Chapter 1
THE BASIC MACROECONOMIC MODEL

In that empire, the Art of Cartography reached such perfection that the Map of a single Province filled up a whole City and the Map of the Empire, a whole province. Over time these Oversized Maps no longer satisfied people and the Cartography Bar made a Map of the Empire that was the size of the Empire and coincided with it. The following generations were less excited about the Study of Cartography and thought this dilated Map was useless and left it out in the Sun and the winter weather. In the Western Deserts, filled with animals and beggars the Ruins of Maps were broken into pieces and left outside: in the whole Country there is no another Geographic Relic. Suárez Miranda. Travels of Prudent Men, IV. Chapter XLV, Lérida 1658

J. L. Borges – Del rigor en la ciencia

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1.0 INTRODUCTION

The Global Economy is tremendously complex and to understand its way of working is unavoidable for macroeconomists. In this chapter we are going to be describing how we do it. We are going to be describing how we organize and simplify the global economy to think about it without getting lost in all of its uncountable details. We are going to be getting into the minds of economists and we are going to be trying to figure out what is their mental model of the global economy.

In the prologue, we have stated that one of the objectives of this text is to help us understand and assess the consequences of economic policy. From a methodology perspective, we have two ways to address this task. The first —test it against the real economy and see what happens —would be absurd. The second approach is to build a real economy simulator that we are interested in, test the policy proposal in it and use the simulations to help us decide if it is worthwhile adapting these policies in the real economy.

The Basic Macroeconomic Model that is described in this theme is an elementary global economy simulator. Thus, it is also a theory of the World and a schematic description and tremendously simplified of the global economy. Much like the Rutherford Atomic Model that used to be studied at school to represent the structure of elements and their particles, the Basic Macroeconomic Model is a parable of the World, an analogy that we should not take literally. And, as in any other parable or any other theory, we are not going to expect the Basic Macroeconomic Model to be too close to reality. Yet, we are going to expect it to be useful, to help us understand the consequences of economic policies in the real world.

To reach this end, in the following pages, we are going to be building a simple theory about economic relationships take place in an imaginary countries, using the economic relationships that take place in the countries in the real world as our reference.

As we are living in a globalized world comprised of countries that are closely linked together, firstly we are going to build a very schematic model of the global economy and, after that, we are going to build highly detailed model of any country. We are going to call the economies of the Rest of the World, everything except our own favorite economy, the Foreign Sector. And we are going to call the detailed model of our own favorite economy the Domestic Sector.

To organize the domestic sector we are going to have a category for all of the public administrations in the Public Sector and the rest of the economy in the Private Sector. And within the scope of the Private Sector, we are going to talk about Households and Companies. Among these 4 characters that are configuring the Basic Macroeconomic Model , Households, Companies, Public Sector and Foreign Sector, there is a complex mesh of economic relations. The economic relationship in the model are simplified versions of what is taking place among the Households, Companies, Public Sector and countries in the real World. In the following pages, we are also going to be describing how we economists do it to describe in a simplified manner economic decisions what aspects we include in our models and which ones we decide to leave out.
1.1 THE BASIC MACROMECONOMIC MODEL

The world we live in is a complicated world indeed. According to data from the CIA in July, 2008, there were approximately 6, 678,000,000 people living in 194 independent countries. Daily the inhabitants of the planet make millions of economic decisions, many of them interrelated. In 2007, as a consequence of these decisions, goods worth 66 billion dollars were produced and acquired, which with today’s exchange rates would now be worth 56 billion dollars.

Box 1.0 The Joke about the Castaways and the Can-opener

An economist, an architect and an engineer were on a South Pacific cruise. And while sailing between Samoa and the Fiji Islands, they ran into a terrible tropical storm. The ship crashed and one way or another all three managed to reach a tiny deserted island. After recovering, they realized that among the remains of the shipwreck, there was a can of bean soup and pack of matches, that for some unknown reason, were still intact. We start the story with our three main characters sitting on the beach underneath the swaying palm trees, trying to figure out how to open the can.

The engineer remembered the Boyle Mariotte Law and proposed lighting a fire with the matches, explaining that when the can heats up to a certain point that the gasses will expand and end up making the can itself explode. Thus they will be able to eat the bean soup. The other castaways admired his clarity and well-thought out plan. Immediately after that, the architect had another idea. “We should build a tiny wall around the fire to ensure that the bean soup does not spill over in every direction once the can explodes.” Everybody agreed that it was indeed a brilliant idea and then they all looked at the economist who was just looking at the ground and seemed to be quite depressed. He had never liked shipwrecks and was wondering what is the world was he supposed to be doing on this stupid island with an architect and an engineer. What were they going to talk about that he’d be interested in? The engineer was egging him on saying “Come’on, Man, what would you do to open the can?” The economists resisted and said, “I don’t know how to open cans and, besides that, if I told you guys what us economists would do, I’m sure you’d laugh at me.” The others insisted time and time again until he finally gave in and spit out, “Whenever we have to open a can, what we do is to say, let’s suppose we have a can-opener”.

Identify the causes and their effects in such a complex world is a very complicated task. If we are not capable of relating causes with their effects, we most certainly will not be able to understand and predict the consequences of the economic policies. When economists address a difficult issue we normally use our favorite method: we simplify it. Like the economist on the Castaway Island, we begin by imagining we have a can-opener. In other words, the global economy is much simpler than it is in reality. Based upon this supposition, we build a schematic model of the reality and then use them to help us answer the questions that we are addressing.

The simplification method makes us decide which aspects of reality should be included in the model and which ones should be omitted. The answer to that question is that we try to build models as simply as we can as long as they are able to answer the questions we are addressing. As in this specific case our aim is to study the effects of the economic policies on people’s welfare and companies in the global economy model that we are building there must be at least one authority
who decides what is the economic policies for people and companies.

In order for models to be useful, they have to be simple. An economic model that were highly complicated, as is the real World would be as useless as the map that Borges described in the quote we used to begin this essay. But clearly the simpler the model is, fewer questions it will be able to answer. This is the tight-rope we have to walk in our simplification process. We are trying to design models that are rich enough to answer the questions to be addressed sufficiently well and simple enough so we can understand them and solve the dilemmas.

1.1.1 A Model of the Global Economy

The starting point in the simplification process that we have described in the prior paragraphs is the GGG. And as the real world is made up by GGG, simplified version of the economy —the global economy model—is also made up by CCC, although logically it is also simplified.

The territory, laws, institutions, customs and language are all features that distinguish CCC in the real world. Yet only the territory, the people who live in it and a few institutional and legal assets are exclusive from each country. Schematically, we may say that a country is a group of people who are living within a defined territory and regulating cohabitation through a set of defined laws. To distinguish them from the country of the real world, we are going to call the countries in the model “Economy”.

Panel A in Graph 1.0 is a schematic and reduced version of the starting point in our simplification process, a simplified world comprised by a collection of ten economies, that we represent with ten polygons, some of them being very simple to identify. In a complete version of this diagram, in which every country on earth were represented by a polygon, were two panels in Graph 1.0 and they would have no less than 194 polygons, and it would be much more confusing and hard to understand. Let’s imagine that to study the GGG we decided to create a model for each of these economies and to represent the economic relations among its residents schematically, connecting each to economies with an arrow. How many arrows would there be if there was an arrow shooting out from each economy to connect it to each and every one of the other economies?

In the diagram of the world represented in Panel B in Graph 1.0 there would be 90 arrows (10x9) and in a graph that’s represented all 194 countries on earth we would have 37,442 arrows (194x193). In any of the two cases, the graph would be virtually impossible to understand. Additionally, many of the details of this excessively complex model are not necessary in order to answer many of the questions that we are addressing.

To be able to understand the model of world, it must be easier to handle. To design it, we are going to imitate the economist in the joke by imagining that we have a ‘can opener.’ In this case, we are going to imagine that the GGG is much simpler than it is in reality.

A model with 194 economies is out of the question. One with ten economies is still too complicated and a model with only one will never be useful because we could not use it to picture foreign trade. So, let’s begin with a model that has two economies or sectors: domestic and foreign.
The Domestic Sector is our favorite economy, the economy that is the basis of our research and our reference economy—the one we are going to refer to in great detail. Foreign sector is an inventive aggregate in which all of the other economies on earth are grouped together. With this simple diagram we are able to go from the 90 arrows in the complex world represented in Panel B in Graph 1.0 to only 2 arrows in the elementary model of the world that is represented in Graph 1.1.

In order to place all of the countries in the world in one single sector we have applied the principle of consolidation. Consolidation means canceling all of the economic relationships that are generated among the CCC in the Foreign Sector and only concentrate on the relations between the Domestic Sectors and the Foreign Sector as a single unit. It is true that by consolidating all of the CCC’s in the world into one single sector we have enormously simplified the problem, but the down side is that we have lost many of it’s finer points. For instance, if the diagram is useful for studying the exports from the Spanish economy, yet it is not useful to study which countries are receiving these exports. At the end of the day, it all balances out. Let’s not worry for the moment about the technical complications of the international economy and let’s look at how the Domestic Sector is organized.

1.1.2 A Model of the Domestic Sector

The next step is to build a Domestic Sector Model in greater detail. We can use the Spanish economy as are our reference making it easier to see how we are going to do it.

In July, 2008, the population of Spain was approximately 40.5 million people and according to the Ministry of Work and Immigration, the Spanish Social Security System had 19.4 millions members. In 2007, the value of the finished goods produced in Spain was approximately 100 billion Euros attributed to a little over 2 percent of the world GDP in parity to it’s purchasing power. Government expenses as stated in the government budget was approximately 400,000 million Euros. The Spanish economy imported foreign goods with a value of 274,000 million Euros and exported non resident goods with a value of 185,000 million Euros.

As you may see by going from the GGG to the Spanish economy, we have not overly simplified things. Individual economies are still too complex and so we don’t have any other choice but to simplify them—we are back to the can opener. In this case to classify the decisions made by people and by companies, we are going to distinguish between those activities that are part of the market that are normal in the market place and those that are not.

In practically every county of the world a part of their economic activities are subject to the rules of the free market. People and companies, carried away by their eagerness to fulfill their objective, compete among themselves in the legal framework that establishes economic ground rules. The result of the activity is the production of private goods. In our simplified Domestic Sector Model we are going to consolidate all of the people and all of the companies that are involved in markets into one single conglomerate that we are going to call the Private Sector. In addition to the market activities, in nearly every country other economic activities are carried out
that are not subject to the rules of competition and the logic imposed by market. The aim of most of these activities is the production of public goods. In our Domestic Sector Model we are going to consolidate all of the people and all of the institutions devoted to supplying and administering public goods in one single conglomerate that we are going to call the Public Sector.

So, as illustrated by Graph 1.2, our Domestic Sector is subdivided into two large sub sectors: a Public Sector and a Private Sector. The Public Sector is concerned about supply of public goods and designing economic policy. The people and the Companies in the Private Sector are competing with each other to reach their objectives by following market rules. This clarification is extremely useful as it is fully comprehensive as the Private Sector and the Public Sector are mutually separated with the sole exception of public owned companies.

1.1.3 A Model of the Private Sector

The in-depth study of the Public Sector is not one of economies prime objectives as we leave it to those concerned with political science and the theory of government. Generally speaking in economic models the Public Sector role is limited to defining economic policy while we do study in great depth its consequences to the Private Sector. Thus economic models have to include an explicit description of the Private Sector.

As Graph 1.3 illustrates, the most popular manner describes the Private Sector in a Model by dividing it into two sections, Households and Companies. As we will see in the following sections, Households are the main decision makers in Macroeconomic Models while Companies are limited to manufacturing goods starting from productive factors and other goods, playing a secondary role.

Graph 1.3 A Model for the Private Sector

The Representative Household and the Representative Firm

It is obvious that in the real world there are many Households and many Companies and they are distinguished by thousands of items. However, once again, all of this diversity is far beyond our capacity to understand and resolve the Model, forcing us to carry out one last simplification that will allow us to work with the Model. In the extreme case, the simplest Model for the Private Sector consolidates all of the Domestic Sector Households into one single Household and all of the Companies into one single Company that we will call the “Representative Household and Company.”

By consolidating all of the Households in a single Representative Household, firstly, we are supposing that all of the Household decisions have enough common elements to ensure that our Model will still be useful in spite of not having considered the differences. Secondly, we are ignoring the economic relationships between individual Households and focusing on the relations between Households and the remaining sectors in the Model. In other words, by consolidating Households and Companies all of the arrows in Graph 1.4 have disappeared in Graph 1.5 and the only ones that are left are representing the economic relationships between the Representative Household,
Representative Company, Public Sector, and Foreign Sector.

For instance, in all economies some Households save and others do not save, which means they are asking for a loan. By consolidating these decisions into a single element the Basic Model is only able to study the consequences of the Household’s net savings for the remaining sectors of the Model but, it cannot study the decisions made in the two types of Households separately. Naturally, the price that we must pay for such a radical simplification is that the Basic Model cannot be used to study differences in income for the progressive effect taxes - which requires two sub-sectors, one for wealthy Households and another for poorer ones - nor for pension systems - that requires one sub-sector for workers and another for retirees - therefore any other problem that may require an explicit modeling for several type of Households.

By consolidating all of the Companies into one single Representative Company, something very similar happens. The Basic Macroeconomic Model makes an extraction of the economic relationships among Companies and only focuses on those of the Representative Company with the remaining sectors in the Model. As we will be seeing in Theme 2, this characteristic ensures us that the Basic Model will be consistent with the calculation of the GNP. Never the less as we have seen earlier in respect to Households, it stops us from using it to answer any question who’s answer would require and explicit modeling of more than one type of Company.

1.1.4 The Basic Macroeconomic Model

Graph 1.5 illustrates the Mental Model of the world that is made by macro economists. We have thought about it so many times that if we made a mental map it would have deep circles all over it. All Macroeconomic theories predict something about Households, Companies, Public Sector or Foreign Sector although at times when the issue we are addressing allows it one or more of these sectors is excluded. For instance some Macroeconomic Models exclude the Foreign Sector. We call them Closed Economy Models. Most elementary analysis also begins by excluding the Public Sector and focusing entirely on the economic relationships between Households and Companies. In the following sections, we are going to describe in detail the decisions of the four sectors of the Basic Macroeconomic Model and the interrelationships. In other words, we are going to provide content for the arrows in Graph 1.5.

1.2 THE PUBLIC SECTOR

The Public Sector in the Basic Macroeconomic Model is briefly described in Section 0.5.1 in Theme 0 and is studied in great detail in Theme 3. In this section we are only going to be concerned with the Public Sector’s relationships with the other sectors in the Model.

In Section 0.5.1 we stated that the most useful manner to picture the Public Sector is to think of it as being a huge company devoted to supplying and financing public goods and services. We also stated that Public Sector financing is subject to a budgetary constraint that simply reminds us that public resources have to be equal to their expenditures.
\[ G + Z + \text{INT} = T + \text{DEF} \quad (1.0) \]

We have also defined each of the major budgetary sections. In order to ensure total understanding here we are going to repeat these definitions. Item G that we are generically using to refer to Public Spending, includes all of the purchasing of goods that is made by the Public Sector. These goods are the public employee’s services and all of the daily goods and investment that the Public Sector purchases to carry out its activities. Item Z includes all of the Transfers that the Public Sector sends to the remaining sectors in the Model. Transfers are expenses for which the Public Sector does not receive anything in return and, hence does not create demand for the other sectors in the Model. Item INT represents the financial expenses of the Public Sector. The same as any other company that has gone into debt to finance part of its activity the Public Sector has to pay the interest on its Public Debt. This interest is income that is received by Households and Companies in the Model.

In respect to the Public Sectors resources the item T includes all of its own resources. This item includes tax resources, fees to the Public Sectors, charges for some of its services, fines, and any other source of income that the Public Sector may have.

Needless to say, the Public Sector receives these resources in the Model. In closing the item DEF represents the financing needs or capacity of the Public Sector. When DEF is positive it means that the Public Sector is increasing its public deficit and when DEF is negative it means that there is a public surplus. Public deficit is increasing ongoing Public Sector debt with the other sectors in the Model. On the other hand, public surpluses enable the Public Sector to reduce public debt or to accumulate financial assets issued by the other sectors in the Model. The five items in the formula 1.0 are the main fiscal policy tools and the manner in which the Public Sector relates to the other sectors in the Model.

1.2.1 The Public Sector and the Rest of the Model

The relationship between the Public Sector and the rest of the Model are as follows:

1. The Public Sector requires the fiscal policy described by the five major items that summarize the public budgets

\[ (G+Z+\text{INT} = T+\text{DEF}) \quad (1.0) \]

2. The Public Sector produces public goods that are consumed by the Households in the Model to produce goods it contracts the services of the productive factor, property of the Household it buys from the Companies consumer goods and those of public investment. In exchange for these goods, the Public Sector pays Households salaries for the public employees and pays Companies the prices of the goods that they purchase.

3. The Public Sector collects taxes, charges fees, and obtains other resources from the other sectors in the Model.

4. The Public Sector transfers part of its resources to the Households and to the Companies in the Model without receiving anything in return.
5. The Public Sector pays the Households in the Model interest derived from the debt that is issued for financing in those periods in which its own resources do not cover required financing for its expenditures.

1.3 HOUSEHOLDS

The things that happen in the economies of the real world in much the same way happen in the Basic Macroeconomic Model in that people form small groups that we are going to call family or Household. Households are the basic decision making units of the Model and may be formed by one single person.

In most societies, Households comprised by several people have a hierarchy and some of its members—normally the parents—have more decision making power than others—generally their children. But most decisions that are made in the Households are collective in nature being made after a certain amount of negotiation regardless of the Households organizational system. For instance, let’s think of the way to which a Household formed by mother and father and two older children decide and distribute their time. Among them they decide who is going to work and for how long every day. They also decide if the children are going to study and how they are going to share the Household tasks. These decisions affect all four people and are made collectively in the Household. The same is true of all other economic decisions being made collectively in the Household.

1.3.1 The Property of the Factors of Production

In real economies, property relationships are very complicated. The ownership of property rights may correspond either to individual people or to a complex combination of legal entities. Additionally, in most countries some productive factors are also owned by the state and others belong to individual people and legal entities residing or registered abroad.

To simplify property relationships, in the Basic Macroeconomic Model we assume that all of the productive factors belong to Households. This supposition is not as varied as it may seem at first glance. Since slavery was abolished, Households are the owners of their own time and of the fruits of their work. As Households are also owners of the Companies, all of the Companies productive factors also belong to them. In all reality, in the Basic Macroeconomic Model we are only making an abstraction of the productive capital that is publicly owned. And if we wished to press the issue, we could always argue that goods that are publicly owned at the end of the day belong to its citizens, in other words, its Household.

1.3.2 Household Decisions

To create a model to describe the decisions that are made by the Household, the Model, we begin by naming some objectives for the Representative Household. We are assuming that the final
aim of its decision is to fulfill these objectives. By describing the Households' objectives without getting into philosophical arguments or getting lost in tiny details is very difficult indeed. If we wonder what the objectives of our own lives are, as a void being taken away by economic issues we may answer something like “being happy” or “living well.” Naturally, the vague reply fits any definition of “happiness” or “a good life.” If we then ask ourselves what do we need to be happy, most of us will come up with a whole list: some of them being more spiritual in nature and others more material. Among the material items we would surely mention food, housing, clothes, and the resources we need to enjoy ourselves. Yet, as we need to work for most of these things, and work being not normally a very enjoyable experience, our goal of “being happy” becomes more complicated.

The Basic Macroeconomic Model assumes that the Representative Household is facing a problem similar to the one we have described in the previous paragraph, or in other words, its objective is “to be happy” and in order to achieve this it needs both goods and enough time to enjoy them. So from a strictly economic perspective and being slightly technical, we say that the Representative Household’s problem is maximized with restrictions. The Household maximizes its happiness but it is limited with the restrictions that are imposed by scarcity. We are going to informally describe the aspects of this problem: time allocation, income allocation and saving allocation. Although these three decisions are obviously interrelated, in the following sections we are going to be studying each of them separately.

### 1.3.3 The Allocation of Time

Dolores is a dentist and she has a modern and pleasant dental clinic and more patients than she can handle. Every Friday she decides how many patients she can attend to in the coming week. Dolores is aware that every hour she spends in the clinic is an hour that she cannot use for other activities, such as playing tennis and going to pick her daughter up at school. To be more specific, Dolores knows that the allocation of her weekly time must meet the following restriction and this is:

\[ h + l = 100 \quad (1.1) \]

The formula (1.1) reminds us the hours we spend working, that we call \( h \) cannot be devoted to other activities, that we generically call \( l \). This also reminds us that people have approximately 100 hours available, on average per week. We reach this number by assuming we have 14 hours per day, multiplied by 7 days and round it off. We do not have 24 hours a day available because we need 10 hours per day to eat, sleep, and take care of our health.

Exercise 1.0: Most Macro Economists love accounting. If we suppose that people have 100 hours available per week, let’s calculate the number of hours available in a lifetime of 80 years of age. Now, subtract your own age from 80 and calculate the number of available hours you have until you turn 80 years of age.

So, the solution to the problem is very simple, \( h^* = 0 \) and \( l^* = 100 \). But to reach the solution we
have ignored a critical detail: Dolores’ working income depends directly on the number of hours she works. Formerly we could describe this dependence as:

\[ y(2) = w \times h \]  

This being explained is where \( y(2) \) is her working income and \( w \) is the average income per hour.

In the Basic Macro economic Model we assume that the Representative Households are facing the same restrictions as Dolores. We are also assuming that to decide how many hours it is going to work, the Representative Household compares the benefits of working —or another words the value of enjoying the goods that can be bought with its working income —with the opportunity costs —or another words the value of using a better alternative of the time it has allocated to working. A household that may choose a number of hours for each of these two tasks has other restrictions and will resolve this problem by working until the value of the last hour worked is equal to the lost opportunity.

There are two characteristics that distinguish the decision about allotting time from other decisions that we make. The first factor is the weekly amount of available time that is exactly the same for every one of us. Bill Gates, Dolores, and the poorest beggar all have 100 hours available per week, although the value of their time and life expectancy of each of them may be very different. The second factor is that time cannot be stored. The 100 hours we had available last week, and I am referring to both the authors and the readers of this text, are not recoverable. Each of us distributed those 100 hours between paid and unpaid activities, but we did not have more than 100 hours available to loan to anyone nor to save to be able to be used in the future.

1.3.4 The Allocation of Income

The second decision that Households must make in most Macroeconomic Models is the allocation of its income. “Income” is a generic name that we give to cover any and all income that Household receives in a period of time. The income allocation of the Representative Household, and in general for all households is limited by the following restrictions:

\[ C + S + P = Y + Z + INT + REN \]  

The Representative Household’s resources are the sum of factorial income that it receives in exchange for the services of its productive factors, that we call \( Y \), or the transfers and as a payment of interest that it receives from the Public Sector, and we call \( Z \) and \( INT \) and the net income that it receives from the Foreign Sector, are called \( REN \). There are three types of expenses: expenses in private consumer goods that we call \( C \), private savings that we call \( S \), and payments to the Public Sector that we call \( P \).

As the largest part of payments to the public sector are tax payments we assume that the representative household cannot decide how much the amount will be. Thus, definition of income that households have available, we call available income (\( YD \)) is as follows:

\[ YD = Y + Z + INT + REN-T \]
We then obtain the simpler version of the constraints that the Representative Households is facing when the time comes to allocate its available income by substituting formula 1.4 in formula 1.3:

\[ C + S = YD \] (1.5)

Formula 1.5 is also useful for defining the Representative Household savings as the part of available income that has not been used.

This way of describing the income allocation decision that must be made by the Representative Household is the following: once its available income is calculated, Households spend on consumer goods until the usefulness that they receive from enjoying these goods equals its opportunity costs, that in this case is the use that they get from saving these resources so they can be available to them in the future.

When thinking about the Income allocation, we should take into account three characteristics of this decision that differentiates it from the decision regarding time allocation. The first one is the income decision is inter-extemporaneous because the usage of available income may be spread over a period of time. If we save if, we are delaying its usage. If we go into debt, we are pushing it forward. The second characteristic is that the available income is not a given because it depends on how much of our time we allocate in carrying out paid activities. The third factor is that the amount of available income to households may vary greatly, partly for the same reason. For example, I have to tell you that Bill Gates income is much greater than that of the authors of this book.

Consumption

Your coffee and donuts for breakfast, blue jeans, t-shirts and athletic shoes, the newspaper, the gasoline, cell phones, ticket to the movies, golf clubs, home appliances, cars, and any and all services that households buy are examples of consumer goods. In all reality, all of the common expenses that Households make are considered to be consumer expenses.

As not all consumption decisions are equal —decision to have a cup of coffee, for example is very different than that of going out and buying a motorcycle - consumer goods are classified as being “long lasting goods and non-long lasting goods”. The Suzuki that Dolores has just bought is an example of a long lasting goods because it will provide her transportation service until someone steals it, crashes it against a light pole, she gives it to her boyfriend, or until she sells it. The same thing is true of cars, home appliances and furniture: They are long lasting goods because in normal conditions they provide their owner’s consumption service flows that last over accountable periods of time.

On the other hand, food, electricity, a night out at the opera and in general, all services are examples on non-long lasting consumer goods. They are called that because they disappear the moment that they are consumed.

The expense decision non-long-lasting goods is differentiated from the expense decision in long-
last lasting goods due to the ease that exists for either delaying or advancing it in time. The longer lasting a good is the greater the ease in advancing or delaying its purchase. For example, waiting a few more months before buying a new car, or to keep on watching your old TV that is still working relatively well, but on the other hand, it is much harder to spend a full week without eating or without heating your house in the middle of January.

The main item among Household expenses that is not considered to be consumption expense is acquisition of new homes, which is considered to be and investment expense, as also happens with Household expense in productive capital and inventory.

Savings

In Formula (1.5) Household savings is the part of its income that is not devoted to consumption. As we have said earlier the choice between consuming and saving inter-extemporaneous because it forces the Household to compare the present with the future—if I consume today I cannot consume in the future and if I save today I cannot consume in the present. The main reason for saving as described in BOX 1.1

BOX 1.1 REASON FOR SAVING Households save to smooth out the timing profile of its consumption pattern: to buy homes and other long lasting goods: to cover unforeseen expenses: and for altruism.

People’s income changes throughout their life and at a relatively foreseeable timing curve as seen in Graph A. At the beginning of their professional life, working income tends to be less, and increases as we accumulate more experience and towards the ending of our working life it stabilizes or even begins to diminish until we retire. The income curve is also known as a vital income cycle.

Graph A: VITAL CYCLE OF INCOME

If a Household with a vital income cycle similar to that represented in Graph A decided to never save at any moment in its life, its consumption curve over time would be exactly the same as the income curve and they would be forced to consume more in some periods and less in others. In order to maintain the consumption curve that is less abrupt and more in accordance with its taste, Households tend to create debt when they are younger and save when they are older.

Another reason which induces Household to save is the purchase of homes, of cars and of other long lasting consumer goods. As the price of these goods tends to be relatively high in comparison to the Households’ income—for example, the price of a house tend to be several years of income—Households have two options for buying them: they either save before buying them or they go into debt, they buy them and then save to be able to pay their debt. In both cases Household consumption must be less than its income in a certain moment and thus its savings must be positive.

Another reason that justifies saving are unforeseen expenses. Diseases, accidents, and temporary period of unemployment are examples of unforeseen expenses that Households must cover. To protect themselves from this type of risk, Households take out insurance policies and pay the corresponding premiums or save to be able to pay these eventualities when they have them. This
type of savings is called precautionary saving.

The forth reason that justifies savings is our concern for the welfare of others, which we Economists call altruism. The most common kind of altruism is the education of our children and inheritances.

1.3.5 The Allocation of Savings

Households’ savings have to be materialized in one way because income that is not consumed cannot simply be left hanging in the air. Goods in which savings are materialized are called assets. Assets are deposits, IOU’s, or long lasting goods that Household buy partly to finance consumption in the future. Examples of assets are cash, bank deposits, public treasury notes, corporate stock and bonds, jewels, homes, productive capital, and in general all items that are included in the ledger on the credit side in the Household books.

Assets are classified into two main categories: real assets and financial assets. Real assets are long lasting goods and because they are, they can be bought in second hand markets.

One part of real assets that Households buy are considered to be consumer goods —gold, jewels, and work of art for example. Thus conventionally these expenses are studied as consumer allocation decisions. The rest of real assets are considered to be investment goods —houses, productive capital and inventory. These expenses are studied as being savings allocation decisions.

Financial assets generically, are debt contracts or IOU’s. In order that a Household may buy a financial asset another agent in the Model —another household, a Company the Public Sector, the Foreign Sector —must be willing to issue the asset and sell it. In other words, financial assets are loans in which the savings Household is the lender and the agent that issues the assets is the borrower. For example, a Household buys a treasury note —public debt —it lends a part of its income to the Public Sector which is the agent that issues the asset. As many loans are risky and to quantify the risk involved in loans is costly financial middlemen appear to facilitate savings and reduce cost between lenders and borrowers.

The saving allocation for individual Households in the real world is subject to the following restriction:

\[ I(h) + L^*(h) + L(h) = S(h) \] (1.6)

In these constraints the resources that are the individual Household’s savings which we call \( S(h) \) and the expenditures are the Household purchases of investment assets that we call \( I(h) \). Financial assets issued by other Households or Private Sector companies, that we call \( L^*(h) \) and of financial assets issued by the Public Sector and or the Foreign Sector which we call \( L(h) \).

The investments are the homes owned by the Households and the buildings, productive capital and inventories that are formally owned by companies. They are formally owned by the companies but indirectly belong to the owners of the companies. In other words, the owners are the Households that have dedicated part of its savings, to buy shares in these companies. Investment in inventory is another aspect. The national account systems include variations in the value of inventories as an
investment expense. This conventional accounting makes Private Sector expenses include a fictitious component because the increase in inventory is really unsold production and this production that no one buys is included in the accounting as if companies that have produced the goods included them as investment expenses had actually bought them. In Theme 3, we will see that this usage is very helpful because it enables us to establish the exact relationship between production and expense.

**BOX 1.2 ASSET PROFITIBILITY AND LIQUIDITY** The allocation of savings decisions are also called portfolio decisions and are relatively complex. This is so true that financial advisory services—the services provided by professionals that are specialized in the analysis of portfolio decisions—generate a large part of the value added and the jobs in the financial sector. Additionally, the study of portfolio decision making has its own area of specialization within the field of economic analysis which is Financial Economy. To be able to decide the composition of its portfolio Households take into account three main characteristic of its assets: profitability, risk and liquidity.

The probability of an asset is the variation of its value over a unit of time. To calculate this concept in addition to taking into account the difference between its purchase value and its sales value, we must account for the value of the service and/or income flow that it provides. For example, to calculate the profitability of a house in addition to the difference between the purchase price and the sales price we must add the value of the rental income that may be explicit if it is inhabited by a renter or implicit if the owner is living there. The second characteristic of assets that concerns savers is the risk involved. In most cases the exact profitability of assets is uncertain. In these cases, when they are talking about the profitability of an asset they are really talking about the expected profitability and in all expectations there is a certain degree of risk that the expectations will not be fulfilled. This is even true in the case of fixed profitability financial assets—they are called fixed because the nominal yield is defined beforehand—it its real yield is uncertain because we never know with 100% certainty what the rate of inflation will be.

As most of us do not like risk, the greater the risk that an asset has the greater its yield must be if and when it turns out favorable. For example, treasury bonds issued by the United States or by Switzerland are very safe and their yield is very low. On the other end of the spectrum stock in high tech startups are high risk assets and its profitability is much greater when and if projects are successful. The third characteristic regarding assets that concern savers is its’ liquidity. The more liquid an asset is, the lower its’ cost to be converted into goods or other assets. For example, a house is an asset with a low degree of liquidity because the cost and time and money that it normally takes to sell it is high. On the other hand, monetary assets are very liquid because they can be used by goods or other assets with little or no cost what so ever.

The secondary category of saving expenditures of individual households is financials assets issued by other Households or by Private Sector companies. Examples of this type of asset are cash, bank deposits, and corporate bonds. In all of these cases, both the lenders and the borrowers are a part of the Private Sector and the amount in the asset credits of the lenders coincides exactly with the debt that appears in the borrowers debit column. So, when we need to study the economic relationship among the Private Sector, Public Sector and the Foreign Sector this type of asset is
consolidated and disappears. Formally, we consolidate the savings allocation decision for all of the Private Sector, the budgetary restraint as described in Formula 1.6 is simplified and becomes the following:

$$I + L = S \ (1.7)$$

Now the variable $S$ is the next savings of the entire Private Sector, the variable $I$ is the entire private investment, the variable $L$ are financial assets that now can only be issued by the Public Sector and by the Foreign Sector.

The variable $L$ may be either positive or negative. When the Private Sector savings are greater than Private Investment, $L$ is positive. It is called Private Sector Financing Capability and the Private Sector uses this financial capability to buy debt issued by either the Public or Foreign Sector. On the other hand, if the Private Sector savings are less than private investment, $L$ is negative. It is then called Private Sector Financing Need and in this case it is the Private Sector that needs to increase its debt with either Public or Foreign Sector either selling IOU’s or part of its equity to finance investments.

**Savings and Wealth**

The total value of a Households asset is its gross value. If we subtract the value of its debt from the gross worth of a Household we will get its net worth. In accounting terms the net value of a household is its’ net equity. As long as a savings of a Household is positive the value of its worth will increase and if its savings is negative the value of its worth will diminish. Lets use $W(h,t)$ to represent the net value of an individual Household at the beginning of a period of time $t$. So the net worth value of this Household at the beginning of the period of time $t+(1)$ is:

$$W(h,t) + (1) = W(h,t) + S(h,t) \ (1.8)$$

We have seen it to be true in respect to saving, the concept of worth has three components: real assets such as vehicles, works of art and jewels are considered to be consumer expenses, houses, productive capital and inventories and are considered to be investment expenses and financial assets or credits. The fund in which investment expenses are accumulated is especially important because it constitutes the domestics sectors productive capital fund. If we use $K(t)$ to represent the value of the capital fund at the beginning of the period of time $(t)$ then the value of the capital fund at the beginning of period of time $(t) + 1$ is :

$$K(t + 1) = K(t) + I(t) \ (1.9)$$

**1.3.6 Households and the Rest of the Model**

- Households are the basic decision making units in the Model
- Households are the owners of all the productive factors in the Model
- Households cover the cost of the Public Sectors own resources and receive public goods and transfers from the Public Sector
- Households sell the services of part of its productive factors to the other sectors in the Model and in exchange for these services receive the corresponding factorial income.

- Households spend part of its available income in consumer goods and save the rest.

- The Private Sector devotes a part of its savings to buy investment goods and lends the rest to the Public Sector and Foreign Sector. In exchange for these loans the Private Sector receives the corresponding interest. If private investment is greater than private savings the Private Sector goes to the Public Sector and the Foreign Sector to finance the difference.

1.4 FIRMS

The complexity of corporate organizations fascinate and yet dishearten any Macro Economist. If we are not able to convincingly answer a question that seems to be so simple as “what is a company,” how in the world are we going to be able to simplify the business reality so as to include companies in our Model?

Some Companies are individuals and in others there are thousands of people working. Some hire thousands of workers and use very little equipment and others employ very few people and use a lot of equipment. Some Companies locate their offices downtown and others have installations in business parks in the suburbs. Some are organized one way, others do it a way that is completely different. A convincing business theory should be able to respond to the questions related to size, localization, and production methods that companies use and any other questions related with its activity. Economists have still not been able to even begin to think about disappearing. Once we have confessed our ignorance we are going to make it into a virtue and replace the immense wealth of real companies with a very simplified diagram which enables us to include Companies in our Model.

Let's begin by thinking about Companies objectives. In section 1.3.1 we have assumed that the Households in the Model are the owners of the Companies. If we want to be coherent with this assumption, Companies objectives should be determined by their owners. The main purpose of the Companies has to be the accomplishment of these objectives. When Henry Ford decided to create Ford Motor Company on June 16, 1903 he did so because he thought that this Company would help him fulfill his critical objective. A century later, Ford was the 4th largest automobile manufacturer on earth. If Ford continued to exist, it was because Ford was still helping owners to accomplish their critical objectives.

GRAPH 1.6: Companies in the Basic Macroeconomic Model

From the Macroeconomic Analysis perspective, what we really are interested in is studying the Companies economic relationship with the other sectors in the Model, or in another words, factor, product, and income flows that are produced between the Companies the Household, the Public Sector and the Foreign Sector. So, from this point of view we do not need to know very much about what it is, nor how each Company is organized and we can even afford to ignore the decision making processes that companies are still using. To make things even easier for us we do not even...
have to worry about the economic relationships that are generated among companies because, as we have learned in Section 1.1.3 the simplest version of the Basic Macroeconomic Model consolidate all Companies to one single Representative Company.

So, as Graph 1.6 illustrates from a Macroeconomic point of view Companies are simply the Model’s production unit and its main function is to transform productive factors into goods. Formally, the productive activity of the Companies in the Macroeconomic Model may be described as a production function. The generic equation of this function is as follows:

\[ Y = A (k,n) \] (1.10)

In this formula the variable Y is the value of the production of final goods. In Theme 2 we will see that this value coincides with the sum of factorial income and so we use the same abbreviation for these two variables. The variable A represents the global productivity of the factors, k is the productive capital fund, and n represents work.

1.4.1 Firms and the Rest of the Model

- The Companies are property of the Households and their function is to help the Household accomplish their objectives.
- The Companies are the basic production units in the Basic Macroeconomic Model
- The Companies hire the services of the productive factors and pay their owners the corresponding factorial income
- The Companies sell their final production to the Household, the Public Sectors and to the Foreign Sectors

1.5 THE FOREIGN SECTOR

The Foreign Sector in the Basic Macroeconomic Model is very briefly described in Section 0.5.2 in Theme 0 and is studied very comprehensively in Theme 7. In this section we are going to be looking only at the relationship of the Foreign Sector with the other sectors in the Basic Macroeconomic Model. As is described in Section 1.1.1 Model ignores differences between the economy in the Foreign Sector and studies all of its decisions as a whole.

The trade of goods and services between the Domestic and Foreign Sectors is registered in its trading balances. The balance of the Foreign Sectors trading balance is as follows:

\[ SBC = X - IM \] (1.11)

Item X in the Formula 1.11 are the Foreign Sectors exports. This item is the value of all the goods that the resident producers of the Foreign Sector sell to resident buyers of the Domestic Sector. The item IM are the Foreign Sectors imports. This item is the value of all of the goods that the resident producers of the Domestic Sector sell to resident buyers in the Foreign Sector. As the Domestic and Foreign Sectors are a total modeling of the Global Economy everything the
Foreign Sector exports is imported by the Domestic Sector and everything that the Foreign Sectors imports is exported by the Domestic Sector. So the balance of the Foreign Sector’s balance of trade coincides perfectly with the balance of the Domestic Sectors balance of trade, one number being positive and the other being negative. This means that if in the accounting of all foreign trade transactions in the real world there were no mistakes nor omissions the total sum of the trading balances for all the countries on earth would be zero. The Domestic and Foreign Sectors receive other ongoing incomes that are not related to the buying and selling of goods. Immigrants send money back home. Companies repatriate profits from abroad. Interest payments are made on loans from abroad and international aid is given. These are all examples of this type of transactions. The balance of all of this income is the net foreign income is represented as REN. If we add the net foreign income to the trading balance we will get the current account balance. The formal equation of this balance is as follows:

$$SBCC = SBC + REN = X - IM + REN$$ (1.12)

As the Foreign income that is received by the Foreign Sector is paid by the Domestic Sector and visa versa, the current account balance of the Foreign and Domestic Sectors also coincide with one being positive and the other being negative. In this case as well if there were no mistakes nor omissions, the sum of the current account balances of every country in the world would be zero.

When the current account balance of the Foreign Sector is positive we say that the Foreign Sector has registered a surplus in its current account balance. In this case the Foreign Sector places its surplus, devoting a part of its savings to buy real or financial assets from the Domestic Sector. On the contrary, when the Foreign Sectors current account balance is negative we say that the Foreign Sector has registered a deficit in its current account balance. In this case the Foreign Sector finances this deficit by selling real assets to the Domestic Sector or by increasing it debt with its’ lenders. If the assets are investment goods, they increase the sectors capital funds that registers the surplus and if they are financial assets, they diminish their external debt or increase it if the sector registers a deficit.

1.5.1 The Foreign Sector and the Rest of the Model

- The Foreign Sector exports goods to the residents of the Domestic Sector and in exchange receives the corresponding payments
- The Foreign Sector imports goods from resident in the Domestic Sector and in exchange makes the corresponding payment
- The Trading balance is the difference between the value of the imports from the value of the exports
- The Foreign Sector receives other income from the Domestic Sector that are not related to the buying and selling of goods and also pays the Domestic Sector this type of income
- The Current Account balance is the sum of the trading balance plus the net balance of this income
• When the Foreign Sector’s current account balance is positive the Foreign Sector places part of its savings in the Domestic Sector’s assets and in exchange receives payment of the corresponding interest. When the Foreign Sector’s current account balance is negative, the roles of borrower and lender are exchanged and it is the Domestic Sector that receives the interest payment.