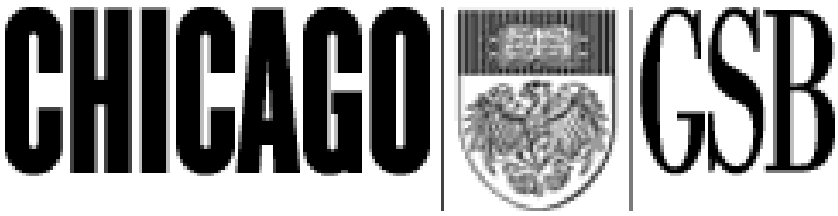

Course: Bus 33450

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Final Exam

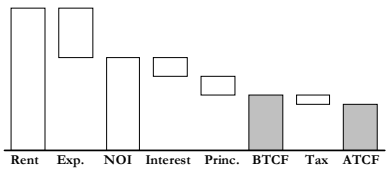
Real Estate Investment Analysis

QUESTION # 1: Discuss the homework assignments for weeks 2, 3, 4, 5, and 7. How useful are these valuation techniques? Is the MRR a useful concept? Does Montecarlo simulation add value to the analysis?

Assignments 2 to 7 mainly dealt with the most complete framework for valuing an income-producing real estate we might use nowadays. It is based on modeling the expected cash flow structure of the estate and taking decisions based on the model (other qualitative analysis should complement this)

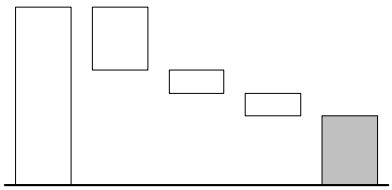
There are three main types of cash flows. Those from the acquisition such as downpayment (-), mortgage (+), acquisition costs (-) and loan points (-). Also those from operations (Figure 1 shows its breakdown). Finally we must take into account the cash flows from the eventual disposition of the estate as well. For instance sale price (+), sale expenses (-), or the remaining mortgage balance (-).

FIGURE 1: CF OPERATIONS



Those cash flows can be calculated before and after taxes. The most important taxes are the operational taxes (Figure 2 shows how to get the taxable base) and the capital gain (over the adjusted basis, which basically is the purchase price less accumulated amortizations, plus structural improvements) taxes. Capital gain taxes are divided into different trenches: depreciation recapture and "real" capital gains.

FIGURE 2: TAXABLE INCOME



After getting the stream of possible cash flows we can calculate the IRR[1] before and after tax of the investment opportunity. From those we may calculate the implicit tax rate so that ATIRR=BTIRR*(Implicit Tax Rate). Also, from the stream of CFs and an assumed -or even calculated depending on the case- cost of capital we may obtain the NPV[2] of the opportunity. The main lessons stemming from performing the valuations were:

1. The return of a real estate investment is certainly much more sensitive to some variables/parameters than to others. I would point out the importance of the legal length of amortization, and of the loan-to-value cap established by the banks as well. Figures 3 and 4 show the variations of ATIRR and the implicit tax rate for combinations of these parameters[3]. We may observe the effect leverage has on the return and also the impact of the amortization policy in the implied tax rate. Tax aspects are key drivers of profitability.

FIGURE 3: SENSITIVITY ATIRR

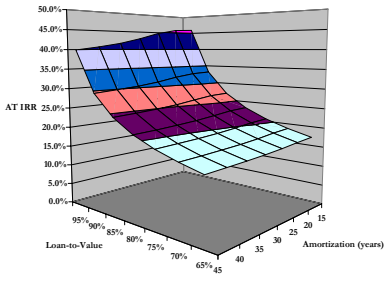
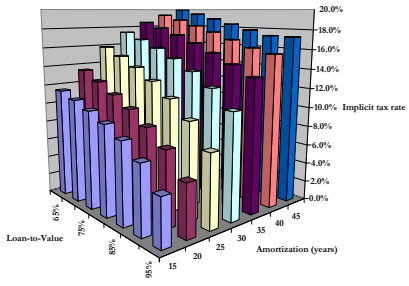


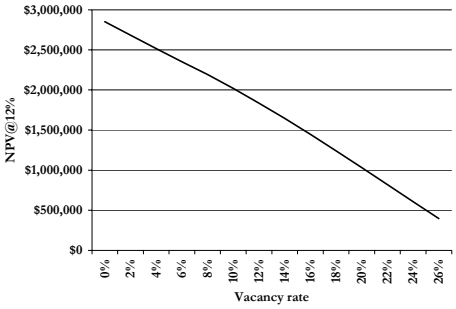
FIGURE 4: SENSITIVITY IMPL. TAX



[1] Internal Rate of Return
[2] Net Present Value
[3] The analysis presented herein relates to property A: "Apartment complex in Florida". However, the conclusions can somehow be extended to any kind of real estate.

2. The IRR and the NPV depend greatly on the occupancy rate. This fact is very important while understanding why smaller players can make a good profit in several real estate sectors: Client management and price segmentation might eventually be accomplished better by dedicated entrepreneurs rather than by big corporations with their rigidities and principal-agent issues. This is a force towards de-economies of scale.

FIGURE 5: SENSITIVITY NPV-OCCUPANCY RATE



The NPV valuation technique is very useful for several reasons:

- It looks at the ability the property has to generate value. Appraisals can be useful for purposes like asking for a loan or examining the actual state, but not to finally take the decision of whether to invest or not[4], even when they include a "Highest and Best Use" valuation. The NPV looks at what we can do with the property, not at what the "market" thinks. Paradoxically, the problem with appraisals is that they are more "objective" than "subjective".
- It gathers all the information available in a meaningful way. Not quick-and-dirty shortcuts such as the cap rate (Year's cash flow over upfront asset investment).
- Permits building-up scenario analysis and simulations. These are very useful for risk analysis, and for structuring partnerships and JV[5] with asymmetric duties and rights between partners.
- Finally, we may structure incentives based on several benchmarks and their impact in value. For instance, the property manager may receive an incremental bonus rate as a function of the revenue he or she is able to raise above a standard occupancy rate and prices. Figure 5 gives us an idea of to what extent we may pay those achievements.

MRR[6] (i.e. the marginal IRR of not selling now and selling in one year time, we shall compare it with our opportunity cost) is a very useful concept. It enables to evaluate the selling decision on a periodical basis (even updating data). Also, it permits having an idea of what would be the threshold price that would lean us to sell. That can make the selling process quieter (less selling rush). However, the MRR analysis has to be complemented with a refinancing analysis that takes into account the incremental cost of borrowing, and the beneficial effect of having two leveraged properties instead of one (especially in terms of taxes and risk diversification). Also renovation and any other embedded real option should be considered before committing to a decision.

Monte Carlo simulation is also very useful. Instead of just adding a risk premium now we can actually watch the risk profile of the opportunity and compare it with our risk-taking profile. Additionally we can model multi-property simulations and observe the benefits of diversification[7] without applying tedious and not always directly applicable theories such as CAPM[8] .However we may be careful with the fact that some of our stochastic variables can be self-correlated. If we do not have a clear understanding of those correlations it is better keeping the simulation simpler. Finally, Monte Carlo may serve to see the risk we would have of running into cash problems anytime, what would seriously jeopardize our ability to capture the full value of the investment for the whole period. Some good investments wrench just because the poor financial strength of the owner, what eventually puts great deal of the value in the hands of any company or bank specialized in this type of rescuing.

[4] Scholars Díaz and Wolverton ("A Longitudinal Examination of the Appraisal Smoothing Hypothesis", RE Economics, 1998) showed empirically that appraisals tend to be certainly inertial along time.
[5] Joint ventures
[6] Marginal rate of return
[7] Especially for the individual investor that can not diversify or hedge by other means.
[8] Capital Asset Pricing Model

QUESTION # 3: What's the future of the REIT Industry?

The history of Real Estate Investment Trusts (REITs) is closely linked to the regulatory and legal environments. That leaves quite an important reasoning gap either for those who argue REITs are merely "an opportunistic coincidence", or for those who defend REITs capture all the advantages of a capital intensity industry, catalyzing the "unavoidable concentration process". Regulation actually clouds the long-term business fundamentals that otherwise would mould the industry.

REITs begum existing in America in the 1880s thanks to a Massachusetts´ law that virtually enabled corporations to circumvent the existing, tough regulations about land ownership for non-productive purposes. Along the decades several acts reinforced the role of REITs as convenient investment vehicles in terms of tax advantages and other "non-business" aspects. Despite this steady legal path the REIT activity suffered from several booms and crashes over time. Maybe because of overreactions to favorable regulations that later on were corrected by the markets. Another possible explanation is that since part of the point of the REITs in those times was having "legal" advantages, those advantages would quickly erode because of competing alternatives or just because the economical conditions changed, making the former advantage worthless. In other words, the market would behave a kind of easy-comes-easy-goes one.

However, the 1980s showed a series of reforms that changed the REIT playground entirely. New legislation was passed that basically turned REITs from passive investment vehicles into active ones, where management would play a key role in the performance of the trust. That provoked an amazing growth only moderated a little bit in 1999, after which it skyrocketed again. The current pool of REITs is quite assorted. Although almost everyone are equity REITs, and most of them are unleveraged and close-end (open-end REITs have historically suffered severe liquidity problems), the sectors they invest and their business models vary broadly. We may find quite a lot of apartments REITs, as of office REITs and diversified REITs as well. We may find very low profile REITs managed by very "analytical analysts", as well as others conducted by pseudo-religiously-inspired, self-proclaimed visionary leaders.

Before hypothesizing what the future of the industry would be it is necessary analyzing the current and potential forces affecting it, and their implications. Those forces can be divided into two broad categories: "forces for concentration" and "forces for fragmentation". However, the issue of consolidation is not the only one for the industry. Therefore many of the analysis would deal with whatever trend or aspect would shape the industry in the future.

The main forces for concentration are:

- Capital availability and cost. Peter Linerman's main point[9] is that REITs are able to raise capital quicker and cheaper than other alternatives. Many scholars such as John H. Vogel[10], however, pointed out that individuals can raise cheap capital with a good track record. And that equity demands can put the actual cost above what debt costs.
- Advantageous cost structure. It is argued that the bigger, the better cost structure. However, the same reasoning has been used for other industries where it finally did not work. Alby Gallum[11] challenges the latest wave of cost rationalization saying that it might simply be done in expense of customer service. I agree that there are some economies of scale. I would point out some attached services, tax code understanding, recruiting[12] and delinquent customers management. However, the impact of those might not be so important in the business. Also,

[9] "The Forces Changing Real Estate Forever", Wharton Real Estate Review, 1997. And "The Forces Changing Real Estate Forever: Five Years Later", Zell/Lurie Real Estate Center, 2002

[10] "Why the new conventional wisdom about REITs is wrong", Tuck School of Business Real Estate Finance, 1997

[11] "Equity Office puts customer service under one roof", Crain's Chicago Business, 2003

[12] The attraction of talent is also a controversial point. REITs would attract risk-averse talent but, on the other hand, Risk-seeking talent would go for starting their own ventures.

there is nothing that prevents many of those activities from spinning-off as independent companies that capture the advantages, serving the real estate industry for a fee.

- Brand/Reputation. Among all the concentration forces this is the one I believe the most in. Real Estate can pose some business and economical risks for non-related companies. The lost revenues and higher internal costs due to less efficient RE management can be important depending on the case. It would therefore be worthwhile for some companies (in my opinion this reasoning applies more to corporations seeking office space than to individuals looking for a flat) paying a premium for that tranquillity and forgetting about that. It is the same reasoning as for why drivers may buy premium tyres for their cars. Imaging a company having to decide between a well known, veteran REIT, and a single owner nobody knows if is going to relax the building maintenance over time. Please note that this last argument is very different from the one that argues that brand is important because if the customer moves from one state to another one he or she would like to repeat with our company. I do not believe that is a real factor and, in case of being, the chances of happening are very few.
- Risk management. "REITs permit diversification, so they make sense" argue some. Others say "Let the investors diversify themselves". Actually I agree with both points of view. There is no value added in a REIT that is able to diversify in different RE sectors because of its size. The investor can, and should, just replicate the diversification by buying shares of undiversified REITs. However, this is not always possible because of transaction costs. Can an individual investor (and the USA it is plenty of them) buy 356 sq ft of office, 4667 shares of Armani, and 1535 shares of IBM? Real Estate cycles are not very correlated with other ones and therefore REITs securities are valuable in many non-RE portfolios. This very same argument has been used to explain why some mutual funds investing in foreign, non-public companies make a lot of sense: those opportunities are not easily attainable by many investors.
- Lobbying. The bigger, the more chances REITs have to influence their survival in Washington, Brussels, or Tokyo for instance. There is not real business fundamental for that but it is a matter of fact.

On the other hand we have several forces acting towards fragmentation:

- Revenue enhancement. Retention, price discrimination and occupancy can put the need of capital aside in importance. See for example Northwestern´s model in the capital-based airlines industry. Albert Ratner stresses that RE needs high doses of creativity for its complexity[13]. This is in my opinion particularly important in the apartment sector.
- Local knowledge and dynamics. For example, local lobbying: who said lobbying is exclusive of Washington? Maybe things happen at a lower level. Bureaucracy management is what keeps the development industry local. Local knowledge makes local banks successful in the most capital intense industry that exits: lending[14].
- Principal-agent problems. RE principal-agent issues are potentially huge. A couple of big scandals can revert the concentration process. Also, over time higher overhead bonuses or other "extra-expenses" would put any eventual advantage at a lower level. The equilibrium for that self-adjusting process would be that which makes indifferent REITs and other means.

With the past track record, and these forces acting we might expect some more favourable tax treatments to come, some scandals that would tighten the disclosure rules and create some scepticism, and a long-run Darwinian process that would decide what models actually make sense. I would advocate for "Office-low profile leadership-regional-strong brand". Also I would expect REITs not to grow much more because it seems the diversification value critical mass (which enable any investor to find the security he is looking for) is more than reached, and because anti-monopoly laws can begin to act (see for instance what Equity Office investment strategy is, Does it matter size? Or local market share?).

[13] "The Forces Not Changing real Estate Forever", Zell/Lurie Real Estate Center, 2002

[14] For interesting insights about that see "The virtual reality of mortgages", McKinsey Quarterly 2000-3

QUESTION # 5: How is real estate different from other goods and markets? How important are these differences?

Real Estate is certainly different from the general idea of goods we have in our minds. It is very important being very aware of those differences in order not to fall into the number of misconceptions and assumptions the industry is plenty of.

The main differences regarding other goods are:

- Durability. Real estate is probably the most durable good that exists. Land lasts virtually forever and buildings last for centuries if proper maintenance is done. Durability poses serious challenges to the common theory of supply and demand equilibrium. In the last question of the present assignment it is presented a framework that tries to overcome this.
- Location. Real Estate depends very much on location. In other words, the product is not "x sq ft of apartment" but "x sq ft of apartment located in Y". A RE broker in Chicago can not ask a peer in NYC to send 100,000 sq ft to fulfil his shortage. This apparently innocent reasoning has tremendous implications for the industry and for its market dynamics (see below).
- Technology intensity. Construction technology is not very complicated, excepting few cases such as skyscrapers and some industrial buildings. Additionally, there are no exclusive features that can differentiate much one estate from others (apart from location).
- Financial value of the asset. Durability, fixed location, and well developed financial institutions have turned real estates into something more than real assets. They can be, and in fact are, used as collateral for loan obligations. Banks charge less risk premiums regarding other collaterals such as, for example, cars, because real estate is safer in terms of state and location. A mortgage is not a loan to pay a house, a mortgage is better defined as a loan that uses a house as collateral.
- Real estate accounts for a very significant part of the economy's wealth. This is especially important for individuals. For most of them real estate is almost 100% of their wealth. It can be even more than 100% if we take into account personal leverage.
- Inelastic and inertial supply. The stock of houses is something that does not vary very much along time. It takes quite a long time decreasing it because the natural depreciation rate is very low. Also it is not easy responding quickly to hikes in demand because there is a construction cycle (project financial evaluation, permits, design, contracting, building, etc) that can take several months, even years depending on the case. Therefore supply is inelastic and inertial.
- Market liquidity. The uniqueness of the product and the low number of transactions regarding the total stock make the market not that liquid as it may seem. Many real estate owners suffer from the "marginal price mirage". They think they can sell their properties whenever they want at the same price the latest neighbour in the district did. If all -or just a fraction- of the neighbours though –and acted- the same, prices would plummet.
- Externalities. Estates have a number of externalities. For example, the appearance of the façade can make the city more valuable or not. Also, we may encounter situations where other's actions influence the value of the estate. For instance, a new district development can leave some properties more valuable because the view is now better, while other properties can be seriously damaged because of a new highway passing aside.

All these peculiarities make the real estate business certainly different from others. Their importance can be observed by the following facts:

- There can be a high monopolistic power. Location actually implies this. The big question while analysing a market is defining the boundaries of it. Many microeconomic and business scholars[15] have pointed out this factor as the key to effectively apply their frameworks. A nation can not be considered a real estate market for the simple reason that an sq ft of apartment in Springfield is not the same product as an sq ft of apartment in Wichita. However it is frequent listening about the USA market and even there are many supply and demand

[15] Michael Porter in his "Competitive Advantage" is a good example of this.

analysis at such a high level. The actual dynamics occur at a much modest level. It is very difficult (it is actually impossible) to accurately define a market. It depends very much on the case but we would conjecture that the retail market can be defined by commercial areas, the apartment market by districts/towns, and the office market by cities. The key factor for this analysis is the ability of a customer to indifferently select an estate around the area: its mobility. This narrow definition of markets implies a greater monopolistic power by owners, that some of them exercise successfully.

- Adjusting, transitory effects are significant in industry's dynamics. The durability and importance of the assets retards reaching an equilibrium point after any given shock. Actually, it seems this industry is always transitioning to another different equilibrium. That would explain why sometimes things happen that seem to contradict any common sense (or framework). Sometimes this industry is more explained by transitions than by equilibriums.
- Regulation. The social importance of real estate (see next point) and of its externalities makes the administrations vastly regulate its activities. Regulation has such an influence that can overshadow most of the other forces playing in the industry. Regulation can reshape the industry and it is important to take this into consideration in such a long-term type of investments.
- Real estate has important, indirect effects in the economy and society. Below there are just a few examples:
  - Social mobility. A government promoting home ownership may think it is fostering familiar happiness. But it is also putting a constrain into resource allocation. Put to an extreme case, image what would represent for the US economy not being able of attract the best aeronautical engineers to Seattle, the best play-writers to Hollywood, and the best Cancer medical researchers to Houston.
  - Economic structure. One example illustrates the point: Spain's land structure[16]. After several centuries of Arabic occupation of what now it is call Spain, the ""Christian"" army begum the "re-conquering" from its northern positions to the south (remember the Arabic army came into Europe from the south, crossing the Gibraltar strait). To finance this venture they promised to pay the army members the land they were conquering. Beginning by the plain troops (the least patient) and ending by the Generals (more patient, but also demanding). The war left a land ownership structure very fragmented in the north, medially in the centre, and very concentrated in the south. Land concentration encourages owners to live from their rents, without the need of doing much more. General population had no other chance rather than working for those landlords. On the other hand, the northern inhabitants could not make their livings with the little portions of land each one had, and begum to associate and set up productive facilities. Some time later the result is now southern Spain among the very poorest areas in the EU[17] while northern Spain is among the richest.
  - Saving vehicle. Estate ownership is a way people enforce themselves to save for retirement, when they can cash the estate by asking for a loan. Many people like this saving vehicle for its visibility and proximity to them.
  - Cheap source of funds. As mentioned before. It is especially important for SME[18] entrepreneurs that otherwise would find problems finding cash.
  - Wealth perception. It has political implications. Take for example the UK where during the 80s RE crisis the value of the country's homes was below the home mortgage value[19].
  - Wealth equity. Tax policy regarding RE can change dramatically the wealth distribution of a society. The most important policies in this sense are those regarding how capital gains are taxed (how much and when). Those policies can effectively undo any apparent, progressive tax scheme.

[16] "Historia Económica Mundial y de España", F. Simón Segura, 1997
[17] European Union
[18] Small and medium enterprises.
[19] Source: The Economist special survey on home real estate, 2003.

QUESTION # 8: What should be done about GSEs?

The Government Sponsored Agencies (GSEs) are basically two: the Federal National Mortgage Association (Fannie Mae) and the Federal Home Loan Mortgage Corporation (Freddie Mac). Both play almost the same role in the mortgage market though Fannie Mae is closer to the VA (Veteran Administration) and to the FHA (Federal Housing Administration), its originally exclusive clients (now there is freedom to chose, but the trend persists). Additionally the Federal Home Loan Banks, especially Chicago's are becoming to play a similar role to that of the two main, pure GSEs.

Fundamentally, the reasons because these two agencies were created are:

- Long-term hedging (or diversification). Mortgage securisation under US federal government guarantee allows the banks to offer products more convenient for the population that were not available before. Specifically that allows offering long-term, fixed-rate mortgages at a reasonable cost. Scholars such as Anthony B. Sanders[20] argue that this function can be perfectly performed by financial institutions as well. Others do not see that so clear: the huge volume of the assets and the maturity of them make banks think it twice before investing. For example, Spanish bank system and institutions are well known for their excellence and performance. But they are not keen of fixed rates (at least in large proportions) and thus mortgages in Spain are 95% floating type. Taking into account that around 90% of houses are in property and that people dedicate a great deal of their rents to serve the debt, a hike in interest rates might cause a dramatic crisis in the national economy, and in the society too.
- Value-Chain specialisation. These two agencies allow banks to focus on mortgage origination, and customer satisfaction without having capital constrains for that. In other words, there is a split of the value chain activities that permits a higher degree of specialisation that potentially would benefit the performance of the entities and of the economy as a whole.
- Social policy tool. GSEs are very powerful and effective policy-making tools. For example, Fannie Mae and Bank One have partnered to launch a special program to allow disabled Chicagoans to qualify for a mortgage[21]. GSEs can make positive-action policies reality in a very actionable, simple and direct way.

However, the functioning of GSAs over the years have let the public to observe their operating issues, some of the of great importance and dangerously growing. The main issues are:

- Principal-agent problem. Latest accounting problems can be nothing but the peak of an iceberg. In the deeper part of the iceberg there would perfectly be special treatment to some institutions in expense of others, making-up the real social impact of the agencies, nepotism, electoral campaigns, etc. Even though almost nothing has been proved, the list is vast enough, and the GSEs are big enough (among the largest companies in the worlds by assets) as to seriously worry about that.
- Value transfer. There is an implicit value of the federal guaranty in the loans. The value of that guarantee must be enormous. Many people outspeak against private investors taking advantage of that guarantee.
- Adverse selection problem (Lemons problem). Currently GSEs not only "buy" the interest risk, but also the credit risk. And the pricing model consists in paying a flat fee for this risk whatever the real credit risk of the originator is in the future. This is very harmful to the banking system because banks, thrifts and other lending institutions would relax their credit scorings (considered by many the core lending activity). The problem is not that they can relax, but rather that they will relax. Originators are in fact encouraged to attract bad new customers with cheap mortgages. Then, the originator would cross-sell a myriad of financial products (credit cards, deposits, funds, etc), making a profit without suffering the downside, that is in the GSEs' side.
- Investors expectations. From the investors stand point the issue is as follows: why shall I invest in a company whose decisions are not entirely aligned with the profit-making assumption? Broadly speaking, the return on companies investment depends on the set of decisions taken under a high

[20] "Government Sponsored Agencies: Do the benefits outweigh the costs?", RE Finance and Economics, 2002
[21] Chicago Sun-Times, November 13th, 2003

degree of uncertainty. However, in the case of GSEs the profitability is marked by decisions taken under a high degree of certainty. We know that if tomorrow GSEs decide to aggressively expand their activities -even more- investors are going to suffer the worse credit conditions (unless GSEs decide to compensate them by other means). This sort of zero-sum game makes the GSEs and the federal government (which in fact are the virtually same) can perfectly draw the agencies returns for the next years. This contradicts the very deep spirit of capitalism where an investor is rewarded for the risk he or she takes, and for how he or she manages that risk. In summary, there are high capitalistic concerns in these types of companies.

Given the formerly pros and cons of the GSEs, many people have been trying to modify certain aspects of them. Either complaining in Washington or, like Alex Pollock, president of the Federal Home Loan Bank of Chicago (FHLB of Chicago) by trying to convert FHLBs into secondary mortgage players. The FHLB of Chicago launched a formidable successfully secondary mortgage programme. Its success stems from the fact that it does not buy the credit risk. Actually, it pays a flat fee to the originators for keeping that, leaving any credit-scoring gain to them as an incentive. What is happening now is that the big GSEs are getting the "apples" while the FHLBs are getting the most profitable clients. For instance, the same Bank One we mentioned before has signed an important long term agreement with the FHLB of Chicago for its normal business[22].

In my opinion, all this facts lead to the following should-be decisions about GSEs:

- The mission has to be redefined. I would lean to its social dimension (positive action) such as ethnic minorities, the disabled, and single-parent families. I would withdraw the goal of just promoting more rates of home ownership because the rate is already enough, and because there is no direct correlation between home ownership and welfare, or social happiness. Germany might be a good example of that.
- I would progressively empty the equity role of the agencies. In other words, In the long-term I would like to see the agencies as mere packers (including federal guarantee) and distributors of securities. Not as the remaining equity of the security. In more technical words, I would encourage the issuing of pass-trough securities (or even collateralised mortgage obligations if the last trench is not subscribed by the agency) instead of bonds. That would solve part of the investing arbitrariness pointed out above. Also that would lead in the long-term to the withdrawal of the agencies from the stock exchanges (not an easy step). On the other side, investors would have the opportunity to invest in securities with complete, permanent information about them. For example "mortgages for general public in Tennessee between 2005 and 2007 under XYZ conditions", or "mortgages for Hispanic minority in southern California under ZYX conditions".
- I would adopt the FHLBs pricing system, leaving credit risk to originators. I would complement this measure with another one setting different credit risk fees for different programs. That way we would not discourage the purchase of securities related to less profitable areas or segments of population. I.e. the agencies have to recognise the fact that different programs have different credit risk, but they leave the individual scoring (deviations from the mean) to originators.
- Finally, something has to be done about corporate governance. It is always easy to give few tips that would put patches in bad practises, especially in the latest, more public-sensitive ones. That has proved not to be very effective over time, especially taking into account that the designers and implementers of the measures are indeed the very same people under scrutiny. Instead I would argue to let the FHLBs to play in the market under the same conditions as the current incumbents (basically letting it re-selling the securities). It is not a matter of competition (as Mr. Pollock defends, virtually we are passing from 2 players to 3), it is just to introduce a new player that in my opinion have much higher standards of corporate governance, setting up a sort of role model in the industry. What causes that "best practice" is the role of the program members in the supervision of the FHLBs. Such fragmented, assorted pool of supervisors is the best long-term guarantee against bad practices.

[22] "The mouse roaring at Fannie and Freddie", Business Week, August 4th 2003

QUESTION # 15: Describe an example of a situation where our supply and demand model would be useful. Explain the movements of prices and quantities using graphs and/or equations.

A) CONCEPTUAL FRAMEWORK

Real Estate is one of the most durable goods that exist. That represents a challenge to the traditional theory of supply and demand because the ongoing stock of houses also counts as offer. It is possible to explain some market dynamics through the traditional framework, but we need to use complicated shapes and sometimes rare assumptions.

For this assignment I am going to use the market dynamics framework for durable goods, which is just a generalization of the traditional approach. A durable good is by definition one that lasts more than one market period. Therefore, in each period there would be a stock of goods "S(t)". And there would be built new stock, call it investment "I(t)" as well. Also, in each period a certain amount of stock would disappears because of the limited durability of the good. We call "δ" the fraction of good that disappears, the "depreciation rate". Thus the following expression must be true:

$S(t) = (1-\delta)\, S(t-1) + I(t)$[23] E1- STOCK ADJUSTMENT

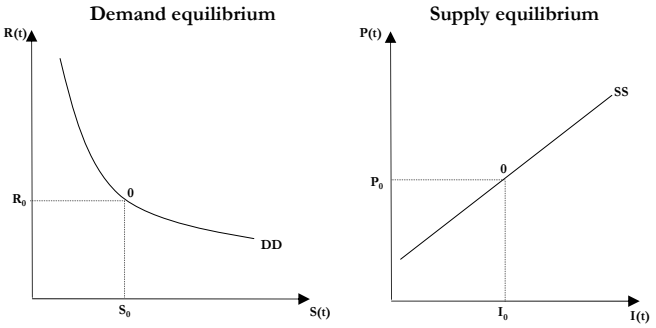
Let's call P(t) the price of the good, and R(t) the equivalent rent of enjoying the good for one period. R(t) is a financial concept. Even if it did not exist rental market for that good the concept would be valid yet. Consumers would demand more or less stock of houses S(t) depending on the market rent R(t) (Demand equilibrium). Similarly, developers would build more or less houses I(t) in a given period depending on the capital price of the good P(t) (Supply equilibrium).

S(t)=Demand (R(t))
E2- DEMAND EQUILIBRIUM

I(T)=Supply (P(t))
E3- SUPPLY EQUILIBRIUM

Graphically we may represent both relations as in figure 6.

FIGURE 6: DEMAND & SUPPLY EQUILIBRIUMS



Finally, there has to be a fourth expression (Remember there are 4 variables, S(t), I(t), R(t), and P(t)) that links the price of a house with its expected flow of rents (not necessarily real, it can be opportunity market rents).

$$P(t) = \sum_{T=t}^{T=\infty} \frac{R(T)*(1-\delta)^T}{(1+r)^T}$$ E4- ASSET PRICING EQUILIBRIUM

Expression 4 can easily be converted into: $R(t) = P(t) - P(t+1)\frac{1-\delta}{1+r}$

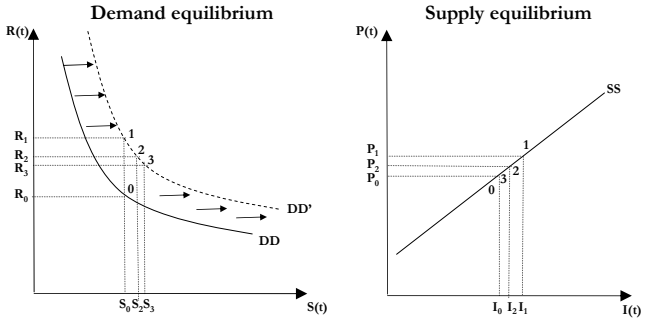
In case of permanent equilibrium over time we would have that I(t+1)=I(t)=I, P(t+1)=P(t)=P, and so on. We call this state the steady state. In the steady state expression 1 turns into I =δ*S, I.e. investment fulfills the gap created by depreciation in order to maintain the same stock of houses over time. Also, in the steady state expression 4 turns into: $P = \frac{R(1+r)}{(r+\delta)}$ (Value of perpetuity)

[23] This model assumes that adjustments take place from period to period. In the case of real estate it can take several periods due to the long production cycle. Therefore we may change I(t) for I(t+T) in the supply equilibrium graph (figure 6). Both analysis would be analogous.

B) APPLICATION EXAMPLE: A POSITIVE SHOCK IN DEMAND

Let's suppose that some good news convince the population that their incomes are going to raise, and therefore[24] the demand curve shifts right in a fashion as shown in figure 7. Now, for the same stock S_0 consumers are willing to pay a higher rent R_1[25]. The higher rent (and the expectation of future, higher ones) makes revisiting the price (see expression 4) to a higher value P_1. By the supply law developers now would also produce more, i.e. I_1.

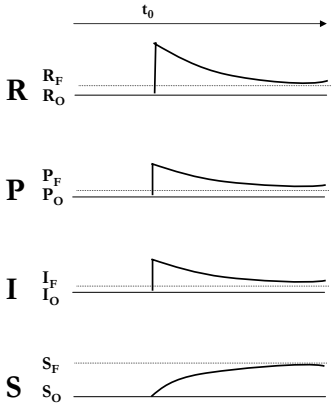
FIGURE 7: TRANSITION AFTER DEMAND POSITIVE SHOCK



The new stock (I_1) would add to the current one ($S_0=S_1$) at a higher pace than depreciation. Making S_2 higher than $S_0=S_1$. Higher S implies lower rents by the law of demand, falling from R_1 to R_2. Now price revision would decrease the price from P_1 to P_2.

The rational continues indefinitely till reaching a new steady state that can be obtained by using the steady state expressions provided before (2 simplified equations plus the fact that also in the steady state the demand and supply laws must be true). Figure 8 shows the time evolution of the above analyzed shock. R_0 represents the original steady state while R_F the final one.

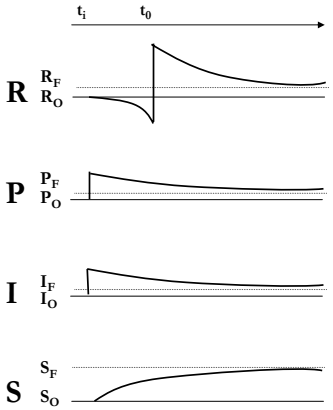
FIGURE 8: EVOLUTION OF MAIN VARIABLES



Note that the shock provokes a transition period that amplifies the real, long-term effects. Especially interesting is the fact that, after the shock, rents and prices continuously decrease.

Imagine now that the same shock occurs, but we know that some time in advance (imaging, for example, that it is a rental tax cut announced 6 months in advance). In t_i, when the information is released, prices will jump for the expectation of higher rents in the future. However, if we follow the same iterative method as before we will see (figure 9) that stock and investment will rise, provoking an oversupply that would depress rents. In the very moment the demand actually shifts (t_o) rents will go up as expected.

FIGURE 9: EVOLUTION OF MAIN VARIABLES WITH INFORMATION RELEASED SOMETIME IN ADVANCE



Releasing the information in advance will make the process smoother excepting for the rents, that suffer instability till the change actually occur.

[24] Assuming Real Estate is a normal good. Otherwise an increase in income would provoke a decrease in the demand (inferior goods)

[25] Or equivalent rent. The rent is an economical concept valid both for owned-houses and for rented ones.

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