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# ACQUISITION OF PERSONAL ASSETS THROUGH LOAN BANK AND COMMERCIAL CREDIT: WHAT'S THE BEST OPTION?

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## ABSTRACT

*The aim of this paper is to determine the most viable and beneficial scenario for acquire an asset, specifically a car. For this purpose, the amortizations model was used, which is why the corresponding financial simulation in the amortization charts on both scenarios are presented. The results lead us to think that the financing option offered by the car company is the most suitable and beneficial for the client.*

**Keywords:** Asset, Banks, Amortization method, Financing, Due payment, Annuity, Car agency.

**JEL Classification:** G10, G20.

**AMS:** 97M30, 97D40.

## Contribution/ Originality

This study contributes in the existing literature about the amortization methods. Its contribution is to demonstrate the most viable option for acquire a car, within Mexican context.

## 1. INTRODUCTION

Nowadays, the nation´s economy has become complicated for most people, even companies, since the economic turbulence that is taking place bring a permanent change in the peso-dollar parity, which causes that potential clients acquire new car vehicles by financing, besides considering that prices may be affected by such economic phenomena. This leads us to question ourselves: what is the best option to acquire a car of the present year in such conditions?

Currently, the car industry spectrum for the consumer is wide because there are several brands of vehicles and models for each of them; in order to choose the car that is more suitable for the domestic use of the client, it is necessary to visit the several agencies to seek the most appropriate according to their needs. Under the hypothetical assumption that a person wants to acquire a car, which elements must be taking into account to take the decision of choosing said vehicle?



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## 2. LITERATURE REVIEW

As we noted in the introduction part of this essay, there is a variety of disciplines in the field of mathematics; such is the example of financial mathematics, which has as main goal the study and analysis of all the financial operation, where the rates, time, capital and interest intervene in several models of calculus or formulas, for example the amortizations (García-Santillán *et al.*, 2016).

In order to understand a little more about the consumer preferences, in the following lines the consumption preferences on the acquisition of assets and services are analyzed and discussed from a theoretical perspective for the purpose of developing an hypothetical scenario from the amortizations given by the distributors vs. the amortizations operated by the financial institutions of the country (*Ib*).

In theory, Moreno-García *et al.* (2015) they referred to the consumer satisfaction elements, among others, establishes that the incentives are elements that favor the acquisition; among this lines, Sierra and Froufe (2006) explains us about the consumer behavior based on the fact that ads carry weight into the decision making of the consumer, since the stimulus (music, sex, landscapes, striking scenes, famous and successful character, affection expressions, etc.) accompanying the product or service announced have extraordinary strength to evoke emotional states of mind and cause affective responses.

Another theory is founded on the linearity of the economic process, in the product preferences and in the relationship with the individual and society needs. Based on the aforementioned, we want to give importance to the possibilities a person has when buying and what is more economically convenient. Also, we must consider the benefits that amortizations have regarding the acquisition of an asset, helping the person to ponder the aspects to evaluate and analyze when making a purchase, taking into account the following key points (García-Santillán, 2014).

Regarding the question made before: what elements must be taking into account to make the decision of choosing a vehicle? We can establish that one of the most important aspects which must be considered when choosing a car is the budget one has. It is needed to seek and compare in different car agencies the car that adjusts to the budget planned to spend. When selecting a car, one must ask the car agency and the bank for a financial simulation, the installment required to pay and then, ponder from each one the advantages and disadvantages of purchase by different entities.

Such financial simulations are made by means of amortization charts. Ayres (1988) says that for accounting effects it is convenient to prepare a chart that shows the distribution of each payment of the amortization regarding the interests covered and the reduction of the debt. Biehler (2008) states that there are several different formats that may be used for the amortization charts, but either amortization chart should provide a payment per payment details of how each dollar paid in an assigned loan pays the indebted interests versus the reduction of the debt.

The chart will have the following elements: installment, outstanding balance at the beginning, past due interest at the end of the installment, payment and paid capital at the end of the time frame.

Regarding the theoretical part of the amortizations, there are several papers from authors that have tried to explain, analyze and understand the subject of amortizations. García-Santillán (2014) says that the amortization concept is associated to the debt, namely, it refers to the gradual payment made to liquidate a debt from a loan or a credit. In the financial context it is common that companies and people seek financing or credit, whether to capitalize themselves or for the acquisition of assets.

Villalobos (2007) agrees with the previous concept of García-Santillán (2014) the amortization of a debt is to liquidate it by periodic payments that include interests. George Brown College (2014) mentions that the amortization method is to redeem the loan principal and interest, by the series of equal payments through similar time lapses. If the payment lapse and the conversion interest period are equal in length, the problem implies working with a simple "annuity". Most of the times, for payments made at the end of a time range means we are dealing with a simple and ordinary annuity. In the same way Blecksmith (2009); García-Santillán (2014); Moreno-García *et al.* (2015) and García-Santillán *et al.* (2016) propose that the amortization of a loan, implies to periodically set apart money for future payments of the debt, usually the ranges are months.

The amortization charts are utilized in order to theoretically explain the specific case regarding to the presented scenario about the acquisition of an asset (car vehicle), all this with the aim of choice the entity that suits us according to a comparison between a bank and a car agency financing.

It should be noted that both the bank and the car company have different ways to present their simulations, since they consider some elements such as: life insurance, commissions, interest rates, taxes, extended guarantee, among others. Therefore, the person that will acquire the vehicle should investigate which are the variables that they consider and also, must know, the amount required to start the purchase of the car, remembering it should be under 20% and also, the installments of the payments. With these theoretic elements as basis, the question we ask ourselves is: what is the credit or financing scheme that has more benefits for the buyer of such vehicle?

## 3. HYPOTETICAL ASSUMPTIONS

The hypothetical assumption we present in this research is about the acquisition of an asset (vehicle) which is purchased through car financing with the amortization mode of past due periodical payments that are constant over a time "$n$" with a determined interest rate "$i$" with capitalizations "$m$", a net present value of the operation designated as "$NPV$" with fixed $Rp_{1...j}$ *amounts.*

To develop a comparative analysis of the research, two scenarios are presented, one through car financing obtained by a bank entity and the other through financing directly from the car agency, considering some elements that credits carry with them, such as life insurance, opening fee and car insurance.

In both cases, it is considered the same price of the vehicle, same installments and the rates determined by each institution. Financial simulations are made and it is calculated from what it is in theory stated.

## 4. MODEL DEVELOPMENT

In order to begin this comparative model, in this first part the data of car financing are presented, as are given by each institution, with elements that are external to the amortization formula, such as car insurance, extended guarantee, tax rate, etc. Therefore, in the second part data are analyzed according the amortization formula. Also, the analysis is made by us.

### Scenario-1. Car Financing Through a Bank Institution

In the first hypothetical scenario the bank entity offers the option of paying the car purchase credit with the following data: the cash value of the operation is $206,400.00 and the credit is paid with an nominal interest rate of **13.91%** monthly capitalized in 72 equal past due payments, giving a deposit of 20% the car value.

| Plan Data | |
|---|---|
| CAR VALUE | $206,400.00 |
| INITIAL DEPOSIT | $41,280.00 |
| FINANCING INSTALLMENTS RATE | $165,120.00 |
| TERM | 72 |
| INTEREST RATE | 11.99% |
| TAX RATE | 1.92% |
| NET INTEREST RATE | 13.91% |
| OPENING FEE | 0.00 |
| LIFE INSURANCE | $3,500.00 |
| EXPENDITURE | $41,280.00 |
| MONTHLY PAYMENT | $3,349.40 |

### 4.1. Amortization Chart Provided by the Bank

**Table-1.** Amortization chart (past due annuity)

| Payment | Annuity | Interest | Capital | Balance |
|---|---|---|---|---|
| 0 | | | | $165,120.00 |
| 1 | $3,227.27 | $1,649.82 | $1,577.45 | $165,120.00 |
| 2 | $3,227.27 | $1,634.06 | $1,593.21 | $163,542.55 |
| 3 | $3,227.27 | $1,618.14 | $1,609.13 | $161,949.35 |
| 4 | $3,227.27 | $1,602.07 | $1,625.20 | $160,340.22 |
| 5 | $3,227.27 | $1,585.83 | $1,641.44 | $158,715.02 |

| | | | | |
|---|---|---|---|---|
| 6 | $3,227.27 | $1,569.43 | $1,657.84 | $157,073.58 |
| 7 | $3,227.27 | $1,552.86 | $1,674.41 | $155,415.74 |
| 8 | $3,227.27 | $1,536.13 | $1,691.14 | $153,741.33 |
| 9 | $3,227.27 | $1,519.24 | $1,708.03 | $152,050.19 |
| 10 | $3,227.27 | $1,502.17 | $1,725.10 | $150,342.16 |
| 11 | $3,227.27 | $1,484.93 | $1,742.34 | $148,617.06 |
| 12 | $3,227.27 | $1,467.52 | $1,759.75 | $146,874.72 |
| 13 | $3,227.27 | $1,449.94 | $1,777.33 | $145,114.97 |
| 14 | $3,227.27 | $1,432.18 | $1,795.09 | $143,337.65 |
| 15 | $3,227.27 | $1,414.25 | $1,813.02 | $141,542.56 |
| 16 | $3,227.27 | $1,396.13 | $1,831.14 | $139,729.54 |
| 17 | $3,227.27 | $1,377.84 | $1,849.43 | $137,898.40 |
| 18 | $3,227.27 | $1,359.36 | $1,867.91 | $136,048.96 |
| 19 | $3,227.27 | $1,340.69 | $1,886.58 | $134,181.05 |
| 20 | $3,227.27 | $1,321.84 | $1,905.43 | $132,294.47 |
| 21 | $3,227.27 | $1,302.80 | $1,924.47 | $130,389.05 |
| 22 | $3,227.27 | $1,283.58 | $1,943.69 | $128,464.58 |
| 23 | $3,227.27 | $1,264.16 | $1,963.11 | $126,520.89 |
| 24 | $3,227.27 | $1,244.54 | $1,982.73 | $124,557.77 |
| 25 | $3,227.27 | $1,224.73 | $2,002.54 | $122,575.04 |
| 26 | $3,227.27 | $1,204.72 | $2,022.55 | $120,572.50 |
| 27 | $3,227.27 | $1,184.51 | $2,042.76 | $118,549.95 |
| 28 | $3,227.27 | $1,164.10 | $2,063.17 | $116,507.20 |
| 29 | $3,227.27 | $1,143.49 | $2,083.78 | $114,444.03 |
| 30 | $3,227.27 | $1,122.67 | $2,104.60 | $112,360.24 |
| 31 | $3,227.27 | $1,101.64 | $2,125.63 | $110,255.64 |
| 32 | $3,227.27 | $1,080.40 | $2,146.87 | $108,130.01 |
| 33 | $3,227.27 | $1,058.95 | $2,168.32 | $105,983.14 |
| 34 | $3,227.27 | $1,037.28 | $2,189.99 | $103,814.82 |
| 35 | $3,227.27 | $1,015.40 | $2,211.87 | $101,624.83 |
| 36 | $3,227.27 | $993.30 | $2,233.97 | $99,412.96 |
| 37 | $3,227.27 | $970.98 | $2,256.29 | $97,179.00 |
| 38 | $3,227.27 | $948.44 | $2,278.83 | $94,922.71 |
| 39 | $3,227.27 | $925.67 | $2,301.60 | $92,643.87 |
| 40 | $3,227.27 | $902.67 | $2,324.60 | $90,342.27 |
| 41 | $3,227.27 | $879.44 | $2,347.83 | $88,017.67 |
| 42 | $3,227.27 | $855.99 | $2,371.28 | $85,669.85 |
| 43 | $3,227.27 | $832.29 | $2,394.98 | $83,298.56 |
| 44 | $3,227.27 | $808.36 | $2,418.91 | $80,903.58 |
| 45 | $3,227.27 | $784.19 | $2,443.08 | $78,484.08 |
| 46 | $3,227.27 | $759.78 | $2,467.49 | $76,041.60 |
| 47 | $3,227.27 | $735.13 | $2,492.14 | $73,574.11 |
| 48 | $3,227.27 | $710.23 | $2,517.04 | $71,081.97 |
| 49 | $3,227.27 | $685.08 | $2,542.19 | $68,564.93 |
| 50 | $3,227.27 | $659.68 | $2,567.59 | $66,022.74 |
| 51 | $3,227.27 | $634.02 | $2,593.25 | $63,455.15 |
| 52 | $3,227.27 | $608.11 | $2,619.16 | $60,861.90 |
| 53 | $3,227.27 | $581.94 | $2,645.33 | $58,242.74 |
| 54 | $3,227.27 | $555.51 | $2,671.76 | $55,597.42 |
| 55 | $3,227.27 | $528.82 | $2,698.45 | $52,925.66 |
| 56 | $3,227.27 | $501.85 | $2,725.42 | $50,227.20 |

| | | | | |
|---|---|---|---|---|
| 57 | $3,227.27 | $474.62 | $2,752.65 | $47,501.79 |
| 58 | $3,227.27 | $447.12 | $2,780.15 | $44,749.14 |
| 59 | $3,227.27 | $419.34 | $2,807.93 | $41,968.99 |
| 60 | $3,227.27 | $391.29 | $2,835.98 | $39,161.06 |
| 61 | $3,227.27 | $362.95 | $2,864.32 | $36,325.08 |
| 62 | $3,227.27 | $334.33 | $2,892.94 | $33,460.76 |
| 63 | $3,227.27 | $305.42 | $2,921.85 | $30,567.82 |
| 64 | $3,227.27 | $276.23 | $2,951.04 | $27,645.97 |
| 65 | $3,227.27 | $246.74 | $2,980.53 | $24,694.93 |
| 66 | $3,227.27 | $216.96 | $3,010.31 | $21,714.40 |
| 67 | $3,227.27 | $186.89 | $3,040.38 | $18,704.10 |
| 68 | $3,227.27 | $156.51 | $3,070.76 | $15,663.71 |
| 69 | $3,227.27 | $125.83 | $3,101.44 | $12,592.95 |
| 70 | $3,227.27 | $94.84 | $3,132.43 | $9,491.51 |
| 71 | $3,227.27 | $63.54 | $3,163.73 | $6,359.07 |
| 72 | $3,227.27 | $31.93 | $3,195.34 | $3,195.34 |
| | $232,363.44 | $67,243.42 | $165,120.02 | $0.00 |

**Source:** Amortization chart provided by the bank:

**Scenario-1.1. Car Financing Through a Bank Institution (Own Calculations)**

In theory we know that:

$$NPV = Rp_1\left[\frac{1-(1+i/m)^{-n}}{i/m}\right] \qquad (1)$$

From there, to know the value of each fee $Rp_1$, it is cleared from the formula (1)

$$Rp_1 = \frac{NPV}{\left[\frac{1-(1+i/m)^{-n}}{i/m}\right]} \qquad (1.1)$$

For the development of this case we have the following data:

$NPV(\$206,400.00-20\%-\text{initial}-\text{payment}) = \$165,120.00+\$3,500.00 = \$168,620.00$

$n = 72\,payments$

$m = monthly$

$i = 13.91\%$

$Rp1 = ?$

$Insurance = \$3,500.00$

$$Rp1=\frac{\$168,620.00}{\left[\frac{1-\left(1+\left(.1391/12\right)\right)^{-72}}{.1391/12}\right]}=\frac{\$168,620.00}{\left[\frac{1-\left(1.0115916\right)^{-72}}{0.0115916}\right]}=\frac{\$168,620.00}{\left[\frac{1-\left(0.4361386\right)}{0.0115916}\right]}$$

$$Rp1=\frac{\$168,620.00}{\left[\frac{0.5638614}{0.0115916}\right]}=\frac{\$168,620.00}{48.6439663}=\$3,466.41$$

The ascertainment with the amortization chart is:

**Table-2.** Amortization chart

| Payment | Annuity | Interest | Capital | Balance |
|---|---|---|---|---|
| 0 | | | | $168,620.00 |
| 1 | $3,349.40 | $1,770.51 | $1,578.89 | $167,041.11 |
| 2 | $3,349.40 | $1,753.93 | $1,595.47 | $165,445.64 |
| 3 | $3,349.40 | $1,737.18 | $1,612.22 | $163,833.42 |
| 4 | $3,349.40 | $1,720.25 | $1,629.15 | $162,204.26 |
| 5 | $3,349.40 | $1,703.14 | $1,646.26 | $160,558.01 |
| 6 | $3,349.40 | $1,685.86 | $1,663.54 | $158,894.46 |
| 7 | $3,349.40 | $1,668.39 | $1,681.01 | $157,213.46 |
| 8 | $3,349.40 | $1,650.74 | $1,698.66 | $155,514.79 |
| 9 | $3,349.40 | $1,632.91 | $1,716.50 | $153,798.30 |
| 10 | $3,349.40 | $1,614.88 | $1,734.52 | $152,063.78 |
| 11 | $3,349.40 | $1,596.67 | $1,752.73 | $150,311.05 |
| 12 | $3,349.40 | $1,578.27 | $1,771.14 | $148,539.91 |
| 13 | $3,349.40 | $1,559.67 | $1,789.73 | $146,750.18 |
| 14 | $3,349.40 | $1,540.88 | $1,808.52 | $144,941.65 |
| 15 | $3,349.40 | $1,521.89 | $1,827.51 | $143,114.14 |
| 16 | $3,349.40 | $1,502.70 | $1,846.70 | $141,267.44 |
| 17 | $3,349.40 | $1,483.31 | $1,866.09 | $139,401.34 |
| 18 | $3,349.40 | $1,463.71 | $1,885.69 | $137,515.65 |
| 19 | $3,349.40 | $1,443.91 | $1,905.49 | $135,610.17 |
| 20 | $3,349.40 | $1,423.91 | $1,925.50 | $133,684.67 |
| 21 | $3,349.40 | $1,403.69 | $1,945.71 | $131,738.96 |
| 22 | $3,349.40 | $1,383.26 | $1,966.14 | $129,772.82 |
| 23 | $3,349.40 | $1,362.61 | $1,986.79 | $127,786.03 |
| 24 | $3,349.40 | $1,341.75 | $2,007.65 | $125,778.38 |
| 25 | $3,349.40 | $1,320.67 | $2,028.73 | $123,749.65 |
| 26 | $3,349.40 | $1,299.37 | $2,050.03 | $121,699.62 |
| 27 | $3,349.40 | $1,277.85 | $2,071.56 | $119,628.07 |
| 28 | $3,349.40 | $1,256.09 | $2,093.31 | $117,534.76 |
| 29 | $3,349.40 | $1,234.11 | $2,115.29 | $115,419.47 |
| 30 | $3,349.40 | $1,211.90 | $2,137.50 | $113,281.97 |
| 31 | $3,349.40 | $1,189.46 | $2,159.94 | $111,122.03 |
| 32 | $3,349.40 | $1,166.78 | $2,182.62 | $108,939.41 |
| 33 | $3,349.40 | $1,143.86 | $2,205.54 | $106,733.88 |
| 34 | $3,349.40 | $1,120.71 | $2,228.70 | $104,505.18 |
| 35 | $3,349.40 | $1,097.30 | $2,252.10 | $102,253.08 |
| 36 | $3,349.40 | $1,073.66 | $2,275.74 | $99,977.34 |

| | | | | |
|---|---|---|---|---|
| 37 | $3,349.40 | $1,049.76 | $2,299.64 | $97,677.70 |
| 38 | $3,349.40 | $1,025.62 | $2,323.79 | $95,353.91 |
| 39 | $3,349.40 | $1,001.22 | $2,348.19 | $93,005.73 |
| 40 | $3,349.40 | $976.56 | $2,372.84 | $90,632.88 |
| 41 | $3,349.40 | $951.65 | $2,397.76 | $88,235.13 |
| 42 | $3,349.40 | $926.47 | $2,422.93 | $85,812.19 |
| 43 | $3,349.40 | $901.03 | $2,448.37 | $83,363.82 |
| 44 | $3,349.40 | $875.32 | $2,474.08 | $80,889.74 |
| 45 | $3,349.40 | $849.34 | $2,500.06 | $78,389.68 |
| 46 | $3,349.40 | $823.09 | $2,526.31 | $75,863.37 |
| 47 | $3,349.40 | $796.57 | $2,552.84 | $73,310.53 |
| 48 | $3,349.40 | $769.76 | $2,579.64 | $70,730.89 |
| 49 | $3,349.40 | $742.67 | $2,606.73 | $68,124.16 |
| 50 | $3,349.40 | $715.30 | $2,634.10 | $65,490.07 |
| 51 | $3,349.40 | $687.65 | $2,661.76 | $62,828.31 |
| 52 | $3,349.40 | $659.70 | $2,689.70 | $60,138.61 |
| 53 | $3,349.40 | $631.46 | $2,717.95 | $57,420.66 |
| 54 | $3,349.40 | $602.92 | $2,746.48 | $54,674.17 |
| 55 | $3,349.40 | $574.08 | $2,775.32 | $51,898.85 |
| 56 | $3,349.40 | $544.94 | $2,804.46 | $49,094.39 |
| 57 | $3,349.40 | $515.49 | $2,833.91 | $46,260.48 |
| 58 | $3,349.40 | $485.74 | $2,863.67 | $43,396.81 |
| 59 | $3,349.40 | $455.67 | $2,893.74 | $40,503.08 |
| 60 | $3,349.40 | $425.28 | $2,924.12 | $37,578.96 |
| 61 | $3,349.40 | $394.58 | $2,954.82 | $34,624.13 |
| 62 | $3,349.40 | $363.55 | $2,985.85 | $31,638.28 |
| 63 | $3,349.40 | $332.20 | $3,017.20 | $28,621.09 |
| 64 | $3,349.40 | $300.52 | $3,048.88 | $25,572.20 |
| 65 | $3,349.40 | $268.51 | $3,080.89 | $22,491.31 |
| 66 | $3,349.40 | $236.16 | $3,113.24 | $19,378.07 |
| 67 | $3,349.40 | $203.47 | $3,145.93 | $16,232.14 |
| 68 | $3,349.40 | $170.44 | $3,178.96 | $13,053.17 |
| 69 | $3,349.40 | $137.06 | $3,212.34 | $9,840.83 |
| 70 | $3,349.40 | $103.33 | $3,246.07 | $6,594.76 |
| 71 | $3,349.40 | $69.24 | $3,280.16 | $3,314.60 |
| 72 | $3,349.40 | $34.80 | $3,314.60 | $0.00 |

**Source:** own

**Scenario-2. Car Financing Through a Car Agency**

In the second hypothetical scenario the car agency offers the option of paying the car purchase credit with the following data: the cash value of the operation is $206,400.00 and this credit is paid with an nominal interest rate of **12.62%** monthly capitalized in 72 equal past due payments, giving a deposit of 20% the car value.

| PLAN DATA | |
|---|---|
| TYPE | Credit |
| PORTFOLIO TYPE | Traditional |
| PRICE | $206,400.00 |
| DEPOSIT | $41,280.00 (20%) |
| FINANCING AMOUNT | $179,170.99 |
| START PAYMENT | $41,280.00 |
| MONTHLY PAYMENT | $4,441.54 |
| OPENNING FEE | 0.00 |
| YEARLY RATE | 12.62% |
| INSTALLMENTS | 72 |

**Table-3.** Amortization chart

| Term | Payment date | Car balance | Capital | Interest | Tax | Car Insurance | Life Insurance | Extended guarantee | Fee |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 01/12/2015 | $ 163,675.16 | $ 1,444.84 | $ 1,447.09 | $ 231.53 | $ 631.17 | $ 172.00 | $ 143.18 | $ 4,069.81 |
| 2 | 01/01/2016 | $ 162,212.70 | $ 1,462.46 | $ 1,721.32 | $ 275.41 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 3 | 01/02/2015 | $ 160,732.40 | $ 1,480.30 | $ 1,705.94 | $ 272.95 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 4 | 01/03/2016 | $ 159,234.04 | $ 1,498.36 | $ 1,690.37 | $ 270.46 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 5 | 01/04/2016 | $ 157,717.40 | $ 1,516.64 | $ 1,674.61 | $ 267.94 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 6 | 01/05/2016 | $ 156,182.26 | $ 1,535.14 | $ 1,658.66 | $ 265.39 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 7 | 01/06/2016 | $ 154,628.39 | $ 1,553.87 | $ 1,642.52 | $ 262.80 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 8 | 01/07/2016 | $ 153,055.57 | $ 1,572.82 | $ 1,626.18 | $ 260.19 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 9 | 01/08/2016 | $ 151,463.55 | $ 1,592.02 | $ 1,609.63 | $ 257.54 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 10 | 01/09/2016 | $ 149,852.11 | $ 1,611.44 | $ 1,592.89 | $ 254.86 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 11 | 01/10/2016 | $ 148,221.01 | $ 1,631.10 | $ 1,575.94 | $ 252.15 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 12 | 01/11/2016 | $ 146,570.02 | $ 1,650.99 | $ 1,558.79 | $ 249.41 | $ 649.21 | $ 172.00 | $ 161.08 | $ 4,441.48 |
| 13 | 01/12/2016 | $ 144,896.59 | $ 1,671.13 | $ 1,541.43 | $ 246.63 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 14 | 01/01/2017 | $ 143,207.37 | $ 1,691.52 | $ 1,523.85 | $ 243.82 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 15 | 01/02/2017 | $ 141,495.21 | $ 1,712.16 | $ 1,506.06 | $ 240.97 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 16 | 01/03/2017 | $ 139,762.17 | $ 1,733.04 | $ 1,488.06 | $ 238.09 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 17 | 01/04/2017 | $ 138,007.98 | $ 1,754.19 | $ 1,469.83 | $ 235.17 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 18 | 01/05/2017 | $ 136,232.39 | $ 1,775.59 | $ 1,451.38 | $ 232.22 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 19 | 01/06/2017 | $ 134,435.14 | $ 1,797.25 | $ 1,432.71 | $ 229.23 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 20 | 01/07/2017 | $ 132,615.97 | $ 1,819.17 | $ 1,413.81 | $ 226.21 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 21 | 01/08/2017 | $ 130,774.61 | $ 1,841.36 | $ 1,394.68 | $ 223.15 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 22 | 01/09/2017 | $ 128,910.78 | $ 1,863.83 | $ 1,375.31 | $ 220.05 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 23 | 01/10/2017 | $ 127,024.21 | $ 1,886.57 | $ 1,355.71 | $ 216.91 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 24 | 01/11/2017 | $ 125,114.63 | $ 1,909.58 | $ 1,335.87 | $ 213.74 | $ 649.21 | $ 172.00 | $ 161.08 | $ 4,441.48 |
| 25 | 01/12/2017 | $ 123,181.76 | $ 1,932.87 | $ 1,315.79 | $ 210.53 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 26 | 01/01/2018 | $ 121,225.30 | $ 1,956.46 | $ 1,295.46 | $ 207.27 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 27 | 01/02/2018 | $ 119,244.98 | $ 1,980.32 | $ 1,274.89 | $ 203.98 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 28 | 01/03/2018 | $ 117,240.50 | $ 2,004.48 | $ 1,254.06 | $ 200.65 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 29 | 01/04/2018 | $ 115,211.57 | $ 2,028.93 | $ 1,232.98 | $ 197.28 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 30 | 01/05/2018 | $ 113,157.88 | $ 2,053.69 | $ 1,211.64 | $ 193.86 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 31 | 01/06/2018 | $ 111,079.14 | $ 2,078.74 | $ 1,190.04 | $ 190.41 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 32 | 01/07/2018 | $ 108,975.04 | $ 2,104.10 | $ 1,168.18 | $ 186.91 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 33 | 01/08/2018 | $ 106,845.27 | $ 2,129.77 | $ 1,146.05 | $ 183.37 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 34 | 01/09/2018 | $ 104,689.53 | $ 2,155.74 | $ 1,123.66 | $ 179.79 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 35 | 01/10/2018 | $ 102,507.48 | $ 2,182.05 | $ 1,100.98 | $ 176.16 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 36 | 01/11/2018 | $ 100,298.82 | $ 2,208.66 | $ 1,078.04 | $ 172.49 | $ 649.21 | $ 172.00 | $ 161.08 | $ 4,441.48 |
| 37 | 01/12/2018 | $ 98,063.21 | $ 2,235.61 | $ 1,054.81 | $ 168.77 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 38 | 01/01/2019 | $ 95,800.33 | $ 2,262.88 | $ 1,031.30 | $ 165.01 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 39 | 01/02/2019 | $ 93,509.84 | $ 2,290.49 | $ 1,007.50 | $ 161.20 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 40 | 01/03/2019 | $ 91,191.41 | $ 2,318.43 | $ 983.41 | $ 157.35 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 41 | 01/04/2019 | $ 88,844.69 | $ 2,346.72 | $ 959.03 | $ 153.44 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 42 | 01/05/2019 | $ 86,469.35 | $ 2,375.34 | $ 934.35 | $ 149.50 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 43 | 01/06/2019 | $ 84,065.03 | $ 2,404.32 | $ 909.37 | $ 145.50 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 44 | 01/07/2019 | $ 81,631.37 | $ 2,433.66 | $ 884.08 | $ 141.45 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 45 | 01/08/2019 | $ 79,168.03 | $ 2,463.34 | $ 858.49 | $ 137.36 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 46 | 01/09/2019 | $ 76,674.63 | $ 2,493.40 | $ 832.58 | $ 133.21 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 47 | 01/10/2019 | $ 74,150.82 | $ 2,523.81 | $ 806.36 | $ 129.02 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 48 | 01/11/2019 | $ 71,596.22 | $ 2,554.60 | $ 779.82 | $ 124.77 | $ 649.21 | $ 172.00 | $ 161.08 | $ 4,441.48 |
| 49 | 01/12/2019 | $ 69,010.45 | $ 2,586.77 | $ 752.95 | $ 120.47 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 50 | 01/01/2020 | $ 66,393.14 | $ 2,617.31 | $ 725.76 | $ 116.12 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 51 | 01/02/2020 | $ 63,743.90 | $ 2,649.24 | $ 698.23 | $ 111.72 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 52 | 01/03/2020 | $ 61,062.34 | $ 2,681.56 | $ 670.37 | $ 107.26 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 53 | 01/04/2020 | $ 58,348.07 | $ 2,714.27 | $ 642.17 | $ 102.75 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 54 | 01/05/2020 | $ 55,600.69 | $ 2,747.38 | $ 613.63 | $ 98.18 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 55 | 01/06/2020 | $ 52,819.79 | $ 2,780.90 | $ 584.73 | $ 93.56 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 56 | 01/07/2020 | $ 50,004.97 | $ 2,814.82 | $ 555.49 | $ 88.88 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 57 | 01/08/2020 | $ 47,155.81 | $ 2,849.16 | $ 525.89 | $ 84.14 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 58 | 01/09/2020 | $ 44,271.89 | $ 2,883.92 | $ 495.92 | $ 79.35 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 59 | 01/10/2020 | $ 41,352.78 | $ 2,919.11 | $ 465.59 | $ 74.46 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 60 | 01/11/2020 | $ 38,398.06 | $ 2,954.72 | $ 434.89 | $ 69.58 | $ 649.21 | $ 172.00 | $ 161.08 | $ 4,441.48 |
| 61 | 01/12/2020 | $ 35,407.30 | $ 2,990.76 | $ 403.82 | $ 64.61 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 62 | 01/01/2021 | $ 32,380.06 | $ 3,027.24 | $ 372.37 | $ 59.58 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 63 | 01/02/2021 | $ 29,315.88 | $ 3,064.18 | $ 340.53 | $ 54.48 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 64 | 01/03/2021 | $ 26,214.33 | $ 3,101.55 | $ 308.31 | $ 49.33 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 65 | 01/04/2021 | $ 23,074.94 | $ 3,139.39 | $ 275.69 | $ 44.11 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 66 | 01/05/2021 | $ 19,897.25 | $ 3,177.69 | $ 242.67 | $ 38.83 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 67 | 01/06/2021 | $ 16,680.79 | $ 3,216.46 | $ 209.25 | $ 33.48 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 68 | 01/07/2021 | $ 13,425.10 | $ 3,255.69 | $ 175.43 | $ 28.07 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 69 | 01/08/2021 | $ 10,129.69 | $ 3,295.41 | $ 141.19 | $ 22.59 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 70 | 01/09/2021 | $ 6,794.07 | $ 3,335.62 | $ 106.53 | $ 17.04 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 71 | 01/10/2021 | $ 3,417.76 | $ 3,376.31 | $ 71.45 | $ 11.43 | $ 649.27 | $ 172.00 | $ 161.08 | $ 4,441.54 |
| 72 | 01/11/2021 | $ - | $ 3,417.76 | $ 35.94 | $ 5.75 | $ 649.21 | $ 172.30 | $ 161.10 | $ 4,442.06 |

**Source:** provide by the car agency

**Scenario-2.2. Car Financing Through a Car Agency (Own Calculations)**

It is calculated by the aforementioned formula.

$$NPV(\$206,400.00 - 20\%\_initial - payment) = \$165,120.00$$

$$n = 72 - payments$$

$$m = monthly$$

$$i = 12.62\%$$

$$Rp1 = ?$$

$$Rp1 = \frac{\$165,120.00}{\left[\frac{1-\left(1+(.1262/12)\right)^{-72}}{.1262/12}\right]} = \frac{\$165,120.00}{\left[\frac{1-(1.0105166)^{-72}}{0.0105166}\right]} = \frac{\$165,120.00}{\left[\frac{1-(0.4708379)}{0.0105166}\right]}$$

$$Rp1 = \frac{\$165,120.00}{\left[\frac{0.5291621}{0.0105166}\right]} = \frac{\$165,120.00}{50.3168419} = \$3,281.60$$

The ascertainment with the amortization chart is:

**Table-4.** Amortization chart (past due annuity)

| Payment | Annuity | Interest | Capital | Balance |
|---|---|---|---|---|
| 0 | | | | $165,120.00 |
| 1 | $3,281.61 | $1,736.51 | $1,545.10 | $163,574.90 |
| 2 | $3,281.61 | $1,720.26 | $1,561.35 | $162,013.55 |
| 3 | $3,281.61 | $1,703.84 | $1,577.77 | $160,435.78 |
| 4 | $3,281.61 | $1,687.25 | $1,594.36 | $158,841.42 |
| 5 | $3,281.61 | $1,670.48 | $1,611.13 | $157,230.29 |
| 6 | $3,281.61 | $1,653.54 | $1,628.07 | $155,602.21 |
| 7 | $3,281.61 | $1,636.42 | $1,645.20 | $153,957.02 |
| 8 | $3,281.61 | $1,619.11 | $1,662.50 | $152,294.52 |
| 9 | $3,281.61 | $1,601.63 | $1,679.98 | $150,614.54 |
| 10 | $3,281.61 | $1,583.96 | $1,697.65 | $148,916.89 |
| 11 | $3,281.61 | $1,566.11 | $1,715.50 | $147,201.39 |
| 12 | $3,281.61 | $1,548.07 | $1,733.54 | $145,467.84 |
| 13 | $3,281.61 | $1,529.84 | $1,751.78 | $143,716.07 |
| 14 | $3,281.61 | $1,511.41 | $1,770.20 | $141,945.87 |
| 15 | $3,281.61 | $1,492.80 | $1,788.81 | $140,157.06 |
| 16 | $3,281.61 | $1,473.99 | $1,807.63 | $138,349.43 |
| 17 | $3,281.61 | $1,454.97 | $1,826.64 | $136,522.79 |
| 18 | $3,281.61 | $1,435.76 | $1,845.85 | $134,676.94 |
| 19 | $3,281.61 | $1,416.35 | $1,865.26 | $132,811.68 |
| 20 | $3,281.61 | $1,396.74 | $1,884.88 | $130,926.81 |
| 21 | $3,281.61 | $1,376.91 | $1,904.70 | $129,022.11 |
| 22 | $3,281.61 | $1,356.88 | $1,924.73 | $127,097.38 |
| 23 | $3,281.61 | $1,336.64 | $1,944.97 | $125,152.41 |
| 24 | $3,281.61 | $1,316.19 | $1,965.43 | $123,186.98 |
| 25 | $3,281.61 | $1,295.52 | $1,986.10 | $121,200.89 |
| 26 | $3,281.61 | $1,274.63 | $2,006.98 | $119,193.90 |

| | | | | |
|---|---|---|---|---|
| 27 | $3,281.61 | $1,253.52 | $2,028.09 | $117,165.82 |
| 28 | $3,281.61 | $1,232.19 | $2,049.42 | $115,116.40 |
| 29 | $3,281.61 | $1,210.64 | $2,070.97 | $113,045.43 |
| 30 | $3,281.61 | $1,188.86 | $2,092.75 | $110,952.67 |
| 31 | $3,281.61 | $1,166.85 | $2,114.76 | $108,837.91 |
| 32 | $3,281.61 | $1,144.61 | $2,137.00 | $106,700.91 |
| 33 | $3,281.61 | $1,122.14 | $2,159.47 | $104,541.44 |
| 34 | $3,281.61 | $1,099.43 | $2,182.18 | $102,359.26 |
| 35 | $3,281.61 | $1,076.48 | $2,205.13 | $100,154.12 |
| 36 | $3,281.61 | $1,053.29 | $2,228.32 | $97,925.80 |
| 37 | $3,281.61 | $1,029.85 | $2,251.76 | $95,674.04 |
| 38 | $3,281.61 | $1,006.17 | $2,275.44 | $93,398.60 |
| 39 | $3,281.61 | $982.24 | $2,299.37 | $91,099.23 |
| 40 | $3,281.61 | $958.06 | $2,323.55 | $88,775.68 |
| 41 | $3,281.61 | $933.62 | $2,347.99 | $86,427.69 |
| 42 | $3,281.61 | $908.93 | $2,372.68 | $84,055.01 |
| 43 | $3,281.61 | $883.98 | $2,397.63 | $81,657.37 |
| 44 | $3,281.61 | $858.76 | $2,422.85 | $79,234.52 |
| 45 | $3,281.61 | $833.28 | $2,448.33 | $76,786.20 |
| 46 | $3,281.61 | $807.53 | $2,474.08 | $74,312.12 |
| 47 | $3,281.61 | $781.52 | $2,500.10 | $71,812.02 |
| 48 | $3,281.61 | $755.22 | $2,526.39 | $69,285.63 |
| 49 | $3,281.61 | $728.65 | $2,552.96 | $66,732.67 |
| 50 | $3,281.61 | $701.81 | $2,579.81 | $64,152.87 |
| 51 | $3,281.61 | $674.67 | $2,606.94 | $61,545.93 |
| 52 | $3,281.61 | $647.26 | $2,634.35 | $58,911.58 |
| 53 | $3,281.61 | $619.55 | $2,662.06 | $56,249.52 |
| 54 | $3,281.61 | $591.56 | $2,690.05 | $53,559.46 |
| 55 | $3,281.61 | $563.27 | $2,718.35 | $50,841.12 |
| 56 | $3,281.61 | $534.68 | $2,746.93 | $48,094.18 |
| 57 | $3,281.61 | $505.79 | $2,775.82 | $45,318.36 |
| 58 | $3,281.61 | $476.60 | $2,805.01 | $42,513.35 |
| 59 | $3,281.61 | $447.10 | $2,834.51 | $39,678.84 |
| 60 | $3,281.61 | $417.29 | $2,864.32 | $36,814.51 |
| 61 | $3,281.61 | $387.17 | $2,894.45 | $33,920.07 |
| 62 | $3,281.61 | $356.73 | $2,924.89 | $30,995.18 |
| 63 | $3,281.61 | $325.97 | $2,955.65 | $28,039.53 |
| 64 | $3,281.61 | $294.88 | $2,986.73 | $25,052.80 |
| 65 | $3,281.61 | $263.47 | $3,018.14 | $22,034.66 |
| 66 | $3,281.61 | $231.73 | $3,049.88 | $18,984.78 |
| 67 | $3,281.61 | $199.66 | $3,081.96 | $15,902.83 |
| 68 | $3,281.61 | $167.24 | $3,114.37 | $12,788.46 |
| 69 | $3,281.61 | $134.49 | $3,147.12 | $9,641.34 |
| 70 | $3,281.61 | $101.39 | $3,180.22 | $6,461.12 |
| 71 | $3,281.61 | $67.95 | $3,213.66 | $3,247.46 |
| 72 | $3,281.61 | $34.15 | $3,247.46 | $0.00 |

**Source:** own

## 5. DISCUSSION AND CONCLUSIONS

As a result of the comparative analysis for both scenarios through amortizations, the following results were obtained:

The operations made clearly offer different results; the bank offers a lowest monthly payment of $3,349.40 in comparison to the car agency since it is a monthly payment of $4,441.54. The bank offers a lower rate of 11.99% in this case. It can be concluded that the bank offers better financing when purchasing an asset, in this case, a vehicle.

This financial mathematics essay had as purpose to see from an economical perspective what is the best option of a person that has the intention of purchasing a car and that the same person may analyze the different financing options at reach. It is important to highlight that amortizations can be carried out in daily life, not only in the acquisition of a car, it can also be a house, a premise, etc. The benefit of approaching this kind of subjects is that, according to the person income, he or she can see the possibility of acquiring such debt and being able to pay it timely.

For closure we could say that, based on this essay, people can realize the implications of purchasing an asset, providing a very useful tool to being able to attain a debt and how to apply it in daily life. Because of the former, first we presented the theory from the authors (Villalobos, 2007; Blecksmith, 2009; García-Santillán, 2014).

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## REFERENCES

Ayres, F.J., 1988. Matemáticas financieras financial maths. México: McGraw-Hill.

Biehler, T.J., 2008. The mathematics of money. New York: McGraw-Hill/Irwin.

Blecksmith, R., 2009. Math 210 finite mathematics. Available from http://www.math.niu.edu/~richard/Math210/int2_ho.pdf.

García-Santillán, Moreno-García, Ortiz-Rivera, Lanza-Vilorio and Lira-Martínez, 2016. Acquisition of personal assets through a set of installments due versus deferred installments: What is the best option? Bulletin of Mathematics and Statistics Research, 4(1): 124-131

García-Santillán, A., 2014. Matemáticas financieras para la toma de decisión financial math for making decision. Electronic versión at Universidad de Málaga Registered at National Library of Spain Nº 2014/60144.

George Brown College, 2014. Formula sheet for financial mathematics. Available from https://www.georgebrown.ca/uploadedFiles/TLC/_documents/pdf.

Moreno-García, García-Santillán, Abascal-Sánchez, González-Zarco and Galindo-Martínez, 2015. A comparative financial modeling to evaluate a real state property with mortgage loan versus investment funds. Bulletin of Mathematics and Statistics Research, 3(4): 10-19

Sierra, B. and T. Froufe, 2006. Publicidad y conducta del consumidor advertising and behavioral consumer. Available from http://www.mercasa.es/files/multimedios/1309247397_DYC_2000_51_109_117.pdf.

Villalobos, J.L., 2007. Matemáticas financieras financial math. México: Pearson Pretince Hall.