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Policy Brief

The Substitution Account as a First Step Toward Reform of the International Monetary System

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INTRODUCTION

Today, the international monetary system is based largely on the US dollar, but reserve currency diversification has begun, thanks to the advent of the euro, and it is apt to continue. Eventually, the renminbi could acquire reserve currency status, and the resulting reserve currency diversification could be more disruptive than it has been to date. To forestall that possibility the quasi-currency issued by the International Monetary Fund (IMF), Special Drawing Rights (SDRs), could be made to play a larger role in the international monetary system, precluding potentially disruptive diversification and achieving more orderly growth in the stock of international reserves.

This policy brief proposes a way in which that objective could be achieved. It was written in response to a remark made by the Governor of the People's Bank of China, but it harks back to an earlier attempt to establish a so-called substitution account lodged in the IMF into which members of the IMF would deposit some of their substantial dollar reserves in exchange for SDRs.

In some of the simulations summarized in this policy brief, the proposal is shown to be quite costly to the United States, but those simulations are deliberately designed to test the robustness of the new regime and potential costs to the United States under strongly adverse circumstances. The "base case" simulation, which traces what would have been the actual evolution of the substitution account from 1995 through 2008, imposes no cost whatsoever on the United States.

In the late 1970s the major industrial countries considered a proposal originating with the staff of the IMF for the creation of a substitution account under the auspices of the IMF. Had that proposal been adopted, central banks and governments would have been free to deposit some or all of their US dollar reserves in the account, obtaining in exchange claims denominated in SDRs. The proposal foundered, however, when the United States refused to take sole responsibility for maintaining the dollar value of the SDR-denominated claims on the proposed account. No other arrangement was acceptable to the other governments involved in the negotiations.[1] The US position was understandable. The US Congress could not be expected to endorse an arrangement under which the United States would have an open-ended financial obligation to guarantee the dollar value of the reserves deposited in the substitution account.

While the proposal was still under consideration, I ran simulations showing how a substitution account might evolve under various assumptions about the relevant interest rates and the dollar value of the SDR, and I published a paper on the

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1. On the proposal and subsequent negotiations, see: Boughton, James M. 2001. *Silent Revolution: The International Monetary Fund, 1979–1989.* Washington: International Monetary Fund; and Solomon, Robert. 1982. *The International Monetary System, 1945–1981.* Revised Edition, Cambridge: Harper & Row.

subject.[2] Thereafter, however, the subject lay dormant for nearly three decades. A search of the recent literature turned up only one brief favorable reference to the idea.[3]

> **"I suggest that a substitution account, once in being, could be a bulwark against the further development of a multi-currency reserve system, which, in my view, could prove to be quite unstable."**

Early last year, however, the subject was revived by Zhou Xiaochuan, governor of the People's Bank of China, whose country holds more than $2.4 trillion of in reserves, largely in US dollars, and cannot readily diversify the currency composition of its huge reserves without causing a significant depreciation of the dollar vis-à-vis other major currencies. He suggested that a substitution account could meet China's need to diversify the currency composition of its reserves without affecting exchange rates. It was Governor Zhou's speech that caused me to return to the subject and produce the new simulations described in this policy brief.

Going further, however, I suggest that a substitution account, once in being, could be a bulwark against the further development of a multi-currency reserve system, which, in my view, could prove to be quite unstable. Most importantly, it could provide the basis for a far-reaching reform of the international reserve regime. The new regime would give the IMF a central role in the monetary system as the principal provider of reserve assets, relieving the United States of a role it has assumed heretofore without having explicitly assessed its benefits or costs. The new regime would not impose financial obligations on the United States, nor would it diminish the role of the dollar as the main medium of exchange for international transactions between private parties.

THE FRAMEWORK

With the exception of one simulation shown later in table 2, the simulations summarized in this policy brief assume that a substitution account was created at the start of 1995 under the auspices of the IMF. At the start of that year, members of the IMF are assumed to deposit voluntarily US\$1 trillion in a substitution account. They receive in exchange SDR-denominated claims at the then prevailing conversion rate between the dollar and the SDR. At the end of that year and every subsequent year through the end of 2008, they earn interest at the prevailing SDR interest rate, while the account itself earns interest from the United States at the 90-day US Treasury bill rate. The simulations close at the end of 2008 (which is not to suggest that the account would be terminated at that point). They are conducted on three bases:

- With no additional dollar payments by the United States, even when the dollar value of the SDR claims on the account falls below the number of dollars in the account.

- With an annual "deficiency payment" made by the United States whenever the number of dollars in the account would otherwise fall below the dollar value of the SDR claims on the account (i.e., when the account would otherwise be insolvent).

- With an annual "cost-sharing payment" made by the United States in an amount equal to only *half* the gap between the number of dollars in the account and the dollar value of the SDR claims on the account, the implicit assumption being that the rest of the gap would be closed by the IMF itself by drawing on its own dollar holdings.

Three summary figures are attached to each simulation:

- The dollar surplus (+) or deficit (-) remaining in the account at the end of 2008.[4]

- The sum of the deficiency or cost-sharing payments made by the United States to maintain the financial integrity of the account.

- The total cost to the United States of its involvement with the account.

The last of these numbers needs to be explained. The interest earned by the IMF on the dollars deposited in the account does *not* constitute a cost to the United States, which would have had to pay interest on the dollars deposited in the account had they been retained by the depositors (although the interest rates involved might have been somewhat different). Hence, the cost to the United States is defined as the cumulative dollar cost *plus* compound interest of the deficiency or cost-sharing payments made by the United States after the establishment of the account.[5]

2. On the potential cost to the United States, see Kenen, Peter B. 1980. The Analytics of a Substitution Account. *Banca Nazionale del Lavoro Quarterly Review* 139. (Reprinted in Kenen, P. B. 1994. *Exchange Rates and the Monetary System*, Aldershot, England: Edward Elgar Publishing Limited.)

3. Bergsten, C. Fred. 2007. How to Solve the Problem of the Dollar. *Financial Times*. (December 11).

4. There can be a deficit at the end of a simulation, as no deficiency or cost-sharing payment is made at the end of the final year.

5. One more point must be made. In some simulations, the US interest rate and SDR interest rate are made to change independently (and in the "worst case" simulations, US interest is made to fall at the same time that the SDR

Table 1   Summary of selected substitution account simulations

Dollar and SDR amounts may be deemed to be in billions of US dollar equivalents. Simulations begin at the end of 1995 with an initial deposit of $1000 with the IMF, and they close at the end of 2008. Simulated shocks to interest rates and exchange rates start at the end of the year 2000.

| | | Final amounts in account | | | Deficiency or cost-sharing payments* | | Dollar surplus (+) or deficit (−) at end of simulation | Cost to United States** |
| | | | SDRs | | | | | |
Type	Permutation	Dollars	In SDRs	In dollar equivalent	Number	Cumulative dollar amount		
Base case simulation								
Simulation with no deficiency or cost-sharing payments (but none needed)		1,588.3	1,007.0	1,551.3	0	0.0	36.9	0.0
With deficiency payments								
Historical	US interest rate falls by 100 bp[1]	1,520.1	977.7	1,505.9	2	61.3	14.1	65.3
Historical	SDR interest rate rises by 100 bp	1,717.7	1,109.5	1,708.9	2	118.3	8.8	129.4
Historical	Dollar depreciates by 20 percent	1,910.3	1,017.0	1,879.8	3	278.0	30.5	322.0
Historical	Worst-case scenario[2]	2,071.0	1,067.0	1,972.2	5	475.5	−0.8	516.6
With cost-sharing payments								
Historical	US interest rate falls by 100 bp[1]	1,541.1	977.7	1,505.9	1	39.2	35.2	32.7
Historical	SDR interest rate rises by 100 bp	1,717.7	1,109.5	1,708.9	2	59.2	8.8	64.6
Historical	Dollar depreciates by 20 percent	1,910.2	1,017.0	1,879.8	3	139.0	30.4	161.6
Historical	Worst-case scenario[2]	1,971.4	1,067.0	1,972.2	5	237.6	−0.8	258.4

*As no deficiency or cost-sharing payment is made at the end of any simulation, the maximum number of deficiency or cost-sharing payments is eight.
**Sum of deficiency or cost-sharing payments including accumulated interest on them. Note that the sum of the cost-sharing payments is approximately equal to one-half of the corresponding sum of deficiency payments; the small differences are due to the cumulative effect of rounding.

1. In this and all other simulations involving a fall in the US interest rate, the SDR interest rate is made to fall by 45 basis points.
2. Composite of the three previous simulations.

Source: Author's computations.

THE SIMULATIONS

Nine simulations are summarized in table 1. All of them are based on actual values of the US and SDR interest rate and the SDR-dollar exchange rate (until they are shocked permanently in the year 2000 in the manner described below). The simulations themselves trace the year-by-year evolution of the account reflecting changes in the dollar value of the SDR, the interest rate paid by the IMF on the SDR-denominated liabilities of the account, and the US Treasury bill rate, which is the rate chosen to calculate the interest paid into the account by the United States.

The base case simulation, tracing the evolution of the account from 1995 to 2008 using actual interest rates and the actual SDR-dollar exchange rate, does not display a single deficiency payment and thus imposes no cost whatsoever on the United States.[6] The cumulative costs to the United States shown elsewhere in table 1 reflect large shocks to the interest rates and to the SDR-dollar exchange rate that I impose on the simulations starting in the year 2000. The costs of the interest-rate shocks are fairly small, but those pertaining to cases in which the dollar depreciates vis-à-vis the SDR are larger, and they grow even larger in the "worst-case" scenario, where the US interest rate falls, the SDR interest rises, and the dollar depreciates vis-à-vis the SDR simultaneously.[7]

With full deficiency payments by the United States, the cumulative cost to the United States is $322.0 billion in the simulation where the dollar depreciates vis-à-vis the SDR, and it rises to $516.6 billion in the "worst-case" simulation. Under a cost-sharing regime, the costs to the United States are, as expected, half as large as those with full deficiency payments,

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interest rate is made to rise). These "shocks" are unrealistic, because the SDR interest rate, like the SDR exchange rate, is a weighted average of national interest rates (those of the United States, United Kingdom, the euro area, and Japan), with the US rate accounting for more than 40 percent of the average. Hence, the simulations involving shocks to the US interest rate are programmed to allow for the interdependence of the two interest rates. Whenever the US interest rate is made to fall by 100 basis points, the SDR interest rate is reduced by 45 basis points. (When the SDR interest rate is made to rise, however, the US interest rate is not adjusted analogously. Hence, the shocks to the SDR interest rate must be deemed to reflect increases in the other interest rates that define the SDR interest rate (those of the United Kingdom, the eurozone, and Japan).

6. In table 2 below, which replicates the base case historical scenario for a much longer period, there are nontrivial costs to the United States.

7. The "worst-case" scenarios are unrealistic, however, as they reflect large increases in the three non-dollar interest rates that enter the calculation of the SDR interest rate, even at a time when the US interest rate is made to fall. They are included to pre-empt criticism that the scenarios pay too little attention to very bad outcomes from standpoint of the United States. It should also be noted that all of the shocks introduced in the year 2000 are quite large relative to the typical year-to-year changes in the variables. (These can be readily calculated from the data in table 2, below, which provides a longer-term version of the base case simulation with full deficiency payments.)

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as the IMF is assumed to bear the other half of the total cost. There are, of course, other ways to maintain the solvency of the account, and some have been suggested by readers of this paper:

- The IMF itself could underwrite the solvency of the account in return for an annual fee paid by the governments depositing dollars with it.

- A "counterpart" account could be established by the United States and lodged within the IMF; it would be debited whenever deficiency payments would otherwise be required and credited when the substitution account held surplus dollars.

- Deficiency or cost-sharing payments could be based on a moving average of the relevant variables to reduce the frequency and size of the deficiency or cost-sharing payments.

These three, moreover, do not exhaust the possibilities.

How large are the deficiency and cost-sharing payments shown in table 1, relative to well-known numbers? Consider the most costly simulation from the US standpoint, the worst-case simulation with full deficiency payments. The *cumulative* total of deficiency payments was equal to 2.6 percent of total US foreign assets in at the end of 2008 and to 3.6 percent of US GDP in that same year. As for the average annual cost of the full deficiency payments, it was less than 0.2 percent of total US foreign assets in 2008 and less than 0.3 percent of US GDP. These are not small numbers, and they suggest that a different regime would be superior from the standpoint of the United States, such as the first of the three possibilities listed earlier—an annual fee charged to the depositors.[8] It must be emphasized, however, that the estimates above derive from simulations devised deliberately to produce high-end costs for the United States. The actual costs are apt to be considerably smaller.

ANOTHER SIMULATION

As was indicated earlier, the simulations summarized in table 1 begin in 1995, when foreign exchange holdings reported to the IMF totaled $1.39 trillion, of which only $1.034 trillion were allocated by currency and only $610 billion were US dollars. By implication, the $1 trillion figure used in the simulations considered above was too large for that year, all the more so because participation in the substitution account would be voluntary.[9]

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8. This regime was also proposed by Michel Camdessus in his speech at a conference in China on November 10, 2009.

9. At the end of 2008, the last full year for which data were available when this paper was written, total foreign exchange reserves stood at the equivalent

For this reason, among others, another simulation is set out fully in table 2.[10] It begins in 1980, chosen as that was the year in which the original proposal for a substitution account

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was rejected, and it runs through 2008, just like the simulations summarized in table 1. It starts with a deposit of $500 billion, half of the amount with which the previous simulations started, and ends in 2008, just like those other simulations.[11] Unlike the base case simulation summarized in table 1, however, it displays a number of deficiency payments and thus a nonzero cost to the United States. But the average annual deficiency payment from the first to last year in which such payments were required was only $38.5 billion (and the average annual cost to the United States over the whole 29-year period covered by table 2 was just $9.3 billion).

BEYOND THE SUBSTITUTION ACCOUNT

The introduction of a substitution account may over time become a major step toward a more comprehensive reform of the international monetary system—a movement toward use of the SDR as a major reserve asset and, ultimately, the primary reserve asset. Absent a global market in which the SDR can be traded for national currencies, it cannot now perform the main function of a reserve currency, used for intervention to influence the value of a country's currency. But a government holding SDRs created by the substitution account could be allowed to sell them to another IMF member in exchange for

that country's national currency, and then use that other country's currency to intervene in the foreign exchange market.[12] Eventually, moreover, allocated SDRs and SDR claims on the substitution account should be consolidated, and obligations currently attaching to the possession of allocated SDRs would then attach to SDRs held in the substitution account.

Once these arrangements had been put in place, moreover, any maintenance-of-value obligation assumed initially by the United States or by the participating countries themselves would be replaced by the existing obligation of the United States to accept SDRs from other IMF members in exchange for US dollars at the prevailing exchange rate between the dollar and the SDR. The membership of the IMF, moreover, should agree that the IMF will allocate additional SDRs on a regular basis at a predetermined rate (which could be changed from time to time as circumstances warrant).

It is thus conceivable that the SDR could become something close to a supranational reserve asset without vesting in any international institution such as the IMF the power to buy or sell a member's currency at its discretion using SDRs.[13] The members of the IMF, however, would have to vest in the IMF the authority to allocate additional SDRs on a regular basis to augment its members' reserves in line with the growth of the global economy.[14]

ANSWERS TO TWO QUESTIONS

■ How many "rounds" of substitution are likely to take place before the transformation of the substitution account into the full-fledged reserve account described above?

■ Should nondollar currencies, such as the euro, be included in the substitution process?

The answer to the first question depends, of course, on the initial size of the substitution account, if and when it is created. Table 3 describes the size and composition of currency reserves in 1995 and mid-2009. It shows that the share of the dollar has risen slightly when measured against the total of "allocated"

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of $6.645 trillion, of which $4.211 trillion were allocated by currency and $2.7 trillion were held in US dollars. (The large unallocated figure for 2008, at $2.434 trillion, strongly suggests that China is among the countries that do not report to the IMF the currency composition of their reserves.)

10. I am grateful to Jonathan Ostry, deputy director of the research department at the IMF, for suggesting that I include this long-term simulation and arranging for me to receive the necessary data, but absolve him from all blame for anything written in this paper.

11. Like the starting figure of $1 trillion used in the simulation summarized in table 1, the starting figure of $500 billion is too large for a simulation starting in1980.

12. That is the case, even now, in respect of SDRs created via periodic allocations, but immediate consolidation of allocated SDRs with those in the substitution account might be impractical for as long as a maintenance-of-value regime is attached to the SDRs in the substitution account.

13. Proposals somewhat similar to this one have been made by others. See: Greenwald, Bruce, and Joseph Stiglitz. 2008. *A Modest Proposal for International Monetary Reform.* Paper prepared for the Istanbul Meeting of the International Economic Association. (June); Helleiner, Eric. 2008. *International Financial Imbalances and Global Governance.* (July); and the speech by Michel Camdessus cited above.

14. The IMF might also be authorized to accept members' remaining or additional holdings of reserve currencies, but that process of ongoing substitution should probably be exercised at the Fund's discretion, not at the discretion of individual governments.

Table 2   Base case historical simulation, 1980 through 2008*
Deficiency payments made
Billions of US dollar equivalents

End of year	US dollars per SDR	SDR interest rate	US interest rate	Dollar amount in SA	SDR amount in SA	Dollar value of SDR amt	US interest payment	Surplus or deficit (–) in account	Deficiency payments made	Cost to United States**
1980	1.299	9.06	11.24	500	384.91	500	0	0	0	0
1981	1.176	12.66	14.35	571.75	433.64	509.86	71.75	61.89	0	0
1982	1.099	11.17	10.77	633.33	482.08	529.8	61.58	103.52	0	0
1983	1.064	8.6	8.87	689.5	523.54	557.04	56.18	132.46	0	0
1984	1.02	8.92	9.81	757.14	570.24	581.64	67.64	175.5	0	0
1985	1.02	7.81	7.73	815.67	614.77	627.07	58.53	188.6	0	0
1986	1.176	6.39	6.15	865.83	654.06	769.17	50.16	96.66	0	0
1987	1.299	5.87	5.95	917.35	692.45	899.49	51.52	17.86	0	0
1988	1.351	6.25	6.88	993.97	735.73	993.97	63.11	0	13.5	14.43
1989	1.282	8.27	8.39	1,077.36	796.57	1,021.21	83.39	56.15	0	15.64
1990	1.351	9.09	7.74	1,174	868.98	1,173.99	0	0	13.25	30.1
1991	1.37	7.72	5.53	1,282.41	936.07	1,282.41	64.92	0	43.49	73.89
1992	1.408	6.26	3.51	1,400.49	994.66	1,400.49	45.01	0	73.07	147.7
1993	1.389	4.64	3.06	1,445.69	1,040.82	1,445.69	42.86	−0.01	2.34	151.52
1994	1.429	4.29	4.35	1,551.13	1,085.47	1,551.13	62.89	0	42.56	195.59
1995	1.515	4.58	5.65	1,719.8	1,135.18	1,719.8	87.64	0	81.03	278.58
1996	1.449	3.9	5.14	1,808.2	1,179.45	1,709.03	88.4	99.17	0	281.36
1997	1.36	4.07	5.2	1,902.23	1,227.46	1,669.34	94.03	232.88	0	284.18
1998	1.351	4.11	4.9	1,995.44	1,277.91	1,726.45	93.21	268.98	0	287.02
1999	1.37	3.48	4.77	2,090.62	1,322.33	1,811.59	95.18	279.03	0	289.89
2000	1.316	4.44	6	2,216.06	1,381.04	1,817.44	125.44	398.61	0	292.79
2001	1.266	3.43	3.48	2,293.18	1,428.35	1,808.29	77.12	484.89	0	295.72
2002	1.299	2.24	1.63	2,330.55	1,460.37	1,897.02	37.38	433.54	0	298.67
2003	1.408	1.65	1.02	2,354.33	1,484.45	2,090.1	23.77	264.22	0	301.66
2004	1.471	1.84	1.39	2,387.05	1,511.7	2,223.71	32.73	163.34	0	304.68
2005	1.471	2.6	3.21	2,463.68	1,551.07	2,281.62	76.62	182.06	0	307.72
2006	1.471	3.69	4.85	2,583.16	1,608.34	2,365.86	119.49	217.3	0	310.8
2007	1.538	4.05	4.45	2,698.11	1,673.47	2,573.8	114.95	124.31	0	313.91
2008	1.587	2.56	1.37	2,735.08	1,716.32	2,723.79	36.96	11.29	0	317.05

Dollar surplus (+) or deficit in account at end of 2008:	11.29
Total of US deficiency or cost-sharing payments:	269.24
Total cost to United States**	317.05

*Entries for 1995 through 2008 may not exactly match those in table 1, both because the basic data come from different sources and because they start in different years with different amounts of dollars deposited initially. Note, however, that the size of the account shown here has come to exceed $1,000 billion well before 1995, the year in which those other simulations begin.
**See note to table 1.

Source: IMF and author's computations.

Table 3   Currency composition of foreign exchange reserves in 1995 and 2009

Currency	Billions of US dollar equivalents	Percentage of total allocated reserves
End of 1995		
Total currency reserves	1,389.8	—
Allocated reserves	1,034.2	100.0
US dollars	610.3	59.0
Pounds	21.9	2.1
Euro area currencies	279.1	27.0
Swiss francs	3.1	0.3
Yen	70.1	6.8
Other currencies	49.4	4.8
Unallocated	355.6	—
End of June 2009		
Total currency reserves	6,801.1	—
Allocated reserves	4,269.5	100.0
US dollars	2,680.5	62.8
Pounds	184.3	4.3
Euros	1,172.8	27.5
Swiss francs	5.2	0.1
Yen	131.9	3.1
Other currencies	94.9	2.2
Unallocated	2,531.5	—

Source: International Monetary Fund, Composition of Official Foreign Exchange Reserves, various issues. Euro area currencies in 1995 include European currency unit claims.

reserves (i.e., those of countries that report voluntarily to the IMF the currency composition of their reserves). It would appear, moreover, that China is not included in this country group. If it were included, the share of the dollar would rise appreciably from 63 percent of allocated reserves to something in the neighborhood of 70 percent.[15] But other major dollar-holding countries would have to support and participate in the creation of a substitution account, and we cannot even infer from Governor's Zhou's much quoted remarks, cited at the start of this paper, that China itself would deposit a large share of its dollar reserves in a substitution account.

It would thus seem that two or three rounds of substitution, stretching across a decade might be required before the

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15. This rough estimate employs the common supposition that some 70 percent of China's reserves are held in dollars.

participants (and others) agreed to the consolidation of their SDR claims on the substitution account with their allocated SDRs so as to create a single SDR reserve account. Yet that is not a long time to wait for a fundamental transformation of the international monetary system. In the interim, the IMF should resume annual allocations at, say, SDR 200 billion per year to raise the share of the SDR in total reserves.

The second question can also be answered by the data in table 3. The euro accounts for little more than a quarter of allocated reserves. Hence, a significant fall in its share might not disrupt the international monetary system to the same extent as a large shift away from the dollar. Yet it would be impossible to convert the substitution account into a full-fledged reserve account without the participation of IMF members that presently hold mainly euro reserves. Otherwise, they could not acquire the SDR-denominated claims required for full participation in the reserve account. In other words, countries that hold mainly euros may not be greatly interested in substitution per se, but they would surely want to participate in the reserve account if and when it is established and would have then to deposit some of their currency reserves with the IMF in order to acquire the SDR balances required for participation in the reserve account.

CONCLUSION

The simulations described in this policy brief make clear that the creation of a substitution account might be costly to the United States, depending on the nature of the maintenance-of-value regime adopted to protect the solvency of the substitution account. The cost could be greatly reduced, however, by adopting a cost-sharing regime or assessing an annual fee on the depositors in the account. The cost to the United States, moreover, must be weighed against another cost that cannot be readily quantified: the effect of reserve currency diversification by central banks that now hold far larger dollar reserves than they are apt to need to cope with balance-of-payments problems. Large-scale diversification could cause a substantial and highly disorderly depreciation of the dollar. It would thus be prudent to give serious thought to Governor's Zhou's suggestion that we revisit the potential benefits and costs of a substitution account lodged in the IMF.