immediately, after estimating this test, existence or non-existence long run relation must be done. To perform this test, the sum of coefficients with dependent variable lag of a fraction is divided into standard deviation. Bearing in mind that calculation statistic (8.25) is more than the crisis amount presented by Banerjee, Doolado, Master (-5.53) in the confidence level of 99%, from the view point of Absolute Value. So, null hypothesis based on non existence long run relation is not supported. Now, the existence of long run relation is supported, this relation is

Table 3: Characteristics of the model estimated by the ARDL model

Hypothesis testing	p-value	F-statistic	test
There is no autocorrelation is accepted	0.182	0.826	Residual serial correlation
The equation is correctly specified	0.324	4.124	Specified model
Residual terms are normally distributed	0.521	2.510	Normalized data
Heteroscedasticity is not accepted.	0.145	1.841	heteroscedasticity

Source: Research Findings

Table 4: Results of estimating Long-term function of agricultural productivity

variable		Coeffi-cient	Standard deviation	t-value
C	Intercept	541.53***	42.857	12.637
Log (LAGRI)	log of the value added agriculture	-0.256***	0.105	2.424
Log (IND)	Logarithm of the value added in the industrial sector	-0.773***	0.159	4.846
Log (OIL)	Logarithm of the value added oil revenue	0.174**	0.086	2.003
Log (SERV)	Log of the value added services	-0.398***	0.164	2.429

*p<0.1 **p<0.05 ***p<0.01

investigated. The results of long run model have been reported in table 4.

According to table 4, it is observed that the variable of value added logarithm in each of agricultural, industrial, services sectors and oil revenues are in the same direction with increasing investment return in agricultural sector, as result, the decrease of ratiocoefficient capital to production is long run in this sector. As it is expected, in the long run, the growth of oil revenues is accompany with increasing investment return in this sector by entering new technology to agricultural sector as well as competition of this sector with importing products. Also, the development of producing machinery ofindustrial sector and optimal exchange and marketing services will lead to improve the return of investment in agricultural sector by the aid of services sector.

In continue, the existence of the co-integration relation between sums of economic variables provide the use of error correction models. The error correction models , in fact, relates short run changes (fluctuation) to their long run amount, and provides the speed of approaching the balanced long run relation, if the short run changes occur in variables. Estimated ECM (-1) coefficient is as follows:

ECM(-1) : -0.241
(.087)

That it statistically is significant and corresponds to the theory in the level of 99%, showing that 24.18% non-balanced error is modifiedand approaches the long run process. In other word, completeadjustment of results obtained from added growth in each economic sector on ratio of increasing capital to production willrequire more than four years period.

DISCUSSION AND CONCLUSION

ICOR is one of indices which can be used as a guide of making decision in investment. Total effect or investment in a sector can be evaluated and compared with other sectors by this index. In other word, the effect of investment on national revenues and love added value of ICOR, as a result the priority of investment can be determined by the ratio of increasing capital to production. In some sector of economy which is index, the rate of capital return is higher; as a result, the allocating capital is placed in priority.

In this research, short run and long run relations, justification coefficient of effects of other economic sectors including oil revenues, industry, services along with value added of agricultural sector on the ratio of capital to production of ICOR of agricultural sector for interval 1971-2011 have been investigated by using time series data and econometric v technics of Autoregressive-Distributed Lag.

According to obtained results, importing effect of oil revenues and non- competing power of agricultural sector in short run lead to decreaseof return of investment in this sector and its weakening. Also, excessive attention to industrial sector in short run with inattention to agricultural sector and weak of its foundations lead to decrease the return of this sector, While services sector improves the growth of investment return of this sector by presenting services to agricultural sector and providing needs of this sector. Evaluating long run model, also, shows that developing relation agricultural sector with each economic sectors and justifying the effects of each of them on this sector along with corresponding farmers with new conditions to compete and enter new technology to this sector lead to decrease the ratio of increasing capital to production in this sector, and in-

crease the return of investment in this sector. But inattention to effective support of agricultural sector in short run in the direction of promoting ability and productions of this sector and inattention to it prevent from improving return in this sector.

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