University of St. Gallen – School of Management, Economics, Law, Social Sciences, InternationalAffairs and Computer Science

Real Estate Finance and Investments: Assignment 2024

Group 9

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1.1 Calculation of Credit Suisse loan

First, the actual loan value must be calculated. This is done, where you Take the LTV-ratio and multiply it by the Value of the house. The result is the Loan.

750.000 CHF * 0,6 = 450.000 CHF, so the mortgage is 450.000 CHF.

To calculate the annual payment, the following formula is needed:

$$PMT = \frac{PV}{\sum_{t=1}^{n} \frac{1}{(1+r)^t}}$$

In Microsoft Excel this can be calculated with the = PMT function, to show the interest payment and the loan balance at the end of each year:

Loan Value	450.000,00 CHF		an. Payment	33.982,09 €	
an. Interest	1,60%				
Year	15				
Year	Loan Value before pmt	interest	PMT	Principal	loan balance at end of year
0					450.000,00 CHF
1	450.000,00 CHF	7.200,00 CHF	33.982,09 €	26.782,09 €	423.217,91 CHF
2	423.217,91 CHF	6.771,49 CHF	33.982,09 €	27.210,60 €	396.007,31 CHF
3	396.007,31 CHF	6.336,12 CHF	33.982,09 €	27.645,97 €	368.361,33 CHF
4	368.361,33 CHF	5.893,78 CHF	33.982,09 €	28.088,31 €	340.273,02 CHF
5	340.273,02 CHF	5.444,37 CHF	33.982,09 €	28.537,72 €	311.735,30 CHF
6	311.735,30 CHF	4.987,76 CHF	33.982,09 €	28.994,33 €	282.740,98 CHF
7	282.740,98 CHF	4.523,86 CHF	33.982,09 €	29.458,23 €	253.282,74 CHF
8	253.282,74 CHF	4.052,52 CHF	33.982,09 €	29.929,57 €	223.353,17 CHF
9	223.353,17 CHF	3.573,65 CHF	33.982,09 €	30.408,44 €	192.944,73 CHF
10	192.944,73 CHF	3.087,12 CHF	33.982,09 €	30.894,97 €	162.049,76 CHF
11	162.049,76 CHF	2.592,80 CHF	33.982,09 €	31.389,29 €	130.660,47 CHF
12	130.660,47 CHF	2.090,57 CHF	33.982,09 €	31.891,52 €	98.768,94 CHF
13	98.768,94 CHF	1.580,30 CHF	33.982,09 €	32.401,79 €	66.367,16 CHF
14	66.367,16 CHF	1.061,87 CHF	33.982,09 €	32.920,22 €	33.446,94 CHF
15	33.446,94 CHF	535,15 CHF	33.982,09 €	33.446,94 €	- CHF

Figure 1: calculations of interest payment and the loan balance

Now, to calculate the net present value (NPV) of interest, this is done with the formula:

$$NPV = \sum_{t=1}^{n} \frac{Interest_t}{(1+d)^t}$$

In this Case:

$$NPV = \frac{7200}{1{,}005^1} + \frac{6771{,}49}{1{,}005^2} + [\ldots] + \frac{535{,}15}{1{,}005^{15}} = \mathbf{58.046{,}61\ CHF}$$

Now, to calculate the effective cost of borrowing, the "net cash disbursed by lender" is needed. In this case (450.000*0,985) 443.250 CHF. With this the PMT formula can be transformed. But the what-if analysis in Excel can also be used:

loan value	443.250,00 CHF		years	15
interest rate	1,80%			
PMT	33.982,09 CHF			

Figure 2: Effective cost of borrowing Credit Suisse plan

1.2 Calculation of Swissquote loan

The effective cost of borrowing can be calculated the same way as in the exercise before:

loan value	482.625,00 CHF		years	10
interest rate	1,19%			
PMT	51.471,26 CHF			

Figure 3: Effective cost of borrowing Swissquote plan

So only judging by the effective cost of borrowing, Reto should prefer the plan of **Swissquote**.

The NPV of the interest rates can also be calculated the same way as in exercise one:

$$NPV = \frac{4875}{1{,}005^1} + \frac{4409{,}04}{1{,}005^2} + [\dots] + \frac{509{,}62}{1{,}005^{10}} = \mathbf{26.673{,}16\ CHF}$$

This means that the **Swissquote** plan is also more favourable in regard to the NPV of interest rates, and Retos friend will recommend it.

For comparison I would reason, that the **NPV of interest rates** gives a more meaningful figure (Discounted Value Priority). This attributes a comparable value to future cashflows.

Another way to compare the plans is by performing an **affordability analysis**. Because with the plan of Swissquote Reto is paying approximately (51.471,26/60.000) 85,8 % of his disposable income for the loan, while he would only be paying (33.982,09/60.000) 56,6 % with the Credit Suisse plan. The affordability analysis evaluates whether the loan can be repaid comfortably.

1.3 Sensitivity analysis

Reto has 60 000 CHF of net disposable income. Using the following formula on excel, we can determine (Yearly Payment Table) the yearly payment of a loan depending of the interest rate and Loan-To-Value.

$$PMT = \frac{PV}{\sum_{t=1}^{n} \frac{1}{(1+r)^t}}$$

Then, by subtracting the results to the original 60 000, we can determine the Maximum affordable closing fee (Maximum affordable closing fee Table)

Yearly Payment:					
		Interest Rate			
		1,0%	1,5%	2,0%	2,5%
LTV	60,0%	32 455,70 CHF	33 724,96 CHF	35 021,46 CHF	36 344,91 CHF
	65,0%	35 160,34 CHF	36 535,37 CHF	37 939,92 CHF	39 373,65 CHF
	70,0%	37 864,98 CHF	39 345,79 CHF	40 858,37 CHF	42 402,39 CHF
	75,0%	40 569,63 CHF	42 156,20 CHF	43 776,83 CHF	45 431,13 CHF
	80,0%	43 274,27 CHF	44 966,61 CHF	46 695,28 CHF	48 459,87 CHF

Maximum affordable closing fee					
		Interest Rate			
		1,0%	1,5%	2,0%	2,5%
LTV	60,0%	27 544,30 CHF	26 275,04 CHF	24 978,54 CHF	23 655,09 CHF
	65,0%	24 839,66 CHF	23 464,63 CHF	22 060,08 CHF	20 626,35 CHF
	70,0%	22 135,02 CHF	20 654,21 CHF	19 141,63 CHF	17 597,61 CHF
	75,0%	19 430,37 CHF	17 843,80 CHF	16 223,17 CHF	14 568,87 CHF
	80,0%	16 725,73 CHF	15 033,39 CHF	13 304,72 CHF	11 540,13 CHF

Figure 4: Yearly payment and Maximum affordable closing fee

1.4 Calculation of the first years' Rent

Price after 15 years (P15) = 923'816.79

Capital gain = P15 -P15 = 923'816.79 – 750'000 = 173'816.79

Tax from sale = 30%*(Capital gain) = 0.3*173'816.79 = 52'145.03

By entering all the values in the statement in an Excel table. We can determine the first year's rent so that the IRR of the cash flows is equal to 1%. (Goal seek Status)

The value obtained is a rent of 48,782 for the first year.

	i		1.60%					Sale Price		923816.798																				
	years		15					-Mortgage balance		0																				
	loan amount		450'000					-sale expenses		9238.16																				
	return		1%		7500			BTCF from sale		914'578.60																				
Year		1		2		3		4		5		6		7		8		9		10		11		12		13		14		15
Proprety Price	CHF	750'000.00	CHF	761'250.00	CHF	772'668.75	CHF	784'258.78	CHF	796'022.66	CHF	807'963.00	CHF	820'082.45	CHF	832'383.68	CHF	844'869.44	CHF	857'542.48	CHF	870'405.62	CHF	883'461.70	CHF	896'713.63	CHF	910'164.33	CHF	923'816.80
Rent	CHF	48'782.00	CHF	50'245.46	CHF	51'752.82	CHF	53'305.40	CHF	54'904.57	CHF	56'551.70	CHF	58'248.25	CHF	59'995.70	CHF	61'795.57	CHF	63'649.44	CHF	65'558.92	CHF	67'525.69	CHF	69'551.46	CHF	71'638.01	CHF	73'787.15
	CHF	4'875.00	CHF	4'948.13	CHF	5'022.35	CHF	5'097.68	CHF	5'174.15	CHF	5'251.76	CHF	5'330.54	CHF	5'410.49	CHF	5'491.65	CHF	5'574.03	CHF	5'657.64	CHF	5'742.50	CHF	5'828.64	CHF	5'916.07	CHF	6'004.81
Debt service	CHF	33'982.09	CHF	33'982.09	CHF	33'982.09	CHF	33'982.09	CHF	33'982.09	CHF	33'982.09	CHF	33'982.09	CHF	33'982.09	CHF	33'982.09	CHF	33'982.09	CHF	33'982.09	CHF	33'982.09	CHF	33'982.09	CHF	33'982.09	CHF	33'982.09
Operating expenses	CHF	4'875.00	CHF	4'948.13	CHF	5'022.35	CHF	5'097.68	CHF	5'174.15	CHF	5'251.76	CHF	5'330.54	CHF	5'410.49	CHF	5'491.65	CHF	5'574.03	CHF	5'657.64	CHF	5'742.50	CHF	5'828.64	CHF	5'916.07	CHF	6'004.81
Capital	CHF	-300'000.00																												
BTCF	CHF	-256'093.00	CHF	45'297.33	CHF	46'730.47	CHF	48'207.72	CHF	49'730.42	CHF	51'299.94	CHF	52'917.72	CHF	54'585.21	CHF	56'303.92	CHF	58'075.41	CHF	59'901.29	CHF	61'783.19	CHF	63'722.82	CHF	65'721.94	CHF	67'782.34
reimbursement	CHF	26'782.09	CHF	27'210.60	CHF	27'645.97	CHF	28'088.31	CHF	28'537.72	CHF	28'994.33	CHF	29'458.23	CHF	29'929.57	CHF	30'408.44	CHF	30'894.97	CHF	31'389.29	CHF	31'891.52	CHF	32'401.79	CHF	32'920.22	CHF	33'446.94
Interest payments	CHF	7'200.00	CHF	6'771.49	CHF	6'336.12	CHF	5'893.78	CHF	5'444.37	CHF	4'987.76	CHF	4'523.86	CHF	4'052.52	CHF	3'573.65	CHF	3'087.12	CHF	2'592.80	CHF	2'090.57	CHF	1'580.30	CHF	1'061.87	CHF	535.15
Taxable Income	CHF	-290'075.09	CHF	11'315.24	CHF	12'748.38	CHF	14'225.63	CHF	15'748.33	CHF	17'317.85	CHF	18'935.63	CHF	20'603.12	CHF	22'321.83	CHF	24'093.32	CHF	25'919.20	CHF	27'801.10	CHF	29'740.73	CHF	31'739.85	CHF	33'800.25
Tax(25% of the tax.inc.)	CHF	-	CHF	2'828.81	CHF	3'187.10	CHF	3'556.41	CHF	3'937.08	CHF	4'329.46	CHF	4'733.91	CHF	5'150.78	CHF	5'580.46	CHF	6'023.33	CHF	6'479.80	CHF	6'950.28	CHF	7'435.18	CHF	7'934.96	CHF	8'450.06
ATCF	CHF	-256'093.00	CHF	8'486.43	CHF	9'561.29	CHF	10'669.22	CHF	11'811.25	CHF	12'988.39	CHF	14'201.72	CHF	15'452.34	CHF	16'741.37	CHF	18'069.99	CHF	19'439.40	CHF	20'850.83	CHF	22'305.55	CHF	23'804.89	CHF	25'350.19
tax adjusted capital gain																													CHF	52'145.03
Cash Flows	CHF	-256'093.00	CHF	8'486.43	CHF	9'561.29	CHF	10'669.22	CHF	11'811.25	CHF	12'988.39	CHF	14'201.72	CHF	15'452.34	CHF	16'741.37	CHF	18'069.99	CHF	19'439.40	CHF	20'850.83	CHF	22'305.55	CHF	23'804.89	CHF	77'495.22
IRR of cash flows		1%																												

Figure 5: calculation of ATCF for 15 years

Property price: 750 000 CHF and growing of 1,5% every year.

Rent: At beginning, unknown

Debt service: Yearly payment of the loan chez Crédit Suisse (Exercise 1)

Operating expenses: maintenance and insurance fees are 0,65% of the property price.

Capital: Original capital for the Loan, paid by Reto (40% of 750 000)

BTCF: Before tax cash flow

Reimbursement: reimbursement of Reto's Loan (Debt service – Interests)

Interest payments: 1,6% of the loan balance each year (which is diminished by the reimbursement each year)

Taxable Income: BTCF – Debt service, which will be diminished by its tax (25%) to give the ATCF (After Tax Cash Flows

2. Property valuation with Discounted Cash Flow

We are hired as a real estate appraiser to obtain an estimate of the value of the entire 20-unit apartment complex in Lugano. The price of the 20-unit apartment complex is CHF 12,000,000. We should estimate the market value of this apartment complex based on the Discounted Cash Flow (DCF) approach and evaluate if the company should purchase it.

Using the DCF approach we assume that the company is not willing to pay more for this complex than the present value of it's all future Net Operating Incomes (NOIs). So, in this case: if the offered Price of the complex (12 000 000 CHF) will be bigger than the estimated Present Value (present values of NOIs and present value of sales price), we will suggest not to invest in this complex.

As a first step we will estimate the Net Operating Income for the whole 20-units apartment complex for the first year:

rental income at full occupancy: CHF 22200 for 20 Units	444000
+ other income CHF 32000 Sports&Wellness	32000
= potential gross income (PGI) CHF	476000
– vacancy losses 5% from market rent	22200
– Credit loss from defaulting tenants 0,5% from PGI	2380
= effective gross income (EGI)	451420
– operating expenses	
• real estate taxes 20% from EGI	90284
• insurance CHF 70 per unit for 20 units	1400
• utility costs	15000
• maintenance costs CHF 36 780	36780
• management fees 10% PGI	47600
= total operating expenses	191064
– CAPEX CHF 24 865	24865
= net operating income (NOI) CHF	235491

Figure 6: Net Operating Income at the first year

Secondly, we determine Net Operating Incomes from the apartment complex over 7 years: Company plans to sell the property at the end year 7. We also take in consideration given growth rates for incomes and expenses:

		Year = t	1	2	3	4	5	6	7
g_R	0.025	rental income at full occupancy: CHF 22200 for 20 Units	444'000.00	455'100.00	466'477.50	478'139.44	490'092.92	502'345.25	514'903.88
g_S&W	0.005	+ other income CHF 32000 Sports&Wellness	32'000.00	32'160.00	32'320.80	32'482.40	32'644.82	32'808.04	32'972.08
		= potential gross income (PGI) CHF	476'000.00	487'260.00	498'798.30	510'621.84	522'737.74	535'153.29	547'875.96
		– vacancy losses 5% from market rent	22'200.00	22'755.00	23'323.88	23'906.97	24'504.65	25'117.26	25'745.19
		– Credit loss from defaulting tenants 0,5% from PGI	2'380.00	2'436.30	2'493.99	2'553.11	2'613.69	2'675.77	2'739.38
		= effective gross income (EGI)	451'420.00	462'068.70	472'980.43	484'161.76	495'619.40	507'360.26	519'391.38
		– operating expenses							
		• real estate taxes 20% from EGI	90'284.00	92'413.74	94'596.09	96'832.35	99'123.88	101'472.05	103'878.28
g_I	0.01	• insurance CHF 70 per unit for 20 units	1'400.00	1'414.00	1'428.14	1'442.42	1'456.85	1'471.41	1'486.13
g_ut	0.02	• utility costs CHF 15000	15'000.00	15'300.00	15'606.00	15'918.12	16'236.48	16'561.21	16'892.44
g_mc	0.022	• maintenance costs CHF 36 780	36'780.00	37'589.16	38'416.12	39'261.28	40'125.02	41'007.77	41'909.95
		• management fees 10% PGI	47'600.00	48'726.00	49'879.83	51'062.18	52'273.77	53'515.33	54'787.60
		= total operating expenses	191'064.00	195'442.90	199'926.18	204'516.35	209'216.01	214'027.78	218'954.38
g_capex	0.02	– CAPEX CHF 24 865	24'865.00	25'362.30	25'869.55	26'386.94	26'914.68	27'452.97	28'002.03
		= net operating income (NOI) CHF	235'491.00	241'263.50	247'184.71	253'258.47	259'488.72	265'879.51	272'434.97

Figure 6: Net Operating Income for 7 years

As next we find the Present Value of the Net Operating Incomes for each year, taking in consideration company's discount rate of 5%:

		Year = t	1	2	3	4	5	6	7
		= net operating income (NOI) CHF	235'491.00	241'263.50	247'184.71	253'258.47	259'488.72	265'879.51	272'434.97
r	0.05	Present Value of NOI(t) = NOI(t)/(1+r)^t	224'277.14	218'833.11	213'527.45	208'356.37	203'316.20	198'403.38	193'614.45

Figure 7: Present Value of Net Operating Incomes

After finding Present Values of the Net Operating Incomes, we want to determine a Net Present Value of the project to evaluate, if the company should purchase the complex.

Summ of PV (NOIs)	1'460'328.10
+PV of Sales Price (= 15 000 000 / (1+r)^7)	10'660'219.95
= Total PV of the project	12'120'548.05
- Price offered	12'000'000.00
= NPV of the project	120'548.05

Figure 8: Net Present Value of the project

From the positive NPV of 120 548.05 CHF we suggest company to invest in the 20-unit apartment complex in Lugano.