Centre for Economic Policy Research
POLICY INSIGHT No.101
April 2020

The "burden" of Swiss public debt: Lessons from research and options for the future

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The Swiss Confederation's finances are in an excellent shape. The Federal government's debt stands at only 13.2% in GDP in 2018 and the yields are negative across the curve. This represents a striking contrast to the situation of rising debt in the 1990's that led the country to adopt a debt brake rule. While most advanced economies experienced deficits over the last decade, Switzerland instead paid back nearly a quarter of its public debt. The Swiss case is only the most striking example of a situation observed in other economies, such as Germany.

Is this still the appropriate policy, or should we instead consider a more flexible approach of public finances? We argue that the latter is warranted. This does not imply getting rid of the debt brake, a tool that has provided welcomed discipline on the budgetary prospect, but simply taking a more balanced view and avoiding the current bias towards surpluses in the implementation of the debt brake. The need for flexibility is stressed in the recent Article IV mission of the IMF (2019).

Sustainable deficits are possible

Switzerland provides a striking illustration of the pattern documented by Blanchard (2019) for the United States, namely that the interest rate on public debt is often lower than the growth rate of GDP. Historical data show that sovereign yields have been lower than the growth rate historically, with the "lost decade" of low growth in the 1990's being an exception. In the current configuration of interest rates and medium run growth forecast, we estimate that Switzerland could keep its debt to GDP ratio steady and still run a primary fiscal deficit of CHF 2.8 billion (0.4% of GDP).

Borrowing to fight the Covid19 epidemic is feasible

The ongoing epidemic requires drastic public health measures that will lead to a very sharp recession in the short-run. The Swiss authorities have taken a serie of fiscal policy measures, such as temporary benefits allowing firms to retain their workers and state-guaranteed loans through banks for businesses, in order to avoid inefficient layoffs and bankruptcies and preserve productive capacity. Several economists have called for an increase in public debt to absorb the cost of the temporary shock (Alós-Ferrer et. Al. 2020, Danthine 2020, Gersbach and Sturm 2020).

We show that Switzerland can fully absorb the cost. Estimates of the cost at this stage range from CHF 36 billion, with current confinement measures in place for three months, to CHF 87 billion, with a more stringent curtailing of non-essential activity for 3 months (Grünenfelder et al. 2020a,b), or even CHF 100 billion (Gersbach and Sturm 2020). If we assume that these costs translate one-for-one into higher public debt, a very pessimistic assumption as the state-guaranteed loans will be paid back to some extent, public debt will initially increase to 18-27% of GDP, which remains a low value. Economic growth will ultimately reduce the debt burden. If the real interest rate remains at -1%, as in recent years, the debt burden will decrease to 12-18% of GDP by 2040 in the absence of primary surpluses. A less optimistic projection with a real rate at 0% still leads to a debt ratio of 14-22%. It would take a sizable increase in the real interest rate to 1.25% for the debt to remain constant relative to GDP. Even then, the debt ratio could be brought back to its current low value by running primary surpluses of 0.2-0.7% of GDP over twenty years

* I am grateful to Philippe Bacchetta, Jean-Pierre Danthine, Dirk Niepelt, Alexandre Swoboda and Charles Wyplosz for comments, as well as Charles Engel and Steve Wu for discussions on estimates of convenience yields. I thank Laura Nowzohour for assistance with the data. Any remaining errors are mine alone

Long-term investments are cheap

The low level of interest rates, which reflects a global trend that is likely to persist, makes public investments in infrastructure, education or research easier to finance. While it is difficult to precisely quantify the returns on these investments, it has likely increased with the need to train the labor force for the challenges of the digital economy, as well as the need to improve energy efficiency. The gap between these returns and the decreasing cost of debt has thus widened compared to the past.

A sovereign wealth fund is an option

The low – even negative – yields required by global investors to hold the Swiss government bonds show that the country has a substantial intangible asset, namely the trust of the world. The Swiss Confederation could take advantage of this through a sovereign wealth fund. The fund would be funded by long-term government bonds and invested in higher return assets. While the idea of a Swiss sovereign wealth fund is often raised in the media, it is usually linked to the large size of the Swiss National Bank's balance sheet. By contrast, we consider a fund entirely distinct from the central bank, as the two institutions have profoundly different mandates.

Considering a range of possible returns, we estimate that a fund of 10% of GDP could generate an annual gain between CHF 0.7 and 2.1 billion (0.1% to 0.3% of GDP). These estimates give an order of magnitude and should be completed with finer analyses to get a more precise picture. While it will of course be important to carefully design the governance structure of the fund so that it can focus on its main task, the governance challenges are manageable.

There is policy space – use it

The strong situation of Swiss public finances is an opportunity. The proper mix of the various options listed above can be debated, but all can be compatible with the debt brake. The policy response to the massive economic cost of the epidemics requires a debt increase, but this is clearly a one-off response to an exogenous and temporary event, and the debt brake can prevent adverse debt dynamics afterwards. The sovereign wealth fund also requires an increase in debt, but it is offset by asset purchases leaving the government's net worth unaffected. These options are better than the current policy of debt repayment that amounts to a debt "reverse gear" rather than a brake.

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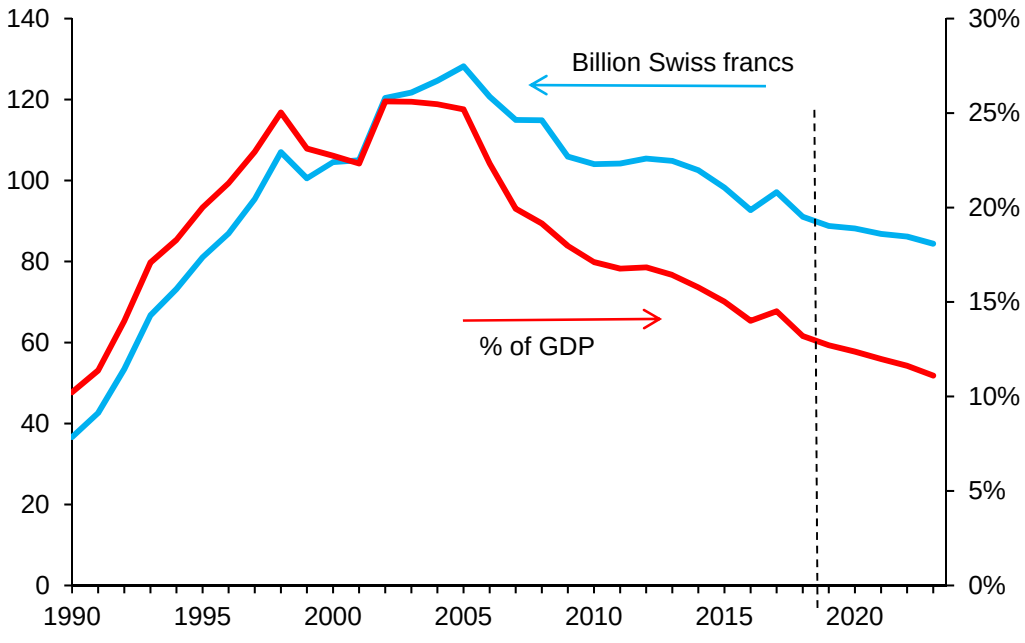
1. Introduction

In his AEA presidential address in January 2019 Olivier Blanchard stressed that higher sovereign debt should not necessarily be seen as a cause for alarm (Blanchard 2009a,b). Focusing on the United States he shows that economic growth is strong enough to stabilize the ratio of public debt to GDP, which is the appropriate indicator for analyzing debt sustainability. This is because the GDP growth rate currently exceeds the interest rate that the government pays on its debt, a gap that is far from being the exception. He concludes that, while debt is not free, the alarmist view often expressed in the debate is not warranted.

Blanchard's point is particularly relevant for Switzerland, as it has experienced a very favorable financial situation since many years (Soguel 2009). Figure 1 shows that the Swiss Federal government's (Confederation) debt has substantially decreased since 2002, moving from 25.6% of GDP (CHF 120.4 billion) to 13.2% in 2018 (CHF 91.1 billion).[1] Forecasts by the Swiss Federal Finance Administration indicate an additional decrease until 2023, when debt should only amount to 11.1% of GDP (CHF 84.4 billion).[2]

Figure 1: Swiss Federal Government's debt
(forecasts since 2019)

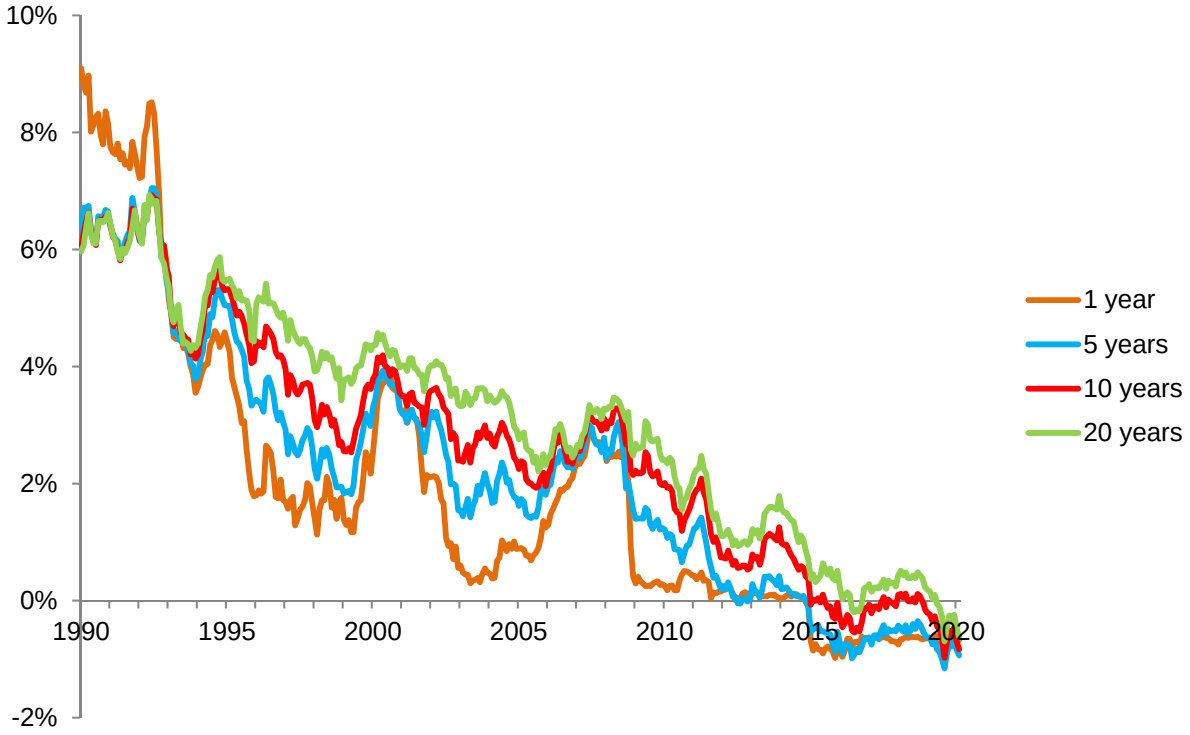


[1] The sources for the data used in this paper are listed in the appendix at the end.
[2] These figures do not include the cost of the measures undertaken to counter the Covid19 epidemics, a point to which we come back below.

This decrease of the debt to GDP ratio reflects not only economic growth, but also the fact that the government has been substantially paying down its debt. The repayments add up to CHF 29.3 billion over 16 years, which represents one quarter of the initial amount, and forecasts show additional reductions of more than CHF 6.7 billion over the next 5 years.

A second striking aspect is the low cost of the Swiss Confederation's debt. Figure 2 shows that the nominal yields on Federal government bonds have fallen to historical lows across all maturities. Investors are currently willing to pay the Swiss government to keep their money, even over long periods. As of February 2020, investing at a horizon of 10 years *costs* investors 0.83% per year, the cost being of 0.61% at a maturity of 20 years and 0.51% at a maturity of 30 years. In other words, investors treat Swiss government bonds as a bank safe, and are willing to pay a rental fee to put their money there.

Figure 2: Yield on Swiss Federal government bonds by maturity



The very low level of public debt and favorable funding terms raise the question of whether the debt brake mechanism in place in Switzerland should be adjusted, as this mechanism has shown a bias toward budgets surplus in practice. A recent report recognizes the issues but recommends against major changes (Brülhart and al. 2017). Tille (2017) presents a critical assessment of the report. A recent analysis by the IMF in their article IV report on Switzerland (2019) also stresses that a more flexible approach to public finances should be taken, without fundamentally putting the debt brake into question. Several economists have called for a more flexible implementation of the debt brake in order to absorb the cost of the ongoing epidemic (Alós-Ferrer et. Al. 2020,

Danthine 2020, Gersbach and Sturm 2020). This debate is not limited to Switzerland and is also taking place more broadly in countries, such as Germany and the Netherland, that have experienced budget surpluses in recent years and have a sizable amount of available fiscal space.

This paper takes stock of the Swiss situation in light of recent research works on public debt. We first document that the global downward trend in interest rates is also present in Switzerland, even after controlling for inflation and the business cycle. While interest rates on private borrowing have also decreased, they have done so by somewhat less than for government bonds. We then show that the interest rate on Swiss government bonds is substantially below the GDP growth rate, and this pattern has been the norm historically with the 1990's being the exception. In light of this gap, we estimate that Switzerland can keep the debt to GDP ratio stable at its current low value and still run an annual primary deficit of CHF 2.8 billion.

The substantial Swiss fiscal space allows the country to rely on public finances to absorb the economic cost of the ongoing epidemics. Even under a pessimistic scenario where the government would have to bear the full cost of a 3 months shutdown on non-essential activities, the debt would increase to only 28% of GDP. It would then gradually decrease, especially if interest rates remain moderate.

The favorable funding terms faced by the Swiss Confederation also offer the option of establishing a sovereign wealth fund that would be financed by debt and invest in higher yielding assets. We consider a broad range of investment options and estimate that a fund amounting to 10% of annual GDP could generate an annual gain between CHF 0.7 billion and CHF 2.1 billion. While the idea of a sovereign wealth fund has been raised on several instances in recent years, the discussion has focused on a fund related to the large balance sheet of the Swiss National Bank. By contrast, we consider a fund that is entirely distinct from the central bank given that the two institutions have profoundly different mandates.

The paper is structured as follows. The next section clarifies the key concepts, with an emphasis on long run patterns. Section 3 reviews the main aspects identified in the literature and applies them to Switzerland. The policy options are considered in section 4. Section 5 focuses on one of them and assesses whether Switzerland should take advantage of favorable funding terms by setting up a sovereign wealth fund, discussing the potential returns as well as governance issues. Section 6 reviews the recent literature on the role of fiscal policy as a business cycle stabilization tool. Section 7 concludes.

2. Clarification of concepts

2.1. Debt dynamics

The starting point of our analysis is the dynamics of public debt. For brevity we focus on the major aspects and leave a more detailed presentation to the appendix at the end of the paper.

We denote the ratio between public debt and GDP at the end of a year *s* by b_s. This ratio is the relevant measure for the analysis as it reflects both the amount of debt and the income generated by the economy. The nominal interest rate on the debt is denoted by i_s^G, and the nominal GDP growth rate by μ_s. The primary deficit is denoted by d_s^p (as a ratio to GDP). The dynamics of the debt to GDP ratio are then written as:

$$b_s - b_{s-1} = d_s^p + \frac{i_s^G - \mu_s}{1+\mu_s} b_{s-1} \qquad (1)$$

The debt ratio can increase for two reasons. First, additional borrowing is needed if taxes do not cover non-interest spending. Second, the interest payments on the debt increase its level. They lead to an increase of the ratio if they exceed the pace of growth (that is if $i_s^G - \mu_s > 0$).

Equation (1) shows that a stabilization of the debt to GDP ratio ($b_s - b_{s-1} = 0$) implies a relation between the primary deficit and the gap between the interest rate and the growth rate:

$$d_s^p = -\frac{i_s^G - \mu_s}{1+\mu_s} b_{s-1} \qquad (2)$$

If the interest rate exceeds the growth rate ($i_s^G > \mu_s$) we need a primary surplus ($d_s^p < 0$). However, the debt to GDP ratio is stabilized even with a primary deficit if the interest rate is below the growth rate ($i_s^G < \mu_s$). The central point of Blanchard (2009a,b) is to show that in the United States the most common pattern is an interest rate below the growth rate ($i_s^G < \mu_s$). Whereas this is clearly the case since the global crisis, the pattern is also quite common historically.

2.2. Financial assets held by the government

The analysis can easily be extended to a case where the government purchases assets in addition to issuing debt. We denote the ratio between assets and GDP by f_s and the nominal interest rate earned on the assets by i_s^P. The dynamics of the government's net debt are then given by a modified version of equation (1):

$$(b_s - f_s) - (b_{s-1} - f_{s-1}) = g_s - t_s + \frac{i_s^G - \mu_s}{1+\mu_s}(b_{s-1} - f_{s-1}) - \frac{i_s^P - i_s^G}{1+\mu_s} f_{s-1} \qquad (3)$$

As before the dynamics of net debt reflect the primary deficit and the gap between the interest rate on government liabilities and the GDP growth rate. A new element is that difference between the interest rate that the government earns on its asset and the one that it pays on its liabilities. The debt to GDP ratio can be stabilized despite a primary deficit if the interest rate on liabilities is lower than GDP growth ($i_s^G - \mu_s < 0$) or if the government earns a higher return on its assets ($i_s^P - i_s^G > 0$). Niepelt (2018) provides a detailed discussion of the theory of debt dynamics.

2.3. A simple model

Before turning to the Swiss case, we show how the gap between different interest rates and the GDP growth rate can arise in a standard macroeconomic model. For brevity we focus on the key elements and leave a detailed presentation to the appendix.

The economy is inhabited by a representative household who consumes, supplies a set amount of labor to a firm, and accumulates capital that she rents to the firm. In addition to capital the household can invest in private bonds and government bonds. The government raises taxes, spends, issues bonds, and can purchase private bonds.

Two elements are central to the analysis. The first, and most important one, is that the household's utility is affect not only by consumption but also by her holdings of government bonds. This is a simple way to capture the convenience yield of public bonds, which provide more liquidity and safety than private bonds do. [3] This special benefit from government bonds implies that the interest rate on them is always smaller than the one on private bonds ($i_s^P > i_s^G$). The second element is that the government can invest in private bonds in addition to issuing its own.

The equilibrium of the model gives the interest rates on sovereign and private bonds. They reflect productivity growth, the household's discount rate, and the special nature of government bonds (i.e. their direct impact on the utility). We can assess the impact of changing various parameters based on a numerical illustration presented in the appendix. This exercise is meant to be illustrative and does not reflect a fine calibration of the Swiss economy – an exercise that would require a much more detailed model. The main findings from the analysis are as follows:

- A decrease in public debt increases the gap between the interest rates on private and government bonds, $i_s^P - i_s^G$, reduces the gap relative to GDP growth, $i_s^G - \mu_s$, as well as the primary balance $t_s - g_s$ required to stabilize the debt to GDP ratio.
- An increase in public debt that is reinvested in private bonds reduces the interest rate gap, $i_s^P - i_s^G$, as well as the primary surplus $t_s - g_s$ needed for stabilization. This last aspect is impacted by the sensitivity of the household's portfolio allocation between government

[3] This modelling approach is identical to the standard money in the utility function assumption to capture the transaction benefits from money holdings.

and private bonds to the interest rate differential, an aspect that is hard to quantify with precision.

- An increase in the household's patience, for instance reflecting greater uncertainty, raises its propensity to save and lowers interest rates. While the impact on the interest rate gap $i_s^P - i_s^G$ is limited, the gap relative to the growth rate $i_s^G - \mu_s$ is substantially reduced, which lowers the primary surplus $t_s - g_s$ needed to stabilize the debt to GDP ratio.
- An increase in the utility that the household directly gets from holding government bonds, for instance reflecting a scarcity of safe assets, reduces the interest rate on these bonds. It increases the interest rate gap, $i_s^P - i_s^G$, reduces the gap vis-a-vis growth, $i_s^G - \mu_s$, as well as the primary balance $t_s - g_s$.
- A decrease in the productivity growth rate lowers all interest rates, but only has a limited impact on the difference between the various interest rates, as well as on the difference between interest rates and the growth rate.

3. Lessons from the literature

3.1. Introduction

This section presents a focused review of the main recent research contributions on interest rates on government bonds, and illustrates them in the Swiss context. We start with the downwards trend in equilibrium interest rates – adjusted for inflation and the business cycle – and then consider the gap between the interest rate and GDP growth, before turning to the gap between interest rates on government and private bonds.

3.2. The downward trend in interest rates

3.2.1. General points

The substantial decrease of interest rates in government bonds has been a major development in advanced economies since many years. Bean and al. (2015) show that the pattern is observed in most advanced economies (with of course the exception of the ones that suffered from a crisis, such as Greece) and not just the United States. Del Negro and al. (2019) estimate the component of interest rate that is common across countries and document a sizable decrease of that global factor. While the downward trend has picked up in the last ten years, it had already been present since the 1980's, which points to the presence of structural drivers.

The analysis needs to take account of inflation and the business cycle. Advanced countries have seen as sizable decrease in inflation since the 1980's which mechanically leads to lower interest rates. We thus need to consider real interest rates. An additional element is the need to correct for the business cycle, as the real interest rate is lower during recessions without this necessarily reflecting a long-term trend.

The literature has focused on the so-called equilibrium real interest rate, also referred to as the natural rate, which is the real interest rate that would prevail if the economy was growing at its potential growth rate (neither overheating nor in recession). This natural rate is not directly observable and is instead estimated based on models. Laubach and Williams (2015) developed an approach that is now standard. They apply it to the United States and conclude that the natural rate has markedly decreased, even before the global crisis, in part because of a decrease of the potential growth rate of GDP. Holston, Laubach and Williams (2018) reach a similar conclusion for other advanced economies, as do Del Negro and al. (2019, 2018) based on a broader sample if countries.

There are several underlying causes for this trend. The first is a decrease in the long-term growth rate of GDP, primarily because of the slowdown in productivity growth seen over the last decade. Demographic factors also play a role. Gagnon, Johannsen and Lopez-Salido (2016) show that the retirement of the baby-boom generation reduces the labor supply, while the capital

accumulated in the past remains in place. The economy is then left with abundant capital, which lowers its marginal productivity and interest rates. Rachel and Summers (2019) review a broad range of drivers that impact households' propensity to save. They conclude that without the increase in public deficits over the last ten years, the decrease in interest rates would have been even sharper. While lower potential growth plays a role, Rachel and Summers (2019) stress that this is a rather recent element while the decrease in interest rates started well before.

Another element is the demand from investors for safe assets that keep their value even during systemic crises. Caballero, Farhi, and Gourinchas (2017) show an imbalance since the beginning of the global crisis between a growing demand and a shrinking supply. Before the crisis safe assets consisted on sovereign debts and structured products developed by financial intermediaries using advances in financial engineering. The crisis sharply changed the environment. The number of countries where sovereign debt can be considered as safe has substantially decreased. In addition, the reliability of structured products as safe assets turned out to be much weaker than expected. This led to a sharp decrease in the supply of safe assets at a time when demand kept increasing, leading to lower interest rates on these assets. In a detailed study of the euro area, Brunnermeier and al. (2016) make a proposal to increase the supply of safe asset by setting up a European wide institution that would hold sovereign bonds from many countries and issue bonds structured into tranches of varying risk.

In addition to being a safe asset, the sovereign debts of some countries are also highly liquid. Given their safety and liquidity sovereign bonds are a benchmark asset for the entire financial system. Their yield is often used as the basis for setting the price of other assets by simply adding a spread. They are also used as collateral for a broad range of investments. Sovereign bonds thus constitute a form of infrastructure for financial markets and are an important element in their development, in the same way as the physical infrastructure is important for the development of economic activity.

The special role of government bonds implies that investors are willing to accept a lower yield compared to other assets. This gap represents a convenience yield provided by public debt.[4] Several recent papers focused on that yield. Del Negro and al. (2017) estimate that the yield gap between US government bonds (at a 10 year maturity) and AAA corporate bonds accounts for a substantial share on the decrease in the yield on government bonds. Jian and al. (2019) show that the convenience yield for short maturities (12 months) play an important role in driving the dollar exchange rate. An increase in the foreign demand for the US dollar raises the convenience yield and appreciates the US currency. Jian and al. (2019) estimates show that this factor accounts for 54% of the quarterly exchange rate volatility. Engel and Wu (2019) broaden the sample to the ten major advanced economies, including Switzerland. They show that the cross-country difference in

[4] In the theoretical model present in the appendix, this convenience yield is driven by the assumption that government bonds directly contribute to utility.

convenience yields[5] is a major driver of the exchange rate, and taking this aspect into account strengthen the estimates of the role of other drivers. A country's currency appreciates when the interest rate or convenience yield on its bond increase relative to their counterparts on foreign bonds. The relevance of the convenience yield is not limited to the United States and is also present for other countries, including Switzerland. [6] This factor has become even more relevant since the 2008 crisis showed that sovereign bonds offer more safety than private bonds.

The various drivers of lower interest rates identified in the literature reflect long-term trends that we can expect to persist, a point stressed by Williams (2017). The environment of low interest rate should therefore not be dismissed as a temporary situation but should be included as a central feature in the scenarios for the dynamics of public finances in coming years.

3.2.2. ***The Swiss case***

What about the Swiss case ? A first approach to compute the real interest rate is to take the difference between the nominal rates (shown in figure 2) and inflation over the last twelve months. While this computation is straightforward, it is important to keep in mind that conceptually the real interest rate should be taken as the difference between the nominal interest rate and the inflation expected over the duration of the investment. For instance, the real interest rate for a 10 year maturity should be built based on expectations of inflation over the next ten years.[7]

Figure 3 shows the evolution of the difference between the nominal interest rates on Swiss Federal government bonds shown in figure 2 and the inflation over the previous year. We observe a clear downward trend since the mid-1990's that has picked up pace since 2015.

[5] For each country the convenience yield is estimated as the difference between the yield on a 1 year government bonds and Libor swaps over the same maturity.
[6] The estimates of Engel and Wu (2019) show a weaker role for Switzerland. This is in part because the unexpected exit from the exchange rate floor against the euro in January 2015 makes that specific month an outlier observation. The results are closer to those for other countries when January 2015 is excluded from the sample.
[7] The simple computation is more reliable at a one year horizon as the measures of inflation expectations at that horizon are quite close from the observed inflation over the previous twelve months.

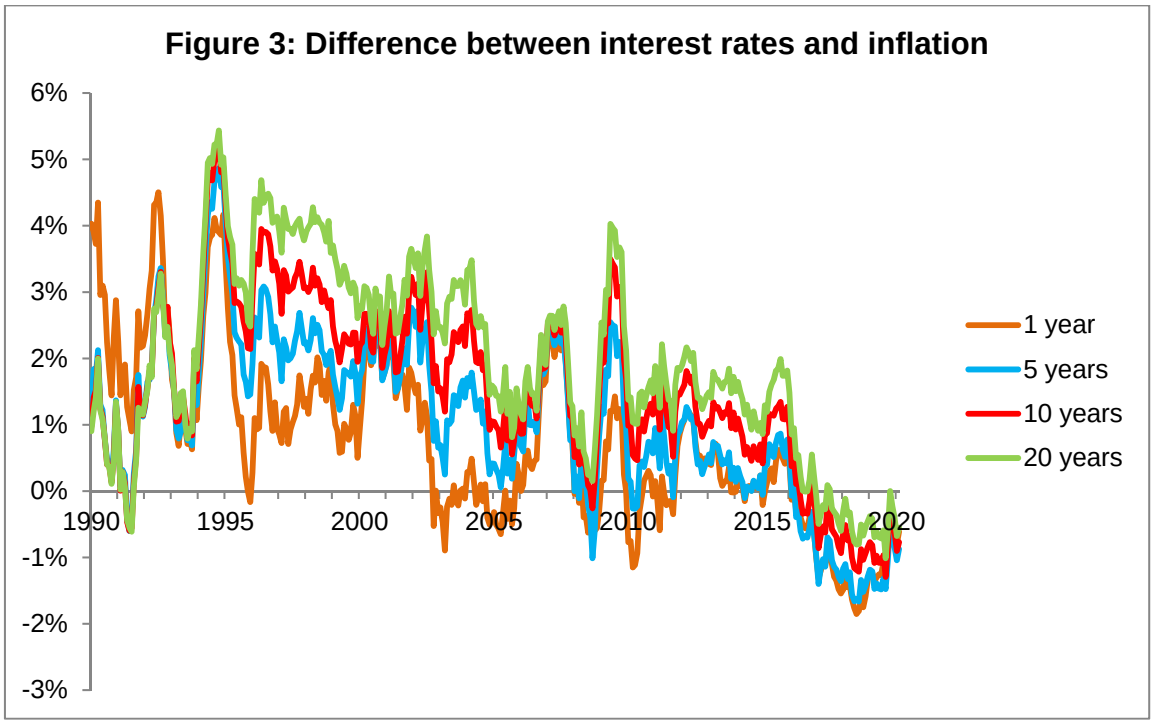
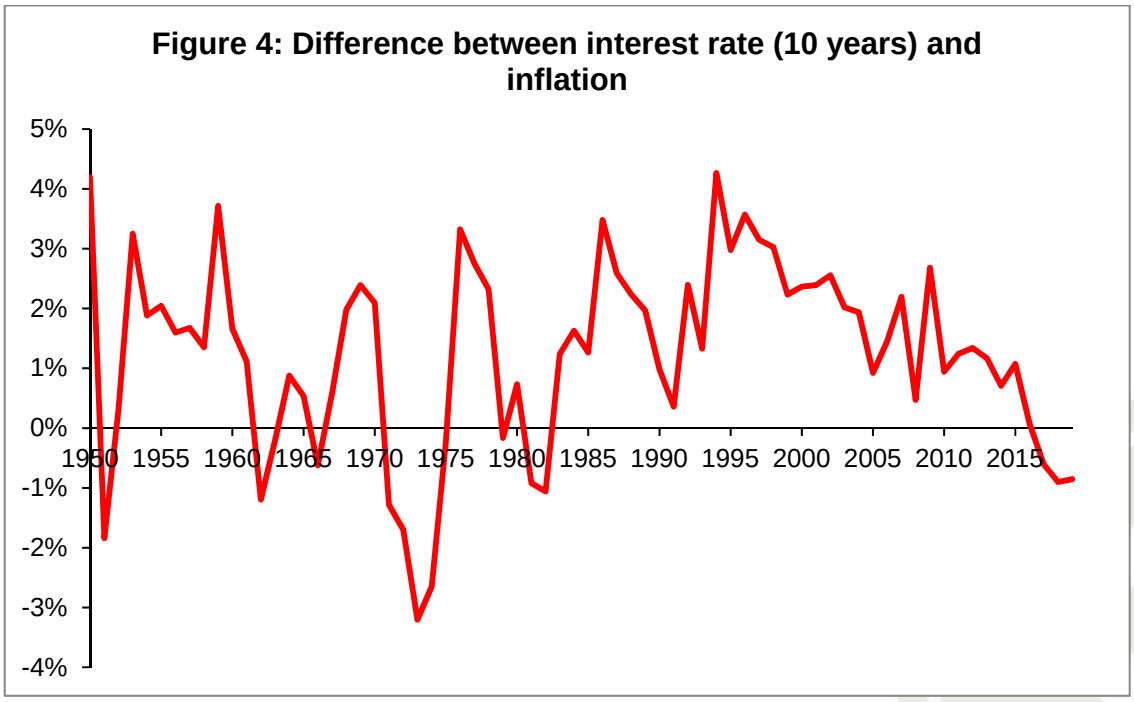
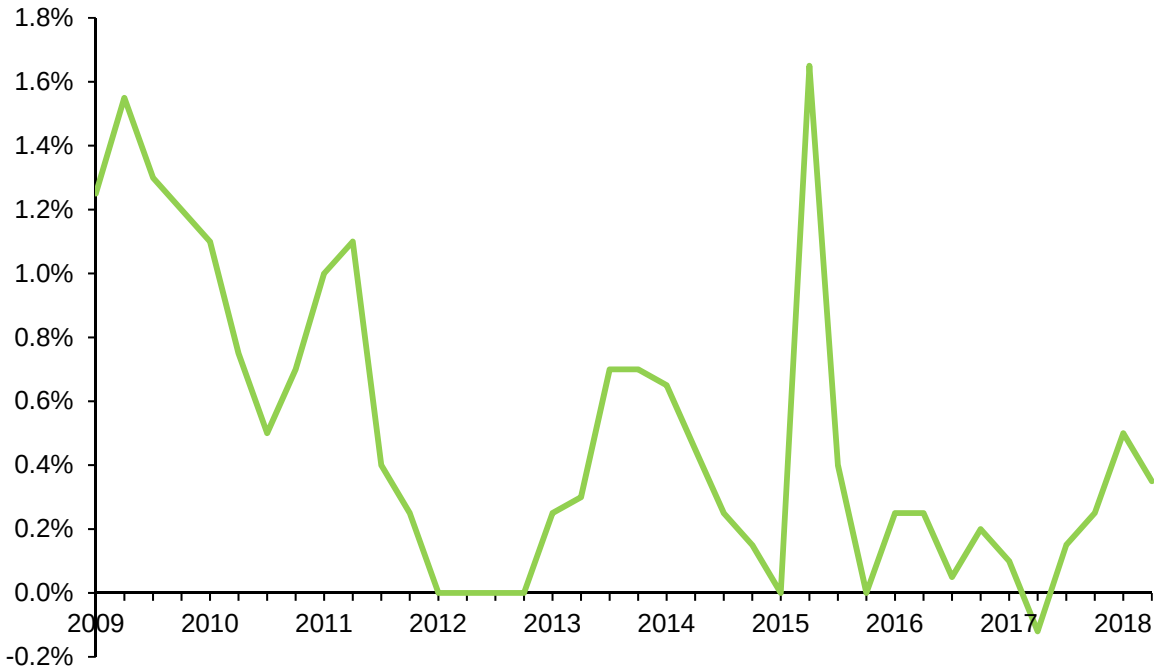


Figure 4 offers a longer perspective and shows the figures (annual averages) since the 1990's based on the yield for a 10 year maturity (red line in figure 3). The real interest rate was clearly positive during the 1950's. It then fluctuated around zero from the early 1960's to the early 1980's, with negative values during the period of high inflation in the 1970's. The real rate since increased until the mid-1990's before starting a long downward trend. An interesting point from the figure is that the low values of recent years are not unusual in historical perspective.



As indicated above, the conceptually correct approach for computing the real interest rate is to rely on inflation expectations. Data on expectations are unfortunately only available for a very short period, in particular for expectations beyond one year. Another approach is to estimate inflation expectations based on a statistical model. The Swiss National Bank published such an estimate for the real interest rate at 10 years horizon (SNB 2018, figure 5.3) shown in figure 5. It is important to bear in mind that these estimates are not perfectly precise. One should thus look at the general trend instead of the value of any particular year. Figure 5 shows that the estimated value of the real interest rate shows a clear decrease at the beginning of the 2010's, and have since fluctuated around a slightly positive value.

Figure 5: Estimated real interest rate (10 years)



To sum up, there has been a clear decrease of the real yield of Swiss government bonds, in line with the trend in other advanced economies.

3.3. Interest rates and growth

3.3.1. General points

As indicated in the introduction, Blanchard (2009 a,b) points that the interest rate on government bonds is often lower than the GDP growth rate. This does not mean that debt is free, as one needs to take account of any crowding out effect at the expense of private investment. Blanchard (2009 a,b) argues that the magnitude of this effect is however limited, as the return on

private capital has not increased.[8] There is then no pressing need to lower debt in the current context, a point shared by Furman and Summers (2019).

A recent analysis by Wyplosz (2019) broadens the horizon to a large sample of advanced economies since the 1960's and offers a more cautious view. Wyplosz (2019) shows that the pattern of an interest rate on public bonds lower than the GDP growth rate is not the standard situation in an international perspective. Overall, the pattern of $i_s^G < \mu_s$ (to use the notation of section 2) is seen in 56% of the years in the United States, and in less than half the time on average in the broader sample. The gap between i_s^G and μ_s is furthermore moderate and quite volatile. In addition, periods of low interest rates are not systematically used to lower the debt burden, which instead increases in half of the observations. This analysis clearly shows that times of low interest rates should not be taken at the norm, but also that there is a high extent of heterogeneity across countries. Some countries benefit from the $i_s^G < \mu_s$ pattern more frequently. This is for instance the case of South Korea (80% of observations) and Switzerland (68% of observations).

3.3.2. ***The Swiss case***

We illustrate the pattern in Switzerland in two ways. We first compare the nominal interest rate on government bonds with a maturity of 10 year and the growth rate of GDP since the 1950's.[9] Figure 6 shows this gap using two measures of GDP growth, namely the value in the year (blue line) and the average over the last two years (green line) in order to smooth the short-term growth volatility. We clearly see that the pattern of an interest rate lower than the growth rate is the rule rather than the exception. This was clearly the case until the 1970's: the gap average -3.27% in the 1950's, -5.30% in the 1960's and -1.91 in the 1970's. The gap then decreased in the 1980's (-1.38%) before turning positive in the 1990's (1.97%). That decade was one of low growth and a sizable increase in the debt to GDP ratio, leading to a policy response in the form of the debt brake. Subsequently, the growth rate has again been higher than the interest rate, both before the crisis (-0.26% in the 2000's) and since 2010 (-1.28%).

[8] Public debt can even be beneficial in an overlapping generation model, even in the presence of rollover risk for the debt.

[9] The numbers are presented as annual averages for clarity.

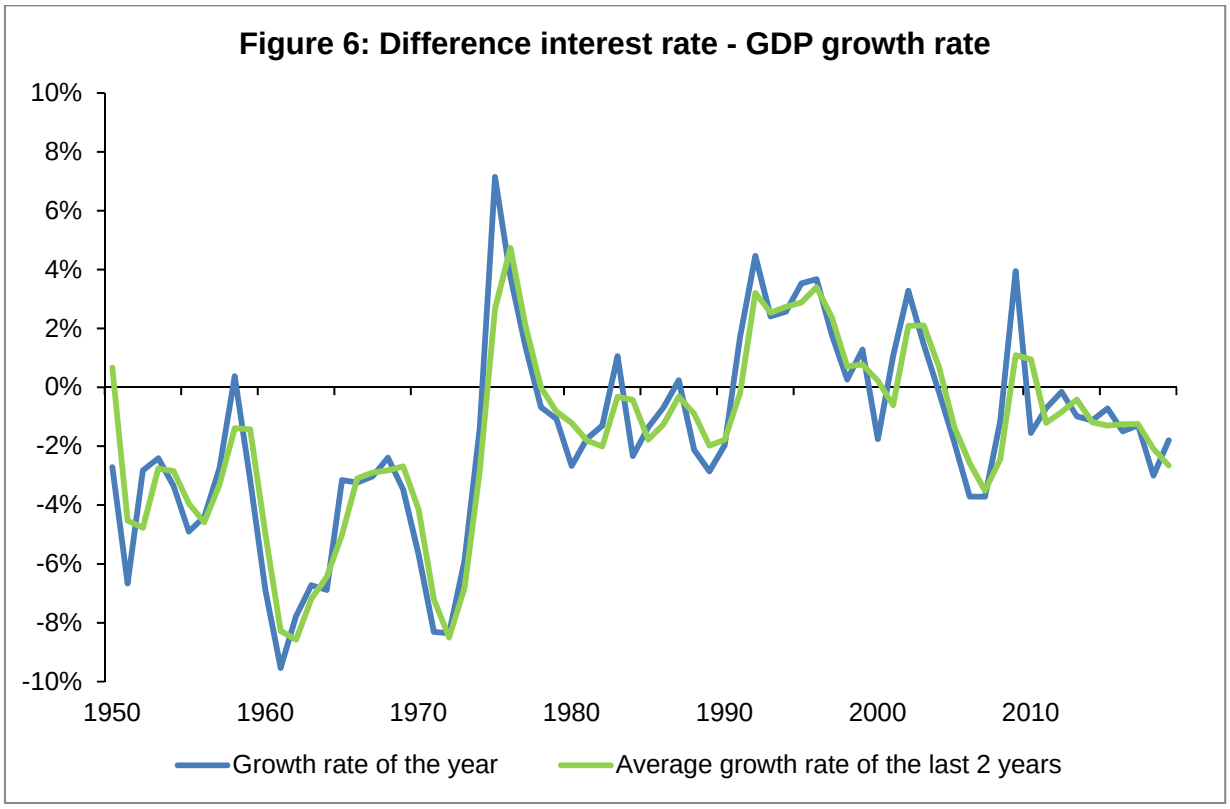
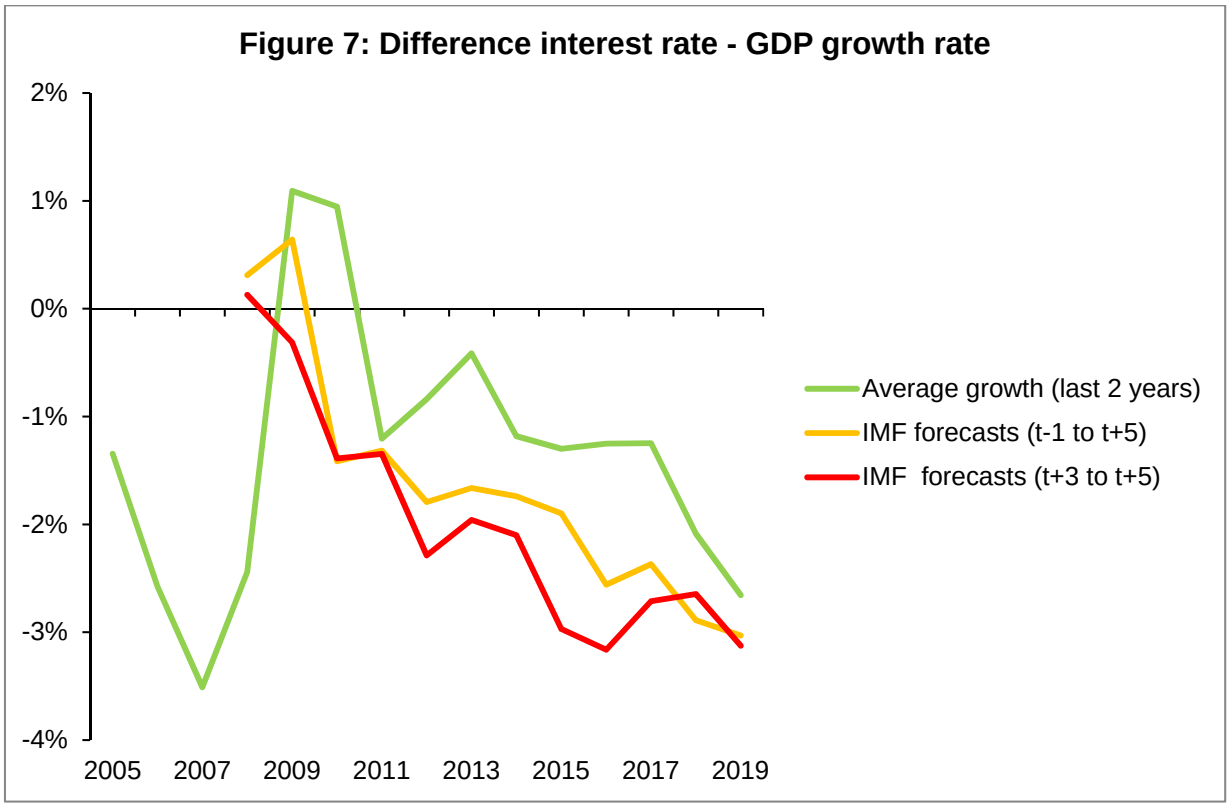


Figure 6 relies on past growth instead of future growth prospects. These are, however, a more relevant measure in a forward-looking analysis, bringing us to the second approach to contrasting interest rates and growth rates. We assess growth prospects using the forecasts for Swiss nominal GDP growth in the various issues of the IMF World Economic Outlook (WEO). The WEO database includes forecasts for the main macroeconomic variables at a horizon of 5 years (for instance, the October 2018 issue includes actual values until 2017 and forecasts from 2018 to 2023). The various issues of the database are available on the IMF website, with 5 years forecasts starting in 2008. We consider two indicators of nominal GDP forecasts taken from the WEO issued in October of year *t*. The first covers the entire forecast horizon with the annualized growth rate from *t-1* to *t+5*. The second focuses on the last two years of the forecast horizon, which reflect the long-term potential growth rate. To do so, we take the annualized growth rate from *t+3* to *t+5*.

Figure 7 shows the difference between the interest rate in Swiss government bonds with a 10 years maturity and the IMF growth forecasts (yellow and red lines). For reference, we also put the difference based on the average growth of the last two years (green line, identical to the one in figure 6). We clearly see that since 2008 the interest rate has been clearly lower than expected growth. The gap has widened and amount to -3% in 2019 based on either the 2018-2024 growth forecast or the 2022-2024 forecast).



In short, Switzerland is clearly in a situation where the interest rate on government bonds is substantially lower than the GDP growth rate.

3.4. Public and private interest rates

3.4.1. General points

While researchers have clearly shown the large decrease of interest rates on sovereign bonds, the pattern for the return on other assets remains debated. Williams (2007) points that the rates of return on stocks and private bonds have also decreased. This point is also raised by Rachel and Summers (2019) who show that the interest rate difference between private and public debts has remained globally steady.

Other contributions reach a different conclusion, with a more pronounced decrease of interest rates on government bonds. Caballero, Farhi, and Gourinchas (2017) estimate the risk premium from the return on stocks using a serie of models and conclude that it has increased. They infer that the decrease in the interest rate on US government bonds reflects their particular nature as a safe asset. Del Negro and al. (2017) undertake a statistical analysis as well as an analysis based on a model calibrated to reflect the US economy. Both approaches lead to the conclusion that the decrease in sovereign yields is more pronounced than the decrease for other assets. They authors argue that this reflects the convenience yield offered by sovereign bonds from their usefulness as

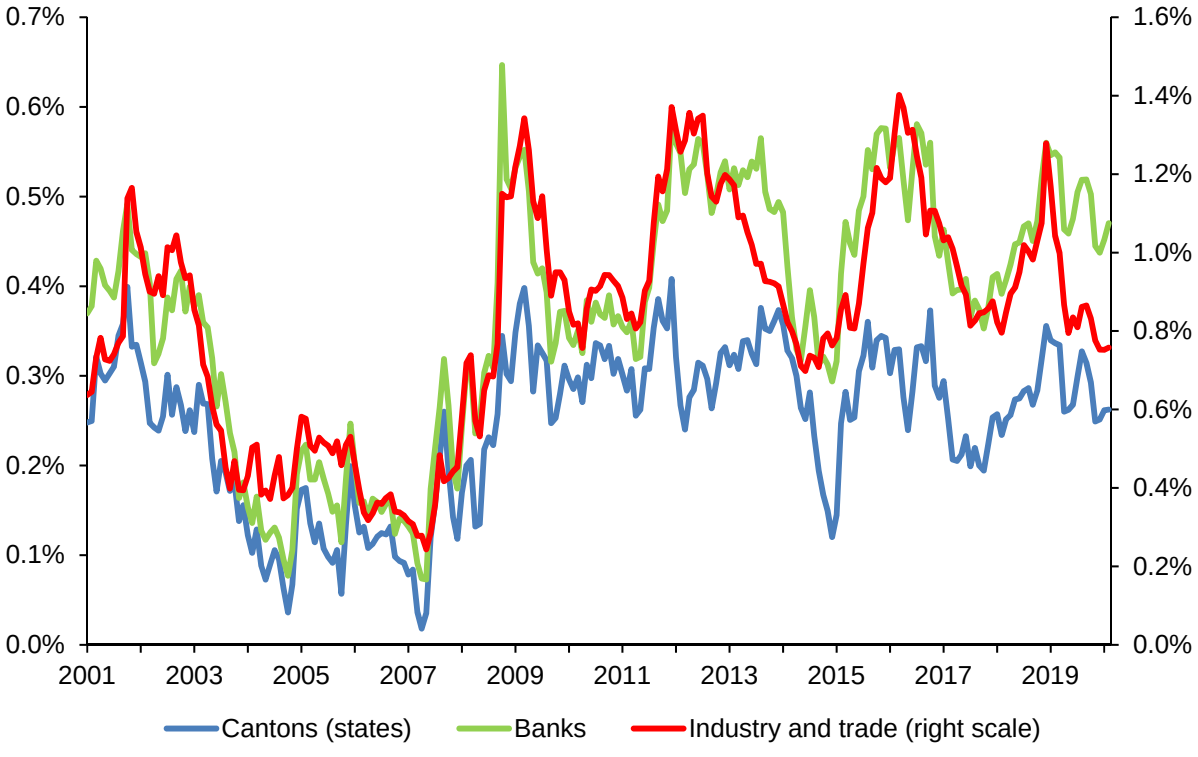
collateral as discussed above, even in comparison to private bonds with a similar AAA rating. In the context of Switzerland, Christen and Soguel (2019) present a detailed analysis of the finances of Swiss Cantons (states) and show that the interest rate on their bonds remains well below the return on private assets, specifically the return on pension funds.

3.4.2. The Swiss case

A comparison of the interest rates on Swiss Federal government bonds with the rates on private bonds faces limited data availability. We assess the pattern from different angles, namely the difference with the interest rate on other bonds of similar maturity, the difference with rates on mortgages and loans for investment, and the gap relative to the money market rate at a short maturity.

The first measure is the difference between the interest rate on Confederation bonds and the rate on other bonds. Figure 8 shows this for bonds with a maturity of 8 years since 2001 for three categories of borrowers: Cantons (blue line), banks (green line) and private non-banking firms (industry and trade, red line).

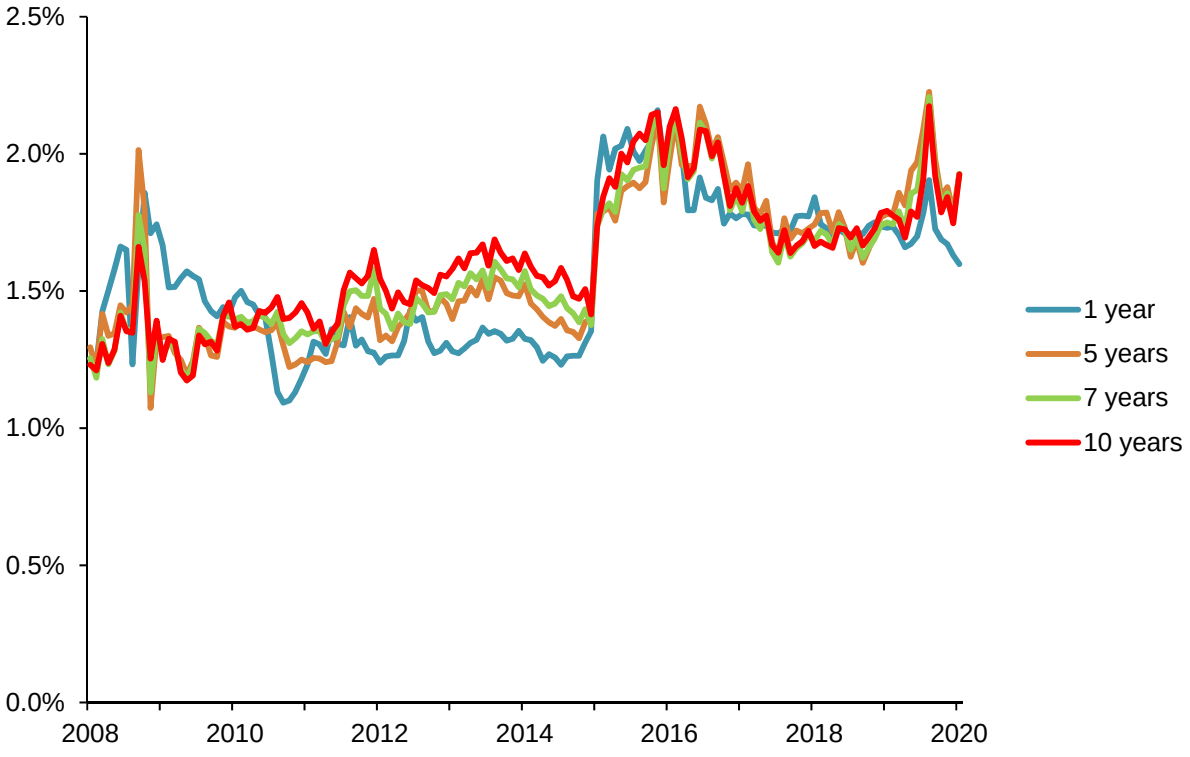
Figure 8: Difference between private yields and yields on Confederation bonds (8 years)



Three points emerge from figure 8. First, Cantons are unsurprisingly able to borrow terms that are more favorable than the ones for private firms, but not as favorable as the terms available to the Confederation. Second, the gap of interest rates relative to the Confederation has increased since the beginning of the crisis, in particular for private borrowers. The average since January 2009 is 0.45% for banks and 0.99% for non-banking firms, compared with 0.16% and 0.42% respectively between January 2004 and December 2007 (the gap for the Cantons moved from 0.11% to 0.29%). A longer perspective however shows a more moderate increase, the gap from January 2001 to December 2002 averaging 0.295 for Cantons, 0.40% for banks and 0.89% for other firms.

Next, we consider the difference between the interest rate on new mortgages and the one on government bonds of the same maturity (figure 9). This difference remained stable since 2015, before showing a clear increase and remaining at a higher value. Between 2010 and 2019 the gap between the mortgage rates and sovereign rates increased by between 0.4% to 0.6%, depending on maturity.

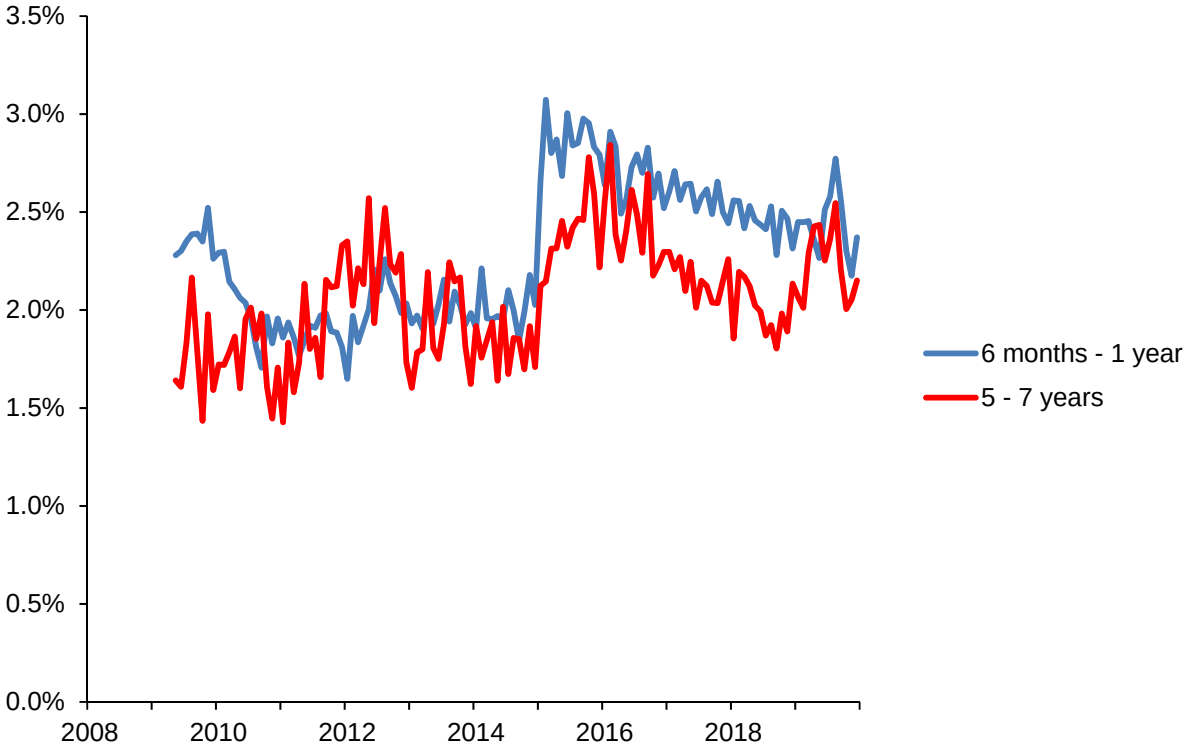
Figure 9: Difference between mortgage rates and yields on Confederation bonds



We undertake the same exercise using the interest rate on new credits to firms aimed at funding investment (figure 10). We contrast the rate on loans with a maturity of 6 months to 1 year against the with the yield on Confederation bonds with a maturity of 1 year (blue line), and the rate on loans with a 5 to 7 years maturity with the average sovereign yield at 5 and 7 years maturity (red line). The pattern is similar to the one for mortgages, with a steady gap until 2015 followed by

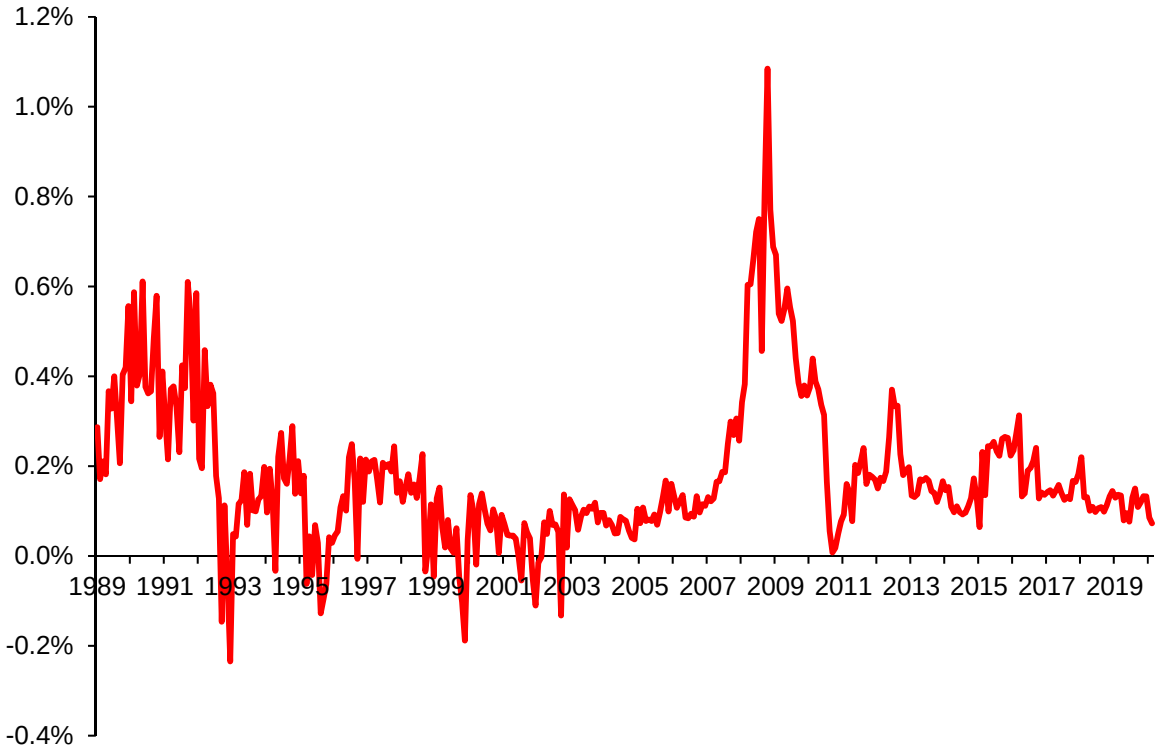
an increase that has since been partially offset. The gap for loans with a maturity of 6 months to 1 year has increased by 0.42% from 2010 and 2019, while that for loans with a maturity of 5 to 7 years has increased by 0.46%.

Figure 10: Difference between investment credit rates and yields on Confederation bonds



Our analysis so far has focused on the interest rate at medium to long horizons, and we complete it by looking at the short term money market rate. Figure 11 shows the difference between the Swiss franc 12 months Libor and return on Confederation bonds with a maturity of 1 year since 1989. As before, we can see a moderate increase. Abstracting from the extreme values at the height of the crisis, the average gap moved from 0.08% (January 1995 to December 2006) to 0.16% (since January 2011).

Figure 11: Difference between Libor and yield on Confederation bonds (1 year)



To sum up, bearing in mind the limited coverage of data, the difference between interest rates for private loans and bonds and the one on Confederation bonds has moderately increased. Note that our analysis focused on the cost at which various borrowers can raise funds, and not on the return that Swiss government could earn from investing. An assessment of that point requires broadening the analysis to other asset categories such as stock, and is presented in section 4.

3.5. Synthesis for Switzerland

Our analysis of the various aspects identified by the research literature in the context of Switzerland lead to three conclusions:

- The global trend towards lower real interest rates on sovereign bonds is also observed in Switzerland.
- The interest rate on Swiss government bonds is lower that the growth rate of GDP, the 1990's being an exception to this pattern. The gap is substantial and has grown wider in recent years.
- The difference between the funding cost of the Confederation and that of other borrowers has increased over the last ten years, although to a moderate extent.

The driving factors identified in recent studies of the decrease of interest rates mostly reflect persistent forces. The favorable funding environment that the Swiss government has been facing since several years, with a low debt and low cost (Soguel 2009), is very likely to last for a long time. The management of public finances should take this element into account, for instance through a more flexible approach to the debt brake as recommended by the IMF (2019).

4. Options for economic policy

4.1. Range of policies

The favorable funding environment could be put to good use in several ways. We consider four options, namely an increase in deficit that does not destabilize the debt to GDP ratio, the use of public debt to spread the economic cost of the Covid19 epidemics, an increase in investments, and a reinvestment policy using a sovereign wealth fund. This latter option being detailed in section 4. Our analysis should be seen in a long-term perspective as the situation of low interest rates is likely to persist. It is thus distinct from a discussion of using public finances as a tool to smooth the business cycle, which is presented in section 5.

4.2. Sustainable deficits

As indicated above the difference between the interest rate and the GDP growth rate allows the Swiss Confederation to run a primary deficit while keeping the ratio of debt to GDP at a steady value. Recall that equation (2) gives the primary deficit that stabilizes the debt ratio as:[10]

$$d^p = \frac{\mu - i^G}{1+\mu} b$$

We use this formula to estimate the primary deficit consistent with keeping the debt to GDP ratio steady at its current value of 13.2%.

Table 1 presents the results. The growth rate of nominal GDP, μ, is taken from IMF World Economic Outlook forecasts (from year t+3 to year t+5), and the nominal interest rate i is the yield on a 10 year Swiss government bond. The first column takes growth forecast published in the October 2019 edition of the WEO (2.64%) and the annual average of the interest rate (-0.49%). These values imply a primary deficit of 0.4% of GDP, which corresponds to CHF 2.8 billion annually. The results are similar if we take the average value of October WEO forecasts and 10 year yield since 2015 (second column of table 1) or since 2010 (third column).

[10] We consider a long term situation where the interest rates, growth rats, and ratios of the various variables to GDP are constant, and remove the *s* subscript for convenience.

Table 1 : Sustainable primary deficit

	Values of 2019	Average 2015-2019	Average 2010-2019
Nominal GDP growth rate (μ)	2.64%	2.73%	2.81%
Nominal interest rate, 10 years (i)	-0.49%	-0.19%	0.44%
Interest-growth gap (i - μ)	-3.12%	-2.92%	-2.37%
Primary deficit, % GDP (d^p).	0.40%	0.38%	0.30%
Primary deficit, CHF billion	2.81	2.63	2.13

Note: the computations are based on the 2018 ratio of debt to GDP ($\boldsymbol{b}$ = 13.2%) and the nominal GDP in 2019 (CHF 699 billion).

The Swiss government can thus afford a primary deficit of about CHF 2.8 billion annually while keeping debt as a low share of GDP. This amount could be used for additional spending or tax cuts. While the debate about the appropriate mix of higher spending and lower taxes goes beyond the scope of this paper, we point that either option is preferable to the current policy of paying downs the debt, which amounts to investing at a negative rate of return.[11]

A point that is often rightly raised in the discussion of Swiss public finances is that the country faces a rising cost of health care as well as funding challenges for the retirement system brought by population aging. These relevant issues do not undercut our point however: we show that a primary deficit is feasible, but say nothing on the amount of taxes and spending leading to the deficit. A given deficit can reflect high values of spending and taxes, or low values of both. The increase in the health and retirement costs should be met by policies limiting costs (higher retirement age for instance) or boosting revenues (higher contributions). The ability to run a primary deficit allows for some moderation of the burden stemming from these adjustments. It would by contrast be questionable to reduce the current debt in order to face the future challenges on better terms, as a debt level of 10% of GDP instead of 13% would not change much in terms of handling persistent increases in health and retirement costs.

[11] This point is illustrated by a simple example contrasting two cases. In the first the government repays 5 billion worth of debt which carried à 0% interest rate. In the second one, the government does not repay the debt but invests the 5 billion at a 0% return. Both situations are effectively identical as the net worth of the government has improved by 5 billion and its cash-flow remains unchanged.

4.3. Spreading the cost of the Covid19 epidemic

4.3.1. Policy measures and their potential cost

The unfolding Covid19 epidemic has generated a massive economic shock. The public health measures required to stem the spread of virus, such as social distancing, have led to a sharp decrease in economic activity as businesses are required to close and worker to remain at home. Limiting the economic damage from the necessary health measures requires a large scale response of economic policy, with fiscal policy playing a central role. The contributors to the e-book by Baldwin and Weder di Mauro (2020) stress the need to keep firms and households afloat during the temporary quarantine periods in order to avoid inefficient bankruptcies and allow growth to resume rapidly once the worst of the epidemic is behind.

The Swiss authorities have taken measures since mid-March to counter the epidemic. These have led to a clear decrease in economic activity, with GDP expected to contract in 2020 (KOF 2020, Seco 2020). The measures have been particularly pronounced in some Cantons such as Ticino. Given the sharp and temporary nature of the economic slowdown, and the fact that it stems from requires public health measures, several economists have stressed the need for economic policy to step forward and limit the damage (Alós-Ferrer et. Al. 2020, Danthine 2020, Gersbach and Sturm 2020). The authorities have adopted a broad range of measures, committing so far CHF 42 billion to the policy effort. The first measure is a substantial use of the temporary unemployment scheme that financially supports workers in firms facing a temporary reduction in business. A second measure is a direct support to firms. The Swiss government has rapidly implement a public guarantee of loans extended by banks to firms facing liquidity shortfalls. Loans of up to CHF 500’000 can be easily granted, carry no interest, and have a maturity of 5 to 7 years. As some firms will not be able to make up for the business lost during the recession, it is likely that some of these loans will have to be covered by the Swiss public finances. As the public support is temporary and stems from a clearly exogenous shock, financing it can be achieved by an increase in the public debt even if this implies a termporary waving of the debt brake rule.

What will be the cost of these measures for government finances? It is still early to come with a firm number, but several contributions provide an order of magnitude. Grünenfelder et al. (2020a,b) estimate that the measures currently in place lead to a cost of CHF 11.8 billion per month. If Switzerland were to adopt a more drastic shutdown of non-essential activities, the cost would increase to CHF 29 billion per month. Danthine (2020) points that a complete shutdown of the economy over two months would cost CHF 115 billion, although in practice even drastic measures would not lead to a complete shutdown. Gersbach and Sturm (2020) advocate committing a fund of CHF 100 billion of fight the epidemic.

4.3.2. ***Scenarios for public debt***

Based on these contributions, we consider three scenarios. Under a moderate cost scenario, the existing measures remain in place for three months, leading to a cost of CHF 36 billion (three months as CHF 12 billion). In a high cost scenario, more drastic measures are adopted for three months with a cost of CHF 87 billion (3 months at CHF 29 billion). In a very high cost scenario the cost amounts to CHF 100 billion, the amount of the fund proposed by Gersbach and Sturm (2020). We take a very pessimistic view and assume that these costs are entirely born by public finances. This is very much an upper bound, as several policy measures take the form of loans that will be repaid, at least partly. As estimating the share of repayments is an uncertain exercise, we take the most pessimistic view to err on the side of caution.

We compute the path of the debt to GDP ratio until 2040 under all three cost scenarios. Doing so requires additional assumption on growth, inflation, and the cost of debt. In terms of real growth, we consider a contraction of 2% in 2020 (falling between the projections of KOF (2020) and Seco (2020)) followed by annual growth of 1.25% (corresponding to the average growth forecasted by Seco until 2040). Turning to inflation, we consider no changes in prices in 2020 and 2021, followed by a 0.7% increase in 2022 and 1% in subsequent years (in line with the SNB (2020) forecast).

We compute the dynamics of debt assuming that the Confederation runs a balanced primary budget. A key parameter is the real interest rate on government debt. We consider a value of -1%, corresponding to the current situation, and a value of 0% in line with the average of the last ten years (see figure 3). We also undertake a robustness analysis with a real interest rate rising to 1%.

Figure 12 presents the path of the debt to GDP ratio under the three cost scenario, considering a value of the real interest rate of -1% (solid lines) and 0% (dotted lines). Table 2 contrasts a broader range of scenarios by showing the debt to GDP ratio of 2040.

Under a moderate cost (CHF 36 billion, yellow lines) the public debt increases to 18.1% of GDP. As the interest rate is lower than the growth rate of GDP, the ratio gradually decreases even without any primary surplus. In 2040 it reaches 11.6% of GDP (with a real interest rate of -1%) or 14.2% of GDP (with a real interest rate of 0%). In other words, the debt to GDP ratio returns to its current value after 20 years when the interest rate on the debt merely offsets inflation. If we consider the high cost scenario (CHF 87 billion, red lines), the debt ratio increases to 25.5% of GDP. This is again followed by a gradual decrease to 20.1%-21.5% in 2040 depending on the real interest rate. The pattern is similar under the highest cost scenario (CHF 100 billion, green lines) where debt increases to 27.4% of GDP.

Our analysis shows that even under the worst scenarios the debt ratio increases to levels that are still moderate and not so much above the ones prevailing from 1995-2005. In addition, these ratio are less of concern than in the earlier period as they reflect temporary measures that were taken in response to a clearly exogenous shock, and not any structural imbalance of public finances

where the paths of spending and taxes would be inconsistent. In addition, recall that we took a stringent assumption that the entire cost of the measure falls on the public debt.

Figure 12: Debt dynamics scenarios (% GDP)

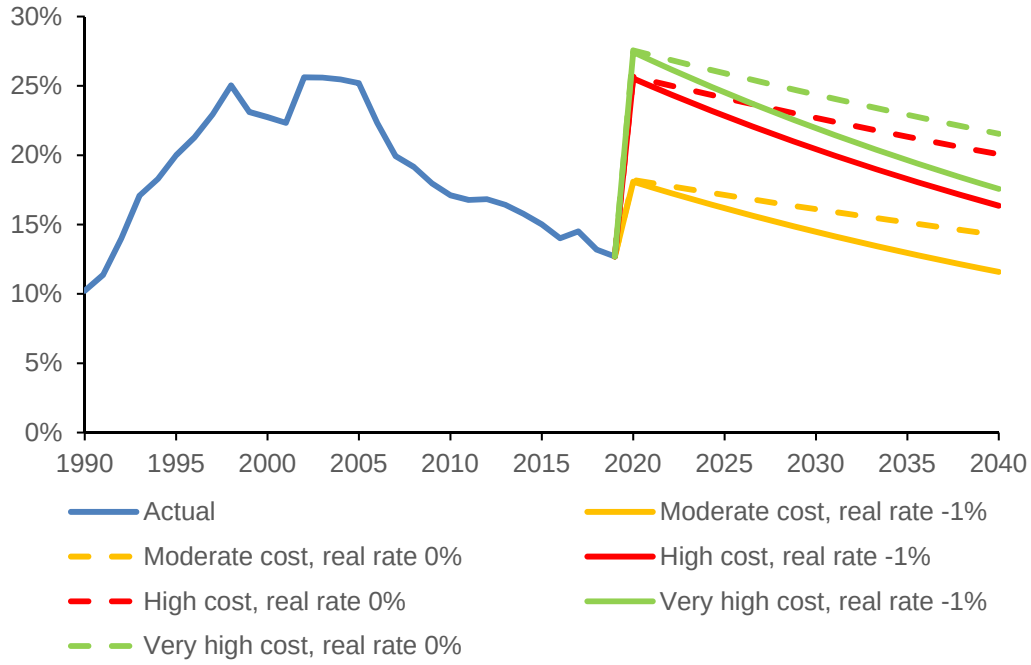
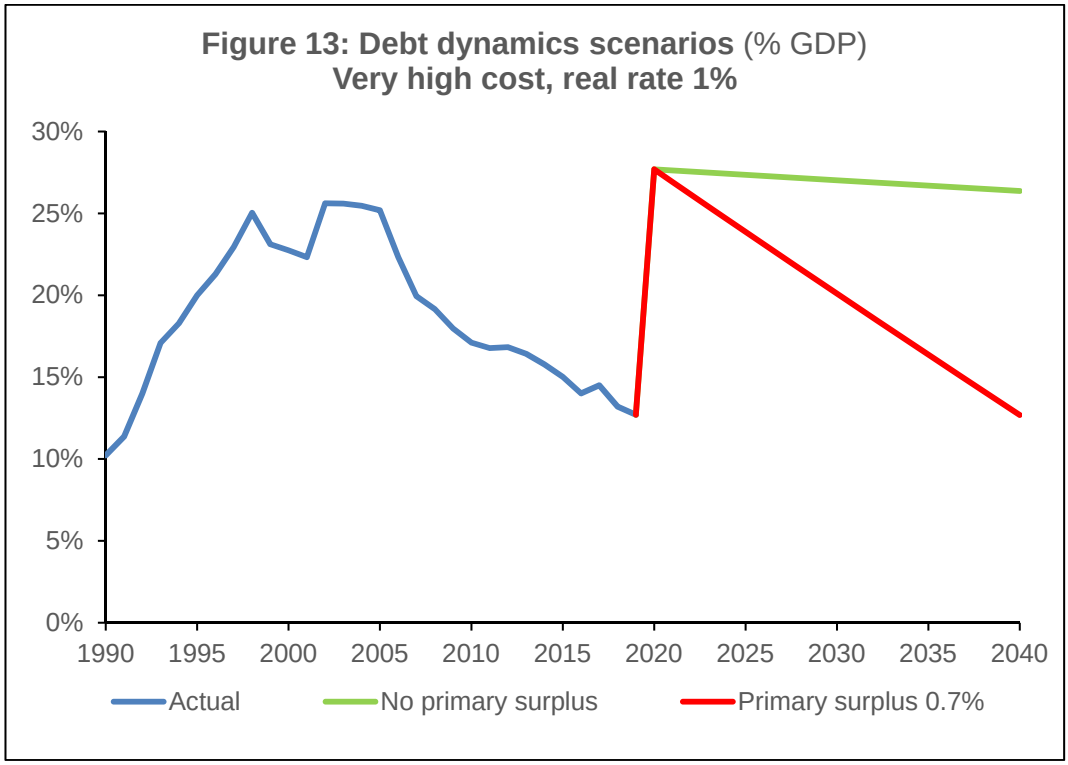


Table 2 : Debt / GDP ratio in 2040

		Real interest rate on debt			
Cost of Covid19 (CHF billion)	Debt/GDP in 2020	-1%	0%	1%, with primary balance = 0	1%, with primary surplus
Moderate, 36	18.1%	11.6%	14.2%	17.5%	13.6%
High, 87	25.5%	16.4%	20.1%	24.6%	12.8%
Very high, 100	27.4%	17.6%	21.5%	26.4%	12.7%

Note: all scenario consider a real growth rate of -2% in 2020 and 1.25% thereafter, an inflation of 0% in 2020-21, 0.7% in 2022 and 1% thereafter. In the absence of policy reaction the primary balance is set at 0% of GDP. In the scenarios with a primary surplus (last column) the surplus is set to 0.2% of GDP in the moderate cost scenario, 0.6% of GDP in the high cost scenario, and 0.7% of GDP in the very high cost case.

Our scenario assume that the real interest rate remains low, albeit in line with the historical experience. We expand our analysis by taking the pessimistic assumption that the real interest rate increase to 1%, which nearly closes the interest – growth gap. Figure 13 shows the path of the debt to GDP ratio under this alternative, focusing on the case of the very high cost for brevity. If the primary budget balance remains at zero (green line), the debt ratio only gradually comes down and still stands 26.4% of GDP in 2040.



Bringing down the debt ratio requires a primary budget surplus. If we consider a surplus of 0.7% of annual GDP, the debt ratio comes down to 13.6% in 2040 (red line), close to its pre-crisis value. The last column of table 2 shows the computations for the various scenarios if the real interest rate increases and a primary surplus is required to bring the debt ratio close to its pre-crisis value by 2040. The required surplus amounts to 0.2% of GDP under the moderate cost scenario and 0.6% under the high cost scenario.

A surplus of 0.7% of GDP amounts to close to CHF5 billion. To put it in perspective, the Confederation's tax revenue currently amounts to 10.1% of GDP, and the overall tax revenue including also the Cantons and municipalities amounts to 21.4% of GDP. The surplus would therefore represent a 3% increase of total taxes (7% increase of taxes paid to the Confederation. This is clearly not a small number, but it would not represent a massive tax increase that would weight on economic activity. In addition, this number reflects a very pessimistic scenario where the epidemic costs is very high, fully transmitted to public finances, and accompanied by an increase in the real interest rate. The actual impact of the crisis will likely be lower.

4.4. Long-term investments

A standard rule in public finances is that debt should be used to finance investment. The low financing cost of government bonds implies that the Swiss government could borrow cheaply to invest in a range of projects.

Such an investment could take the form of physical capital (infrastructure, energy efficiency) or human capital (training). Conceptually the gain from the investment can be measured from the gap between the rate of return and the funding cost of the government. Computing an estimate of the return of investment is however a complex exercise as some of the return is indirect. Infrastructures support growth, and generate tax revenues in addition to the direct benefit from higher growth. Similarly, training is beneficial for the people directly involved but also indirectly in the form of jobs created by the spending of trained people. Finally, investing in better energy efficiency generates externalities through reduced pollution. A lowering or simplification of the tax system can also be seen as a form of investment as it raises the incentives for firms to increase their productive capacity. This is particularly the case for the tax treatment of innovation. Computing estimates of the return is however a complex task.

Even though estimating of the rates of returns on the various investments goes beyond the scope of this paper, these rates are very unlikely to have decreased in parallel with the interest rates on government bonds. The opposite is more likely given the need for training (in schools and on the job) to prepare the labor force to the challenge of the digital economy, as well as the need for increased energy efficiency in the context of climate change. Higher rates of returns, combined with the lower interest rate, clearly imply that the net return has increased in recent years, even though giving a specific numerical value is delicate. The choice between the various investment options will require a much more detailed assessment than the one presented here, and also reflects a political choice.

The investments can be undertaken within the existing budget procedures, leading to an increase in the ratio of debt to GDP (unless they are funded from the primary deficit discussed above). This raises the question of whether the debt burden could become excessive. It would clearly be preferable to face any future economic crisis with a relatively low ratio of debt to GDP. A low debt offers the option to face future problems in a more serene way, and the financial value of this option (similar to the value of a call or put financial option) should be included in the analysis. In other words, a reduction of the debt can be seen as a precautionary savings to generate more room for maneuver in case of future problems.

Estimating the value of the option offered by a low debt is a complex exercise beyond the scope of this paper. Still, two elements are worth pointing. First the low (even negative) interest rates on government bonds imply that a policy of precautionary savings through paying down the debt is costly. Second, one needs to take the level of public debt into account. If it represents 60% of GDP (as in the Maastricht criterion) one should carefully think about the option cost of the debt.

Switzerland however is in a very different situation given the very low level of the debt. It would keep a sizable margin for maneuver even with an increase in the debt to GDP ratio, which implies a low value of the option. Espinoza and al. (2015) present a discussion of this aspect and compute estimates of countries' fiscal space, that is the difference between the current debt level and the maximum that the country could bear. They show that Switzerland is one of the countries with the highest margin estimated at 202% of GDP.

An additional point to take into account is that government bonds represent a form of infrastructure for financial market as they are a benchmark product used in the pricing of other assets and as collateral. Public debt can then be seen as a central element for the attractiveness of a financial center, and being able to offer such an asset is a competitive advantage for a country such as Switzerland where financial intermediation is an important economic activity. Bacchetta (2017) points that in the current situation, the problem with Swiss debt is rather that its level is too low.

4.5. Financial investments

One last option for policy is to invest in higher yielding assets, i.e. to create a sovereign wealth fund. Under this scenario the Swiss Confederation would issue bonds and invest the proceedings in other assets. Bacchetta (2017) stresses the benefits that such a fund could bring, and Christen and Soguel (2019) compute estimates on the return that Swiss Cantons could get from following such a strategy. A sovereign fund is an option that is easier to evaluate than other investments as we can rely on financial market data. Setting up the fund would however put in place a structure that is separate from the one used in the standard borrowing by the government. We assess this option in the next section.

5. A sovereign wealth fund for Switzerland?

5.1. Introduction

One of the options available to the Swiss Confederation, given the low cost of its debt, is to invest in assets yielding a return higher that the interest rate on government bonds. The question of whether Switzerland should set up a sovereign wealth fund, as many other countries have, has been regularly debated in recent years. This discussion has been stimulated by the substantial increase of the balance sheet of the SNB, and increase due to the conduct of monetary policy during the crisis that led the central bank to accumulate large amounts of foreign exchange reserves. It is however problematic to link the central banks to a sovereign wealth fund, as these two institutions have fundamentally different mandates. A central bank is tasked with maintaining price and financial stability. This often requires it to adjust its balance sheet in short order, hence the need to hold liquid assets. A sovereign wealth fund by contrast is tasked with generating a good return on its asset over long periods, which translates into a longer horizon and the possibility to invest in assets that are less liquid but yield a higher return. We therefore consider an institution that is entirely distinct from the SNB.

While the majority of sovereign wealth funds are financed by the revenue from natural resources, for instance oil producers in the Middle East and Norway, a country needs not be a commodity producer to set up a fund. An example is given by Singapore where public funds manage assets abroad that are financed by the savings of the population. In addition, physical assets such as commodities are only one type of resource that a country has. The confidence that global investors have in the country's institution can be thought of as an intangible asset, in the same way as a well-established brand is an asset for a firm.

In this section we assess whether the ability of the Swiss Confederation to borrow at low rates could be used to invest in a portfolio with good return. As discussed at the end of section 4, this approach is distinct from the usual issuance of debt to finance public investments which can be put in place within the existing budgetary procedures. After discussing the particular nature of a fund financed by debt, we assess the prospects based on a broad range of potential investments, and conclude with a discussion of governance aspects which are a major element.

5.2. A particular fund

Existing sovereign wealth funds are long investors whose assets are financed by revenues from past extraction of natural resources or savings accumulated by private agents. A fund financed by government bonds would be a particular case as it would rely on leverage. As is the case with any leveraged investor, the fund should be careful to ensure that a weak return on its assets does

not put it in a position where its assets would durably be worth less that the bonds initially issued to fund it.

While the use of leverage implies a more complex situation than the usual sovereign wealth funds, this aspect can be managed. First, it is a standard issue for all financial intermediaries that invest funds raised from third parties, and is part of their risk management. In addition, leverage is a source of vulnerability when the maturity of liabilities is short, as the fund is then exposed to the risk of funding suddenly drying up. A fund financed by long-term bonds has a more substantial room for maneuver. A financing risk remains as investors may only be willing to refinance the bonds at maturity at a higher interest rate. This risk can be managed by sequencing the maturities so that the fund isn't exposed to the need of having to refinance a large amount of liabilities in a short time. Furthermore, a loss of investors' confidence in the solvency of Switzerland is quite unlikely as long as the Federal government's debt does not rise to high level. As debt currently stands at 14.5% of GDP, the country has a substantial margin.

The option for the government to benefit from cheap funding costs to invest at a profit has already been proposed for Switzerland. Bacchetta (2017) stresses that Swiss government bonds are a safe asset in high demand from investors. The Confederation can then benefit from a negative risk premium reflecting the confidence that markets grant it. Christen and Soguel (2019) assess a sovereign wealth funds at the level of the Cantons. They recognize that the issuance of additional debt can lead to higher interest rates, and undertake a statistical analysis of the impact of the cantonal debt level on the spread between their interest rate and the one on Federal government bonds. The analysis shows that additional debt leads to some increase in the interest rate paid by the Cantons. The authors then consider the net return of a fund financed by debt and invested in the same portfolio as Swiss pension funds. For each Canton they estimate the debt level that would maximize the return from this leveraged investment. Their results show the presence of a sizable margin, albeit with substantial heterogeneity across Cantons. For the median Canton reaching the optimal investment level requires a tripling of the debt (Christen and Soguel 2019, table 2), leading to an increase of the interest rate by 0.8 percentage point. The income generated by the fund represents 14.5% of the Canton's annual tax revenue. [12] The authors also consider a more cautious strategy where debt is not raised above the value of annual tax revenue. This alternative approach translates into a 57% debt increase for the median Canton, with an additional revenue equivalent to 0.13% of annual tax receipts.

[12] For the average Canton the addition income represents 4.78% of annual revenue, but this average is driven by a few Cantons with very specific financial situations. The median is less sensitive to these outliers.

5.3. Potential return on the fund

5.3.1. Portfolios

While assessing the financing cost of a sovereign wealth fund is easily done by taking the interest rate on the Swiss Federal government bonds, the rate of return that can be expected on the assets is more complex to assess. We therefore consider several alternatives. The historical real rates of returns for the various assets are presented in figure A.1 in the appendix.

The first two benchmarks are the returns on Swiss retirement funds. We first consider the median rate of return on Swiss pension funds since 1997, taken from Christen and Soguel (2019) and updated to 2018 based on SwissCanto (2019). The second reference is the return on the compensation fund of the Swiss AVS. The AVS is the pay-as-you-go component of the Swiss payment system, and the contributions received in excess of benefits paid in the past are put in a compensation fund that is invested in a diversified portfolio. The data are from Compenswiss (2018) for the period 2006-2018, and include rates of return before and after risk hedging.

The second category of benchmark is based on the performance of assets held by Swiss resident abroad. These returns are taken from the Net International Investment Position (NIIP) data compiled by the Swiss National Bank, which includes a decomposition of the changes in the values of assets and liabilities between financial flows and various valuation gains since 2015. For previous years we rely on the estimates computed by Stoffels and Tille (2018). Given the small size of Switzerland, the domestic investments by a sovereign wealth fund could be large enough to move the market and lower the returns. This issue is not a concern for investments abroad, at the cost of being exposed to fluctuations in exchange rates. The data from the balance of payments and the NIIP allow us to compute the returns from interest and dividend payments, from capital gains and losses driven by exchange rate fluctuations, and from capital gains and losses due to fluctuations in asset prices.

We focus on specific categories of investments in the NIIP data, namely portfolio investment in bonds and equities and the foreign exchange reserves held by the SNB. We abstract from foreign direct investments as it covers holdings within a corporate group (unlike portfolio investments) and bank lending as it consists mostly of short term positions. The inclusion of the SNB reserves in our analysis is done solely to show the return on its portfolio. As indicated above, the mandate of a central bank is fundamentally different from that of a sovereign wealth fund.

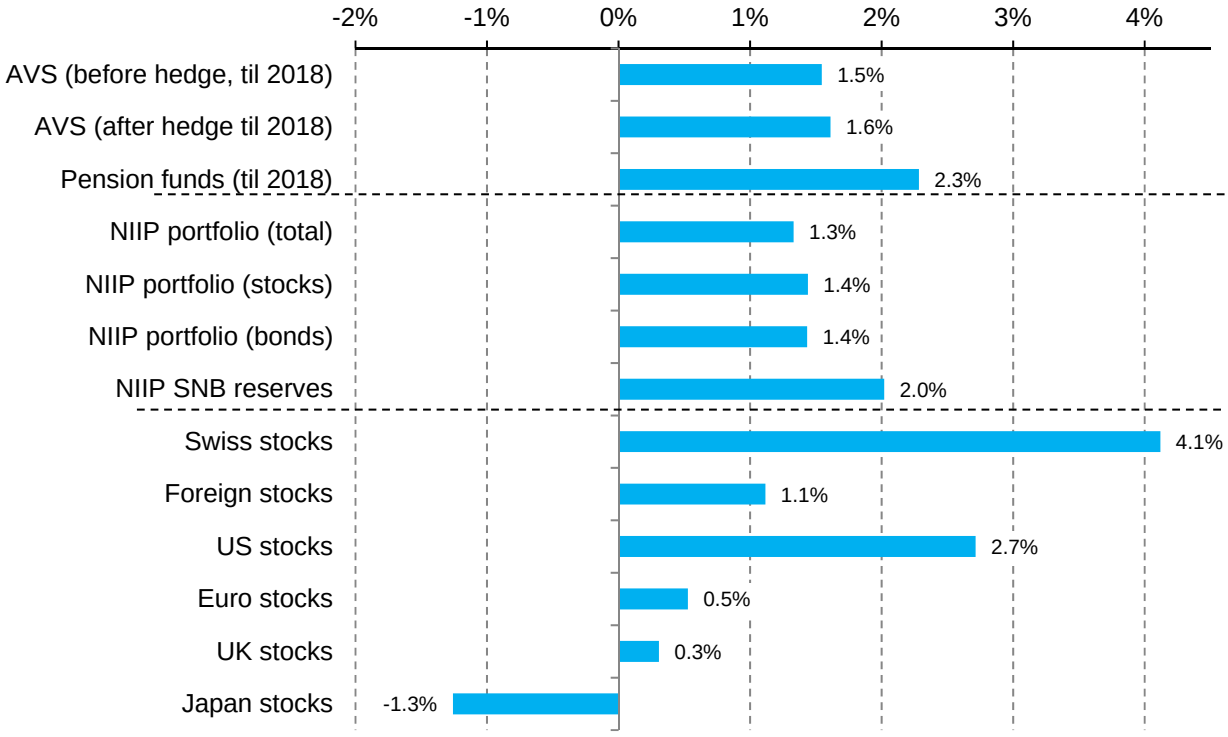
The last benchmark we use is the return on investments in stock markets. We consider the returns on the stock markets of Switzerland, the United States, the euro area, the United Kingdom and Japan. We rely on total return indices, including reinvestment of dividends, taken from Datastream since 1988. These indices are measured in local currencies and we convert them in

Swiss franc.[13] We also consider an average of the returns in foreign countries weighting them by their share to the overall GDP.

5.3.2. Average returns and volatility

To ease the comparison between the various portfolios we compute the returns from 2000 until 2019. Two exceptions are the AVS compensation fund for which the data only cover the 2006-2018 sample, and the median Swiss pension fund for which the data go until 2018. As inflation has decreased from the early 2000's we base our analysis on real rates of returns, deflating the nominal rates by the inflation of the corresponding year. The performance over several years is measured by the average real return (computed as the geometric average of the annual real rates) and the standard deviation of annual real rates of returns.[14]

Figure 14: Average real rate of return since 2000 (AVS: 2006)



The average annual real rates of return are presented in figure 14. The first block shows the results for the AVS fund and the pension funds, with rates between 1.5% and 2.3%. The second block presents the figures for the various categories of assets held abroad by Swiss residents, based on the external Net International Investment Position data. The return on overall portfolio assets

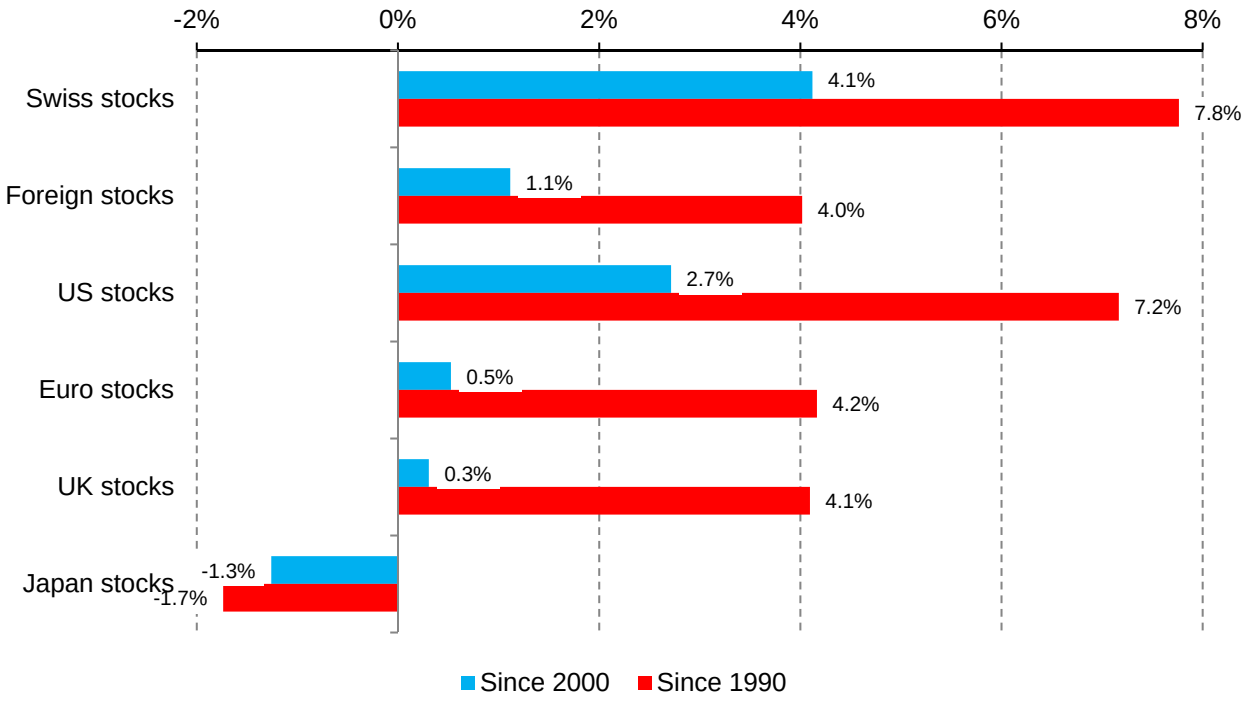
[13] The returns for a given year are based on stock indices and exchange in December of each year.
[14] The exact formulas are presented in the appendix.

(1.3%) is a bit below the one generated by pension funds, with similar returns for bonds and stocks. The return on the reserves of the SNB is higher (2.0%).[15]

The last block of figure 14 focuses on the returns on stock markets. The Swiss market yielded an average return of 4.1% that substantially outperformed foreign markets, especially outside the United States. While a Swiss investor earned a real return (in Swiss terms) of 2.7% on the US market, she obtained a lowered return in Europe and a negative one in Japan. This weak performance of Europe and Japan translates in a low real return (1.1%) on a portfolio invested in the various countries in line with their GDP values.

The weak performance of stock markets in figure 14 is in large part due to negative returns in the early 2000's and during the global crisis. The situation is more nuanced if we take a longer sample. Figure 15 shows the average real rate of return since 2000 (blue bars, corresponding to the values in figure 14) and since 1990 (red bars). Stock markets performed much better when we consider a longer horizon, with the exception of Japan that has faced challenging times since the early 1990's. While the average return on the Swiss market (7.8%) still exceeds that of foreign markets (4.0%), the return on these remains sizable especially in the United States.

Figure 15: Average real rate of return

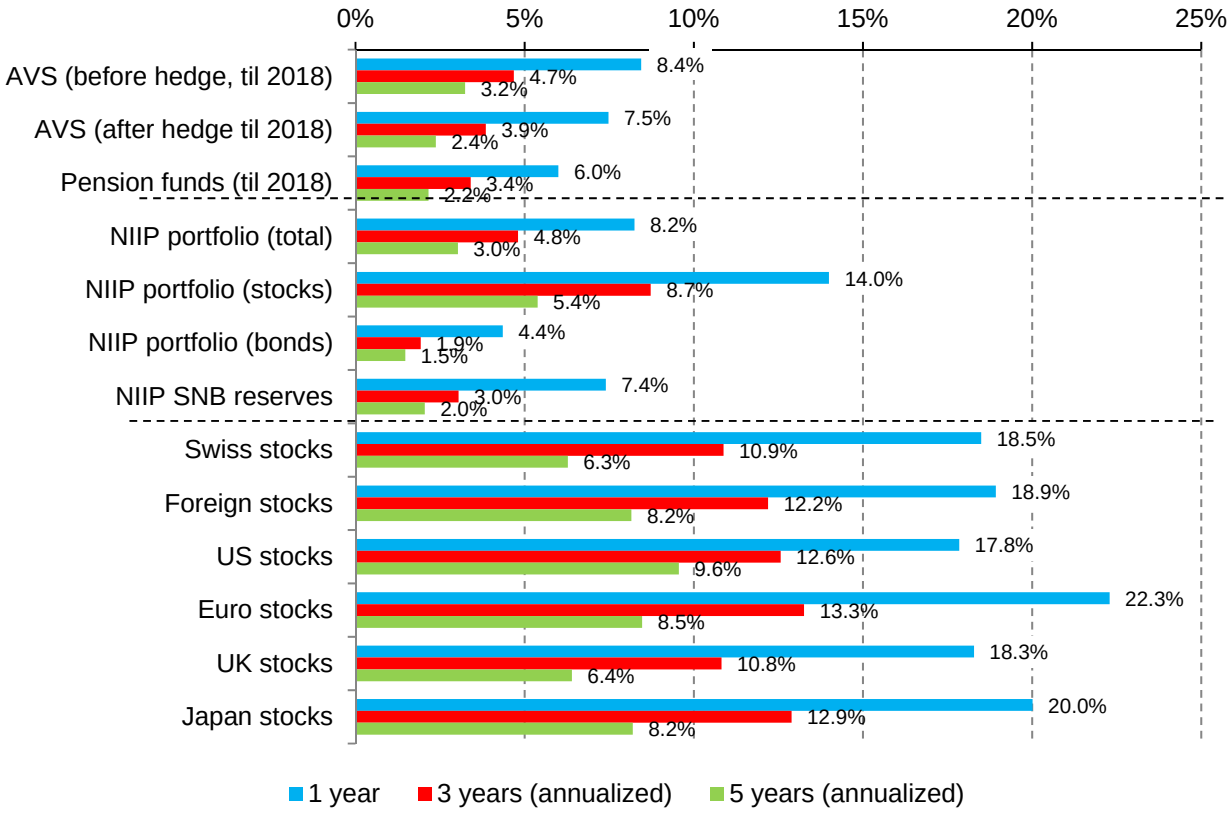


[15] The stronger return on the SNB reserves compared to the portfolio investments is an interesting aspect. It may results from a favorable investment timing. The central bank increased the share of stocks in its portfolio in the most recent years of the sample, and thus avoided the weak performance of stocks in earlier that lowered the rate of return for portfolio investment.

Simply extending the horizon by a decade raises the real return on foreign stocks by about than 3%. This is due to the fact that stock markets had particularly bad years in the early 2000's and in 2008-2009, as shown in figure A.1 in the appendix. Of course the adverse performance of stock markets in early 2020 will lead to weaker returns than the ones presented in the figures. Nonetheless, the figures includes periods of weak markets, such as the 2008-2009 crisis and are thus not biased towards years of high returns. While the NIIP data unfortunately do not allow us to compute the rate of returns since 1990, we can construct an estimate based on some assumptions. The analysis by Stoffels and Tille (2018) shows that stocks accounted for half of the investment in the portfolio category of the NIIP at the beginning of the 2000's. A simple computation leads to an estimate of 2.9% for the average rate of return on the overall portfolio category in the NIIP data.[16]

Broadly speaking figure 14 indicates a real rate of return between 1.3% (portfolio investment abroad) and 2% (pension funds), or even 2.9% (portfolio investment abroad in the longer sample). Higher returns can be obtained on stock markets, at the cost of a higher exposure to substantially weak returns in some markets.

Figure 16: Standard deviation of real rate of return since 2000



[16] . We consider a real return on bonds equal to 1.4% (from figure 14) and a real return on stocks equal to 4.4% instead of 1.4% (return of figure 12 plus the 3% difference of foreign stock returns between the red and blue bars in figure 15). This leads to an overall portfolio return of 2.9%: 0.0289=(1+0.03+0.014)^(0.5)*(1+0.014)^(0.5)-1.

Our analysis should of course take the volatility of returns into account. It is presenting in figure 16. Blue bars show the standard deviation of annual rates of returns. Unsurprisingly the investments in stocks display the most volatile returns, and the ones on foreign bonds are more stable despite the presence of exchange rate risk. The volatility of portfolios including both stocks and bonds lies between these two extremes. The volatility of the returns on the SNB reserves and the AVS fund (after hedging) stands at around 7.5%, with the returns of pension funds being steadier. The standard deviation for pension funds should however be taken with some caution: the data indicate the return of the median fund, but this is not the same fund from one year to the next. Thus the rate of return for a given fund can be more volatile than for the median fund.

The volatility of returns at a horizon of one year is not the most appropriate for a sovereign wealth fund with a long-term investment horizon. To illustrate the point we also compute the standard deviations of annualized returns over longer horizons, namely 3 and 5 years. For each year in the sample we compute the average return over the last 3 (5) years. We then take the standard deviation of that moving average. The results are shown by the red bars (3 years horizon) and the green bars (5 years). We clearly see that this moderate lengthening of the horizon substantially lowers the volatility of returns. While stocks portfolio still show the most volatility, this is reduced by a factor of 3 by moving from a one year horizon to a five years one. Bonds portfolio remains the safest, and portfolio with a mix of the two show a volatility that is higher, though still moderate.

Figure 17: Average return and risk

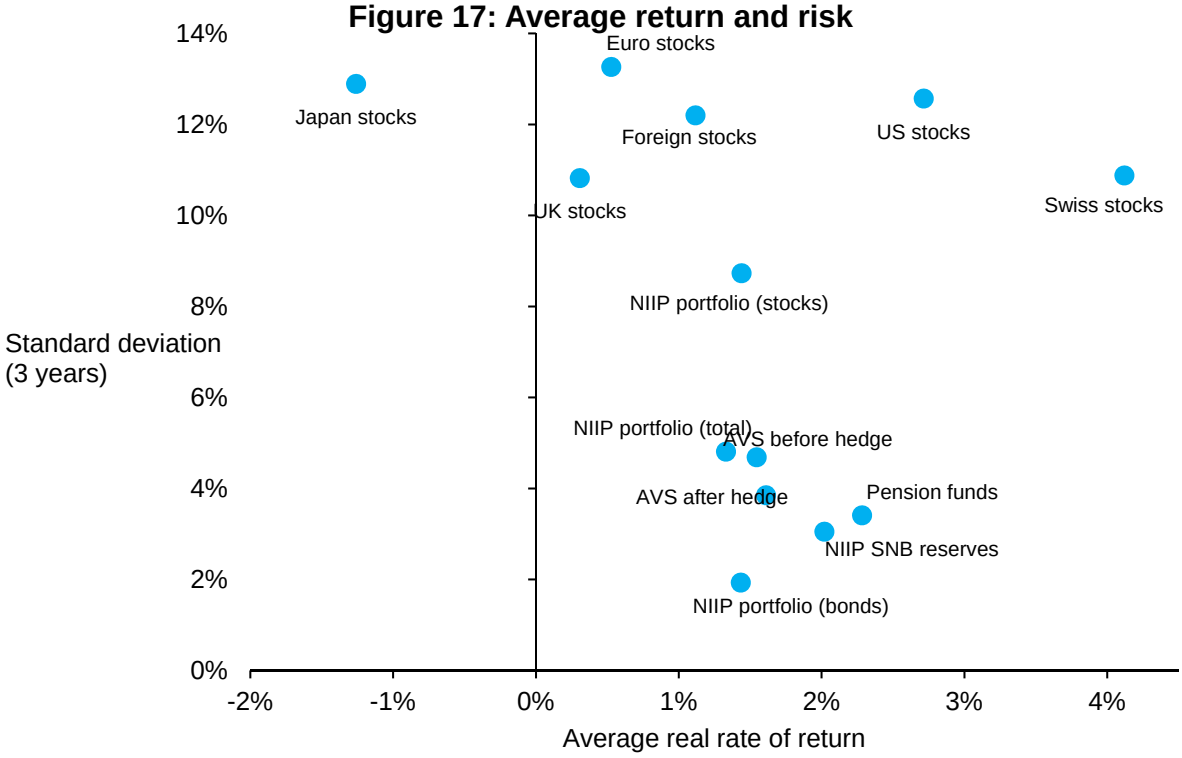
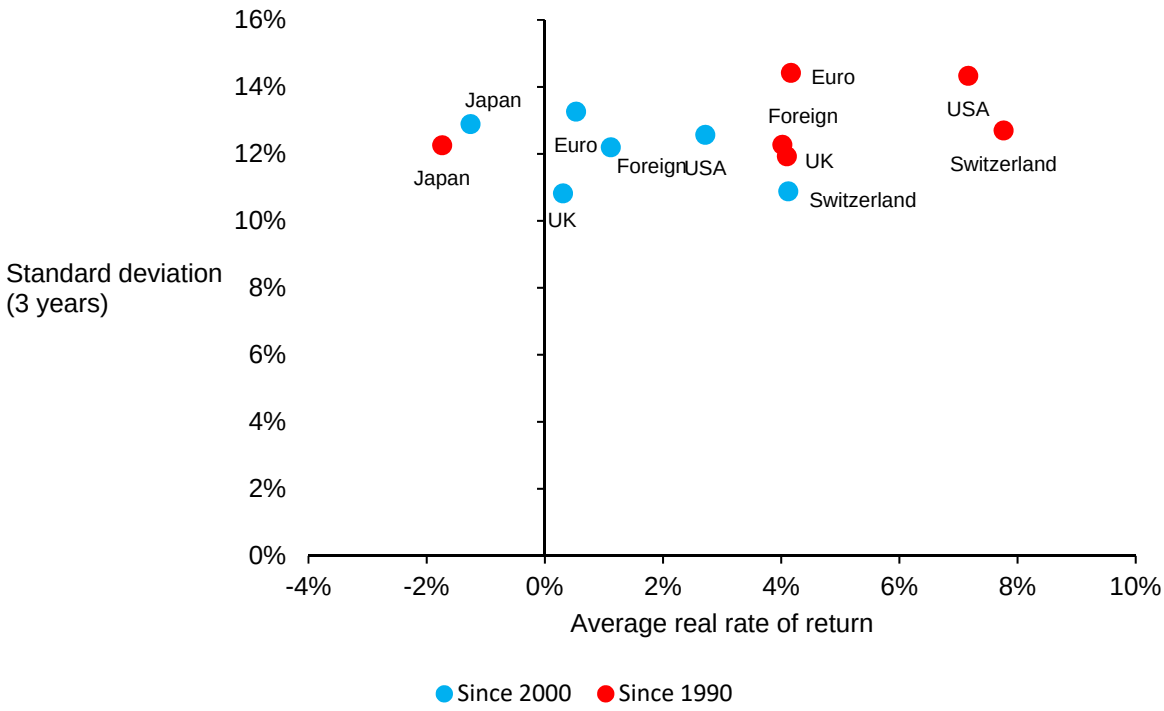


Figure 17 presents the combinations of average real rate of returns (horizontal axis, corresponding to figure 14) and risk measured at the 3 years horizon (vertical axis, corresponding to the red bars in figure 16). The most interesting portfolios are the ones located in the lower right corner with a high average return for a moderate risk. The portfolios of the AVS funds and median pension funds are in this configuration, as are the reserves of the SNB. The portfolio of foreign bonds also presents an interesting option, although with a lower average return. Stock portfolios display a sizable risk without a clear gain in terms of average returns, except for the Swiss market.

As indicated above stock portfolios have experienced a weak spell during the crisis of 2008. Figure 18 is built along the same lines as figure 17 and focuses on investment in the stock markets. It shows the pattern since 2000 (blue dots, corresponding to figure 17) and since 1990 (red dots). With the exception of Japan, the situation is substantially different over the longer sample, with a higher average rate of return for only a moderate increase in risk (red dots are clearly to the right of the corresponding blue dots, and only moderately above them).

Figure 18: Average return and risk



Our analysis shows diversified funds such as the one of the AVS or pension funds can deliver an average real return of 1.5% to 2.3%. Investments in foreign markets give average returns between 1.3% (bonds) and 2.0% (SNB reserves). We therefore consider an interval of 1% to 2% for our analysis. These values are relatively conservative as investments in stocks can give higher average returns, but at the cost of an exposure to risk that can weight on returns for long periods.

5.3.3. ***How much would a sovereign wealth fund yield?***

As the sovereign wealth funds would be funded by Confederation bonds, we need to put the 1-2% real return on assets in perspective with the cost of debt. At first we may want to simply take the average real interest rate since 2000, i.e. 1.16% for a 10 years maturity. This leads to a moderate margin between the return on assets and the cost of debt.

This simple approach is however questionable. As we have shown the real interest rate on the Swiss Federal government bonds has clearly decreased over the last twenty years (figure 3), with an average value of 0.08% between 2014 and 2019, and a negative value of -0.85% in 2019 for ten year bonds. The literature has shown that this trend is broadly observed in advanced countries and reflects structural factors. It is therefore likely that the Confederation will be able to borrow at low rate for many years. An interesting aspect is that the downward trend is specific to the interest rate on government bonds. By contrast the real rates of return on the various portfolios analyzed above show no such trend.[17] The decrease in the interest rate on sovereign bonds translates into a higher gap relative to the returns on the various assets.

In addition the interest rate on a Confederation bond issued today remains valid for the entire maturity, even if the price of the bond on the secondary market subsequently decreases. We consider a nominal interest rate of 0% on government bonds[18] and an inflation rate of 1% in the future. This value corresponds to the middle of the 0-2% range defined as price stability by the SNB. In addition, the forecast of the SNB in its latest quarterly bulleting (SNB 2020) shows that an inflation rate of 1% should be reached by 2022. With these figures, we obtain a real interest rate of -1% for the Confederation bonds. All in all, a range of -1% to 0% for the real interest rate on government bonds is reasonable.

Table 1 shows the estimated return on a sovereign wealth fund. We consider a fund equivalent to 10% of GDP (CHF 70 billion) and rely on our estimates for the real rate of return on the fund's assets and the real interest rate on the bonds used to finance it discussed above. Table 3 shows an annual return between 0.1% and 0.3% of GDP, i.e CHF 700 million to CHF 2.10 billion. A fund amounting to 10% of GDP is quite sizable, but not unrealistic as it would bring the debt to GDP ratio to 23.2% which is still a moderate value. Even if we take the most pessimistic scenario for the cost of countering the economic impact of the Covid19 epidemic, the fund would push the debt to 37.4% of GDP. This would be outside historical bounds, but by no means excessive. In addition the issuance of additional debt would provide financial markets the safe asset that they are craving, a form of financial infrastructure as discussed above.

[17] An econometric analysis confirms this point. If we regress the real rate of return of the various investment options on a linear trend, the estimated coefficient is never significantly different from zero. The same regression using the real interest rate on government bonds shows a strongly significant negative coefficient on the trend.

[18] Even though the rate is currently much lower, we take a conservative approach for our computations.

Table 3 : profits on a portfolio of 10% of GDP
CHF billion and % of GDP

		Real interest rate on government bonds	
		0%	-1%
Real rate of return on assets	1%	0.7 ; 0.1%	1.4 ; 0.2%
	2%	1.4 ; 0.2%	2.1 ; 0.3%

A more cautious alternative would be to use the reimbursement of the debt forecasted until 2023 (CHF 6.7 billion, figure 1). This would lead to returns about 1/10th of the ones in table 3.

Our analysis shows that the Swiss Confederation could generate sizable profits by investing along the same lines as pension funds or the AVS fund instead of paying down the debt. Such a sovereign would not be a magic want, as the profits would not be enough to solve the challenges of the cost of pensions or health for instance. It would still bring a useful additional margin.

The computations presented in this section aim at establishing an order of magnitude for the foreseeable profits. The can be substantially refined in more detailed analyses of the investment options to obtain more precise estimates.

5.4. Governance issues

A major lesson from the literature on the political economy of public finances is the presence of a deficit bias as the authorities have an incentive to pass the cost of their decisions onto others (Brülhart and al. 2017, Fatás and al. 2019, Wyplosz 2019). In the context of a sovereign wealth fund this implies a risk that investments are chosen based on political considerations rather than on long term returns. The governance of the fund is thus a central element, both for its setup and its day-to-day management.

As indicated above the fund should be separate from the central bank given the profound difference between their respective mandates. While Norway offers an example of a sovereign wealth fund managed within the central bank, this governance structure has recently come under criticism from Knut Kjaer who headed the fun from 1998 to 2007 (Financial Times 2019b). He stresses the need to have an independent institution manage the fund following the recommendation of an expert committee rather than putting it in the central bank.[19]

[19] The potential impact of the fund's investment on exchange rates could affect monetary policy. In the current configuration we can expect that an increase in the supply of safe asset denominated in Swiss franc – issued to finance the fund – leads to a weakening of the franc as it would reduce the scarcity of sage assets. This mechanism, which is hard to precisely quantify, would support the SNB in its efforts to counter the strength of the Swiss franc.

While the fund should be separate from the central bank, the two institutions show some parallels in terms of their governance. The role of the central bank is to ensure price and financial stability. As its policies take time to deploy their effect, the institution must conduct its policy looking beyond short term economic fluctuations. The literature on the optimal governance of central banks stresses the need for their independence to shield them from short-sighted political pressures. This independence is granted within a well-defined framework set by the legislative authorities, and comes with a duty of accountability and communication through speeches and regular media communication.

A sovereign wealth fund is faced with similar challenges as it needs to focus on the long term return on its investments, and it is important to protect it from pressures that would steer it away from this mandate. The fund should be managed by an independent entity. At the time of the fund setup, the institution would receive an explicit mandate from the political authorities regarding its objectives. The mandate should specify the horizon of the investments, the decision rules regarding the risk tolerance and the split of investment between domestic and foreign assets. The mandate given by the authorities should focus on setting up the strategic objectives and leave their implementation to the management of the fund. This would ensure that political pressures do not affect the operational conduct of the fund, for instance in choosing specific domestic investments with a risk of favoring politically sensitive sectors. A well-defined mandate would also facilitate the interaction with neighboring countries, as otherwise investments in foreign assets could lead to accusations of political influence of exchange rate manipulation.

The definition of the investment horizon should also ensure that the fund does not come under undue pressures when some of it investments will show losses during times of weakening markets, as situation that will certainly occur at some point. The entity managing the fund will need to regularly present and motivate its investment choices within the given mandate. Conpenswiss, who manages the funds of social insurances, offers an interesting example, even though its mandate is not solely geared towards long-term returns.[20]

Another aspect of governance is the procedure for the payment of earnings from the fund to the political authorities. This can also be subjected to political pressures for the fund to disburse its returns faster than it should from a long-term perspective. In addition, the volatile return on some assets can translate into volatile payments, or even to a situation where the value of assets would fall below the amount of sovereign debt that was initially issued to finance the fund. Here also the governance of the central bank offers an interesting benchmark, as the return on its foreign exchange reserves also fluctuates substantially with markets. In Switzerland the transfer of the SNB profits, beyond the dividend paid to shareholders, is set in a clear and transparent rule.[21] In a first step, some of the profits are put in a « provision for monetary reserves» in order to ensure that the

[20] https://www.compenswiss.ch/fr/?page_name=intro
[21] https://www.snb.ch/fr/iabout/snb/annacc/id/snb_annac_profit

central bank's equity remains at a sufficient level. The remaining profits (or losses) are put in a « provision for future payments», which can have negative balance. The payment to the Confederation and the Canton is then set based on agreement between the SNB and the Confederation that is renewed every 5 years. This mechanism allows for the payment to be smoothed across years, with the « provision for future payments» acting as a buffer, and to anchor it in a predetermined rule. A similar mechanism could be put in place for a sovereign wealth fund. In the early years of the fund operations, profits could be used to set up an equity buffer. After that, profits could be put into a provision from which payments to the government would be drawn based on a preset rule aimed at smoothing them.

Governance issues are essential to ensure that a sovereign wealth fund is soundly managed with a long-term view. These challenges are however not very different from the ones faced by existing institutions, such as the central bank, and can be handled using rules and structures that are in place in these institutions.

A question specific to the Swiss context is whether a fund would be consistent with the debt brake rule. From an economic point of view the answer is yes. While the fund is financed by additional public debt, it is invested in financial assets and thus does not constitute net liability. In addition, the fund could be financed simply by using the amounts that will instead go towards paying down the debt under the current projections. This would leave the debt unchanged.

6. Impact of temporary policies

6.1. Introduction

The analysis in sections 3-4 focuses on a long term view of the trends in interest rates and their relation to growth. This section completes the analysis by considering the suitability of fiscal policy as a tool to smooth the business cycle, a point that is often debated and has been the object of many recent studies.

The effectiveness of fiscal policy is most often presented in the form of the « fiscal multiplier». This number indicates whether fiscal policy impacts GDP growth, and if so whether there is an effect beyond the direct impact of government spending. We can distinguish between three cases:

- Multiplier equal to 0: GDP is not affected by the policy. The direct impact of higher public consumption is fully offset by a reduction in private consumption or investment, for instance because borrowing by the government diverts funds away from private investment (the so-called « crowding *out* » effect).
- Multiplier between 0 and 1: GDP increases moderately. The direct impact of government spending is only partially offset by a decrease in private demand. Fiscal policy can then stimulate growth, but its effectiveness is limited by the adjustment of consumers and firms.
- Multiplier equal to 1 or higher: GDP increases substantially. The direct impact of public spending is magnified by an increase in consumption or investment. This can be the case if firms are initially in a « wait and see » stance due to uncertain demand. In that case the fiscal expansion acts as a prop to private demand (« crowding *in* » effect).

We start with a review of theoretical considerations before presenting the main findings from the recent literature.

6.2. Theoretical aspects

The starting point of theoretical works is often the Keynesian model that focuses on aggregate demand, under the assumption that the economy does not face supply constraints and instead has under-used resources, due for instance to high unemployment. An increase in government spending raises GDP. This in turn increases the income of households, inducing them to spend more and boosting GDP further. This amplification is, however, offset by an increase in interest rates, which raises the funding cost of firms and reduces investment. The final impact of fiscal policy depends on the relative strength of these mechanisms.

A limitation of the standard Keynesian model is that it focuses on the short-term behavior of the economy and abstracts from households' and firms' intertemporal decisions. These decisions

can however materially lower the effectiveness of fiscal policy. The central mechanism is the so-called « Ricardian equivalence ». We illustrate it in the context of a temporary tax cut funded by additional public debt. In the long run the government will raise taxes to pay for the interest on the debt. Household choose their consumption taking account not only of the short-term situation but also on the long term. They foresee the future increase in taxes, which will lower their future available income, and choose to save to smooth consumption through time. The additional savings exactly match the extra government debt. The temporary tax cut is thus entirely saved and has no impact on GDP in the short run.

The Ricardian equivalence mechanism rests on the assumptions that households and the government share the same time horizon and can access financial markets on the same terms. If this is not the case, fiscal policy has an effect. It can for instance be the case that households face a temporarily low income and would like to borrow, but cannot because of credit constraints. A temporary tax cut then offers them the opportunity to increase their resources today at the cost of a lower income in the future, in other words to borrow via the government. This pattern is relevant during a recession, but less so during a boom when households are not constrained. We can therefore expect the effectiveness of fiscal policy to be stronger during recessions than during expansions.

An additional element relevant for the effectiveness of fiscal policy is the reaction of the central bank. Consider the case where a fiscal expansion is only partially offset by lower private demand and raises GDP. The increase in activity leads to inflationary pressures. As the central bank is tasked with ensuring price stability, it reacts by tightening monetary policy to dampen growth. The stimulus from fiscal policy is then offset by a contractionary monetary policy. The reaction by the central bank however takes place provided that it is itself free to move. Consider instead a situation where inflation is too low and the central bank cannot stimulate economic activity (for instance because it is faced with a lower bound on interest rates). The central bank then welcomes the inflationary stimulus from fiscal policy and does not offset it. We can thus expect fiscal policy to be more effective in times where monetary policy is constrained, for instance by a limited ability to push interest rates in negative territory.

The theoretical analysis also underscores the relevance of the exchange rate regime in an open economy, with fiscal policy being more effective in a fixed exchange rate regime. The increase in government spending leads to a higher interest rate (as in a closed economy) which translates into an appreciation of the currency. With a flexible exchange rate this appreciation reduces the competitiveness of exporters and leads to a trade deficit which limits growth. Under fixed exchange rate regime the central bank has to intervene to counter the appreciation of the currency, and monetary policy takes an expansionary stance. This reinforces the fiscal stimulus leading to a strong effect on growth.

The view of economists on fiscal policy has substantially evolved with the global crisis. Beforehand the profession was broadly skeptical of the usefulness of fiscal policy as a way to handle the business cycle as several empirical studies showed a limited impact. The consensus was that business cycle management was best left to monetary policy. The crisis has led to a reassessment of this view. Fiscal policy has been used, which allowed economists to update the results of their studies.

6.3. **A contrasted effectiveness**

Recent contributions show that the fiscal multiplier is sensitive to the economic environment and to the specific policies implemented. Ramey (2011) reviews the results from a broad range of papers and finds that the estimates of the multiplier lay between 0.8 and 1.5.[22] This shows that fiscal policy can support growth but with a very heterogeneous impact.

A long-standing challenge for the analysis is to correctly identify the causal linkages between public spending and growth. Fiscal deficits tend to increase during recession as tax revenue drops, unemployment insurance expenditures increase, and the authorities can choose to increase spending in response to the recession. The ensuing positive relation between recessions and fiscal deficits could lead to the erroneous conclusion that higher deficits reduce GDP, or at least to under estimate any positive impact. It is then important to identify increases in fiscal deficits that are not a response to a weakening business cycle. This can be done based on a statistical analysis that estimates the automatic response of deficits to the business cycle and treats deviation from this as exogenous deficits. An alternative method is a more qualitative analysis that assesses whether a higher deficit reflects an explicit choice, looking at specific policy steps (such as the adoption of an additional budget by the government), communication by the authorities, or discussions in the economic press surrounding the deficit increase.

A central question is the extent to which the impact of fiscal deficit depends on the economic environment. As indicated above we can expect policy to have a weak impact if the economy is doing well as productive resources are then fully used, and a strong impact in a recession where public spending uses resources that would otherwise be idle and is not at the expense of private demand. Auerbach and Gorodnichenko (2010) present an analysis that allows for the effect of fiscal policy to depend on the state of the business cycle. They show that the multiplier is higher during recessions than during times of healthy growth. Ramey (2019) stresses that more recent studies point that this result is sensitive to the specific approach adopted by the researchers.[23] Cohen-Setton

[22] Some studies find a substantially lower multiplier.

[23] The core element of the analysis is to contrast the impact of government spending depending on the initial extent of resource underutilization. A standard measure is the output gap, i.e. the difference between GDP and the level that would deliver full employment. The impact of a fiscal expansion in year *t* is stronger if one considers the output gap in year *t* instead of the output gap in year *t-1*. This indicates that the current situation of the economy is the relevant measure. Similarly, the role of the business cycle is weaker if the unemployment rate is used instead of the output gap.

and al. (2019) study the effectiveness for the OECD countries from 1970 to 2006. They identify the situations where an increase in the deficit reflects an explicit policy by combining a statistical approach with a qualitative assessment based on the communication by the authorities and press articles. They also focus on deficit increases that increase a threshold, as small increases can have a more marginal effect. Their analysis gives an estimated multiplier of 1.5 on average, with a sharp contrast between times when the economy grows robustly (with a multiplier of zero) and times of recession (with a multiplier equal to 3).

The specific nature of spending is also important. Public investments, especially in infrastructure, can boost the long-term potential rate of growth. They are particularly appropriate at times where the financing cost of public debt is low, as stress by the IMF (2014).

Corsetti, Meier and Mueller (2012) assess the role of the exchange rate regime. They show that a fiscal expansion is less effective with a flexible exchange rate than with a peg, in line with theory. The difference reflects a deeper contraction of investment under a flexible exchange rate, which is partially offset by an increase in the trade balance thanks to a depreciation of the currency. The composition of growth is thus different from what theory suggests. In addition, the impact of the exchange rate regime on the fiscal multiplier is of a small magnitude.

Ramey (2019) reviews the most recent studies and contrasts the multiplier depending on the specific features of the fiscal policy. The literature finds a range of 0.6 to 1.0 for the multiplier associated with government spending. Other studies consider the impact of tax increases. They find higher multipliers that for spending, with a range between 2 and 3. The studies based on models calibrated to reflect the actual behavior of the economy however find much lower value for the multiplier following a tax change. Another set of papers focuses on transfers to households. While the impact is moderate in general (multiplier between 0.2 and 0.6) it is much stronger for transfers targeted to households that face borrowing constraints (multiplier close to 2).

The reaction of monetary policy plays an important role. An increase in government spending has a stronger impact, with a multiplier between 1.5 and 2.5, when monetary policy is constrained by the lower bound on interest rates. Cohen-Setton and al. (2019) also find that the role of the business cycle operates largely through a different reaction of monetary policy. In times of healthy growth the central bank raises the interest rate following a fiscal expansion, while it does not do so in times of weak growth. This shows that fiscal policy has a particular role to play when the central bank is less able to stabilize the business cycle. A policy of fiscal stimulus should thus not be conditioned on the state of the business cycle per se, but on the policy margin available to the central bank (Lagervall 2019). This point was recently underscored by Laurence Boone of the OECD in the context of the euro area (Financial Times, 2019a). The recent assessment of the Swiss

This reflects the fact that unemployment tends to lag the business cycle, and the unemployment rate in year *t* is more closely linked to the output gap of year *t-1*. Finally the specific approach to quantify the state of the economy matters (using the probability of being in a recession, instead of a 0-1 dummy for a recession, impacts the results).

economy by the IMF (2019) also emphasizes the need to use the fiscal policy margin in support of monetary policy.

Blinder (2016) shows that the assumptions underlying the Ricardian equivalence are rarely met, and fiscal policy has a place in the toolkit used for macroeconomic stabilization. Given that budgetary decision processes can be slow, he recommends relying on strengthened automatic stabilizers, as well as using temporary subsidies for the purchase of durable goods, such as cars.

6.4. Fiscal consolidation strategies

Several studies have focused on the impact of policies aimed at lowering structural deficits. Fatás and Summers (2016) shows that the tightening of spending since 2010 in several countries have lowered growth both in the short run and in terms of long run potential. This adverse impact on output is large enough to lead to a higher debt to GDP ratio, despite the reduction of the debt itself. The IMF (2014) conducts an analysis of episodes where deficits have been reduced through an explicit policy effort, and not merely thanks to a strong growth spell. Such a reduction weighs on growth. The cost can be lowered by an expansionary monetary policy, or through a depreciation of the exchange rate that raises exports. The analysis of the IMF also shows that it is better to lower the fiscal deficit through a reduction in spending than through higher taxes.

Alesina, Favero and Giavazzi (2019) study the impact of a broad sample of episodes where governments put in place specific measures to durably reduce their deficits. While these measures lower growth, the authors point that this cost is temporary. This is especially the case when the deficit is lowered by reducing expenditures. A deficit cut through higher taxes leads to a deeper and longer recession driven by a sharp contraction of investment. The recession is then sufficiently severe to offset the effect of the deficit reduction on the debt to GDP ratio. The authors stress that the high cost of the fiscal austerity measures in the euro area reflects the fact that they mostly took the form of increases in taxes.

6.5. Synthesis

The main lesson from the literature on the growth impact of fiscal policy is that the effects are highly heterogeneous. Three points are particularly noteworthy.

- Investment expenditures support growth. However, infrastructure projects take time to be put in place, and their usefulness to handle short term movements in the business cycle is questionable (regardless of their long term benefits).
- Policies targeted to households who face credit constraints are highly effective, as they have a high propensity to spend. An increase in unemployment benefits, or transfers targeted to low income households during a recession is an effective policy to stimulate aggregate demand.

- Fiscal policy is particularly effective when it comes in support of the central banks at time when monetary policy faces constraints. The crisis has shown that while monetary policy can still operate when interest rates have been lowered to zero or below, the central bank's task is more challenging then. A stimulus from fiscal policy is then welcome and is not offset by a reaction of monetary policy.

A challenge for the relying on fiscal policy to handle business cycle movements is that the budgetary decisions can take time. It is then better to rely on automatic stabilizers, a point stressed by Blinder (2016), keeping the option to rely on additional stimulus in case of a particularly deep recession. From this point of view the Swiss mechanism of temporary reductions of working time covered by the unemployment insurance and temporary extensions of the benefits duration are fully adequate. An avenue for future analysis would be to strengthen such mechanisms. This could take the form of a negative income tax for low income level, building on the US Earned Income Tax Credit: instead of starting at a 0% marginal rate the scale of the progressive income tax could include a negative rate for the lower income tranches, thereby supporting poorer households.

The literature shows that in normal times monetary policy remains the most appropriate tool for business cycle policy, given its ability to reach quickly. The crisis has shown nonetheless that the conduct of monetary policy is more complex when the central bank only has a limited margin to lower interest rates. Given the persistent downward trend in interest rates, we can expect that in the future monetary policy will face this problem more frequently than in the past, and thereby need support from fiscal policy. Such support should take place within a clearly specified framework for two reasons. First, political decision processes could be too slow to be effective in a timely manner. Second, the independence of the central bank is a major element for it being able to fulfil its price stability mandate, and it will be important to ensure that the support from fiscal policy does not turn into an excuse to erode this independence. An avenue for future work is the design of an automatic mechanism leading to a more expansionary fiscal stance once the interest rate set by the central bank reaches a set threshold.

7. Conclusion

The financial situation of the Swiss Confederation is likely the envy of finance ministers in several other advanced economies, with a low debt level and no deficit. While this state of affairs is clearly better than facing a high indebtedness, there can be too much of a good think, and public debt can be too low. This is relevant for Switzerland where the debt to GDP ratio is low and has been decreasing for many years, a trend that looked set to continue before the ongoing epidemic. Swiss public finances are not under pressure from markets, quite the contrary as investors are willing to pay for the privilege to put their funds with the Swiss government even at long maturities.

This paper shows that the favorable environment is likely to persist. The decrease in interest rate on sovereign bonds is part of a long trend that is broadly seen in advanced economies. The interest rate paid by the Confederation is clearly below the growth rate of GDP, and this patter is far from unusual in historical perspective. In this context, paying back the debt is a costly policy. Given the low level of interest rate the Swiss government could afford a sizable budget deficit and still keep the debt steady as a low ratio to GDP. It could also use the substantial fiscal policy space to handle the economic costs of the Covid19 epidemic. The authorities could also take advantage of the low funding costs and invest in higher return assets, thereby making good use of the intangible asset that is the trust of investors. While setting up such a sovereign investment funds raises several governance issues, they can be handled.

The analysis draws on the results from recent academic contributions and applies them to the Swiss case. For sure several of the elements considered, such as the deficit consistent with a steady debt to GDP ratio or the return prospects of a sovereign wealth funds, can be analyzed in more details. This however does not constitute an excuse for a lack of ambitious and costly prudence in the conduct of economic policy. « Yes we can » is a more suitable attitude.

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9. Appendix

9.1. Data sources

The Swiss Federal Government (Confederation) debt is taken from the Swiss National Bank (SNB) database, based on the figures from the Swiss Federal Finance Office, which indicates the effective amounts from 1991 to 2017 and forecasts from 2018 to 2022. These data are completed by the Swiss Federal Statistics Office (OFS) for the 1990 figures.

SNB, 1991-2023	https://data.snb.ch/fr/topics/uvo#!/cube/pubfin
OFS, 1990-2018	https://www.bfs.admin.ch/bfs/fr/home/statistiques/administration-finances-publiques/depenses-dettes.assetdetail.8247258.html

The growth rate of nominal GDP is taken from the Swiss Secretatariat for Economics Affaires (SECO) since 1980. Data from the OFS are used to extend the SECO numbers back to 1948. The IMF forecasts since 2008 are taken from the World Economic Outlook database.

SECO, 1980-2019	https://www.seco.admin.ch/seco/fr/home/wirtschaftslage---wirtschaftspolitik/Wirtschaftslage/bip-quartalsschaetzungen-/daten.html
OFS, 1948-2017	https://www.bfs.admin.ch/bfs/de/home/statistiken/volkswirtschaft/volkswirtschaftliche-gesamtrechnung/bruttoinlandprodukt.assetdetail.6067517.html
IMF forecasts	https://www.imf.org/en/Publications/SPROLLS/world-economic-outlook-databases#sort=%40imfdate%20descending

The yield on Swiss Confederation bonds are taken from the SNB database since 1986 for several maturities. These figures are completed from the ones from the OFS for the yield on bonds with 10 years maturity since 1979, and the Swiss historical statistics database for yields since 1948.

SNB, 1986-2019	https://data.snb.ch/fr/topics/ziredev#!/cube/rendoblim
OFS, 1979-2019	https://www.bfs.admin.ch/bfs/fr/home/statistiques/monnaie-banques-assurances/marches-financiers.assetdetail.6486664.html
Historical statistics, 1905-1986	https://hsso.ch/get/O.18bc.xlsx

The interest rates on mortgages and investment loans for various maturities, the yields on corporate bonds, and the LIBOR rate are taken from the SNB database.

BNS, mortgages since January 2008	https://data.snb.ch/fr/topics/ziredev#!/cube/zikrepro
BNS, investment loans since May 2009	https://data.snb.ch/fr/topics/ziredev#!/cube/zikredlauf
BNS, yield on private bonds since Janaury 2001	https://data.snb.ch/fr/topics/ziredev#!/cube/rendoblid
BNS, 12-months LIBOR since January 1989	https://data.snb.ch/fr/topics/ziredev#!/cube/zimoma

The returns on the various portfolios in the analysis of the sovereign wealth funds come from several sources. The returns on portfolio assets held abroad by Swiss resident investors are taken from the SNB statistics that provide a decomposition of the changes of positions across financial flows and various valuation effects since 2015. The values before 2015 are the estimates of Stoffels

and Tille (2018). The yield of the AVS retirement fund is taken from the website of Compenswiss and its annual reports until 2018. The median return of Swiss pension funds is taken from Christen and Soguel (2019) and uptaded based on the annual study of pension funds by SwissCanto until 2018. MSCI total return indices on stock markets (including reinvested dividends) are from Datastream and are adjusted for exchange rates from the SNB database to compute returns in Swiss francs. GDP data used for the weighting of foreign returns are taken from the IMF World Economic Outlook database.

Assets from the Swiss net international investment position, SNB (since 2015) and Stoffels and Tille (2018), 2000-2014.	https://data.snb.ch/en/topics/aube#!/cube/auvezebq https://ideas.repec.org/a/usg/auswrt/201869011-40.html
AVS investment fund, 2006-2018	https://www.compenswiss.ch/asset/fr/?page_name=aaperf
Median return of Swiss pension funds, Christen and Soguel (2019) and SwissCanto (2019, 2015)	https://sjes.springeropen.com/articles/10.1186/s41937-019-0030-x https://www.swisscanto.com/media/pub/1_vorsorgen/pub-107-pks-2019-resultat-fra.pdf https://www.swisscanto.com/media/pub/1_vorsorgen/pub-106-pks-2015-resultat-fra.pdf
MSCI « total performance » indices 1988-2019	Datastream : MSSWITL(RI) (Suisse), MSUSAML(RI) (USA), MSEMUIL(RI) (Euro), MSUTDKL(RI) (Royaume Uni), MSJPANL(RI) (Japon)
Exchange rate indices 1988-2019	https://data.snb.ch/fr/topics/ziredev#!/cube/devwkieffim https://data.snb.ch/fr/topics/ziredev#!/cube/devwkibiim
Nominal GDP in US dollar, 1988-2019, IMF	https://www.imf.org/external/pubs/ft/weo/2019/01/weodata/index.aspx

9.2. **Public debt dynamics**

At the beginning of a time period (year, quarter) denoted by *s*, the government inherits a debt accumulated in the past. We denote the nominal debt by B_{s-1}. The government pays and interest rate i_s^G.[24] It raises an amount T_s of taxes and undertakes an amount G_s of spending. The primary deficit is denoted by $D_s^p = G_s - T_s$. The total deficit is funded by additional debt leading to an amount B_s of debt at the end of the period *s* :

$$B_s - B_{s-1} = G_s - T_s + i_s^G B_{s-1} \qquad (A.1)$$

The GDP generated in period *s* is denoted by Y_s. We can thus rewrite (A.1) with variables expressed as ratio to GDP, denoting these ratios by lower-case letter. For instance, the ratio of debt to GDP is $b_s = B_s/Y_s$. This leads to:

$$b_s = g_s - t_s + \frac{1 + i_s^G}{1 + \mu_s} b_{s-1} \qquad (A.2)$$

where μ_s is the growth rate of nominal GDP. From (A.2) we get the following dynamic equation for the debt to GDP ratio:

$$b_s - b_{s-1} = d_s^p + \frac{i_s^G - \mu_s}{1 + \mu_s} b_{s-1} \qquad (A.3)$$

The analysis can easily be extended to a situation where the government invests in financial assets in addition to borrowing. Specifically, the government holds assets of value F_{s-1} at the beginning pf period *s* which yield and interest rate i_s^P. The relation (A.1) then becomes:

$$(B_s - F_s) - (B_{s-1} - F_{s-1}) = G_s - T_s + i_s^G B_{s-1} - i_s^P F_{s-1} \qquad (A.4)$$

where $B_s - F_s$ is the net debt taking account of financial assets. This relation is written in terms of ratios relative to GDP as follows:

$$(b_s - f_s) - (b_{s-1} - f_{s-1}) = g_s - t_s + \frac{i_s^G - \mu_s}{1 + \mu_s}(b_{s-1} - f_{s-1}) - \frac{i_s^P - i_s^G}{1 + \mu_s} f_{s-1} \qquad (A.5)$$

[24] The index *G* indicates that the interest rate applies to government bonds.

9.3. A simple macroeconomic model

9.3.1. Main features

9.3.1.1. Consumer's utility

We consider a standard macroeconomic model where the country is inhabited by a representative agent who maximizes an infinite horizon utility. Utility reflects consumption C and the holdings of government bonds X^G (expressed as a ratio to consumption). The direct utility provided by government bonds is a simple way to model the convenience yields they provide in form of a safe liquid asset. This approach is similar to the standard money in the utility specification. The intertemporal utility from the point of view of the initial period 0 is:

$$U_0 = \sum_{s=0}^{\infty} \frac{1}{(1+\sigma)^s} \left[ln(C_s) + \frac{\gamma}{1-\epsilon} \left(\frac{X_s^G}{C_s} \right)^{1-\epsilon} \right]$$

where σ is the discount factor, a higher value of σ indicating higher impatience. The parameter γ reflects the utility weight of government bonds. We take a log utility of consumption for simplicity.

9.3.1.2. Production and firms' optimization

Goods are produced by a firm that uses capital K and labor L. For simplicity we consider that the labor supply is constant. The production function includes total factor productivity A that grows at a constant rate μ. We consider a standard Cobb-Douglas specification:

$$Y_s = (A_s)^{1-\alpha} (K_{s-1})^{\alpha} (L)^{1-\alpha} \qquad \alpha \leq 1$$

where capital is indexed by the period in which it was built, s-1. The firm pays a wage rate w and a capital rental cost r. We normalize the price of goods to unity so that the wage and rental rates are in real terms. The profits during period s are:

$$Y_s - r_s K_{s-1} - w_s L$$

The profit maximization by the firm leads to the standard equalization of marginal returns to marginal costs:

$$r_s = \alpha (A_s)^{1-\alpha} (K_{s-1})^{\alpha-1} (L)^{1-\alpha} = \alpha \frac{Y_s}{K_{s-1}}$$

$$w_s = (1-\alpha)(A_s)^{1-\alpha} (K_{s-1})^{\alpha} (L)^{\alpha} = (1-\alpha) \frac{Y_s}{L}$$

9.3.1.3. Government

Household's optimization The government raises an amount T_s of taxes and spends an amount G_s. It pays an interest rate i_s^G on its debt B_{s-1}. It also holds an amount F_{s-1} of private bonds that are claims on the household and pay an interest rate i_s^P. The dynamics of net debt is given by equation (4) in the text:

$$B_s - F_s = G_s - T_s + (1 + i_s^G)B_{s-1} - (1 + i_s^P)F_{s-1}$$

9.3.1.4.

The household supplies a constant amount of labor to the firm. The household owns the capital and invests in building additional capital. Capital depreciates at a rate δ. In addition to government bonds, the household can hold private bonds. We denote the amount held by X_s^P paying an interest rate i_s^P.

The resources of the household in period *s* are the labor income $w_s L$, the capital rental income $r_s K_{s-1}$, the depreciated capital returned by the firm $(1-\delta)K_{s-1}$, and the returns on sovereign and private bonds $(1 + i_s^G)X_{s-1}^G$ and $(1 + i_s^P)X_{s-1}^P$. These resources are used for consumption C_s, taxes T_s, building of new capital K_s,, and savings into sovereign and private bonds X_s^G and X_s^P. The flow budget constraint is then:

$$C_s + T_s + K_s + X_s^G + X_s^P = w_s L + r_s K_{s-1} + (1-\delta)K_{s-1} + (1 + i_s^G)X_{s-1}^G + (1 + i_s^P)X_{s-1}^P$$

The household chooses the holdings of capital, sovereign and private bonds to maximize her utility subject to the budget constraint.[25] This leads to three optimality conditions. The first two are the standard Euler conditions for the investment in capital and private bonds :

$$\frac{C_{s+1}}{C_s} = \frac{1 + i_{s+1}^P}{1+\sigma} \quad ; \quad \frac{C_{s+1}}{C_s} = \frac{1 + r_{s+1} - \delta}{1+\sigma}$$

The growth rate of consumption reflects the return on private bonds – equal to the return of capital – adjusted for the discount rate.

The third optimality condition is the Euler condition for the investment in sovereign bounds, combined with the corresponding condition for private bonds. It shows that the investment in sovereign bonds reflects their direct contribution to utility as well as the spread between the returns of sovereign and private bonds, $i_{s+1}^P - i_{s+1}^G > 0$:

$$\frac{X_s^G}{C_s} = \left(\gamma \frac{1 + i_{s+1}^P}{i_{s+1}^P - i_{s+1}^G}\right)^{\frac{1}{\epsilon}}$$

[25] We consider that the household takes the consumption level that scales the utility from sovereign bonds holdings as given for simplicity.

As government bonds have a direct utility benefit, they give a lower return than private bonds in equilibrium ($i^P_{s+1} > i^G_{s+1}$). Otherwise government bonds would strictly dominate private bonds, and if anything the household would want to take a large short position in private bonds to invest in government bonds. The term $1/\epsilon$ reflects how sensitive the demand for sovereign bonds is to the spread between rates of returns. The lower ϵ, the more sensitive the demand is to the interest rate differential, and the lower the change in the return gap that is needed to deliver a given portfolio reallocation between government and private bonds.

If government bonds deliver no direct utility ($\gamma = 0$) they become identical to private bonds ($i^P_{s+1} = i^G_{s+1}$) and the relation above is irrelevant.

9.3.1.5. Market equilibria

The equilibrium of the bond markets requires that government bonds are held by households and that private bonds held by the government correspond to the liabilities of households: [26]

$$B_s = X^G_s \quad ; \quad F_s + X^P_s = 0$$

The equilibrium of the market for good is obtained by adding up the household's and government's budget constraints and using the equilibrium conditions of bond markets, as well as the fact that the sum of payments to factors is equal to GDP. GDP is then used for household's consumption, government spending, and capital accumulation net of depreciation:

$$Y_s = C_s + G_s + K_s - (1-\delta)K_{s-1}$$

9.3.2. ***Balanced growth path***

9.3.2.1. Ratios relative to GDP

We focus on the solution when the economy is on a balanced growth path. Capital, consumption, government spending, GDP and investment holding then all grow at the rate of productivity μ. The ratios of the variables to GDP are then constant and denoted as follows:

$$k = \frac{K_{s-1}}{Y_s} \quad ; \quad c = \frac{C_s}{Y_s} \quad ; \quad g = \frac{G_s}{Y_s} \quad ; \quad t = \frac{T_s}{Y_s} \quad ; \quad b = \frac{B_s}{Y_s} \quad ; \quad f = \frac{F_s}{Y_s}$$

The interest rates on government and private bonds are also constant and equal to i^G and i^P respectively. The rental cost of capital is constant and equal to r.

As private consumption grows at the same rate as productivity, the interest rate on private bonds reflects this growth rate and the discount factor:

[26] If the government holds no private bonds, the equilibrium amount is $X^P_s = 0$ and the only role of private bonds is to generate a private interest rate i^P_s.

$$1 + i^P = (1 + \sigma)(1 + \mu)$$

This implies that the interest rate on private bonds is always larger than the growth rate of GDP: $i^P > \mu$.

The rental cost of capital also reflects the growth rate and the discount rate. Using the firm's optimal choice, we get the ratio of capital to GDP:

$$k = \frac{\alpha}{r} = \frac{\alpha}{(1 + \sigma)(1 + \mu) - (1 - \delta)}$$

The ratio of private consumption to GDP follows from the equilibrium of the market for goods, and is affected by the exogenous ratio of government spending to GDP:

$$c = 1 - g - k(\delta + \mu)$$

9.3.2.2. Interest rate on government bonds

The last step is to solve for the interest rate on government bonds. We do so using two relations. The first reflects the household's portfolio choice :

$$\frac{b}{c} = \left(\gamma \frac{1 + i^P}{i^P - i^G}\right)^{\frac{1}{\epsilon}}$$

This relation shows that the interest rate i^G is low (for a given interest rate on private bonds) when the ratio of public debt to consumption is low, as there is then less need to induce the household to hold government bonds, and the utility impact of government bonds is high.

The second relation is the budget constraint of the government:

$$0 = g - t + \frac{i^G - \mu}{1 + \mu} b - \frac{i^P - \mu}{1 + \mu} f$$

Taken together these two relations give the interest rate i^G and one out of the three variables that characterize public finances (t, b, f) taking the other two variables as given. We choose to take the government's debt and financial assets, b and f, as given and let the taxes t to adjust as needed for the government's budget constraint to hold. This implies:

$$i^G = i^P - \left(\frac{c}{b}\right)^{\epsilon} \gamma(1 + i^P) \quad ; \quad t = g - (c)^{\epsilon}(b)^{1-\epsilon}\gamma(1 + \sigma) + \frac{i^P - \mu}{1 + \mu}(b - f)$$

The interest rate on government bonds is always lower than the rate in private bonds:

$$i^G - i^P = -\left(\frac{c}{b}\right)^{\epsilon} \gamma(1 + \sigma)(1 + \mu) < 0$$

The interest rate on government bonds can also be lower than the growth rate of GDP if the ratio between private consumption and public debt is high enough:

$$i^G - \mu = \left[\sigma - \left(\frac{c}{b}\right)^{\epsilon} \gamma(1+\sigma)\right](1+\mu)$$

The impact of government debt on taxes and the primary balance depends on the weight of the bonds in the household's utility. Consider an increase in the gross debt without any change in the net debt (an identical increase in b and f). This change has no impact on t when government bonds provide no direct utility ($\gamma = 0$), as government and private bonds are then identical.

When government bonds impact the utility ($\gamma > 0$) an identical increase in b and f impacts taxes, but in a way that depends on how sensitive is the household's portfolio allocation to the interest rate differential, as indicated by the term ϵ. Two offsetting effects are at work. First, as $i^G < i^P$ an increase in public debt that is reinvested in private bonds generates an income stream for the government that lowers taxes. Second, the increase in debt b requires a higher interest rate i to induce the household to switch her portfolio towards government bonds, leading to a higher interest rate cost for the government and higher taxes. If $\epsilon = 1$ the two effects cancel out and taxes are unchanged. If $\epsilon < 1$ the portfolio choice of the household is very sensitive to the interest rate, and a moderate increase in the interest rate is enough to induce the needed portfolio reallocation. In that case a higher public debt leads to lower taxes.

9.3.2.3. Numerical examples

We illustrate the model with a serie of numerical examples. Given the stylized nature of the model, the results should not be seen as a fine calibration matching the Swiss economy but as an illustration of the various mechanisms.

In our basis scenario, we set the discount rate σ at 2%, and the growth rate μ also at that value. This gives an interest rate on private bonds i^P of 4.04%. The capital depreciation rate δ is set at 2%, and we take a share of capital in production α equal to 30%. This gives a value of 4.97 for the capital to GDP ratio. We set the ratio g of government spending to GDP at 20% giving a ratio c of private consumption to GDP of 60%.

We set the ratio b between gross government debt to GDP at 20% and consider that the government holds no assets, $f = 0$. We take a value of 0.5 for ϵ, the sensitivity of the portfolio choice to the interest rate gap, and set the direct utility impact of government debt γ to 0.003 so as to get a spread of 0.54 percentage points between the two interest rates. The interest rate on government bonds i^G is then equal to 3.50% and exceeds the growth rate. Keeping the ratio of government debt to GDP constant requires a primary surplus of 0.29% of GDP. La stabilisation de la dette publique par rapport au PIB requiert un surplus primaire de 0.29 % du PIB.

We now consider the impact in changing the various parameters. The tables below show the effect on the interest rates and the primary budget deficit. The first column in each table corresponds to the baseline case described above.

A decrease in government gross debt reduces the interest rate on government bonds and widens the gap relative to the interest rate on private bonds (which itself is unchanged).

Gross debt b, %GDP	20	15	10	5
Private rate i^P, %	4.04	4.04	4.04	4.04
Government rate i^G, %	3.50	3.42	3.27	2.96
Spread $i^G - i^P$, %	-0.54	-0.62	-0.77	-1.08
Rate-growth gap $i^G - \mu$, %	1.50	1.42	1.27	0.96
Primary deficit $g - t$, %GDP	-0.29	-0.21	-0.12	-0.05

An increase in the private bond holdings by the government has no impact on interest rates. It allows for a reduction of the primary surplus need to stabilize the net debt.

Assets f, %GDP	0	5	10	15
Private rate i^P, %	4.04	4.04	4.04	4.04
Government rate i^G, %	3.50	3.50	3.50	3.50
Spread $i^G - i^P$, %	-0.54	-0.54	-0.54	-0.54
Rate-growth gap $i^G - \mu$, %	1.50	1.50	1.50	1.50
Primary deficit $g - t$, %GDP	-0.29	-0.19	-0.09	0.01

An increase in both the assets and the liabilities of the government reduces the spread between the interest rates, as well as the primary balance required to stabilize the debt (marginally).

Gross debt b, %GDP	20	25	30	35
Assets f, %GDP	0	5	10	15
Private rate i^P, %	4.04	4.04	4.04	4.04
Government rate i^G, %	3.50	3.56	3.60	3.63
Spread $i^G - i^P$, %	-0.54	-0.48	-0.44	-0.41
Rate-growth gap $i^G - \mu$, %	1.50	1.56	1.60	1.63
Primary deficit $g - t$, %GDP	-0.29	-0.28	-0.27	-0.26

An increase in the household's patience (a lower discount rate) reduces both interest rates. The effect is stronger for the rate on private bonds and lowers the spread between the interest rates (marginally). The gap between the interest rate and the growth rate is lower, which in turn decreases the primary surplus requires for debt stabilization.

Discount rate σ, %	2	1.5	1.0	0.5
Private rate i^P, %	4.04	3.53	3.02	2.51
Government rate i^G, %	3.50	3.00	2.50	2.01
Spread $i^G - i^P$, %	-0.54	-0.53	-0.52	-0.50
Rate-growth gap $i^G - \mu$, %	1.50	1.00	0.50	0.01
Primary deficit $g - t$, %GDP	-0.29	-0.20	-0.10	0.00

An increase in the direct impact of government bonds on the utility lowers the interest rate on government bonds without any effect on the rate on private bonds. This reduces the primary surplus needed for debt stabilization.

Utility weight γ	0.003	0.004	0.005	0.006
Private rate i^P, %	4.04	4.04	4.04	4.04
Government rate i^G, %	3.50	3.32	3.14	2.96
Spread $i^G - i^P$, %	-0.54	-0.72	-0.90	-1.08
Rate-growth gap $i^G - \mu$, %	1.50	1.32	1.14	0.96
Primary deficit $g - t$, %GDP	-0.29	-0.26	-0.22	-0.19

A decrease in the growth rate of the economy lowers all interest rates and has little effect on their difference, as well as on the spread between the interest rates and growth (and thereby on the primary surplus).

Growth rate μ, %	2.0	1.5	1.0	0.5
Private rate i^P, %	4.04	3.53	3.02	2.51
Government rate i^G, %	3.50	2.99	2.48	1.96
Spread $i^G - i^P$, %	-0.54	-0.54	-0.54	-0.55
Rate-growth gap $i^G - \mu$, %	1.50	1.49	1.48	1.46
Primary deficit $g - t$, %GDP	-0.29	-0.29	-0.29	-0.29

9.4. Returns on the sovereign wealth fund's assets

The data on the returns on the AVS fund, the Swiss pension funds, and the portfolio assets in the net international investment position all give values for the nominal returns for a year *t* that we denote by i_t.

The total return index on the stock market of country *p* is denoted by Ind_t^p, measured in the country's currency. The exchange rate index, in terms of foreign currency per Swiss franc, is denoted by FX_t^p. Both indices are measured in December. The nominal return is computed as follows:

$$i_t^p = \frac{Ind_t^p / FX_t^p}{Ind_{t-1}^p / FX_{t-1}^p} - 1$$

The real returns are computed by dividing the nominal returns by the Swiss inflation rate π_t between December of year *t-1* and December of year *t*:

$$r_t = \frac{1 + i_t}{1 + \pi_t} - 1$$

The values of r_t for the different assets are illustrated in figure A.1.

The average annual return between the end of year *t-1* and the end of year *t+h*, denoted by $\bar{r}_{t,t+h}$, is computed by taking the geometric average of annual returns (i.e. the arithmetic average if the logs of $1 + r_s$): [27]

$$\bar{r}_{t,t+h} = \left(\prod_{s=t}^{t+h} (1 + r_s) \right)^{1/h} - 1 = exp\left(\frac{1}{h} \sum_{s=t}^{t+h} ln(1 + r_s) \right) - 1$$

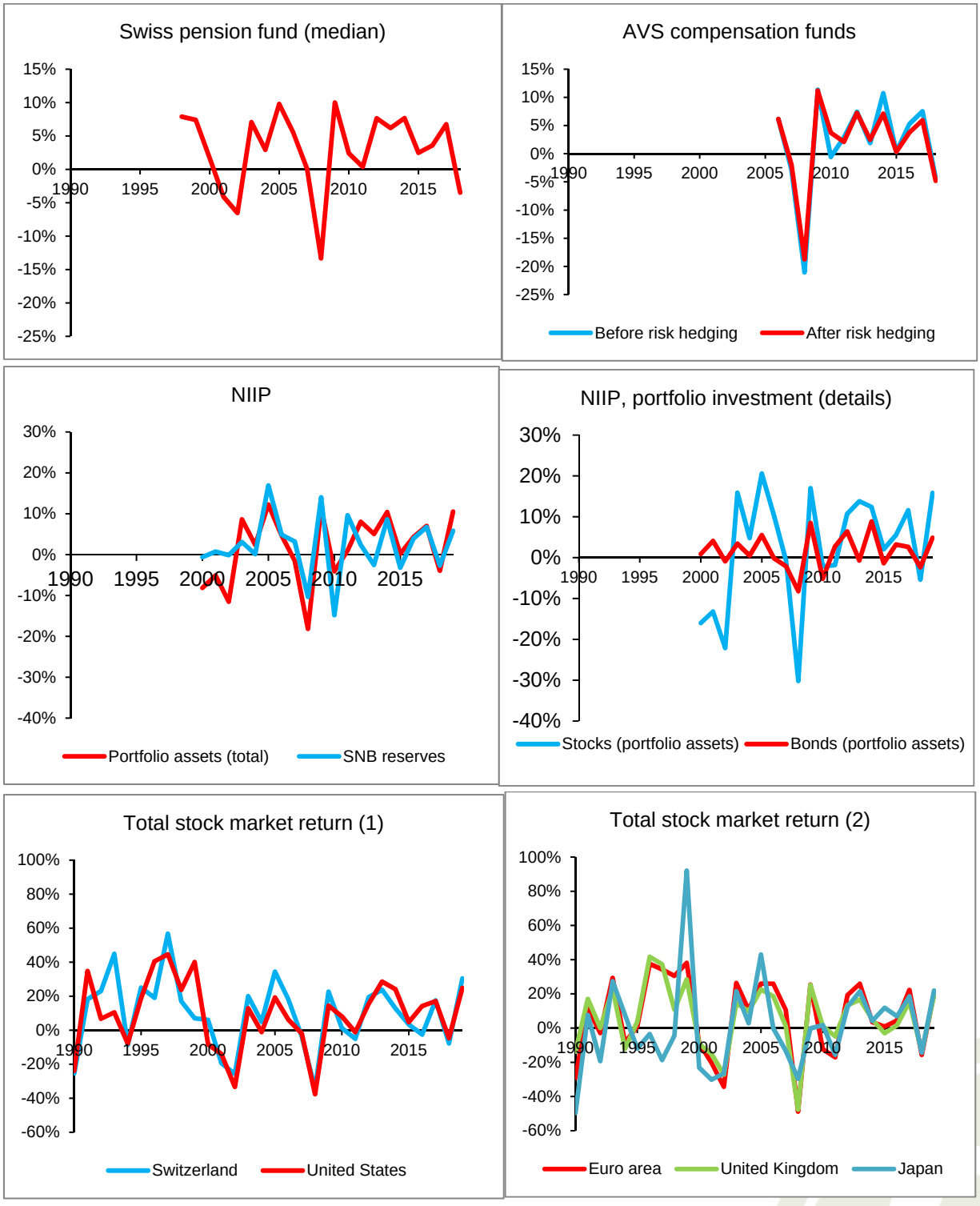
The volatility of returns is measured by the standard deviation of r_s :

$$\sigma_{t,t+h} = \left(\frac{1}{h} \sum_{s=t}^{t+h} \left(r_s - \frac{1}{h} \sum_{s=t}^{t+h} r_s \right)^2 \right)^{1/2}$$

This standard deviation is computed for returns over a year. We can also compute it for returns over 3 or 5 years by replacing r_s by $\bar{r}_{s-2,s}$ and $\bar{r}_{s-4,s}$ respectively.

[27] $\bar{r}_{t,t+h}$ is the appropriate measure. It differs from the arithmetic average of annual returns $(1/h) \sum_{s=t}^{t+h} r_s$ which gives a biased picture when returns are volatile. We illustrate this with a simple example of returns over two years. In a first case the return is 15% per year. In a second case the return is 30% in the first year and zero in the second year. An investor that put in 100 ends up with 132.25 after two years in the first case and 130 in the second case. The arithmetic average of returns is 30% in both cases, while $\bar{r}_{t,t+h}$ is equal to 15% and 14.02% respectively.

Figure A.1 : Real return on assets



NIIP : net international investment position.

About the Author

Cédric Tille is a Professor of Economics at the Graduate Institute for International and Development Studies. Prior to joining the Institute, he worked in the International Research Function of the Federal Reserve Bank of New York. His research focuses on the impact of financial globalization on international economic linkages, covering theoretical and empirical contributions. Recent works analyzes the Swiss foreign investment positions, the determinants of currency use in international trade, and the drivers of banks' activities in different currencies.