PROFIT EVOLUTION FOR RESIDENTIAL CONSTRUCTION PROJECTS ACCORDING TO PROJECT CHARACTERISTICS

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This paper analyzes the evolution of financial variables considered in residential real estate projects in Quito, Ecuador. The analysis depends on the general characteristics of each project since 2006. Specifically, the analysis relates the profitability of a series of projects with their type, total size in square meters, and general costs of construction, among other factors. For this, 344 real estate business plans were studied to obtain general information of the construction, and later categorized according to financial variables established. Usually, the initial planning of construction projects is not fully accomplished, due to such factors as the owner, design, location, or financial reasons. As demonstrated, the misuse of resources causes delays in the construction process, leading to economic loss. Essentially, the financial planning must provide a detailed explanation of the behavior of the variables affecting the proposed project's viability and financial efficiency. The results obtained for general and annual profitability find that general characteristics, such as type and size, affected profitability by increasing chronologically. Additionally, it was found that general profitability was most beneficial for a specific type of building and house, regarding its size, which is an essential financial factor to consider when investing or carrying out the construction of any project.

Keywords: Finances in real estate, Construction profitability, Evolution of profits, Financial factors.

1 INTRODUCTION

Built environment and infrastructure projects use many resources, both economic and human, in the planning and delivery process. However, such resources are often poorly managed, especially the financial indicators management in both the planning and delivery phases (Garza González 2006). Thus, it is not surprising that, after completion, multiple projects exceed the planned budget, deadlines are not fulfilled, or the final financial factors remain unclear (Sun et al. 2022). Indeed, this global problem has special implications in countries where the construction sector receives direct influence from economic, political, and social policies. Currently, it is necessary to implement solutions in project planning, starting from a well thought-out and thoroughly analyzed business plan, to have better management of the financial factors of a project throughout the life cycle of such construction projects.

Regardless of the size and purpose of the construction project, financial management is still a challenge and a cause for concern to projects stakeholders (Ifediora and Obineme 2017). For example, residential construction projects, on average, waste about 30% of the resources invested in them (Galarza Meza 2011). Furthermore, the tendency has not changed recently. Approximately
67.9% of the construction projects executed worldwide end up with serious delays and financial inconsistencies (Sun et al. 2022). Many of those projects do not even make it to final completion and end up in indeterminate pauses and even complete abandonment (Ifediora and Obineme 2017). Incorrect resource management also affects the selling prices planning. Because of the uncertainty of the financial factors, project prices usually include an extra protection from fluctuations in the project financial performance (Eze and Lim 2013).

One path to overcoming such challenges is to have a better understanding of the financial factors and their interaction within a project (Gironella Masgrau 2005). This study aims to analyze the financial information from 344 real estate projects, both residential and commercial, developed in Quito, Ecuador since 2006. The analysis of the financial factors aims to understand the evolution of such factors in the specified timeframe, their correlation, and their impact on the profitability of the construction projects (Manrique Reyes 2017).

2 BACKGROUND

There are many factors involved in the real estate market that must be carefully analyzed when trying to reach conclusions about its present and predicting the possible changes that might occur in the field. For example, property rights, leases, titles, profitability, and many other key definitions when investing in such a changeable area (Floyd and Allen 2002). Inside the construction world, there are a wide range of projects possible (Solórzano Bákit et al. 2020). The cost and effort required to carry on any type of real estate project depends on the size and special necessities the construction involves, factors that will directly impact the benefits obtained from the mentioned project (Mourgues and Fischer 2001). By definition, a house is a single independent living unit (Elizalde Anaya 2020), while buildings include multiple independent housing units, or with multiple purposes (Elizalde Anaya 2020). The financial variables in this study are income, expenses, behavior of financial variables over time, project duration, feasibility, efficiency, utility, etc. The expenses of a real estate project refer to the project’s total cost of the process of construction, labor, and planning of the project (Hincapié and Durán 2006).

In economic terms, utility is a value that measures the level of satisfaction received from a certain group of goods or services (Besanko and Braeutigam 2020). This concept can be applied to construction projects, where the utility is understood to be the level of income generated by the project. The general utility of a project is an economic variable that measures the level of satisfaction earned from the execution and completion of the project, within the complete range of time of the project (Besanko and Braeutigam 2020). In construction projects, this concept is applied to the complete time of execution and construction of the project. The annual utility of a project measures the earnings from the execution and completion of the project in a yearly basis (Besanko and Braeutigam 2020).

Profitability in general terms can be defined as the measurement of the efficiency produced by the capitals used in a project in a specific period of time (Santiesteban Zaldívar 2011). The extraction of information was all aimed at obtaining profitability values that show a reliable tendency over the years. Profitability can be obtained by a mathematical operation which divides the utility of the project with the financial resources that it has used, also referred to as its expenses (Gironella Masgrau 2005). This term will later also be referred to only as project profitability. To achieve success in a project, it is necessary to have optimal and positive annual profitability; this means that the financial resources of it are used effectively. Therefore, the project will be profitable when its resources are not being wasted. When talking about annual profitability, it is important to mention that this financial variable refers to the percentage measure of the change in value the investment has experienced, which could be gains or losses, over the course of a year (Ortiz 2019).
With the objective of adapting this case study to the Ecuadorian reality, the variables must all relate in a way to local documentation into account. The analysis of profitability itself does not vary according to location, since it is a numerical value that was directly extracted from the business plans obtained from the university repository. The classification of the project size is given by the STHV-50-2019 resolution of the Quito Metropolitan District (QMD), such as small (one to six floors, and no greater than 4000 m²), medium (seven to twelve floors and no greater than 5000 m²), large (thirteen to eighteen floors and no greater than 6500 m²), and extra-large scale (nineteen+ and greater area than 6500 m²) (Secretaria de Territorio, Hábitat y Vivienda 2019).

3 METHODOLOGY

For the present study, the researchers gathered data from real estate projects, both residential and commercial, developed in Quito, Ecuador from 2006 to the present. To obtain the information, researchers mined the business plans of 344 real estate projects, and their characteristics. The variables were the duration of the project, the size based on square meters of construction, the annual and general income, its costs, and the general profitability of the project, among others. From this, every variable relevant to the composition of the project was tabulated in an electronic spreadsheet in Excel to obtain significant relationships between variables. For any type of scientific research, the ability to interpret data and information presented in tables is essential and a key element to obtain analytical results from the study done (Estrella 2014). From here, it was possible to consider possible factors that affected the relationship between some general and financial variables. In such way, it was possible to organize, analyze, and create a relationship between general real estate variables and financial variables of the projects.

For the analysis, the data was divided into two larger groups according to project characteristics: houses projects and apartment building projects. Then, the data was segmented every five years, which allowed to observe the evolution of the profitability of distinct types of projects over the years.

Additionally, the duration of the construction projects, in months, was used to calculate the annual profitability to obtain an overall profitability of the papers analyzed. A statistical analysis of the profitability, both annual and general, was obtained to generate a graph that portrayed a clearer relationship between the main characteristics and the profitability of diverse types of real estate projects in Quito, Ecuador. With a plot graph, the growth and variation on the profitability of houses and apartment building projects became much more evident. Indeed, during the collection and organization of data it was proven how research skills positively influence the generation of results for any type of scientific investigation.

4 RESULTS

4.1 General Findings

Results were collected for both project profitability and annual profitability, and it was found that, indeed, the project characteristics defined above (type, size, and year) have an impact on both types of profitability. In other words, increasing trends into the future were found. As preliminary results in the study, the project, or general, profitability was graphed from all the real estate projects in the database to have an overall visualization of how changeable profitability can be. As it can be seen, the information for general profitability of all the projects, both for houses and for buildings, seems as if there is no real trend with project characteristics. However, the specific results for each type of profitability are presented below, and show that the size, typology, and year of construction of a
project influence the general and annual profitability. In other words, the considerable amount of information gathered was averaged and summarized in the following section.

### 4.2 Specific Findings

Regarding general and annual profitability for both houses and buildings, the following Table 1 shows both variables of the real estate projects analyzed, in the analysis period 2006-2020, separated by each five-year span and sizes.

**Table 1. Average general and annual profitability of buildings.**

<table>
<thead>
<tr>
<th>Size</th>
<th>Period 1</th>
<th>Period 2</th>
<th>Period 3</th>
<th>Size total</th>
<th>Period 1</th>
<th>Period 2</th>
<th>Period 3</th>
<th>Size total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extra-Large</td>
<td>5</td>
<td>29.53%</td>
<td>29.74%</td>
<td>30.72%</td>
<td>5</td>
<td>29.53%</td>
<td>29.74%</td>
<td>30.72%</td>
</tr>
<tr>
<td>Large</td>
<td>0</td>
<td>10.53%</td>
<td>10.53%</td>
<td>10.53%</td>
<td>0</td>
<td>10.53%</td>
<td>10.53%</td>
<td>10.53%</td>
</tr>
<tr>
<td>Medium</td>
<td>17</td>
<td>30.56%</td>
<td>30.56%</td>
<td>30.56%</td>
<td>17</td>
<td>30.56%</td>
<td>30.56%</td>
<td>30.56%</td>
</tr>
<tr>
<td>Small</td>
<td>15</td>
<td>26.48%</td>
<td>26.48%</td>
<td>26.48%</td>
<td>15</td>
<td>26.48%</td>
<td>26.48%</td>
<td>26.48%</td>
</tr>
<tr>
<td>Outside QM</td>
<td>0</td>
<td>32.04%</td>
<td>32.04%</td>
<td>32.04%</td>
<td>0</td>
<td>32.04%</td>
<td>32.04%</td>
<td>32.04%</td>
</tr>
<tr>
<td>Total</td>
<td>27.50%</td>
<td>32.64%</td>
<td>32.64%</td>
<td>32.64%</td>
<td>27.50%</td>
<td>32.64%</td>
<td>32.64%</td>
<td>32.64%</td>
</tr>
</tbody>
</table>

Regarding the buildings, there is a solely increasing trend in the building type of projects for general profitability. On the other side, annual profitability shows a decrease during its first two periods and changes its trend between the second and last period. The trend for buildings is shown in Figure 1. Figure 1 shows that, when talking about general profitability, almost all kinds of projects show increasing trends, except for medium sized buildings. In annual profitability, all kinds of building projects repeat the same behavior mentioned above, again except for medium sized buildings. In contrast, house projects show a trend that found that from the period 2006-2010 to the period 2011-2015 there is a slight decrease, which then tends to take an increasing trend until 2020. This behavior repeats itself for both general and annual profitability in housing projects; this is illustrated in the following figure.

The same behavior mentioned above, again except for medium sized buildings. In contrast, house projects show a trend where from the period 2006-2010 to the period 2011-2015 there is a slight decrease, which then tends to take an increasing trend until 2020. This behavior repeats itself for both general and annual profitability in housing projects; this is illustrated in Figure 1.

This graphic shows different behaviors depending on the house project size. For general project profitability, medium sized projects show an always increasing trend, while extra-large house projects have a decreasing trend between periods 2 and 3. The other sizes behave the same as the average. In annual profitability, the curves show decreasing trends in all sizes except for medium projects once again, which makes the average curve behavior vary between all three periods.

### 5 DISCUSSION

The outcomes of this research have provided insight into the relationship between the characteristics of real estate projects and their general and annual profitability. There has been a
continuous growth of the general profitability for the last three periods. On the other hand, when analyzing the annual profitability of the projects throughout the same period of analysis, it decreases in the intermediate five-year period, while it returns to an increasing trend for the third five-year period.

Making a comparison, the behavior of annual profitability is consistent with Sun et al. (2022) since projects, especially buildings, can tend to financial disparities due to their magnitude and the time it takes to build and deliver them. In contrast, the performance of the general profitability is not conforming with Garza González (2006) because, if resources are being managed inefficiently, there would not be a continuous growth of the general profitability of a project as it is depicted in these results.

Additionally, as a proposal, this research provides the necessary information for a construction company to know which projects are the most convenient to carry out in the future if its objective is to maximize its profitability. That is, if they want to build a real estate project to generate the best profitability, they must choose appropriately according to the type and size of the project to be carried out. For example, from the point of view of general profitability, the most beneficial project for buildings is ‘extra-large’ while for houses it is medium size. Likewise, if a focus on annual profitability is preferred, the behavior repeats and the size with the best profitability for a building project is extra-large while the ideal size for a house project would be medium. It is important to emphasize that the highest value of annual profitability for buildings is for projects of this type, but outside of Quito in other cities of Ecuador. However, the highest annual profitability is proposed for extra-large buildings to maintain consistency in the comparison of results by establishing that all projects are built in the same location which in this case is Quito.

In synthesis, it is important to analyze these factors when considering a real estate project to avoid the problems exposed by Ifediora and Obineme (2017). It is important to note that the results here presented are relevant for a decision to be taken in just a couple of months or years hereon. However, annual or general profitability for buildings and houses is very likely to change since the construction sector is considerably volatile. Thus, the importance of constantly feeding the database as soon as more theses of constructed projects are available in the USFQ MDI repository to maintain the relevance and usefulness of this study.

6 CONCLUSIONS
The case study aims to identify the evolving patterns of financial variables in real estate projects over time to provide construction professionals with insights into project behavior and determine which type and size of projects yield better results based on constructors’ interests. Data from over
344 real estate projects in Ecuador, mostly in QMD, was collected, leading to a solid database for tabulation and graphing of the variables. Results indicate that extra-large buildings and medium-sized house projects (4000 m² to 5000 m²) showed better general profitability with a growing trend over the years, indicating continued growth in the construction industry. Annual profitability analysis revealed that buildings outside QMD and medium-sized house projects also had favorable percentages, though showing fluctuations. The study addresses the importance of efficient construction planning to promote economic growth and reactivation, especially in resource-limited countries like Ecuador. Understanding financial variables can lead to informed decisions for construction companies, promoting faster reactivation and economic development. The research highlights the interconnectedness of financial and real estate variables, applicable to various cities in Ecuador, aiding resource management for more viable future projects.

References