Department of Economics and Finance

Chair of Mathematical Finance

AN INSIGHT ON STUDENT LOANS IN THE U.S. AND IN ITALY

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1. Introduction

According to the data from Federconsumatoris' survey conducted in 2018 on Italian household debt, Italian families are indebted for approximately € 97 billion in total. About € 7.1 billion of debts is linked to the cost of education, in particular high school and university, representing more than 7% of the household debt. Despite the fact that student loans in Italy are not very popular, throughout the years more and more families are starting to cover education expenses with these loans. In the United States, the same trend holds, indeed, student loans, which were once a modest part of the U.S. household debt, now account for more than $1.5 trillion. They have been growing throughout the years and are starting to cause several policy issues and public concerns. This is due to the fact that the biggest part of such debt ($1.4 trillion) are Federal loans, which are complicated financial contracts with unique features. These include forgiveness, deferral, income-based schemes, and consolidation. All these characteristics are what makes these loan particularly sophisticated and difficult to manage and value. Italian student loans, compared to American loans, are not as sophisticated: the repayment strategies are very similar to those of a "standard" loan and do not feature any income-based scheme, consolidation, or forgiveness horizon. But, at the same time, repayment strategies differ importantly among different Italian Banks, as section 2 will analyze. Both in US and in Italy, in some cases, students can either apply for deferral or forbearance, making no principal payments for a certain period of time. Moreover, the average student loan debt balance is higher in the United States ($ 37.113) than in Italy (€ 7.970)[1]. This is because the maximum balance available to American and Italian students differs significantly. In the United States PLUS loans have no maximum balance, allowing eligible students to borrow larger quantities of money, but paying slightly higher interest rates compared to undergraduate and graduate loans. In Italy, as this paper will analyze, the maximum amount offered by Italian banks for student loans is consistently smaller and varies, the higher being set at €70.000 by BNL. On the upside, Italian Student loans feature lower interest rates. We are going to analyze two Italian student loans: "Per Merito" offered by the Intesa Sanpaolo Group and "Futuriamo" offered by Banca Nazionale del Lavoro (BNL) and find the cost minimizing strategy for the repayment of such loans. I decided to examine this topic because it is particularly relevant to me, since I am currently financing my bachelor's and master's degrees with such instruments. I'm interested in finding the repayment strategy that will minimize the present value of future payments, to help students like me, using these loans, to lower the costs of financing. Moreover, I want to find new alternative

[1] Hanson, M. (2022, May 30). *Student Loan Debt Statistics*. Education Data Initiative. Retrieved from https://educationdata.org/student-loan-debt-statistics

repayment strategies that could make such products more attractive to eligible students, so to help them finance their studies.

2. Student Loans – Mathematical Analysis

In this chapter we are going to analyze mathematically different kind of student loans to better understand how they work, how interests are calculated and what is the best repayment strategy i.e., the strategy that will feature the lowest present value (lower costs). We will start with American student loans, by investigating Guasoni et al. approach in their paper "American Student Loans: Repayment and Valuation" published on October 7 2020, and replicate their methodology to find the cost minimizing strategy for the two main Italian Student Loans: Intesa Sanpaolo "per Merito" and BNL "Futuriamo". A direct comparison between the two follows.

2.1 American Student Loans

Federal loans are fixed-rate debt contracts that makes funds available to students to cover living and tuition fees expenses. Repayment of such contracts starts after graduation and can be done with different strategies: students, can enroll in income-based schemes that allows them to pay back the debt with monthly installments, that are due only if their income is above a pre-determined threshold. The installment amount will be proportional to the latter. Moreover, Federal loans, can feature after a certain period (usually from 20 to 25 years) a forgiveness of the residual outstanding debt, on which the student must repay only taxes. Guasoni et al (2020) find a repayment strategy that yield the lowers present value given all these different repayment methods, the compounding, and the balance. Such strategy is consistent a priori with the minimization of the net worth of a household, and a posteriori, offers significant protection to negative shocks through income-based repayment schemes (Guasoni et al, 2020). In fact, income-based schemes, lower risks, hedging income fluctuations, and costs.

The cost-minimizing strategy found is of two types: the first suggests that "if the balance is small enough, one should pay as much as possible until the loan is paid off" (Guasoni et al, 2020); the second instead "otherwise, one should do so up to a critical horizon, and then enroll in an income-based repayment scheme, paying the required minimum until the loan is forgiven" (Guasoni et al, 2020). The Critical Horizon is defined as the point in which the costs of compounding equal the benefits of forgiveness.

It is important to remark that Federal loans balance grows linearly at the fixed interest rate. The interest charged on such loans depends on the type of loan taken by the student: undergraduate loans are currently charged an interest rate of 4,53%, for a maximum balance of $57.500,00; Graduate loans have a slightly higher maximum balance, currently set at $138.000,00 with an interest rate of 6,08%; Direct PLUS loans have no maximum balance and are charged an interest rate of 7,08%.

Federal student loans are unsecured debt contracts, that, unlike other, cannot be discharged in bankruptcy except in very rare situations (Mueller and Yannelis, 2019) and a borrower wage could be garnished for life in case of default. Delinquency is rare and would result in damaging the credit score of the borrower, reducing its access to further credit. That is because, income-based schemes, are a good alternative in case of default, allowing borrowers not to damage their credit score when they cannot afford to make payments in case of a mare income or no income. Therefore, default it is not taken into consideration in the analysis of American student loans by Guasoni et al. (2020). Empirical evidence (Delisible et al., 2018) shows furthermore that defaults are not reconcilable with borrower's optimal choices but are more likely to depend on lack of information on such options by the latter.

To calculate the cost minimizing strategy for Federal student loans, Guasoni et al. (2020) consider the following parameters: the final balance (at the date of graduation) is x > 0 and the student seeks for a repayment strategy α aimed at minimizing future payments discounted at the interest rate r > 0. The rate r represents the opportunity cost of money i.e., the risk free rate. The overall interest rate of the loan is given by r + β where Beta is a spread that considers the risk factor and is always greater than zero. Hence, we can deduce that paying the loan earlier reduces compounding costs. α_t is the chosen repayment rate at time t, and b_t^α the balance that evolves according to the dynamics

$$db_t^\alpha = (r + \beta)b_t^\alpha dt - \alpha_t dt, \quad b_0 = x > 0$$

We must also take into account the forgiveness of such loan. As explained above, on the forgiven balance b_T^α the student must only pay taxes, with rate $\omega \in (0,1)$. The tax payment on the balance at time T, b_T^α , will be denoted as ω_T^α . The forgiveness horizon could increase the student willingness to delay payments countering the compounding motive. The frequency of payments at time t can vary and it is in the interval m(t) – M(t) where m(t) is the minimum payment the student can do

under income-based schemes and M(t) the maximum payment that he could make considering all other living expenses not to incur in further debt. Taking into consideration all these variables, Guasoni et al. find the present value of future payments to be equal to

$$J(x,\alpha) := \int_0^\tau e^{-rt}\alpha_t dt + e^{-r\tau}\omega b_\tau$$

where τ is the time at which the loan is either repaid in full or forgiven. The goal is to minimize the present value of future payments. That is denoted as

$$v(x) := \inf_{\alpha\in\mathcal{A}} J(x,\alpha)$$

where $\mathcal{A}$ is the set of feasible repayment strategies. Guasoni et al. define the critical balance x^*

$$x^* := \int_0^{t^*} e^{-(r+\beta)s} M(s)ds > 0$$

where the argument of the integral is derived from the deterministic control theory, being the discount factor for continuous compounding to find the present value. $t^* \epsilon\ (t_c\,;T)$ where t_c is the critical horizon, defined as

$$t_c := \left(T + \frac{\log\omega}{\beta}\right)^+ \in [0,T)$$

Then the strategy $\alpha^* \epsilon\ \mathcal{A}$ for any $x > 0$ is derived, and features two different and distinct equations: the first is the strategy for balances grater to the critical balance x^* and the secondo for balances smaller or equal to x^*

$$\alpha_t^* := \begin{cases} M(t)1_{[0,t_c]}(t) + m(t)1_{(t_c,T]}(t) & t\in[0,T], \quad if\ x > x^*, \quad (max\text{-}min) \\ M(t) & t\in[0,T], \quad if\ x \le x^*, \quad (max) \end{cases}$$

Then the two strategies to minimize the loan present value are denoted as $v(x) = v_1(x)$ for $x > x^*$ and $v(x) = v_2(x)$ for $x \le x^*$

$$v_1(x) := \int_0^{t_c} e^{-rs} M(s)ds + \int_{t_c}^{T} e^{-rs} m(s)ds + \omega e^{\beta T} \left(x - \int_0^{t_c} e^{-(r+\beta)s} M(s)ds - \int_{t_c}^{T} e^{-(r+\beta)s} m(s)ds \right)$$

$$v_2(x) := \int_0^{t_M} e^{-rs} M(s)ds, \quad where\ t_M > 0\ satisfies\ \ x = \int_0^{t_M} e^{-(r+\beta)s} M(s)ds.$$

The two strategies must be chosen according to the balance x at the time T (graduation) to minimize the loan costs. If $x \leq x^*$ i.e. the loan balance x at T is bigger than the critical balance x^*, then the cheapest repayment strategy is to do maximum payments for all of the loan-term length of the loan ("max" strategy). If $x > x^*$ then the student should adopt the "max-min" strategy, making maximum payments until the critical horizon t_c and then enroll in an income-based scheme making minimum payments until the remaining balance is forgiven. In the case in which the critical horizon t_c is zero, then we should adopt the "min" strategy, enrolling immediately in an income-based scheme.

The critical balance x^* is the balance at which the two strategies, "max" and "max-min", yields the same costs.

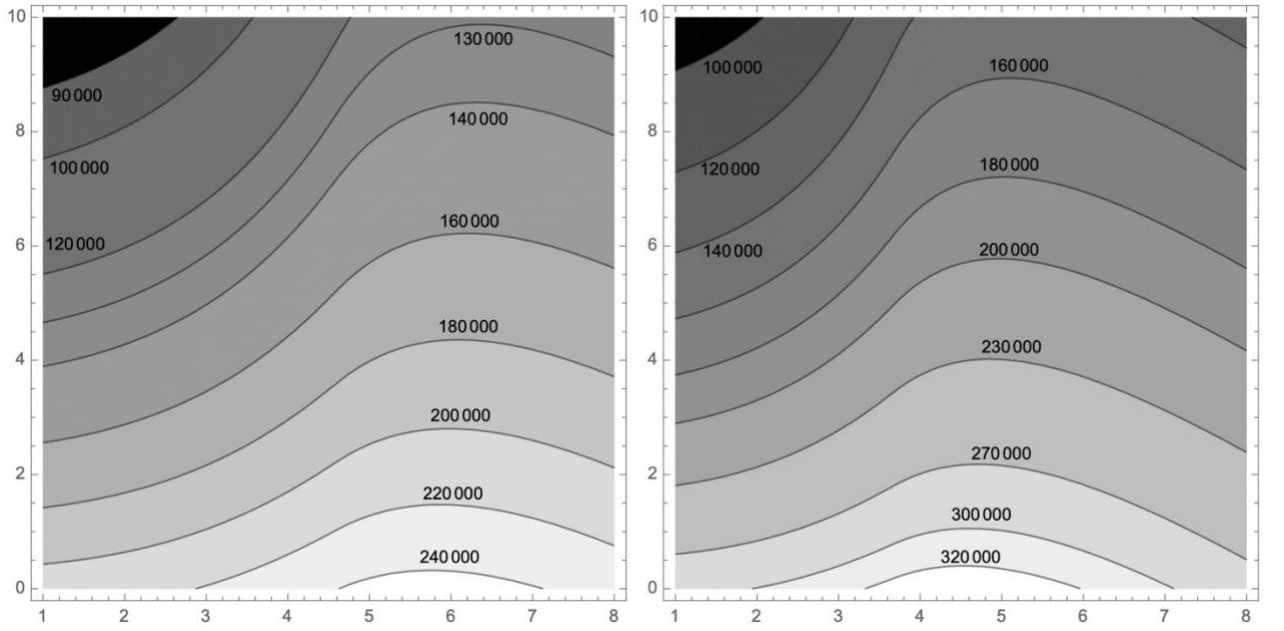


Figure 1: Critical balance for Federal student loans. Retrieved from the paper "American Student Loans: Repayment and Valuation", Guasoni et al., 2020, p. 7

In Figure 1, the critical balance x^* (contours) for Federal student loans is shown, above which the "max-min" repayment strategy is cheaper against loan spread β. The latter is on the horizontal axis, while on the vertical axis we have parameters of the discount rate. Intuitively, for balances below such line, the "max" strategy yields lower costs and should be chosen. On the right, we have the critical horizon for the forgiveness horizon $T = 25$ and on the left for $T = 20$. The critical balance x^* has been calculated considering the following parameters for both forgiveness horizons: $g = 4\%$ (annual growth of income/poverty level); $\omega = 40\%$ and m(t) and M(t) are respectively equal to 10% and 30% above income subsistence of $32.000,00. The main findings are that the relationship between the critical balance, the discount rate and the spread is nonlinear. In case of low balances, x^* is highly sensitive to the discount rate r, so in case of low interest rates it optimal to repay large balances early, and in case of high discount rate, deferral is encouraged. "A borrower with high opportunity cost of capital has a stronger preference to later than earlier payments because the latter entails a higher sacrifice in return" (Guasoni et al. ,2020). So, for borrowers with high discount rates, it optimal to do maximum payments for balances up to $100.000 - $150.000 above which they should enroll in income-based schemes (Guasoni et al., 2020). As the discount rate decreases, the critical balance increases. (e.g. for r = 3% x* = $160.000 - $200.000). To choose the cost minimizing strategy, the borrower should compare the costs deriving from the "max" or "max-min" strategy and choose the lowest between the two. Hence, the complexity of calculating the critical balance for a borrower is ostensible. The main takeaways from the critical balance analysis are that for small loan balances, the borrower should make maximum payments, while for large balances, above the critical balance x^* the borrower can benefit from income-based repayment schemes (Guasoni et al, 2020).

To dig deeper into this issue, we must analyze the cost to balance ratio for the three main types of loans previously mentioned (undergraduate, graduate, and PLUS loans) with different discount rates.

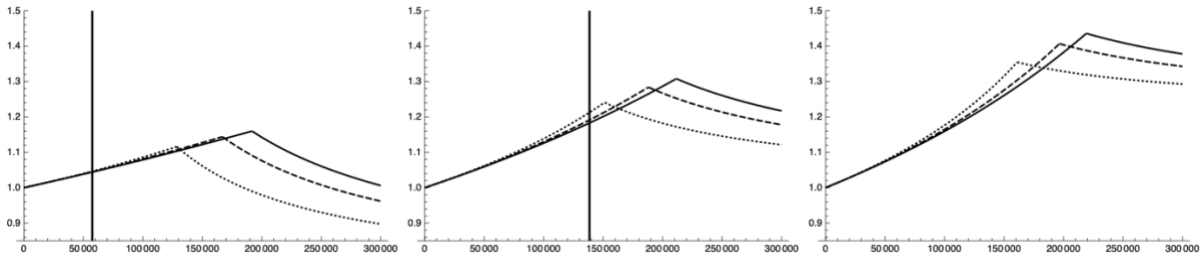


Figure 2: Cost-to-balance ratio for Federal student loans. Retrieved from the paper "American Student Loans: Repayment and Valuation", Guasoni et al., 2020, p. 8

In Figure 2, the cost-to-balance ratio of the three Federal loans (undergraduate (left), graduate(center) and PLUS (right)) are shown. On the horizontal axis we have the loan balance, while on the vertical axis the cost-to-balance ratio. Three discount rates have been considered: 1,5% (solid line) representing a public lender - risk free rate; 3% (dashed line) representing a borrower with good credit score; 6% (dotted line) indicative of a borrower with bad credit score. To calculate the cost-to-balance ratios the same parameters used for the critical balance analysis have been used. The vertical lines in the undergraduate and graduate loans graphs are the maximum balances allowed, being respectively $57.500,00 and $138.000,00. We can observe how for small balances there are no big differences between the three different lines, since interest rate play a smaller role in the valuation of such loans. Therefore, income-based schemes do not offer any subsidies, shown by the fact that the lines reflecting the risk-free interest rate (solid) are above one. The difference between the three lines subsists for higher balances only, thus after enrollment in income-based schemes, and is caused by the difference in discount rates. The higher the discount rates, the minor would be the threshold x^* for enrolling in income-based schemes. Over the threshold x^* the marginal cost of borrowing will be equal to the tax rate $\omega e^{\beta T}$ and the additional balance over such threshold does not affect payments neither in the "max" and "min" periods of the repayment of the loan (Guasoni et al., 2020). A big additional balance leads the cost-to-balance ratio to converge towards the marginal ratio $\omega e^{\beta T}$ (Guasoni et al., 2020). Hence, the marginal cost of borrowing increases together with the balance up to the point where enrolling in income-based schemes becomes optimal, and the marginal cost of borrowing tends to drop towards the constant $\omega e^{\beta T}$. Intuitively, the average unit cost of borrowing is going to be lower for very high balances rather than for medium balances (Guasoni et al, 2020).

In conclusion, according to the analysis conducted by Guasoni et al. (2020) in their paper "American Student Loans: Repayment and Valuation" the cost minimizing strategy to lower Federal Loans costs (i.e. present value) have two optimal solutions: A small loan, hence featuring a small balance, (undergraduate and graduate loans) should be paid as soon as possible, doing maximum payments ("max" strategy"). Otherwise, if the loan balance is medium or high (PLUS loans), the best repiamnet strategy is to do maximum payments until the critical horizon previously identified, and then enroll into an income-based scheme doing minimum payments until the remaining loan balance is forgiven.

2.1 Intesa Sanpaolo "per Merito" Student Loan Analysis

The Intesa Sanpaolo Group is one of the leading banking groups in Europe, with a market cap. of €40.5 billion. In Italy it is the market leader in all the three sectors in which it operates: retail, corporate and wealth management. Currently Intesa Sanpaolo Group offers its services to over 13.5 million customers in Italy and has a market share of no less than 12% in most regions of the country. Moreover, Intesa Sanpaolo has an international presence operating in commercial banking in the Middle East, North Africa, Central and Eastern Europe, and supports corporate customers in more than 25 countries around the globe. The Group aims at being the "engine" of sustainable and inclusive growth, and therefore, within its products, we can find student loans that have as the objetive help ambitious and excellent students to finance their studies. Our focus is on the "per Merito" student loan, that gives the possibility to eligible students to finance university, masters 'studies or post-diploma courses. This loan is very flexible, it fits a wide range of specific needs, and it is easy to get. In the following table, some key characteristics of "Per Merito" are illustrated:

Maximum Balance	50.000,00 €
Minimum Balance	2.000,00 €
Maximum Loan-term length (in months)	360
Minimum Loan-term length (in months)	6
Maximum Pre-amortization length (in months)	48
Interest rate (Loan-term length ≤ 10 Years)	EURIRS 10Years + 1,30%
Interest rate (Loan-term length > 10 Years)	EURIRS 15Years+ 1,50%
Interest Rate (Pre-amortization)	Same as Interest rate
Default Rate	Interest Rate + 2,00%
Disbursement	Every 6m - max x10
Amortization	French
Installment	Monthly

Table 1: The data represented in the table is retrieved from "Foglio Informativo n. 429/141 – Finanziamento "per Merito" (Atenei/Enti Garanti)" updated the 01.04.2022 available on the Intesa Sanpaolo website.

The maximum balance is set at € 50.000 and the minimum balance at € 2.000. Those are respectively the maximum and minimum amounts of money a student asking the for the "per Merito" loan can borrow. The maximum balance allowed by the bank varies according to several factors: the first factor that affects the maximum balance available is the type of partnership the

bank and the university or entity has. If the University has a partnership with Intesa Sanpaolo for this loan, it is considered an "Ente Garante" and the data on the table above applies. This is the case we are going to consider for our analysis. Instead, if the University/entity is not a partner, it is considered an "Ente non Garante" and completely different procedures are followed. The other two factors that influence the latter are the type of degree/course the student applies for and whether the student is studying in his hometown (Studente in Sede) or not (Studente fuori Sede). The disbursement of the maximum allowed balance, is made according to a precise scheme: the total amount is divided according to the years of study (i.e., the necessary years to obtain the degree), it is disbursed every 6 months and a maximum of 10 payments is allowed. For example, let's assume that we take a €50.000 loan and the period of studies lasts 5 years (60 months). The disbursement plan will, then, feature n. 10 payments of €5.000, one every 6 months. The disbursement of each tranche is allowed if and only if the student has reached the minimum academic achievements set by the bank in the loan contract. The personal loan term length – the amount of time in which the borrower needs to pay back all the outstanding debt – can vary and is upon the student to choose it. The maximum loan-term length allowed by Intesa Sanpaolo is set at 360 months (30 Years) and the minimum at 6 months. As for the maximum balance, also the length of the loans' term can depend on the type of partnership, but, in most of the cases, it is upon the student to choose the preferred loan-term lenght, having the opportunity to know upfront the installment amount. The latter is a very important factor that needs to be chosen carefully, because it directly influences the interest rate charged on the loan. If the personal loan-term lenght does not exceed 10 years (respectively 120 months), then the interest rate is going to be calculated taking into account the EURIRS 10 Years plus a spread of 1,30%. Otherwise, if it is bigger than 10 years, the interest rate is going to be the sum of the EURIRS 15 years and a spread of 1,50%. Therefore, if the loan-term lenght chosen by the student exceeds 10 years, the interest rate will result higher, increasing the overall Present Value (PV) of the loan. To calculate the interest rate, Intesa Sanpaolo uses the EURIRS – rate for transactions in euros of "Interest Rate Swap" against the 6 months Euribor observed on the Reuters platform at 11 am Frankfurt time (alternatively on Bridge Telerate at the same London time if it is not available on Reuters) – observed the penultimate working day of June prior to the signing of the loan contract. The interest rate is fixed and stays constant throughout all the loan-term of the loan. It is moreover used to calculate the interests on the pre-amortization period. Indeed, it is possible to ask for a pre-amortization period before starting the reimbursement of the loan. Over such period no capital nor interest payments must be made, and the lenght cannot exceed 48 months. In the latter period, interests on the outstanding debt are calculated and added to the first installment of the amortization plan. The amortization plan is calculated using a French amortization scheme and

features monthly payments. In case of default – no payment or late payment of one installment – a default rate is applied, calculated with the interest rate plus a spread of 2,00%.

We are now going to analyze the "per Merito" loan by calculating its amortization plan, to see how the present value of such loan can be reduced. We set the amount borrowed at €50.000 (the maximum balance allowed, spread over 5 years of study), the loan term lenght at 10 years, the pre-amortization period at 24 months and an interest rate at 1,43% (calculated taking into consideration the EURIRS 10 years for the last working day of June 2021 of 0,13% plus 1,30% spread). No defaults are taken into consideration.

T	C	Ci	Cd	D
0				5.000,00 €
3	- €	17,88 €	- €	5.000,00 €
6	- €	17,88 €	- €	10.000,00 €
9	- €	35,75 €	- €	10.000,00 €
12	107,25 €	35,75 €	- €	15.000,00 €
15	- €	53,63 €	- €	15.000,00 €
18	- €	53,63 €	- €	20.000,00 €
21	- €	71,50 €	- €	20.000,00 €
24	250,25 €	71,50 €	- €	25.000,00 €
27	- €	89,38 €	- €	25.000,00 €
30	- €	89,38 €	- €	30.000,00 €
33	- €	107,25 €	- €	30.000,00 €
36	393,25 €	107,25 €	- €	35.000,00 €
39	- €	125,13 €	- €	35.000,00 €
42	- €	125,13 €	- €	40.000,00 €
45	- €	143,00 €	- €	40.000,00 €
48	536,25 €	143,00 €	- €	45.000,00 €
51	- €	160,88 €	- €	45.000,00 €
54	- €	160,88 €	- €	50.000,00 €
57	- €	178,75 €	- €	50.000,00 €
60	679,25 €	178,75 €	- €	50.000,00 €
12m		715,00 €	- €	50.000,00 €
24m		715,00 €	- €	50.000,00 €
36m	- €	- €	- €	50.000,00 €
48m	- €	- €	- €	50.000,00 €
1	1.877,42 €	59,58 €	1.817,83 €	48.182,17 €
2	447,42 €	57,42 €	390,00 €	47.792,17 €
3	447,42 €	56,95 €	390,46 €	47.401,70 €
4	447,42 €	56,49 €	390,93 €	47.010,78 €
5	447,42 €	56,02 €	391,39 €	46.619,38 €
6	447,42 €	55,55 €	391,86 €	46.227,52 €

Table 2: Amortization table for the "per Merito" loan.

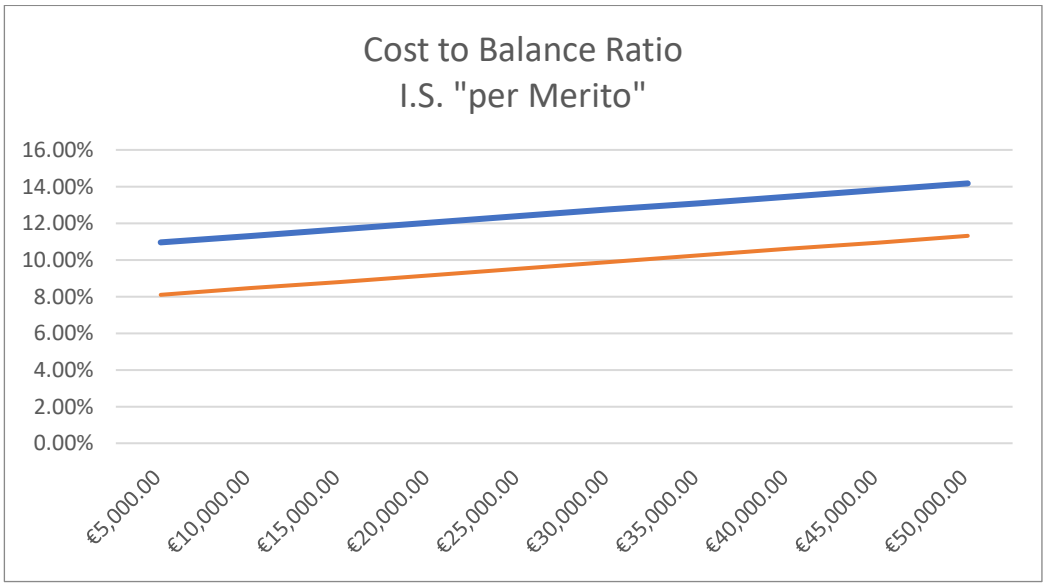
In Table 2 the disbursement, pre-amortization and the first 6 months of the amortization plan are shown. T represent the time (in months); C represents the installments; Ci and Cd are respectively the interests and the debt paid in each installment. D is the outstanding debt (at time T).
Table 2 can be divided into three main sections: the first section, from month 0 to month 60, represents the disbursement period; time in which the 10 loan tranches are disbursed. The second section, going from T=12m to T=48m features the pre-amortization period; while the third section, (months 1,2,3,4,5,6) the first 6 months of the amortization period. In the disbursement period, each of the 10 trances of €5.000 is made available to the student every 6 month, staring in month 0, as shown in column D. Meanwhile, interests on the outstanding debt Ci are calculated at the fixed annual rate of 1,43% quarterly compounded. In our analysis we assume the outstanding debt to be equal to the maximum available balance at each time. The interests due are deducted annually from the loan maximum available balance. In fact, we can see from Table 1 that the interests are calculated every 3 months but are due every 12 months (at time T 12,24,36,48 and 60). The interests of the pre-amortization period are calculated annually at the same fixed rate as before (1,43%) and are going to be paid together with the first installment. In fact, in the amortization plan, in month 1 the installment paid C is €1877,42 (€715,00 + €715,00 + €447,42). In the third section, the monthly installment C is equal to €447,20. The interests Ci are calculated dividing the annual interest rate by 12 (since monthly installments) and multiplied by the outstanding debt D at time T-1. Being a French amortization scheme, we can observe how interest paid in each installment Ci decreases as the balance D decreases and the capital payments Cd increases (intuitively Cd=C-Ci).

Initial Debt	50.000,00 €
Interest Rate	1,43%
Disbursement Interests	1.966,25 €
Pre-amortization period (in months)	24
Pre-Amortization Interests	1.430,00 €
Loan-term lenght (in months)	120
Installment	-447,42 €
Amortization Interests	3.689,91 €

Tot. Interests	7.086,16 €
Tot. Ci+Cd	57.086,16 €

Table 3: overall costs of the "per Merito" loan.

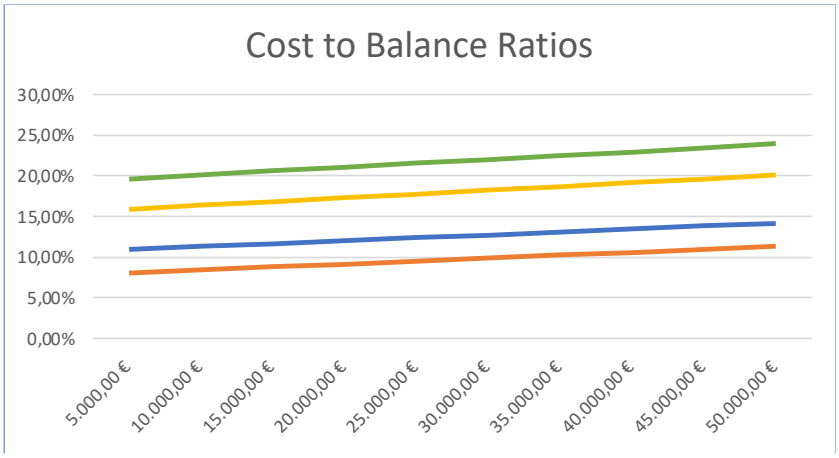
In Table 3 we have a brief recap of the parameters previously set and total costs of the loans' disbursement, pre-amortization, and amortization period. The total interest paid in the three faces are €7.086,16 where €1.966,25 are interest paid during the disbursement period (27,75% of all interests paid); €1.430,00 are pre-amortization interests (20,18% of all interest paid) and €3.689,91 are interest paid during the amortization of the loan (52,07% of all interest paid). The total amount paid that is the total interests Ci plus the capital Cd is €57.086,16. From these results we can clearly see that the impact of the interest paid during the pre-amortization is relevant and needs to be better analyzed to find a strategy to reduce the total present value of the loan. Hence, we are now going to look at the cost-to-balance ratio of the loan, with and without the pre-amortization period.



Graph 1: Cost balance ratio of the "per Merito" loan with 10 years loan-term length and with/without pre-amortization

In Graph 1, two lines are represented: the blue line shows the cost to balance ratio of the loan with 24 months pre-amortization; while the orange line the same loan with no pre-amortization period. On the X-axis we have the loan balances from € 5.000 to €50.000 with intervals of €5.000. On the Y-axis the value of the cost to balance ratio is shown. It has been obtained by calculating the costs with pre-amortization period (for the blue line) or without (for the orange line) of the loan with the 10 different balances and then divided by the original balance, obtaining the cost to balance ratio for

each of the loans' balances. As we can clearly notice from Graph 1, the cost to balance ratio increases linearly with the balance: it goes from 8,09% (for €5.000) to 11,31% (for €50.000) for the loan without the pre-amortization period and from 10,95% (for €5.000) to 14,17% (for €50.000) for the loan with the amortization-period. The latter denotes increased costs over the one without the pre-amortization period by 2,86% and this delta remains constant for all the loan balances. This trend stays unchanged also with bigger loan-term lenghts, as shown in Graph 2.

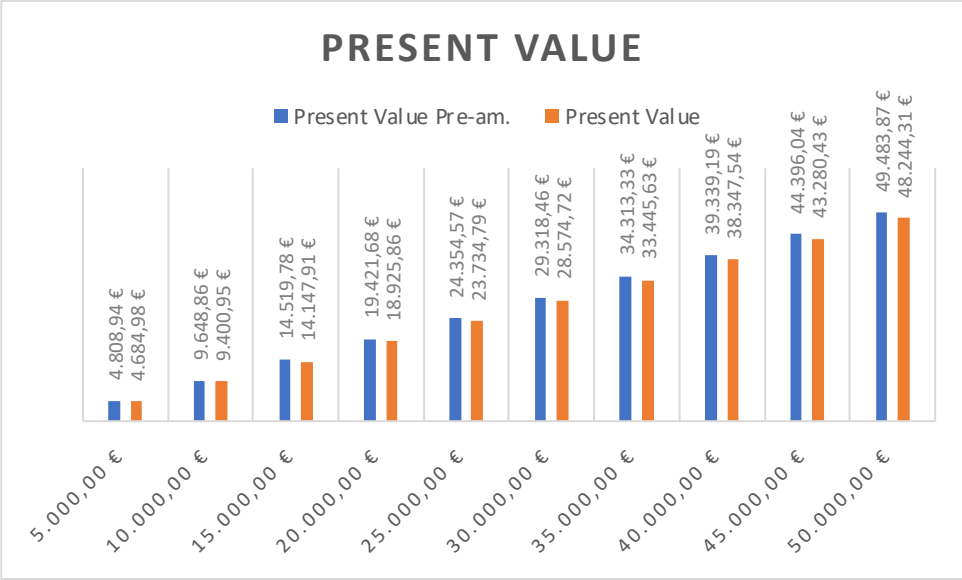


Graph 2: cost to balance ratios of loan terms of 10 and 15 years with and without pre-amortization period.

In graph 2, four lines are represented: the blue and the orange lines are specular to Graph 1 (respectively the cost to balance ratios with 10 years loan-term length with and without the pre-amortization period); the yellow line shows the cost to balance ratio of the 15-year loan without the pre-amortization period; the green the same loan-term length as the latter but with the 24 months pre-amortization period. As on graph 1, on the X-axis we have the loan balances from € 5.000 to €50.000 with intervals of €5.000 and on the Y-axis the value of the cost to balance ratio, the latter being calculated as previously illustrated for graph 1. When the loan-term lenght increases over 10 years, the interest rate rises and thus affects negatively the overall costs associated to the loan. This is the case with and without the pre-amortization period. We can clearly see this phenomenon comparing the orange and yellow line: both do not take into consideration the pre-amortization period, but only the increase in interest rate, from 1,43% to 1,89%. The cost to balance ratio in this case increases of 7,77%, for the balance of €5.000, up to 8,81% (for €50.000). The same trend holds in the case of pre-amortization, with a delta between the 10- and 15-years loan-term lengths from 8,70% (for €5.000) up to 9,73% (for €50.000), significantly higher compared to the previous case. Furthermore, we can observe how the lines from the 15 years loan-term length are steeper compared to the lines of the 10-year loan-term length. Perhaps the difference of the cost to balance ratios of the extremes of the balances (€5.000 and €50.000) is consistently smaller for loan-term

lengths below or equal to 10 years (being 3,22%) and increases with the 15 years loan-term length (being 4,5%). Therefore, choosing a smaller loan-term length result in a smaller difference in cost-to balance-ratios across all balances.

However, this is an indicator that does not take into account several factors such as the dates in which the loan is disbursed, the inflation rate or other compounded interest rate the student would earn. To overcome this issue and obtain more accurate results, we must take into consideration the present value of such loan in the two different scenarios (with and without pre-amortization) at the end of the period (i.e. at the end of the amortization of the loan).



Graph 3: Present Value for the "per Merito" loan with loan-term length of 10 years, with and without pre-amortization period.

In Graph 3, the present value of the "per Merito" loan is represented for each of the 10 balances (from €5.000 to €50.000 with intervals of €5.000). We take into consideration a loan-term length of 10 years, since it yields lower costs, and the aim of our analysis is to investigate the effects of the pre-amortization period. In blue, the values for the loan with a 24-month pre-amortization period are shown, while in orange, the latter loan without the pre-amortization period. From the graph, we can observe how the trend previously established with the cost-to-balance ratio analysis holds, since for every of the loan balances, the present value is grater for the loan with the pre-amortization period. However, we can notice how the difference between the two is minor compared to the cost-to-balance ratio analysis, especially for small balances (€123,96 for the balance €5.000,00). Meanwhile, for bigger balances, the present value delta between the two scenarios tends to be bigger (€1.239,56 for the balance €50.000,00) because it tends to have a higher increase for the loan

with a pre-amortization period. Thus, analyzing the present values of the "per Merito" loan, we can confirm that a pre-amortization period, results in higher present values, and hence should be avoided.

In conclusion, to lower the overall cost and the present value of the "per Merito" loan, the student should opt for loan-term lengths smaller or equal to 10 years. This allows the student to face lower interest rates, bearing slightly higher installments. It is important to remark that the interest rate has a big impact on the overall present value of the loan since it is used to calculate not only interests for the amortization plan but also interest during the disbursement period and the pre-amortization period that together account for just less than 50% of the overall interests of the loan. Moreover, students should try to avoid taking a pre-amortization period or choose it as small as possible given its big impact on the overall loan present value especially for large balances.

2.2 BNL "Futuriamo" Student Loan Analysis

In this section, we will analyze the student loan offered by BNL, called "Futuriamo". It presents different characteristics from the Intesa Sanpaolo's loan previously analyzed, as we shall see from the following table:

Maximum Balance	70.000,00 €
Minimum Balance	5.000,00 €
Maximum Loan-term length (in months)	6
Minimum Loan-term length (in months)	120
Maximum Pre-amortization period (in months)	36
Interest rate	2,00%
Interest Rate (Pre-amortization)	Same as Interest rate
Default Rate	Interest rate + 2 b.p.
Imposta Sostitutiva	0,25%
Disbursement	At T0 100% Balance
Amortization	French
Installment	Monthly

Table 4: The data represented in the table is retrieved from "Informazioni Europee di Base sul Credito ai Consumatori" available on the BNL website valid until 31-06-2022.

The maximum balance is set at € 70.000 and the minimum balance at € 5.000, both higher compared to Intesa Sanpaolo "per Merito" loan. The maximum balance allowed by the bank varies, and it is specific for each student. BNL allows students to borrow money only for certain types of expenses, including University fees (Bachelor, Masters and MBA), language courses, Erasmus programs, books and PCs/Tablets and for students not studying in their hometown, living and transportation expenses. All these can be financed through the "Futuriamo" loan if incurred in the 12 months prior or after the stipulation of such loan and needs to be proven by documentation. The total maximum balance allowed by BNL is the sum of all these expenses. The disbursement of the maximum allowed balance, unlike in the "per Merito" loan, is made in one tranche at the beginning of the period. The loan-term length can vary, and it is upon the student to choose it. The maximum allowed by BNL is set at 120 months (10 Years) and the minimum at 6 months. The reimbursement of such loan starts right after the amount is disbursed. It is indeed possible to benefit from a pre-amortization period where only interest payments are due, to delay capital payments, reducing the installment amount. The latter can last no longer than 36 months. Unlike in "per Merito", during such period, it is not possible not to have any payments of interests. Those are calculated annually on the outstanding debt. Within the total loan term of the "Futuriamo" loan, all the capital needs to be repaid together with interests. The pre-amortization period won't be added to the maximum loan-term length of 120 months but will have to be calculated in it. For example, if we take a 24-month pre-amortization period, the amortization will last (120-24) 96 months. Therefore, choosing a pre-amortization period decreases the amortization length, significantly increasing the installment amount. The interest rate charged during the pre-amortization and amortization periods coincides. It is set by BNL, and it is a fixed rate. The amortization plan is calculated using a French amortization scheme and features monthly payments. In case of default – no payment or late payment of one installment – a default rate is applied, calculated adding to the interest rate a spread of 2 basis points. Moreover, on the initial balance, the "Imposta Sostitutiva" tax is calculated, being 0,25%.

We are now going to analyze the "Futuriamo" loan by calculating its amortization table using for each parameter the same value used for the "per Merito" loan analysis, in order to have a direct comparison between the two. We set the balance at € 50,000, the pre-amortization period at 24 months and the loan-term length at 10 years. The interest rate used for our calculations is the one currently set by BNL for this loan, being equal to 2,00% (fixed and monthly compounded). No defaults are taken into consideration.

T	C	Ci	Cd	D
0				50.125,00 €
1	83,54 €	83,54 €	- €	50.125,00 €
2	83,54 €	83,54 €	- €	50.125,00 €
3	83,54 €	83,54 €	- €	50.125,00 €
4	83,54 €	83,54 €	- €	50.125,00 €
5	83,54 €	83,54 €	- €	50.125,00 €
6	83,54 €	83,54 €	- €	50.125,00 €
…				
18	83,54 €	83,54 €	- €	50.125,00 €
19	83,54 €	83,54 €	- €	50.125,00 €
20	83,54 €	83,54 €	- €	50.125,00 €
21	83,54 €	83,54 €	- €	50.125,00 €
22	83,54 €	83,54 €	- €	50.125,00 €
23	83,54 €	83,54 €	- €	50.125,00 €
24	83,54 €	83,54 €	- €	50.125,00 €
Amortization				
0	- €	- €	- €	50.125,00 €
1	565,45 €	83,54 €	481,91 €	49.643,09 €
2	565,45 €	82,74 €	482,72 €	49.160,37 €
3	565,45 €	81,93 €	483,52 €	48.676,85 €
4	565,45 €	81,13 €	484,33 €	48.192,53 €
5	565,45 €	80,32 €	485,13 €	47.707,39 €
6	565,45 €	79,51 €	485,94 €	47.221,45 €

Table 5: Amortization table for the "Futuriamo" loan.

In Table 5, the first and last 6 months of pre-amortization and the first 6 months of the amortization plan are shown. T represent the time (in months); C represents the installments; Ci and Cd are respectively the interests and the debt paid in each installment. D is the outstanding debt (at time T). Table 5 can be divided into two main sections: the first section, from month 0-6 to month 18-24, represents the first 6 and last 6 months of the pre-amortization period; while the second section, (months 0,1,2,3,4,5,6) the first 6 months of the amortization period. The disbursement of the total maximum balance (€50,000) is made available to the student in month 0. On the maximum balance, the "Imposta Sostitutiva" is calculated, multiplying 0,25% for the total balance, (€50,000*0,25%) that is equal to €50.125,00. On this amount, interests during the pre-amortization of the loan are calculated at the fixed yearly interest rate of 2.00% monthly compounded. During the latter period, only interest payments (Ci) are due monthly, being €83,54. Since no capital payments are made, we can see how the outstanding debt D remains unchanged during the pre-amortization period, and thus also interest payments Ci features the same amount throughout this period. In this case, since we are

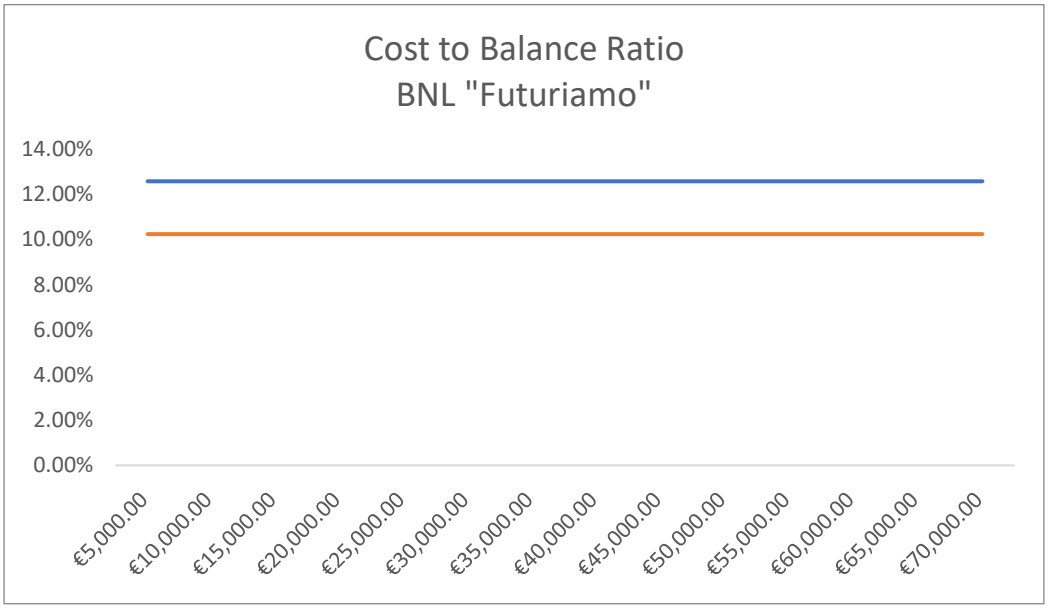
considering a pre-amortization period of 24 months, the amortization period will last 96 months (120-24), as previously explained. The monthly installment C amounts to €565,45. Since the loan follows the French scheme, installments are fixed, while interests payments Ci decreases as the balance D decreases and capital Cd increases. The interests Ci are obtained by dividing the annual interest rate by 12 (since monthly installments) and multiplied by the outstanding debt D at time T-1. The capital payments Cd are thus the difference between the amount of the installment C and the interest Ci.

Initial Debt	50.000,00 €
"Imposta Sostitutiva" tax	0,25%
Tot. with tax	50.125,00 €
Interest Rate	2,00%
Pre-amortization period (in months)	24
Pre-Amortization Interests	2.005,00 €
Pre-amortization Installment	83,54 €
Amortization Duration (in months)	96
Interessi Amm.	4.158,56 €
Rata Amm	-565,45 €
Tot. Interessi	6.288,56 €
Tot. Ci+Cd	56.288,56 €

Table 6: overall costs of the "Futuriamo" loan.

In Table 6 we have a brief recap of the parameters previously set, the installment amounts and the total costs for the pre-amortization and amortization period. The total costs of the loan are the outcome of the sum of the interests paid during the pre-amortization and amortization of the loan and of the "Imposta Sostitutiva" tax. They amount to €56.288,56. Interests paid in the two phases sum to €6.288,56 where €2.005,00 are pre-amortization interests and account for 31,88% of all interests and €4.158,56 are amortization interests (66,13% of all interest paid). The "Imposta Sostitutiva" tax is €125,00 being only the 1,99% of all interests. For the "Futuriamo" loan, like for the "per Merito" loan, we can notice how the interests paid during the pre-amortization period have a consistent impact on the total cost of the loan. We'll thus further analyze the pre-amortization period costs, to better understand its impact on the Present Value of the loan and to find a strategy

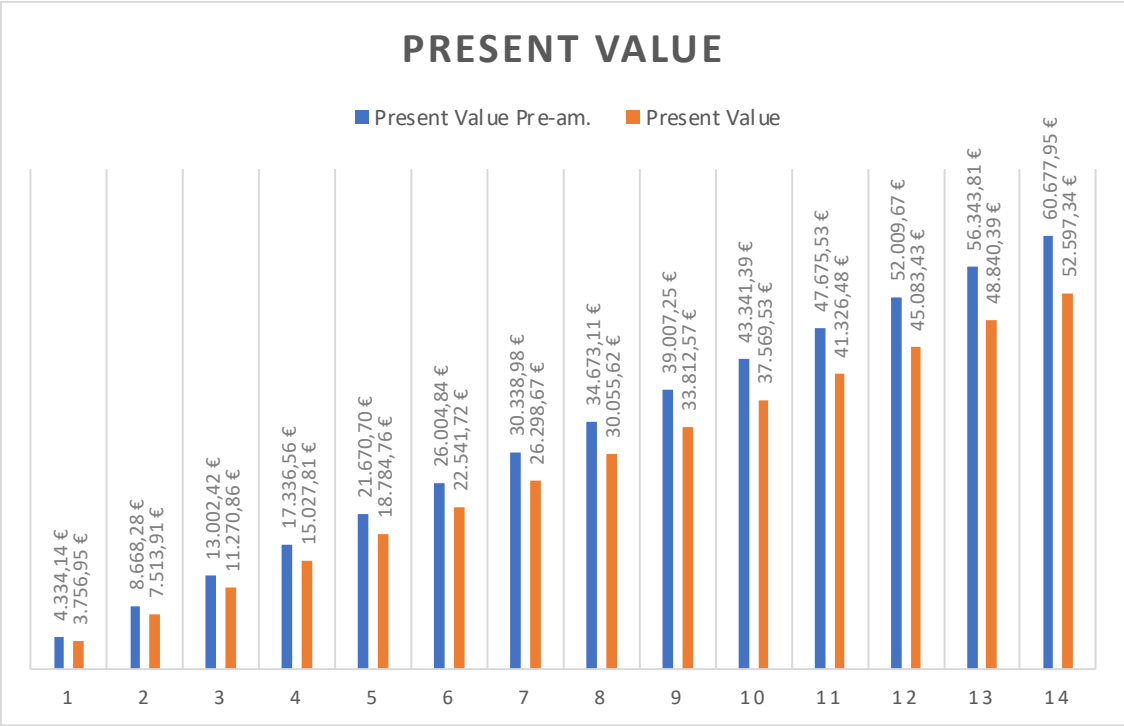
to reduce the latter. Hence, we are now going to look at the cost-to-balance ratio, with and without the pre-amortization period:



Graph 4: Cost balance ratio of the "Futuriamo" loan with 10 years loan-term lenght with/without pre-amortization

Graph 4 features two lines: the upper blue one shows the cost to balance ratio of the loan with 24 months of pre-amortization; while the bottom orange line the same loan with no pre-amortization period. On the X-axis we have the loan balances from € 5.000 to €70.000. We take into consideration balances with intervals of €5.000. On the Y-axis the value of the cost to balance ratio is shown. It has been obtained following the same procedure as in the analysis of the "per Merito" loan, by calculating the total interests with pre-amortization period (for the blue line) or without (for the orange line) of the loan with the 14 different balances and then divided by the original balance, obtaining the cost to balance ratio for each of the loans' balances. We can observe how both lines are flat, meaning that the cost-to-balance ratio remain unchanged for all balances. This happens because unlike in the "per Merito" loan, the entire loan balance is made available to the student immediately (at T0). This implies that there aren't any disbursement interests that, in "per Merito" loan, increased with the balance, accounted for 27,75% of the total interest due and directly impacted the cost-to-balance ratios. For the "Futuriamo" loan without pre-amortization it is 10,24%, while if we take a pre-amortization period of 24 months, it rises to 12,58%. Hence, taking a pre-amortization period of 24 months increases the overall costs of the loan of 2,34%. This trend stays unchanged also with smaller (12 months) or larger (36 months) pre-amortization periods.

However, to be even more precise and to give a concrete example of the real difference in costs between the loan with and without pre-amortization period, we must take into consideration the Present Value of the loan in the two cases. By calculating the P.V. we obtain today's value of a certain sum of money in contrast to its future value if it was invested at a compound interest rate.



Graph 5: Cost balance ratio of the "Futuriamo" loan with 10 years loan-term lenght and with/without pre-amortization

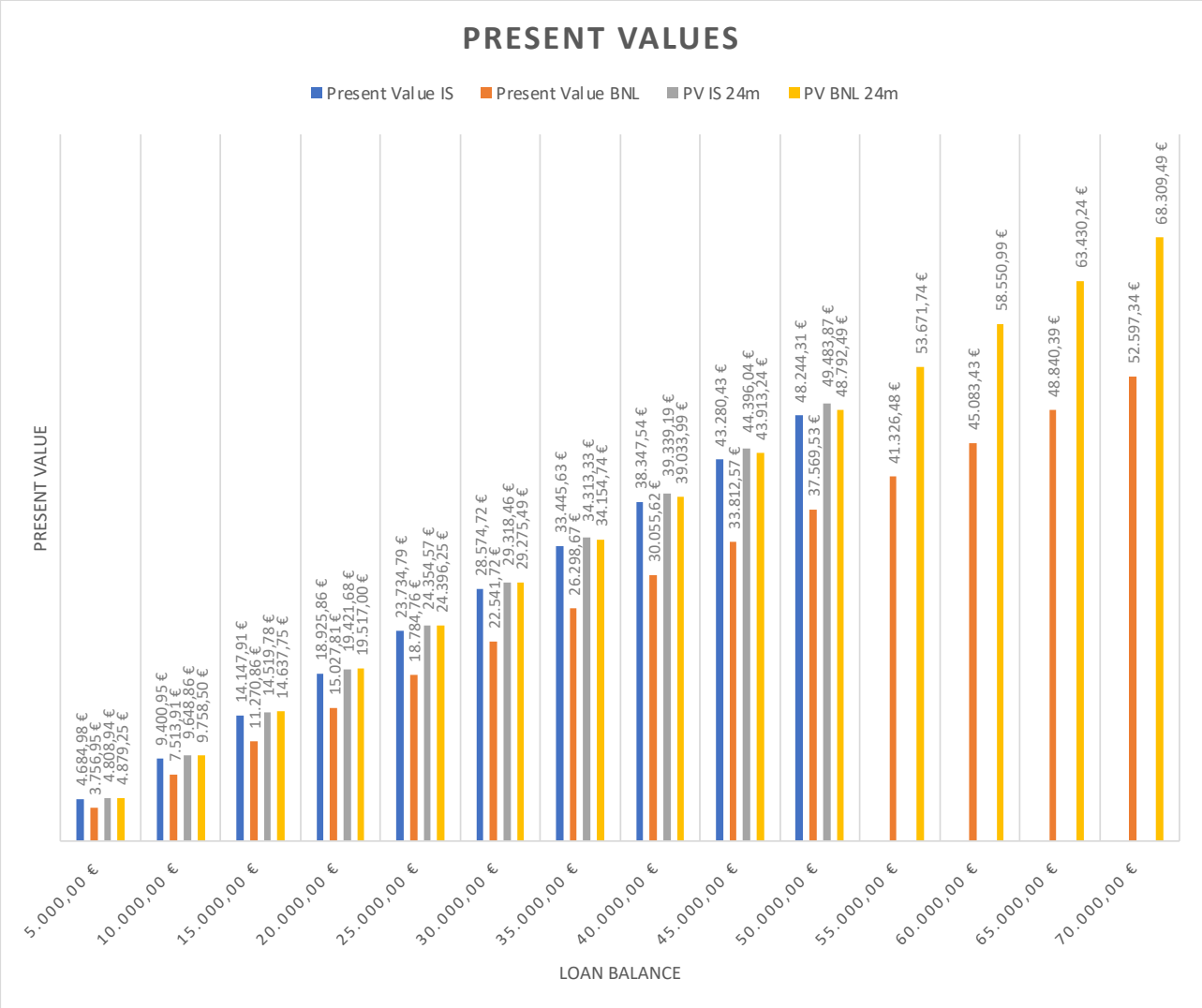
In Graph 5, the Present Value for all the 14 different loan balances (1 is €5.000,00 ; 14 is €70.000,00) is shown. In blue, we have the PV for the "Futuriamo" loan with a pre-amortization period of 24 months, while in orange the same loan but without a pre-amortization period. In both cases, we can observe a constant increase of the P.V. from smaller to bigger balances. However, it faces a sharper increase in the case in which we consider the pre amortization period. Numerically, this is proven by the difference of the smallest and the largest balances Present Values. With the pre-amortization period, the increase is € 56.343,81; while without it, is € 48.840,39. The most important distinction to capture, is that the Present Value for each balance in case of a pre-amortization period, is consistently higher for each of the 14 loan balances. This result gives proof that taking the pre-amortization period increases costs and the overall Present Value of the loan.

Hence, to pursue a cost minimizing strategy, students should avoid taking a pre-amortization period. Alternatively, if the student needs it, it should take it as small as possible, hence reducing as much as possible the loans' PV. A possible alternative strategy to do so, could be to take the

"Futuriamo" loan 12 months after having paid the first University fees, thus reducing the pre-amortization period and the Present Value of such loan.

2.3 A Direct Comparison Between "per Merito" and "Futuriamo"

In the two analyses above, we have seen which is the cost minimizing strategy for both the "per Merito" and the "Futuriamo" loan. In this section we will compare them directly, to see which loan is convenient for a student for every balance amount, from €5.000,00 to €50.000,00. We will start by analyzing the present values of the two loans together, both with and without a pre-amortization period.



Graph 6: Present Values (vertical axis) of the "Futuriamo" and "per Merito" loans with 10 years loan-term lenght and with/without pre-amortization for each of the 14 balances (horizontal axis)

In Graph 6, the present values of the two loans with and without the 24-month pre-amortization period are shown. We will start by comparing first the "per Merito" loan (Blue lines) and the

"Futuriamo" loan (Orange lines) without the pre-amortization period. It is immediately noticeable that the present value of the BNL loan is consistently lower for all the balances and the delta between the two tends to increase together with the loan balance: for €5.000,00 the delta is €928,03 while for €50.000,00 is €10,674,78. Hence, if a student does not need to take a pre-amortization period, the loan that has the lowest present value for all balances i.e. the smaller costs, is the "Futuriamo" loan. Comparing the two loans with the 24-month pre-amortization period (in yellow we have BNL "Futuriamo" and in gray "per Merito") we obtain very interesting results: for small balances, going from €5.000,00 to balances up to €25.000,00, the Intesa Sanpaolo loan features smaller present values, while for loan balances bigger than €25.000,00 "Futuriamo" shows smaller present values. The present value for the latter loan, tends to have a slightly sharper increase, however, the delta between the two is very small for all the balances, the biggest being €691,38 for the balance of €50.000,00. Therefore, in case of a pre-amortization period of 24 months, if the balance needed by the student is smaller than €30.000,00 is cheaper to take the "per Merito" loan, while for balances equal or higher, the BNL loan should be chosen.

However, the significant difference between the two loans present values, is given by the fact that Intesa Sanpaolo charges interest to the student during the disbursement of the loan, raising overall costs and making the period for which money are borrowed longer, while BNL doesn't consider any disbursement period. For this reason, it is very unlikely that a student taking the "Futuriamo" loan is able to study and at the same time repay such loan. Thus, taking a pre-amortization period is necessary in most of the cases for the BNL loan, while it is not for "per Merito". Hence, taking the "per Merito" loan without a pre-amortization period (Blue lines), can be compared to the "Futuriamo" loan with a pre-amortization period of 24 months (Yellow lines). This is because both presents exclusively interest payments during the disbursement for "perMerito" and during the pre-amortization period for "Futuriamo". From Graph 6, we can observe that the Present Values for the Intesa Sanpaolo loan are smaller for all balances. The delta is small, but significant to conclude that at paribus conditions, the "per Merito" loan has smaller present value i.e. smaller costs compared to "Futuriamo". This is also confirmed by the Future value of both loans:

Costants: Duration is set at 10 years, pre-amortization period at 0 months(per Merito)/24 months (Futuriamo)										
Initial Loan Balance	**5.000,00 €**	**10.000,00 €**	**15.000,00 €**	**20.000,00 €**	**25.000,00 €**	**30.000,00 €**	**35.000,00 €**	**40.000,00 €**	**45.000,00 €**	**50.000,00 €**
Future Value IS	5.404,74 €	10.845,23 €	16.321,47 €	21.833,46 €	27.381,21 €	32.964,70 €	38.583,94 €	44.238,93 €	49.929,67 €	55.656,16 €
Future Value BNL	5.628,86 €	11.257,71 €	16.886,57 €	22.515,42 €	28.144,28 €	33.773,13 €	39.401,99 €	45.030,85 €	50.659,70 €	56.288,56 €

Table 7: Future value for the 10 loan initial balances for the "per Merito" loan without pre-amortization and for the "Futuriamo" loan with pre-amortization.

Furthermore the “Futuriamo” loan features significantly higher installments than “per Merito” at paribus conditions. Other factors that must be taken into consideration for our analysis are non-numerical. The “per Merito” loan is more flexible, allows students to change the amortization plan one time without paying any fines to Intesa Sanpaolo. Capital payments to lower the outstanding debt are free of charge of any interests and can be made at any time. Moreover, in case of an “Ente Garante”, the student is able to take the loan without any guarantee, since the university will do so for him. Instead, BNL, asks for the student parents’ signature, to have a guarantee in case of default. This could result in a limit of the ability of the parents to take further financing from banks. Furthermore, selection criterion to take the “Futuriamo” loan are stricter, and some students could not be able to take such loan.

3. Effects of Student Loans

While student loans have the potential to increase access to higher education, research over the last decade has revealed significant drawbacks. Higher student loan balances have been found to reduce home ownership (Mezza et al., 2019), inhibit entrepreneurship (Krishnan and Wang, 2019) and public sector employment (Rothstein and Rouse, 2011). Moreover, students facing high debts tend to delay marriage (Gicheva, 2016), postpone parenthood (Shao, 2015) and enrollment in graduate or professional degrees (Malcom and Dowd, 2012; Zhang, 2013), and increase cohabitation with parents (Malcom and Dowd, 2012; Zhang (Bleemer et al., 2014; Dettling and Hsu, 2018). The relationship between student loans and tuition also deserves some attention: Lucca et al. (2018) find that an increase in the subsidized loan maximum leads to a 60-cent increase in tuition fees price, that becomes stickier, implying that colleges are the ones benefitting from a large portion of government loan subsidies rather than students. This phenomenon is called the "Bennett hypothesis," named after William Bennet, the Secretary of Education who, in 1987, publicly formulated the link between student loan availability and tuition fees. In this section we are going to focus on the main demerits brought by student loans and analyze effects on graduate school attendance and program choice, borrower’s propensity to entrepreneurship and default on student loans.

3.1 Effects on Graduate School Attendance and Program Choice

High debt balances could lead borrowers to take poor decisions about their future, on schooling, career paths, and family formation (Lei Zhang, 2010). Public concerns about such influence of educational debt on the latter decisions have been recently growing. The main cause for such influence is related to economic factors and can be explained by the utility maximization model according to which educational debt should have no effect on individuals' future decisions and on prices faced by individuals (interest rate). It should only impact the income (income effect). Instead, these big debt balances have been found from Lei Zheng (2010) to have relevant impact for two main reasons: Credit Constraint is considered the first of these reasons. That is because occurred borrowing, makes more difficult to take further debt, raising the overall costs (since higher interests are charged) or obliging to borrow smaller balances (with same interest rate charged), reducing the willingness of borrowers to take further debt (Cameron and Taber, 2004). The second relevant factor is the debt aversion of individuals (Field, 2009) that could lower their utility. The study conducted by Lei Zhang (2010) finds that educational debt has significant effects on the graduate-school decision. Is thus proven that for students with a bachelor's degree, received from public colleges (that yield higher loan balances) a $1.000,00 increase in the overall college debt decreases graduate school attendance by 2.7 percentage points. This effect is more consistent with more expensive programs such as PHDs, MBAs and professional degrees. Instead, for private education students, debt does not have an effect graduate-school attendance and yields a positive effect for MBAs and professional degrees attendance. But what is interesting, is that the debt is found to have an impact only on the decision-making process of the student, but not on the persistence i.e. the ability of the student to study once enrolled in graduate school. Moreover, educational debt, is found not to have any impact on early career choices (1-2 years after graduation) of both private and public bachelor's students nor on the formation of a family. However, more recent studies by Gicheva (2016) found that there is a propensity of students facing high educational debts, to postpone marriage and thus family formation.

3.2 Effects on the Borrowers' Propensity for Entrepreneurship

Recent studies conducted by Karthik Krishnan and Pinshuo Wang (2017), find that high education debt balances can hinder entrepreneurship. That is because educational debt and the possibility of starting-up a business, are found to be two factors that are negatively correlated. Nevertheless, this negative relationship lasts no longer when the start-up is successful. It is due to several factors, among which entrepreneurs with high debt balances have a bigger propensity to default on their educational debt when starting up a small business. Moreover, there is a negative correlation

between the latter and the propensity to start large firms. Other factors instead, suggests the opposite outcome, such as family wealth and startup financial constraints. Students coming from wealthy families, are more inclined towards starting up a business, and present a reduced propensity to default or incur in additional debt. Family wealth helps to collateralize business loans and ease the access to the latter. Financial constraints to start up a business, in most cases, apart from some specific online businesses, are a determinant factor, because large amount of financing is needed to fund a start-up venture. However, borrowers facing high educational debt, are as likely to be tuned down for business credit, as individuals with no educational debt. But "Evidence indicates that student debt may inhibit entrepreneurship by exacerbating the effect of negative business outcomes on the individual" according to Karthik Krishnan and Pinshuo Wang (2017). As previously mentioned on our analysis on American student loans, the burden of student debt is very significant in the United States, being over $ 1.4 Trillion. Given the main findings of Karthik Krishnan and Pinshuo Wang (2017) analysis, such phenomena could give rise to some serious problems in the near future. This is because a growing number of students are facing educational debt, resulting in a greater number of borrowers that will be unable to start-up successful big firms, creating significant problems to the U.S. economy. Thus, policymakers should start to pay bigger attention to such phenomena (Karthik Krishnan and Pinshuo Wang, 2017).

3.3 Effects of Default on Student Loans' Borrowers

In the United States, according to the law, default on student loans occurs when the borrower that is reaping the debt, is not capable of meeting its obligations i.e., on-time payment of one installment, for 270 days[2] Students can sometimes try to avoid default through forbearance or deferral, period in which no payments are due, but only interests are calculated[3]. Furthermore, income-based schemes could be a valid alternative to hedge default since no payments are due if the income level is below a certain threshold. Usually, after default, there will be a collecting agency that will oversee resolving the situation. It can do so in many ways: there are "soft" and "hard" exits form default[4]. Rehabilitation and Consolidation are both "soft" exits: in the former, borrowers change the nature of the loan from defaulted to good, by making a number of on-time payments. The latter instead, involves the practice in which the borrower takes a new loan to pay the defaulted one, that is

[2] US Department of Education, Federal Student Aid, "Understanding Delinquency and Default," https://studentaid.ed.gov/sa/repay-loans/default.
[3] US Department of Education, Federal Student Aid, "Deferment and Forebearance," https://studentaid.ed.gov/sa/repay-loans/ deferment-forbearance
[4] Delisle et. Al. "Federal student loan defaults: What happens after borrowers default and why." American Enterprise Institute, 2018. https://www.aei.org/research-products/report/federal-student-loan-defaults-what-happens-after-borrowers-default-and-why/

automatically a good standing loan since new. However, it is possible to redefault on rehabilitated and consolidated loans. The two "hard" exits provide for a full payoff of the loan (all at once or over time, voluntarily or involuntarily) or Discharge. In such rare cases, the borrower is exempted from paying the loan outstanding balance. According to the computations of Delisle et al. (2018) on defaulted loan, 16% followed Consolidation, 39% Rehabilitation, 41% a Full Payoff and 4% have been Discharged. For Italian student loans, something similar holds. In case of insolvency, the bank charges a spread on the missed installment and in case of more than one installment not paid, it can follow a path similar to the American Full Payoff, asking for a certain percentage of the borrowers' wage or fore closuring the borrowers' assets depending on who guaranteed. It can happen, that the bank signals the borrower to the "Centrale Rischi" CRIF as "Cattivo Pagatore" making harder or even denying him access to further financing in the future.

4. Conclusions

Student loans, both in Italy and in the United States, are complex debt contracts with unique covenants. In the U.S., the cost minimizing strategy is of two types: the first one is to make for small loan, (undergraduate and graduate loans) maximum payments ("max" strategy") and should be paid as soon as possible. In case of bigger balances (PLUS loans), the best repayment strategy is to do maximum payments until the critical horizon, and then enroll into an income-based scheme doing minimum payments until the remaining loan balance is forgiven ("max-min" strategy). By contrast, Italian student loans, in particular "per Merito" by Intesa Sanpaolo and "Futuriamo" by BNL, are less complicated and feature easier repayment strategies. For the "per Merito" student loan, the cost minimizing strategy is to opt for loan-term lenghts smaller or equal to 10 years, because they yield lower interest rates. It is important to remark that the interest rate has a big impact on the overall present value of the loan since it is used to calculate not only interests for the amortization plan but also interest during the disbursement period and the pre-amortization period that together account for just less than 50% of the overall interests of the loan. For "Futuriamo", the same holds, hence, to minimize the loans present value we should choose smaller loan-term lenghts that lowers the cost of compounding. Moreover, in both loans, students should try to avoid taking a pre-amortization period, or choose it as small as possible, given its big impact on the overall loan present value especially for large balances. At paribus conditions, Intesa Sanpaolo's "per Merito" loan features slightly smaller present value i.e., lower costs, compared to the "Futuriamo" student loan. Italian banks providing student loans, could start to take more inspiration from American

student loans, including new repayment strategies such as income-based schemes, making it easier for the student to repay educational debt and that could make such products more attractive. Although student loans have the potential to increase access to higher education, authorities should start to oversee and intervene over the growing demand and negative effects caused by it. This necessary to mitigate future drawbacks on society, in particular the growth of the U.S. economic system in the next years.

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Appendix

These tables represent the calculations for the Intesa Sanpaolo “per Merito” loan, and hence the data used for Graphs 1, 2, 3 and 6.

I.S. "per Merito"	Costants: Duration is set at 10 years, pre-amortization period at 0 months									
Loan Balance	**5.000,00 €**	**10.000,00 €**	**15.000,00 €**	**20.000,00 €**	**25.000,00 €**	**30.000,00 €**	**35.000,00 €**	**40.000,00 €**	**45.000,00 €**	**50.000,00 €**
Future Value	5.404,74 €	10.845,23 €	16.321,47 €	21.833,46 €	27.381,21 €	32.964,70 €	38.583,94 €	44.238,93 €	49.929,67 €	55.656,16 €
Cost to Balance Ratio	8,09%	8,45%	8,81%	9,17%	9,52%	9,88%	10,24%	10,60%	10,95%	11,31%
Present Value	4.684,98 €	9.400,95 €	14.147,91 €	18.925,86 €	23.734,79 €	28.574,72 €	33.445,63 €	38.347,54 €	43.280,43 €	48.244,31 €

I.S. "per Merito"	Costants: Duration is set at 10 years, pre-amortization period at 24 months									
Loan Balance	**5.000,00 €**	**10.000,00 €**	**15.000,00 €**	**20.000,00 €**	**25.000,00 €**	**30.000,00 €**	**35.000,00 €**	**40.000,00 €**	**45.000,00 €**	**50.000,00 €**
Future Value	5.547,74 €	11.131,23 €	16.750,47 €	22.405,46 €	28.096,21 €	33.822,70 €	39.584,94 €	45.382,93 €	51.216,67 €	57.086,16 €
Cost to Balance Ratio	10,95%	11,31%	11,67%	12,03%	12,38%	12,74%	13,10%	13,46%	13,81%	14,17%
Present Value	4.808,94 €	9.648,86 €	14.519,78 €	19.421,68 €	24.354,57 €	29.318,46 €	34.313,33 €	39.339,19 €	44.396,04 €	49.483,87 €

I.S. "per Merito"	Costants: Duration is set at 15 years, pre-amortization period at 0 months									
Loan Balance	**5.000,00 €**	**10.000,00 €**	**15.000,00 €**	**20.000,00 €**	**25.000,00 €**	**30.000,00 €**	**35.000,00 €**	**40.000,00 €**	**45.000,00 €**	**50.000,00 €**
Cost to Balance Ratio	15,87%	16,34%	16,81%	17,28%	17,76%	18,23%	18,70%	19,17%	19,65%	20,12%
Future Value	5.793,35 €	11.633,96 €	17.521,81 €	23.456,92 €	29.439,27 €	35.468,87 €	41.545,73 €	47.669,83 €	53.841,19 €	60.059,79 €
Present Value	4.796,37 €	9.631,87 €	14.506,48 €	19.420,21 €	24.373,05 €	29.365,02 €	34.396,11 €	39.466,31 €	44.575,63 €	49.724,08 €

I.S. "per Merito"	Costants: Duration is set at 15 years, pre-amortization period at 24 months									
Loan Balance	**5.000,00 €**	**10.000,00 €**	**15.000,00 €**	**20.000,00 €**	**25.000,00 €**	**30.000,00 €**	**35.000,00 €**	**40.000,00 €**	**45.000,00 €**	**50.000,00 €**
Cost to Balance Ratio	19,65%	20,12%	20,59%	21,06%	21,54%	22,01%	22,48%	22,95%	23,43%	23,90%
Future Value	5.982,35 €	12.011,96 €	18.088,81 €	24.212,92 €	30.384,27 €	36.602,87 €	42.868,73 €	49.181,83 €	55.542,19 €	61.949,79 €
Present Value	4.952,85 €	9.944,82 €	14.975,90 €	20.046,11 €	25.155,43 €	30.303,87 €	35.491,43 €	40.718,11 €	45.983,91 €	51.288,82 €

Calculations for the BNL “Futuriamo” loan follows, used for Graphs 4,5 and 6.

BNL "Futuriamo"	Costants: Total duration is set at 10 years, pre-amortization period at 0 months													
Loan Balance	**5.000,00 €**	**10.000,00 €**	**15.000,00 €**	**20.000,00 €**	**25.000,00 €**	**30.000,00 €**	**35.000,00 €**	**40.000,00 €**	**45.000,00 €**	**50.000,00 €**	**55.000,00 €**	**60.000,00 €**	**65.000,00 €**	**70.000,00 €**
Cost to Balance Ratio	10,24%	10,24%	10,24%	10,24%	10,24%	10,24%	10,24%	10,24%	10,24%	10,24%	10,24%	10,24%	10,24%	10,24%
Future Value	5.511,88 €	11.023,76 €	16.535,63 €	22.047,51 €	27.559,39 €	33.071,27 €	38.583,14 €	44.095,02 €	49.606,90 €	55.118,78 €	60.630,66 €	66.142,53 €	71.654,41 €	77.166,29 €
Present Value	4.777,85 €	9.555,70 €	14.333,55 €	19.111,40 €	23.889,25 €	28.667,10 €	33.444,94 €	38.222,79 €	43.000,64 €	47.778,49 €	52.556,34 €	57.334,19 €	62.112,04 €	66.889,89 €

BNL "Futuriamo"	Costants: Total duration is set at 10 years, pre-amortization period at 24 months													
Loan Balance	**5.000,00 €**	**10.000,00 €**	**15.000,00 €**	**20.000,00 €**	**25.000,00 €**	**30.000,00 €**	**35.000,00 €**	**40.000,00 €**	**45.000,00 €**	**50.000,00 €**	**55.000,00 €**	**60.000,00 €**	**65.000,00 €**	**70.000,00 €**
Cost to Balance Ratio	12,58%	12,58%	12,58%	12,58%	12,58%	12,58%	12,58%	12,58%	12,58%	12,58%	12,58%	12,58%	12,58%	12,58%
Future Value	5.628,86 €	11.257,71 €	16.886,57 €	22.515,42 €	28.144,28 €	33.773,13 €	39.401,99 €	45.030,85 €	50.659,70 €	56.288,56 €	61.917,41 €	67.546,27 €	73.175,13 €	78.803,98 €
Present Value	4.879,25 €	9.758,50 €	14.637,75 €	19.517,00 €	24.396,25 €	29.275,49 €	34.154,74 €	39.033,99 €	43.913,24 €	48.792,49 €	53.671,74 €	58.550,99 €	63.430,24 €	68.309,49 €