First-in-Class

The Making of Mexico's New Investment Industry

Three Case Studies

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Angels, Devils and Genies

The making of Mexico's first Hedge Fund *

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Abstract

Despite the fact that Mexico's capital and derivatives markets can be considered as reasonably well developed *vis-à-vis* other Emerging Economies, it was not until November of 2013 that Actinver launched the first Long-Short fund in the country: the *"Genie"*[1]. The reason for the delay is attributable to transaction costs, the lack of liquidity of all but the top 40 stocks listed in the Bolsa and the relatively tight limits that most fund operating companies have set on pledging collateral for derivatives transactions, and on selling short stocks. Despite these shortcomings there was a real opportunity to develop a Mexico Long-Short product. On the one hand, the Mexican Bolsa Index ETF is very liquid and on the other hand, there is also a locally listed -1x inverse Bolsa Index ETF, the *"Devil"*, and a 2x leveraged Bolsa Index ETF, the*"Angel"*. By focusing on this liquid node of the market, the architecture of the *Genie* coupled a technically based long-short Bolsa algorithm with an efficient use of *Angels* and *Devils*. This design allowed the *Genie* to minimize transaction costs while offering clients a strategy capable of taking advantage of market-wide movements. This document looks in detail at the regulatory, transactional and portfolio management issues raised and addressed during the creation of this fund.

1 Context

1.1 Conditions for a Viable Hedge Fund

With the exception of Brazil, no other Emerging Market in Latin America had any locally listed hedge fund until the end of 2013.

From the perspective of a developed market, a well functioning hedge fund has to meet some minimal conditions:

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[1]Registered as Fondo ActinTK. Wee will refer to it as *Genie* in this document.

- There should be a relatively large number of stocks. Asset managers must be able to bring about diversified portfolios and to enhance their with various sources of leverage.
- The available stocks must be sufficiently liquid to allow portfolio managers to get in-and-out of their positions fast enough in response to changing conditions.
- The regulatory and market infrastructure should provide portfolio managers with the tools to short these stocks either by short sales or via the use of liquid equity derivatives.

By looking at this list, only Brazil and no other country in Latin America meets all three requirements.[2]. In contrast, Mexico has a more modest, albeit well functioning cash and derivatives market. There are fewer stocks and a lack of a deep equity derivatives base. However, this should not a reason to abandon completely the idea of setting up a hedge fund to the extent that one could obviate the idea of necessarily having a "classic" fund with many stocks leveraged with equity derivatives. By shifting the emphasis towards a specialized hedge fund that can go long and short the entire market, Mexico qualified for having a simpler and yet attractive product for local and foreign investors.

Table 1: Two Approaches to Hedge Funds in Latin America

Concept	Principle	Platform	Example
Multi-Stock (Long-Short)	Fundamentally Driven (Factor Loadings)	Short Sales and Equity Derivatives	Brazil
Market Index (Long-Short)	Momentum Driven (Technical Analysis)	Index Derivatives and Inverse and Leveraged ETFs	Mexico

1.2 Ingredients for a Index based Long-Short Fund in Mexico

For the purposes of setting up and operating a Long-Short hedge fund, the Mexican capital market can be described in terms of a handful of stylized facts.

- The Mexican Bolsa has a decent trading volume, although concentrated in very few stocks
  - Bolsa trades an average daily volume of 1 billion USD.
  - More than 60 % of the volume is concentrated in the top 40 stocks.
  - All these stocks can be sold short, however the lending market for these securities is rather thin.

[2]According to 2013 data published by the World Federation of Exchanges, Brazil has 362 listed companies, a market capitalization of 1.2 trillion USD, a monthly equity traded volume of 0.7 trillion USD, and a total of 929 million optional contracts on individual stocks traded during 2012. Using this metric, Brazil has the deepest and most active listed equity derivatives market in the world

  - Only 10 out of these 40 stocks have equity options listed and traded in the Mexican Derivatives Market. Here, liquidity is concentrated in only three companies.

- The Mexican Bolsa Index (the IPC®) can be easily traded using the iShares NAFTRAC ETF®. This stock trades in excess of 60 million shares a day and holds assets under management in excess of 8.5 billion USD. The ETF follows the IPC®Bolsa Index with no tracking error thanks to its unique design features.[3]

- The Mexican IPC futures market has a modest trading volume compared to the cash market. In fact, the average daily volume for this contract is about 160 million USD per day. Despite this, the market makers behind this market can sustain with no difficulty the rebalancing of a long-short portfolio in the range of 700 to 800 million USD.[4]

- Investment Funds (i.e. Mutual Funds) are regulated by the Central Bank and the Mexican SEC(i.e. CNBV) as for the use of derivatives and short sales. This regulation establishes that they can only use derivatives listed in so called "acceptable markets" (i.e. Bolsa, MexDer and those of countries that are either OECD members or members of the Technical Committee of IOSCO).

- There are two leveraged ETFs. One delivers the daily inverse of the return of the Bolsa Index. The other one deliver twice the daily return. These ETFs are created and redeemed using iShares NAFTRAC®at a *notional* price that reflects the return of the index with no tracking error. The underlying liquidity of these ETFs is the same as that of NAFTRAC®.

Table 2: Basic Metrics of the Mexican Capital Market in 2013

Concept	Shares Traded (ADV)	Value Traded (USD)	Short Sales	Futures or Options
Bolsa	200 million	1,200 million	—	Futures and Options
NAFTRAC	60 million	300 million	Yes	Via leveraged ETFs
Top 40 stocks	120 million	650 million	Yes all	Only 10 stocks
IPC Futures	4,800 contracts	160 million	—	—

Source: BMV and MexDer

[3]iShares NAFTRAC®has been designed to offer a *price return*, instead of a *total return*. It keeps two separate accounts. A "securities" account that handles creations and redemptions and an "expenses" account that absorbs operating costs using the dividends paid by the underlying assets. Thanks to this design, the ETF has shown no tracking error over its 12 years of existence.

[4]This is obviously an educated guess. The main market makers for the IPC® futures contracts are Banco Santander, Bank of America and Barclays. Consultations with some or all of them are behind this assessment

1.3 Objectives and considerations for the First Hedge Fund

1.3.1 Objectives

With these ingredients at hand one could think of a fund with the following objectives:

Long-Short Bolsa In the ideal scenario one would like to have a product that makes money when the market index goes down and that leverages the gains when the market index goes up.

Few False Signals One would want a fund that more often than not finds itself invested in leveraged positions when the Bolsa Index rises and inverse positions when it declines.

Low Operating Costs Since we are considering a portfolio that will constantly rebalance the entire position across three states (long, short and neutral), transaction costs could become extremely large. Thus, one requires an architecture that reduces the costs associated to spreads and trading commissions.

Flexible One would prefer to have a fund with instruments that can be easily and efficiently loaded and/or unloaded more than once in a single trading session.

1.3.2 Taxation and Regulation

Subject to the following constraints:

Regulation Regulation issued by the Central Bank and the Mexican SEC restricts *listed* investment funds to using only *listed* securities and derivatives. Thus, one had to rule out any OTC counterparty from the outset.

Taxation The Fund, and any of the vehicles through which it would operate, must qualify as *see-through-entities* to eliminate any tax bias. specially for the shares issued for non taxable entities.

Operational and Market risk The fund could face significant counterparty, operational and market risks. The choice of the underlying instruments must be such that they are easy to understand, price, valuate, trade. They must also have a minimal counterparty risk.

1.3.3 Market Context

In addition to the mentioned above, the product must be designed to succeed in the marketplace given the following context:

Competition Getting the *Genie* approved by the Mexican SEC was a process that took over 18 months. During this period, the regulatory bodies took a look at internal controls, operational design, invest-

ment policies and pricing (i.e. fees). Considering the length of this process, and assuming that any new entrant would face a similar approval process, the *Genie* should expect to benefit from a window of *"no"* competition for a while.

Distribution Under an investment fund format, the distribution of the *Genie* has to be done through the proprietary channels of the fund sponsor and the channels of third parties via distribution agreements. By its nature, this product would intended for high net worth clients and institutional investors. Foreign investors could also have access to it through an account held with one of the fund distributors or directly with the sponsor.

Fees The Mexican authorities have not authorized non-linear pricing formulas for investment funds. Therefore, the pricing formula must be defined in terms of a fixed percentage of the assets under management.

Market spillovers One could anticipate that if the size of the fund becomes significant, it could beget at least three types of market externalities.

- If and when competition arises in this segment there could be players of significant size that could crowd the underlying market in a way that by itself affects the volatility and tradeability of the Bolsa Index and its listed derivatives.
- If and when the fund reaches a size larger than a 800 million USD it could become difficult to trade the index. It may become impossible to rebalance the fund in a single trading session. The rebalancing may need to be spread out along several trading sessions, thus reducing the effectiveness of the trading strategy.
- When and if the fund achieves a significant size, other market participants may have sufficient elements to anticipate its moves, thus posing a situation where the orderly process of price formation may be compromised (i.e. *market cornering*).

Track Record The main problem of selling a strategy to clients when the product is first to market is that there is no track record for the portfolio managers. Therefore, the sponsor may have to openly delineate its underlying methodology. This would imply having to share some sort back-tested and/or simulated scenarios aiming at providing some guidance on potential performance. This fact lowers the barriers to entry to competitors that would want to simply replicate the *Genie*. In this environment, operational efficiency and distribution capacity becomes ever more crucial for the success of the product.

2 Operational Architecture

Given these objectives and constraints, the design process boiled down to just a handful of critical decisions. They are summarized in table 3.

Table 3: Choices for an Operational Platform

Concept	Alternative A	Alternative B
Neutral position	Use of ETFs	Replicate the market portfolio
Short and Leveraged Positions	Use ETFs	Using listed IPC®Futures
Strategy	Based on a disclosed model	Discretionary

2.1 Angels and Devils and NAFTRACs®

The *Genie* uses ETFs for handling its positions. Below we mention some of the distinct features of these specific instruments. The reader will soon realize the convenience and simplicity that comes from choosing these building blocks.

2.1.1 NAFTRAC ®

No tracking error This ETF was designed to track the Bolsa IPC Index. Historically, NAFTRAC®has show no tracking error. Furthermore, its portfolio is rebalanced every day in such a way that the notional value is equal to a $1/1,000$ of the Index.

Low fees The ETF has an all-in fee of 25 bps.

Tradeable Given its one-to-$1,000$ relation with the index, traders have found this ETF easy to appraise and to arbitrage.It has a very deep secondary market.

Exchangeable for Angels and Devils NAFTRAC®is *"the"* eligible security in the creation and redemption baskets of *Angels* and *Devils*. Therefore, neutral positions can be transformed into long or short positions without having to sell or buy NAFTRACs®, to later buy or sell *Angels* or *Devils*. Instead, these three ETFs are simply interchangeable among themselves at the "*Issuing Trust*" level.

2.1.2 *Angels* and *Devils*

Angels: Design and operation

- The ETF intends to deliver 2x the daily return of the Bolsa Index.

- Its balance sheet has NAFTRACs®and *notional amounts* of the IPC®*listed* Futures in the same proportion.
- At the beginning and at the end of each trading day the futures positions of the ETF are marked-to-market in such a way that the only position it holds, and thus the entire notional (NAV) and accounting value of the ETF is equal to its gross holdings of NAFTRACs®.
- Creations and redemptions are done at a notional price (NAV) twice a day. At $9:30$ am and at $2:00$ pm [5]. The notional price is defined by 1

$$NAV_{(C/R)_t} = NAV_{last_{t-1}} * 2 * (1 + \Delta\%IPC_{(C/R)_t, last_{t-1}}) \tag{1}$$

  where *last* means the closing price of the IPC, and C/R is the time of a creation or redemption window in the intra-day market.
- Creations and redemptions have no cost.
- Investment (i.e. Mutual) Funds can operate directly with the *Issuing Trust* of the *Angel* doing creations and redemptions at the notional price. There is no spread between creation and redemption operations.
- The ETF is fully listed in the Mexican Stock Exchange. Has both, a primary and secondary market. Since it only has listed securities or contracts in its balance sheet it qualifies as an eligible instrument for Investment Funds from the point of view of the Regulators.
- The ETF is a *see-through* vehicle for tax purposes.

Devils: Design and operation

- The ETF intends to deliver -1x the daily return of the Bolsa Index.
- Its balance sheet has NAFTRACs®and a notional amount twice as large in sold listed futures contracts of the IPC®.
- At the beginning and at the end of every trading day the futures positions in the ETF are marked-to-market in such a way that the only position it has, and thus the entire notional (NAV) and accounting value of the ETF is equal to its gross holdings of NAFTRACs®.
- Creations and redemptions are done at a notional (NAV) price twice a day. At $9:30$ am and at $2:00$ pm. The notional price is defined by 2

$$NAV_{(C/R)_t} = NAV_{last_{t-1}} * (-1)(1 + \Delta\%IPC_{(C/R)_t, last_{t-1}}) \tag{2}$$

  where *last* means the closing price of the IPC, and C/R is the time of a creation or redemption window in the intra-day market.

[5] Market hours run from 8.30 am to $3:00$ pm

- Creations and redemptions have no cost.
- Investment (i.e. Mutual) Funds can operate directly with the Issuing Trust of the *Devil* doing creations and redemptions at the notional price. There is no spread between creation and redemption operations.
- The ETF is fully listed in the Mexican Stock Exchange. Has both a primary and secondary market. Since it only has listed securities or contracts in its balance sheet it qualifies as an eligible instrument for Investment Funds from the point of view of the Regulators.
- The ETF is a *see-through* vehicle for tax purposes.

Considering all of the above, one can come up with a very simple operational scaffolding, as shown in table 4.

Table 4: Simple Architecture of the *Genie*

Signal	Leverage	Portfolio
If Bolsa IPC® expected to rise	$\beta = 2$	100 % in *Angeles*
If Bolsa IPC® expected to drop	$\beta = -1$	100 % in *Diablos*
If Bolsa IPC® expected to move laterally	$\beta = 1$	100 % in *NAFTRACS®*

This design has the following significant advantages:

No bid-ask spreads All rebalancing transactions are plain *conversions* of ETFs from one to the other at their notional value.

Zero re-balancing costs Creations and redemptions of *Angels* and *Devils* into and from NAFTRACs® are done via instructions sent directly to the *Issuing Trust* of the ETFs. The *Issuing Trust* does not charge any amount for creations and redemptions.

Tight control of the β of the Fund According their sponsor, during 2013, the *Angels* had a β of 1.989 and the *Devils* had a β of -0.99. [6]. We have also highlighted that NAFTRAC ® has a β of 1.0. All these numbers put together make it possible to control, to a significant degree the β of the hedge fund.

Capacity to do large intra-day rebalancings Considering,

- that the fund managers needs only to have NAFTRACs ® to operate;
- that this ETF is the single most traded security in Mexico's market; and,
- that there are two daily windows for creations and redemptions after the opening and before market close,

[6] Source:Actinver TRACS S. de RL.

the *Genie* is capable of shifting its entire position up to 2 times in a day with very low operational and market risk.

Transparency The accounting of the *Genie* is rather simple and straightforward. It only has up to three securities at a time, all of them with prices determined in the continuous market and published in the Bolsa data dissemination platforms. In addition all instruments used for investing in the *Genie* are see-through vehicles for tax and regulatory purposes.

3 An Allocation Algorithm

We present in this section an allocation rule for combining the above mentioned ETFs in a Long-Short Bolsa Fund[7]. We built this rule based on the signals produced by conventional technical analysis. The sponsor of the *Genie* claims that he/she uses also technical signals. He/she discloses, in the sales materials a back-testing said to be the outcome of using such class of signals. However the details of his/her actual methodology are not disclosed. Here we spell out a construct that can be seen as an interpretation of what the sponsor may have intended to do. Our intention is to illustrate a way of addressing a market opportunity without attempting to exactly replicate the back-testings of the sponsor. The actual methodology followed by the fund operating company may be significantly different.

3.1 An Expert System using Technical Analysis

We mentioned before that due to the lack of a track record, a fund that is a first-in-class needs to be supported by an algorithm that can be back-tested and to unveil the reaction function of the portfolio manager, at least for some time. Given the design suggested in table 4 a logical way to proceed would be to build an algorithm based on technical analysis indicators as depicted in figure A.1. For a fund that requires frequent rebalancing the challenge is to find the right indicator to extract a long/neutral/short signal. In principle, it is hard to think of an indicator that is ex-ante superior to another. In practice, technical analysts look at several indicators in combination before making a recommendation.

Here we suggest taking an approach similar to what one would expect to see in a real-life investment committee (see table 5). That is, lets imagine for a moment that we could put together in one room 5 specialists. Each one focuses on a particular methodology. For our purposes we looked at Moving Averages, Bollinger Bands, RSI, MACD and Williams %R. Each specialist issues a recommendation using the parameters described in Appendix A.

[7]The methodology presented in this section ($\copyright inMexico$) is not intended for commercial use without the written permission of the author.

Table 5: Searching for a Technical Algorithm

Step	Objective	Criterion
i.	Choice of Technical Indicators	SMA, Bollinger, MACD, RSI, W%R
ii.	Streamlining the recommendations	Market information and stop loses
iii.	Run back-testings	Alternative voting scenarios
iv.	Strategy Selection	Ranking strategies based on total returns, volatility and "quality" of alternative paths

Table 6: Types of Recommendation

Recommendation	β
Strongly Bearish	-1.0
Somewhat Bearish	-0.5
Neutral	1.0
Somewhat Bullish	1.5
Strongly Bullish	2.0

Each member of this expert group will use data from January 1, 2004 to January 10, 2014. They are asked to produce a recommendation every day. He/she will know at the time of issuing the recommendation all past information including the level of the IPC® index at the market open on the same day. The expert will fill out one or more ballots with his/her respective recommendation.

The number of ballots that each member receives depends on the assessment that the Chairman of the committee has made of the accuracy of past predictions, as explained in section 3.2.

Before each member casts his/vote, they are allowed to streamline their recommendations. On the one hand, if an announcement of the US FED is expected on the following day, the expert makes the decision to stay neutral during the current day and the day of such announcement. On the other hand, if over the last three trading sessions the strategy has accumulated a loss of 3% or more, the recommended position for the fund will remain neutral during three more trading sessions before returning to the standard recommendations of the technical signal.

At the Committee voting session the Chairman selects the recommendation with more votes.

Once the decision is made, the fund is rebalanced at the time of the first window of creations and redemptions of *Angels* and *Devils*. The position is held during trading session and overnight.

3.2 Optimization and Strategy Selection

3.2.1 Vote Allocation

Not all technical signals perform equally well for the time series of the Bolsa Index.[8] This algorithm is based in a simple exercise of choosing systematically the best combination of opinions coming from these 5 experts.

Initial vote allocation We assume that each specialist is given two votes. So the total number of ballots is 10.

Redistribution of votes We take two ballots from the voters that are considered the worse performers and passed on to the two who are the best performers. So we end up in a situation where two strategies have one vote, another has two and two of them have three.

Scenarios All scenarios considered are shown in table A.6. Obviously we could consider more extreme alternatives where all votes removed from the worst performers go to only one of them, or analogous distributions. However, here we choose to keep a relatively simple exercise that gives some consideration to all strategies at all times. We must point out that Scenario # 1 in table A.6 refers to the case when the portfolio strategy remains neutral all throughout the sample period.

3.2.2 Back-testings

In Appendix B one can clearly see the limits of strategies purely based on technical analysis, but also one can notice how well they respond when coupled with some market or macro-fundamental information.

The Base Case: NO FED days, NO Stop Loss The back-testings of the 30 scenarios are displayed in figure B.2. This figure displays an horizontal line that corresponds to the level of the IPC® at the end of the sample period. The striking result is that only a handful of combinations of committee vote allocations actually beat the Index, even over an extended period.

Including FED days The consideration of FED days for the Mexican market is clearly non trivial. We see two interesting features in figure B.3. One is that there are more strategies that can beat the index over the sample period. The second is that the performance of one of them, which happens to be # 18 offers substantially better results than before.

[8] One can consider extensions to this model such as endogenously determining the parameters of each technical model, or including more simulation scenarios, however the general sense of he results does not change materially. Thus, to keep things clear and simple in this document we will work through a minimal model

Stop Losses However, the most interesting results come from combining FED days and Stop Losses. In fact, figure B.4 shows that about two thirds of the combinations of technical signals beat the index, and they do so by a significant margin.

The above results, an the inspection of figure B.5 allow us to make the following remarks.

- Technical Analysis, if left unattended, can lead to really bad outcomes.
- The combination of some technical signals with fundamental information and some pragmatic portfolio management can lead to rather attractive outcomes in most cases. Moreover, the worst strategies albeit disappointing, hardly end in catastrophic outcomes.
- It is a fact that volatility in the best scenarios looks high. However, once the results are normalized by the value of the portfolio they do not look as bad. Notwithstanding, it seems that the scenario of highest returns will hardly make clients and portfolio managers feel comfortable.
- Finally, figure B.6 suggests that the strategies that rank at the top of the list will win and lose money as many times as the Index does. However, from the fact that we end up with significant long term gains *vis à vis* the Index means that in average the strategies gains are larger and the loses smaller than the index, which is in the end what one wanted of the portfolio in the first place.

3.2.3 Static vs. Dynamic Choices

Our example rests on two important simplifications. On the one hand we are assuming that the strategists do not learn from past mistakes. A natural evolution of the algorithm would be to give them the chance to introduce some sort of learning process by means of which they could dynamically adjust the parameters of their models. For the purposes of this document we have decided to keep the parameters of the technical indicators fixed at levels that could be considered as commonly used in the industry. The other one would be to give the Chairman of the committee the chance to revise the voting weights annually lets say, by looking the performance of the previous year. In fact, it is clear that no strategy is the best year after year. So, we simulate a situation in which one picks the best last performer. Figures C.3 y C.4 in **??** highlight the fact that doing so will lead us to a timid outcome that end under-performing the index.

3.2.4 A word on Loses

Despite the large drops in absolute terms that we see in the strategies that end up on top in terms of commutative returns, percentage-wise most portfolios report loses that are not disproportionately large when compared with the Index. Figure C.5 shows that about one fourth of the scenarios have average loses that are equal or smaller than those of the IPC®. One has to acknowledge that this benign outcome

is connected to the mechanism of stop losses embedded in the algorithm. Also, it is a fact that 2013 was a terrible year for the more aggressive scenarios. Ideally one would like to find a combination of signals that delivers consistent growth without abrupt disappointments, albeit if they happen only from time to time.

3.2.5 A Preferred Strategy

The rankings of the competing strategies are shown in Appendix B. Despite the fact that it seems that the voting arrangement # 28 appears superior, it is worth considering other options that may appear less ambitious but that deliver a smoother ride for the investors.

Appendix C shows with the help of figure C.6 two scenarios that deliver decent returns after transiting along a relatively smooth ride. Recalling the algorithm as described in figure A.1, we spelled out our belief that in designing a product one has to take into account the tendency of clients to strongly dislike loses, specially when the benchmark or other simpler investments are making money. Thus, smoother paths with shorter episodes of missed signals must be seriously considered. Given the parsimony of our voting scenarios it was possible to visually inspect one by one the back-testings to come up with the following:

Conservative Scenario #9 combines an attractive long term return interrupted by a couple of corrections, one in 2009 and another in 2011. The rest of the path is less eventful. Particularly 2013 performs well.

Less Conservative Scenario # 21 is smother during most of the ride, however shows a spike and a correction during $2012 - 2013$ that seems to big.

Preferred Scenario A good compromise would be to look at the most aggressive case; Scenario # 28 and linearly combine it with the two competing alternatives listed above. There is nothing really systematic about this proposal. Is rather more pragmatic, but makes sense in terms of approaching clients and managing the portfolio. In practice one ends up with fractional βs that can be implemented with combinations of *Angels*, *Devils*, and NAFTRACs®. The simulation shown in figure C.6 has a mix of 40% *Conservative*, 40% *Less conservative* and 20% *Aggressive*

4 Evaluation of the Preferred Strategy

4.1 Summary Statistics

Table D.1 is self explanatory.

- The average monthly return of the Portfolio is almost *twice* that of the Index.

- The maximum monthly return of the Portfolio is *more than twice* the maximum monthly return of the Index.
- The worst performing month of the strategy is about the same size of the worst month for the Index.
- The average return of the Index shows low skewness, whereas the Portfolio is skewed upwards, as expected.
- Both returns show large kurtosis.
- The standard deviation of the Portfolio is larger than the Index, but not proportionately as large as the difference in average monthly returns.
- The variability of the results, as measured by the Interquartile range is, however, 50% larger in the Portfolio *vis à vis* that of the Index.

4.2 Statistical Properties

Evaluating the performance of hedge funds is one of the most challenging tasks.[1] The fact that these strategies rely so much on leverage induces non-linearity [3], which renders the traditional factor-loadings model useless.[2] In addition, these funds explicitly intend to load factors of higher momenta. In our case we have the advantage of dealing with a portfolio of which we perfectly know the architecture, strategy and design behind. Therefore we can take this as a laboratory case. We could think of it as some sort of structured product built out of the combination of simpler derivatives. This could also help us to highlight the kind of factors that one could use when modeling products that invest in higher momenta of the IPC® Index.[4] [5].

The *Genie* is, the facto, a bundle of several derivatives products.

Call on the Index : The combination of the switch from neutral or short to long acts as an option when combined with the levered long of the Angel.

Stop Loss : When this is seen as a dynamic hedging strategy, it *de facto* works as a put option on the index

Short on the Index : *Mutatis mutandis*, this is the inverse strategy of the call. However, it is worth noticing that the short has twice as much leverage than the levered long.

Syntectic options via dynamic hedging : The frequent switching from one level of β to another, contingent on several "strikes" will make this strategy a bit more complex than a simple straddle deriving from the juxtaposition of options. This dynamic component is likely to come up as some sort of buying or selling of volatility or a higher momentum.

In trying to nail down an arbitrage exercise to evaluate the portfolio one should expect that instead of the traditional CAPM model with an α, a β and a bunch of factors, what will come up will be a non linear model with a changing δ at different strikes; some buying or selling of volatility and, obviously a premium that has to be paid in exchange for the purchase of the various derivatives embedded in the strategy.
Table D.3, using the variables defined in D.2 shows that:

A negative Constant . One could see this as a negative α. However, we are dealing here with a derivative product, so the constants may be better interpreted as the shadow premium paid to get exposure to higher momenta. the question would be if the strategy is paying too much or too little for such derivatives. This is not addressed here and may be a subject for further analysis.

A δ of 1.15 % in an UP market . The product delivers a reasonable δ in the way up, albeit shy of the maximum up δ 2.0 in a scenario of perfect foresight .

A small δ in a down market The strategy, once we consider the Macro-volatility factor (i.e. FX and interest rate volatility), does not directly deliver any positive return in a down market. However, it seems to reach, in average, the purpose of limiting losses rather efficiently.

A higher return in a market with higher Macro-volatility . An interesting finding is that this strategy seems to add value in times of high Macro-volatility. It is worth noticing that the volatility of long term interest rates and that of the exchange rate seem to be highly correlated to the point that we see multicolinearity in the regressions. We opted to keep the variable that gives us the best fit.

No response to higher Bolsa volatility . Once we include the Macro variables, the Bolsa Volatility Index does not appear as a significant explanatory variable in our regressions.

An acceptable fit Considering R^2 that are commonly seen in the literature on returns of Hedge Funds, the fit of the regression appears acceptable. Furthermore, taking a look at the error terms in Appendix D and figures D.1, D.2 and D.3 it seems hard to get any other systematic relationship beyond our specification.

So, in a nutshell one could say that the strategy is a:

- Long a Call on the ***return*** of the Index.
- The Call delivers a δ of 1.15
- The Strike on the call is a zero percent ***return*** on the Index
- It has an added Macro-volatility long position.
- It has a shadow premium that is implicitly paid by the investor

4.2.1 **Portfolio Performance** 2009 – 2013

Before concluding, we considered interesting to take a look at the performance of our Preferred Strategy after the 2008 market collapse. The results for the second half of our sample period do not change in sign and overall orders of magnitude with respect to the results of the whole sample. However, we see a nice outcome that could be spelled out as:

- a higher δ for the up-movements in the market. We are talking now of something of the order of 1.2
- a zero δ in the down market.
- a strong and significant long volatility embedded derivative with a significant shadow price for the combined options and longs.

5 Concluding Remarks

Despite the fact that Mexico's capital and derivatives markets can be considered as reasonably well developed *vis-à-vis* other Emerging Economies, it was not until November of 2013 that Actinver launched the first Long-Short fund in the country: the *"Genie"*. By focusing on this liquid node of the market, the architecture of the *Genie* coupled a technically based long-short Bolsa algorithm with an efficient use of *Angels* and *Devils*. This design allowed the *Genie* to minimize transaction costs while offering clients a strategy to take advantage of market-wide movements. We presented an algorithm based on Technical Analysis tools that is likely to reflect the intentions of the Portfolio Manager of this Fund. We found that implementing this strategy can be seen as simple three-piece bundle of relatively complex derivatives. It also seems to offer a very acceptable starting point for this industry in Mexico. Looking ahead, it is reasonable to think that the use of inverse and leveraged ETFs will facilitate the setting up of more funds like the *Genie* using a combination of leverage, shorting and stock-picking. Notwithstanding, it feels that there is still a long way to go for Mexico before reaching the level of sophistication that we see in markets like Brazil. Time will tell how fundamental this innovation in Mexico's market will be.

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[2] Kat H.M. and J. Miffre *Performance Evaluation and Conditioning Information* 2002: CASS Business School Working Paper, December.

[3] Favre, L. and A. Ranaldo *How to Price Hedge Funds, from two to four Moment CAPM* 2003: EDHEC Risk and Asset Management Research Centre, October.

[4] Agarwal V. and N.Y. Naik *Risk and Portfolio Decisions involving Hedge Funds* 2004: Review of Financial Studies, vo. 17, number 1, Spring.

[5] Jaeger L. and C. Wagner *Factor Modelling and Benchmarking of Hedge Funds: Can passive Investments in Hedge Funds deliver?* 2005: Journal of Alternative Investments, Winter

Appendix A Parameters for the Technical Analysis

Table A.1: Strategy 1. Moving Averages

Recommendation	Signal
Strongly Bearish	$IPC > SMA_{20}$ and $SMA_{50} > SMA_{200}$
Somewhat Bearish	$SMA_{50} > SMA_{200}$
Neutral	Otherwise
Somewhat Bullish	$SMA_{50} \leq SMA_{200}$
Strongly Bullish	$IPC \leq SMA_{20}$ and $SMA_{50} \leq SMA_{200}$

Table A.2: Strategy 2., Bollinger Bands

Recommendation	Signal
Strongly Bearish	Below moving average and declining
Somewhat Bearish	Above moving average and declining
Neutral	Close to any of the bands (At least at 80% of the distance between the center and either bound)
Somewhat Bullish	Above moving average and rising
Strongly Bullish	Below moving average and rising

Table A.3: Strategy 3. MACD

Recommendation	Signal
Strongly Bearish	$MACD \leq -400$
Somewhat Bearish	$-200 \geq MACD \geq -400$
Neutral	Otherwise
Somewhat Bullish	$200 \leq MACD \leq 400$
Strongly Bullish	$MACD \geq -400$

Table A.4: Strategy 4. RSI

Recommendation	Signal
Strongly Bearish	$RSI \leq 30$
Somewhat Bearish	$40 \geq RSI \geq 30$
Neutral	Otherwise
Somewhat Bullish	$70 \geq RSI \geq 60$
Strongly Bullish	$RSI \geq 70$

Table A.5: Strategy 5. Williams %R

Recommendation	Signal
Strongly Bearish	$\%R \geq -30$
Somewhat Bearish	$40 \leq \%R \leq -30$
Neutral	Otherwise
Somewhat Bullish	$-60 \geq \%R \geq -80$
Strongly Bullish	$\%R \leq -80$

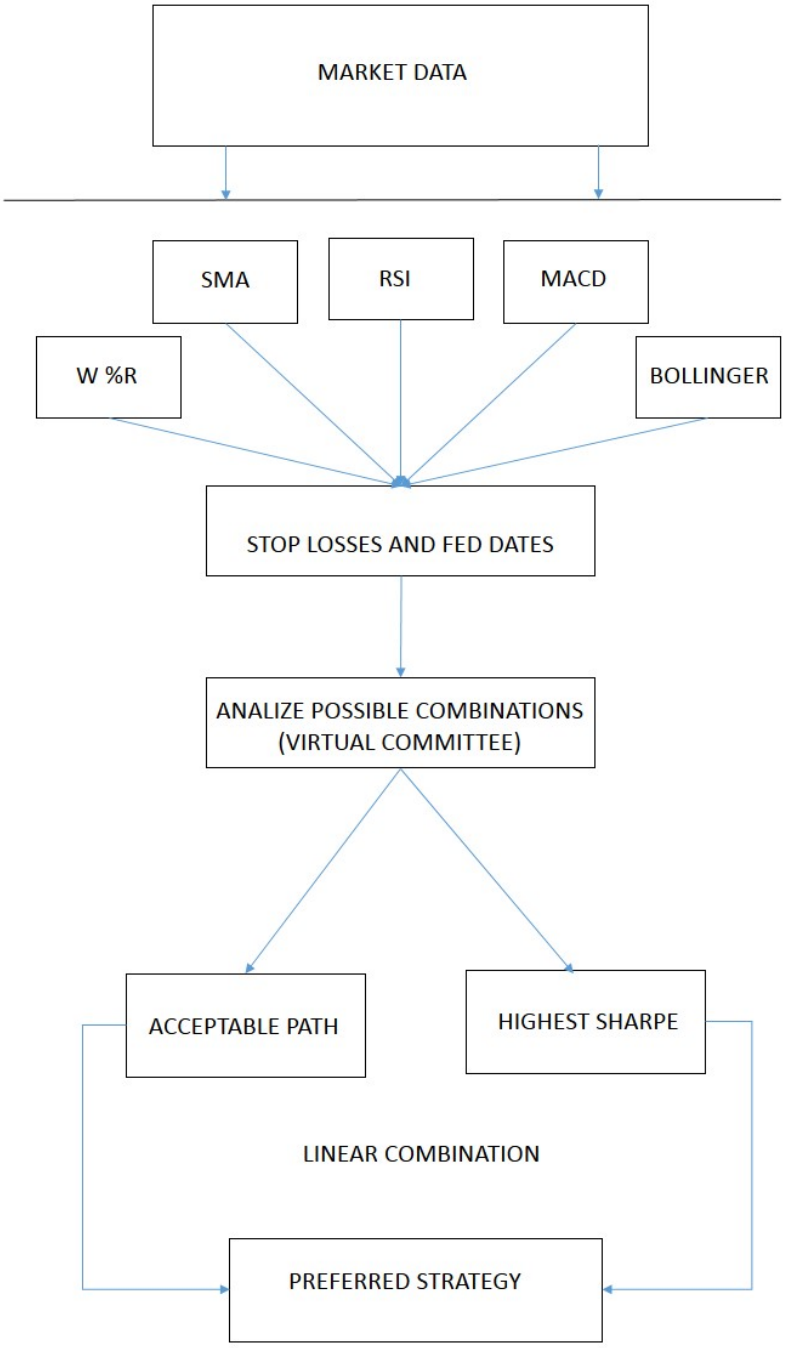

Figure A.1: Algorithm

Table A.6: Voting Scenarios by Strategy Number

Scenario #	1 vote	1 votes	2 votes	3 votes	3 votes
1	0	0	0	0	0
2	4	5	3	1	2
3	4	5	2	1	3
4	4	5	1	2	3
5	3	5	4	1	2
6	3	5	2	1	4
7	3	5	1	2	4
8	3	4	5	1	2
9	3	4	2	1	5
10	3	4	1	2	5
11	2	5	4	1	3
12	2	5	3	1	4
13	2	5	1	3	4
14	2	4	5	1	3
15	2	4	3	1	5
16	2	4	1	3	5
17	2	3	5	1	4
18	2	3	4	1	5
19	2	3	1	4	5
20	1	5	4	2	3
21	1	5	3	2	4
22	1	5	2	3	4
23	1	4	5	2	3
24	1	4	3	2	5
25	1	4	2	3	5
26	1	3	5	2	4
27	1	3	4	2	5
28	1	3	2	4	5
29	1	2	5	3	4
30	1	2	4	3	5
31	1	2	3	4	5

Appendix B Back-testings

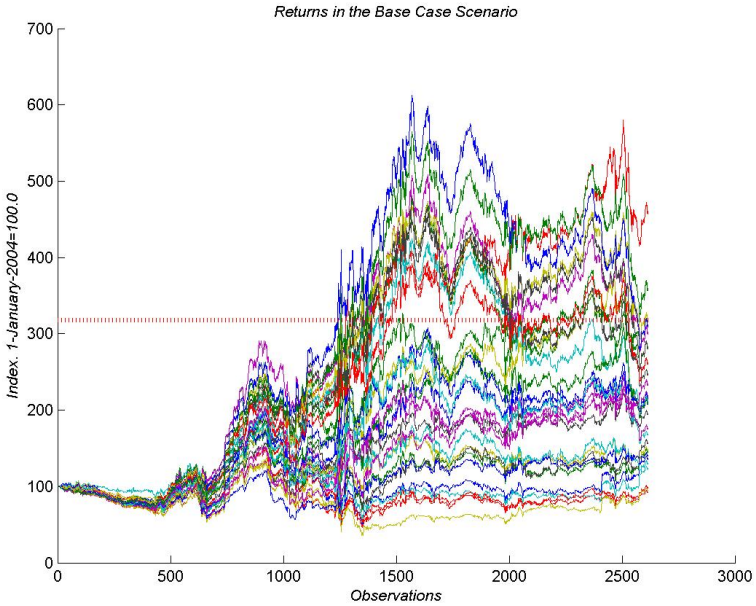

Figure B.2: Simulations only with Technical Signals

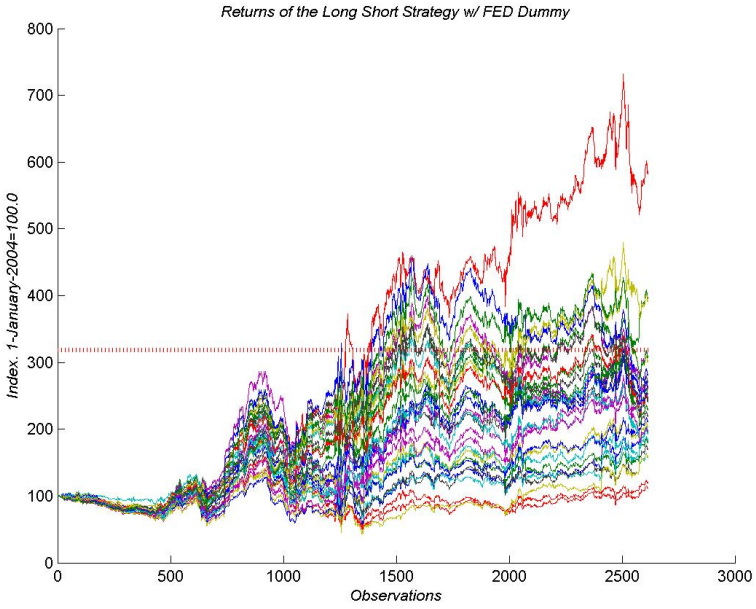

Figure B.3: Simulations going neutral on FED days

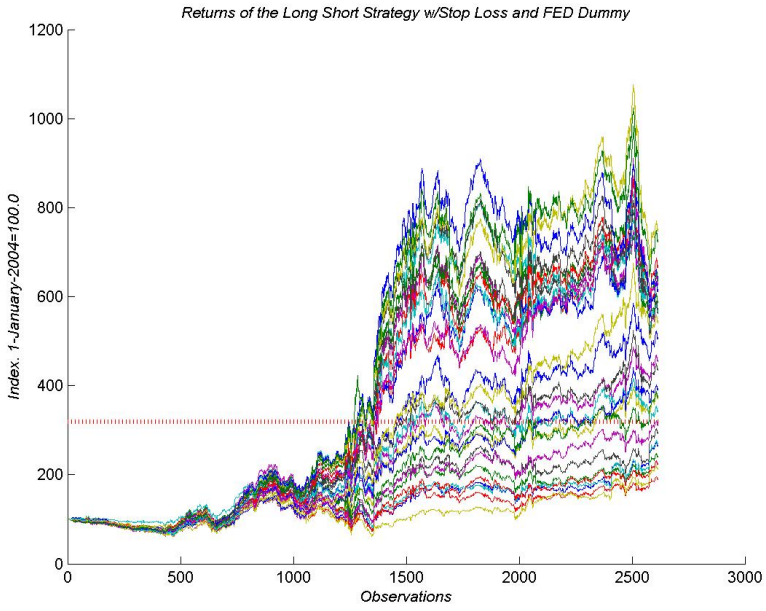

Figure B.4: Simulations with FED days and Stop Losses

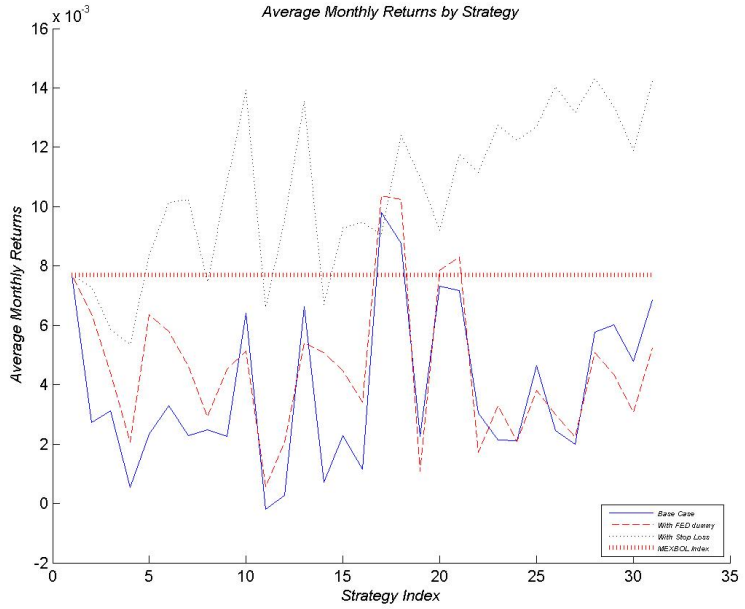

Figure B.5: Average Monthly Returns by Strategy

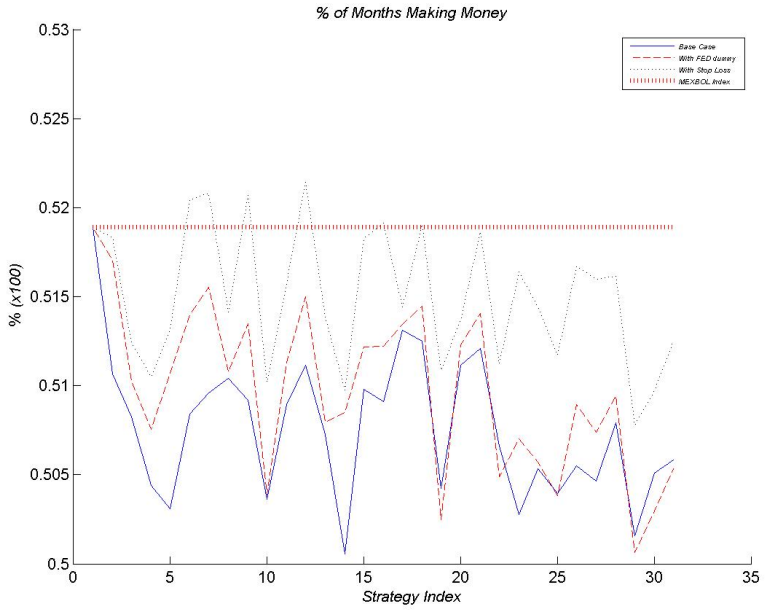

Figure B.6: % of Months Making Money

Table B.1: Rankings in the Base Case

Monthly Return	Volatility	Sharpe
17	1	1
18	22	17
1	28	18
20	31	31
21	30	13
31	13	21
13	29	10
10	25	20
29	19	28
28	10	29
30	16	30
25	9	25
6	15	22
3	27	6
22	11	3
2	12	19
8	21	8
26	23	2
5	24	26
7	26	15
15	18	9
9	8	5
19	6	23
23	5	7
24	20	27
27	14	24
16	7	16
14	4	14
4	2	4
12	17	12
11	3	11

Table B.2: Rankings with FED days and Stop Loses

Monthly Return	Volatility	Sharpe
28	1	28
31	16	31
26	15	10
10	19	25
13	21	13
29	25	29
27	22	27
23	28	18
25	18	21
18	31	26
24	9	23
30	12	19
21	13	30
22	30	22
19	11	24
9	10	9
7	6	16
6	7	15
12	27	7
16	29	6
15	17	12
20	4	1
17	20	20
5	2	17
1	23	5
8	5	2
2	24	8
14	14	11
11	3	14
3	8	3
4	26	4

Appendix C Dynamic Strategy Selection

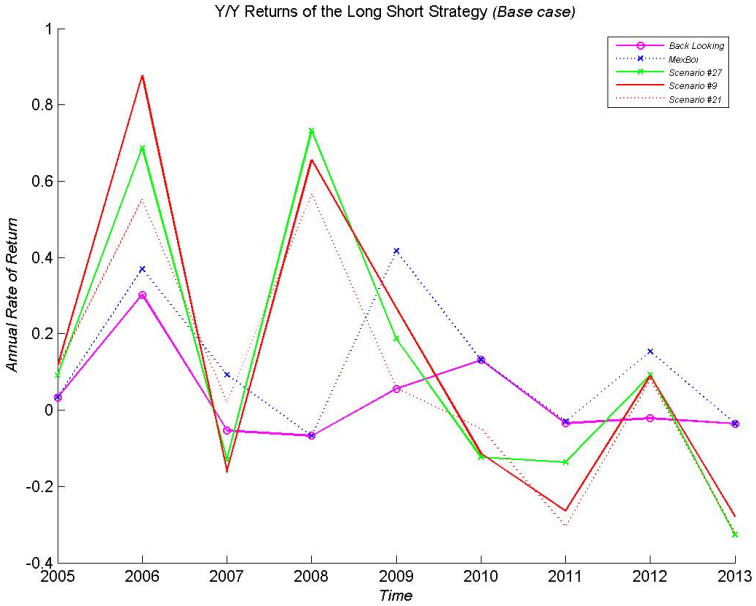

Figure C.1: Annual Returns. Base Case

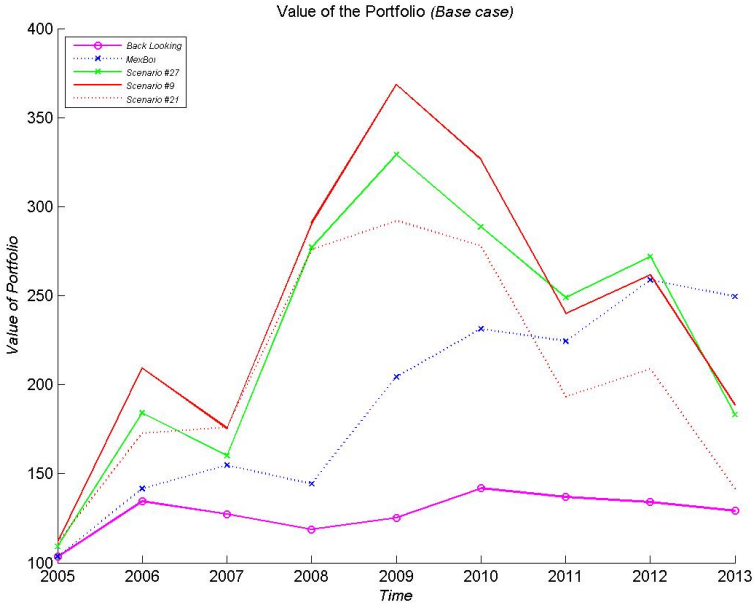

Figure C.2: Level of the Index. Base case

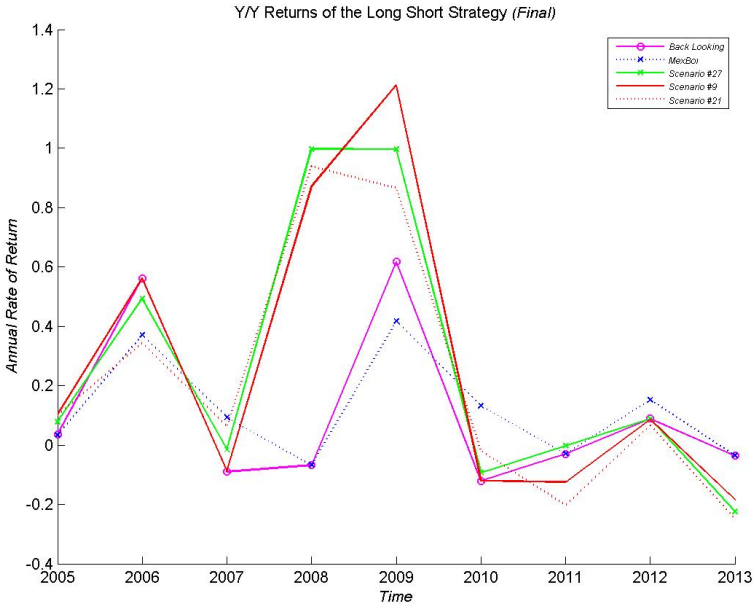

Figure C.3: Annual Returns. With FED days and Stop Loss

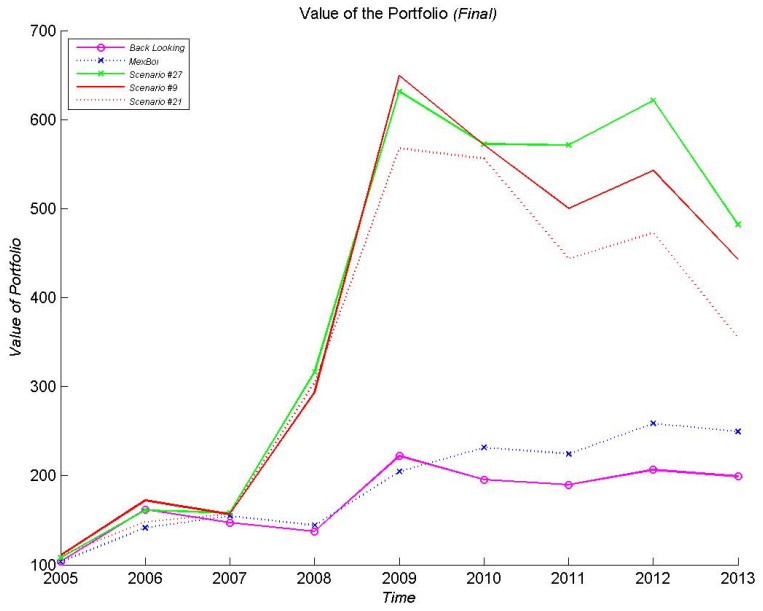

Figure C.4: Level of the Index. With FED days and Stop Loss

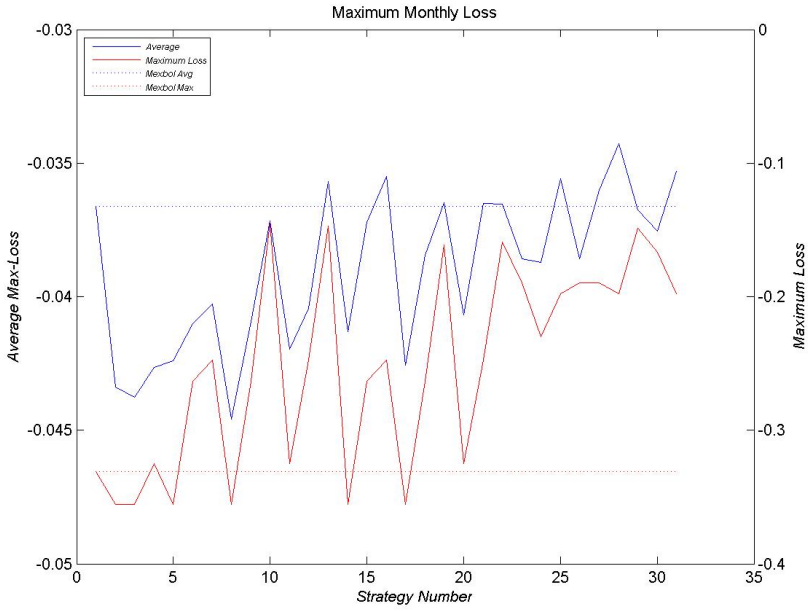

Figure C.5: Average and Maximum Monthly Loses

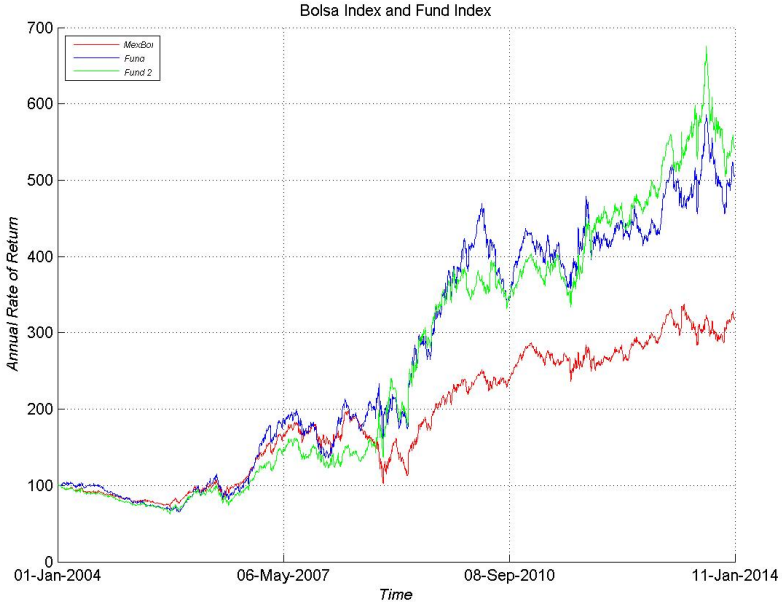

Figure C.6: Choice of an Acceptable Path

Appendix D Summary Statistics, Regression Results and Residuals

Table D.1: Summary Statistics

Stats	**Index**	**Portfolio**
mean	.011255	.0235145
max	.1695579	.4158255
min	-.1896425	-.2052047
sd	.0534692	.0852514
skewness	-.0607207	.795163
kurtosis	4.88356	6.2281
interquartile range	.0649325	.0985063

Table D.2: Definitions

Variable	Specification
Mkt Ret	Monthly Return of the Index vs Monthly Return of CETES
Mkt Ret* Down Dummy	Mkt Ret multiplied for a dummy that is equal to 1 in negative months
IPC std dev	Intra-month standard deviation of daily return of the Index
UMS 10y std dev	Intra-month standard deviation of the daily data on YTM of the 10y Mexican Sovereign USD bond
FX std dev	Intra-month standard deviation of the daily rate of depreciation of the MXN vs. the USD

Table D.3: Factor Identification

	Plain	Mkt vol	Rate vol	FX vol	FX and Rate
Mkt Ret	1.199***	1.164***	1.167***	1.145***	1.147***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mkt Ret* Down Dummy	-0.972***	-0.854***	-0.733***	-0.762***	-0.695***
	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)
IPC std dev		0.859	0.292		
		(0.173)	(0.665)		
10y UMS std dev			0.214**		0.129
			(0.006)		(0.147)
FX std dev				0.106***	0.0730
				(0.001)	(0.076)
Constant	-0.0128*	-0.0207**	-0.0264**	-0.0228***	-0.0265***
	(0.012)	(0.008)	(0.001)	(0.000)	(0.000)
Observations	119	119	109	119	109
F	75.62	51.42	39.31	58.74	41.21
df_m	2	3	4	3	4
df_r	116	115	104	115	104
r2	0.566	0.573	0.602	0.605	0.613

p-values in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table D.4: Regression Results for two sub-samples

	2004-09	2009-13	2004-13
Mkt Ret	0.949***	1.221***	1.145***
	(0.000)	(0.000)	(0.000)
Mkt Ret* Down Dummy	-0.169	-1.211***	-0.762***
	(0.551)	(0.000)	(0.000)
FX std dev	0.207***	0.0986*	0.106***
	(0.001)	(0.023)	(0.001)
Constant	-0.0147	-0.0324***	-0.0228***
	(0.053)	(0.001)	(0.000)
Observations	59	61	119
F	32.82	35.68	58.74
df_m	3	3	3
df_r	55	57	115
r2	0.642	0.653	0.605

p-values in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

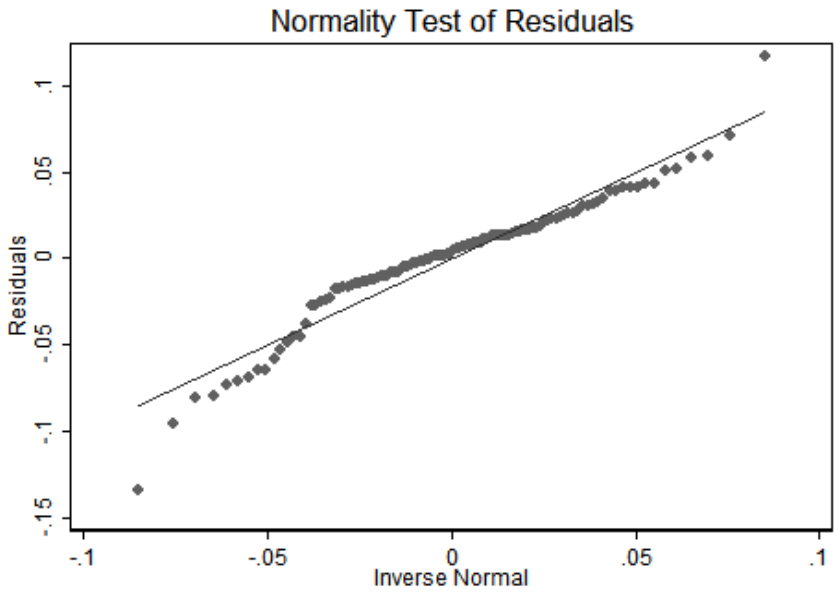

Figure D.1: Deviation from Normality of Residuals

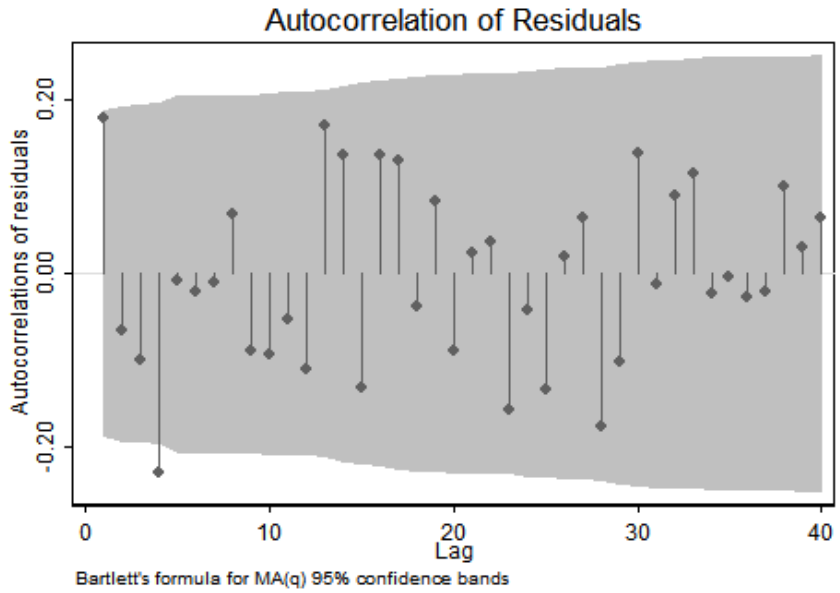

Figure D.2: Autocorrelogram of Residuals

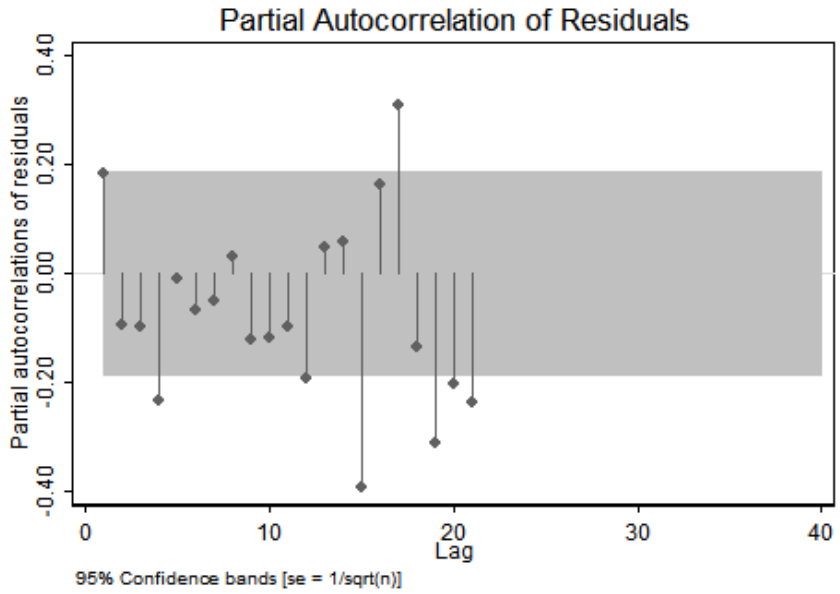

Figure D.3: Partial Correlogram of Residuals

FIBRAS: a Nutritious Part of a Healthy Portfolio
The Making of Mexico's REIT(FIBRA) Industry *

Alejandro Reynoso†

Abstract

Ten years ago, Mexico's government introduced changes to the Income Tax Code which intended to set the foundations of a domestic (FIBRA) REIT Industry. Despite the interest of the authorities to develop the listed Real Estate market, it took seven more years to see the first FIBRA in the Mexican Stock Exchange. In contrast to the long *hibernation* of the idea, during the 36 months following the first IPO the assets under management of FIBRAS skyrocketed form less than USD 600 million to more than USD20 billion at present. The existing seven FIBRAS hold a wide range of properties including office buildings, shopping malls, industrial facilities, warehouses and business class hotels. This paper talks about the making of Mexico's REIT industry by addressing three questions: why did it take so long to get it started?; why did it grow so fast once the first FIBRA came to market?, and where will the industry go from here?

1 Context: a Quick Tutorial on FIBRAS

The purpose of this section is to give those readers unfamiliar with FIBRAS a context to better assess the topics of structure, taxation, incentive mechanisms and regulation that are discussed in this document. We will quickly go through the following issues:

- State of the Mexican Investment Management industry with an emphasis on its need for alternative Asset Classes.
- Main drivers of the Real Estate industry in Mexico.
- Legal framework of FIBRAS.
- Stylized structural features of the Mexican REITS.

*This document does not intend to sell nor recommend any particular product, security or fund. All the examples presented here are for illustration purposes and may differ from the actual characteristics of the products due to the decision of the author to simplify the description of the alluded instruments.

†Visiting Fellow, Judge Business School, University of Cambridge. The author is responsible for all opinions and mistakes.

- Stylized business model of the Mexican REITS

Needless to say that those readers already familiar with FIBRAS can proceed directly to section 2.

1.1 Mexico's Investors are looking for New Asset Classes

Over the past 20 years, Mexico has undergone a deep transformation of the Asset Management industry. The reform of the Social Security System carried out in the early and mid 1990 consisted of a Chilean-style privatization of the pay-as-you-go pension platform. Since then, the retirement component of the Social Security taxes goes to individual savings accounts administered by professional fund managers known as AFORES. After almost a generation, this reform has attained a tangible macroeconomic relevance. At present, the pension fund managers administer USD 160 billion[1]. Additional contributions of new and existing workers add at least 10% to the mass of investible savings every year. The reinvestment of the portfolio returns represents an additional source of cash.

Nowadays, institutional investors operate in an environment that can be described as follows:

- **Low fiscal deficits.** Mexico has one of the lowest debt/GDP ratios in the Latin American region, just below 40%. For 2014, the Federal Government has a projected Budget Deficit of 2.0% of GDP and a Public Sector Borrowing Requirement (PSBR) of less than 3.5% of GDP. The Budget should be balanced before 2017 [2], taking the PSBR to about 2.0% of GDP in the medium term.
- **Small capital market.** Compared to countries with a similar level of development, Mexico's listed capital market is still small. There are only 146 fully listed companies with a market capitalization of USD 526 billion.[3]
- **Low interest rates.** Mexico has not been the exception in the global monetary easing. The drop in real an nominal rates since 2009 has been steady and pronounced. At the moment of writing this document, the 3-year government inflation-linked bonds have a yield of 1.15%; of 2.15% for 10 years and 3.72% for 30 years.

In this environment, the Mexican professional investors are understandably considering non-traditional assets. Over the past 5 years, we have seen them gradually increasing their exposure to non-Mexican equities, structured credit products, private equity vehicles and FIBRAS. The regulation applicable to the investment regime AFORES has been successively adapted to allow larger allocations in alternative investments. As part of these adaptations, FIBRAS have been qualified as *suitable* assets.

[1] CONSAR. Report to Congress, March 2014

[2] Criterios Generales de Politica Economica para el 2014, Presidencia de la Republica Mexicana

[3] World Federation of Exchanges Database

1.2 The Drivers of Mexico's Real Estate: NAFTA and the Middle Class

The Mexican Economy has three main drivers which have an direct impact in the Real Estate market relevant for FIBRAS.

NAFTA "means" more industrial facilities. [4] Mexico is closely integrated to the United States economy. The flow of trade between both countries is of USD 1 billion per day. Mexico is the second largest car exporter in the world and is rapidly entering sectors such as aerospace, electronics and higher-end manufacturing. Logistics has become a crucial part of Mexicos's connection with the US production chain. In the nine industrial corridors and in the Greater Mexico City metropolitan area, there are more than $1,600$ industrial properties larger than $200,000$ sq.ft., making a total of more than 190 million sq.ft. of leasable area. At present there are more than 4 million sq.ft. under construction and 6 million sq.ft. These projects will be added to the inventory in 2014 and 2015 [5] .

The expanding middle class "means" more shopping malls. Mexico has a population of 120 million. Mexico's PPP adjusted GDP is USD 1.8 trillion, according to the IMF. This makes it the 11th largest economy with a per-capita purchasing power of USD$15,000$. The demographic transition combined with the impact of the last 30 years of urbanization and development policies (education, health, infrastructure, etc.), and of other factors such as the remittances of more than 20 million *hispanos* of Mexican origin in the US, have contributed to the expansion of the middle class. All these consumers, empowered with rising incomes, have had a visible impact in the retail space market. The country has today more than 500 shopping malls with a size of at least $100,000$ sq.ft. of gross leasable area (GLA), totaling an excess of 170 million sq.ft. of prime commercial Real Estate. It is worth mentioning that in 2007 this market segment had only 100 million sq.ft. of GLA. In addition to all this, the larger brands of retailers have almost $1,800$ department stores; $5,000$ supermarkets and super-centers and $25,500$ specialty stores.[6] .

The modernization of the economy "means" new office space. The skyline of Mexico City is a reflection of the rapid pace of its modernization in sectors such as financial services, professional services, telecommunications, entertainment, education and health and the increased presence of foreign companies. The recently approved energy and telecommunications reforms lead in the direction of even more demand for high quality office space. The Greater Mexico City market has a total of 70 million sq.ft. of GLA of high quality space. Just in 2013 we saw the addition of another $500,000$ sq. ft. to

[4] NAFTA stands for North American Free Trade Agreement

[5] Source, Colliers Lomelin, Industrial Market Overview, 4th. Quarter, 2013

[6] Source, Colliers Lomelin, Retail Market Overview, 4th. Quarter, 2013

the inventory. [7] It is expected that the aforementioned reforms will represent an additional demand for close to 10 million sq.ft., which would need to be absorbed in the next 5 years. This imposes a massive pressure to this specific segment of market.

1.3 The (Legal) Definition of FIBRAS

FIBRAS are contracts regulated by:

Laws .

- Income Tax Law.
- Value Added Tax Law.
- Federal Tax Code.
- Securities Market Act.
- State and Local Tax Laws.

Regulatory Circulars .

- Rules to Issuers in the Securities Market by the Banking and Securities Commission.
- AFORE Investment Regime rules issued by the Retirement Savings Regulatory Commission.
- Insurance companies Investment Regime rules issued by the Insurance and Bonding Commission.
- Investment fund (Mutual Fund) rules issued by the Banking and Securities Commission.
- Rules on Governance and Leverage of FIBRAS issued by the Central Bank and the Banking and Securities Commission.

Listing, Trading and Settlement rules .

- Trading and listing rules for FIBRAS issued by the Mexican Stock Exchange.
- Deposit and settlement rules for FIBRAS issued by the Securities Central Counterparty and the Central Deposit Corporation.

Since the Federal Tax regulations applicable to FIBRAS were the first to be issued, the definition of this asset class as used in other laws and rules is often remitted to the Income Tax Law.

The Acronym: FIBRA stands for *Fideicomiso* (Trust) de Infraestructura y Bienes Raices (Real Estate). An interesting observation from the name is that the legal and tax setting of FIBRAS already contemplates Infrastructure REITS, which goes beyond the scope of the present study.

Qualified Real Estate Assets: Real Estate assets must fit one of the following two concepts:

[7] Source, Colliers Lomelin, Office Market Overview, 4th. Quarter, 2013

- Real Assets or projects on Real Assets, provided that they do or will generate cash flows derived from a lease.
- Second, loans on Real Assets or projects that the latter do or will generate cash flows derived from a lease.

The Location of the Assets: All assets must be located in Mexico.

The Lease: To qualify for a FIBRA status, the underlying assets must be on leases that can be specified as a linear expression with one or two of the following components:

- A component that specifies an amount to be paid by unit of leased surface. This component can be denominated in pesos, foreign currency or indexed to inflation. However, it is required that this component remains constant during the duration of the lease.
- A variable component only if it is expressed as a fixed proportion of the total revenues of the tenant.

No other component or formula is deemed acceptable.

The Investment Regime: FIBRAS must hold at least 70% of their portfolio in Real Assets. The remainder must be invested in cash, Mexican Government debt or bank deposits.

The Ownership Structure: There are two possible formats.

- *Unlisted* FIBRAS must have at least 5 Shareholders; no one can have more than 20% equity interest; and these partners must be un-related parties.
- *Publicly traded FIBRAS* are not subject to any ownership constraint other than those generally applicable to any other publicly listed corporation.

The securities: The FIBRA trust issues tradeable and non-amortizable certificates. These certificates give the holders corporate and economic rights analogous to those of common shares. FIBRAS issue only one class of certificates. The certificates are traded in the secondary market as any other listed stock.

1.4 Structural Features

The standard pieces of a FIBRA are:

The Trust The issuing Trust is just the depository of the assets. From the applicable Mexican regulation, this Trust can only hold Real Estate and the allowed liquid investments. The Trust can not have any other asset, such as shares of a subsidiary company, nor can have employees nor can conduct any other kind of activities different from owning, operating and developing Real Assets.

The Control Group The scaffolding of a FIBRA is based on a set of contracts. The Trust itself is not a corporation but just a contract. We typically have that:

- The Settlor is in many cases itself a Trust established by the Founders who contribute either assets, the structuring services, or both to the FIBRA.
- The FIBRA Trust indenture often states that the Founders will have the right to appoint the majority of members of the Board of Directors.

The External Advisor . Up to today, all FIBRAS are externally managed. The Advisor typically is a corporation owned by the Founders. Usually there are three types of contracts between the Advisor and the FIBRA.

- Management Contract. The Advisor is in charge of the management and commercialization of the assets of the FIBRA. For this service there is a Management Fee, often defined as a fraction of the rental income of the managed properties.
- Advisory Contract. The Advisor leads the strategy and financial management of the FIBRA. For this service there is an Advisory Fee with two modalities:
  - A fixed percentage of Assets Under Management (Gross or Net, depending on the issuer).
  - A Performance Fee, specified as a formula that is a function of the gross rental income and/or the return of the certificates in the secondary market.
- Acquisition Contract. Repeatedly the Advisor plays the role of a Real Estate broker. For this service it charges the FIBRA an Acquisition Fee as a percentage of the value of the purchases of assets coming from non-related parties.

The Governing Bodies . In an effort to try to balance the power of the Founders with that of the rest of the Shareholders (certificate-holders), FIBRAS currently have a set of governing bodies which try to mimic the governance structure of a Publicly Listed Company (SAB in the Mexican Law).

- General Assembly of Shareholders
  - This instance sets the rules on the main decisions of the FIBRA such as, eligible investments, large investments, leverage, capital increases, distributions and the long term strategic plan.
  - Most decisions are taken by simple majority.
- The Board (Technical Committee)
  - The majority of its members is appointed by the Founders through the Control Trust.
  - At least 25% of the Board members are Independent Directors.
  - Any Shareholder with 10% of the equity interest in the FIBRA has the right to a seat at the Board.

  - Decisions are adopted by simple majority.
- The Practices Committee.
  - The committee decides on investment practices, procurement, acquisitions, Real Estate developments and related party transactions.
  - This committee is integrated with a majority of Independent Directors. In some FIBRAS this committee has only Independent Directors.
  - The committee adopts its decisions by a simple majority.
- The Nominations Committee
  - Its role is to propose to the General Assembly the candidate for new Independent Members replacing the the exiting ones.
  - This committee is integrated with a majority of Independent Directors.
  - The committee adopts its decisions by a simple majority.
- The Audit Committee
  - Its role is to audit the financial information of the FIBRA.
  - This committee is integrated only with Independent Directors.
  - The committee adopts decisions by a simple majority.

The anti-PFIC Civil Society . All FIBRAS up to now have placed their certificates globally under Rule 144A or Reg S. US investors are sensible to the fact that the Internal Revenue Service may classify FIBRAS as Passive Foreign Investment Companies. To avoid such ruling while remaining compliant with the Mexican Tax Law (which precludes FIBRAS from owning shares of subsidiaries or other companies), the Trust usually becomes a majority partners of a Civil Society [8] which has a non-negligible number of employees who carry out certain material and relevant tasks for the FIBRA.

The Poison Pill . To present, all FIBRAS have poison pills in the form of:

- A requirement of super-majority, which can go as high as 90% of the votes in the General Assembly of Shareholders, for the removal of the Advisor. The Mexican Banking and Securities Commission is in the process of issuing a regulation that sets a cap of 66% to this super-majority requirement. However diluted, the fact remains that there are significant obstacles to removing the Advisor.

[8] A civil society (SC) is formed by a contract in which the members mutually obligate themselves to combine their resources or efforts in order to realize a common purpose of a predominantly economic character. The goal of the society must not, however, constitute commercial speculation.

- Punitive cancellation charges. The Advisory Contracts contain elevated cancelation charges, frequently amounting to the obligation of the FIBRA to make a payment in full of notional amounts to be accrued during the remaining portion of the agreement.

1.5 Supply, Demand and the FIBRA Life Cycle

A strong demand of Real Estate in every segment, and the desire of investors to allocate resources in Alternative Assets are the two ends of the market connected by FIBRAS. The funding and investment cycle of the FIBRAS can can be explained in the context of this market environment.

The Founders. The starting point is usually at the level of an unlisted "entity" that has developed and owned property. We deliberately use the word "entity", because more often than not we encounter groups formed by one or more families that have pooled money for several generations to develop and lease properties. These "non-institutional" portfolios are often large, sometimes reaching several USD billions in value. Despite their success, these portfolios can not grow beyond their "organic" potential. In fact, they are mostly limited to the re-investment of a fraction of their net operating income. In general, access to bank financing is meager, in part due to the slow process of-recapitalization of the financial system and in part due to the aversion of these families to incur in any significant leverage. In general, the Founders perceive an opportunity in re-cycling some of their properties by contributing them to a FIBRA. The resources that proceed from the secondary tranche of a FIBRA public offering are applied to funding newer properties to be developed outside the FIBRA. They are intended to be contributed to the FIBRA later on. The Founders capture value by becoming External Managers of the FIBRA, thus being able to charge management and development fees. The Founders also expect to reap the benefits from the cap rate compression associated high-cap projects sold/contributed on to the FIBRA once they stabilize.

The Initial Portfolio. The Initial Portfolio typically has two components.

- The "contribution portfolio" composed of properties owned and operated by the Founders. Generally, the Founders receive shares[9] of the FIBRA in exchange for these properties. These shares are customarily subject to a lock-up that goes from 1 to 5 years.
- There is also an "acquisition portfolio", purchased with the primary tranche of the proceeds from the IPO. This portfolio may or may not include related party properties.

The IPO. The Initial Public Offering of every FIBRA has had a domestic and an international tranche. In practice the local component represents roughly 55% of the transaction. The size of the IPOs

[9]Technically speaking, FIBRAS do not issue shares but Certificates. We will use both concepts interchangeably.

has ranged from USD250 million to USD 1 billion. The use of cash proceeds goes in part to a secondary component which could range from almost nothing to 90% of the transaction. Taking out two outliers out (FIBRA Macquarie and Prudential's FIBRA Terrafina) of the seven existing FIBRAS, the secondary component has been around 30% of the money raised. The acquisition portfolio absorbs roughly 50% of the offering. The remainder goes to pay-out the leverage of the contributed and acquired portfolio and to build a cash-reserve that is expected to be used for new property developments and opportunistic acquisitions.

New Acquisitions and Developments. FIBRAS have been very active in developing and buying properties. Given the large unmet needs for commercial, office and industrial and the fact of having a very fragmented market, the Founders have taken advantage of numerous opportunities once empowered with the purchasing capacity obtained at the IPO. They have exploited their access to value accreting acquisitions and to high-cap-rate projects that could be rapidly incorporated to the FIBRA. Furthermore, early incumbents have faced insignificant competition from non-FIBRA players who do not remotely have a comparable "fire power". It is worth underscoring that as time has gone by, the internal development component of FIBRAS has increased from a negligible fraction at the inception of the industry, to somewhat around 20% of the assets at present.

The Follow On. Only two of the seven FIBRAS have done at least one follow-on. The uncertainty in the interest rate-sensitive segment of the financial market has introduced significant volatility in the FIBRA markets. Most FIBRAS have decided to postpone their return to the market for a while. Despite this, the largest FIBRA, FIBRA UNO, has come back twice to the market raising more than USD 3 billion. FIBRA HOTEL, a developer of business class hotels was able to IPO and go for a first follow-on in a time interval of 6 months for a total of USD0.6 billion. The FIBRA UNO follow-on has been applied to buying large portfolios previously owned by international Real Estate funds or large Mexican Real Estate companies.

Leverage. Five out of seven FIBRAS were set up without leverage. Notwithstanding, all of them have resorted to borrowing as time has passed. At the time of writing this document, the Central Bank and the Banking and Securities Commission were about to introduce a new regulation establishing limits to borrowing by FIBRAS attending to two criteria. On the one hand, setting limits to the overall loan-to-value. On the other hand, establishing a liquidity requirement forcing FIBRAS to match shorter term borrowing with their capacity to jointly meet the minimum statutory distributions and debt service and amortization. This issue will be more thoroughly discussed in section 4.3 and Appendix H.

Close the loop and repeat . Go back to "New Acquisitions and Developments"; close and repeat the

cycle.

With the exception of FIBRA UNO, FIBRAS are still to young to complete cycle described in this section. However we must expect all of them to go through the road already paved by the first one.
In our opinion, the viability of this cycle is supported by the following three facts.

- **The source of funding is still very large**. We are very far away from exhausting the available funds of AFORES and other institutional investors. In addition, we perceive that the appetite for alternative assets remains high.
- **Mexico it is still a place where it is possible to find inexpensive Real Estate** The fragmentation and attractive valuations in the retail, hotel and industrial segments [10] make us think of this as an under-penetrated and high-growth component of the capital markets.
- **The set of development opportunities is still very large**. Mexico has an expanding market driven by strong underlying forces that support an expansionary view of new world-class properties.

2 The Hibernation of Mexico's REIT Industry

The securities and the Real Estate communities in Mexico had been talking about FIBRAS for a very long time. The debate begun late in 2003, but the first FIBRA did not come to market until March of 2011. Furthermore, it took yet for the first FIBRA an unsuccessful attempt to go public in February of that year before the March placement. Such a convulsive start was the preamble of an "exuberant" expansion in the months that followed. The long hibernation of the idea of REITS in Mexico, in our opinion, can be explained by looking at the confluence of four factors. The first two, attributable to incomplete regulation. The other two having to do with the sources of Real Estate financing as well the size of the inventory of "FIBRA-able" assets.

2.1 Tax issues

The necessary conditions for viable REITS were set in place sequentially. This fact got potential issuers interested and frustrated at the same time. On the one hand each change could be seen (almost) always as an improvement; however such improvements were not comprehensive enough to make possible the frictionless migration of the assets owned by "non-institutional" entities into fully listed issuing trusts.
Below we summarize the chronology of amendments to the tax legislation that led to the current regime.

The 2003 **Tax Reform** .

[10] Most FIBRAS show unlevered cap rates above 8% for inflation adjusted lease contracts. Acquisition cap rates can be found in the double digit area

- **What the Reform did:**
  - Allowed Real Estate owners to perform sale-and-lease backs with a tenor of maximum of 10 years without triggering a taxable event.
  - The counterparty of the sale-and-lease back would be a see-through trust, christened as FIBRA.
- **Main drawbacks:**
  - Limited impact in terms of scale and scope.
  - The only benefit would be for certain companies to unload on-balance assets into special purpose financial vehicles. There was no scope for tradeable equity-like securities issued by the trust .
- **Impact:** Minimal.

The 2005 Tax Reform .

- **What the Reform did:**
  - Created the tradeable FIBRA. Opened the way for a fully listed FIBRA with capital gains tax exemption and a see-through treatment.
  - Explicitly stated that the contribution of assets to a FIBRA trust was a non-taxable event. Then, this allowed Founders to conform a FIBRA while deferring taxation until the trust certificates obtained pursuant to such transfer were sold in the secondary market.
  - Exempted all transactions involving FIBRA exchange traded certificates from the Value Added Tax.
  - Opened a loophole for re-stating asset values and thus re-setting higher the tax depreciation allowance to higher levels for companies adopting a hybrid format known as SIBRA. SIBRAS would conceptually be corporations with the same treatment as FIBRAS without the need to go through a re-packaging of their assets.
- **Main drawbacks:**
  - Although at the Federal Taxation level the reorganization of a Real Estate venture into a FIBRA would be a neutral event, local and state property takes remained un-coordinated precluding the potential Founders of a FIBRA to pursue such structure without triggering property transfer taxes.
- **Impact:**
  - Substantial shift into tax-planning transactions. There was a proliferation of SIBRAS and unlisted FIBRAS.

The 2007-2008 Tax Reform .

- **What the Reform did:**
  - Eliminated the loophole for Tax-planning FIBRAS
  - Introduced the IETU flat-tax on top of the Income Tax affecting all activities in the economy, including FIBRAS.
  - Mexico City and other jurisdictions recognized asset contributions to FIBRAS as non-taxable events.
- **Main drawbacks:**
  - An ambiguity in the IETU Tax code created uncertainty on whether FIBRAS remained as see-through or whether they were subject to the new tax.
  - It was not clear if any tax credit deriving from the IETU Tax Law could be allocated to the holders of the certificates or to the settlor of a FIBRA trust.
- **Impact:**
  - All activities in structuring FIBRAS and SIBRAS stopped altogether.

The 2010 Tax Ruling .[11]

- **What the Ruling did:**
  - It restored the tax neutrality of IETU and Income Tax by establishing a clear mechanism for allocating tax credits on IETU and ratifying the beneficial treatment of FIBRA granted by the 2005 reform.
  - More local opted for homologating their tax codes to the Federal Tax Code. These amendments allowed for the deferral of property transfer taxes on properties contributed to listed FIBRA trusts. The exchange of certificates in the secondary market was also exempted of the respective property transfer taxes.
- **Main drawbacks:**
  - At this point the legal and/or procedural obstacles for creating a listed FIBRA had been resolved.
  - That said, the law had some ambiguities and loopholes that were noticed once the first FIBRAS came to market. The most noticeable one had to do with the conditions that have to be met by lease contracts. These loopholes became the substance of the most recent reform.
- **Impact:**
  - The impact of these last changes was material and substantial. The first listed and publicly traded FIBRAS came to market.

[11] This time around was not the change of the Law but the issuance of a Regulatory Circular what hat the material effect on FIBRAS.

The 2014 Tax Reform .

- **What the Ruling did:**
  - It eliminated completely the regime for SIBRAS, forcing them to unwind the deferred taxes accrued in the previous years.
  - It explicitly stated that the leases signed by FIBRAS and their tenants must be such that any variable component should be a *fixed* percentage of the *revenues* of the tenant.
  - The Tax Reform in the section applicable to individuals and foreign tax persons established a 10% *surtax* on dividends of listed corporations and a 10% capital gains tax on realized capital gains on traded stocks. It is worthwhile mentioning that prior to this reform both concepts were exempted of the income tax. Asymmetrically, the distributions of FIBRAS [12] were not subjected to the *surtax*, while the capital gains remained non-taxed.
- **Main drawbacks:**
  - None, in our opinion.
- **Impact:**
  - It added certainty to the FIBRA Regime. It also enhanced the tax advantage of FIBRAS over alternative corporate structures used for Real Estate investment.

2.2 Market and Investor Regulation

The Regulation of 2005 .

- **What the ruling did**
  - It put in place the listing and trading rules of the Mexican Stock Exchange and those of the Central Deposit and Central Counterparty were updated to homologate FIBRAS to stocks.
  - The Insurance and Bonding Companies supervisory Agency included listed FIBRAS in the catalog of acceptable assets for the technical reserves of insurers.
- **The drawbacks**.
  - None in our opinion.
- **Impact**.

[12] Distributions are taxed at the rate applicable to the final beneficiary. The tax base is calculated after deducting expenses and depreciation of the FIBRA from its revenues. For the purpose of comparing FIBRAS with corporations we can say that at present corporations pay the corporate income tax and then, when making distribution shareholders pay the 10% *surtax*. FIBRAS in turn are not taxed. The beneficiary owners pay the corresponding tax on the NOTIONAL taxable income of the FIBRA. There is NO *surtax* on distributions. With respect to capital gains, stocks are taxed and FIBRA certificates are not.

- Although it was an acceptable first attempt, the tax environment remained uncertain and incomplete making it difficult to get a listed FIBRA. We should remark that in early 2006 there was a first FIBRA filing that did not prosper [13].

The regulation of 2007 .

- **What the ruling did**
  - The Pension Fund Supervisory Agency accepted FIBRAS as investible assets for AFORES.
  - The Government of Mexico City modified its internal statutes to be able to structure FIBRAS by contributing some assets owned by the city.
- **The drawbacks**.
  - None, in our opinion.
- **Impact**
  - The ruling regarding AFORES will prove to have a very large impact once the tax reforms were completed. AFORES are the most important investors in FIBRAS and we expect that they will remain engaged in the long run.

The regulator's approach to FIBRAS in 2011 .

- **What their approach did**
  - The authorities received the filing of FIBRA UNO and agreed to work together with the structuring agent to address the practical details not explicitly contemplated in the regulation. Given the many idiosyncratic particularities of FIBRAS and also given the absence of a precedent, aspect such as governance, accounting and reporting needed to be specifically answered as rulings and *ad hoc* authorizations.
  - the first key ruling was to allow FIBRAS to issue Stock Traded non-amortizable Corporate Bonds, known as *Cebures*, instead of Certificates of Participation, or CPO. This was critical because the former allows for the establishment of FIBRAS *before* the assets are legally contributed to the Trust. Furthermore, certificates can be then issued prior to the acquisition of the assets. CPO, in contrast required to first have the assets and then issue the certificates.
  - The second key ruling had to do with corporate matters. In abstract, trusts can structure their governance with enormous flexibility. In fact, the authorities induced a structural template that acknowledges and seeks to mitigate the impact derived from the fact that the FOUNDERS of a FIBRA at some point down the road, will end up controlling large amounts of assets with

[13] Grupo Clubes Casablanca filed in July, 2006

a relatively small proportion of equity interest. To balance this asymmetry, the authorities accepted organizations as the one described in section 1.4.

  - The third ruling was issued pursuant to permitting Mutual Funds to Invest in FIBRAS and also to clarifying that these securities were suitable for retail investors.

- **The drawbacks**
  - None, in our opinion.
- **Impact**
  - Very material. All these clarifications, criteria and rulings created the scaffolding for today's listing of today's exchange traded FIBRAS.

The Securities Market Act of 2014 .

- **What the new legislation did**
  - The new Securities Market Act makes an explicit reference to FIBRAS and provides the authorities with clear attributions to issue secondary regulation specifically applicable to them. The purpose was to add legal certainty to the existing structures and to have a more stable framework for the design, implementation and operation of FIBRAS.
  - Pursuant to the revamped law, the authorities are in the final stages of the issuance of a regulatory circular establishing:
    * Explicit statutory leverage limits and liquidity requirements to FIBRAS. Specifically, FIBRAS can not leverage beyond ration of 50% loan-to-value. They will also have to create liquidity provisions to meet their debt amortization schedules.
    * Limits to the super-majority requirements embedded in the *poison pills*, taking them down from the vote of $85 - 90\%$ of Shareholders to 66%
- **The drawbacks**:
  - the authorities took several months between the passing of the law and the release of the new regulation. The uncertainty generated by this delay has affected the decisions of potential new entrants and induced the postponement of the existing ones in matters such as capitalization and leverage.
- **Impact**:
  - In our opinion, the impact on the decisions of most FIBRAS is marginal, while improving the environment for investors. We expect this to be a favorable progression in the evolution of the FIBRA industry.

2.3 Investor base

Unquestionably there were tax and regulatory issues that explain the *hibernation* of FIBRAS for over seven years. However, in our opinion there are other factors that also contributed to the delay.

One of them has to do with the size of institutional investors. The AFORES that today carry more than USD160 billion in investible resources [14] handled less than 30 billion in 2003. [15] Their investment regime was also far more restrictive than today's. Back then, the perceived valuations in the stock market and in the fixed income markets allegedly offered a most attractive destination for the available cash. Understandably, the pitch for a new asset class was far less appealing than it is at present.

2.4 Supply side

On the supply side, for a long time conditions were not as clear as they are today. Local developers looking for resources outside the "family based" platform that we described in section 1.4, had access to large international Real Estate Funds of the profile of Prologis, Prudential, GE Capital, Macquarie or Eurohypo, to mention a few. These companies had available resources to profit on the noticeable need for top-quality commercial and industrial properties. For over a decade these financial instances partnered with Mexican developers to put together portfolios which, as time passed, reached a sufficiently large size to become suitable for listing in the Stock Market.

When FIBRAS came to market several things coincided:

- The investment cycles of the foreign Real Estate Funds were ending, posing the need for vehicles for divesting via offerings in the listed markets.
- Some of these funds were badly hit by the global crisis of 2008 which forced them to look for an efficient way to dispose of them.
- It was clear for developers that their sources of funding needed to be move away from traditional financing into a format that could connect them directly with institutional investors at home and abroad.
- The crisis also sent some large local players, like GICSA, in the direction of insolvency. Their portfolios were of high quality and placed in irreplaceable locations.

The concurrence of these circumstances led to a more vivid interest in FIBRAS. It is not surprising that Macquaire and Prudential set up FIBRAS of their own. Other large players like GE and Mexico Retail Properties sold their assets to FIBRAS. Finally, portfolios like GICSA's were also acquired by FIBRAS.

[14] Corresponding to the balances of the RCV accounts of AFORES at the end of February of 2014

[15] Source: Centro de Estudios de Finanzas Publicas, Mexico's House of Representatives. Balances on December 31, 2003

2.5 The *Aestivation* of FIBRAS

In our opinion, the coming to be of FIBRAS[16] is the result of a good idea which was ahead of its time. When it was first propelled by the initiative of the Mexican Stock Exchange and the Ministry of Finance the ingredients were not there. There were many pieces of regulation to be articulated; the institutional investor did not have neither enough money nor appetite for Alternative Assets; and there were to few properties suited for FIBRAS. Eventually all the pieces came together. The merit goes to the tenacity and perseverance of a handful of people who had the vision to keep the idea alive until it became a reality.
In summary, in 2011 all the right circumstances were in place:

- An adequate tax environment.
- A regulatory framework flexible enough to accommodate to the idiosyncracies of a Real Estate market in transition.
- A inclusive investment regime that enabled AFORES, Mutual Funds, Insurance Companies and retail investors to participate.
- The retrenching of competing sources of funding, mostly international specialized funds and banks.
- An existing good and large enough inventory of FIBRA-able assets.
- The global expansion of REITS, specially across emerging markets created a space where Mexican FIBRAS could be a part of the expanding demand from internationally diversified Real Estate investors.[16], [5].

3 The Rapid Expansion of the FIBRA Industry

3.1 The First Generation of FIBRAS: The Facts

If we put all the considerations that we have presented up to this point one could expect a vigorous take off of this industry, as it effectively happened. The most salient facts achieved between March of 2011 and March of 2014 are:

- There are seven FIBRAS with a combined market capitalization of USD 12 billion.
- The FIBRA Industry manages close to USD 20 billion in assets
- FIBRAS own and operate more than 60 million sq. ft. of leasable area in industrial properties.
- FIBRAS own and operate more than 5 million sq. ft. of leasable area in high quality office space
- FIBRAS own and operate more than 30 million sq. ft. of leasable in retail commercial space.

[16] Aestivation is the antonym of Hibernation

- FIBRAS own and operate more than $8,500$ hotel rooms in the segment of limited and full services segment.
- FIBRAS own properties that generate a combined an annual Net Operating Income in excess of 1.5 billion dollars.
- FIBRAS are already present in the corporate bond market with an issuance in excess of USD 2 billion.
- FIBRAS are developing more than $1,500$ hotel rooms, 0.8 million sq.ft.of office space, 1 million sq.ft. of commercial and 5 million sq.ft. of industrial and logistics space.
- There are already public filings of 4 additional FIBRAS in the retail, industrial, office and hotel segments.

3.2 Reasons for the Accelerated Take-off of the Industry

In our opinion there are three factors that explain the accelerated take-off of the FIBRA industry. On the one hand, the tax regime once completed, offered an environment that significantly favored FIBRAS *vis a vis* other corporate structures. Second, the market regulation allowed to put in place Externally Managed FIBRAS which enabled the Founders to capture a substantial value from the FIBRA without completely eliminating its attractiveness for investors. Finally in retrospect FIBRA certificates performed, ex-ante and ex-post, as a new asset class in their own right. That is, as FIBRAS showed low correlation with other assets and became an instrument capable of offering a mix of risk and return that expanded the efficient frontier.

3.2.1 Favorable Taxation

FIBRAS offer a very advantageous tax structure. This was true back in 2011 when the first FIBRA came to market, and it is even more significant today after the recent tax reforms. In Appendix B we compare the value of three competing structures under the tax rules effective precisely in 2011

An Inmobiliaria Company . These are fully taxed Real Estate corporations. This type of entity has no restrictions on distributions, leverage or any other constraint that we may find with FIBRAS. In turn it is subject to the Corporate Income Tax at the level of the company, that is, before distributions are made.

An Internally Managed FIBRA , where there are no fees charged by any agent outside the FIBRA. At present there are no cases of Internally Managed FIBRAS, but we think that modeling them allows us to have a good benchmark for our analysis.

An Externally Managed FIBRA , which is modeled along the lines of our description in section 1.4.

The models in Appendix B produce a set of normalized projections.

Figures B.18 y B.20 show the present value of the cash flows distributed by each one of the structures recognizing that the life-cycle of the Real Estate ventures goes through two stages. One of minimum distributions and maximum investment during the first years of operation and a second of maximum distributions.

These figures show the value of each structure at different cutting-off times. Namely,each graph portrays 30 scenarios for each structure. Each scenario corresponds to different stopping times for the investment phase of the cycle, and therefore differen starting times for the accelerated distribution phase.

We intended to parameterize the models to capture the most commonly found practices in the FIBRA industry today. These values and features are summarized in table B.1.

In order to make a fair comparison across structures one needs to contrast the optimal solution of each type of Real Estate organization against the others. With that in mind and the inspection of figures B.18 a B.21 we reach the following statements.

FIBRAS are 15% **more valuable than Inmobiliarias** . When the effects of structure and taxation are fully accounted for, FIBRAS are superior to investing in Real Estate. This is true assuming that in both structures are operated in such a way that they maximize the equity value of Shareholders. We should notice that the optimal stopping time (where the curves in figures B.18 y B.20 reach their respective maxima) for Inmobiliarias and Internally Managed FIBRAS is not very different.

Externally Managed FIBRAS are at least value-equivalent to Inmobiliarias . To bring the Externally Managed FIBRAS to our discussion we need to look at the objectives of the Managers. They have some stock (as Founders) and also they obtain the flows from the external Advisor which they control. In our model, this induces higher investment over a more prolonged period and postpones distributions considerably. Figures B.19 and B.21 reflect this. When we compare the value of the structure at the optimum stopping time in figures B.18 and B.20 we notice that the value of the Inmobiliaria and the Externally Managed FIBRA are practically the same.

As stated above, the tax dominance of FIBRAS documented in Appendix B underestimates the situation after the 2014 tax reform.

- **FIBRAS remain exempt of capital gains taxes, Inmobiliarias don't**. Starting in 2014, investors in Exchange Traded Inmobiliarias are subject to a 10% capital gains tax.
- **Distributions of FIBRAS are subject to lower taxation**. FIBRAS were not affected by a recently approved surtax on dividends for Exchange Listed corporations. Income coming from Inmobiliarias, however, is fully affected by this amendment to the Income Tax Code.

See tables B.2 and B.3 for a summary on how taxation works for individual and institutional investors from 2014 onwards.

3.2.2 High rewards for Founders of Externally Managed Structures

We have highlighted that the asymmetric tax treatment of Inmobiliarias and FIBRAS created and advantage for FIBRAS. Without any doubt this was a necessary condition for getting the industry on its way. However, translating this advantage into the actual foundation and listing of FIBRAS required of a structure that would allow the Founders to capture some of the intrinsic value of the FIBRA. This value had to be ample enough to justify the the effort of "going public", but not so high to make these Externally Managed FIBRAS uncompetitive against Inmobiliarias.

In Appendix C we present a model that allows us to assess the order of magnitude of the value captured by the Advisor for the set of parameters in table C.1.

The model is built upon two main sources of value for the Advisor:

- **Fees related to the operation of the FIBRA**. Here we make reference to the management fee, the advisory fee and the asset acquisition fees.
- **Fees related to the development of Real Estate**. Here we introduce the fact that more often than not Founders are also developers. This has allowed Founders to charge development *fees* and to transfer a significant portion of the development *risk* to the FIBRA.

The model in Appendix C differs from the one in Appendix B by explicitly accounting for the uncertain cap rate brought about by developing entirely new properties. The results of the simulations are:

- Focusing on the valuation of the FIBRA at the optimal stopping solution (see Figure C.2), the estimated value captured by the Founders deriving from development, advisory and management fees could go as high as $13 - 15\%$ of the value of a FIBRA. It is important to underscore that this estimate does not include the equity interest that they have directly in the FIBRA by virtue of their contributions to the initial portfolio, and thus to the initial capitalization of the venture.
- Figures C.4 to C.6 show the impact of fees and volatility on relative valuations by comparing the realization of the Monte Carlo simulations on an Internally Managed and an Externally Managed FIBRA. To simplify our analysis, at this instance we decided to look at the incidence on FIBRA Shareholders while setting the stopping time to be equal to 15 years. This value is close to the optimal for Case 1. In exchange for this lost degree of freedom, we allow variations in the proportion of the budget dedicated to new projects as opposed to the purchase of existing and stabilized assets. Depending on the weight of the development component, which in practice varies significantly across

FIBRAS, it could be said that the "dead weight cost" of the ADVISOR can be placed in the range of 7 to 20% of the FIBRA.

The external ADVISORS happen to be extremely valuable companies on their own right. Using the numbers from our stylized model one could say that for an industry that has a market cap in excess of USD12 bn, the ADVISOR most be worth anywhere between USD1 bn and USD2 bn. Not a negligible number by any means.

To the incentives associated to the the external management itself, the FOUNDERS also benefit from the cap rate compression of the assets contributed at the moment of formation of the REIT.

- **Cap rates in the public market are attractive**. If we look at the recent placements of FIBRAS and also at the acquisitions they make, we can notice that there is a spread in average of 100 bps to 150 bps between the listed and private market even for relatively large portfolios. Creating a FIBRA means for FOUNDERS the opportunity to capture that spread.
- **The mix of contributed and purchased assets matters**. An issue that is closely related to the previous point has to do with the process of forming the initial portfolio. By contributing assets to a FIBRA the FOUNDERS can average much more attractive cap rates for their own assets if the pool them together with some other cheaper properties to be acquired with cash raised at the IPO. For example, lets consider a situation where IPOs of comparable portfolios are valued at a cap rate of 9%. Now, assume that the cap rate in the private market is 10%. The FOUNDERS frequently ponder three scenarios.
  - ***To sell their assets to another FIBRA*** at a cap of 10%
  - ***To contribute their assets to an existing FIBRA*** at a cap rate of 9%
  - ***To create a new FIBRA*** where the initial portfolio has 50% of its assets coming from the FOUNDERS and the rest from an acquisition portfolio valued at a cap of 10%. Given that the IPO price is at a cap rate of 9%, the actual compression achieved by the founders is of 200 bps by the mere fact of organizing the FIBRA. This implies means that the pre-existing assets of the FOUNDERS can be revalued significantly by setting up and sponsoring a FIBRA.

3.2.3 Opportunities arising from the Corporate and Financial Levering of FIBRAS

We have mentioned that FIBRAS are contracts, not corporations. Thus, the FOUNDERS have the capacity to dilute way beyond the 50% equity interest of corporations without challenging any legal boundary about control. In fact, FIBRAS have the potential to multiply the seed capital of the FOUNDERS through two avenues.

- **Corporate Leverage**. We pointed out in section 1.4 that the CONTROL GROUP of FIBRAS can set up a mechanism to control the assets with 10% equity interest. This gives the FOUNDERS the capacity to multiply the size of the Assets Under Management up to 11 times their seed capital without losing the control of the business.
- **Financial Leverage**. In practice, FIBRAS have set themselves a maximum leverage limit of 50% loan-to-value. In the near future this limit may also be formalized in the regulation to be released by Banco de Mexico and the Mexican Banking and Securities Commission. Then, through financial leverage FIBRAS get another multiplier of two times.

EXTERNALLY MANAGED FIBRAS where there is value to be captured by the ADVISOR from the amount of Assets Under Management, the aforementioned multipliers which add up to $40x$ constitute a powerful incentive for setting up new FIBRAS.

The model in Appendix F compares the short-term and long-term growth rates of FIBRAS and Inmobiliarias in this context.[17].

Appendix G furthers the analysis by introducing a simulation routine that allows to introduce the notion of an optimal capital structure. Figure G.3 casts the following noteworthy results.

- **Optimal capital structure.** Figure G.2 corresponds to a FIBRA that, in the steady state has, per every 100 pesos in assets, 11 pesos in equity held by MANAGERS, 39 pesos held by SHAREHOLDERS and 50 pesos in debt.
- **Delayed optimal stopping time.** We notice that the optimal stoping time is 8 years longer than our standard model as presented in the previous sections. This is explained by the fact that we are assuming a gradual process of dilution of the FIBRA. Notwithstanding, there are other mechanisms, not modeled in the Appendix G, such as lump-sum investments that could accelerate such process.

In the context of this section, we think of a case where the FOUNDER'S capitalization at inception is 25%. This is no different from what was the case of FIBRA UNO. We also make some assumptions on the structure as reported in table G.1. We end up with a multiplier at the "optimal capital structure solution" between 9 and 10 times. In practice, the trend after FIBRA UNO has been to see FIBRAS with starting level FOUNDER'S equity that is significantly lower. Later on we will come back to this matter and discuss the consequences a *thin* capitalization. [18].

Just for completeness, figure G.3 shows a surface that plots the dividend yield trajectory for each stopping time scenario. If we focus our attention on the one corresponding to the optimal stopping derived from

[17]There is a vast literature on the topic of governance structure and incentive structure on efficiency and valuation of REITS for the US. The reader may consider benefit from the views expressed in [6], [8], [13], [12],[11]

[18]On a discussion addressing the issue of the optimal capital structure of US REITs see [1]

figure G.2 we end up with a very monotonic path of a gradual rise in dividend yields, with a modest jump at the end of the simulation horizon.

3.2.4 FIBRAS are a New Asset Class

Despite the lack of a long enough track record of FIBRAS, there is some evidence supporting the notion that they have contributed to expanding the space of investible securities in Mexico. [19]

Appendix I uses information of FIBRA UNO. This is the "oldest" FIBRA and by far the largest and most liquid of the industry. We will take it as a proxy for the industry as a whole. Table I.1 shows that FIBRA UNO bears essentially no correlation with neither the overall equity market nor with the usual factors. Except for its correlation with long term "bonos", the very low R^2 and the insignificant regression coefficients seem to support the idea that FIBRAS meet the criterion for a new asset class.

Appendix J works with weekly information for the 15 most representative stocks in the Mexican Bolsa, plus the Bolsa Index and the Total US REIT ETF (IShares IYR) and FIBRA UNO. In the case of figure J.1 the data runs from the third week in March of 2011 to the last week in March of 2014. In the case of figure J.2, the sample includes weekly returns from May 2013 to March 2014. Here we include only those FIBRAS that entered the market before May 2013. Both figures are scaled to display the equivalent monthly returns.

We notice three things:

- **FIBRAS expand the Efficient Frontier**. Figure J.1 shows that , ex-post , FIBRA UNO is on the efficient frontier. There is no way to know if the situation will remain as such in the future. What is a fact is that those investors who participated in the IPO and successive follow-on have benefited from including this REIT in their portfolios.
- **FIBRAS add positive returns but also volatility to the Portfolios**. FIBRAS are rather volatile assets. Their coming to market took place in an environment of very low interest rates, and have been affected by the turn around of rates during 2013. In the first two years FIBRA UNO enjoyed a sustained process of cap rate compression. In the last 12 months prices dropped and stabilized at lower levels.
- **The risk−return mix varies significantly across FIBRAS**. This assertion comes from inspecting figure J.2. Some FIBRAS have failed to deliver a significant and lasting cap compression while showing significant volatility.

Looking ahead it remains to be seen to what extent FIBRAS effectively be an asset with a more balanced

[19] Some useful references for the US REIT market on this specific topic can be found in [2], [10], [3], [4] and [15].

mix of yield and capital gains and thus becoming a permanent contributor to the efficient investment frontier. Yet in our opinion, the Mexican Real Estate market remains undervalued in comparison to other emerging markets, and the opportunities ahead deriving from demographics and economic progress seem to be arguments powerful enough to keep the interest of institutional investors locally and overseas.

4 The Road Ahead: Regulation, Best Practices and more Growth

4.1 The Market needs better FIBRAS

In our opinion the emergence of FIBRAS can be seen as a success. They are the outcome of a long and complex process of building and placing together many pieces of taxation, regulation, investment regime and incentives to Founders. We think that to a large extent, to break the inertia of a Real Estate industry based in the pooling of family resources, and catapulting it to an Exchange Traded platform, it was necessary to "over-relax" certain aspects of regulation and taxation.

Looking ahead, some of these incentives are not necessary once "the escape velocity" has been attained. Furthermore, the future growth of the industry depends on the ability of the various players to update the current structures with the objective of converging to international standards.

Now that there are FIBRAS, the market needs better FIBRAS.

- FIBRAS must be internally managed.[14]
- FIBRAS must rely less on poison pills and more on performance. [9]
- FIBRAS must have better and explicit risk control mechanisms.
- FIBRAS must fully take advantage of a fragmented Mexican Real Estate Market.
- FIBRAS must deliver higher distributions. [19], [7].

4.2 Internally Managed FIBRAS

We have seen that Externally Managed FIBRAS:

- Are too expensive for FIBRA Shareholders.
- Tend to allocate more-than-optimal risk in the FIBRA
- Tend to over-invest at the expense of the flow of distributions received by the FIBRA Shareholders

The industry needs to make a transition towards more internalized structures. There may be some room for regulation, however the good news in our opinion, is that there are structures which are Pareto superior to the current ones without eliminating altogether the external Managers.

We want to carry out a discussion on this proposition in two levels. First, we can look at the incentive structure of the current players and see if we could figure out a more efficient contract between the principal and the agent. Then, we can bring the authorities into play and briefly discuss the impact of the upcoming regulation on this topic.

The contract between SHAREHOLDERS and MANAGERS has two components. Fees and Shares. For FOUNDERS, fees offer a stable flow of cash. Are in most cases disconnected from the actual performance of the assets. On the other hand, shares offer the upside of cap compression, as well as a share of the volatile revenues, which could offer an upside when the investment in projects is successful.

Appendix D generates a map of indifference curves for both participants. When SHAREHOLDERS are very risk averse, they are willing to give away a substantial participation in the company in exchange for a reduction in fees. Real-estate-wise, one could think that MANAGERS can diversify their risk better than SHAREHOLDERS. to that extent we believe that it is reasonable to model MANAGERS and risk neutral and SHAREHOLDERS as risk averse.

Lets look, for example, at figure D.2. Consider the indifference curve that crosses the horizontal axes at 0.7. We see, for example that for the proposed set of parameters it may be reasonable to think that SHAREHOLDERS would be satisfied with an arrangement that exchanges 15% of the FIBRA in exchange for a 25% reduction in fees.

In Appendix E we take this exercise a set further by focusing exclusively in the set of contract arrangements that maximizes the expected utility of the MANAGERS. Figures E.2 and E.3 illustrate the cases already commented before. Namely a situation where the objectives of SHAREHOLDERS and MANAGERS are not fully aligned. This is shown by the fact that the optimal stopping time for both agents is different. Figure E.4 shows an interesting result where SHAREHOLDERS keep the same fee structure as in the baseline scenario of figure E.2 and give away 15% of the FIBRA to the MANAGERS. This solution optimizes the expected utility to every one at the common "early stopping time" solution.

The main takeaway from these two exercises is that having a substantial equity interest of MANAGERS constitutes an important step in the effort to align the optimal decisions of internally and EXTERNALLY MANAGED FIBRAS.

Regulators hare looking at the issue of management very closely. At the time of writing this document there is a project for a regulatory letter to be issued by the Mexican Securities and Banking Commission that aside from addressing the issue of leverage (that we will look at in the following section) includes some governance considerations.

- **Fees and External Managers remain unregulated**. The fact remains that FIBRAS being contracts will conserve the flexibility they have today to put together structures for distributing functions

and fees.

- **Poison pills are regulated**. In spite of the aforementioned flexibility, the authorities have decided to impose as a condition for registering as issuers of Exchange Traded Certificates, the requirement of including in the indenture of the Trust a condition that states that MANAGERS can be removed, without recourse, by the vote of 2/3 of the SHAREHOLDERS. This contrast with the prevailing situation where the super-majority for removal in most indentures is in the $85 to 90\%$ range.
- **More active role of Shareholders in large transactions**. The regulator also explicitly requires SHAREHOLDERS approval for large transactions, changes in the business plan and other decisions that can have a material and large impact.

4.3 Regulation on Leverage

Unlike Inmobiliaria companies, levered FIBRAS face the risk of what we call *Regulatory Default*. Namely, at any time FIBRAS need to have enough cash at hand to:

- Make the minimum statutory distributions of 95% of the Notional Net Taxable Income.
- Cover the interest and amortization of their outstanding debt.

There could be circumstances in which they may find themselves with enough cash to meet only one of the obligations. Not paying the lenders could prove as catastrophic as not making the required distributions and thus losing the FIBRA status, forcing de-listing and forfeiting all tax benefits.

Appendix H approaches this issue by showing a couple of examples that suggest that even a limit of 50% loan-to-value may be to high for keeping the probability of regulatory default below 10%. Perhaps a limit of 20% to 30% would be more acceptable.

To the extent that a failing FIBRA could adversely hit the entire industry, the financial authorities are addressing this issue with a regulation currently under discussion. This regulation combines the amount of leverage with the availability of cash in the positions of the FIBRAS in the spirit of a similar regulation currently applicable to banking institutions [17].

4.4 A more "Mexican" Business Strategy

In the first stages of this industry, the FOUNDERS and their advisors and investment bankers made a deliberate effort to package assets that look as much as possible like the asset bundles seen in US REITS and large REITS elsewhere. An important objective behind this was to bridge as much as possible the idiosyncratic gap between Mexico and the archetype in the minds of REAL ESTATE specialized institutional investors overseas. These asset bundles included large malls, industrial facilities leased to multinational

corporations, hotel chains linked to global brands and high-end real office space in Mexico City. There is no question that doing this has facilitated the communication between the Mexican and the global business community. However, the downside is that sooner rather than later the pool of assets of this size and quality will begin to dry-up, pushing the prices higher or inducing FIBRAS to take on more development risk. Mexico is a large Emerging Market. For the reasons mentioned at the beginning of this document one should expect to see a large expansion of the inventory of small to medium size commercial and industrial properties. This part of the market remains large, fragmented and with much higher cap rates than the levels that we have seen up to today. The challenge is about making issuers and asset managers comfortable about issuing and investing in FIBRAS that, from the point of view of their incentive structure are closer to the international standards, but that in terms of the composition of their property portfolio are closer to the opportunities underlying an imperfect and yet profitable market.

5 Concluding Remarks

This document addresses three questions about Mexico's REIT industry. On the one hand, looking at the past decade we wanted to understand why it took so long to get from the first attempts to the IPO of the first FIBRA.

We believe that many factors, from regulation, taxation, competition, inventory of acceptable assets and entrepreneurial pre-conditions had to be met. The merit goes to the authorities and some industry leaders that kept the impulse of the initial ideas for over 7 years of trial and error.

The second question aimed to explore the reasons behind such a fast take-off of the industry once the obstacles for the first IPO were overcome. Our view is that the market and regulatory environment permitted to put together structures that enabled the Founders of the FIBRAS to capture sizeable rents while, at the same time, investors obtained access to an asset class that contributed to improving the risk-return mix in their portfolios. We claimed that such a relaxed and advantageous setting for the Founders can be justified in the context of the efforts made to bring the industry to its "escape velocity" out of the "gravitational pull" of a Real Estate industry based on family-business like structures.

Looking ahead we think that FIBRAS will experience a positive evolution. Driven by incentives and regulation, FIBRA structures will conform to international standards of Internal Management, governance and transparency. In parallel, we expect FIBRAS to hold higher yielding assets by taking advantage od an under-penetrated, fragmented and rapidly growing Real Estate opportunities in Mexico.

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Appendix A Notation

	Constant	Generates a constant signal
	Step Function	Its value is equal to one until time 't' and zero onwards.
	Step Function	Its value is equal to zero until time 't' and one onwards
	Random Number Generator	Generates a signal from a Uniform Distribution.
	Gain	Amplifies the signal by a constant factor
	Integrator	Integrates the input signal
	Derivative	Generates the time derivative of the input signal
	Mathematical Function	Applies a mathematical function to the input signal
	Lag Operator	Lags the input signal by one period.
	Memory Operator	Stores the value of the previous period
	Saturation Operator	Limits the input signal to a range [a,b]

Appendix B Model of a Real Estate Business Unit

B.1 Description and Parameters

The purpose of this Appendix is to compare the value of a Real Estate operations under different legal structures. The model is built to produce cash flows over a finite period defined to be of 30 years. In addition, we compute 30 scenarios for each structure using as a criterion what we define as *stopping time*. The definition of *stopping time* is related to the specific distribution policies that the Real Estate structures can have.

Before the Stopping Moment The entity re-invests the maximum possible amounts, thus reducing the distribution to the minimum statutory levels defined by the respective laws and regulations.

After the Stopping Moment The entity maximizes the distributions.

For each scenario of cash flows we compute their present value. The simulation exercises produce plot with three concave curves. We define *optimal stoping time* as the scenario, indexed by its corresponding *stopping time*, where the respective curve attains a global maximum.

When comparing the value produced by each structure in the body of the document, we look at the set of maximum values produced by the optimization exercise.

The setting here is of a deterministic. Volatility is introduced later on. For calibrating the model, we chose values for the relevant parameters having in mind the stylized facts of the of the Mexican REIT market. For calculating the discounted values, in this instance we use the *risk-free inflation indexed* long term rate of government securities. When volatility is included, we will rely on the specification of the Expected Utility Function for capturing the impact of risk on valuations. Therefore we will abstain for suggesting directly any risk premium as a spread on the risk-free rates.

All exercises assume that all cash flows and rates are *inflation indexed*.

The main features of each structure are:

Inmobiliaria The company is a fully taxable entity and has no restrictions or limitations as to how its dividend and investment policy is defined.

Internally Managed FIBRA This is a see-through entity that has to make distributions of at least 95% of what would be the Notional Taxable Income. This FIBRA internalizes all its administrative and operating costs.

Externally Managed FIBRA This is a see-through entity that has to make distributions of at least 95% of what would be the taxable base of a normal corporation. This FIBRA *out-sources* the administration to Managers. The fees are enumerated in table B.1

Table B.1: Model Specification

Parameter	Concept	Value
`depreciation`	Depreciation rate allowed by the tax law	0.10
`capex`	Material depreciation of the asset	0.025
`purchases`	Proportion of Investment Budget	Case 1. 0.70
	destined to buying existing assets	Case 2. 0.55
`cap`	Cap Rate of stabilized assets	0.10
`icap`	Cap Rate of Real Estate developments	0.20
`op costs`	Operating costs factor	0.10
	of an internally Managed FIBRA	
`disc rate`	Risk free rate of 30 year UDIBONOS	0.03
`mgt fee`	Management Fee of the external manager	0.10
	defined as a proportion of the NOI	
`acq fee`	Fee that the external manager charges	0.03
	for acquisitions as a proportion of such	
	purchases	
`asset fee`	Fee that the external manager charges	0.03
	for managing the assets as a proportion	
	of the AUM	

Cap Compression . The Simulink® diagrams in the Appendix are partitioned into *Systems* and *Sub-Systems* to facilitate their comprehension. Most *Sub-Systems* are accounting identities. However, some play the role of operators acting on input variables. The most noticeable one is the `eff caprate` block that captures the effect of cap rate compression on acquisition assets that a FIBRA may experience when buying assets too fast.

Acquisitions vs. Developments . The model makes a clear distinction between these two alternative allocations of the Investment Budget. Acquisitions are considered *stabilized assets* that generate a *normal* cap rate. On the other hand, developments deliver a higher cap rate, however the model imposes a lag of two periods between the allocation of the cash and the generation of return from the new, albeit *non-stabilized*, assets.

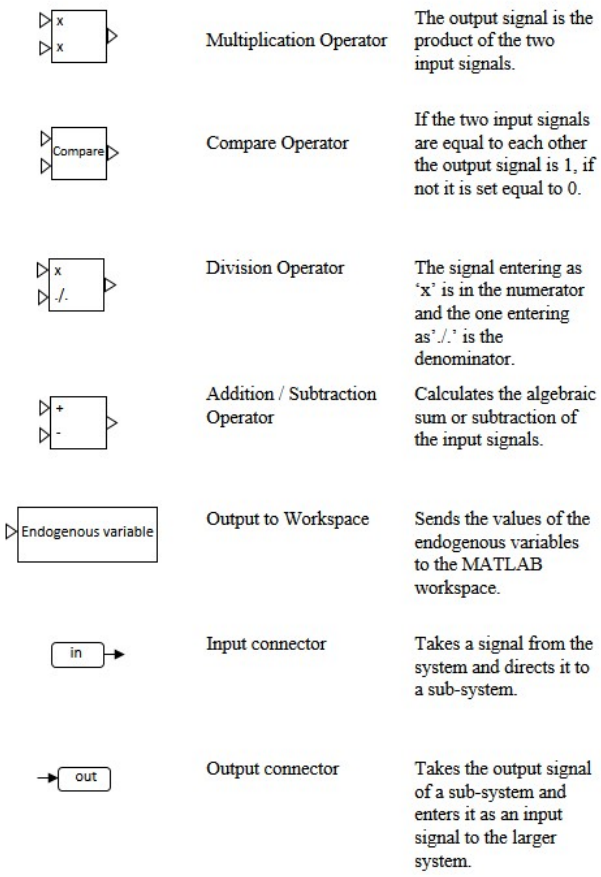

Figure A.1: Notation used the Appendices

B.2 Structure of a Real Estate Inmobiliaria Company

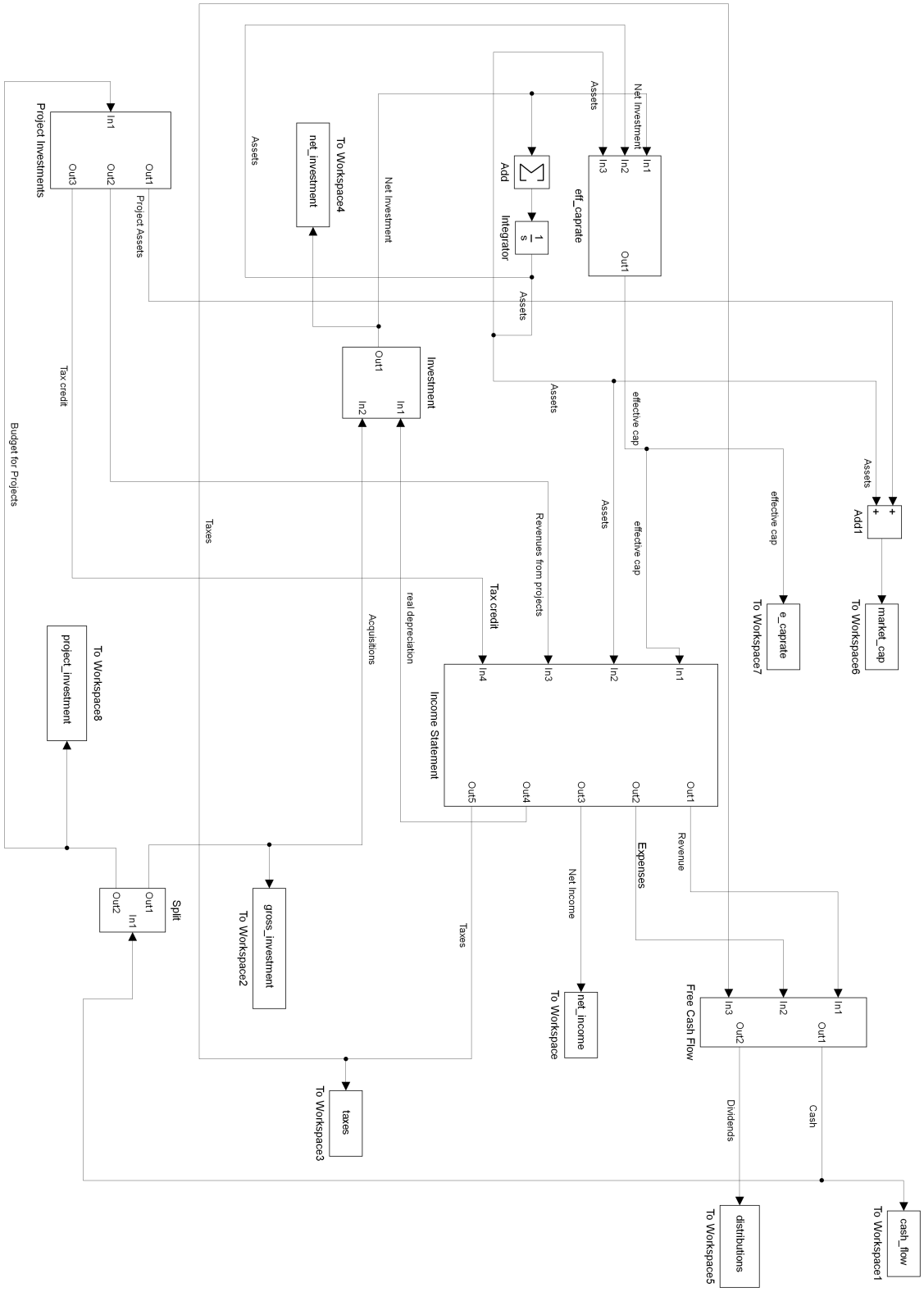

Figure B.1: Cash Flow Diagram of an Inmobiliaria

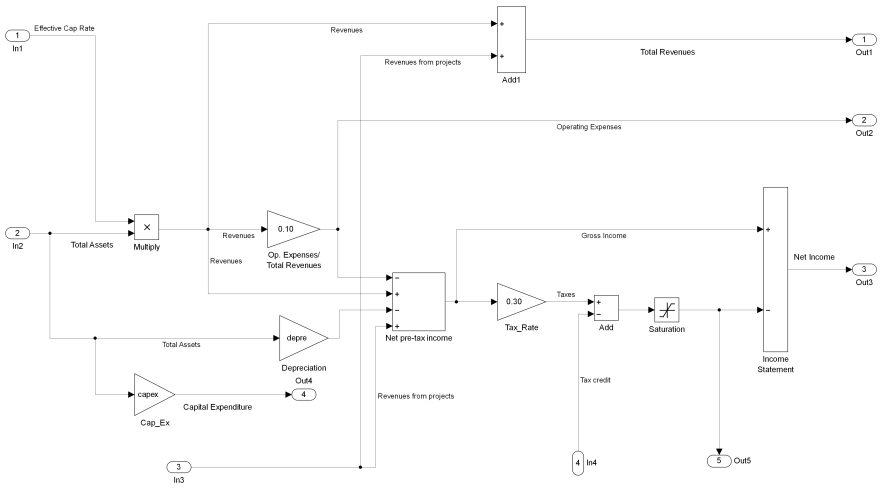

Figure B.2: Income Statement Sub-System

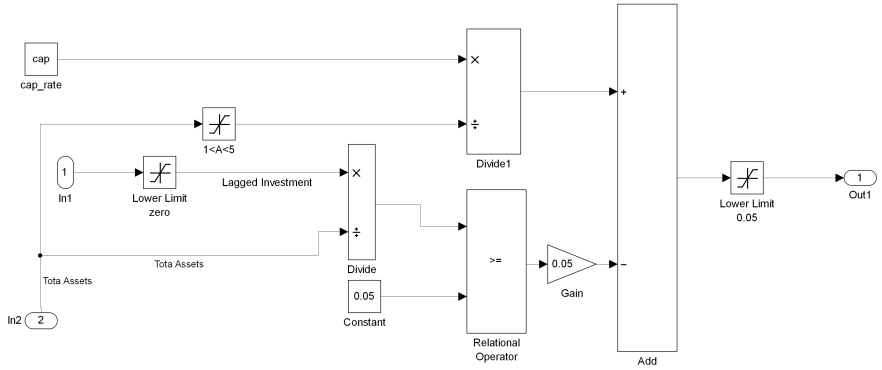

Figure B.3: Cap Rate Compression Sub-system

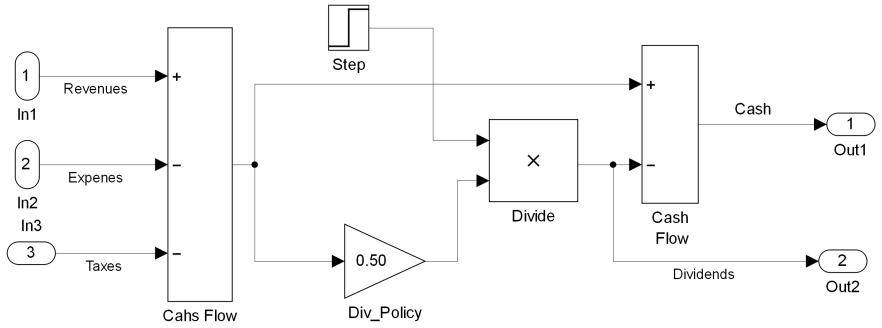

Figure B.4: Free Cash Flow Sub-system

B.3 Structure of an Internally Managed FIBRA

The Simulink ®model for an Internally Managed FIBRA is the same as figure B.1 with the exception of the *Sub-System* in figure B.4 which is replaced by figure B.11.

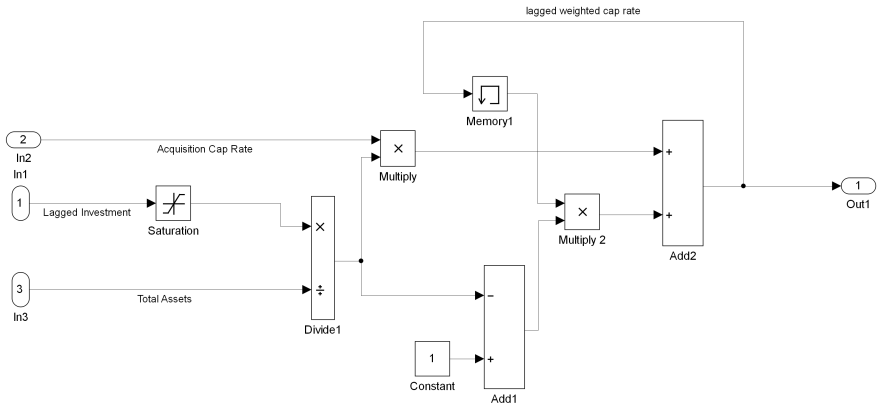

Figure B.5: Weighted Cap Rate Sub-system

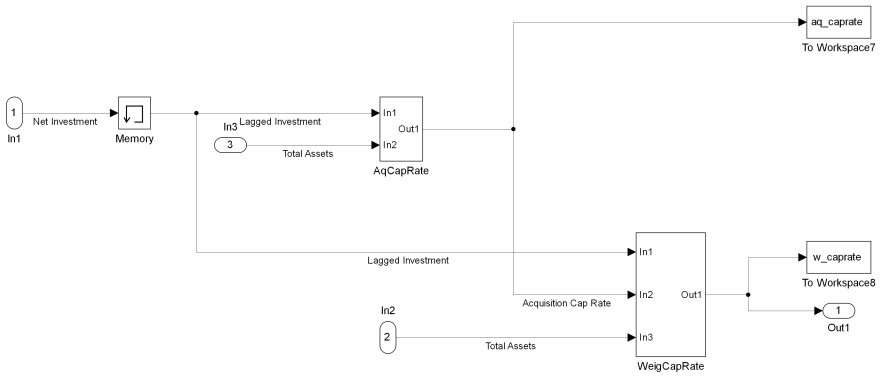

Figure B.6: Effective Cap Rate Sub-system

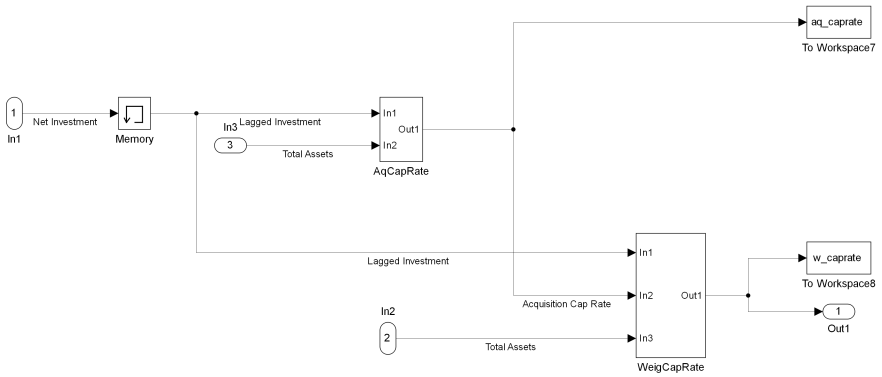

Figure B.7: Effective Cap Rate Sub-system

For ease of reference we reproduce the whole INTERNALLY MANAGED FIBRA *System* and the income statement *Sub-system*. All other Sub-systems follow the same specification of INMOBILIARIAS.

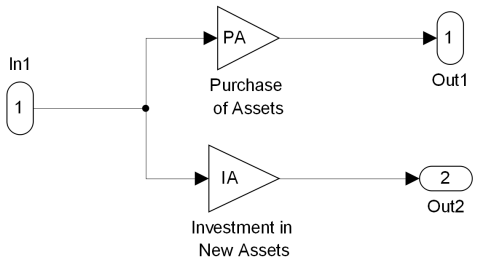

Figure B.8: Construction vs. Buying Split Sub-system

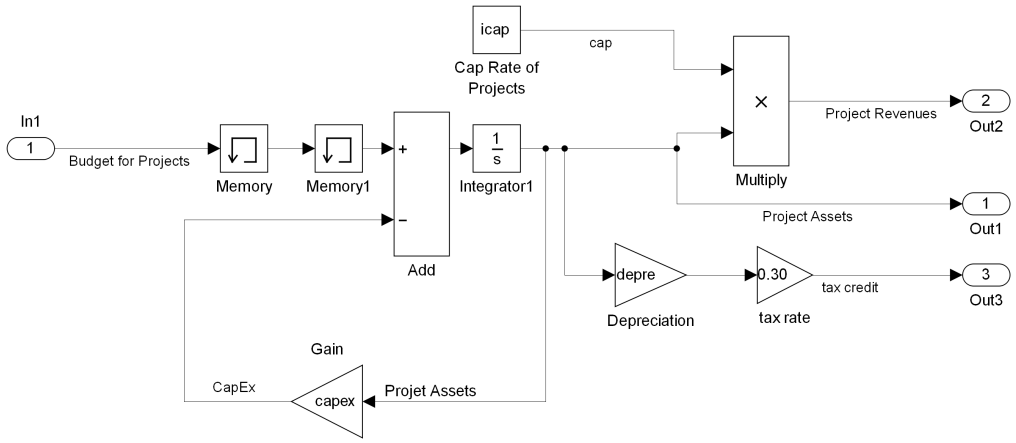

Figure B.9: Project Investments Sub-system

B.4 Structure of an Externally Managed FIBRA

The Simulink ®model for an Externally Managed FIBRA is shown in figure B.13. We reproduce bellow the more important *Sub-systems*. Those blocks not explicitly presented in this section are the same as the corresponding ones for Inmobiliarias.

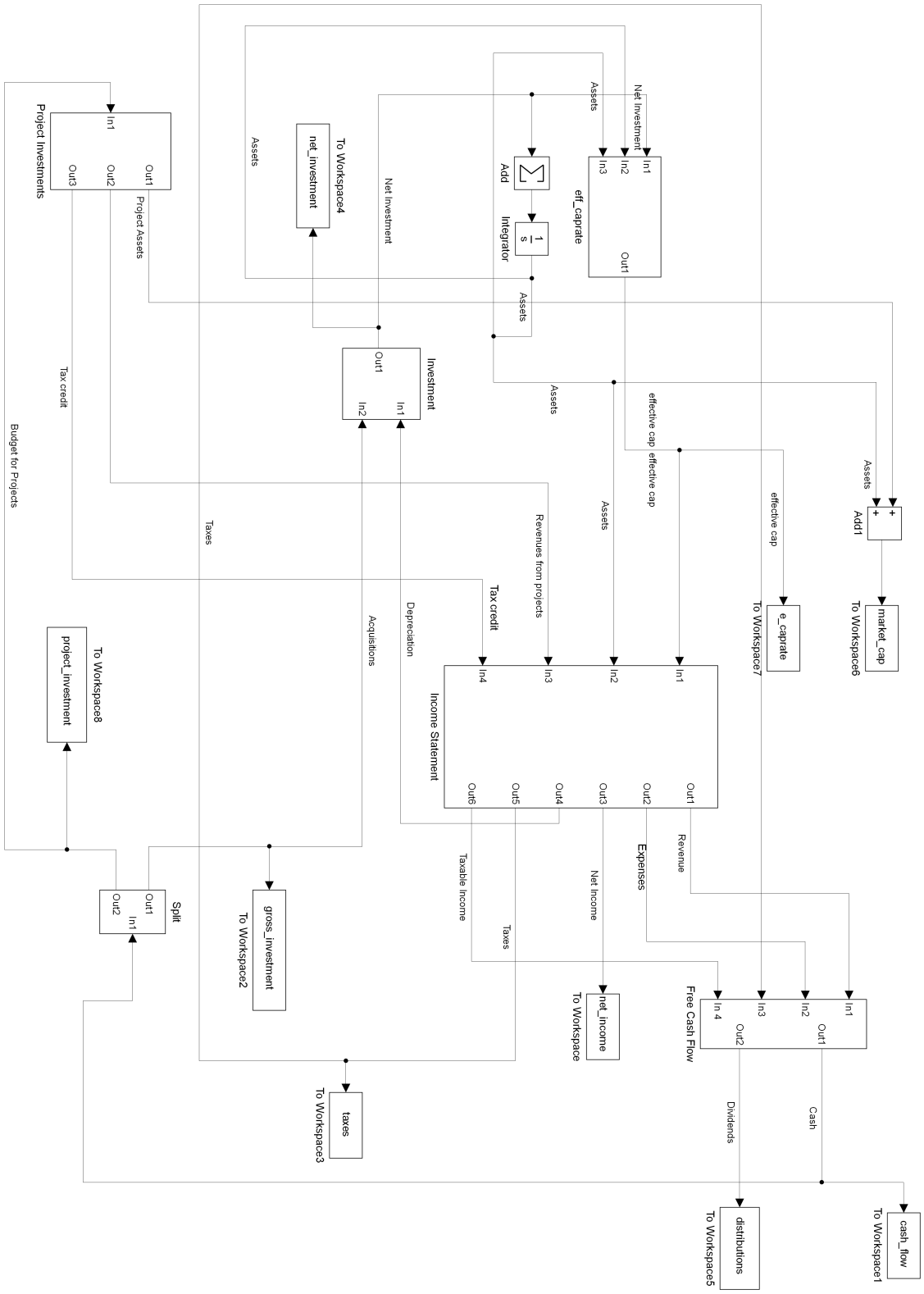

Figure B.10: Internally Managed FIBRA

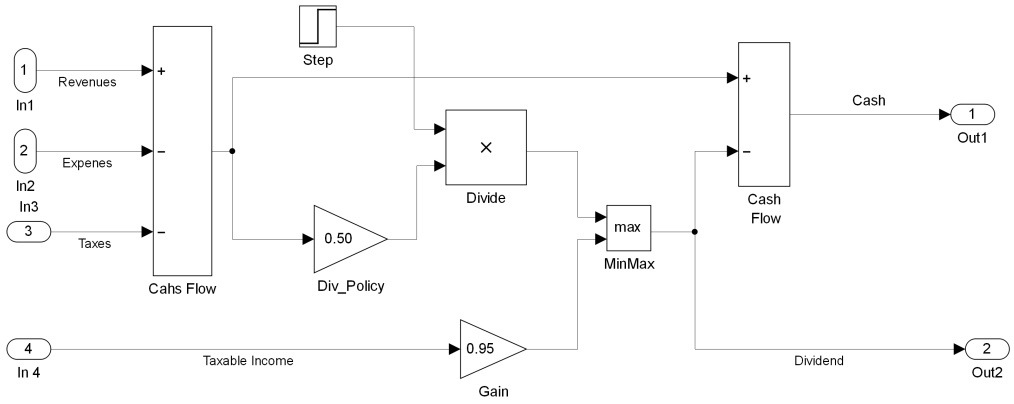

Figure B.11: Free Cash Flow Internally Managed Sub-system

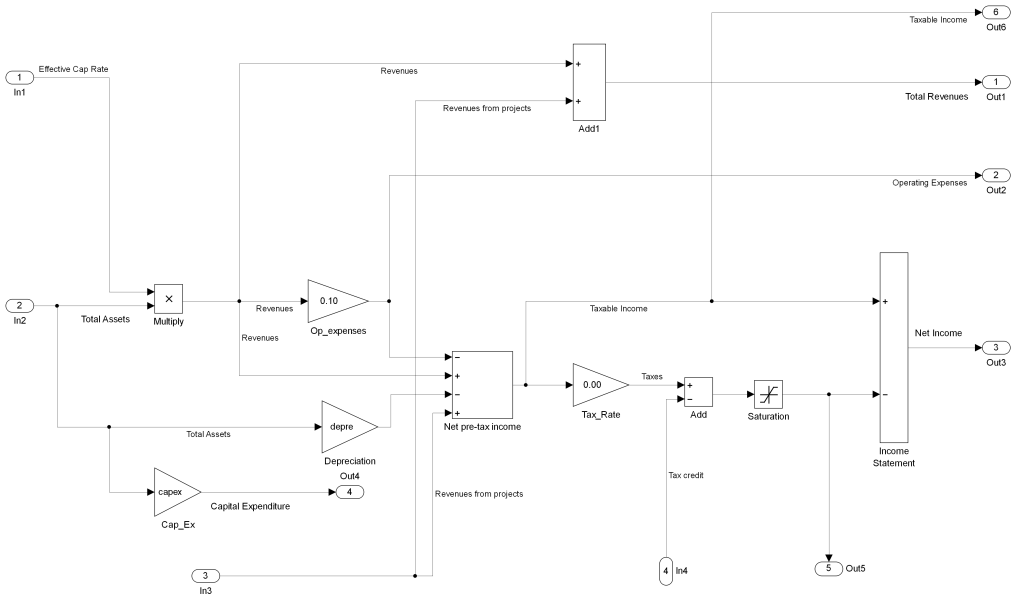

Figure B.12: Income Statement Sub-system

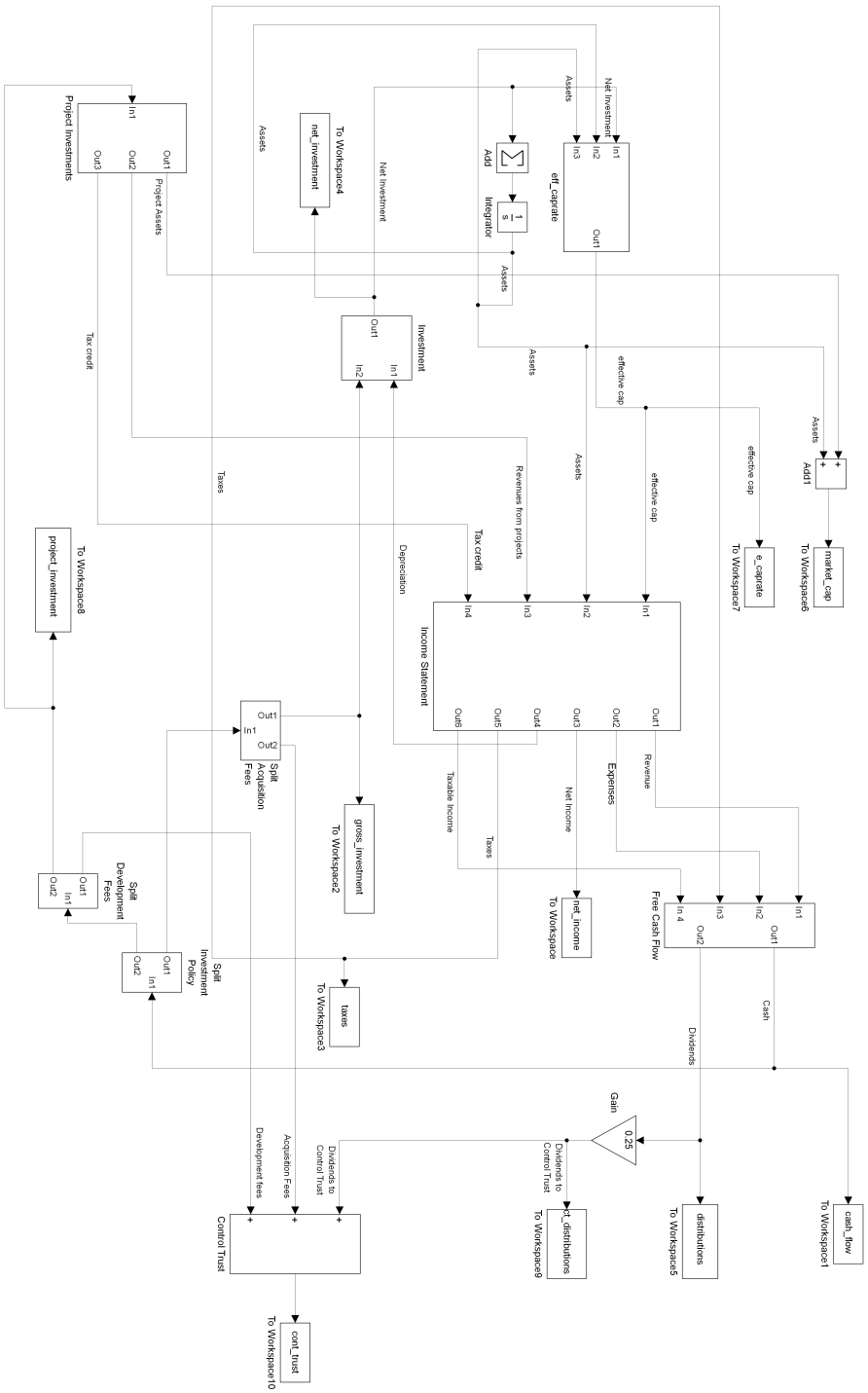

Figure B.13: Externally Managed FIBRA

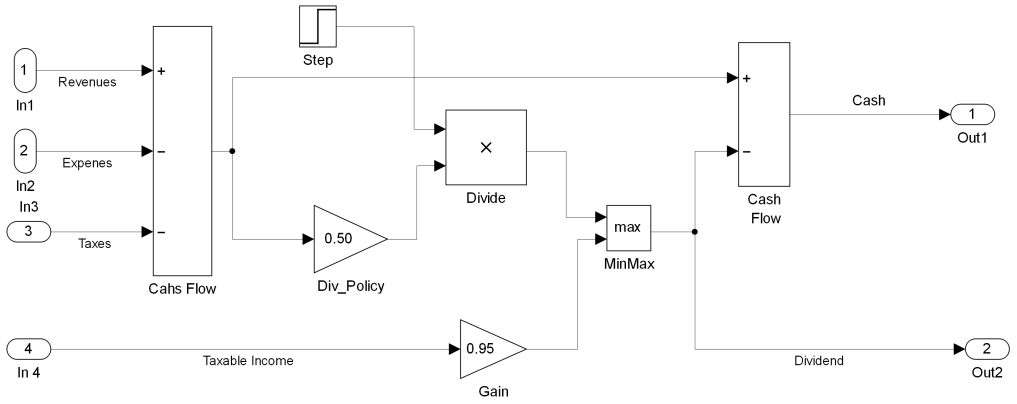

Figure B.14: Free Cash Flow Internally Managed Sub-system

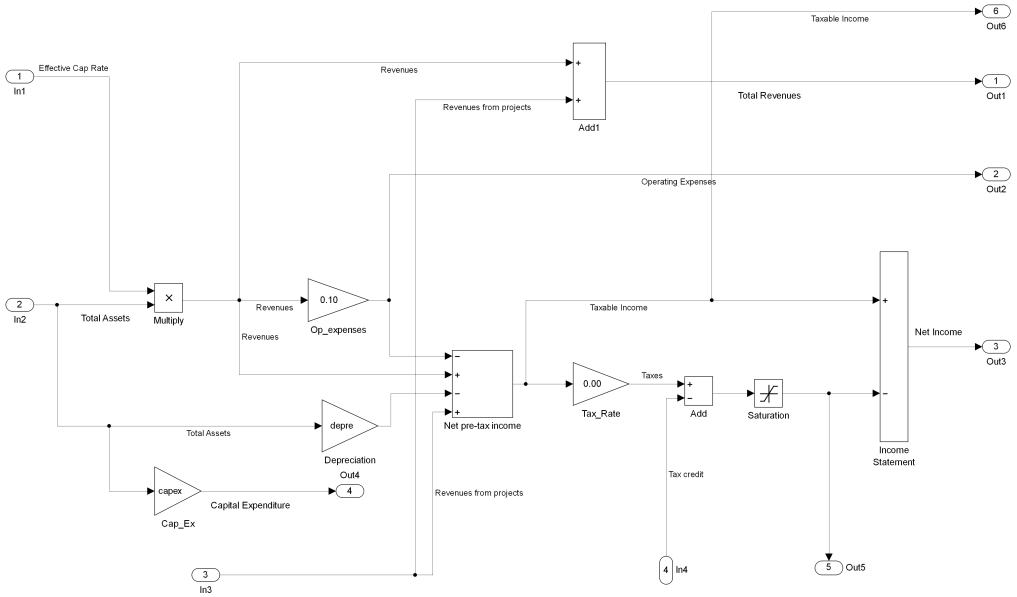

Figure B.15: Income Statement Sub-system

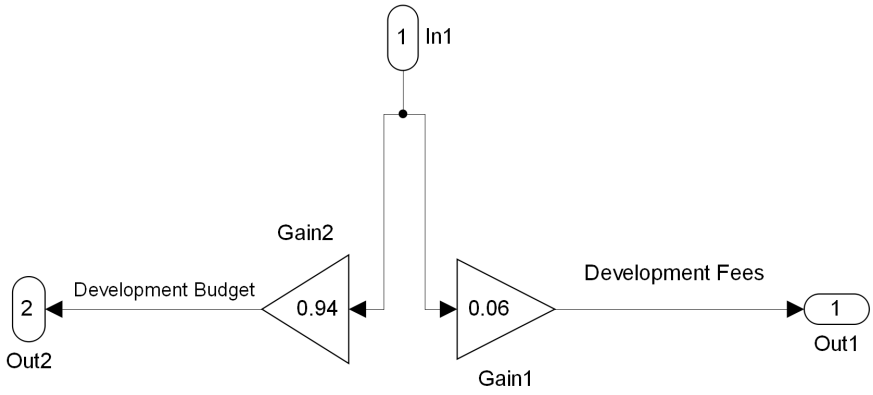

Figure B.16: Development Fees

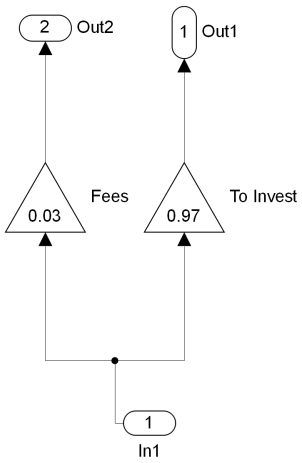

Figure B.17: Budget for Development of New Properties

B.5 Simulation Results

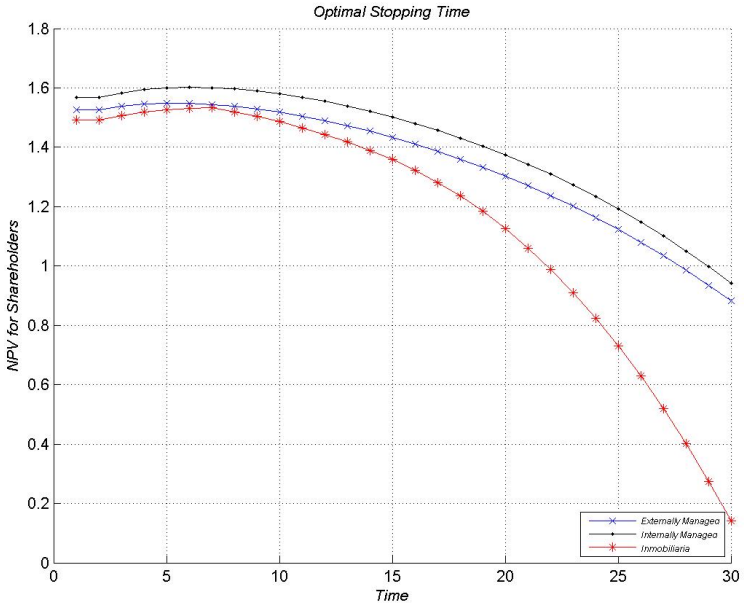

Figure B.18: Case 1. Relative Value of Real Estate Structures

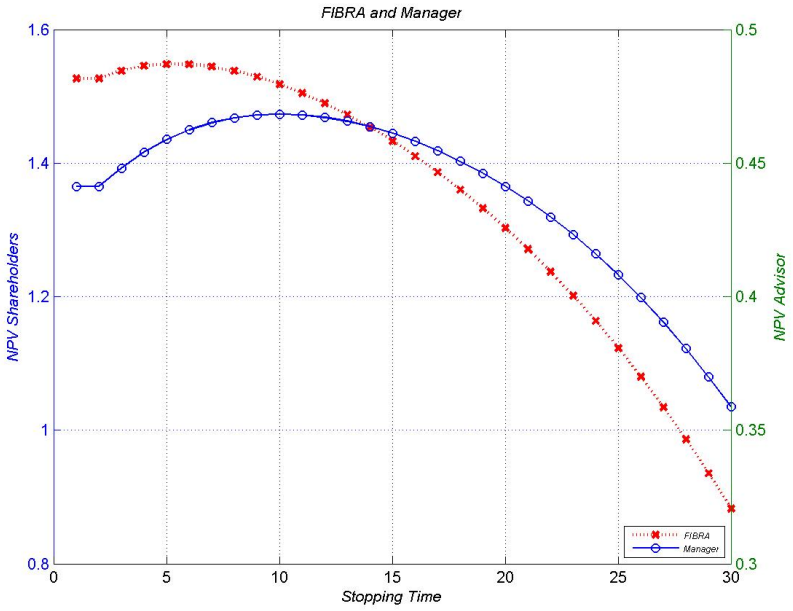

Figure B.19: Case 1. Optimal Stopping (Investment)

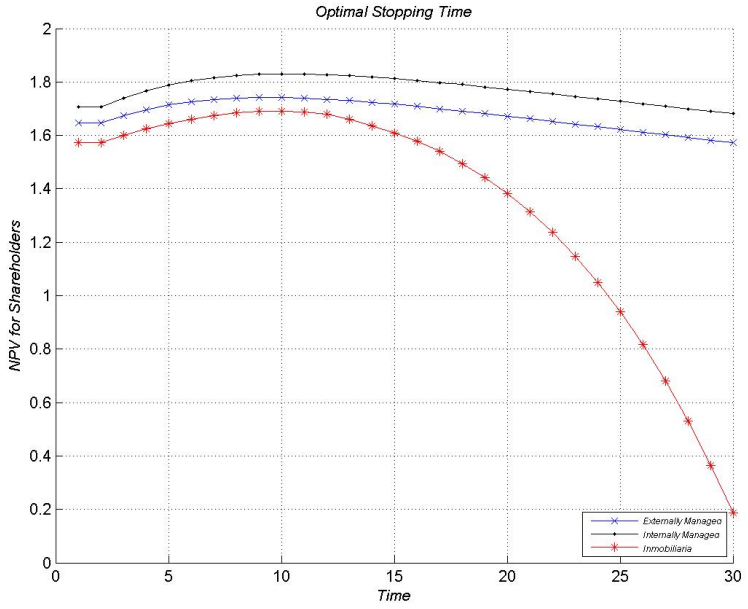

Figure B.20: Case 2. Relative Value of Real Estate Structures

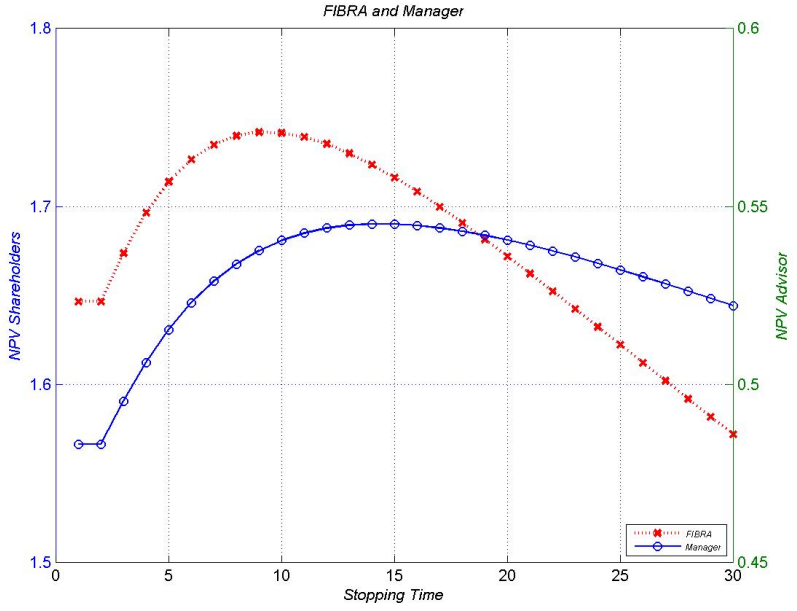

Figure B.21: Case 2. Optimal Stopping (Investment)

Table B.2: Taxation (2014−). Individuals

	FIBRA	**Inmobiliaria**
Tax on net income	35%	30%
Surtax on dividends	0%	10%
Total tax on income	35%	40%
Capital gains tax	0%	10%

Table B.3: Taxation (2014−). AFORES

	FIBRA	**Inmobiliaria**
Tax on net income	0%	30%
Surtax on dividends	0%	0%
Total tax on income	0%	30%
Capital gains tax	0%	0%

Table B.4: Traded FIBRAS in the Mexican Stock Exchange

FIBRA	**Management**	**Fees**
Fibra UNO	Externally Managed	Management, Advisory, Acquisition and Performance
Fibra Hotel	Externally Managed	Management, Advisory, Development
Fibra Macquarie	Externally Managed	Management, Advisory, Acquisition and Performance
Fibra INN	Externally Managed	Management, Advisory, Acquisition
Terrafina	Externally Managed	Management, Advisory, Acquisition and Performance
Fibra Shop	Externally Managed	Advisory
Fibra Danhos	Externally Managed	Management,Advisory and Development

Appendix C Basic Real Estate Model with Volatility

C.1 Description and Parameters

The model in this section allows to see how the structure changes by:

Introducing Volatility . Volatility is introduced by simply scaling the cap rate of *new* Real Estate *developments* by a factor specified as a random variable uniformly distributed between 0 and 1.

Risk Neutral Agents Our model has, in the case of an Internally Managed FIBRA only one agent namely, the Shareholders. In the case of an Externally Managed FIBRA there are two, the Manager and the Shareholders. In both cases these agents are considered to be risk neutral. This assumption will be relaxed further ahead in the Appendices section.

Monte Carlo We ran simulated cash flows for 30 years. Year after year the cap rate of investments fluctuates following an independent random shock. This defines a path of cash flows for which we calculate the present value. This exercise is repeated 500 times. This means that the agents will see 500 independent paths.

Optimal Path . The agents use the mean value of the paths to build the curves shown in the results section of this Appendix. Given the concavity of these lines there is a unique optimum which we will use to compare the Internally and Externally Managed entities.

It is worth mentioning that in contrast with what was done in Appendix B, we have re-calibrated the parameter `purchases` down to 0.20 with the purpose of highlighting one of the most important distinctions between both types of FIBRAS.

Table C.1: Model Specification

Parameter	Concept	Value
`depreciation`	Depreciation rate allowed by the tax law	0.10
`capex`	Material depreciation of the asset	0.025
`purchases`	Proportion of Investment Budget	Case 1. 0.20
	destined to buying existing assets	Case 2. 0.50
		Case 3. 0.80
`cap`	Cap Rate of stabilized assets	0.10
`icap`	Maximum cap rate of developments	0.20
`random number`	Random factor from an	$[0, 1]$
	independent uniformly distributed sample.	
`disc rate`	Risk free rate of 30 year UDIBONOS	0.03
`mgt fee`	Management Fee of the external manager	0.10
	defined as a proportion of the NOI	
`acq fee`	Fee that the external manager charges	0.03
	for acquisitions as a proportion of such	
	purchases	
`asset fee`	Fee that the external manager charges	0.03
	for managing the assets as a proportion	
	of the AUM	

C.2 Simulation Results

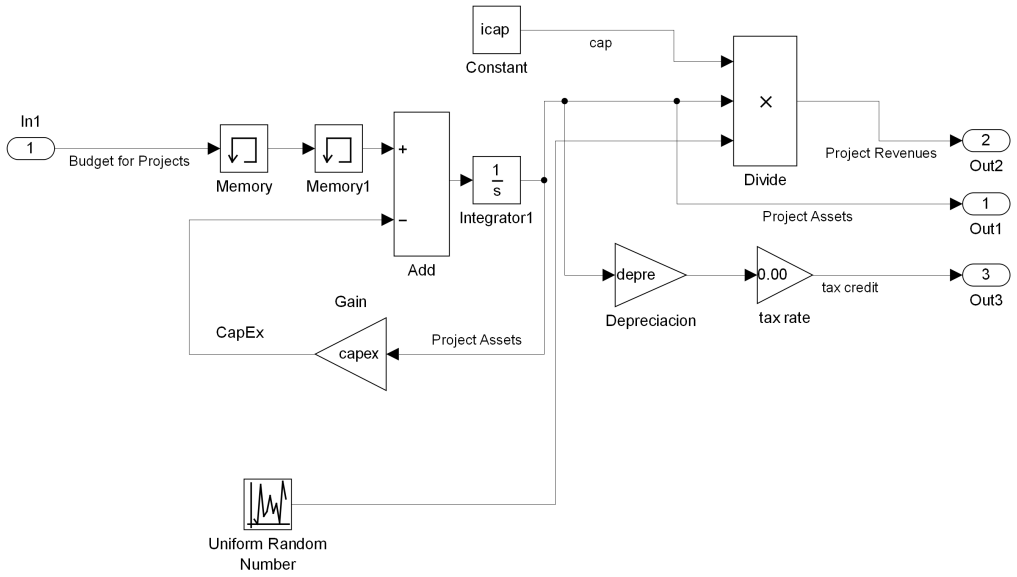

Figure C.1: Volatile Cap Rate in New Projects

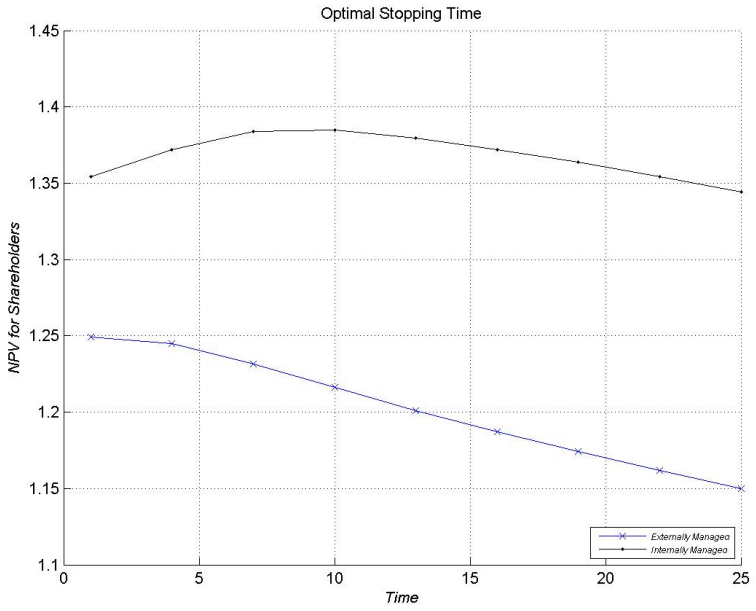

Figure C.2: Expected Value. Internally vs. Externally Managed FIBRAS

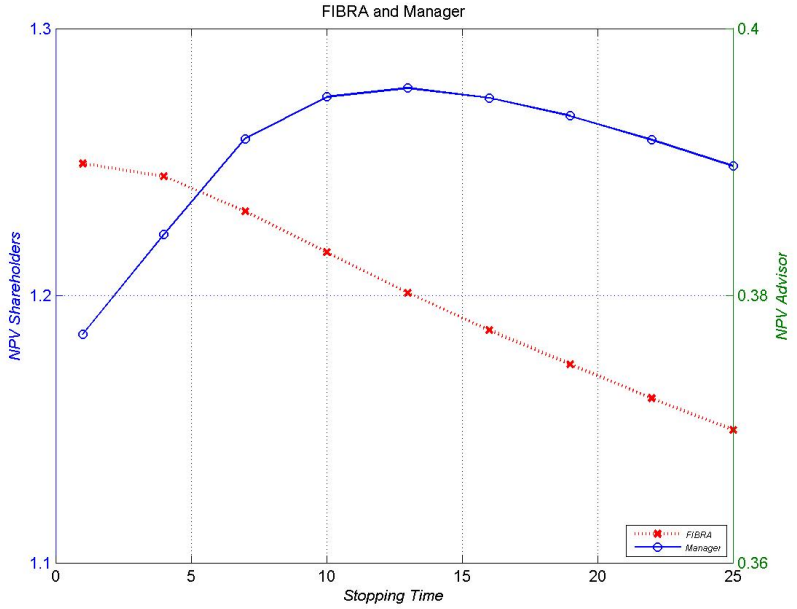

Figure C.3: Optimal Stopping (Investment) with Volatility

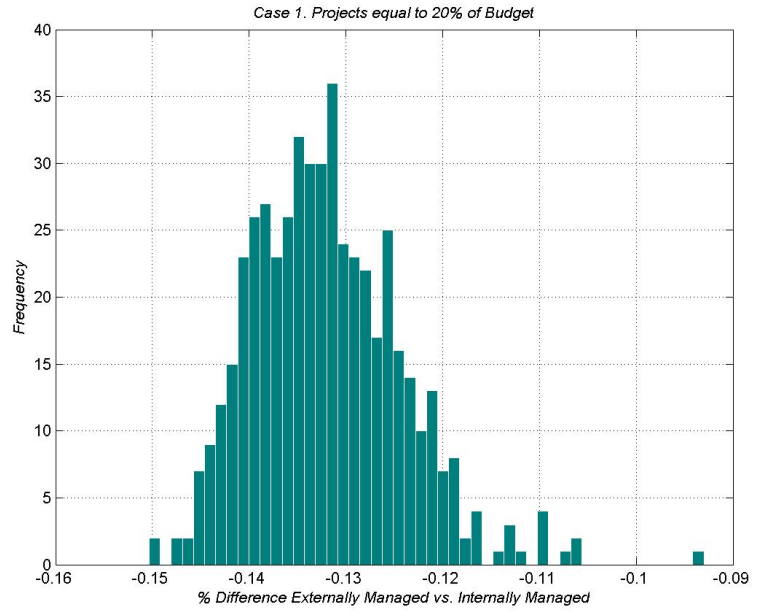

Figure C.4: Value Lost in Externally Managed FIBRAS. Case 1.

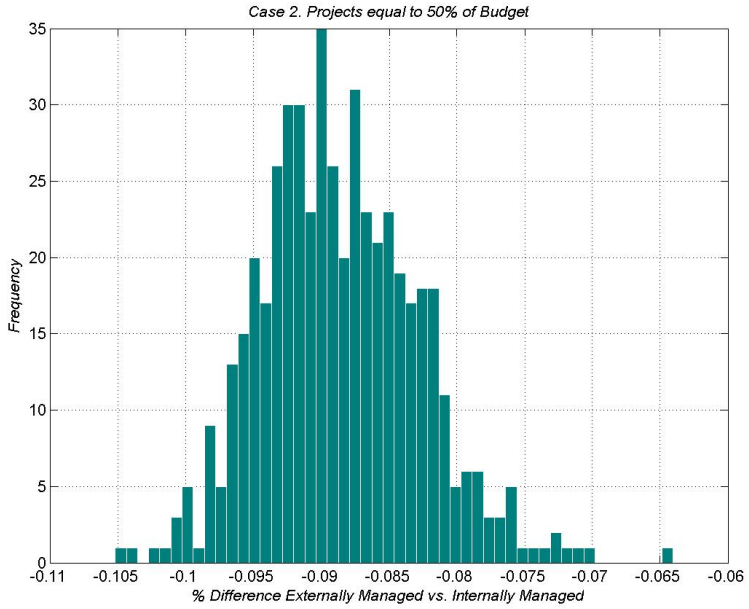

Figure C.5: Value Lost in Externally Managed FIBRAS. Case 2.

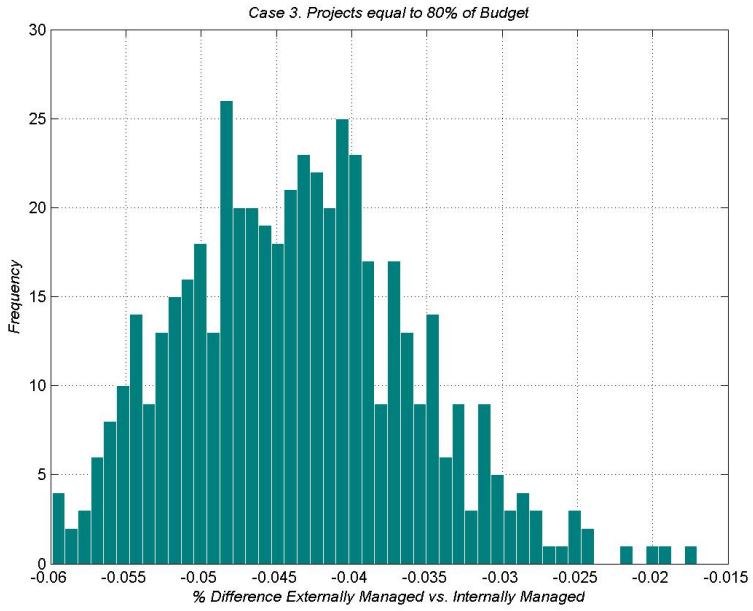

Figure C.6: Value Lost in Externally Managed FIBRAS. Case 3.

Appendix D Model with Risk Averse Investors

D.1 Definitions and Parameters

This Appendix addresses provides us with a framework for discussing Pareto Optimal contract structures between the FIBRA Shareholders and the Managers. To capture the essence of the question at hand we eliminate some of the details of the structures discussed previously without compromising the main conclusions.

Focus on Share Allocation . Along the simulation we change the parameter `sharing`. The purpose is to be able to generate a map of indifference curves for Shareholders and Managers. Each curve shows the combination of fees and shares to external Managers that delivers the same expected utility for each group.

Risk Averse Shareholders . We consider that Shareholders are risk averse and that have limited access to diversifying out the volatility underlying the FIBRA. In contrast, we see the manager as more able to hedge the volatility. This assumption can be captured by taking him as a risk neutral agent.

Expected Utility Function . We will use a very simple utility function,

$$E(U) = E(X) - 100 * var(X) \tag{1}$$

Simplified Fee Structure . We assume a single fee specified as a proportion of total assets under management.

Monte Carlo . First we take a pair of values for `fees` and `sharing`. For each pair we run 100 simulations of 30 years each. The range of values for the single fee goes from 1% to 3%. The range of sharing goes from 0% to 100%. For each set of 100 simulations the Shareholders compute their expected utility. The Managers compute the expected present value.

It is worth considering that since there is no implicit de-centralized optimization on the side of each one of the agents, the mapping of Pareto allocations is conceptually though to be reached by means of a an exogenous mechanism, such as regulation. In the next Appendix we move closer to a market-solution by allowing the agents to optimize their decisions.

Table D.1: Model Specification

Parameter	**Concept**	**Value**
`random number`	Random factor from an independent uniformly distributed sample.	$[0, 1]$
`fees`	Management Fee of the external manager defined as a proportion of the AUM	`changes during simulations`
`sharing`	Means the share participation of SHAREHOLDERS	`changes during simulations`

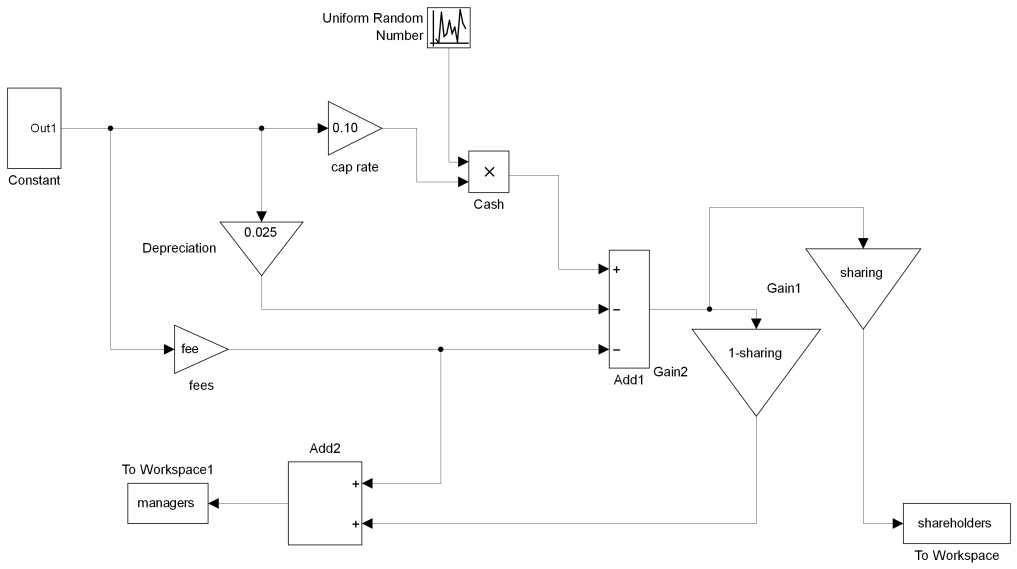

Figure D.1: Simplified Model of a FIBRA with a volatile Cap Rate

D.2 Simulation Results

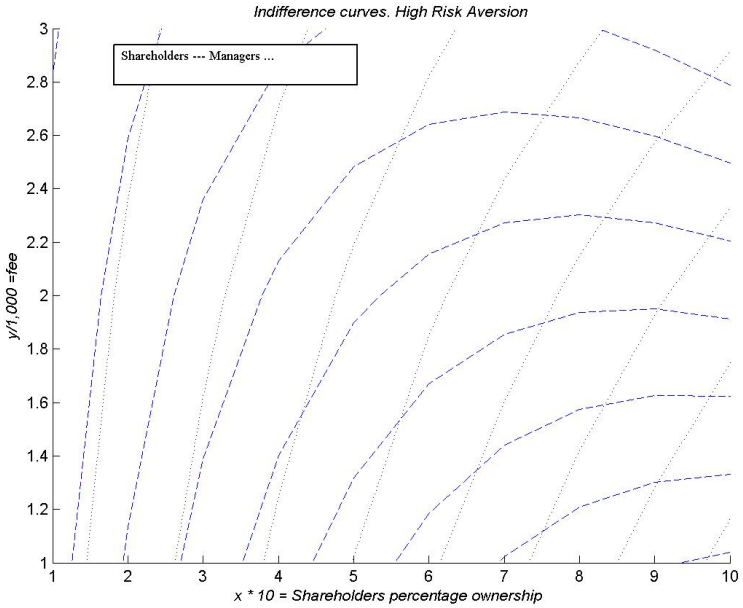

Figure D.2: Simplified Model of a FIBRA with a volatile Cap Rate

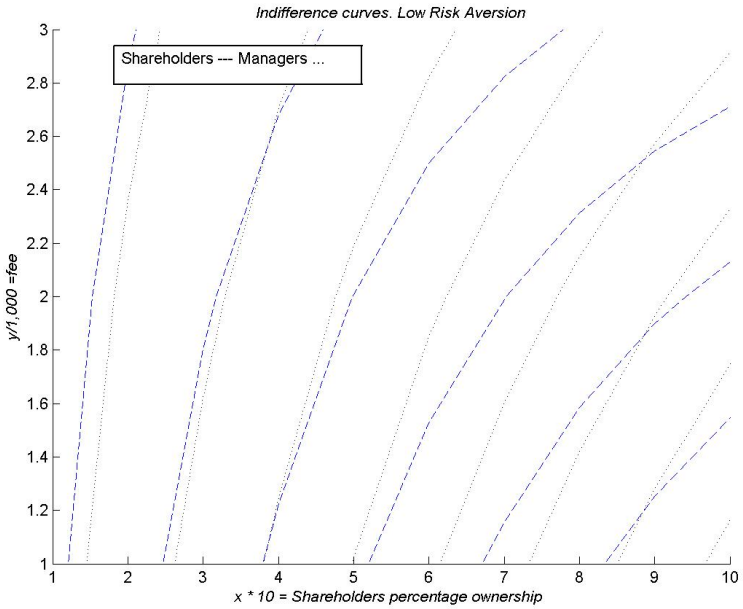

Figure D.3: Simplified Model of a FIBRA with a volatile Cap Rate

Appendix E Optimal Contract in an Externally Managed FIBRA

E.1 Definitions and Parameters

This Appendix is a progression of the previous section. It adds the criterion of optimal stopping to the notion of combining the property structure and fee structure

An optimization criterion . We assume that both, SHAREHOLDERS and MANAGERS look at maximizing their respective objective functions under uncertainty. At that point we seek for an arrangement that get SHAREHOLDERS as close as possible to their ideal state.

Monte Carlo We carried out three batches of simulations. In each batch we run 100 revenue paths per *stopping time*. Each path has 30 periods. Thus there are 30 *stopping times* per simulation. In total we ran $270,000$ draws of the random shock.

Comparing figure E.1 with figure D.1 the only difference is the *stopping switch* that is used in the optimization example.

Table E.1: Model Specification

Parameter	Concept	Value
`random number`	Random factor from an independent uniformly distributed sample.	$[0,1]$
`fees`	Management Fee of the external manager defined as a proportion of the AUM	`changes during simulations`
`sharing`	Means the share participation of SHAREHOLDERS	`changes during simulations`
`stop switch`	Is the operator used for mapping the expected utility across stopping times	`changes during simulations`

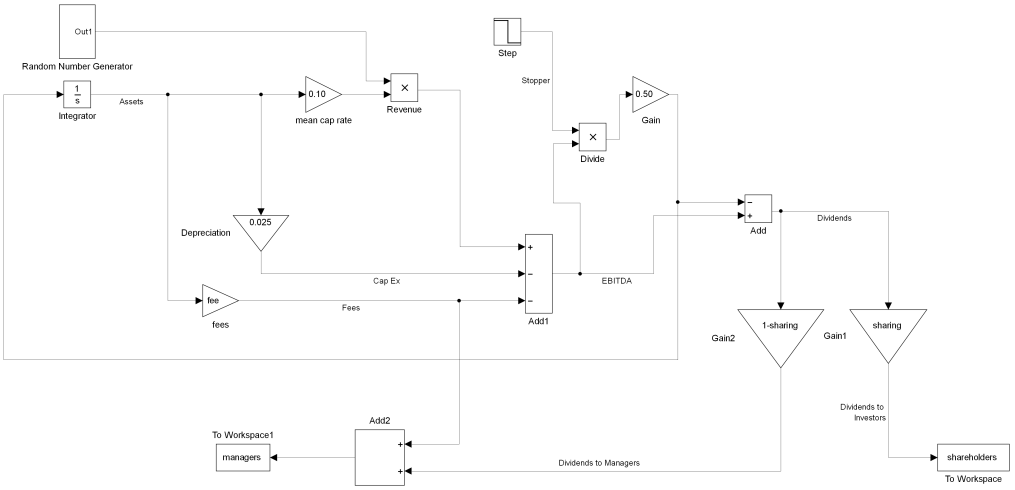

Figure E.1: Simplified Model of a FIBRA. Volatility and Stopping Switch

E.2 Simulation Results

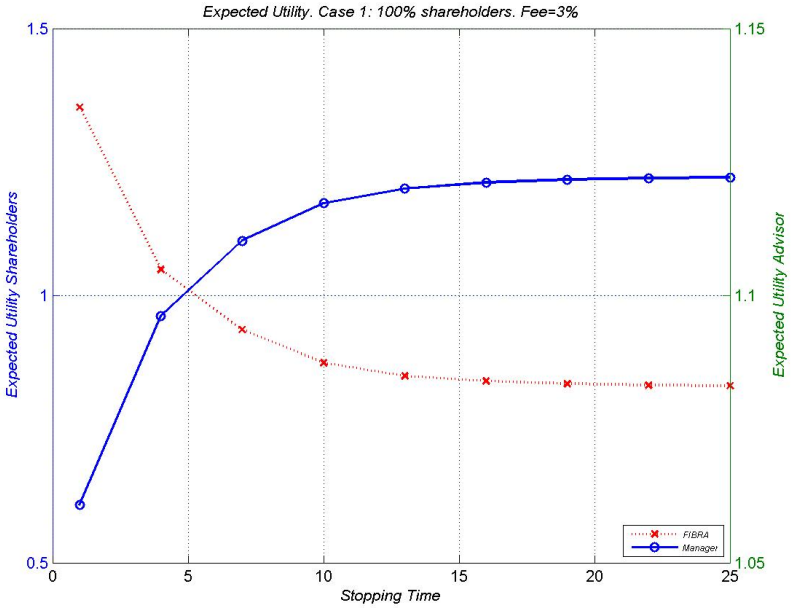

Figure E.2: Case 1. Optimal Stopping

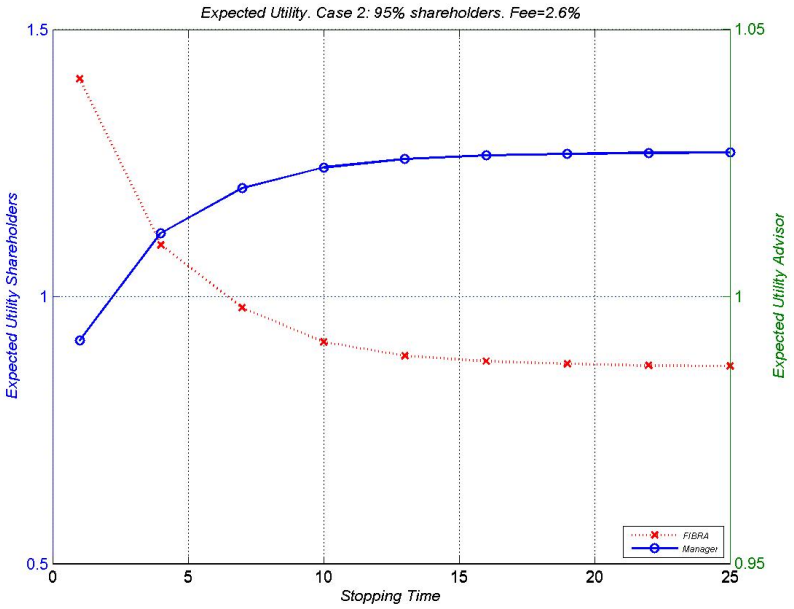

Figure E.3: Case 2. Optimal Stopping

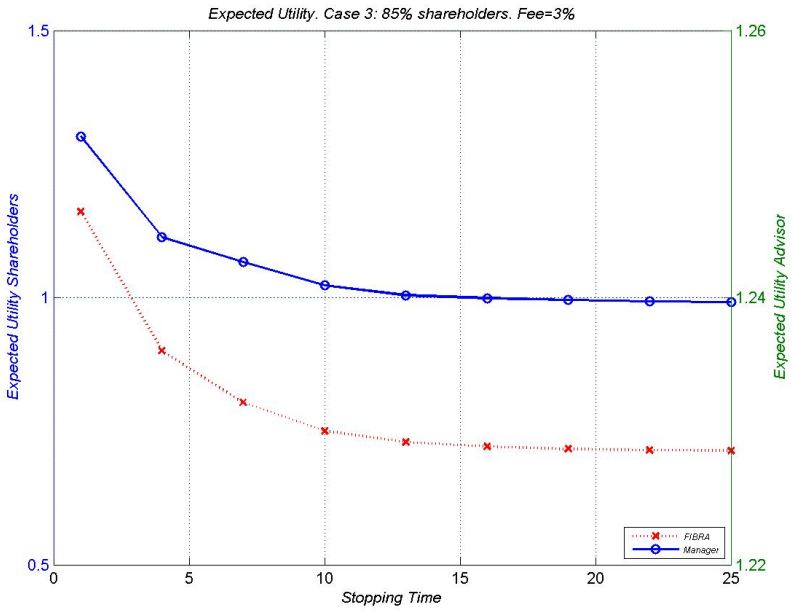

Figure E.4: Case 3. Optimal Stopping

Appendix F Growht capabilities of a FIBRA vs an Inmobiliaria

F.1 Definitions and Parameters

FIBRAS can leverage their structures to speed up growth and to attain a larger size than Inmobiliarias.

Corporate Leverage We pointed out in the body of the document that a key difference between a FIBRA and an Inmobiliaria is that the former is a vehicle structured as a Trust Agreement and the latter is a Corporation. This means that FIBRAS can put in place mechanism to allow the FOUNDERS to keep the control of most of the decisions with an equity stake way below 50%, while FOUNDERS of Inmobiliarias are restricted to keeping at least a 50% stake to ensure the control of the key decisions of the venture.

Financial Leverage FIBRAS, in the same way as Inmobiliarias, can resort on financial leverage to enhance its financial performance. Most of them have set their limits to total borrowing to a ratio of loan to value below 50%

The simulation model keeps most of the standard operational features of a FIBRA while adding a couple of feedback loops.

Dilution Loop We start in a situation where the founding SHAREHOLDERS (MANAGERS) hold 50% of the FIBRA. We set the the minimum acceptable stake to down to 10%, which is the standard set by the most recently listed FIBRAS. We then assume that the FIBRA goes to the capital markets at the tenor of expression 2:

$$\triangle\ float(t) = 0.75 * (0.95 * TotalAssets - float(t-1)) \tag{2}$$

Borrowing Loop We set a target of 50% loan-to-value. Then we set the loop defined by 3:

$$\triangle\ debt(t) = 0.75 * (0.50 * TotalAssets - debt(t-1)) \tag{3}$$

F.2 Simulation Results

Table F.1: Model Specification

Parameter	**Concept**	**Value**
`depreciation`	Depreciation rate allowed by the tax law	0.10
`capex`	Material depreciation of the asset	0.025
`cap`	Cap Rate of stabilized assets	0.10
`disc rate`	Risk free rate of 30 year UDIBONOS	0.03
`minimum equity`	Minimum equity of FOUNDERS	0.05
	as a proportion of total assets	

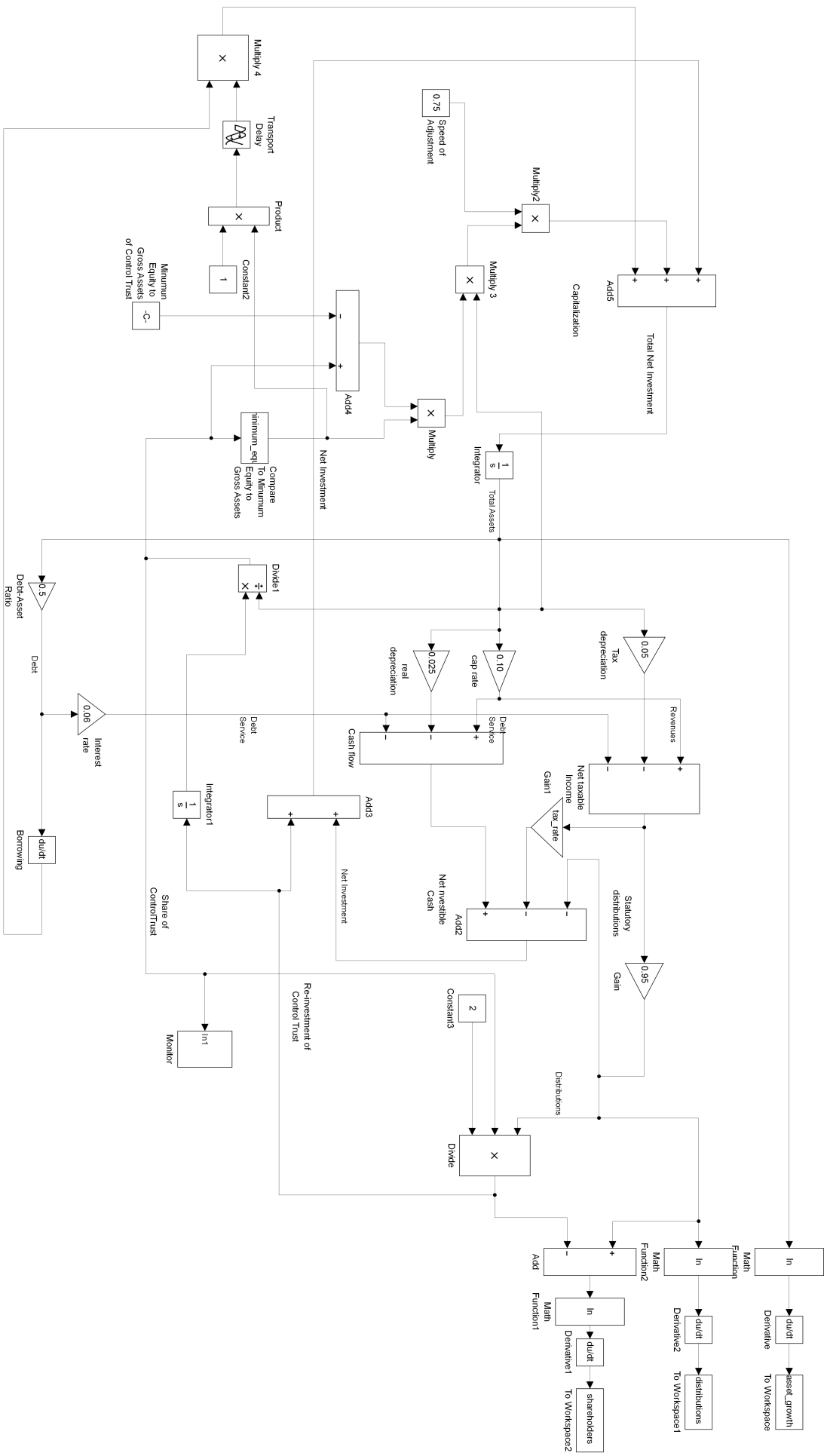

Figure F.1: Simplified Model of a FIBRA, Long Term Growth

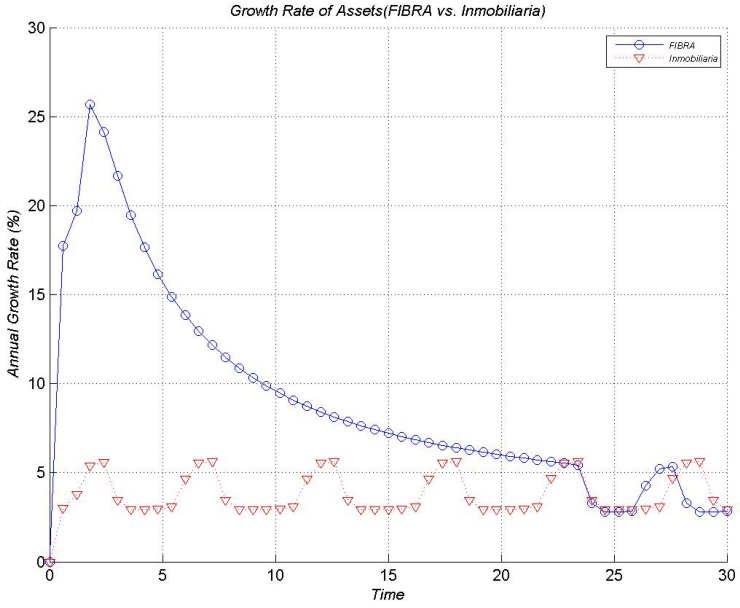

Figure F.2: Growth Rate of Total Assets. Fibra vs. Inmobiliaria

Appendix G Framework for Estimating the Optimal Dilution of Founders

G.1 Definitions and Parameters

In Appendix F we ran a simple growth model of a FIBRA. In that case we set the acceptable dilution of the FOUNDERS as an endogenous variable. Here we elaborate the model a little more by making the ownership structure an endogenous variable. To that end, we re-introduce the *optimal stopping* idea to locate the point where the FOUNDERS would stop diluting and borrowing to settle to the *cruising speed* (steady state) of the FIBRA.

The parameters used in the simulation are included in table G.1.

Table G.1: Model Specification

Parameter	**Concept**	**Value**
`depreciation`	Depreciation rate allowed by the tax law	0.10
`capex`	Material depreciation of the asset	0.025
`cap`	Cap Rate of stabilized assets	0.10
`disc rate`	Risk free rate of 30 year UDIBONOS	0.03
`minimum equity`	Minimum equity of FOUNDERS as a proportion of total assets	0.05

G.2 Simulation Results

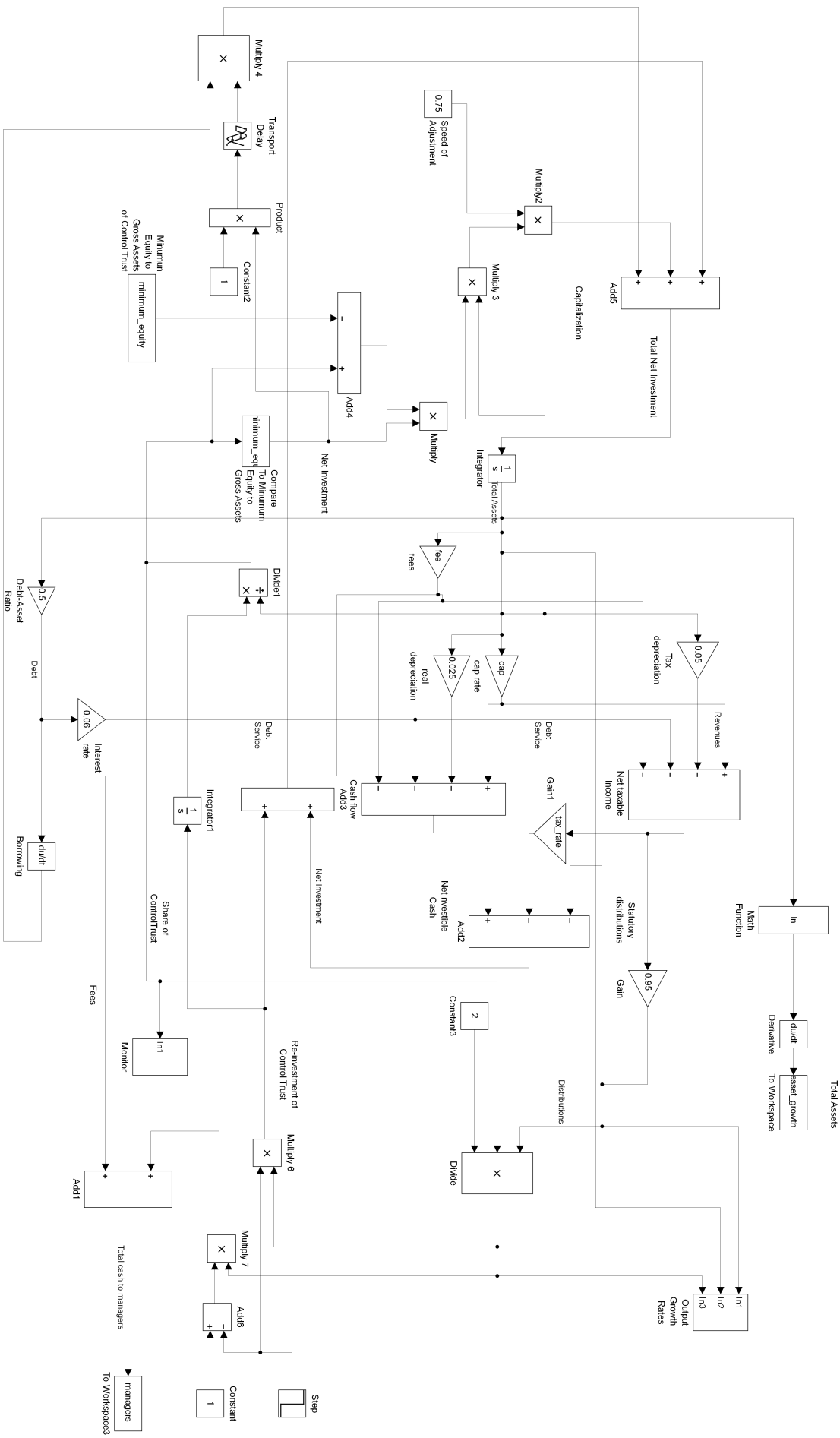

Figure G.1: Simplified Model of a FIBRA. Long Term Growth

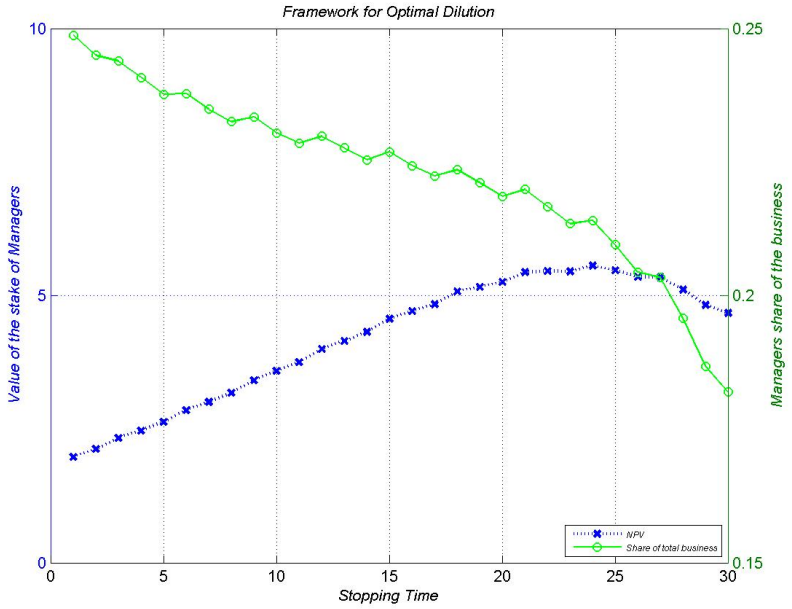

Figure G.2: Framework for Optimal Dilution

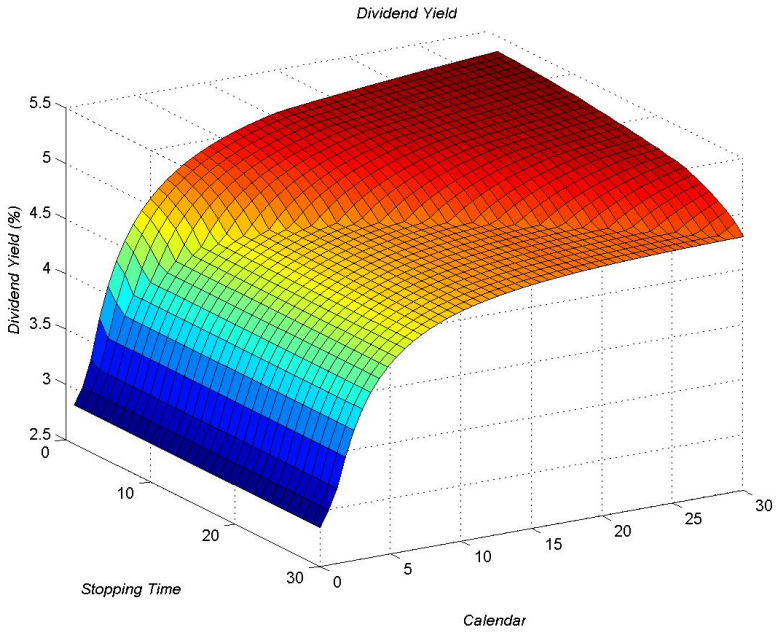

Figure G.3: Dividend Yield for Shareholders

Appendix H Risk of Regulatory Default

H.1 Definitions and Parameters

A critical feature of FIBRAS is their *see through tax status*. To keep such status they need to comply with three things.

Lease Agreements . Lease agreements are constrained to comply with the requirements enumerated in section1.4.

Distributions . Distributions need to amount to at least 95% of the *Notional* taxable income of the trust.

Maximum cash . Fibras can not hold more than 30% of the assets in cash.

When a FIBRA takes on debt it may find itself in a situation where paying the service and amortization of the loans may be incompatible with the minimum distribution requirements. At that point, the dilemma arises between either defaulting on the loans or defaulting on the regulation. Either case would be catastrophic.

In an interesting and rather unprecedented action aimed at limiting the risk of non-banking entities, the Central Bank has taken the lead in addressing this situation by releasing jointly with the Banking and Securities Commission a regulation analogous to the liquidity requirements set on banking institutions after the *Tequila Crisis* [17].

To conduct a sensitivity analysis we work with two parameters.

Volatility . The random shock t acts on the cap rate through a multiplication operator. We draw the shock from independent uniformly distributed numbers. The range of the underlying random variable is changed across scenarios.

Interest rates . We also present three scenarios of real long term borrowing rates.

We assume that the FIBRA borrows with a maturity of 30 years, and is subject to a linear amortization with a one year *grace period*. The parameters used in the simulation are included in table G.1.

Table H.1: Model Specification

Parameter	**Concept**	**Value**
`depreciation`	Depreciation rate allowed by the tax law	0.05
`capex`	Material depreciation of the asset	0.03
`cap`	Cap Rate of stabilized assets	0.10
`grace`	Grace Period	1 year
`disc rate`	Risk free rate of 30 year UDIBONOS	0.03
`min prob`	Lower bound for the random variable	
	Case 1	0.5
	Case 2	0.8
`max prob`	Upper bound for the random variable	
	Case 1	1.2
	Case 2	1.2

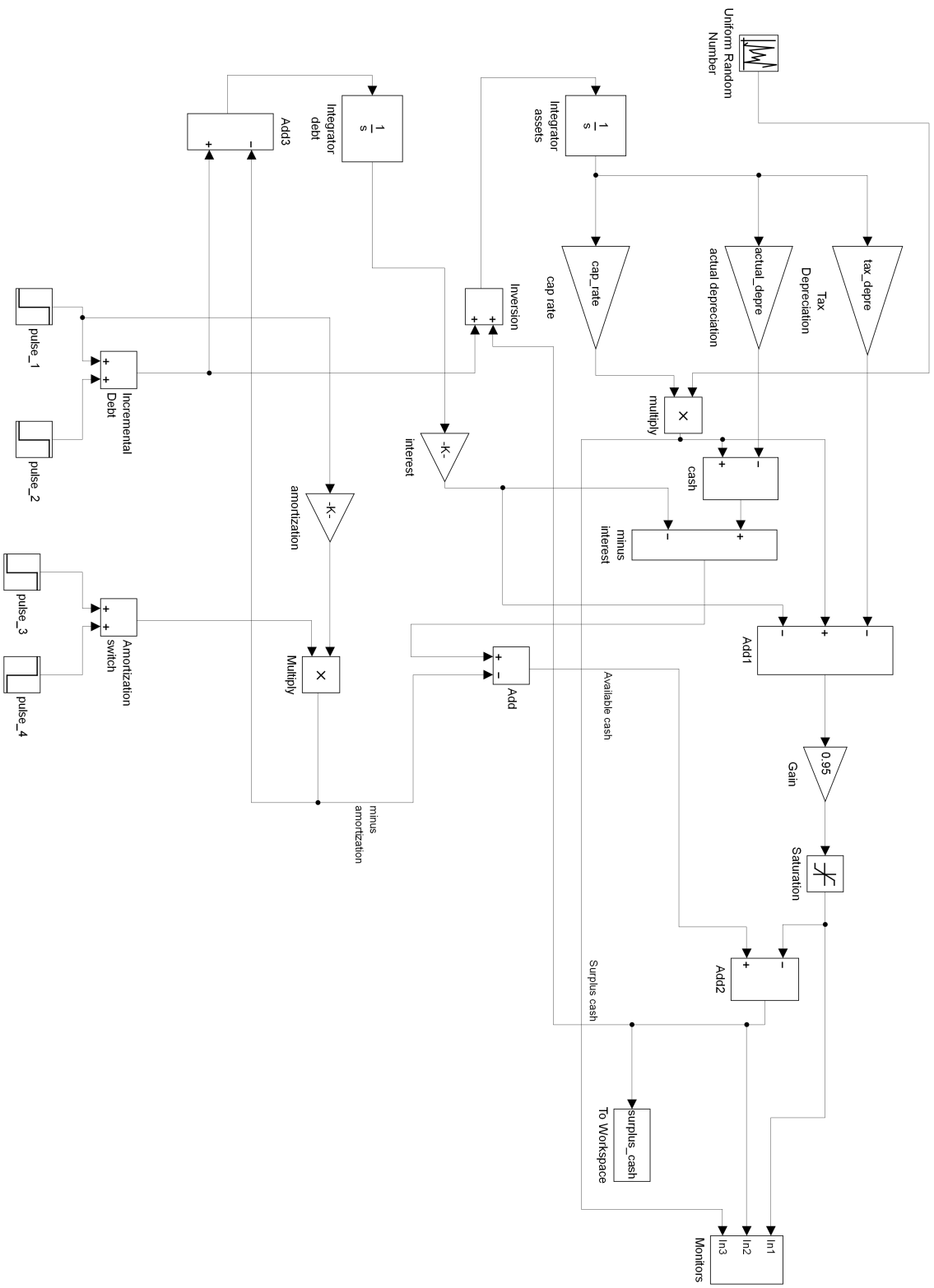

Figure H.1: Model for Assessing Regulatory Default

H.2 Simulation Results

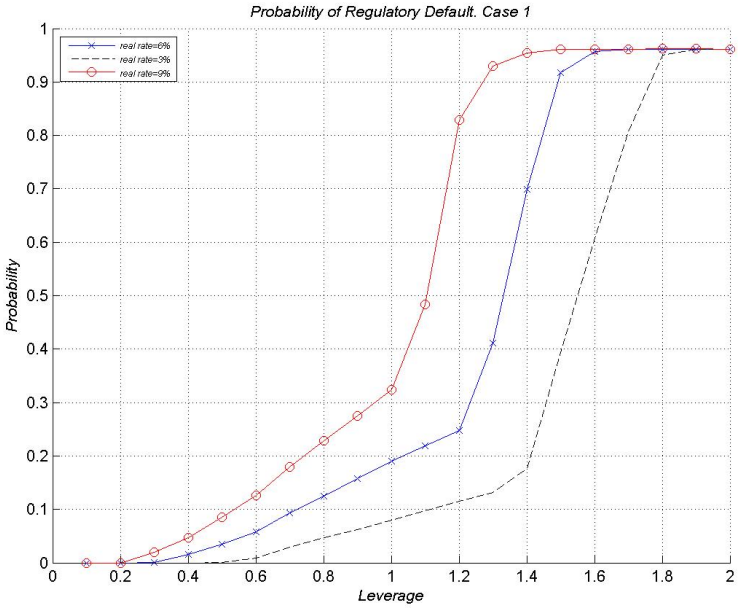

Figure H.2: Risk of Regulatory Default. Case 1.

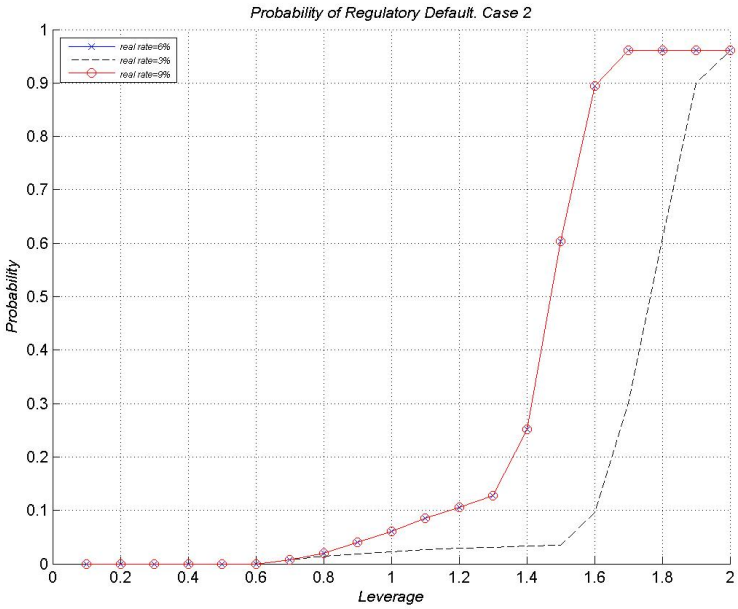

Figure H.3: Risk of Regulatory Default. Case 2.

Appendix I FIBRA UNO: Factor Loadings

Table I.1: Regression Results

Specifications	Model 1	Model 2	Model 3	Model 4	Model 5
Market	0.0654	0.0531	0.0241	0.0230	0.0150
	(0.791)	(0.834)	(0.925)	(0.930)	(0.955)
M10 Bono	1.112*	1.137*	1.127*	1.121*	1.030
	(0.032)	(0.033)	(0.035)	(0.041)	(0.070)
Size Factor		0.0128	-0.00530	-0.00604	0.00132
		(0.762)	(0.911)	(0.901)	(0.979)
Momentum Factor			0.0131	0.0126	0.0105
			(0.396)	(0.449)	(0.541)
Value Factor				0.00340	0.0102
				(0.928)	(0.796)
IShares IYR					0.234
					(0.526)
Constant	0.000920	0.000730	0.000887	0.000889	0.000715
	(0.074)	(0.368)	(0.290)	(0.297)	(0.427)
Observations	37	37	37	37	37
F	2.691	1.778	1.507	1.170	1.025
df_m	2	3	4	5	6
df_r	34	33	32	31	30
r2	0.137	0.139	0.159	0.159	0.170

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The dependent variable is the monthly total returns of FIBRA UNO from March of 2011 to April of 2014. The source is the Mexican Stock Exchange. The variable "Market" corresponds to the total return of iShares Naftrac which tracks the MEXBOL IPC Index. The source is the Mexican Stock Exchange. The variable "M10 Bono" is the total return of the M10 10 year Mexican Government peso denominated bond. the source is VALMER, a registered Price Vendor. The Factor Variables come from [18]. The *Size Factor* corresponds to the so called *Evergreen Factor* in the reference. The *Value* Factor corresponds to the *Valuation Factor* in the reference. The *Momentum Factor* corresponds to the one with the same name in the reference. The iShares IYR factor corresponds to the total return in pesos of the ETF. The source is Bloomberg.

Appendix J FIBRAS and the Efficient Frontier

Table J.1: Traded FIBRAS in the Mexican Stock Exchange

FIBRA	IPO date	Market Cap USD bn.	Market Segment
Fibra UNO	March 2011	5.9	Diversified
Fibra Hotel	November 2012	0.9	Business class hotels
Fibra Macquarie	November 2012	1.2	Diversified
Fibra INN	March 2013	0.4	Business Class hotels
Terrafina	March 2013	0.8	Industrial Property
Fibra Shop	July 2013	0.5	Commercial Property
Fibra Danhos	October 2013	3.0	Diversified

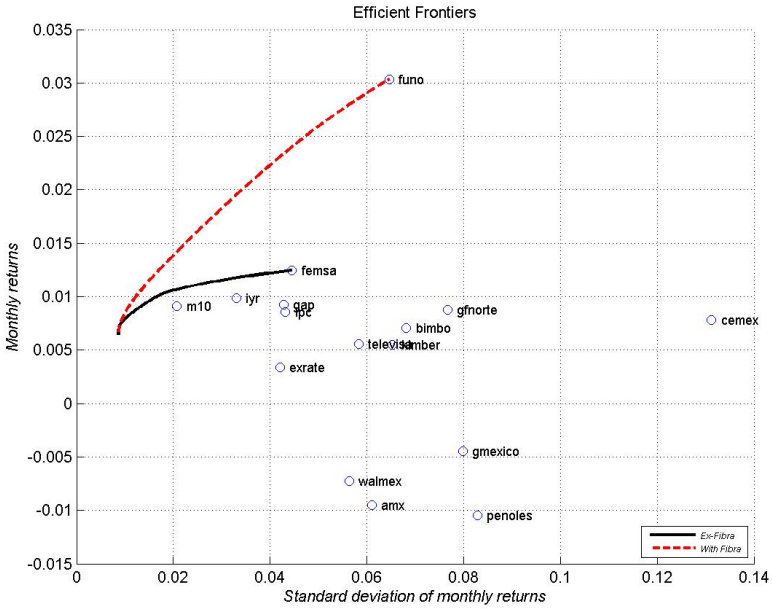

Figure J.1: Efficient Frontier: FUNO, Bonds and Bolsa Stocks

The efficient frontiers are computed with weekly information for the 15 most representative stocks in the Mexican Bolsa, plus the Bolsa Index and the Total US REIT ETF (IShares IYR) and FIBRA UNO. In the case of figure J.1 the data runs from the third week in March of 2011 to the last week in March of 2014. In the case of figure J.2, the sample includes weekly returns from May 2013 to March 2014. Here we include only those FIBRAS that entered the market before May 2013. Both figures are scaled to display the equivalent monthly returns. In all cases the source is the Mexican Stock Exchange. We carry out the exercises with no short sales and no other constraints on the components of the portfolios.

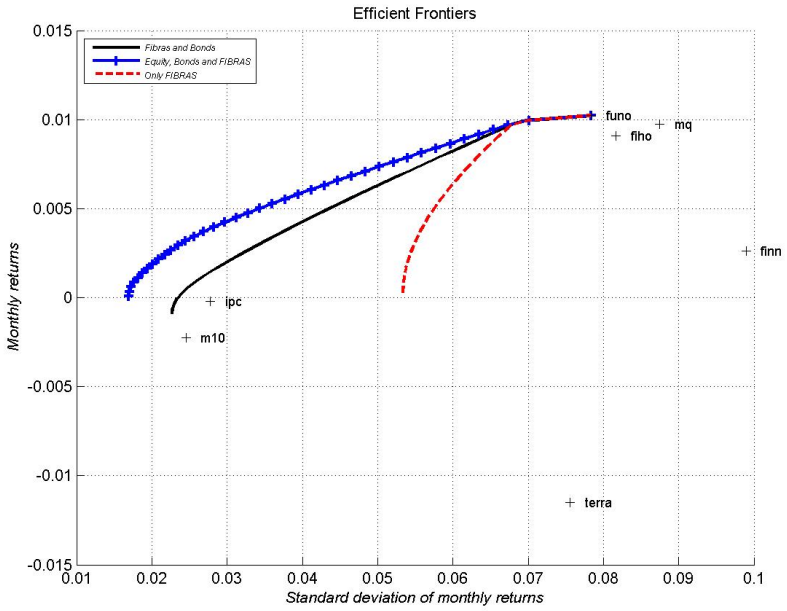

Figure J.2: Efficient Frontier with and without Fibras

Get Smart!...SMARTRAC
The Making of Mexico's First Fundamentally Weighted ETF *

Alejandro Reynoso†

Abstract

Mexico's ETF industry has achieved a significant success. It is built upon a model that juxtaposes fully-listed local ETFs and cross-listed international ETFs. For more than 10 years, the peso-denominated ETF market has been dominated by NAFTRAC, which follows the Mexican Bolsa market index. More recently, the idea of improving the market reference with an index with a better risk/return performance has gained acceptance. Along this process, Actinver Financial Group approached the Mexican Bolsa to ask for a new large-cap benchmark made from fundamental information. In response, the Mexican Exchange developed the Bursa Optimo Index, released in November of 2013. Soon thereafter, in April of 2014, Actinver launched its companion tracker, SMARTRAC. This document looks in at the practical and conceptual aspects behind the design of the new Index, as well as at the operational and structural features of this tracker.

1 Context

1.1 Mexico's ETF Industry

Mexican investors, mostly clients in the high net worth segment and institutional investors have welcomed ETFs as a key component of their portfolios for more than 10 years. See table A.1

*This document does not intend to sell nor recommend any particular product, security or fund. All the examples presented here are for illustration purposes and may differ from the actual characteristics of the products due to the decision of the author to simplify the description of the alluded instruments. SMARTRAC® is a trademark of Actinver; IPC® and Bursa Optimo® are trademarks of Bolsa Mexicana de Valores; NAFTRAC ® is a trademark of BlackRock

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- In 2002, A National Development Bank (NAFIN) in conjunction with the main broker dealers, designed and placed in the market the first Mexican ETF: NAFTRAC. This ETF intends to replicate the "price-return" of the Mexican Bolsa Index IPC . As we will explain in section 5.1 , this ETF is the uncontestable leader in Latin America in terms of assets under management and liquidity.

- In 2004 the Bolsa trading platform opened a section[1] for cross-listings of ETFs registered in developed markets [2] At present, the inventory of cross-listed ETFs exceeds 400 from a wide range of sponsors, being iShares, ProShares, PowerShares and Widsomtree the most conspicuous.

- In 2006 and 2007, Barclays Global Investors (now BlackRock) and BBVA Bancomer joined NAFIN as sponsors of local ETFs. A series of new products came to the market mostly under the format of long-only equity trackers.

- In 2009, iShares locally listed the first family of peso denominated fixed income ETFs, encompassing the Mexican Government yield curve as well as the Inflation Indexed market and the Corporate Bond market.

- In 2010, SmartShares, currently a company of Grupo Financiero Actinver, put in the market an inverse daily Bolsa return ETF (known in the marketplace as the *Devil*) and a $2X$ leveraged daily Bolsa return ETF (known as the *Angel*).

- In 2014, Smartshares launched SMARTRAC , the first tracker of a fundamentally weighted index.

1.2 The Space of Fundamentally Weighted ETFs

The industry of fundamentally weighted ETFs has developed very recently. The first published and more widely used fundamental indexes date from 2006, and most of the associated ETFs have been released in the past three years.
From a conceptual point of view, we can classify the existing fundamental indexes in three groups.

Multi Factor Optimized Indexes . These benchmarks are done combining optimization algorithms over a multi factor set of variables. The pioneers in this field are the FTSE RAFI indexes developed by Robert Arnott and Jason Hsu at Research Affiliates. [1], [2], [8]. Russell las also teamed up with

[1]This section is known as International Quotations System, or SIC following its acronym in Spanish. In a nutshell, this platform allows for local trading and settlement of securities that are held by international custodians trhoug sub-custodian agreements with the Mexican Central Deposit and the Central Counterparty

[2]The SIC grands automatic recognition to securities listed in OECD member countries and in countries that are members of the Technical Committee of IOSCO.

RAFI to develop a host of fundamental international indexes [7]. As we will see later on, the Bursa Optimo Index falls in this category.

Alpha Dex Methodology . Without minimizing its technical merits, this methodology developed by First Trust follows a more heuristic approach.It takes a set of multiple factors and ranks the stocks according to each factor. At the end, every stock gets a score and those with the highest score make the sample. The weights, once adjusted for size, reflect the relative score of each stock.

Single Factor Fundamental Benchmarks . This approach has been preferred by ETF sponsors like Widsomtree. It takes a single factor, like dividend distributions and uses it as a criterion for weighting the components of the index

Although it is still to early to tell, it appears that investors are really paying attention to the breed of ETFs that has sprung around the new benchmarks. In general, we have seen that the industry of trackers shows little interest in products that focus in small niches. In fact, most liquidity and AUM is rather agglomerated around the top 100 issues. New ETFs tend to stay way behind the industry leaders and much outside the interest of investors.

The fundamentally based ETFs seem to have become the exception. There is already more than a dozen of them that have broken the threshold of 1 billion USD and some of them, like *PRF* from Powershares, are becoming mainstream products. The ETFs using these benchmarks are mostly concentrated in North America. See table A.2.

In the United States . There are over 70 fundamentally weighted ETFs. We estimate an AUM of around 25 billion. Powershares has become the industry leader. They teamed up with FTSE RAFI to put together a family of products that encompasses various segments of the US market. Another player worth mentioning is First Trust, which has a large offering of Alpha Dex ETFs which includes multiple sectors, industries and international markets. Other large players like Vanguard and Schwab have entered this market segment as recently as mid 2013.

In Canada . There are 3 fundamentally weighted ETFs sponsored by BlackRock with an estimated AUM of 1 billion USD. In the past, iShares Canada has been a sort of testing ground for product development in the US. It is meaningful to see the leader in the ETF industry worldwide sponsoring these fundamental ETFs, of which one follows the US market. These ETF are also referred to FTSE RAFI indexes.

In Mexico . There is 1 fundamentally weighted ETFs, SMARTRAC, about which we will talk more throughout this document.

2 Improving the risk-return performance of the IPC Index

Looking at the preferences of Mexican investors, the IPC is a very powerful reference which has sustained the competition of new indices and benchmarks throughout the years. Thus, any significant contribution to the industry would have to come from much more than simply tweaking the index weights and samples along the usual size, concentration and liquidity criteria.
In principle:

Optimal Portfolio vs. Market Weighted. The first natural question to ask ourselves is whether the current weights of the IPC index deliver a risk/return mix that are any close to the efficient frontier. If that is not the case, then the opportunity arises in finding a portfolio with the same securities that consistently delivers a superior performance.

Forward looking rebalancing. The weights of the IPC index are re-calibrated on a quarterly basis in such a way that increases the weight of stocks that have had a significant price increase. Thus, it is not designed to mitigate the risk associated with stocks that may be reaching levels of overvaluation or becoming over-bought.

Focusing on the most liquid segment of the market. It has been claimed that despite the fact that the IPC has the most liquid stocks in Mexico, the smallest 5 in the group usually experience some difficulty in trading specially around the dates when the sample is updated. Therefore, without any major lose of efficiency, an alternative Index could focus in the subset that has the highest liquidity.

2.1 The IPC vs. Optimal portfolios

We decided to carry out a basic exercise. Here we will try to see if a Markowitz portfolio optimization using the same IPC components takes us to a portfolio with a better risk/return mix than the Index.[12], [10].

- We look at monthly returns from January of 2007 to December of 2013 of the IPC and of the 12 companies that have been part of the IPC during the entire sample period. For future reference we will call them *"the evergreens"*. See table B.1.
- We calculate the efficient frontiers for a portfolio object with NAFTRACs and the *evergreen*stocks.
- We do not allow for short sales.
- We compare the results with the with the risk/return of the Index.

- We then calculate the optimal weights for a case where we maximize the Sharpe Ratio.
- We finally calculate the optimal weights for the case where we keep the volatility of the portfolio equal to that of the benchmark while maximizing the return of the portfolio.

The results can be summarized as follows:

- In each and every year the Index, represented by "NAFTRACISHARES" in figure B.1 is well inside the efficient frontier attained by a combination of NAFTRACs and *evergreens*.
- From the inspection of figures B.2 to B.8, it is clear that the optimal mix of *evergreens* and the Index differs significantly from year to year.
- Figure B.9 suggests that the spread between the Index and the optimal portfolio is very substantial. Controlling by volatility, the return is almost twice as big on the frontier vs. the benchmark.
- Looking at optimal Sharpe ratios as depicted by Figure B.10 the result is similar. As expected, one can see substantial reductions in volatility without sacrificing return in any meaningful way.

2.2 Can we have a better index? *ex-ante* vs. *ex-post* optimal weights

The fact that the weights of the stocks in the optimal portfolios change so much from year to year should make us wonder whether it is actually possible to get an index of any practical relevance by using past information.

Lets give the name of "*ex-post index*" to the outcome of an exercise where we use the optimum weights of the previous period to define the weights of the new index in the current period.

The inspection of Figure B.11 shows that both, the benchmark index and the *ex-post* optimization end up in the same place after a while. For the purpose of this example we used the optimal portfolios presented in figure B.9.

Thus, any attempt of having an index capable of consistently taking the portfolio closer to the efficient frontier by using ex-post weights is futile. Therefore, we need a forecasting mechanism that links current information with the expected performance of the stock if we have any aspiration to approximate the *ex-ante* weights of an optimal portfolio.

2.3 Looking at fundamentals for a hint of *ex-ante* optimal weights

Although fundamental information comes with some lag it is rather frequent, and definitely it is updated more regularly than the weights of the IPC index.

We begin with a very simple question. Can we use current and lagged fundamental information to predict what the *ex-ante* weights of optimal portfolios will look like?
The experiment to respond to this question goes as follows.

Step 1. We computed *perfect foresight* optimal portfolios for every year . We actually took the exercises of the previous sections and looked at the weights for the components of portfolios of *evergreens* and NAFTRACs. We obtained two portfolios per year. One is the outcome of an optimization conditional on having the same volatility of the index. We will call this the "Maximum Return" portfolio. The other gets us to the maximum Sharpe combination of risk and return. We will call it "Optimal Sharpe".

Step 2. We computed a set of dummy variables . We constructed a set of dummy variables where a stock that has a positive weight in the optimal portfolio at a point in time gets a 1 for that specific period. If the stock has a weight of zero, thus the dummy is zero.

Step 3. We chose a suitable set of fundamental variables. The Mexican Stock Exchange, as an Index and information provider put together a data set of fundamentals. This set ranks companies in terms of the five fundamentals shown in Table C.1. The information is reported on a triannual basis. Firms are arranged by quintile. The top quintile corresponds to the value of the fundamental variable that is considered more likely to be associated to positive excess return of the stock. All firms in each quintile are given the same score. Scores go from 0 to 1.0. We used this data set for our experiment.

Step 4. We ran a Logit regression on upgrades vs. fundamentals . We looked for a relationship (if any) between upgrade probabilities and lagged fundamentals. With that in mind, we run a Logit regression that intends to see if there is any connection between recent -yet, not contemporary- fundamental information and the probability of finding a company in the optimized index at the time of the next rebalancing.

$$log_{\frac{p_{j,t}}{(1-p_{j,t})}} = \alpha_j + \sum_{k=1}^{2}\sum_{q=1}^{5}\beta_{k,q}\phi_{j,t-1,k,q} + \sum_{k=1}^{3}\sum_{q=1}^{5}\gamma_{k,q}\phi_{j,t-2,k,q} \tag{1}$$

where,

t is the year during which the Perfect Foresight weights are calculated. $t = 2007..2013$.

k is the number of triannual period in any year. $k = 1..3$.

j is the number of the company. The portfolio object has 12 companies plus NAFTRAC. $j = 1..13$.

$\phi_{(..q)}$ is the fundamental variable q. $q = 1..5$.

p is the probability of having a company having the fundamentals ϕ in the optimal sample.

Step 5. We constructed an index using fundamental information. Provided that we had found a relationship between fundamental and the assets in the optimal sample, the idea would be to construct an index that has a core portfolio similar to the IPC with overweights for stocks with the highest probability of being part of the optimal portfolio.

3 A Stylized Model of a Fundamentally Weighted Index

3.1 Results of Logit Regressions

The results of regression 1 are reported in Appendix B. The main conclusions are:

Good Fit. The inspection of the fit statistics in table C.2, which corresponds to the portfolio optimization conditioned to having the same volatility of the benchmark, *"MaxRet"* , and the one of the maximum *Sharpe* ratio, show a good fit. What this means is that we can take fundamental information of the previous five triannual periods to build an ex-ante optimal portfolio acceptably similar to its perfect foresight outcome.

Separation at around 60% **Probability.** Figures C.1 and C.2 confirm the conclusion. Furthermore, in the case of the *MaxRet* we see ex-post upgrades almost every time that the upgrade probability ex-ante is above 50%. The results are also encouraging, albeit less clear cut in the *Sharpe* optimization.

Linkage between Fundamentals and Optimal weights. We have found then a bridge between fundamental information and our objective of getting closer to the efficient frontier. At this point, we could say that we have a mechanism for defining the sub-sample of *evergreens* that one could use from year to year in our overweight pportfolio.

3.2 A stylized model of a Fundamentally Weighted Portfolio

When deciding on the weights for the components of a "New Index" we thought of two alternatives.

- Equally weighting all the stocks that make the cut-off of 50% probability of being in the optimal portfolio for the following year. From the fact that all stocks in the *evergreen* subset have similar liquidity and size that could be a practical approach.

- Assigning the weights as a function of the fundamentals. This can be achieved by using the estimated probabilities of the Logit model as a way to qualify how good the fundamentals of a stock are *vis à vis* the rest of the stocks in the sub-sample. We decided to do so. The outcome is shown in tables D.1 and D.2.

Figure D.1 displays the IPC and the index that results from applying the weights of the previously mentioned tables to an investment that starts with 100.0 in January of 2009 and runs until the end of 2013.

- Given the large spreads between the benchmark and the optimal frontier, it does not come as a surprise the fact that the *MaxRet*-related index and the *Sharpe*-related index significantly outperform the benchmark.

- We can also see that in the long run *MaxRet* outperforms *Sharpe*, but relative to the IPC both examples can be seen as equivalent. See figure D.1.

Now, a concerning issue follows from the fact that both indices are too concentrated in very few issuers. Going back to the bigger picture in this document, we must recall that the intention was to enhance a *core* portfolio based on the IPC by adding overweights to some stocks in a systematic fashion. In Figure D.2 we give shape to our idea of a more "eclectic" Index which is a linear combination of 2/3 the IPC and 1/3 *MaxRet*.
In *essence*, as will become clear soon enough, this is how the methodology of the *Bursa Optimo* Index looks like.

4 The Bursa Optimo Index

4.1 The Methodology

This index was released in late 2013. Bolsa Mexicana de Valores, as the index provider has also produced a back-run from March 2007 to present. The exact methodology of the index is publicly available in the Bolsa website. A summary of the distinctive characteristics of this methodology is contained in Figure E.1. At the risk of oversimplifying the description, these are its most salient features:

It underscores liquidity. Out of the 35 stocks in the Mexican Bolsa benchmark, the index keeps the top 30. From the point of view of a portfolio manager of an ETF replicating the index, this simplifies the rebalancing. From the stand point of market makers or larger investors involved in the creation and redemption of ETF certificates, this also facilitates its arbitrage.

It combines fundamentals with tradeability criteria. Fundamental factors account for 40% of the weights assigned to the participating stocks. The remaining 60% follows the commonly used criteria of free float and liquidity.

It re-sets the *weights* frequently. The *weights* are revised three times a year. The weight allocated to each fundamental factor derives from an optimization algorithm that works as follows:

- It takes a data set of fundamental information for the previous five years.
- It calibrates the weights to each fundamental as to maximize the Sharpe Ratio of the portfolio.
- It consgrains the optimization to the following conditions:
  - No stock can have an overall weight above 25%
  - No sub-set of 5 stocks can have a weight above 60%

The *sample* is re-set annually. To the extent that the sample for the index is a *de facto* sub-sample of the market benchmark, which in turn is revised once a year, the group of companies that are part of Bursa Optimo is also updated once a year.

The reader will notice that instead of going through the two stage process that was described in the previous section (i.e. Sharpe Optimization-> Logit Model-> Weights), the index provider goes directly in an integrated process from the Sharpe Optimization to the Index Weights.

4.2 Back-runs and comparative performance *vis à vis* the IPC Index

Figure E.2 displays the information calculated by the Mexican Stock Exchange for the benchmark index and the new index. At glance one can conclude that the new reference can add value to those portfolios that choose it as a benchmark. The descriptive statistics in table E.1 indicate that:

- The average monthly returns of the new index are almost 40% larger that those of the benchmark.
- The volatility of both indexes is very similar.
- The new index has a "fatter" tail to the right than the benchmark, derived from the fact that the maximum monthly return of the new index is also 40% larger than the value shown for that concept by the IPC index.
- Both indexes show similar kurtosis.

4.3 Excess Returns and the Factor Loadings of the Bursa Optimo Index

We ran a few regressions of the returns of the new index on the returns of the benchmark and some factors. These factors are similar in nature, albeit not in the exact definition, to the ones commonly used in portfolio analysis. [4], [5], [6].

Evergreen Factor. As we highlighted in previous sections, there is a subset of companies that has been in the IPC during the whole sample period. These companies, perhaps from the fact that are the survivors of every sample revision, have shown a tendency to outperform the index. With this in mind, we simply built a factor of the excess return of *evergreens* versus the index. [11]

Valuation. Bolsa ended up with the factors listed in table C.1 after exploring a much larger list. The P/E ratio seemed to dominate the more standard price-to-book factor commonly applied. So, we decided to use a factor of the excess return of the companies with lower P/E ratio over more expensive companies.[3].

Momentum In this case we stayed with the standard definition.[9].

The sample period runs from March 2007 to December 2013. For building the valuation factor we needed to use the factor data set prepared by Bolsa Mexicana on a triannual basis. We linearly interpolated the scores in such data set to have an approximation of monthly scores. We used these scores to separate overvalued from undervalued companies. Then we used the monthly returns of each stock to put together the factor.

The regression results reported in E.2 are comfortably trivial.

An insignificant α, once the factors are accounted for . Indeed, one would expect that the excess returns can be explained by the contribution of specific factors. This is certainly the case. Not surprisingly the β is very close to 1 while the R^2 is way above 90% and other measures of goodness of fit are very satisfactory.

Factor Loadings: Evergreen Factor . The evergreen stocks play a significant role. Again, this result is not unexpected in light of the underlying optimization mechanism implicit in the design of the index.

Factor Loadings: Valuation . Regarding this factor, perhaps what calls the attention is that it is meaningful with a lag of 6 months. One would expect perhaps a more immediate connection between returns and fundamentals, however since we are comparing he returns with those of an index that is revised only once a year, there is plenty of room for stickiness. The Bursa Optimo index itself has some stickiness of at least four months to reflect changing conditions.

Residuals . In our opinion, the regression residuals come back reasonably well behaved despite a few deviations from normality in extreme values (Figure$E.3$) . Figures $E.4$ and $E.5$ confirm the absence of autocorrelation.

5 SMARTRAC

5.1 The role model: NAFTRAC's success

The record of NAFTRAC deserves more than a footnote. It is an enormously successful product which has more than USD 8 billion in Assets under Management and trades more than 60 million shares a day. It has an enviable zero tracking error all throughout its almost 12 years of existence. It is at least six times larger than the next Latin American ETF and would rank in the top 150 worldwide. Three distinctive features explain, in our opinion, its great success.

The Right Index. NAFTRAC follows the unquestionable Mexico Market benchmark, the IPC Index. This index takes the 35 largest and most liquid companies and assigns to them weights proportional to their free float. This tracker has become an integral part of the core portfolio of most asset managers and pension funds.

Price Return instead of Total Return. By focusing on price returns, NAFTRAC uses proceeds of dividends and other sources of revenue (i.e. securities lending) to absorb any possible tracking error. Creations and redemptions are done based on a basket of securities that exactly replicates the index at every moment. This facilitates pricing and arbitrage.

Priced at 1/1000 **of the Index.** As a consequence of the feature mentioned above, the intra-day secondary market of this security shows a very narrow spread around a price that tightly fluctuates at around 1/1000 of the Index.

The rest of the Equity ETFs in this market do not share one or more of these features. Most of them are linked to total return benchmarks. They have also displayed a non-negligible tracking error and have seen their liquidity affected by the difficulty in assessing their fair value in the secondary market.

5.2 Operational Architecture of SMARTRAC

SMARTRAC is very similar to NAFTRAC in most of its fundamental characteristics, as summarized in table F.1 and figure F.1

Price Return ETF Both ETFs have separate accounts for securities and cash. The cash accounts receive dividends from the stocks and this cash is either distributed or used for absorbing any tracking error.

Designed to have zero tracking error . All creations and redemptions are done based on a securities basket that exactly replicates the composition of the index. To the extent that the expenses account is sufficient to cushion the transaction costs of daily rebalancing, the tracking error of the ETF is zero. See Figure F.2.

Elevated liquidity of underlying baskets . Both ETFs address the most liquid node of the Mexican market. Even in times of significant market stress, the liquidity in the stocks that are components of both indexes has been sufficient to accommodate large swings in assets under management.

Easy to arbitrage . In the same fashion as NAFTRAC , the new ETF has been calibrated to trade at a fraction of the index, which in this case is 1/10. This makes its trading and arbitrage transparent and easy.

There are however some differences which intend to streamline its operation,

Smaller Creation and Redemption UNITS . SMARTRAC was designed thinking of facilitating access to smaller investors. The creation and redemption units are worth only $12,000$ USD, which is about 1/20 of the size of a unit of NAFTRAC . This may contribute to enhance the liquidity and pulverization of the tracker in its early stages.

Any intermediary can do Creations and Redemptions directly . Transaction costs for institutional investors in the case of SMARTRAC are zero. These investors are not required to go through third parties for creations or redemptions. This is a significant step forward in the direction of increasing the penetration of ETFs in Mexico's asset management industry.

There is a financing mechanism to greatly mitigate the risk of tracking error . SMARTRAC features several mechanisms that act as safety nets to minimize the risk of tracking error. On the one hand, the expenses for investors are capped at the level of the management fee. If the expenses go beyond that fee, they are absorbed by the sponsor. In addition, if for any reason the cash held in the expenses account would be insufficient to compensate for any the tracking error, the sponsor would provide the funding necessary for as long as necessary until the cash position is built back up to the levels required to maintain such zero tracking error.

6 Concluding Remarks

Mexico's ETF industry has achieved a significant success. This is the result of a good combination of local and international ETFs, a solid design of the flagship tracker (NAFTRAC) and the growing involvement of local participants. The development of new indexes and products is an encouraging trend in the second most important market in Latin America. The Bursa Optimo index has behind it a convincing statistical evidence of its capacity to consistently outperform the IPC. In addition, SMARTRAC joins a host similar trackers in the US and Canada in what seems to be one of the most dynamic niches of the industry. Finally, SMARTRAC profits on the already rich Mexican experience of trackers while trying to become an even more transparent and tradeable instrument. Time will tell if this new product attains a larger and lasting impact in its own market and in the region.

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Appendix A The ETF Space

Table A.1: Map of Mexico's ETF Industry

Concept	Highlights
Traditional Equity ETFs	9 trackers.
	4 market-wide and 6 small cap or industry-specific.
Fundamentally Weighted ETF	1 tracker.
Fixed Income ETFs	6 trackers.
	5 tracking Government Bonds and 1 tracking Corporate Bonds.
Inverse and Leveraged ETFs	2 trackers.
	One -1x Inverse and one 2x leveraged.
Cross Listed ETFs	451 trackers.
	Equity, Commodities, Currencies and Fixed Income.
Assets Under Management	Local ETFs have and AUM of around USD 15 billion.
	Cross Listed ETFs have and AUM of close to USD 20 billion.
Daily Trading Volume	In excess of 100 million shares.
Sponsors of Local ETFs	BBVA Bancomer, BlackRock and Actinver.
Main Sponsors of Cross Listed ETFs	BlackRock, State Street, JP Morgan and Deutsche Bank

Source: BMV

Table A.2: Map of the Smart-Beta ETF Industry

Sponsor	Concept	Main products	Country of registration
First Trust	Alpha Dex ETFs	FYX, FMK, FEX FXO	United States
Powershares	FTSE RAFI ETFs	PRF, PRFZ, PXF	United States
Wisdomtree	Fundamental Dividend	DTD, DLN, DON, EXT, EZY	United States
Schwab	Schwab Fundamental Indexes	FNDB, FNDX, FNDA	United States
iShares	iShares Fundamental	CLU, CIE, CRQ	Canada
Actinver	Smartshares	SMRTRC14	Mexico

Source: websites of the sponsors

Appendix B Portfolio Optimization Exercises

Table B.1: Evergreen Stocks

Company	Ticker
ALFA	ALFAA
America Movil	AMXL
Grupo Bimbo	BIMBOA
Cementos Mexicanos	CEMEX CPO
Grupo Elektra	ELEKTRA
Grupo FEMSA	FEMNSAUBD
Grupo Aeroportuario del Pacifico	GAPB
Grupo Financiero Banorte	GFNORTEO
Grupo Mexico	GMEXICO
Ingenieros Civiles Asociados	ICA
Kimberly Clark Mexico	KIMBERA
Walmart Mexico	WALMEX

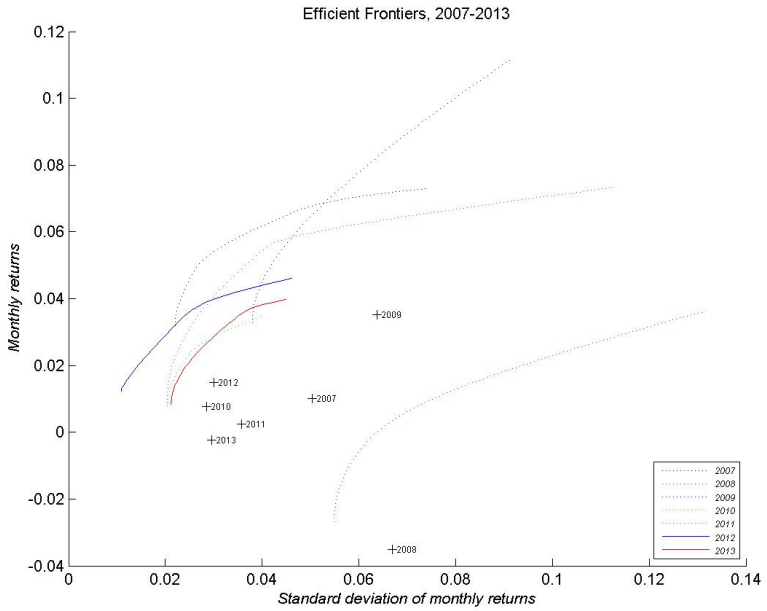

Figure B.1: Efficient Frontiers 2007-2013

Appendix C Fundamental Variables and Logit Estimation

Table C.1: Fundamental Variables

Variable 1	Net Profits/ Net sales	Ratio
Variable 2	Net profits	Growth rate
Variable 3	Debt/Equity	Ratio
Variable 4	Operating Income	Growth Rate
Variable 5	Price/Earnings	Ratio

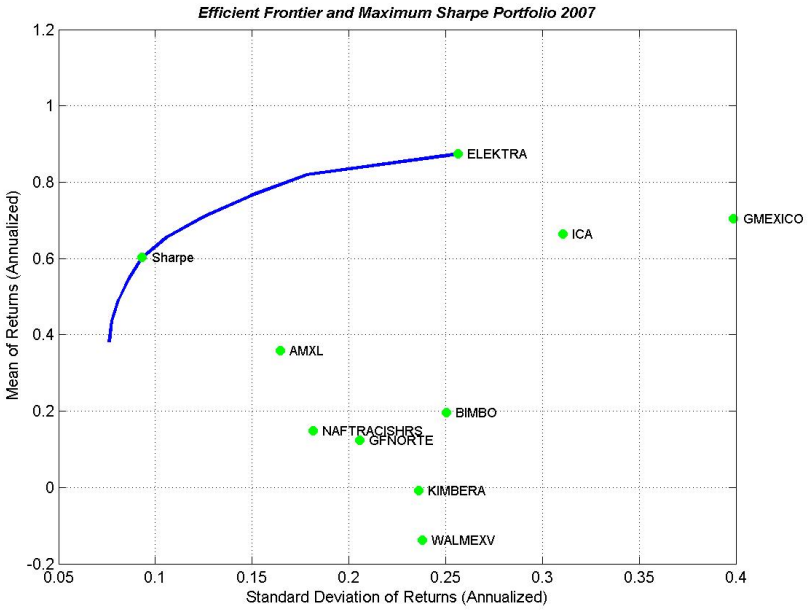

Figure B.2: Optimum Sharpe Portfolio 2007

Appendix D Expected Optimal Weight Tables

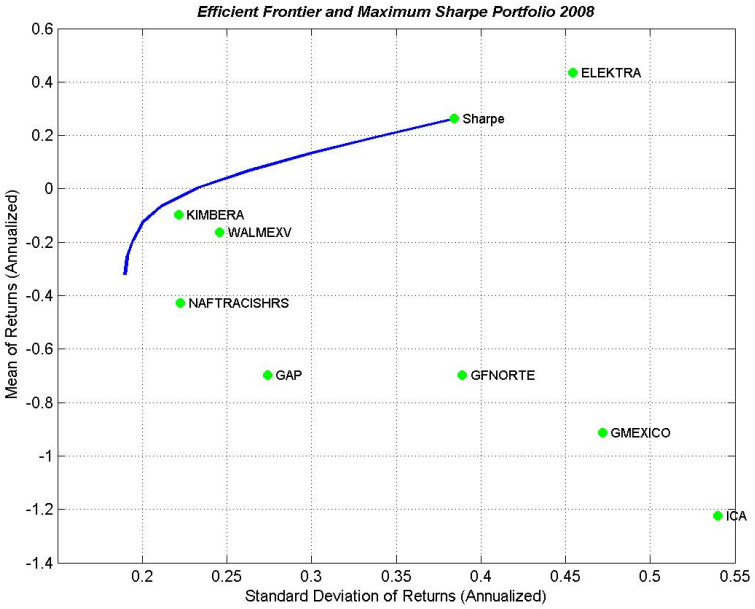

Figure B.3: Optimum Sharpe Portfolio 2008

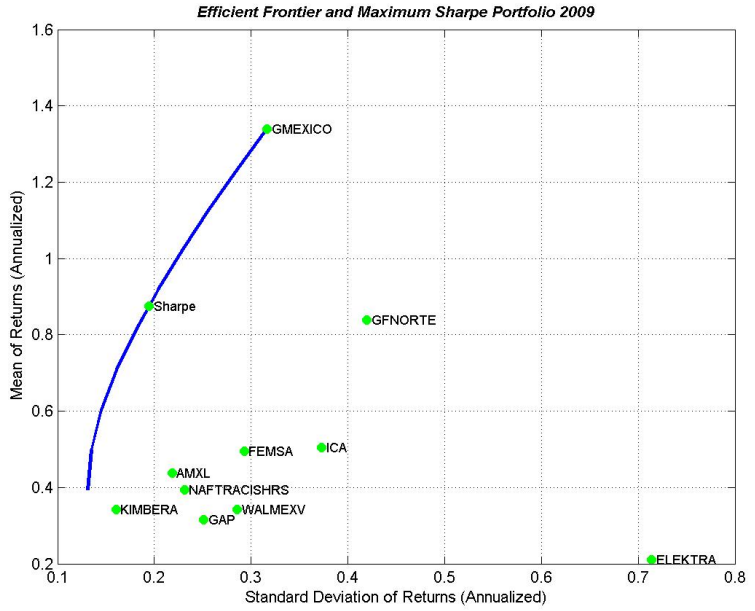

Figure B.4: Optimum Sharpe Portfolio 2009

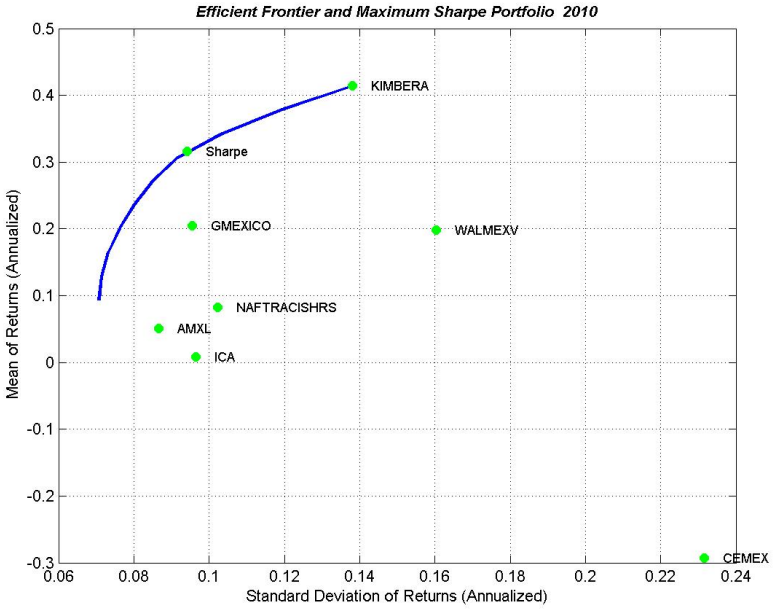

Figure B.5: Optimum Sharpe Portfolio 2010

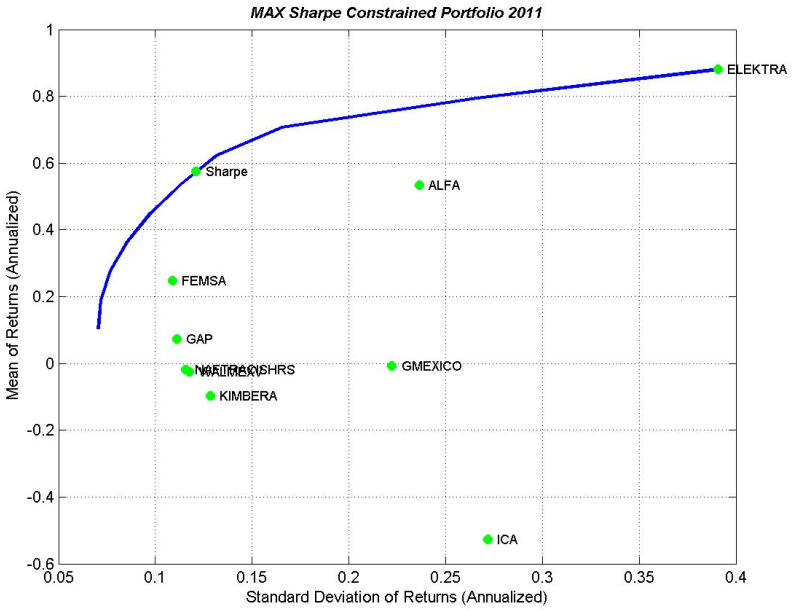

Figure B.6: Optimum Sharpe Portfolio 2011

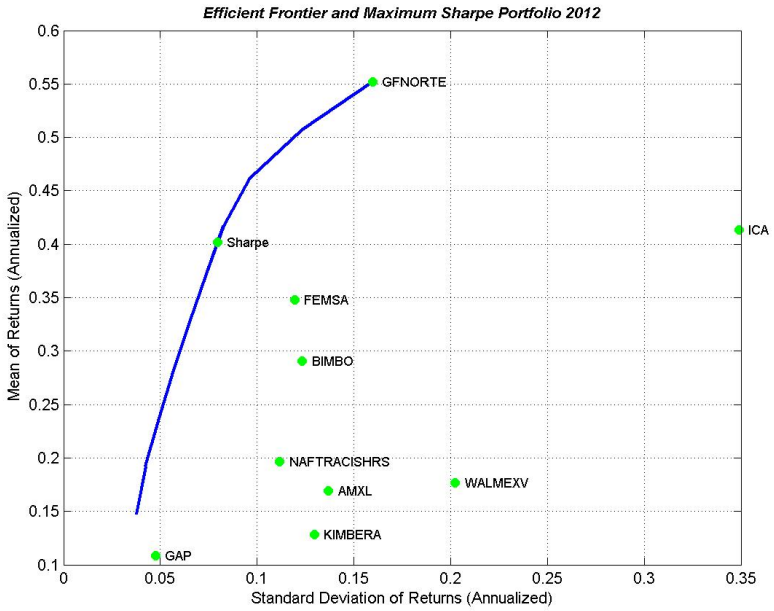

Figure B.7: Optimum Sharpe Portfolio 2012

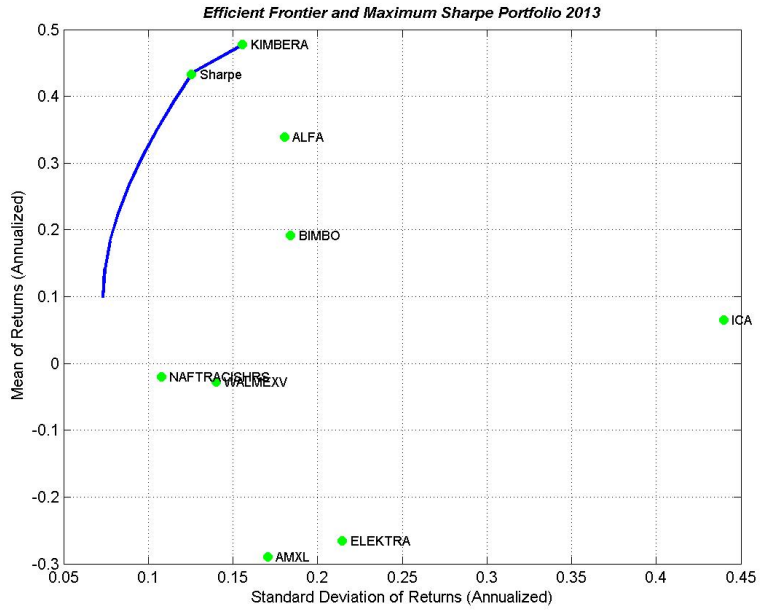

Figure B.8: Optimum Sharpe Portfolio 2013

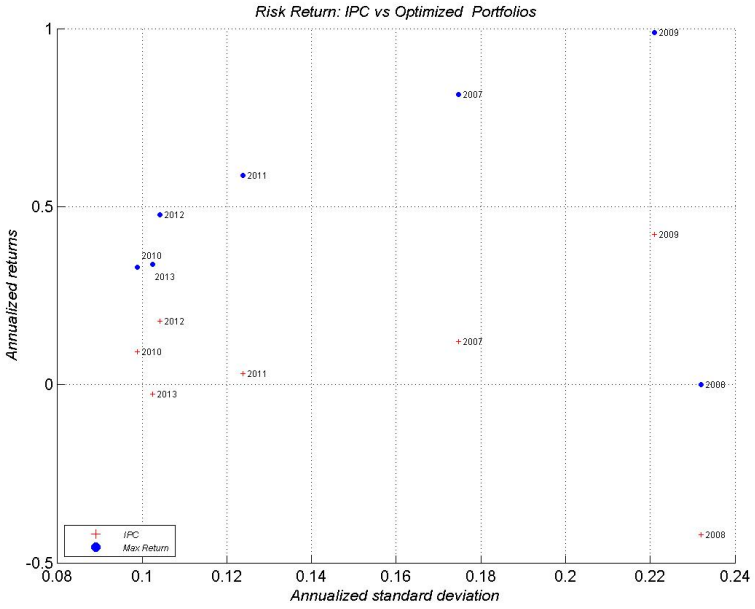

Figure B.9: Optimization with volatility constrained to be the same as the IPC

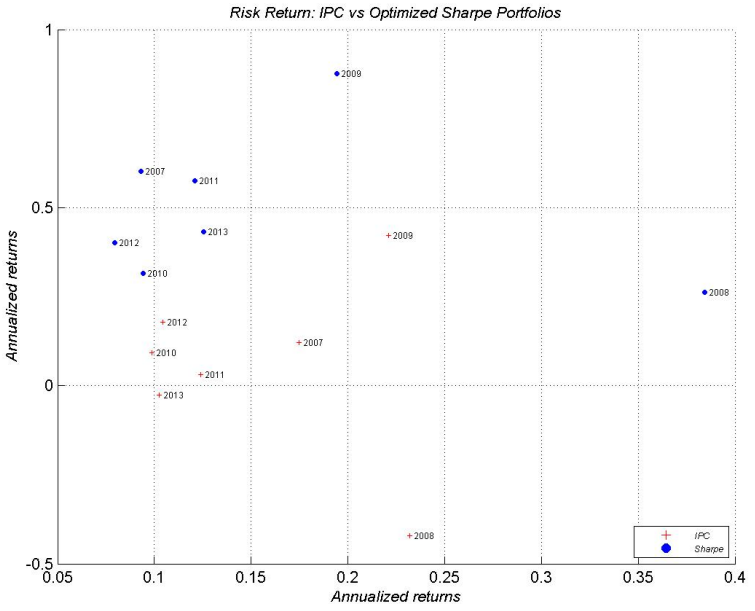

Figure B.10: Maximum Sharpe Optimization

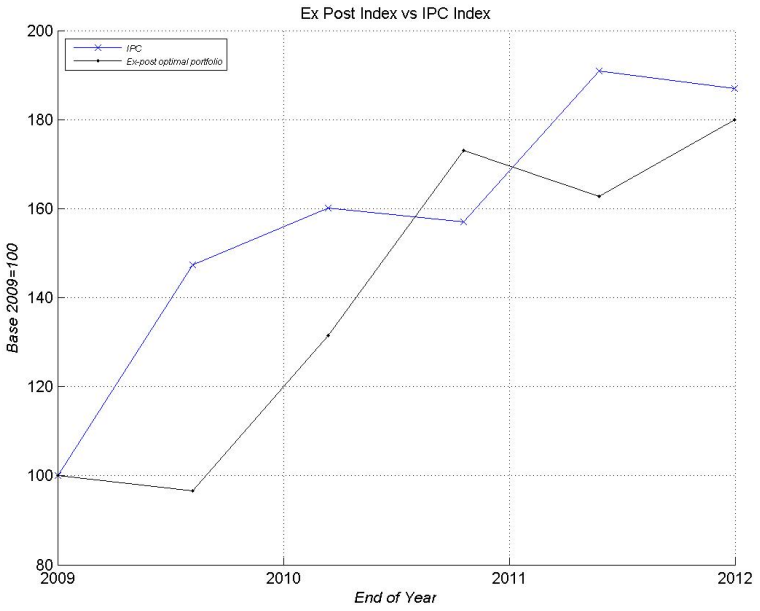

Figure B.11: Ex Ante vs Ex Post Optimization

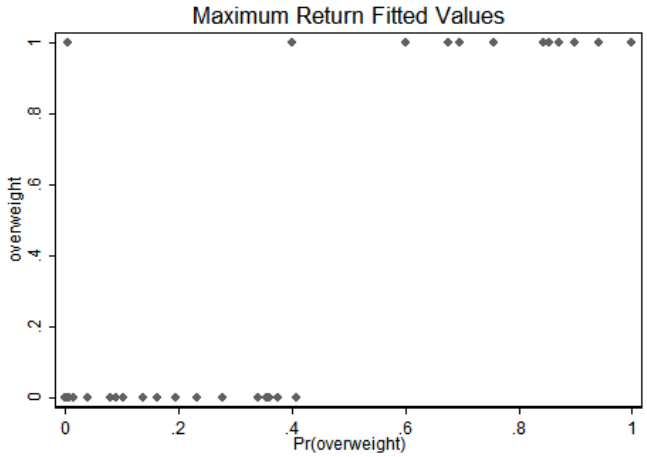

Figure C.1: Logit Fit for Volatility Constrained Optimization

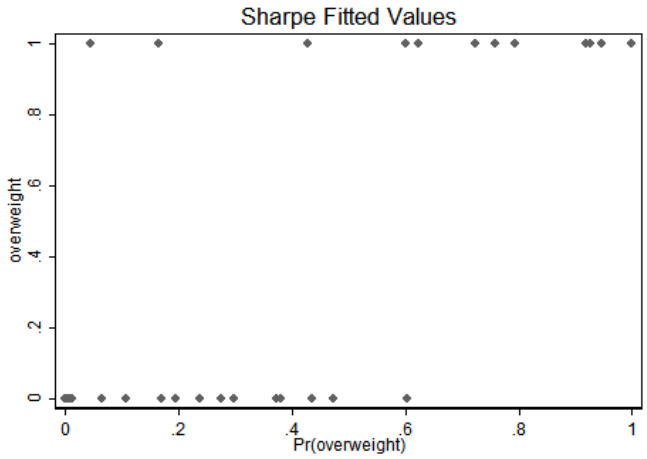

Figure C.2: Logit Fit for *Sharpe* Optimal Overweights

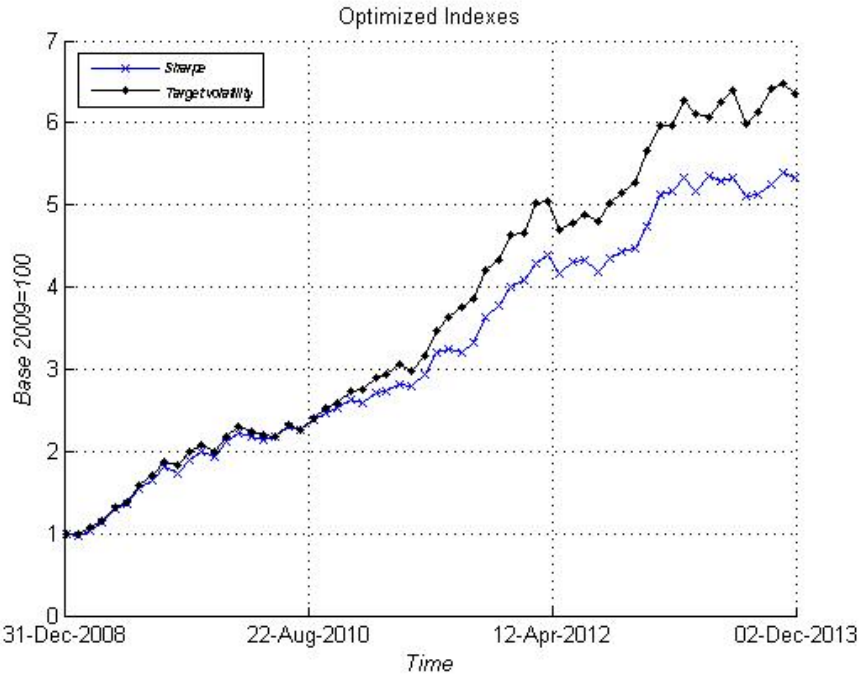

Figure D.1: *Sharpe* and *Maxret* Portfolios

Table C.2: Logit Goodness of Fit

	MaxRet Model	Sharpe Model
N	65	65
Log Lik Intercept Only	-33.8653	-36.2746
Log Likelihood Full Model	-12.5490	-12.9239
Std Dev	25.0980	25.8479
DF of Std Dev	39	40
LR X2	42.6326	46.7012
LR X2 df	25	24
Prob >LR	0.0154	0.0036
McFadden's R2	0.6294	0.6437
McFadden's Adj R2	-0.1383	-0.0455
Maximum Likelihood R2	0.4810	0.5125
Cragg and Uhler R2	0.7432	0.7621
McKelvey and Zavoina R2	0.9892	0.9959
Efron's R2	0.7418	0.6775
Variance of y*	303.3813	805.3721
Variance of Error	3.2899	3.2898
Count R2	0.9692	0.9385
Adj Count R2	0.8571	0.7500
AIC	1.1861	1.1669
AIC*n	77.0980	75.8479
BIC	-137.7031	-141.1276
BIC p	61.7271	53.4840
N param	26	25
N rhs	25	24

Table D.1: Vol-Constrained *"ProbWeight"* Portfolios

	2009	2010	2011	2012	2013
ALFA	0.132	0.064	0.419	0.000	0.126
AMX	0.000	0.000	0.151	0.000	0.275
BIMBO	0.039	0.000	0.000	0.000	0.267
CEMEX	0.000	0.000	0.006	0.000	0.028
ELEKTRA	0.000	0.000	0.419	0.148	0.000
FEMSA	0.000	0.095	0.000	0.246	0.002
GAP	0.000	0.104	0.002	0.000	0.000
GFNORTE	0.093	0.045	0.000	0.327	0.000
GMEXICO	0.287	0.210	0.002	0.050	0.000
ICA	0.000	0.011	0.001	0.129	0.032
KIMBER	0.449	0.278	0.000	0.100	0.270
WALMART	0.000	0.193	0.000	0.000	0.000
Total	1.000	1.000	1.000	1.000	1.000

Table D.2: Maximum Sharpe *"ProbWeight"* Portfolios

	2009	2010	2011	2012	2013
ALFA	0.100	0.116	0.353	0.000	0.091
AMX	0.000	0.004	0.000	0.157	0.240
BIMBO	0.063	0.000	0.000	0.182	0.000
CEMEX	0.000	0.000	0.069	0.000	0.209
ELEKTRA	0.000	0.000	0.353	0.093	0.000
FEMSA	0.000	0.076	0.098	0.187	0.000
GAP	0.160	0.001	0.016	0.000	0.059
GFNORTE	0.161	0.000	0.000	0.183	0.001
GMEXICO	0.203	0.167	0.084	0.000	0.000
ICA	0.045	0.000	0.023	0.198	0.000
KIMBER	0.267	0.391	0.004	0.000	0.399
WALMART	0.000	0.244	0.000	0.000	0.000
Total	1.000	1.000	1.000	1.000	1.000

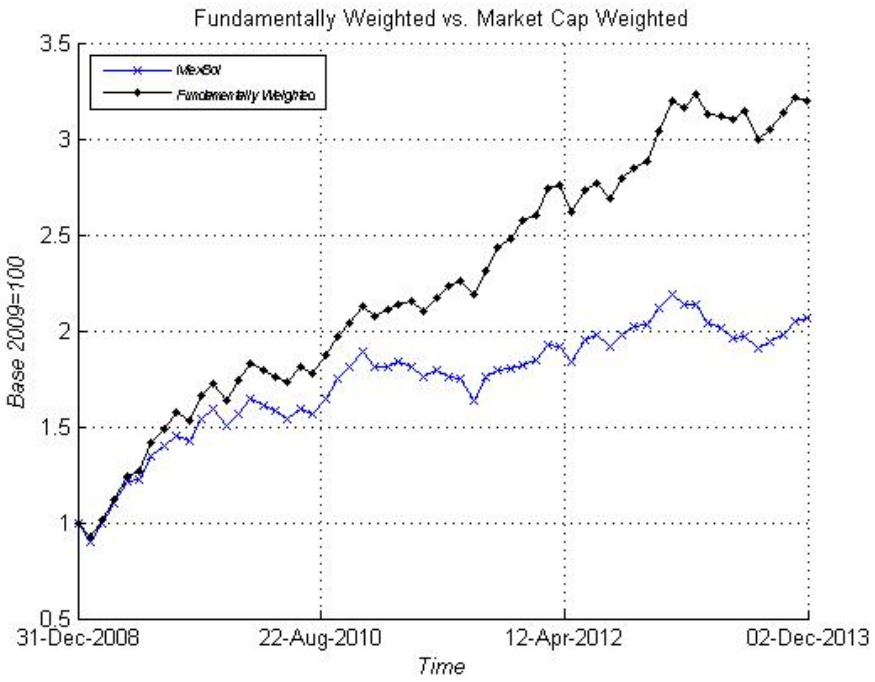

Figure D.2: *New* Index vs. IPC

Appendix E Bursa Optimo Index

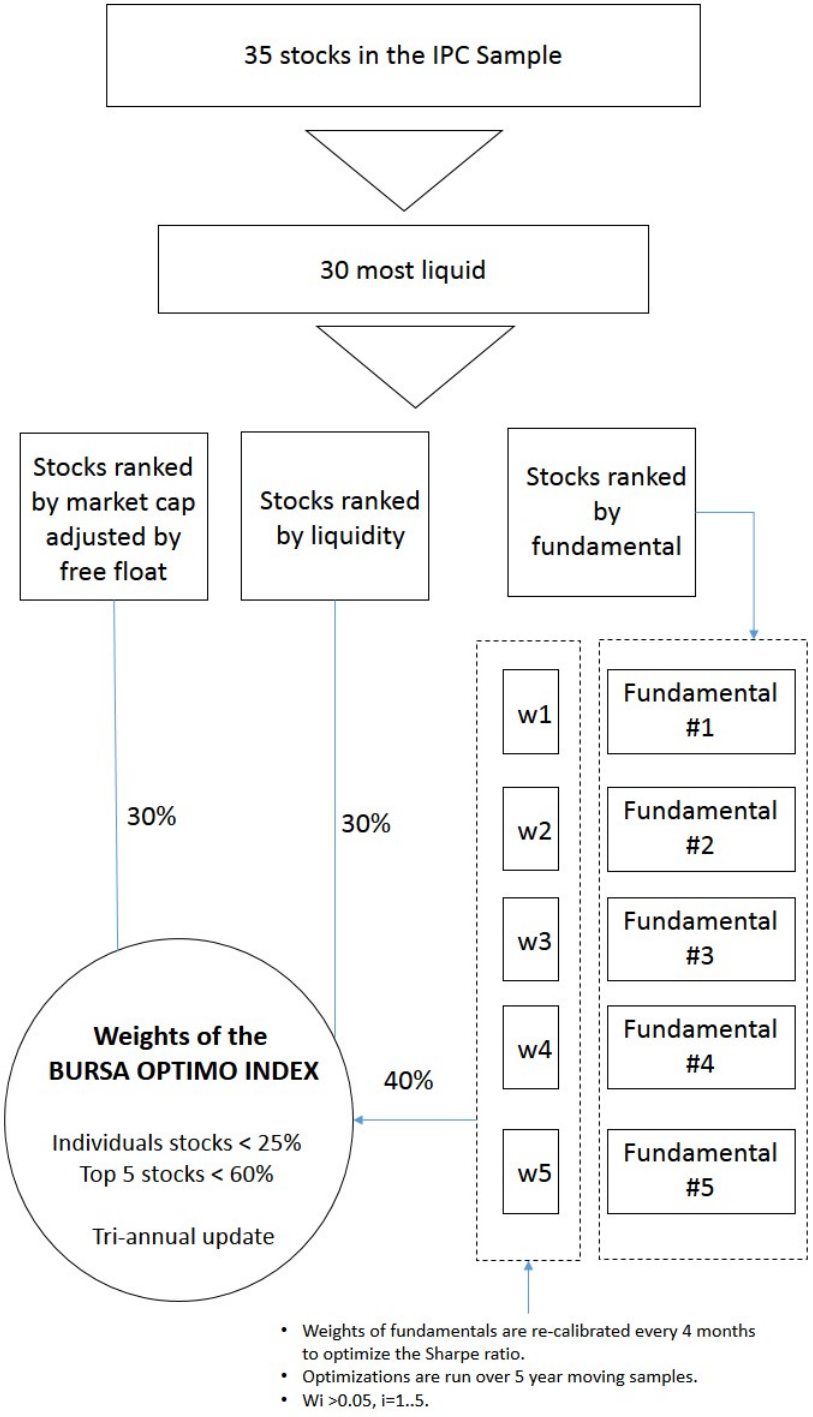

Figure E.1: Methodology of the Bursa Optimo Index

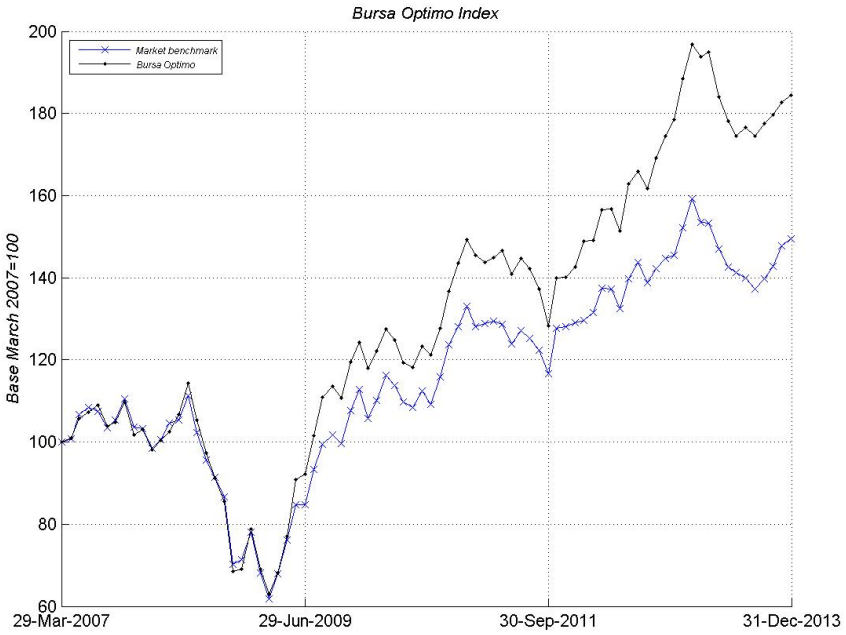

Figure E.2: Back-testings Bursa Optimo

Table E.1:

Statistics	**Bolsa Index**	**Bursa Optimo**
mean	.0063638	.0092551
max	.1212834	.1787383
min	-.1881497	-.1982203
sd	.0526372	.0580352
skewness	-.5310508	-.2384265
kurtosis	4.493761	4.713681
iqr	.069211	.0685062

Source:Bolsa Mexicana de Valores

Appendix F Functional Features of SMARTRAC

Table E.2: Factor Loadings. Bursa Optimo Index

	CAPM	Evergreen	Momentum	Valuation	Model
Market Factor	1.065***	1.084***	0.939***	1.060***	1.078***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Evergreen factor		0.220***			0.253***
		(0.000)			(0.000)
Momentum Factor			0.170***		
			(0.000)		
L6.Valuation Factor				0.159	0.183*
				(0.073)	(0.023)
Constant	0.00248	-0.000700	0.00146	0.00284	-0.000528
	(0.146)	(0.691)	(0.341)	(0.108)	(0.765)
Observations	81	81	81	75	75
F	1106.2	659.1	699.7	552.3	461.4
df_m	1	2	2	2	3
df_r	79	78	78	72	71
r2	0.933	0.944	0.947	0.939	0.951

p-values in parentheses

Bursa Optimo - Factor Loadings

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

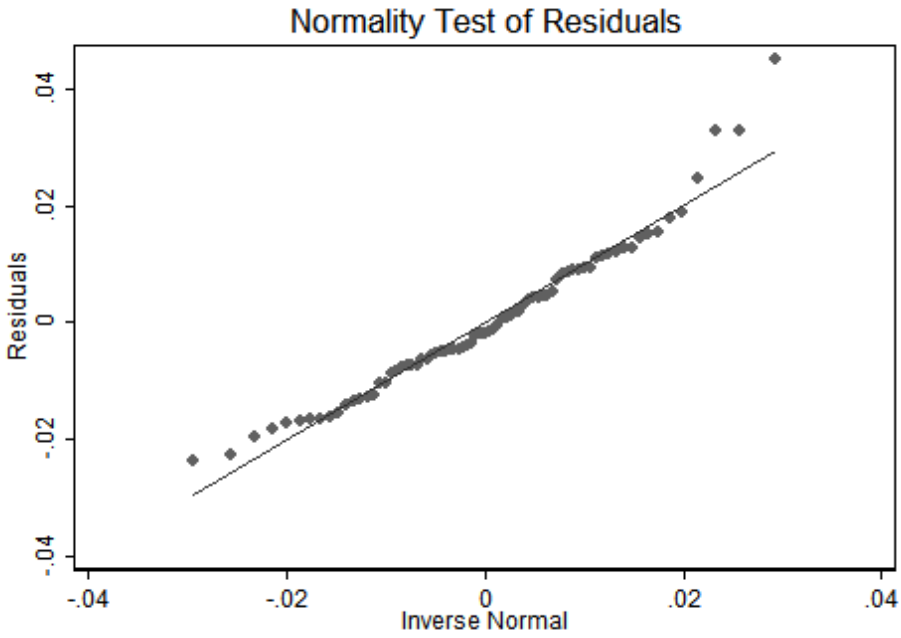

Figure E.3: Normality of Residuals

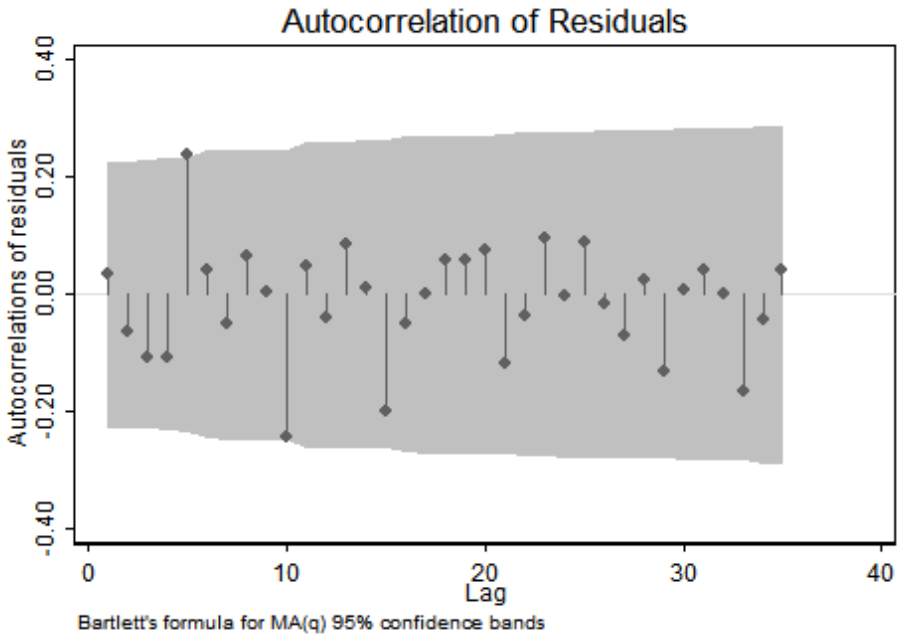

Figure E.4: Autocorrelogram of Residuals

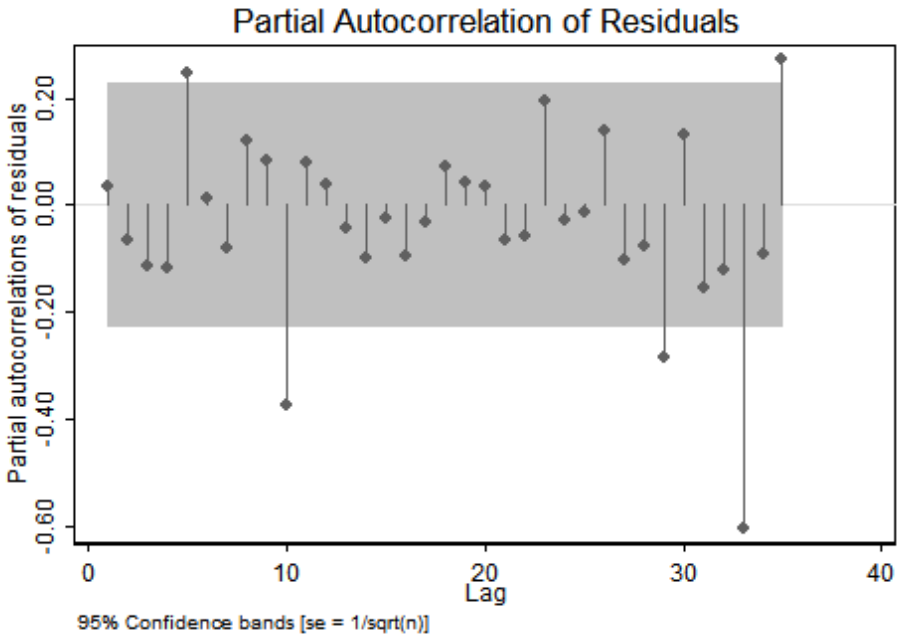

Figure E.5: Partial Correlogram of Residuals

Table F.1: Functional Features

Feature	SMARTRAC	NAFTRAC
+ Securities and expenses account are separate.	✓	✓
+ Creation and Redemption at NAV of the Securities account.	✓	✓
+ Creation and Redemption baskets	1/10 of the Index	1/1000 of the Index
+ Size of UNITS	13,000 USD	300,000 USD
+ Weight re-calibration	Forward looking	Backward looking
+ Continuous primary market	✓	✓
+ Continuous secondary market	✓	✓
+ See-through tax status	✓	✓
+ Price Return vs. Total Return ETF	Price Return	Price Return
+ Entities than can create and redeem UNITS	Banks, broker dealers, mutual funds, other financial intermediaries.	Broker dealers

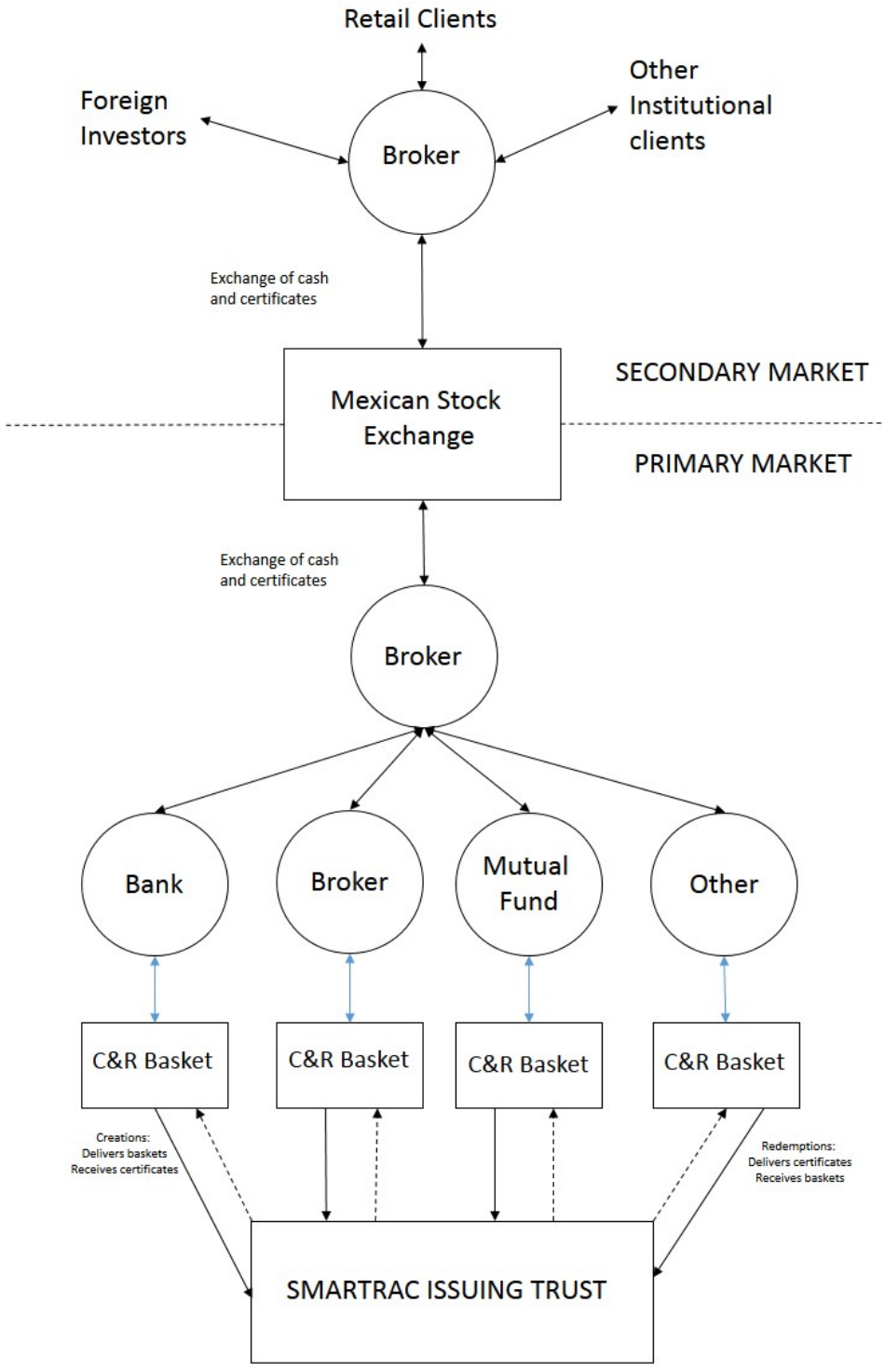

Figure F.1: Primary and Secondary Market for SMARTRACS

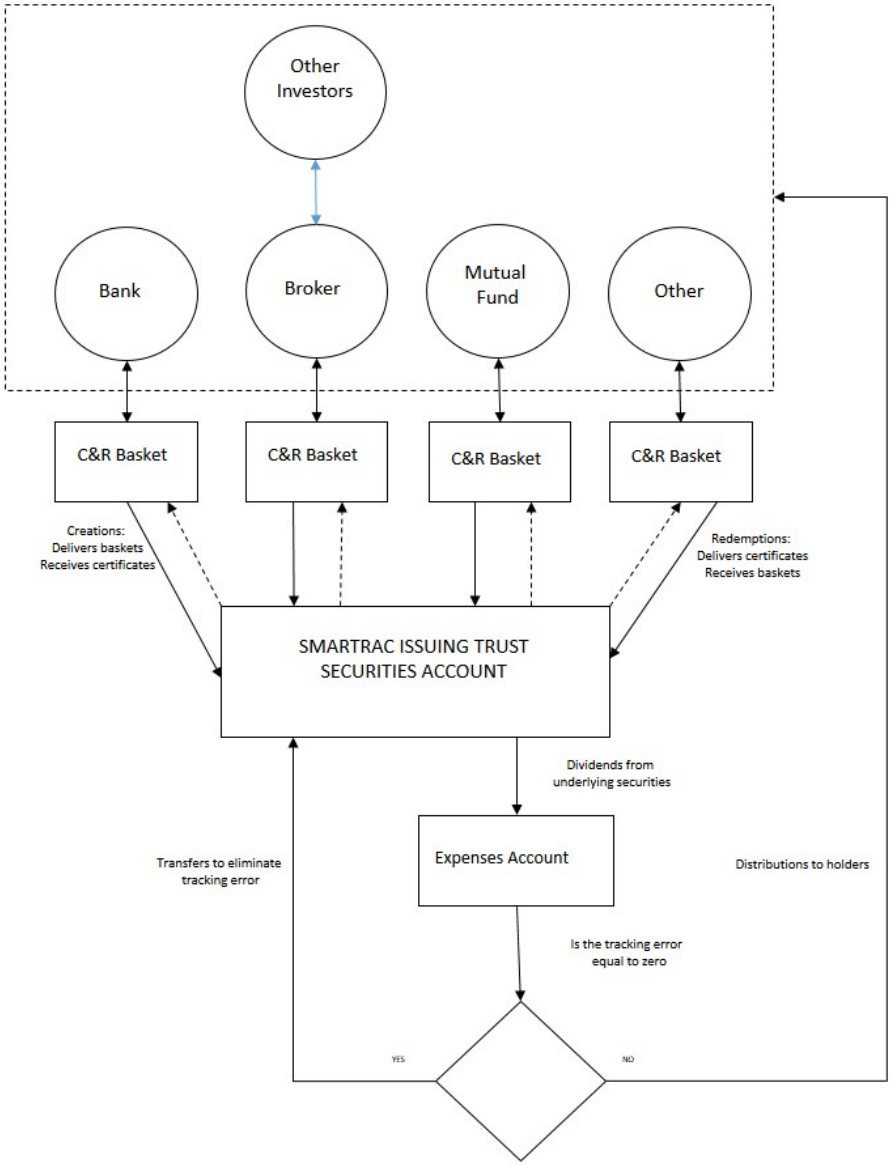

Figure F.2: Zero Tracking Error Mechanism