

Grzegorz Parosa

Savings and Liquidity Gluts and the American Long-Term Interest Rates Before the Great Financial Crisis

Abstract

Objectives: This article examines the impact of the global savings glut on the long-term interest rates in the United States before the Great Financial Crisis. It presents the impact mechanics of global savings on interest rates, discusses arguments supporting and contradicting the significance of this phenomenon, presents an alternative concept, namely global liquidity glut, and estimates the significance of both phenomena in shaping long-term interest rates in the USA before the crisis.

Research Design & Methods: First, the impact of purchases of the US treasury bonds made by foreign investors on long-term interest rates is being assessed. Second, metrics representing global savings and liquidity gluts are being used to explain those purchases. Finally, a counterfactual exercise is used to reveal the impact that each of those factors had on the American ten-year treasury yields.

Findings: The statistical analysis of both effects shows that foreign purchases of the Treasuries lowered the US long-term interest rates by up to 140 bps, with excess global savings depressing them by approximately 45 bps, and excess liquidity by another 75 bps.

Implications / Recommendations: Monetary policy, as well as savings rates, might have wider than only local consequences. Excess liquidity and savings in one country can impact interest rates in other areas.

Contribution / Value Added: This article presents an alternative and neglected in literature explanation for the phenomena of low long-term interest rates before the Great Financial Crisis in the USA, namely global liquidity glut that depressed interest rates more powerfully than excessive global savings, contributing to the development of the investment bubble on the housing market and, thus, the Great Financial Crisis.

Keywords: Great Financial Crisis, savings glut, banking glut, liquidity glut, global liquidity

Article classification: research article

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Grzegorz Parosa, Warsaw School of Economics, al. Niepodległości 162, 02-554, Warsaw, gparosa@gmail.com, ORCID: 0000-0002-3128-817X.

Introduction

The Great Financial Crisis of 2008 in the United States was the most severe one since the Great Depression and the Second World War. Many factors, including market abuse, inefficient institutions, and legal and regulatory failures made mortgage financing too cheap and accessible, fuelling the real estate bubble. One of the factors facilitating access to credit was undoubtedly its low cost. Several factors contributed to the low cost of financing, and the concept of global savings glut is one of them. It ties together current account imbalances experienced by the global economy in the early 21st century and purchases of the US Treasuries made by foreign investors.

The objective of this article is to confront the prevalent in literature explanation of low levels of long-term interest rates in the US before 2008, namely savings glut against another possible explanation – liquidity glut. The first chapter of the article is devoted to explaining the phenomenon of savings glut and its origins, and discussing the arguments of its proponents. The second chapter focuses on the shortcomings of savings glut theory, presenting counter-arguments to those described in the previous part. The third chapter introduces an alternative explanation for the low level of long-term interest rates in the US before the Great Financial Crisis – liquidity glut. Finally, in the last chapter, the impact of foreign investors on yields on the US Treasuries is assessed and then decomposed into savings and liquidity gluts' effects in order to determine which effect, if any, had had a greater impact on long-term interest rates in the US before the crisis.

The essence of savings glut

From the US current account deficit to excess savings

In 2005, Ben Bernanke, not yet the chairman of the Federal Reserve Bank, investigated the problem of growing current account deficit

in the United States. These considerations – exploring why the world's largest economy is a net borrower – led Bernanke to formulate the concept of global savings glut. The current account balance can be viewed from two different perspectives (Bernanke, 2005). The first one is directly related to the surplus of imports over exports. If Americans receive payments for goods and services sold abroad that are insufficient to cover their foreign purchases, they must borrow the difference on international financial markets. However, Bernanke prefers to look at the deficit in terms of savings and investments. In his opinion, the strong increase in imports of foreign goods to the United States was related to the increase in 'excessive' savings overseas. Countries with excess savings, wishing to invest them in the US, had to convert them into dollars. This resulted in the appreciation of the American currency. The more expensive dollar increased the profitability of exports to the United States, reducing the international attractiveness of goods produced there and leading to a decrease in US net exports, creating a current account deficit. This approach constitutes the essence of the savings glut concept.

Sources of excess savings

There exist many reasons for the excess of savings in the global financial market. Developed countries are mostly the ones with ageing populations, where a growing proportion of life is spent in retirement. Citizens of these countries are saving more to make sure that they can support themselves after leaving employment. These savings are not invested locally as those countries often experience slow economic growths (e.g. Japan), low population growth, and high fiscal burdens (e.g. Germany), all of which effectively depress returns on investments (Domeij & Floden, 2006). Nevertheless, the surplus of these countries, excluding Japan, constitutes merely 10% of all the savings that came to the US.

Japan is an important source of global savings. The economic crisis of the early 1990s, because of the height of corporate leverage, quickly became a balance sheet crisis (Risaburo, 2010). Excessive leverage led many companies to bankruptcy, while others, unwilling to share their fate, began to fix their balance sheets, making companies stop borrowing and investing, and start saving (debt rejection syndrome) (Koo, 2004). This behaviour of the corporate sector made it a net supplier of capital. If companies did not invest their savings, those savings, although smaller than before the crisis, had to be invested abroad.

The reason for the increased savings in the so-called Asian Tigers was different. Their saving was caused by the fear generated by the crisis that hit that region of the world at the end of the 20th century (Felipe, Kintar & Lim, 2006). Fearing a similar crisis, those countries started to accumulate considerable foreign exchange reserves, commonly called war chests, which could be used in a situation of sudden foreign capital outflow in order to stabilise exchange rates. Moreover, underdeveloped banking sectors across developing economies depress corporate investment rates, pushing savings abroad (Wam, Weng & Xu, 2017). From 1980 to 2014, Asian countries generated about 1/3 of the world GDP growth and half of the savings growth (Arora, Tyers & Zhang, 2014).

By far, the biggest source of savings in the world was China. Since 1990, Chinese citizens, companies, and the state taken together generated about 1/3 of new global savings (Arora, Tyers & Zhang, 2014; Ma & Yi, 2010). The high propensity of the Chinese to save is a result of the demographic structure, their wealth, changes in the pension system, and the restructuring of companies. High savings help orient the economy towards exports by keeping the exchange rate low versus the dollar, a typical strategy for China as well as many other developing countries (Dooley, Folkerts-Landau & Garber, 2009). The fast growth pace of the Chinese economy combined with a high propensity to save makes China generate significant amounts of savings every year (Hall, 2017).

There is yet another reason for increased savings in oil-exporting countries. From the 1980s to the beginning of this century, oil cost between \$20 and \$30 per barrel. In 2002, however, its price started to increase, reaching \$150 in 2008. Such a strong increase in oil prices boosted the value of exports from oil-producing countries and, subsequently, the current account surplus, generating significant additional savings in these countries. Of course, these countries did not have enough investment opportunities, so the funds quickly returned to international markets (Belke & Gros, 2010). It should be noted, however, that such a process had taken place also before the analysed period and is usually called petrodollar recycling (Nsouli, 2006). On the other hand, it was the strongest in 2008, when the Great Financial Crisis had already begun, abating the importance of oil exporters in causing the crisis.

The direction of capital movements on the world market of 2001-2008

The analysis of global savings in static terms is not sufficient to show the impact of their global excess on the US long-term interest rates. It is also necessary to prove that savings generated outside the United States have largely flowed into that country.

More light on the problem of international capital flows is shed in Figure 1, which shows the accumulated current account balances over the period of 2000-2008. It can be easily seen that the US deficit had to be covered by surpluses of the rest of the world. It is also clear that significant current account surpluses were generated by three groups of countries:

1. Highly developed ageing countries, such as Japan and Germany,
2. Oil exporting countries, led by Saudi Arabia,
3. China and the Asian Tigers (they started generating high surpluses after the South Asian crisis, so this is not visible on the map).

Having identified potential sources of financing for the US deficit, it must be established what



Figure 1. Accumulated current account balances worldwide in the years 2000-2008 in USD bn.

Source: World Economic Outlook, International Monetary Fund, 2018.

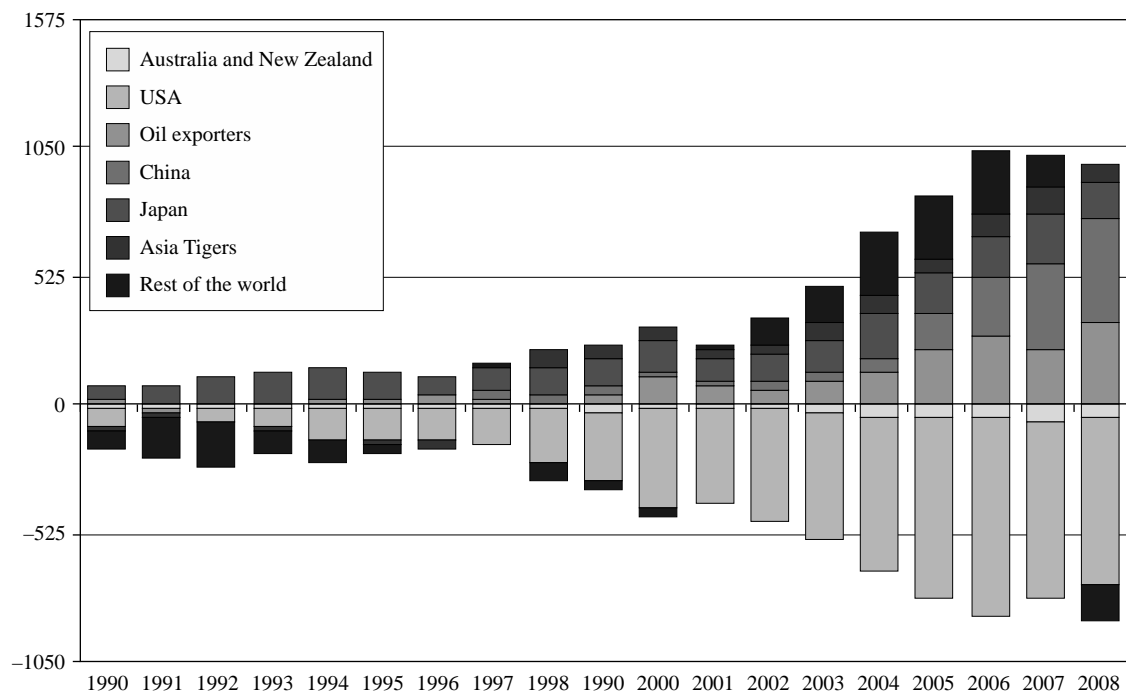


Figure 2. Current account balances of selected countries in the years 1990-2008 in USD bn.

Source: own elaboration based on Balance of Payments, OECD.Stat.

part of the US deficit they could cover. Figure 2 presents changes in current account balances in countries constituting the above-mentioned groups and the United States in the years 1980-2008. A strong negative correlation is clearly visible. The correlation coefficient between the US current account deficit and the sum of surpluses of countries from the three groups mentioned above (-0.85) confirms this observation. In the years preceding the crisis, the USA had used 10% of all global savings, and 75% of the global current account surpluses flowed there.

Factors attracting capital to the US

Two phenomena are still puzzling. Why did global savings go en masse to the United States and why did they continue to flow to the United States despite the falling long-term interest rates that made investing there less attractive (Dooley, Folkerts-Landau & Garber, 2009)?

The quality of institutions is crucial to the investment climate. Whether the legal system in a given country is stable and guarantees justice and order, minimises corruption, and ensures a high level of protection of property rights determines investment decisions (Chinn & Ito, 2006). The United States has always been at the top of rankings devoted to such issues. It is not without reason that investors all over the world used to say that money invested in the US “flew to safety” (Chandrasekhar & Ghosh, 2005). No less important are formal institutions, closely related to financial markets. Highly developed financial markets, rich in complex financial instruments, were able to absorb the excess savings (Clarida, 2005) created on less developed markets. In addition, market development in the US caused the rate of savings to decrease, which further increased the demand for savings from outside (Bernanke, 2005).

These factors combined with the size of the American economy, and historical events led to the use of the US dollar as a world currency. This means that most of the world’s reserves are held

in dollar-denominated securities. This, on the one hand, increases the demand for such instruments and, on the other, makes other countries able to accept relatively lower rates of return than on identical non-dollar-denominated investments (Chandrasekhar & Ghosh, 2005).

These factors, obviously, did not change abruptly in the run-up of the crisis. Therefore, they could not directly contribute to the increased inflow of funds to the US during this period. Their role should be seen as a counteracting mechanism that would normally lead to a reduction in the amount of money invested in the United States. The obligation to select dollar-denominated assets for reserve purposes and the desire to acquire the least risky assets motivated so many investors to invest in the US.

Relevant research confirms that the quality of US institutions (Alfaro, Kalemli-Ozcan & Volosovych, 2007), the deregulation of the US banking sector of the 1980s, which opened it to external financing (Hoffmann & Stewen, 2014), and the use of the USD as a global reserve currency (Chandrasekhar & Ghosh, 2005) were important factors in attracting savings to the US in the wake of the Great Financial Crisis.

By 1995, for two decades, labour productivity in the United States had been increasing by 0.5 to 1% per year. Since 1995, however, there was a significant acceleration to 3% annually. This leap is usually attributed to technical progress and the development of the so-called new economy (Bems, Dedola & Smets, 2007). Such an important change had several important consequences. First of all, higher productivity increased the expected rates of return in the USA, resulting in an inflow of capital to the USA, which, in turn, contributed to the appreciation of the dollar. Secondly, the investment rate in the US alone also increased. Finally, expectations of higher rates of return led to an increase in asset prices, the wealth of households, and their expected future income. This resulted in a decrease in the savings rate and an increase in consumption. Labour productivity growth is the single best predictor

of many economic phenomena of the US economy at the turn of centuries. This includes current account deficits, rising asset prices, and falling savings rates. Research shows that this is one of the key factors influencing the US current account deficit, explaining even 1/3 of its value (Hunt & Rebucci, 2005).

The conundrum

According to the pure theory of expectations, long-term interest rates should move as their short-term counterparts do. Both were moving in line with this theory's predictions until 2002. In the second half of 2004, FED ended its policy of maintaining interest rates at 1% and initiated a series of Fed Funds Rate hikes, bringing it to 5.25% by mid-2006. By the end of 2004, however, the growing Fed Funds Rate was accompanied by a falling yield on a ten-year US government bond. The general downward trend in bond yields continued until mid-2005. In the light of pure expectation theory, such market behaviour was atypical and could indicate that the investor's perception of future economic conditions was negative. This led to the question of what, if not the decision of the FED, drove the yields on ten-year bonds. For Alan Greenspan, the natural candidates were global savings coming to the US, most likely in the form of mass purchases of US bonds by foreign investors and the governments of developing countries (primarily China and the Asian Tigers) (Greenspan, 2010).

The criticism of the savings glut concept

America consuming too much

For most part of the 1990s, the US had to raise between 3% and 7% of its GDP from abroad to cover its investment needs. This situation started to change in 1998 when the capital requirements of the world's largest economy began to exceed the savings of the Americans by an even higher margin. In 2004 and 2005, investments exceeded

savings by 13%. This was due to a stronger fall in the savings rate than in the investment rate. Research suggests that on the verge of the crisis, the United States experienced a shortage of savings rather than an investment boom (Hubbard, 2006). Excess savings flowing into the US should cause an investment boom; instead, in the pre-crisis period, consumption was on the rise (Laibson & Mollerstrom, 2010).

David Laibson and Johanna Mollerstrom (2010) propose another explanation for the events before the crisis. In their research, they take into account the existence of the real estate and stock market bubble. For eighteen OECD countries, bubbles in asset markets explain the growing consumption, foreign capital inflows, and falling bond yields better than the competing concepts. In these authors' opinion, rising property prices explain half of the volatility of current account deficits.

The fact is, however, that a very strong link between the savings of China and the USA existed. The correlation coefficient between these values was -0.71. This means that the Chinese were saving for the Americans and the Americans were consuming for the Chinese. In the face of the aforementioned studies, the United States, which consumes a large part of its income and sucks in the world's savings, is to blame for this phenomenon to a greater extent (Summers, 2004).

Twin deficits

The twin deficit theory states that the current account deficit is positively correlated with the budget deficit. The government's debt is partly financed by foreign funds, whose inflow increases the current account deficit. Increasing government spending also drives domestic demand. This causes interest rates to rise relatively to rates in other countries. Higher interest rates attract investors who need to convert their resources to invest, strengthening the demand for the currency of a country that increases its budget deficit and leading to the appreciation of its exchange rate. As a result, imports into that country become more

attractive and exports do not create the current account deficit to such a great extent (Corsetti & Müller, 2006).

However, the significance of this dependence is highly questionable. In the history of the United States, there were periods in which both deficits increased and decreased simultaneously, as well as periods in which they moved in opposite directions. For example, when the trade balance deteriorated between 1990 and 2005, the government's debt fell in the 1990s and rose strongly after 2000. The situation was different in the 1980s, when the deterioration and subsequent improvement in the trade balance was accompanied by an increase and subsequent decrease in the budget deficit (Bems, Dedola & Smets, 2007).

Twin deficits were repeatedly analysed quantitatively. Unfortunately, the results differ significantly. Depending on the group of countries, period, and methodology, correlation coefficients vary between 0.07 and 0.375 (Bems, Dedola & Smets, 2007). From the point of view of this article, the most suitable studies conducted for the United States in the period preceding the Great Financial Crisis show a correlation coefficient of 0.2 (Erceg, Guerrieri & Gust, 2005). Combined with the previously described mechanism of the budget deficit influencing the current account deficit, the fiscal deficit run by the US government before the crisis had had some impact on the current account deficit, but it was not a key factor in its creation.

Parsimonious Asia

The concept of developing countries flooding the world with money and thus contributing to the decline of interest rates in the USA is opposed by the main party accused, namely the Chinese. They claim that the level of savings in their country was regular, and it is the Americans who consumed too much (Batson, 2009). The opinion of the Chinese seems to be confirmed by relevant research. While after 2000 there was indeed a clear increase in savings in South-East Asian countries, a more detailed analysis dating back to the early

1990s shows that nothing unusual happened with savings rates there. Everything seems to indicate that it was not the excessive savings at the beginning of this century, but, rather, it had been low levels of savings in previous years that had been an anomaly (Felipe, Kintar & Lim, 2006). This situation was most likely caused by the crisis of that region in 1997. The subsequent growth should rather be seen as a return to average. One exception is China, whose savings in relation to GDP not only returned to the pre-crisis levels, but increased by ten percentage points. This was caused by reasons unique to China, such as the speed of income growth and the changing demographic structure (Modigliani & Cao Shi, 2004). It should also be noted that Chinese investments grew only slightly more slowly during this period.

It seems that the problem of Asian countries was not an elevated level of savings in relation to the normal volume of investment opportunities, but too few investment opportunities in relation to the historically normal level of savings (investment drought) (Felipe, Kintar & Lim, 2006). As in the case of savings, the fall in investment happened after the Asian crisis. The main reasons for this involve weak credit production and overcapacity created before the crisis (Felipe, Kintar & Lim, 2006). The low level of investment in Asia led to a weaker economic growth, which, in turn, contributed to lower imports from the United States and lower economic activity there, which, in turn, reduced interest rates. Lower expected returns in Asia also resulted in the relative attractiveness of the USA to the investors, further strengthening the dollar and – through an increased demand for the US Treasuries – depressed the long-term US interest rates. Studies indicate that these mechanisms had a significant impact on the creation of the US current account deficit, explaining 30% of its value (Ferguson, 2005).

The conundrum – a mystery solved

The behaviour of long-term interest rates after the Fed Funds Rate increased in 2004 and

2005 suggests the presence of a factor other than short-term interest rates that drove their long-term counterparts. However, the research does not support the conclusions of the former Chairman of the FED, namely that this factor was the excess of global savings flooding the US.

It is difficult to accuse foreigners when similar phenomena did also occur in the US and the share of the Treasuries with a maturity longer than five years in foreign government portfolios amounted only to 27% (Tao, 2005). It turns out that the most important factor in shaping the conundrum was the time premium, i.e. the compensation demanded by investors in return for postponing consumption over time. Its fall can be attributed to the decreasing market volatility and a greater predictability of monetary policy (Backus & Wright, 2007).

Some authors indicate that the unexpected behaviour of long-term interest rates was due to the inertia of the bond market (Fels, 2005). In their opinion, the amount of excess monetary liquidity on the markets was unprecedented, and small changes in short-term interest rates could not change that in a short time. Among others, John Taylor (2009) claims that the cause of the conundrum should be seen in keeping the Fed Funds Rate too low for too long, which led to the creation of excessive liquidity. It is highly likely that if the monetary authorities had raised the interest rates earlier, the conundrum would have occurred with reduced force or not at all.

The mere fact that the conundrum existed does not entitle one to draw conclusions about the influx of savings occurring before it, as Alan Greenspan does. After all, if at the time of the conundrum the inflow of foreign funds was as strong as before, it could not cause long-term rates to fall only after the Fed Funds Rate had been reduced. In such a situation, it is expected that the rates would be reduced by a certain amount throughout the period of the increased inflow of the foreign funds. The conundrum must have been caused by a factor taking effect precisely when short-term interest rates started to be raised. This coincidence makes

it much more probable that maintaining interest rates on the record-low level of 1% reduced the efficiency of monetary policy.

Global savings ex-post

The strongest argument against savings glut was made, among others, by John B. Taylor (2009) and Stephen Roach (2009). The former one not only believes that global savings glut did not exist, but he even claims that there was a global savings shortfall. This thesis is confirmed by the IMF research (Terrones & Cardarelli, 2005). Global savings in 2002 were on their lowest levels since the 1970s (the IMF analysis goes only that far). In 2002, although savings started to grow, they remained at record-low levels until 2004.

However, such an argument could only be used after the period to which it relates. Monetary policymakers did not have access to relevant data when deciding on the level of short-term interest rates. The increase in the current account deficit combined with rising savings rates in some countries might have led to the conclusion that a surplus of savings existed and depressed long-term interest rates. The data available at that time indicated a significant fall in inflation to only 0.6% per year, suggesting a real risk of deflation (Zandi, 2009). Mitigation of that risk became the main objective of monetary policy during that period (Bernanke, 2002).

The mere absence of a surplus of global savings in absolute terms does not, however, directly contradict the savings glut theory, which states not so much that there were too many savings, but that they were unevenly distributed. It is therefore sufficient to increase the ratio of savings of the rest of the world to savings in the United States. For long-term interest rates in the US, whether a fixed part of growing savings or a larger part of fixed or falling savings flowed to the US was irrelevant; the result in both cases would be the decline of interest rates.

The review of empirical studies on the savings glut's impact on the US economy

The impact of foreign investments on long-term interest rates in the US was thoroughly analysed. Bertaut (2011) indicates a drop in yields by 11 to 15 bps in response to purchases worth USD 100 billion. Warnock and Warnock suggest that such purchases lower rates by 15-32 bps, Beltran reports 49 bps, Gagnon 6 bps, D'Amico and King 10 bps, and Hamilton and Wu 4 bps. Rudebush, Swanson and Wu, on the other hand, found no impact of bond purchases on their profitability (Bertaut et al., 2011).

Francis and Veronica Warnock (2006) verified the impact of American ten-year bond purchases by foreign investors on long-term interest rates, and came to the conclusion that foreign purchases had lowered the yields on the ten-year Treasuries by 90 bps before the crisis. They also stated that two-thirds of this decline could be attributed to purchases made by countries from South-East Asia. The development of this study is presented later in this paper.

Vipin Arora, Rod Tyers and Ying Zhang (2014) investigated the impact of surpluses in China's and Japan's current accounts on the yields on long-term US government bonds while controlling the effects of monetary policy. They found out that every additional \$1 billion of surpluses in these two countries results in a 4.6 bps drop in real US yields.

Pietro Cova and Filippo Natoli (2016) analysed the impact of the savings glut on the yields of ten-year US bonds before the crisis, comparing it with the impact of the banking glut. They estimated the total impact of savings glut to be 80 bps. The significance of savings glut was also analysed by Alejandro Justiniano, Giorgio Primiceri and Andrea Tambalotti (2013), who indicated that a decrease in bond yields before the crisis by ca. 100 bps had been caused by excessive savings. Bertaut (2011) also assessed the significance of this effect, finding a 50-140 bps drop in ten-year bond yields due to savings glut. Steinberg (2019) established that the global savings glut accounted

for almost the whole US trade deficit, but was not the main factor driving real interest rates.

Liquidity glut

An alternative to the concept of savings glut is the theory of liquidity glut discussed in this chapter. It assumes that it was not excessive savings, but excessive monetary liquidity that flowed into the USA, depressing long-term interest rates.

Monetary liquidity

Monetary liquidity is linked to short-term interest rates and the aggregate money supply – it determines the state of money markets (Becker, 2007). Different indicators are used to measure monetary liquidity. The Marshallian K seems to be the most appropriate indicator for an international liquidity analysis (Fels, 2005). It is obtained by dividing one of the monetary aggregates by the nominal value of GDP. Since central banks nowadays are putting a very small amount of money into circulation directly, the widest available aggregate, M3, seems most appropriate (Becker, 2007).

It should be noted that the global liquidity at the M3 level is mostly American. As an issuer of the dollar, the FED controls 40%. Another 30% is held by the European Central Bank, and another 15% by the Bank of Japan. 5% is issued by the Bank of England, while the rest of the world controls 10% of the world's liquidity (Belke & Gros, 2010).

The impact of global liquidity on bond yields has been studied. Mesut Türkay (2018) proves that global liquidity can explain 10% of the volatility of government bond yields. Simon Gilchrist, Vivian Z. Yue and Egon Zakrajsek (2016) point to a decrease in the US risk premiums of 5-15 bps in response to a 10-bps decrease in the Fed Funds Rate and a 4-10 bps decrease in premiums in other developed countries. Marcel Frazscher, Marco Duca and Roland Straub (2013) analysed the impact of unconventional US monetary policy on yields of government bonds issued by non-US

governments. According to these authors' study, the entire quantitative easing programme in 2010 was responsible for a drop in risk premiums in developed countries of about 210 bps as well as in developing countries of approximately 160 bps.

The right amount of liquidity and the effects of its excess

In order to determine whether central banks supplied too much money to international markets, it is necessary to define what the right amount of money is. In order to support all transactions in the economy, the money supply should grow at the rate of economic growth, assuming that its velocity is constant¹. Each additional increment is an excess of liquidity (Fels, 2005). Money not used in economic transactions must be used differently. There is extensive literature available on the effects of excess liquidity, which clearly states that it leads to inflation through three channels (Baks

& Kramer, 2007). First, excess liquidity means that there are more funds for which a relatively fixed amount of goods can be bought. Secondly, an increase in liquidity combined with an increase in asset prices gives the impression of improving economic conditions and, as a result, improves investor sentiment. Finally, a decrease in interest rates associated with an increase in liquidity causes a reduction in the discount factors used to value future cash flows. The effects of excess liquidity might, therefore, be similar to the proposed effects of excess savings.

Global liquidity before the crisis

The changes in the Marshallian K between 1995 and 2008 in countries responsible for the creation of most of the world's liquidity are presented in Figure 3. Any increase in the Marshallian K should be interpreted as the creation of excessive liquidity. It is clear that the global money supply

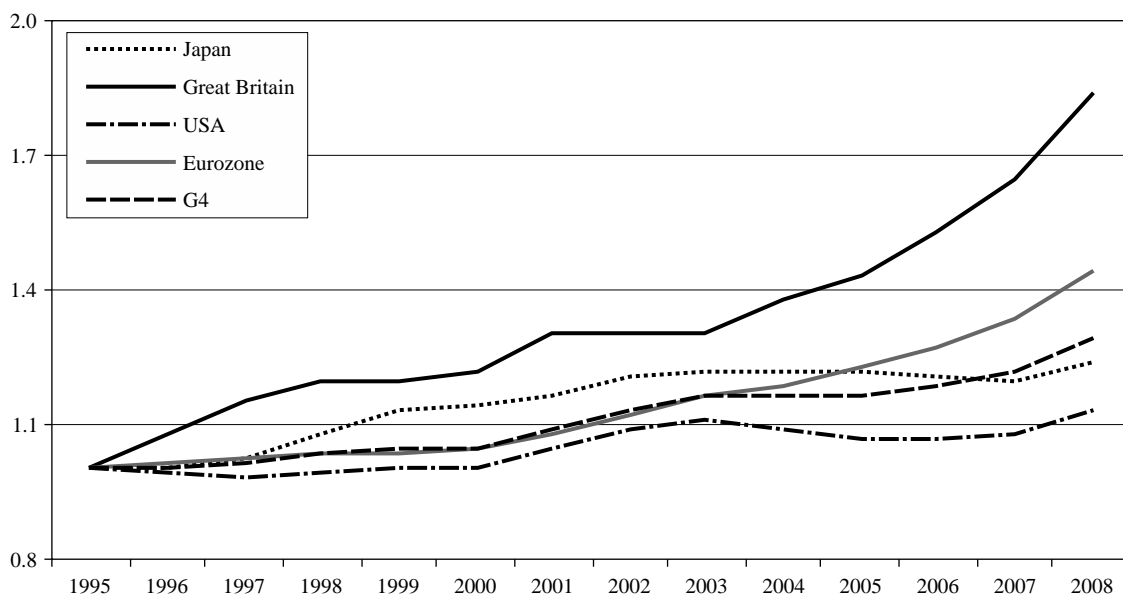


Figure 3. The Marshallian K for the creators of world liquidity in the years 1995-2008, 1995 = 1

Source: own elaboration based on data from OECD.Stat.

¹ In fact, due to increasing specialisation, the value of transactions in a given economy is growing faster than the economy itself, which inflates the amount of 'excess' liquidity suggested by this indicator.

remained relatively stable until 2000, with the only exception being Japan, which was still struggling with the effects of the crisis of the early 1990s. The intensive creation of excessive liquidity began in 2001. By 2004, the international market had been flooded by a money surplus of nearly 20% of issuers' GDP (Becker, 2007). In 2004, the United States stopped its monetary expansion, but concurrently the European Central Bank and the Bank of England increased their activity in this field. This resulted in a continuous increase in global excess liquidity in the period preceding the outbreak of the crisis in 2007 (Belke & Gros, 2010).

In the period of 2001-2008, there was an excess of liquidity worldwide. However, the sources of this liquidity evolved over time, and in order for the liquidity glut theory to be deemed valid, it must be proved that liquidity can move across borders just as much as savings in the savings glut theory can. The best proof of the international character of liquidity seems to be Japan. The country had a policy of keeping interest rates permanently at 0%, which made it an excellent source of liquidity. In the period of 2004-2007 alone, the loans taken out in Japan by foreign banks under the carry trade mechanism increased from 2.7% to 43% on the Japanese interbank lending market (Becker, 2007). Similar mechanisms were also observed in the United States and the European Union (Baks & Kramer, 2007), where an increase in money supply resulted in an increase in the liquidity of the rest of the world.

The excess of liquidity also better fits the events that took place after the outbreak of the crisis (Bracke & Fidora, 2008; Reiseman, 2010). The banks experienced shortages of capital, not liquidity, and increasing the latter did not bring any results. The very fact that the crisis broke out also comes as a surprise, if it was caused by savings. Those savings did not disappear in 2007-2009; on the contrary, they grew further in that period (World Bank, 2010). Studies confirm that global liquidity affected the real estate market much more than the prices of consumer goods or other investment assets did (Darius, 2010).

Global Banking Glut

After the end of the Great Financial Crisis, Claudio Borio and Piti Disyatat (2011) criticised the concept of savings glut for focusing on the imbalance of current accounts between countries and ignoring the importance of financial flows, financial sector regulation, and excessive credit supply. They claimed that the problem was not directly caused by excessive savings, but by excess financial flexibility in the financial sector.

Borio and Disyatat's comments reflect the global banking glut theory (Shin, 2011). According to this theory, the main factor lowering interest rates in the USA was purchases made by banks, mainly European. International bank financing was made possible in the US by the deregulation of the sector in the 1980s (Hoffmann & Stewen, 2014). Because banks did not buy government bonds, they could not influence their yields in a direct way. Yet, instruments directly related to mortgage loan financing (MBS) were of great interest to European banks. The increased demand for these instruments caused their valuations to increase and the yields on them to decrease, which, in turn, led to a relative increase in the attractiveness of American government bonds, which consequently attracted investors who expected the rates of return to fall further. In this way, purchases of instruments based on mortgage loans not only fuelled the real estate bubble in a direct manner, but they also facilitated its creation by depressing long-term interest rates (Justiniano, Primiceri & Tambalotti, 2007). Indeed, while the inflow of foreign funds into the government bond market before the crisis had been about \$1 trillion, purchases of corporate bonds and mortgage-backed securities by European banks amounted to \$1.25 trillion (Bertaut et al., 2011).

Empirical research confirms the important role of purchases made by banks. Bertaut (2011) estimates their impact on ABS yields at 60-160 bps. Maria Punzi and Karlo Kauko (2015) studied the importance of bank inflows and the acquisition of the Treasuries by foreign investors for the supply

of mortgages and real estate prices. The banks' actions explain 17% and 36% of their volatility respectively, and the purchase of bonds only 0.2% and 0.4%. Moreover, Pietro Cova and Filippo Natoli (2016) examined the impact of this mechanism on the yields of ten-year US government bonds, finding out a decrease in their yields of 30 bps at the beginning of the 21st century and as much as 200 bps just before the crisis – much more than the impact of savings glut. Similarly, Alejandro Justiniano, Giorgio Primiceri and Andrea Tambalotti (2013) claim that banking glut depressed the Treasury yields by 40 bps.

Global banking glut is no alternative to the concepts of savings glut and liquidity glut. Rather, it is a possible channel of transmission of excessive savings or liquidity to the American market. The purchases of European banks could be financed both by savings and by excess monetary liquidity. Measuring global liquidity with the Marshallian K based on the M3 aggregate allows for taking into account not only the effects of monetary policies conducted by countries, but also for taking into account bank credit – liquidity created by banks. In this way, the research carried out in the next chapter takes into account global banking glut

effects in the size of the savings glut effect (if European banks financed themselves with savings) or liquidity glut (if banks financed their activities with less restrictive capital requirements and cheaper money related to the loose monetary policy applied by the monetary authorities in different countries during that period).

The statistical analysis of the savings and liquidity gluts' impact on the US long-term interest rates

Capital inflows to the USA and long-term interest rates

The research presented in this chapter is an extension of that carried out by Francis and Veronica Warnock (2006). They conducted a study of the factors determining long-term interest rates in the US between 1985 and 2005. For the purpose of this work, the study was repeated for the period 1995-2008. The same explanatory variables were used to explain the yields on ten-year US government bonds and the data was obtained from the same sources. Two variables had to be dropped as the budget deficit and the expected

Table 1. Description, data sources, and results of estimating the model of yields of ten-year US government bonds

| Explanatory variable | Coefficient | Description | Data source | p-value |
|------------------------------|-------------|---|---|-----------------------|
| πe_{t+10} | 1.255 | Expected inflation in 10 years | Philadelphia Fed's Survey of Professional Forecasters | $8.66 \cdot 10^{-11}$ |
| ff_t | 0.275 | Fed Funds Rate | FRB Data Download Program | $9.63 \cdot 10^{-25}$ |
| $\pi e_{t+1} - \pi e_{t+10}$ | 0.210 | Inflation expected next year minus inflation expected in 10 years | Blue Chip Survey | 0.011 |
| rp_t | 0.957 | Risk premium | 36-month long-term interest rate variation (moving average) | 0.015 |
| $foreign_t$ | -0.267 | Foreign purchases of 10-year US bonds | Treasury International Capital System | $9.33 \cdot 10^{-5}$ |

Source: own elaboration.

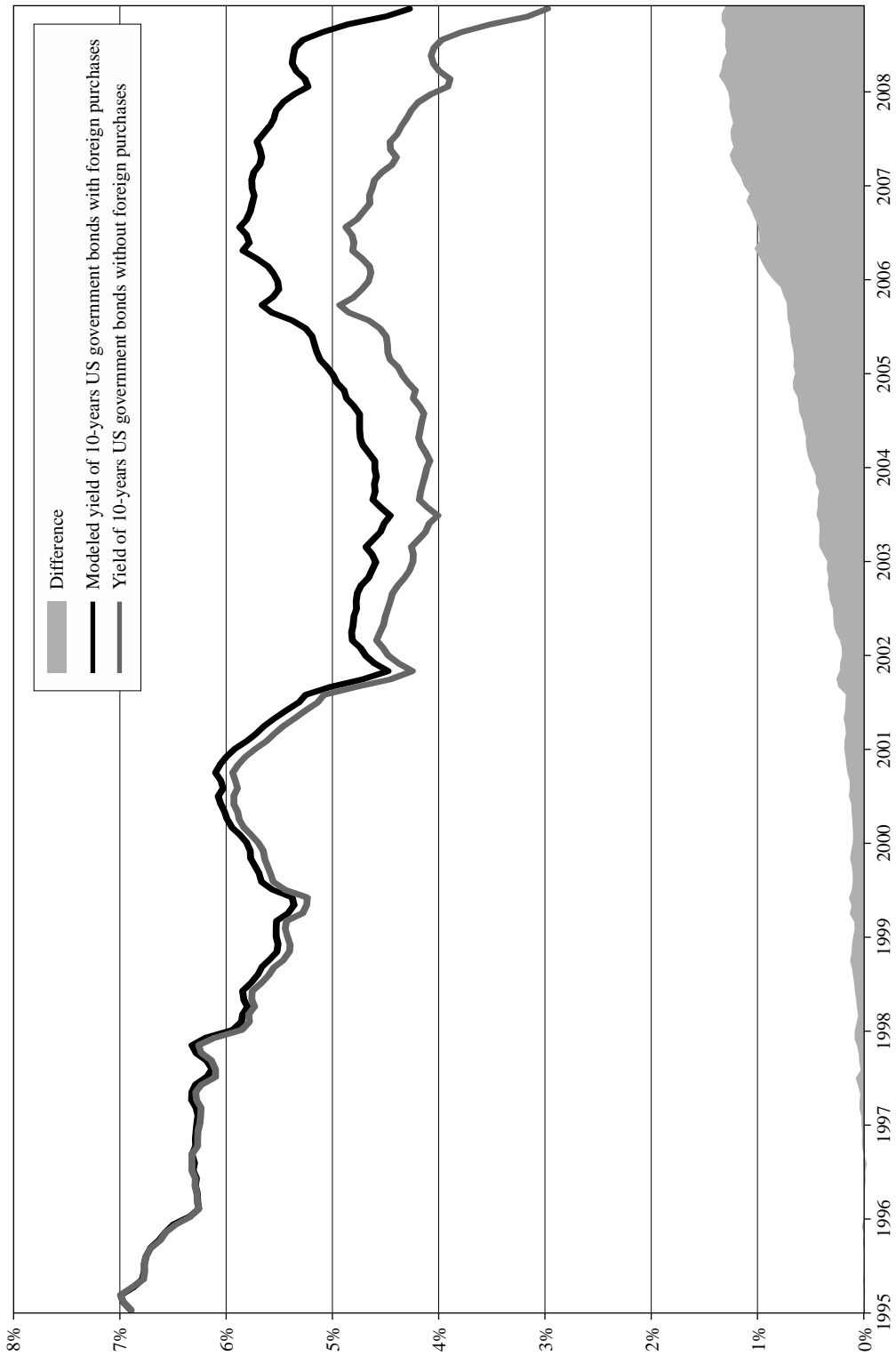


Figure 4. Yield on the ten-year US government bond with and without taking into account the demand shock associated with the inflow of foreign capital in the years 1995-2009, and the difference

Source: own elaboration.

GDP growth in the following year turned out to be statistically insignificant between 1995 and 2008. The estimated formula was, therefore, as follows:

$$i_{t,10} = a + b\pi e_{t+10} + cff_t + d(\pi e_{t+1} - \pi e_{t+10}) + e(rp_t) + \varepsilon_t$$

All explanatory variables used – alongside the results of the estimation obtained using LSM as well as the data sources – are listed in Table 1.

The R^2 coefficient of the model is 0.82. Thorough tests of statistical correctness of the model did not show any irregularities.

In order to determine the impact of foreign capital inflows on long-term interest rates, an alternative scenario was calculated. It assumes that the explanatory variable responsible for the capital inflow to the US takes a constant value, equal to that from the beginning of the period. In this way, the demand shock associated with increased purchases of the US Treasuries by foreign investors was eliminated. Figure 4 presents the yields on ten-year government bonds, indicated by the model with and without the analysed demand shock.

Figure 4 leaves no doubt as to the significance of foreign inflows for the long-term interest rate developments in the US. The growing importance of this factor in the period between the 2001 crisis and the one starting in 2007 is also clearly visible. While before the year 2001 foreign capital had had a marginal impact on ten-year government bond yields, in 2005 it was 80 and in 2008 it amounted to 140 basis points. These results are consistent with those obtained by Francis and Veronica Warnock (2006).

Savings glut or liquidity glut?

After determining that purchases made by non-US entities were responsible for reducing ten-year bond yields by as much as 140 basis points in 2007, it remains to be clarified why those purchases were made. The paper presents two alternative explanations: excess savings and excess liquidity.

In order to determine the significance of each of these two factors, a multiple regression model was estimated. To explain foreign purchases of the American Treasuries, two variables representing the two discussed phenomena were used. The sum of savings in the countries previously identified as sources of excess savings in relation to their GDPs acted as representations of the savings glut. The Marshallian K for the countries-sources of global liquidity represented global liquidity. The estimated formula is as follows:

$$\text{foreign}_t = amk_t + bsr_t + \varepsilon_t$$

The regression might overestimate the share of the liquidity glut effect in depressing the long-term interest rates because of an upward trend both in the variable representing this effect and in bond purchases made by foreign investors. Moreover, some steady growth of the Marshallian K is natural and results from the growing specialisation of the economies. Therefore, the results of the estimation with de-trended Marshallian K are presented. The trend was established based on the growth of this indicator in the years 1995-2000. The Marshallian K was growing steadily then by about 1% a year. The entire trend has been removed, which, in turn, might underestimate the share of the liquidity glut effect in the overall reduction of yield of ten-year bonds. However, it is not possible to determine which part of this increase occurs due to the growing specialisation of economies and which part is due to the increase in excessive liquidity. The explanatory variables, the results of the estimation done using LSM, and the data sources are all listed in Table 2.

The R^2 coefficient of the model is 0.91. Taking into consideration the mechanisms described above, it can be concluded that both variables analysed together are responsible for the variance of the yields on ten-year US government bonds over the considered period. The relevant tests leave no doubt as to the relevance of both explanatory variables.

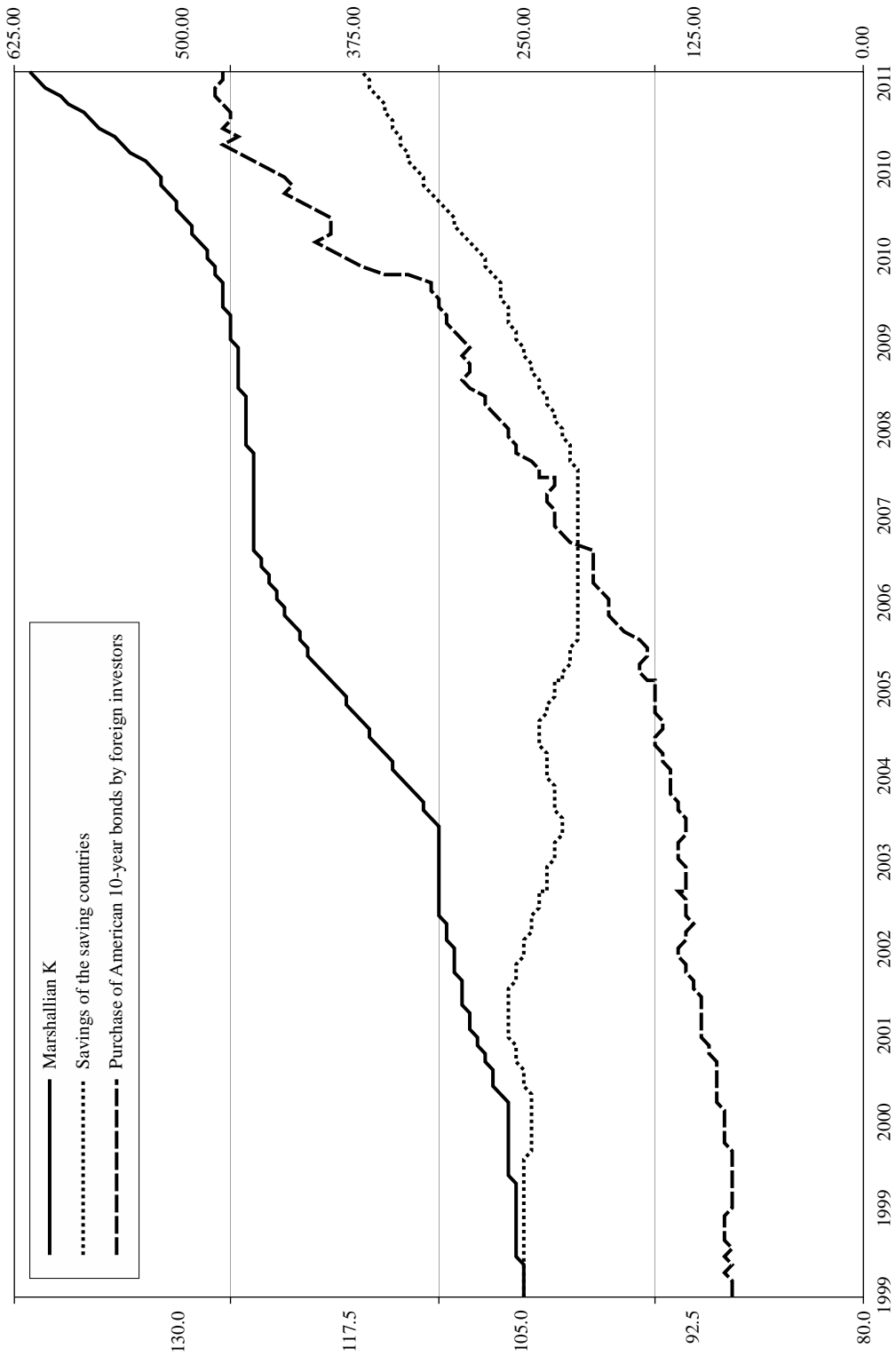


Figure 5. Marshallian K, savings rate in countries suspected of generating excessive savings (left axis) and the purchases of the US ten-year bonds by foreign investors (right axis) in 1995-2008. 1995 = 100

Source: own elaboration based on OECD.Stat data.

Table 2. Description, data sources and results of the estimation of the sources of the US ten-year bond purchases model

| Explanatory variable | Coefficient | Description | Data source | p-value |
|----------------------|-------------|---|--|-----------------------|
| mk_t | 0.171 | World Marshallian K | OECD.Stat | $2.92 \cdot 10^{-59}$ |
| sr_t | 51.046 | Savings rate in global surplus saving countries weighted by their GDP | Global Development Finance, The World Bank | $2.62 \cdot 10^{-37}$ |

Source: own elaboration.

In order to determine to what extent each of the examined effects was responsible for purchases of American bonds, four scenarios were estimated and compared. In the first one, both the demand shocks related to savings and liquidity gluts were included. The second and third ones take into account only one of these factors, while the fourth one assumes that foreign purchases of the American Treasuries did not take place. The first and the fourth ones were already presented in the previous subsection. Figure 6 demonstrates all four scenarios.

The impact of both effects increased over time, but the weight and direction are different. This phenomenon is presented in Figure 7, showing the impact that each of those particular factors had on the long-term interest rate in the USA.

Until the beginning of 2006, out of the two factors analysed, only liquidity was significant in depressing long-term interest rates. The excess of savings was smaller in this period than in 1995, and this shortfall relatively increased the yield on bonds by about 20 bps. Later, however, savings started to increase and in 2007 they reduced

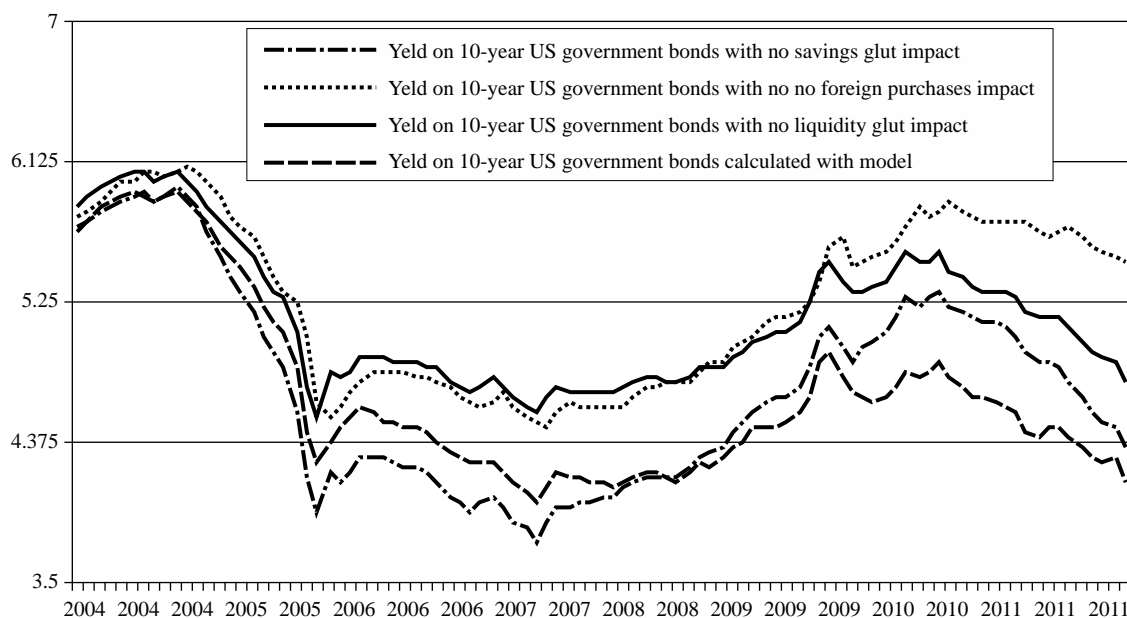


Figure 6. Yields on ten-year US government bonds with and without taking into account demand shocks related to the inflow of global savings and liquidity in 2000-2008, p.p.

Source: own elaboration.

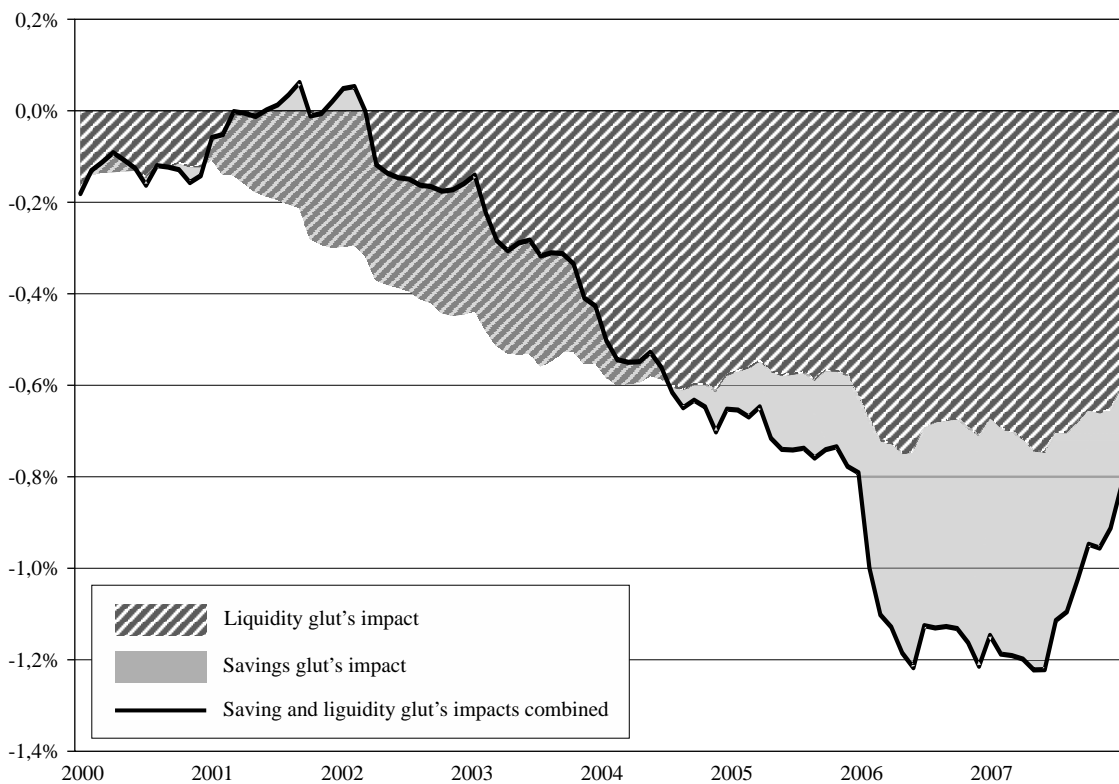


Figure 7. The impact of global savings and liquidity gluts on the profitability of ten-year US government bonds in the years 2000-2008

Source: own elaboration.

the long-term interest rates by 45 bps. Nevertheless, the importance of savings is marginal when compared to monetary liquidity. It was decreasing interest rates throughout the whole period. In 2000, it was 20 bps. and in 2008 – 75 bps. Both factors explain the 120 out of 140 bps drop in long-term interest rates caused by foreign purchases of the Treasuries.

It should be remembered that the development of the speculative bubble had taken place earlier, i.e. before the supply shock associated with the accumulation of savings started to be significant. In 2006, the existence of a real estate bubble was a fact (Zandi, 2009). In the period of 2000-2006, practically only excess liquidity reduced long-term interest rates, which is why – assuming that

it was the low interest rates that contributed to the crisis – it was the global liquidity glut that helped its creation, not the savings glut.

Concluding remarks

A closer look at the countries that were excessive savers shows that they have no common denominator. Savings of countries with ageing populations constitute too small a portion of global savings to affect interest rates in the US. The Asian Tigers increased their savings during the considered period, but this was a return to the long-term average. This increase in savings surpassed growth in investments, forcing savings abroad. Oil exporters always recorded significant

surpluses, and a significant growth took place long after the bubble in the US real estate market had developed. China, in turn, was indeed saving more and more. At the same time, Americans were saving far less than their economy required during that period, and they had to cover these deficiencies on international markets.

The US Treasuries were bought with funds originating in many parts of the world, leading to a reduction of long-term interest rates by 140 bps in 2007. Such significant purchases of American bonds were possible due to the investment attractiveness of the US. A high quality of institutions, a wide range of available financial instruments, highly developed financial market, high productivity, and attractive rates of return were just some of the factors attracting capital. High consumption and insufficient savings to cover investment needs were also of great importance. This, combined with the ability to issue a world reserve currency, enabled the United States to raise any amount of capital.

However, the attractiveness of the US alone could not finance the purchase of the Treasuries. This paper discusses two possible sources of the financing of those purchases: savings gluts and liquidity gluts. Although the former ones actually existed, its significance in shaping the level of long-term interest rates before the Great Financial Crisis in the US had been relatively low, peaking at 45 bps in 2007. Moreover, its impact became significant when the real estate bubble had already existed. The issue of excess liquidity is different. In contrast to savings, it reached record levels in the period of 2001-2007. Sources have changed over time, but through the far-reaching integration of financial markets, one can talk about global rather than local liquidity. It flowed to the United States and lowered the yields on government bonds – both directly and indirectly – by up to 75bps, resulting in a cheaper mortgage and, consequently, helping the real estate bubble grow.

Further research is necessary to establish whether similar effects occur today, when levels of current account imbalances are similar to

the pre-Great Financial Crisis levels and after the tightening of monetary policy in the US, as well as the continuing of ultra-low interest rate policies and the quantitative easing in Europe and Japan.

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