Hedging real estate's with real or nominal interest rate

Leiv Synnes, 2009-03-31

Introduction

The real interest rate is the compensation for postponing one's consumption. An investor also wants compensation for inflation, i.e. the loss of purchasing power. The fluctuations of these two factors explain the most of the variances in the nominal interest rates.

Real estate investments are immune against changes in the price level. Increased inflation will increase the nominal interest rate and will lead to higher financial costs. As higher inflation also increase both revenues and asset values the real profit and the real equity will remain unchanged. It is therefore not needed to hedge the inflation from a wealth perspective. In fact, the variance in the equity level will actually increase with nominal duration of the debts.

It is the real interest rate that should be hedged in order to protect the real profit and the real equity level. By using real interest rate bonds with long duration the return on the investment can be secured.

But inflation can still be a problem for a real estate company, since the cash flow from the business and the result in the profit and loss statement vary with the nominal interest rate. And low result and cash flow can be dangerous.

One way to secure the cash flow is to use bonds or swaps where the inflation compensation is paid at maturity. In this case both the debts and the property values will increase with inflation, keeping the cash flow and capital structure immune for changes in the price level.

To secure the result in the profit and loss statement both the real interest rate and the inflation must be hedged. For real estate companies the decision on whether to hedge the inflation or not is really a decision on having variance in the result or in the equity level.

Real interest rate and inflation

Interest is the price paid for borrowing an asset for a certain period of time. The percentage paid on the assets value, over a specific period, is called interest rate.

The demanded *real interest rate*, *i*, of a bond can be expressed by the following equation:

$$i = i_f + i_p + l_p$$

Where i_f is the real risk free interest rate, i_p is the real risk premium and i_p is the liquidity premium.

The interest on short treasure bills or government bond is usually described as the risk free interest in a currency. If the investor chooses bonds with higher risk he will charge an interest rate risk premium that is equivalent to the increased risk. The liquidity is another factor. If you are a small issuer and cannot offer a secondary market for your bond, the investor will for sure demand a premium versus liquid bonds.

An investor would also like to get a compensation for *inflation*, i.e. the loss of purchasing power due to a general increase in prices. If the general prices increases annually with two percent the investor would like to have two percent compensation. Otherwise he would actually not be able buy the same amount of goods in the future.

The normal definition of inflation is the annual relative change in consumer price index (CPI)[1]. CPI is published by the relevant statistic bureau in a country and is measured by the weighted average of prices in a specified basket of goods, which reflects the common consumption pattern.

With Fishers equation we can calculate the demanded *nominal interest rate*, which consider both the demanded real interest rate and the compensation for inflation[2].

$$(R-1) = (1+i) \times (1+\pi)$$

Where *R* is the nominal interest rate, *i* is the real interest rate and π is the inflation. Normally, the following approximation is used to describe the relationship:

$$R \approx i + \pi$$

[1] Statistic Sweden, homepage, March 2009
[2] Brealey et al . p76

When looking at the formula we can see that in theory the inflation level do not influence the real interest rate that investors demands. If the inflation level increase there will automatically be an increase in nominal rates, but the real interest rate will remain constant.

Investors also want a premium for taking on inflation risk [3]. The risk exists because we can't know how the general price level will develop in the future. So the compensation for inflation can be divided in the expected inflation and an inflation risk premium.

$$\pi = \pi_e + \pi_p$$

Where π is inflation compensation, π_e is the expected inflation and π_p is the inflation risk premium.

One way for the borrower to reduce the interest rate is to take over the inflation risk premium. This can be done by paying the real interest rate plus the actual inflation. In this case the borrower will have an extra risk since he does not know the financial cost in advance. Later in this text products regarding inflation and real interest are studied.

Historic developments of inflation and real interest rate

The studies in this chapter will mostly focus on the Swedish market. The text should be considered as a theory that could be applied to other countries.

Throughout history the phenomenon of inflation has proven to both vital and unpredictable. There are examples of sovereigns that have tried to decrease the value of its currency in order to increase sales and cold rushes that have increase the money supply. This is only two of the factors that have caused unpredictable inflation. Inventions like the railroad and internet are examples where boost in productivity has decreased inflation tendencies. This shows how difficult it is for investors to predict the inflation. Most investor's investment horizon is over decades which make in crucial to make a plan on how to deal with changes in the price level. [4]

Picture 1 shows the annual inflation in Sweden since 1830. Looking at this chart it is sure that inflation is unpredictable and high volatile. This illustrates the risk with long debt or assets with fixed nominal interest rate.

[3] Brealey et al. P 72
[4] Greer, 2006, p 1

Picture 1: Inflation in Sweden from 1830 to 2009 [5]

High variance in inflation increases the uncertainty for both lenders and borrowers. It is more difficult to predict the future and since investments become more unpredictable the demanded return on investments becomes higher. It can also be so that investors choose to do the investment in another market, where the inflation is predictable. This means that fewer investments is worth making and the activity in the economy is reduced. Inflation also changes the distribution of income and wealth between different groups in a society. In order to maintain a good economic development for all groups most governments aim to control the inflation level. [6]

Today most of the developed countries and many of development countries uses a monetary policy which includes an inflation target. [7] The central banks are using tools like changing the interest level in order to maintain the inflation at desired levels. Sweden has today an inflation target of two percent, were the inflation is allowed to move between one and three percent[8]. The European central bank, ECB, has the goal of keeping the inflation under but close to two percent [9].

Since the creation of an inflation policy many countries have succeeded in maintaining a desired level of increase in prices and in keeping the inflation expectation and desired levels.

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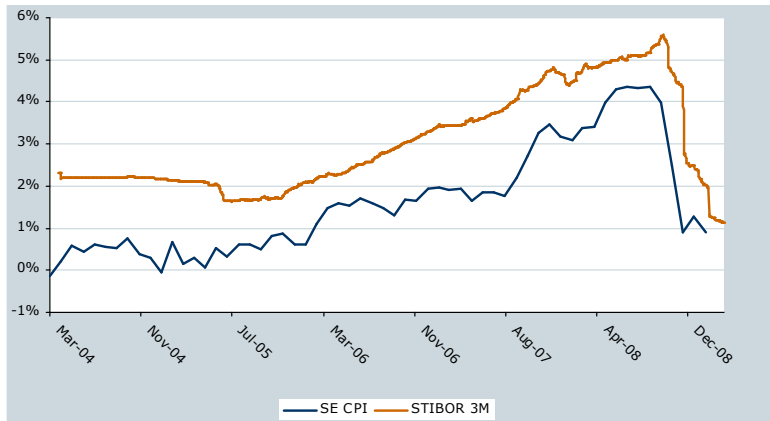
[5] Statistics Sweden, homepage, 2009 March
[6] Riksbanken, homepage, 2009 March
[7] Berg, 2005, p 20
[8] Riksbanken, 2008, p 12 Penningpolitiken i Sverige
[9] ECB, homepage, March 2009

Picture 2 shows the development of the inflation (SE CPI) and the floating nominal interest rate (Stibor 3M) between 2004 and 2009 in Sweden. When inflation is increasing the central bank increases the capital costs in order to cool down the economy. When inflation falls back the central bank lowers the interest rates.



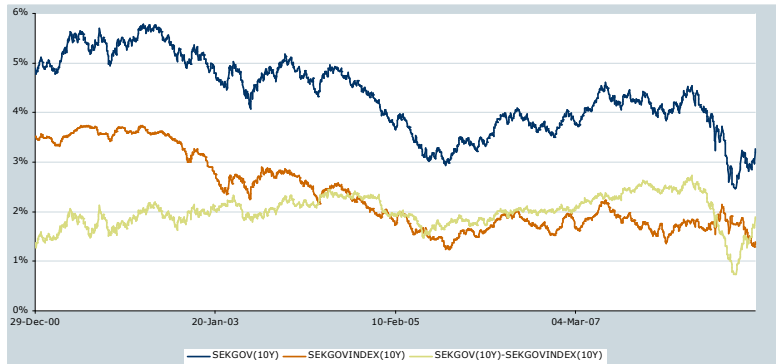
Picture 2: Actual inflation in sweden and Stibor 3M[10]

It is worth mentioning that interest is a major part of the CPI and when the interest rate is hiked by the central bank the inflation is actually increased. It takes approximately two years for an interest hike to fully lower the activity in the economy. So a great part of the increased inflation during the last years has actually been created by the central banks when trying to cool down the markets.

The Swedish government issues both long bonds with fixed nominal interest rates and long bonds with fixed real interest. The difference in the interest rate between the bonds can approximately be considered as the average inflation until maturity of the bonds and is widely referred to as the *Breakeven inflation* (BEI).[11]

In picture 3 the interest level on 10 year nominal and real interest rate government bonds and the breakeven inflation are shown. We can see that the inflation expectations vary in the region of the target of two percent. We can also see that the real interest rate has declined during the last ten years. The falling real interest rate has been a driving force behind increased price values of assets.

[10] Nordea e-markets, 2009
[11] Calmvik, 2007, p 5



Picture 3: Nominal interest (blue), Real interest rate (red) and inflation (yellow)

The breakeven inflation is only an approximation of the inflation expectations. To get the true expected inflation the BEI must be adjusted from some distortions[12]. The two distortions that are easiest to understand are the liquidity premium and the inflation risk premium.

The inflation risk premium increases the nominal interest rate but not the real interest rate and therefore must the infla tion expectations be lowered with the premium. The market for real interest rate bonds is smaller than the market for bonds with nominal rates. So the investors therefore demand a higher liquidity premium on real interest rate bond and this difference must be considered when analyzing expected inflation from the BEI.

Other distortions to think about when studying BEI is the possible mismatch of cash flows and the different cost of carry between the nominal and real interest rate bond. Finally, the seasonality of the CPI must also be considered.[13]

Period	Sweden	Germany	USA	Japan
1960-69	2,1	4,3	2,8	1,7
1970-79	1,4	3,5	1,4	-1,3
1980-89	3,2	4,1	4,0	2,9
1990-99	4,1	3,8	3,2	2,2
1960-99	2,7	3,9	2,9	1,3

Picture 4: Long real interest rates in different countries [14]

[12] Calmvik, 2007, p 6
[13] Calmvik, 2007, p 6
[14] Riksbanken, 2001, p27

In picture 4 the long real interest rates in Sweden, Germany, Japan and USA are compared.

The market for real interest rate bonds has not been developed for so many years. So the statistic in picture 4 is created by using the 10 year interest rate on government bonds minus measured annual inflation. It is important to point out that the statistic is therefore the received real interest rate, not the expected real interest rate. The variance in the real interest rate can partly be explained by unexpected changes in the inflation and is therefore not only due to changed demanded real interest rate.

From the picture we can see that the real interest rate in Sweden has fluctuated between 1.4 percent during the 70s and 4.1 percent during the nineties. During the 70s the inflation increased worldwide due to increased oil prices. The effect was that the investors probably ended up with less real return on the investment than expected. The opposite occurred in the 90s. The inflation fell back due to economic downturn and a new inflation policy.

The development of the real interest rate in each country is affected by the global development of savings and investments. Even though capital can move across borders, there can still be differences in real interest rates between countries. Preferences and regulation among in the markets might still explain some differences in real interest rates between currencies.

Comparisons between the decades and between countries is tricky because there have been regulations and different monetary policies throughout history.

So how high should the real interest rate be? It is not easy to answer exactly on this. But the rate should probably be somewhere between two and three percent. Because of this, borrowers should be willing to hedge the real interest rate when it is close to or under two percent. This is especially good for investors that own assets that have a negative correlation with the real interest rate.

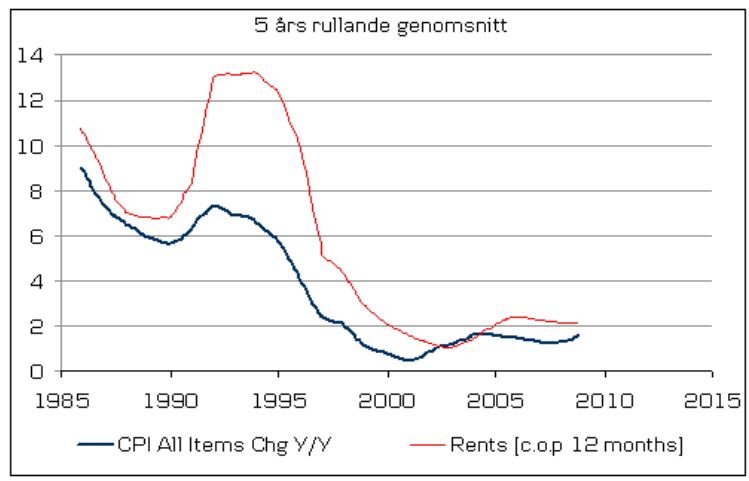
Real estate as an inflation hedge

Since the 1970s, when inflation increased dramatically, real estate has been increasingly popular as an inflation hedge. Real estate work as an inflation hedge since the return normally equals or exceeds the inflation over long periods of time. [15]

It easy to understand that revenue from real estate and the value of real estate follows inflation when (i) the link is given by public regulations or (ii) when the link comes through inflation - adjusted contracts.

The rents on residential apartments in Sweden are regulated, and the system has basically the effect that the r ents increase with the price level. For short periods the correlation between inflation and rent level is not that strong. But for longer periods the connection is strong. In picture 5 the running five year inflation is compared with the running five year rental increase.

One reason that can explain that the rents has increased more than inflation is that some components in the index has increased much and those components hits real estate companies extra hard. For example has energy cost increased more th an inflation and that has the real estate companies been able to compensate themselves for.



Picture 5: Runing change in 5y CPI and residential rents [16]

It is normal to have a clause in commercial rental agreement that the rents should increase with inflation in full or in part. If the rental contract is long then this will also have an effect on the

[15] Jaffe et al p 27
[16] Danske Markets, 2009

value. If rental contract is short then the inflation hedge will also be short. However, from a theoretical point of view the rents should increase in line with inflation if all other factors remain stable.

The effect inflation has on income and equity

We will now study how the inflation affects a real estate's income and balances. Let us assume that the inflation is two percent and nominal bank interest rate for a bank loan is 5.1 percent. We also assume that the net operating income increase in line with inflation and that the yield on the properties is not affected by changes in inflation. Assuming this, the property value increases with two percent per year as in picture 6.

Balance Sheet	**2008-01-01**	**2008-12-31**
Property	100 000	102 000
Cash	0	458
Total assets	**100 000**	**102 458**
Bank Loan	70 000	70 000
Other debts		
Equity	30 000	32 458
Debts and Equity	**100 000**	**102 458**

Figure 6: Example of balance sheet

The cash in the company increases with 458 which is due to a positive result according to figure 7. In total the equity increases with 2 458.

Profit and loss statement	
Revenues	8 000
Property costs	-4 000
Net operating income	4 000
Interests cost	-3 542
Result	**458**

Figure 7: Example of profit and loss statement.

Now let us study what will happen with the company if the inflation is three percent instead of two percent. The revenues increases but also the financial costs will increase as the bank would like to have compensation for the inflation. In figure 8 we

can see that the result in the profit and loss statement for the real estate firm has decreased from 458 to -224.

	Inflation	
Profit and loss statement	**2%**	**3%**
Revenues	8 000	8 078
Property costs	-4 000	-4 039
Net operating income	4 000	4 039
Interests cost	-3 542	-4 263
Result	**458**	**-224**

Picture 8: Profit and loss statement, increased inflation

We must also analyse how the balances changes when the inflation increases from two to three percent. In picture 9 we can see that the equity also increases to when inflation increases. With two percent inflation the equity is 32 458 and with three percent inflation the equity are 32 776. This is the case since the positive effect inflation has on property values is greater than the negative effect on financial costs.

		2% inflation	3% inflation
Balance Sheet	**2008-01-01**	**2008-12-31**	**2008-12-31**
Property	100 000	102 000	103 000
Cash		458	
Total assets	**100 000**	**102 458**	**103 000**
Bank Loan	70 000	70 000	70 000
Other debts			224
Equity	30 000	32 458	32 776
Total equity and debt	**100 000**	**102 458**	**103 000**

Picture 9: Balance sheet of a real estate company

This is however not the whole story. As the inflation increases the investor will actually be able to buy fewer items with his money. So we must understand how the real equity for the investor has developed.

This can be done by discounting the balance sheets with the actual inflation. Independent of the inflation the real value of the property will be 100 000 after one year. The equity will increase with 1 822 to 31 822, which means that the debts must decrease to 68 178.

Real value after one year	
Asssets	100 000
Equity	31 822
Debts	68 178
Total equity and del	100 000

Picture 10: Real value after one year

Hedging by using fixed real and nominal interest rate

There are two main forces that make nominal interest rate levels fluctuate, and those are inflation and the real interest rate. The best hedging might not be to hedge both components simultaneously and in the same way.

Hedging the balance sheet for real estate companies

A real estate produces more or less predictable cash flows over time. The present value weighted average maturity of cash flows is the duration of the asset[17].

With duration analysis the sensibility of the assets value to changes in the interest rate is measured.

It is possible to calculate the duration in the equity through the formula;

$$D_A \times Assets = D_E \times Equity + D_D \times Debt$$

Were D_A is the duration for assets, D_E is the duration for equity and D_D is the duration for debt[18].

> **Example 1 – Duration in equity**
> A real estate company has properties which are valued with a discount rate of 8 percent. The duration of the assets is therefore 12.5 years (1/0.08). The properties are financed with 50 percent equity and 50 percent debt. The duration of the debt is 10 years. Using the equation of above, we calculate the duration in the equity to 15 years ((12.5-0.5*10)/0.5).

The Gordon growth model is a cash flow model for valuing a stock or a business. The value of company can be calculated through the following formula[19];

[17] Söderlind, p. 1996, p 50-52
[18] Hägg, 2000, p. 12

$$P = \sum_{t=1}^{\infty} D \times \frac{(1+g)^t}{(1+k)^t}$$

Were P is the price, D is the dividend, g is the growth rate of the dividend and k in the required rate of return. For infinite series the formula can be stated as[20];

$$P_0 = \frac{D_1}{(k-g)}$$

The demanded rate of return can be split up unto a real rate of return, *i,* and an inflation compensation, π.

If the growth in dividend from a real estate follows the inflation level then the formula can be described as;

$$P_0 = \frac{D_1}{((i+\pi)-\pi)}$$

$$P_0 = \frac{D_1}{i}$$

This means that the value of the property is not affected by inflation. Only changes in the real interest rate should have an effect on the price. This makes the calculation in example 1 incorrect if the interest rate change is due to changed inflation expectation. If the inflation increases the value of long fixed nominal debt will decrease, but the value of the property may be unchanged.

But if the real estate only has fixed real interest debt, the formula will work. Then the inflation will neither affect the property value nor the value of debt, hence the equity level will remain the same regardless of inflation.

This illustrates that real interest rate is better for hedging the equity level in a real estate company. If the real estate company uses long nominal interest hedges the result will be higher volatility in the equity, since the inflation might be hedged twice.

[19] Wikipedia, homepage, 2009 March
[20] Investoropedia, homepage, March 2009

Example 2 – The risk with fixed nominal debt
A real estate company has issued ten year loans with a fixed nominal rate on five percent to cover the interest rate risk. The expected inflation is two percent and the real interest is three percent. Then the inflation drops and are expected to be one percent on average for the next ten years. The negative effect is that the real interest the company will pay is now four percent. Furthermore the loan position will have a negative market value which increases the debt in the company and reduces the equity.

Hedging the result and cash flow

If the revenues from a property are linked to inflation, one could think that the inflation should not be hedged. One problem for real estate companies is that the debt is normally much larger than the net operating income.

Example 3 – Securing the cash flow
If a property is valued with a yield of five percent, the value of the property is 20 times larger than the net operating income. If the LTV is 50 percent the debt is 10 times larger than the net operating income. If the inflation increases the financial costs will increase ten times more than the net operating income.

This means that the inflation must be hedged by 90 percent in order to get no variations in the result due to variance in the price level.

The best solution for achieving the situation that the result is immune to changing interest rates is therefore to use 90 percent fixed nominal debt and 10 percent fixed real debt.

Interest cost is shown in the profit and loss statement and in the cash-flow analysis. Increasing nominal interest will reduce the result and the cash flow.

Another thing to consider is the covenants in the loan agreements. It is very usual to have an interest cover ratio (ICR) or debt cover ratio (DCR) specified in the loan documentation. The ICR only calculates the interest costs in relation with revenues. DCR also includes amortisations for the loan.

The reason behind the covenants is that the bank would like to be sure that the customer can pay according to the loan agreement.

Large increase in the nominal interest rates can be troublesome and many real estate companies hedges therefore the nominal

interest rate in order to get stable financial costs and to secure the cash flow.

As nominal interest hedges is useful to protect the cash flow but dangerous to the equity level, the hedging strategy must be chosen carefully.

The length of the interest hedge is an important factor. Since the interest rate risk increases with duration the company must figure out if it is necessary to fully hedge the cash flow from all inflation risk.

In order to reduce the risk on the market value of the fixed nominal debts the company can choose to use short or medium long nominal hedges and/or to leave some of the debt with floating interest rate.

Each real estate company is specific and the owners may have different risk aversion or preferences on which risk that is accepted and which risk that must be hedged. It is basically the owner's decision on to choose volatility in the cash flow or in the equity level.

Inflation products

CPI-linked securities are interest bearing bonds which are protected against inflation. They are often referred to as linkers since the principal is linked to inflation. Linkers were first launched in the UK in 1981. The market for CPI-products was only a niche market until the US and French governments introduced inflation-linked bond issuance programs in the end of 1990s. Sweden started issuing linkers in 1994 and German y started in 2006.[21]

Today the market for linkers primarily consists of sovereign debt, with privately issued inflation-linked bonds constituting only a small portion of the market.

In the end of the 1990s the inflation derivatives market also began to develop with the result that there now exist a truly global market for inflation-linked products. In 2003 the market for inflation derivatives were of 25 billion EUR and in 2006 the market had increased to 80 billion EUR. Further rapid growth is expected during the years to come. So far most of the

[21] Calmvik, 2007, p 5

development and increasing volume has come from the European countries, but today there is also fast progress in the US and in some Asian markets.[22]

The normal way to fund a company is to have loans with a mix of floating and fixed nominal interest rate. We will here present the basic tools on how to split up the nominal interest rate risk into real interest rate risk and risk on inflation. From time to time it might be useful for company to lock in a certain real interest rate or an inflation level.

Issuing real interest debt

Instead of issuing a debt with a fixed or floating interest rate level, a company could issue debt with fixed real interest rate and floating inflation.

The issued real interest bond can be structured so that the inflation compensation is paid out annually or at the maturity of the bond. There is also possibility to build in a protection against deflation. If the general price level decrease the investor might otherwise end up receiving less money back, in nominal terms, than he has lent out.

Picture 11 shows a CPI-linked bond where the inflation compensation is paid out in arrears. We can see that the cash flow is much better than the interest costs during the lifetime of the bond. The debt in nominal terms will actually increase until maturity of the bond. Since the company borrows money each year the possibility to give dividends or to make other investments increases.

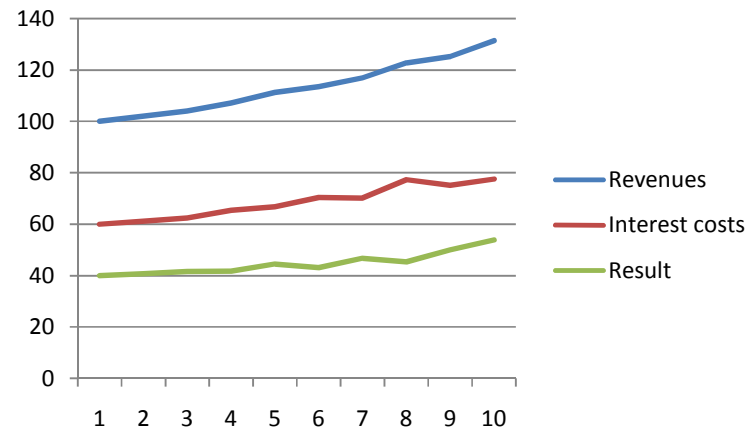
Year	Nominal debt	Real interest	Inflation	Nominal interest	Intrest costs	Cash flow
0	100,0	3%	2%	5%	-5,0	-3,0
1	102,0	3%	1%	4%	-4,1	-3,1
2	103,0	3%	3%	6%	-6,2	-3,1
3	106,1	3%	1%	4%	-4,2	-3,2
4	107,2	3%	4%	7%	-7,5	-3,2
5	111,5	3%	3%	6%	-6,7	-18,1
Total					-33,7	-33,7

Picture 11: CPI linked with compensation at maturity

If the revenues increase with inflation the company can manage a higher nominal debt without any problems with the result. In picture 12 both revenues and interest cost increases with

[22] Benhamou, 2007, p 4

inflation and the result is growing in nominal terms. In real money the result is not growing.



Picture 12: How revenues, cost and result varies with CPI

Issuing real interest rate bonds can be a good idea for those who have assets that increase in value with inflation. It is a possibility to lock in the real interest at preferred level without being forced to also lock in the inflation. It can be situations when the real interest level is low but the estimated inflation is high.

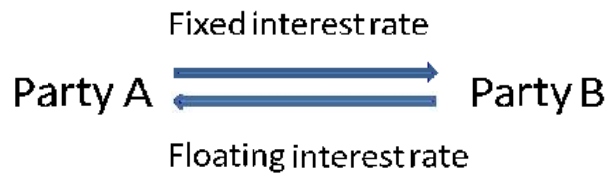
If the value of a company's assets increases with inflation the loan to value can be stable when using long CPI-linked bonds with inflation compensation at maturity. Being able to maintain the preferred capital structure is a huge advantage for a company.

Practically it might not be so easy to get bank loans that increase with inflation. The banks rather prefer amortizations. The solution could be to issue debt in the capital markets.

There is also output and supply factors to consider when issuing debt. There might be a shortage for real interest bonds in the market, which will give a possibility to get the funding at good level. So issuing real interest rate bonds should always be considered as an alternative when issuing debt.

Inflation derivatives

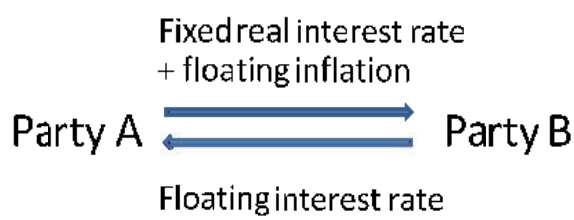
An interest rate swap is a binding agreement between parties to exchange income and payment streams, denominated in one single currency. In a normal interest rate swap one party pays fixed interest to the other party and receives a floating interest instead.[23] The structure of such a swap is described in picture 13.



Picture 13: Interest rate swap

In an ordinary interest rate swap nominal interests are exchanged between the parties. With help from inflation derivatives the nominal interest rate risk can be divided into real interest rate risk and risk on inflation.

A swap where one party receive floating interest and the other party receive fixed real interest rate plus actual inflation is called a year on year swap. In picture 14 the swap is illustrated.



Picture 14: Year on year swap

If party A has a bank loan with floating interest rate the net result for party A will be to pay fixed real interest rate and floating inflation. The effect is that Party A´s interest cost are sensible to inflation but not to changes in the real interest rate.

The product is especially useful for companies that also have revenues that increase with inflation. The product is also good to use when the real interest is low and when inflation is high. The company might want to look in low real interest rates for a long time but might not be willing to fix the inflation at high levels.

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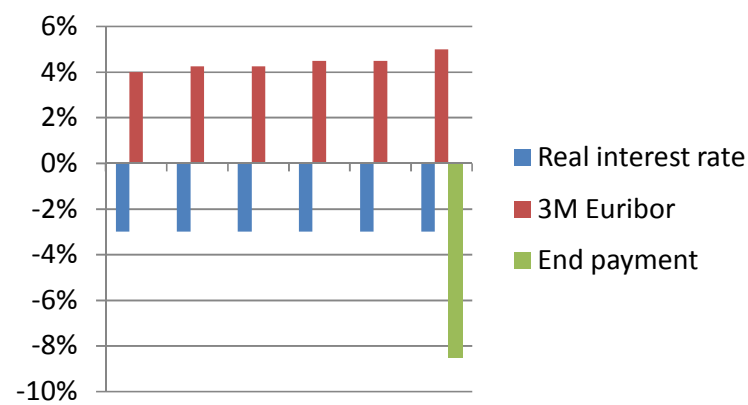
[23] Stephens, p 92

This is particularly useful for real estate's companies. It is important to lock in real interest levels, but it might not be equally important to lock in the inflation.

If inflation is not hedged the interest cost are likely to increase when the economy is strong and vice versa. In good times should companies also be able to bear higher cost since the sales might be booming simultaneously. So even if there is no perfect correlation between prices on the company's products and the inflation, the company might be selling more and can therefore bear higher costs. Similarly when the economy is slowing down and sales are reduced the company will be helped with lower financial costs.

Real interest rate swap

The real interest swap is similar to the year-on-year swap. The difference is that the inflation is not paid out annually. Instead the inflation is paid out at maturity. The principal is also increased with inflation annually. The net sum of a loan with floating interest and a real interest rate swap will be equal with the fixed real interest rate loan described earlier. Picture 15 shows the cash flows in a real interest swap.



Picture 15: Real interest swap

The idea is to maintain the size of the hedge in real terms. Since the inflation is not paid out, it is possible to increase the cash flow in an investment. The product is suitable for investments, for example in real estate, that maintain their real value over time. The product is particularly suitable for investments that will be divested at the maturity of the contract. Then the sale of the assets can pay the negative cash flow from the swap at maturity.

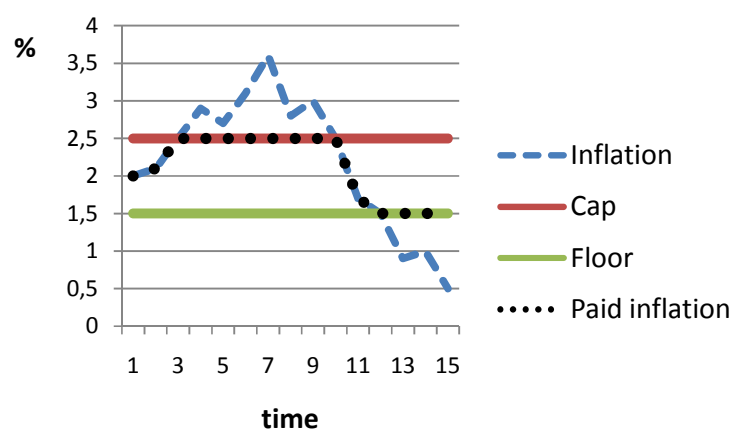
Inflation options and structured inflation derivatives

With the use of options on inflation it is possible to be protected against a sudden increase in inflation. An inflation cap is a derivative in which the buyer receives payments at the end of each period in which the inflation exceeds the agreed price leve l, the strike price. By buying a cap the borrower can be protected against high inflation. This kind of option is called a cap because the inflation level will be capped on a certain level.

It could be useful for real estate companies to use caps on inflation were the strike price equal the inflation level were the cash flow in the company is expected to be negative. If the strike price is far from being in the money the cost for the insurance will be small.

An inflation floor is a put option on the inflat ion level. The seller pays money to the buyer if the actual inflation is less than the strike price. For selling this right the seller receives a premium.

If the borrower buys an inflation cap and sells a inflation floor he has created a band within the paid inflation compensation will fluctuate. This combination of options is called an inflation collar and the idea is that the price for the option that is bought should equal the price on the price on the option that is sold, so that the structure will be cost free. Picture xx illustrates a collar, where the paid inflation can vary between 1.5 and 2. 5 percent.



Picture 16: An inflation collar

The market of inflation derivatives also contains structured products, where options and swaps are combined, and h ybrid derivatives where real and nominal products are put together.

These kinds of products can be useful from time to time, but they will not be described in this text. Further information of structured derivatives can be found in the book Inflation risks and products by Benaben and Goldenberg.

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