Developing a Liquid Market for Inflation-Indexed Government Securities: Lessons from Earlier Experiences

By Pu Shen

After a slow start in the 1980s, inflation-indexed government securities have gradually become more common in developed countries. A number of potential benefits arise with a government conducting part of its borrowing through inflation-indexed securities. Chief among them are better risk sharing for the economy, reduced government borrowing costs, less incentive for a deeply indebted government to inflate away its debt, and a new source of information about investors' inflation expectations. Many developed countries in coming decades will face the need to borrow more to finance the retirement of baby boomers. In the near future, a useful tool for these governments may be inflation-indexed securities.

The experience of the countries that have already experimented with inflation-indexed government securities suggests that, to achieve the full benefits of these securities, liquid markets are essential. But, for inflation-indexed securities, liquid markets do not come easily.

This article reviews the experiences of a few countries that have issued inflation-indexed securities and draws some common lessons about promoting market liquidity. The first section broadly describes the inflation-

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indexed security programs in a number of developed countries and highlights some of their common features. The second section examines the main potential benefits of such securities. The third section explains why market liquidity is essential. The fourth section draws some lessons from a number of countries about developing market liquidity.

I. COMMON FEATURES OF INFLATION-INDEXED GOVERNMENT SECURITIES

The most important feature of an inflation-indexed government security (IIGS) is that its nominal payments grow with inflation. That is, the real rate of return for a buy-and-hold investor is fixed at the time of purchasing regardless of future inflation.[1] In contrast, payment for a conventional debt security is fixed in nominal terms, and its real rate of return for a buy-and-hold investor will be inversely related to the realized inflation during the holding period.

What are IIGSs?

While governments have experimented with different forms of the IIGS, a fairly common structure has emerged. In this structure, the principal is indexed to grow at the same rate as an index of prices, and the coupon rate is fixed at issuance. As the nominal coupon payment is equal to the nominal principal multiplied by the coupon rate, the nominal coupon payment will also grow at the same rate as the price index. At maturity, investors in an IIGS are paid the nominal value of the principal, which equals the sum of the initial principal (par) and the cumulated growth in the nominal principal due to realized inflation during the life of the security. In short, both the coupon and principal payments of this kind of IIGS are structured such that, regardless of inflation, all payments are constant in terms of purchasing power.[2]

The price index on which the inflation adjustment is based is typically a measure of consumer prices, such as the CPI.[3] Such a measure is preferred to a broader price index because, ultimately, investment gains will be used for consumption, and therefore the most relevant inflation risk for investors is the risk of increasing consumer prices. The same rationale also suggests the chosen price index should measure overall inflation for consumer goods and services, as opposed to a narrower index such as core CPI, which typically excludes volatile inflation in energy and food products. As

a practical matter, lagged values of the price index must be used to calculate the inflation adjustments. This is necessary both because consumer price indexes are published with a delay of at least a month and because investors need to know the accrued inflation adjustments to trade an IIGS on the secondary market.

The majority of IIGSs have maturities of at least five years at issuance. One reason for issuing mainly long-term IIGSs is that at longer horizons the inflation risk these securities are designed to protect against tends to be more pronounced. Another reason is that with the lags in indexation, there is inevitably residual inflation risk. This risk is negligible for an IIGS with a long maturity but can be significant for an IIGS with only a few months left to mature.

IIGSs in developed countries

Since the early 1980s, a number of developed countries have experimented with inflation-indexed government securities. Among them are the United Kingdom, Australia, New Zealand, Canada, the United States, Sweden, France, and Italy. Table 1 provides a summary of these IIGS programs.[4]

Table 1

INFLATION-INDEXED GOVERNMENT SECURITIES IN A FEW DEVELOPED COUNTRIES

Country	Starting Date	Still Active?	IIGS' Share (%) of Total Government Debt (as of year)
United Kingdom	1981	Yes	29 (2008)
Australia	1985	No (Suspended 2003)	15 (2005)
Canada	1994	Yes	< 2 (2007)
Sweden	1994	Yes	26 (2007)
New Zealand	1996	No (Suspended 1999)	-
United States	1997	Yes	11 (2008)
France	1998	Yes	13 (2007)
Italy	2003	Yes	7 (2008)

Source: Author's calculation based on data from the web pages of Debt Management Office, UK; Reserve Bank of Australia; Bank of Canada; Swedish National Debt Office; Statistics New Zealand; and the Treasury Departments of United States, France, and Italy.

The United Kingdom was the first developed country to issue inflation-indexed government securities, or an index-linked gilt. The first index-linked gilt was a 15-year bond issued in March 1981.[5] Since then, these gilts have become a regular component of UK government debt financing, accounting for 29 percent of total government debt in 2008.

Australia was another early adopter of the IIGS. Their first IIGS was issued in 1985, called a Commonwealth Government Capital Indexed Bond (CIB).[6] Both 10-year and 20-year maturities were available at issuance. Unlike in the UK, the IIGS program in Australia has played only a limited role in government financing. The program has been intermittent, partly due to changes in federal government fiscal conditions and outlooks. IIGSs accounted for about 15 percent of government debt in 2005, but no new securities have been issued since 2003.[7]

Canada's experience with IIGSs has been somewhat similar to that of Australia. Canada started their IIGS program in December 1991, issuing what they called a Real-Return Bond (RRB). RRBs are concentrated in longer maturities. This IIGS program started about the same time the Bank of Canada adopted formal inflation targeting. Both initiatives were part of a concerted effort by the Canadian government to convey to the public its resolve to reduce then-rampant inflation. RRBs have remained a niche program in Canada, currently accounting for less than 2 percent of total government debt. The small scale of the program is due partly to the quick success of the inflation battle, which reduced the public's inflation expectations and perceived inflation risk, and partly to improvement in the government's fiscal balances and the consequent reduction of borrowing needs.

IIGSs gained more public attention in 1997 when the U.S. Treasury started its program of Treasury Inflation Protection Securities (TIPS). The first such security was a 10-year note issued in January 1997. Treasury has since issued 10-year TIPS at least twice per year. It has also issued 5-year, 20-year, and 30-year TIPS. Currently, three lengths of maturity of TIPS are issued annually: the 5-year, the 10-year, and the 20-year. TIPS account for a large portion of new issuance in long-term securities. However, due to Treasury's heavy reliance on shorter-term debt (maturities of 5-years or less), TIPS currently account for only 11 percent of total government debt.

After the United States, France and Italy also started IIGS programs. The French started issuing IIGSs in 1998, initially using the French consumer price index, excluding tobacco products.[8] After the launch of the single currency of euro, the inflation index was changed in 2001 to an index based on the euro zone harmonized consumer price inflation (HICP). The Italian program started in 2003 and also uses the HICP as the inflation index.

II. POTENTIAL BENEFITS OF INFLATION-INDEXED GOVERNMENT SECURITIES

IIGSs have been adopted by a number of developed countries because they may bring important benefits to investors and governments. The potential benefits include better risk sharing in the economy, reduced government borrowing costs, less incentive for a deeply indebted government to inflate away its debt, and a new source of information about investors' inflation outlooks.

IIGSs allow better risk sharing between investors and government

The most important benefit of an IIGS is that it allows better risk sharing in an economy. Inflation risk is the risk that future realized inflation may be different from people's expectations. Conventional debt securities force investors to bear this risk because the principal and coupon payments of a conventional debt are fixed in nominal terms. As a result, higher-than-expected inflation reduces the real rates of return of conventional debt. For example, when investors buy a conventional 10-year Treasury note at the auction yield of 4 percent, collectively they have locked-in a nominal return of 4 percent for ten years.[9] But the real rate of return, measured by the purchasing power of today's money, depends on inflation during the life of the note. If the average inflation rate for the next ten years is 2.5 percent, the real rate of return will be 1.5 percent (4-2.5=1.5). But if the average inflation rate for the next ten years turns out to be higher, say, 4 percent, then the real rate of return for investors will be zero. Clearly, many investors do not like inflation risk.

In addition, inflation risk is difficult for individual investors to hedge. While values of general stock indexes or land tend to rise with inflation in the long run, these assets have other risks investors may not like. Further, empirical evidence suggests that in the short run, stocks or real estate assets

tend to be poor hedges of inflation. Campbell and Vuolteenaho documented the short-term negative correlation between stock returns and inflation. Hartzell and others found that real estate securities are worse hedges against inflation than stocks in some countries and comparable to stocks in other countries.

With IIGSs, the risk of higher-than-expected inflation is shifted from investors to the government. Governments are better able to bear such risk because taxes are typically levied on nominal income, which tends to increase with inflation.[10] Therefore, government tax receipts usually grow with inflation as well, providing the government the income to make the higher nominal payments offered by IIGSs.

IIGSs may reduce government borrowing costs

This benefit naturally follows the better risk sharing provided by IIGSs. When a government borrows in the form of conventional debt, investors who do not like inflation risk typically require a higher rate of return on securities to compensate them for bearing the inflation risk. This additional return is called the inflation-risk premium. The inflation-risk premium increases the borrowing costs for the government, and eliminating the risk premium by replacing the conventional debt with IIGSs lowers the borrowing costs.

The savings to the government achieved through IIGSs are desirable from society's point of view. Lower government borrowing costs imply lower burdens for taxpayers, as they are ultimately responsible for paying government borrowing costs. At the same time, investors are no worse off with IIGSs, even though IIGSs have lower expected real rates of returns, because investors do not have to bear the inflation risk.[11]

IIGSs reduce the ability of a deeply indebted government to inflate away its debt

An issuer of conventional debt usually gains when realized inflation is higher than expected at the time of the debt issuance, because higher inflation reduces the real costs of the fixed nominal payments of the debt. The reverse also holds true: If realized inflation is lower than expected, the issuer's real cost of the debt service burden increases. Most developed countries today have considerable government debt. Thus, financing debt with conventional debt securities creates an "inflation benefit" to these governments.[12] If, however, a considerable portion of the government borrowing

is conducted through IIGSs, the real interest cost of which is fixed at the time of the issuance, the ability of a government to inflate away its debt will be curtailed.

Reducing a government's ability to inflate away its debt generally helps the country achieve low and stable inflation. Monetary policy used to be conducted by the government in a number of developed countries and still is in many developing countries. IIGSs reduce the ability of governments to inflate away their debt burdens and therefore help anchor the public's inflation expectations (Monks). Even in countries where monetary policy is conducted by independent central banks, as in most developed countries nowadays, a large fiscal debt may induce an inflation bias in some politicians, who in turn may make the central bank's work more difficult. In both cases, reducing the ability of government treasurers and politicians to inflate away its debt should help to create an environment more conducive to low and stable inflation.

IIGSs may provide a new source of information on investors' inflation outlook

The fourth potential benefit of IIGSs is that the market yields of these securities may provide valuable information to both market analysts and policymakers about investors' inflation outlook.[13]

In the past, yields on conventional government debt securities, based on market trading prices, were closely monitored by both policymakers and the private sector, as these yields contain information on inflation compensation:

(1) *nominal yield on a conventional security = real interest rate + inflation compensation.*

Inflation compensation has two components. One is the inflation expectation and the other is the inflation-risk premium. An increase in inflation compensation can be due to either increases in investors' expected future inflation or to increases in their required inflation-risk premium, or both. In all three cases, an increase in inflation compensation would be an indication of less investor confidence in the central bank's ability to control future inflation and therefore is closely monitored. Nevertheless, as one cannot directly observe inflation compensation, but only its sum with the real interest rate, the inference errors can at times be substantial.

The addition of IIGSs provides a new source of information about inflation compensation: the difference between the yields on a conventional government debt and on an IIGS with comparable maturity. This yield difference is often called "breakeven inflation," and its changes can be viewed as changes in inflation compensation if certain assumptions are correct.[14] To see this, note first that:

(2) *real yield on an IIGS = real interest rate + liquidity premium.*

The liquidity premium is the compensation that investors require for holding a security less liquid than conventional government debt. (This will be discussed in more detail in the next section.) The difference between (1) and (2) is:

(3) *breakeven inflation = (1) – (2) = inflation compensation – liquidity premium.*

If the liquidity premium in the IIGS is small or roughly constant, then changes in breakeven inflation will be a good proxy for changes in inflation compensation. As a result, in countries with IIGS programs, breakeven inflation is closely monitored by both market analysts and policymakers to gauge changes in investors' inflation compensation. When the liquidity premium is nontrivial and time varying, changes in breakeven inflation cannot be translated one-to-one to changes in inflation compensation. Nevertheless, combining the observations of changes in the market yields of both conventional and IIGS government debt may allow analysts to obtain more precise estimates of changes in inflation compensation.[15]

III. THE IMPORTANCE OF DEVELOPING A LIQUID MARKET FOR IIGSs

As explained in the last section, a number of important potential benefits arise from using IIGSs to finance government debt. Experiences of the adopters of IIGSs suggest, however, that turning these potential benefits into reality requires deep, liquid IIGS markets, which presents a significant challenge. This section discusses the importance of liquid markets for IIGSs and then investigates why liquid markets seem hard to achieve.

Why liquid markets are necessary to achieve the potential benefits of IIGSs

Liquid markets are necessary to fully capture the benefits of IIGSs. Without such markets, there would be a sizable liquidity premium in the yield of the securities. The liquidity premium is the additional yield a financial asset must carry to compensate its investors for having to trade it in less-liquid markets.[16] A less-liquid trading market is characterized by higher trading costs. In general, investors need to adjust their portfolios frequently due to changes in their personal finances or investment opportunities. When they adjust their portfolios, they will incur trading costs. Ultimately, what matters to investors is the expected rate of return net of transaction costs. Therefore, everything else equal, securities that cost more to trade will have to carry an additional yield relative to other similar securities with more liquid markets to offset the higher transaction cost. This additional yield is called the liquidity premium.

A large liquidity premium can reduce the benefits of IIGSs in several ways. First, a large liquidity premium can substantially increase the interest costs to a government in financing its borrowing through IIGSs. In fact, if the size of the liquidity premium is comparable to the inflation-risk premium on conventional debt, there will be no cost savings to the government from replacing conventional debt with IIGSs. In addition, the presence of a sizable liquidity premium is likely to discourage a government from issuing a large amount of IIGSs. But if an IIGS program is only a niche program, the benefits of better risk sharing in the economy will be limited. Further, because the bulk of total government borrowing will still be in conventional debt securities, the ability of the government to inflate away its debt will hardly be reduced. Finally, poor market liquidity is not only likely to cause a sizable liquidity premium, but is also likely to be associated with a variable liquidity premium, making it more difficult to extract information about investors' inflation compensation from breakeven inflation. For example, during the financial market crisis in the fall of 1998, the 10-year breakeven rate of inflation in the United States fell under 1 percent, mostly due to increases in the size of the liquidity premium.[17]

The size of the liquidity premium is related not only to trading costs, but also to how frequently the security is expected to be traded. A hypothetical example may help to illustrate the point. For simplic-

ity of exposition, suppose the trading cost of a conventional Treasury security is zero. Say the yield of such a Treasury bond is currently 4 percent. Now consider another bond exactly like this Treasury bond in every aspect, except that whenever investors buy or sell it, the trading cost is equivalent to 0.1 percentage point of the yield. Because this second bond is fundamentally the same as the first one, it is natural that investors would require the same rate of return for both bonds net of the transaction costs. Therefore, if the expected trading frequency of the second bond is twice a year, then the second bond would have to carry a yield of 4.2 percent (4 + 0.1*2) to be attractive to investors. The additional 0.2 percentage point of yield is the liquidity premium.[18] This example further demonstrates that as investors' trading frequencies tend to vary over time (for example, more frequent trading may be desirable during financial crises), the liquidity premium tends to vary over time as well.

Why liquid markets are hard to develop for IIGSs

The markets for IIGSs tend to have poor liquidity because, first, these securities are new and fundamentally different from traditional debt securities. Most traditional debt securities come with fixed nominal coupon payments and par principals. An IIGS, however, typically has variable nominal coupon and principal payments, which vary with realized inflation during the holding period. Investors appear to find it difficult to evaluate this new form of debt security.

The second reason there is typically much less trading of IIGSs is that they are usually poor candidates for hedging purposes, which reduces their trading activity considerably as much daily trading arises from hedging needs. A hedging strategy usually involves using securities with similar exposures but offsetting responses to a risk to construct a portfolio to manage the risk. The main risk of IIGSs is the risk that market-clearing real interest rates may change over time. Very few other financial assets have such a simple risk exposure, making IIGSs unique, yet not useful in hedging activity.[19] In comparison, the trading markets for conventional government debt securities are among the most liquid financial markets in many countries, partly because these securities are used to hedge a variety of other debt securities, such as company debt or mortgage securities. In fact, the mar-

kets for conventional government debt securities are often viewed as the benchmark, and liquidity premia on such securities are negligible for most purposes.

The third reason that IIGSs tend to have poor liquidity lies in their investors' preferences. As IIGSs provide good long-term protection against inflation, they are particularly appealing to long-term investors, especially those whose future obligations are tied to inflation, such as pension funds and insurance companies. These investors, however, often are happy to leave an IIGS in their portfolios until maturity and therefore trade them little. For these reasons, trading markets for relatively new IIGSs tend to have poor liquidity, and consequently, the yields of IIGSs may include large liquidity premia.[20]

To summarize, while IIGSs can be very beneficial to the society, a country must develop liquid markets for these securities to achieve their full benefits.

IV. DEVELOPING LIQUID MARKETS FOR IIGSs—LESSONS LEARNED

The experience of IIGS programs in many developed countries demonstrates the importance of developing market liquidity, which turns out to be a difficult task. Some common lessons can be drawn from such experience, which going forward may help these countries as well as newcomers. Chief among the lessons are the following: The design of an IIGS should be chosen carefully to make a security that is easy to understand and trade. The government should be willing to make a sizable initial investment in their program to help develop the market. And the ideal timing of initiation is generally before the arrival of persistent fiscal borrowing due to long-term factors.

The design of an IIGS

The design of an IIGS directly affects its appeal to the public. A well-designed IIGS makes it easier for the public to understand and trade and therefore increases investor demand and market liquidity. Design issues include forms, indexes, and maturities.

Many forms of IIGSs have been tried.[21] The form of principal indexation with a fixed coupon rate turns out to have been the most popular form with investors. The UK started their index-linked gilt with this form,

and all countries listed in Table 1 have converged to it over time, suggesting that this form is most conducive to a deep and liquid market for IIGSs.

Australia started its IIGS program with the principal indexation form, called the Commonwealth Government Capital Indexed Bond (CIB). The government then immediately introduced an Indexed Annuity Bond (IAB). An IAB pays its holders quarterly for a fixed length of period, in this case either ten or 20 years. The initial payment is called the "base payment," and the subsequent payments are indexed to the cumulative inflation since issuance. At maturity, the quarterly payments simply terminate. The main difference between an IAB and CIB is that there is no principal payment at the time of maturity for an IAB. Because investor interest in IABs was limited, these securities were issued for just three years (McCray; Deacon and others).

Sweden started its IIGS program in 1994 with a 20-year, zero-coupon bond. In this case, investors will not receive any payments until 2014 when the bond matures, at which time they will receive a lump-sum payment which, after adjusting for the cumulative inflation from 1994 to 2014, gives investors the real rate of return set at the time of the issuance. Investor reception to this bond was somewhat hesitant, and the Swedish government switched to the more common, principal-indexation type of IIGS in 1997 (Deacon and others).

These experiences suggest that the principal-indexation form of IIGS is likely a better design. Part of its appeal may lie in its simplicity: While the nominal values of the principal and the coupon payments grow with inflation, they both are fixed in real terms. Therefore, substituting real rates for nominal rates, many concepts and tools used in analyzing conventional debt securities can be applied to this form of IIGS.[22]

The index used to adjust for inflation, as well as the indexation lag, have also converged across countries over time. All countries discussed earlier essentially use an overall CPI for their index. The indexation lag is another issue that may affect the appeal of an IIGS and therefore its liquidity. Indexation lag is unavoidable due to lags in collecting and publishing inflation data as well as to the need to know the accrued inflation adjustments since the previous coupon payment date to allow trading and settlement before the next coupon payment date. Practically, the minimal lag is about three months, which was first adopted by Canada and by almost all other

IIGS countries afterward. In the UK, the lag was initially eight months but has been cut to three months.[23]

The maturity of an IIGS may also affect its appeal to investors. As investors generally consider it more difficult to predict inflation in the distant future, an IIGS with longer maturity tends to be more popular with investors. For example, in the UK, the government has experimented with various lengths of maturity for the index-linked gilts, from six years to 50 years. Based on investor reception, recent issuance has concentrated on the longer spectrum. In fact, many developed countries currently only issue IIGSs with a maturity of ten years or longer, although the U.S. Treasury still issues 5-year TIPS.

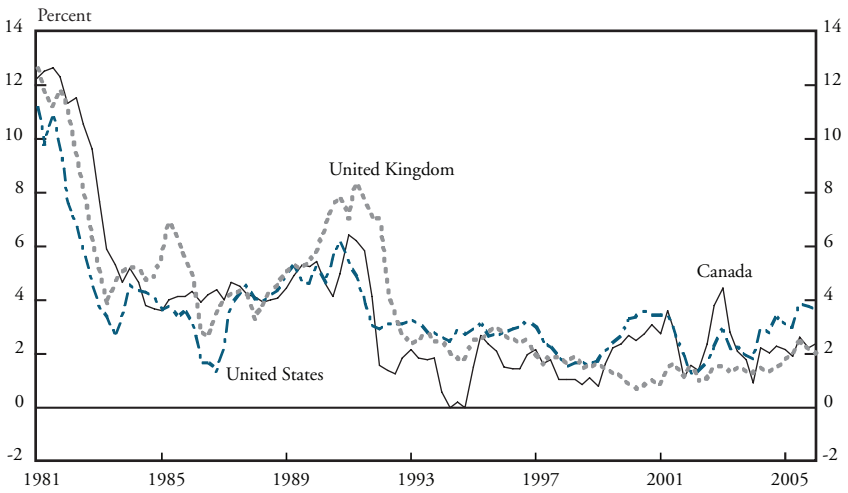
Initial investment

Experience also suggests that IIGSs are fundamentally so very different from conventional debt securities that acceptance takes considerable learning on the part of investors. Therefore, for an IIGS program to be successful, a government needs to be willing to make a sizable initial investment that includes educating and working with investors, committing to continuous issuance to allow for a gradual development of an investor base and market infrastructures, and possibly paying high yields (due to liquidity premia) for earlier IIGSs to help the market reach a critical scale.

Currently, both the UK and United States have very active IIGS programs due to the considerable initial investment from their respective governments. The UK was the first developed country to launch an IIGS program. When the first 15-year gilt was issued in March 1981, only pension funds were allowed to participate in their auction.[24] After initial success, demand for the index-linked gilt weakened, partly due to the quick decline of inflation (Chart 1). But the UK government persevered. They published studies and pamphlets to help investors understand index-linked gilts. The Bank of England has made the trading prices and yields of the securities easily accessible to the public, just as they do for conventional government debt securities. The restriction on ownership was quickly removed to allow the expansion of the investor base. A few refinements to the program have also been made to encourage investor interest and participation. For example, both auction schedules and auction formats have been adjusted to better respond to market demand.[25]

Chart 1

INFLATION HAS DECLINED FROM EARLY 1980s



Source: OECD

The UK government has also made a conscious effort to provide a supply of fresh IIGSs to investors. For example, it maintained the IIGS program even when its fiscal balance was in surplus in the late 1980s.[26] A supply of fresh IIGSs is important to the development of trading market liquidity. At the beginning of an IIGS program, the outstanding volume is naturally small and due to the attraction of the securities to long-term investors, many of the existing ones may have been "locked away" in some buy-and-hold portfolios. Therefore, for the trading market to develop, it is important that fresh new issues are offered to investors. Since 1998, the UK authority has committed to supplying at least 2.5 billion pounds of new IIGSs each fiscal year.

With its long history and steadfast support from the government, the IIGS market in the UK is now considered one of the more liquid ones. The outstanding IIGSs represent close to 30 percent of total government debt, and the secondary trading market is active.[27] While there are most likely still liquidity premia in yields of index-linked gilts, their magnitudes are likely no larger than inflation-risk premia in conventional gilts (Shen and Corning).

The U.S. experience also demonstrates the necessity of initial investment. Treasury has spent considerable effort in investor education since the

launch of TIPS. For example, in addition to providing many pamphlets about TIPS, Treasury has developed a comprehensive website regarding the security.[28] Treasury also launched inflation-indexed savings bonds (I-bonds) soon after the launch of TIPS. This program has helped individual investors understand the concept of inflation-indexed securities and possibly increased their interest in TIPS.[29]

Tapping its expertise in developing highly liquid markets for conventional Treasury securities, Treasury understood the importance of a regular supply to market liquidity and thus committed to regular issuance of the 10-year TIPS early on. Since its debut in 1997, every January a new 10-year TIPS has been issued, which typically reopens in July the same year.[30] This issuance schedule was maintained even around 2000 when the Treasury had to discontinue some other conventional debt issuance due to budget surpluses and reduced borrowing needs. Regular issuance helps professional investors plan ahead in managing their portfolios and makes it possible for the private sector to set up mutual funds and exchange traded funds (ETFs) specializing in TIPS. It also makes comparing prices among older and newer TIPS more straightforward and therefore promotes arbitrage-induced trading in these securities.[31]

Even with these efforts, the liquidity premia remained considerable in early TIPS.[32] For example, the first ten auctions of the 10-year TIPS had an average auction yield of 3.8 percent. In comparison, the average auction yield for 10-year conventional treasuries for the same period was about 5.7 percent. Given that expected inflation for the next ten years at the time was about 2.5 percent, according to credible survey evidence, the minimal amount of liquidity premium that Treasury paid in these earlier TIPS was about 0.6 percentage point.[33]

After a slow start, TIPS have gradually been accepted by investors and become an integral part of U.S. government debt financing, especially in the long-term debt sector. Last year, roughly a third of U.S. government borrowing at maturities of ten years or beyond was through TIPS.[34] Market liquidity also appeared to have improved somewhat until the current financial crisis, which has brought considerable increases in liquidity premia in many assets. Looking forward, liquidity premium will likely remain a component of the yields of TIPS, and thus caution is advised when deriving information about investor inflation compensation from breakeven inflation (Shen 2006, Gurkeynak and others).[35]

Timing the launch of IIGSs

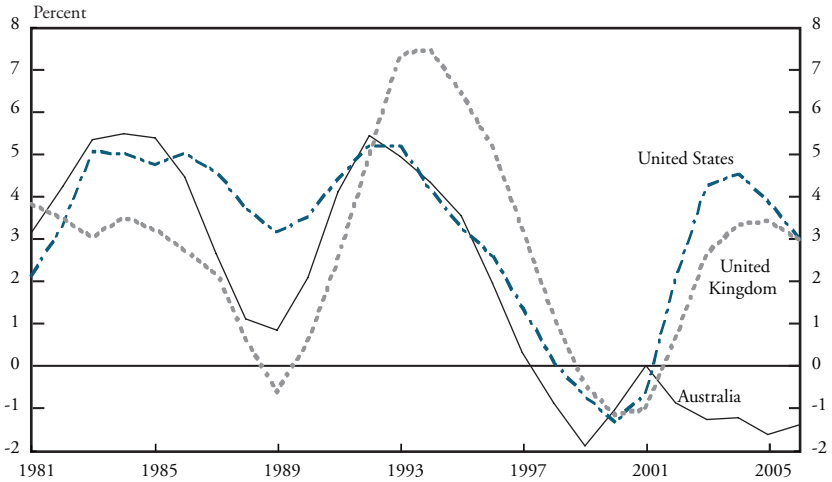
Timing the introduction of an IIGS program plays a role in its success. The most important factor to be considered in determining the timing is fiscal outlook. If significant and persistent fiscal borrowing is projected in the not-too-distant future, then it may be advisable to launch (or enhance) an IIGS before the large amount of borrowing needs materializes, as it usually takes considerable time to convince investors that large amounts of IIGSs can be issued at reasonable rates. On the other hand, if a country has little fiscal debt and is projected to have an essentially balanced fiscal budget going forward, it may be better not to launch an IIGS program. One reason is that the benefits of an IIGS are significant only when a country has accumulated sizable national debt or has to finance persistent fiscal deficits. Another reason not to launch a new program is that the uncertain supply of an IIGS when fiscal budgets are close to balanced will exacerbate poor liquidity conditions, leading to a large liquidity premium in the IIGS that would offset the benefits.

Australia's experience illustrates that without a steady, consistent supply of IIGSs, it is difficult for investors to be comfortable with the new security. Consequently, the poor market liquidity tends to be exacerbated. Australia was an early adopter of IIGSs, issuing its first security in 1985. After some challenging early years, investors began to gain a better understanding of the new securities. Auction results improved by early 1988, with the real yield falling from over 6 percent to under 5 percent (McCray). A sharp improvement in the government's budget, however, led to an early suspension of the IIGS program (Chart 2). The issuance of inflation-indexed debt securities by some state governments and utility authorities kept the interest in indexed securities alive. The trading market was underdeveloped, though, without the participation of fresh IIGSs. In 1993, with the federal budget returning to sizable deficits, the government reopened the IIGS program and put in more effort to improve the market infrastructure. But before markets were fully developed, the government suspended the IIGS program again in 2003 as a result of its sustained budget surplus since the late 1990s.[36]

The U.S. experience provides additional support for the importance of fiscal outlook. The United States launched its TIPS program in early 1997 when the government's long-term fiscal health was slowly improving and a small deficit or surplus was projected for the coming decade, ac-

Chart 2

FISCAL BALANCES VARY GREATLY OVER TIME (FISCAL DEFICIT/SURPLUS AS SHARE OF GDP)



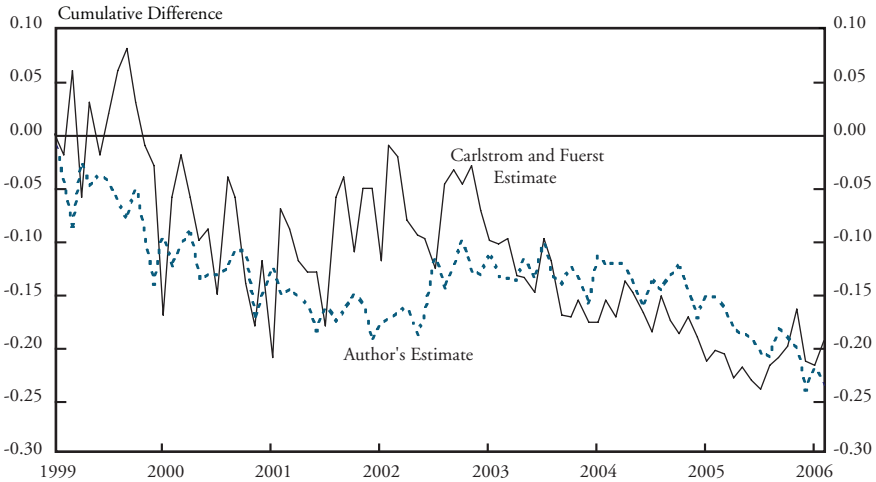
Source: OECD

cording to the Congressional Budget Office. In subsequent years, however, larger than expected fiscal surpluses poured in. With the rapid decline in borrowing needs, some TIPS issuance was suspended, such as the 5-year and 30-year TIPS, casting doubt on the viability of TIPS program. This uncertainty might have contributed to the persistently large liquidity premium in TIPS. With the return of chronic fiscal deficits, a new annual issuance of 20-year TIPS was introduced in 2004, and 5-year TIPS were resumed in 2005. The reduced doubt as to the future of TIPS since then appears to have helped improve market liquidity. While it is difficult to estimate precisely, two recent studies (one by the author and the other by Carlstrom and Fuerst) suggest that the liquidity premium declined slightly from 2003 to 2006 (Chart 3).

These experiences suggest the long-term fiscal outlook can significantly affect the supply of IIGSs and hence market liquidity. If a country is expected to have an essentially balanced fiscal budget in the near future, then the benefits of an IIGS program will be limited and unlikely to justify the necessary initial investment. On the other hand, such a program might be justified for a country projected to need persistent fiscal borrowing in the near future, such as many developed countries with large numbers of baby

Chart 3

LIQUIDITY PREMIUM FELL SLIGHTLY FROM 2003 TO 2006
(CHANGES BASED TO JANUARY 1999)



boomers retiring in the coming decades. Given the long process needed to develop market liquidity, it may be advisable for these countries to start an IIGS program sooner rather than later. Thus, a considerable portion of the projected future borrowing could be conducted through IIGSs.

Historically, some countries launched their IIGS programs when the level of inflation and the public concerns about inflation risk were high. Naturally, an IIGS program is likely to get better public reception when levels of inflation, or concerns about inflation risk, are high. The experiences of the UK and Canada, however, suggest that while IIGS may help a country in its battle against inflation, the good reception of an IIGS due to high levels of inflation tends to be short-lived.

The UK launched the modern IIGS program. Many UK economists had previously advocated the idea of IIGSs to the government, among them John Maynard Keynes. But it took the high inflation of the 1970s to convince the UK government. At that time, with surprisingly persistent, high inflation, there were enormous concerns about future inflation among the public and widespread demands that the government take decisive actions to reduce inflation (Chart 1). This turned out to be the catalyst for the launch of the IIGS. In fact, one of the chief reasons given by the

government for launching the IIGS was to help to convince the public of its anti-inflation policy and to reduce its borrowing costs (Monks).

After the initial success of the index-linked gilts, however, investors' interest in IIGSs waned quickly as the rapid decline of inflation led to lower nominal rates of return on an IIGS relative to conventional government debt issued in the early 1980s. While the IIGS helped the government avoid making high, locked-in nominal coupon payments after inflation fell, the securities appeared to be a worse investment than conventional debt for investors in an environment of declining inflation. This perception distracted investors from focusing on the fundamental benefit of zero inflation risk with index-linked gilts.

The Canadian experience also shows that the initial interest due to high inflation anxiety can wane quickly with the decline of inflation, implying that launching an IIGS at the height of inflation concerns may not be the best timing for success. In Canada, the IIGS program was started about the same time the Bank of Canada adopted formal inflation targeting. Both programs were part of a concerted effort of the Canadian government to convey to the public its resolve to reduce then-rampant inflation. Partly due to the quick success of the inflation battle, which drastically reduced the public's inflation expectations and perceived risks of inflation, and partly due to improvement in the government fiscal balance and the resulting reduction in borrowing needs, IIGSs have remained a tiny niche program in Canada. Currently, less than 2 percent of the total outstanding Canadian government debt is in IIGSs.

To recap, the experiences of early adopters of IIGS programs in developed countries suggest that to fully capture the benefits of the IIGSs, the securities need to be well-designed to promote easy understanding and trading by investors. The government also needs to be willing to undertake a sizeable initial investment and make a long-term commitment to the program. While the public's concern about inflation was a factor in the launch of IIGS programs in some countries, the deciding factor should be the long-term fiscal outlook, as the benefits may outweigh the costs only when a country faces sizable and persistent fiscal borrowing needs. Further, given the long learning process on the part of investors, countries may be better off to launch the IIGS program well before such borrowing needs materialize.

V. CONCLUSION

An IIGS program can provide substantial benefits to a country, especially one expecting persistent fiscal deficits that will require it to borrow heavily in the future. The potential benefits of IIGSs include a better sharing of risks between investors and government, a reduction of government borrowing costs, less incentive for a government to inflate away its debt, and more information for investors and policymakers about inflation expectations. For these benefits to be fully achieved, however, the market for IIGSs must be highly liquid.

This article studies the experiences of early adopters of IIGS in developed countries to learn what steps governments can take to improve the liquidity of their IIGS markets. The article concludes that governments can increase liquidity by designing their securities carefully, by investing heavily in educating the public about the securities, and by making a credible, long-term commitment to issuing IIGSs. The article also concludes that a government expecting persistent future deficits should launch its IIGS far enough in advance of its borrowing needs to allow investors to become familiar with the new securities.

ENDNOTES

[1]Personal income taxes, however, may lower the after-tax real rates of return when inflation goes up. Shen (1998) provides such an example.

[2]Shen (1998) provides a useful summary of the U.S. IIGS program, much of which applies to more general IIGS as well.

[3]Countries have in the past experimented with other indices. For example, the French government issued government bonds indexed to the value of gold in the 1950s and 1970s. A number of countries have issued government bonds whose payments are indexed to some foreign currencies.

[4]Some of the materials for the remainder of this section draw from Deacon and others.

[5]Before the launch of index-linked gilts, which can be freely resold to third parties, the UK government had started to issue inflation-indexed nontradable national savings certificates aimed at small investors in 1975.

[6]Interestingly, the State Electricity Commission of Victoria issued the first inflation-indexed bond in Australia in 1983, before the federal government began to issue such securities.

[7]Australia's neighbor, New Zealand, also ventured into IIGSs in 1996, but suspended the program after only three years.

[8]IIGSs, however, were not the first indexed debt instrument issued by the French government. It issued bonds indexed to gold prices in the 1950s and again in the 1970s. Not surprisingly, with the surge of gold prices in the 1970s and 1980s, some of these bonds turned out to be very costly for the government and, consequently, for French taxpayers. With hindsight, it is clear that the government had no advantage in hedging the price risk of gold, and therefore, issuing gold-indexed debt was unlikely to promote better risk sharing in the economy.

[9]While an individual investor may sell the Treasury note before its maturity, some other investor will have to buy it. Therefore, collectively, investors have to hold it to maturity. For simplicity of exposition, the terms "yields" and "rates of return" are used interchangeably in this article, as well as "auction yields" and "coupon rates." Interested readers can easily find the precise definitions and subtle differences among these terms in most introductory finance textbooks.

[10]In other words, the government is naturally "hedged" against inflation. In fact, governments can be over-hedged against inflation due to the progressive taxes in most developed countries. With progressive taxes, the marginal tax rates tend to be higher for higher-income households. As tax brackets deciding the marginal tax rates are typically only indexed to inflation with delays, higher inflation tends to push more taxpayers into higher marginal tax rates, increasing the share of taxpayers subjected to higher tax rates, leading to higher average taxes.

[11]Another source of savings to the government is that IIGSs may allow the government to pay a smaller inflation risk premium on conventional Treasury

securities. The reason is that investors who are least tolerant of the inflation risk will be drawn to IIGSs, leaving the remaining investors in conventional treasuries less sensitive to inflation risk.

[12]Removing such an inflation incentive was one of the reasons given by the UK government in launching its IIGS programs. It is also likely part of the rationale for taking away the job of controlling inflation from direct government agencies and giving it to independent central banks in most developed countries.

[13]The market prices of IIGS may also provide more information about the prevailing market rate of real interest, which can be particularly useful for policymakers. For example, as the market rate of real interest tends to fall in economic downturns, up-to-date knowledge of this rate may allow a central bank to adjust monetary policy quickly, before the actual slowdown is reported by statistical agencies, which is typically with a substantial time lag.

[14]The difference is called "breakeven inflation" because if future average inflation equals the difference, then the returns for buy-and-hold investors are the same, thus breakeven, for the conventional debt and the IIGS.

[15]For details about obtaining market inflation expectations from IIGS, see Gurkeynak and others as well as Shen and Corning.

[16]It is sometimes also called the liquidity risk premium, as part of the additional yield is to compensate investors for bearing the risk that trading costs may increase suddenly in an illiquid market (Shen and Starr). Liquidity premia in U.S. TIPS have widened considerably in the recent financial crisis, confirming that liquidity premia are also risk premia that may vary greatly over time.

[17]Liquidity premia tend to increase during financial crises. For example, in the 1998 crisis, there were widespread increases in liquidity premia in many financial assets, including dated (off-the-run) conventional treasuries. In the current financial crisis, similar increases in liquidity premia have been observed. In particular, some of the breakeven rates of inflation on TIPS in the U.S. fell greatly in the fall of 2008 as the crisis deepened.

[18]Amihud and Mendelson provide a general model for this kind of liquidity premium. The actual size of the liquidity premium is an empirical issue. In the U.S., different estimates of the liquidity premium lead to disagreements as to whether on net TIPS actually reduce government borrowing costs (Roush and others).

[19]The second major risk in IIGS is, ironically, the liquidity risk: the risk that their trading markets will be particularly illiquid and that the liquidity premia in their yields will increase considerably during financial crises. Liquidity risk is generally as difficult to hedge as it is asset/market specific.

[20]For example, Deacon and others report that in the UK, trading cost is still much higher for index-linked gilts as "the bid-ask spreads charged by dealers [are] widely accepted to be significantly wider than those for conventional gilts."

[21]Examples include the principal indexation form with fixed coupon rate, the annuity bond with payment indexation, the zero coupon bond with fixed real

growth rate of principal, and the coupon rate indexed to inflation. One form that was considered but not adopted in the U.S. was to have fixed nominal coupon payments but also pay out all growth in the nominal value of the principal due to inflation each period.

[22]There are, however, exceptions. For example, the concept of duration is not easily applied to IIGSs (see footnote 22, Shen 1998).

[23]Originally, it was thought necessary to have knowledge of the next coupon payments for trades to settle before the next coupon payment day. As a result, the lag was set at eight months: two for the data collection delay, and six for the semi-annual coupon pay day. With the three-month delay, trades are settled without the knowledge of the next coupon payments, only the accrued coupon payments up to the trading day, but that is sufficient to allow trades to complete.

[24]Even though investors were very interested in such a bond, there were also a lot of uncertainties about what would be the reasonable rate on the new bond, reflected in an unusually wide range of auction bids. In anticipation of the investors' hesitation, the auction format was a single-price format, meaning all winning bids bought the bond at the same yield. Its coupon rate was eventually set at 2 percent.

[25]For example, after several auctions left considerable amounts of the planned index-linked gilt unsold, auctions were suspended in 1988 and index-linked gilts were only sold through reopening existing ones. Auctions were resumed in 1998 when it was judged to suit market demand.

[26]When the fiscal budget turned to surplus in the late 1980s, auctions of new gilts had to be cut back and some of the existing debt bought back. The UK government limited the buyback program to conventional gilts to help maintain the liquidity in the IIGS market, although the issuance of new IIGS had to be suspended. They were resumed in 1998.

[27]Deacon and others report that the over-the-counter derivative market in the indexed gilts has also grown in the UK, which should help the liquidity in the primary trading market.

[28]*http://www.savingsbonds.gov/indiv/products/prod_tips_glance.htm.*

[29]TIPS are "marketable" as they can be traded to a third party freely. Savings bonds, in contrast, are non-marketable, but can be redeemed before maturity. Savings bonds have long been popular among small investors as an easy and safe way to save small amounts of money for the long term.

[30]The reopening of a security is the issuance of an additional amount with the same maturity date and coupon rate as the original security but usually a different purchase price.

[31]TIPS are also set to be eligible for STRIPS programs (their coupons and principals can be traded separately) to give investors more flexibility and trading opportunities and, hopefully, better market liquidity.

[32]As liquidity premia are measured relative to conventional treasuries, one of the reasons that they appear to be high is that conventional treasuries are excep-

tionally liquid. This liquidity is due to the fact that conventional treasuries are not only widely used for hedging purposes, but also for collateral for short-term funding (re-purchase agreements) in the U.S.

[33]Assuming the inflation risk premium in the conventional debt securities to be zero gives the minimal magnitude of liquidity premium. For the example in the text, equation (3) then implies liquidity premium = 2.5 – (5.7 – 3.8) = 0.6. If the inflation risk premium in the conventional debt was nonzero, then the liquidity premium would be even higher. Nevertheless, as the Treasury saves on the inflation risk premium, 0.6 percentage point is still a good measure of the cost to the Treasury of developing the TIPS market.

[34]The share of TIPS in total Treasury debt, however, has declined in recent years, as Treasury has shifted much of its borrowing to the shorter end of the maturity spectrum since 2001.

[35]In fact, liquidity premia appear to have increased considerably since March 2008 as the current financial crisis has spread and deepened. For example, the 10-year breakeven rate fell to less than 0.5 percent for some days in October, most likely due to the dramatic increase in the liquidity premium caused by heightened concern about liquidity risk. Market participants appear to be particularly wary about liquidity risk during financial crises, possibly due to the impossibility of hedging such a risk.

[36]Canada provides a similar example that the improvement in fiscal budgets and outlook limited the development (and benefits) of their IIGS program.

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