The World Currency Unit: Can it Work?

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Abstract:

This paper uses the World Currency Unit framework of Ho(2000) to consider the feasibility and the benefits for a country to link its currency to the WCU. It also throws light on the workability of "global bonds" denominated in the WCU. I estimated the value of the WCU over the years using IMF and OECD data. Data from Hong Kong, Japan, the United States, the UK, and South Korea suggest that real exchange rate indices based on the WCU concept provide a useful explanatory variable for real exports, implying that a country that pegs its currency to the WCU can enjoy less fluctuations in competitiveness. Real interest rates based on the WCU concept are also found to be a significant explanatory variable for net domestic demand, implying that a WCU-exchange standard will be an attractive option for smaller countries, and will bring the world closer to monetary and capital market integration.

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Are present international monetary arrangements optimal? My answer is no. There is a missing ingredient in the international monetary system. The missing factor is a stable world currency. Until such a facility is created, the existing arrangements, while likely to continue, will be, at best, second best.

Robert A. Mundell, 1995

1.   Introduction

Mundell(1995) maintained that having a common world currency will be the best solution to the world's international monetary problems.   Economists, however, though sharing the view that having a common world currency would facilitate trade and investment,[1] generally recognize that a common world currency that is not based on gold or some other recognized commodity standard would be difficult to implement. On the other hand, since the value of gold is not stable, few economists take return to the gold standard seriously[2].

Taking the hint from Fisher(1913), Shiller(1998), Ho(2000) proposed a unit of account that offers the prospect of being truly stable in value. Named the World Currency Unit (WCU), it promises to be a superior alternative to gold as a currency standard. Although it is not meant to be the basis for a common world currency throughout the world, it brings the world one step closer to that first-best world envisaged by Mundell. Conceptually the idea of a WCU dates back to Irving Fisher, who had urged the introduction of a stable real value unit of account as early as 1913. The concept was explored at length by Warren Coats(1994), but a workable idea was

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[1] Frankel and Rose(1996) argue that economic integration, in particular monetary integration, would enhance trade links and thus cause a higher correlation of business cycles across nations. Countries may therefore realize greater benefit than may be envisaged prior to joining a monetary union.

[2] See Macesich(1999) for a discussion of the various options, including a return to the gold standard.

yet to be worked out.

Ho suggested using a basket of goods and services at some base year to be the basis of the unit. This basket should be representative of world output. This composite representative output consists of the GDPs of the key economic zones in the base year. The five economic zones include the United States, the Euro zone, Japan, Canada, and Australia.[3] Since the GDPs of these zones are priced in different currencies, they must be converted into a common currency for summation. The total value, in US dollars, is scaled down to equal US$100 during the base year.

Let Q_{i0} be the GDP of country/zone i in base year 0. Thus in the base year:

$$1 \text{ WCU} = \lambda \sum Q_{i0} \cdot e_{i0} = \text{US\$ } 100 \qquad [1]$$

where λ is the scaling factor

i is any of the five major economies

e_{i0} is the exchange rate converting one unit of the currency of i into US$ in base year 0.

The value of this basket in terms of the US dollar, and for that matter any currency, will change over time, but as long as we have defined the unit clearly, then no matter how the nominal value in terms of a currency changes, it still embodies the same composite real good. Over time, Q_{i0} in current domestic prices may increase because of inflation. Currency i may also appreciate against the US dollar. Either way, other things being equal, the nominal value of the WCU basket in US dollars will increase, but it will buy the same composite real good. Figure 1 shows the

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[3]   These economic zones are representative in that they comprise the world's major industrial zones as well as major producers of primary goods.

changes in the nominal value of the WCU, computed using IMF and OECD statistics, from 1983 to 1999. A caveat must be added though. In revaluing the WCU basket, I use the consumer price indices of the different countries/zones, even though in principle GDP deflators would have been more appropriate. I do this because the GDP deflators are usually available after a relatively long lag. Since the WCU is intended to be a unit of account ready to be used on a day-to-day basis, for practical reasons CPIs are used instead of GDP deflators in deriving the current values of the unit.

Figure 1: Value of the WCU in U.S $ 1983-1999

Exchange rate: US$ per WCU (base year: 1990)
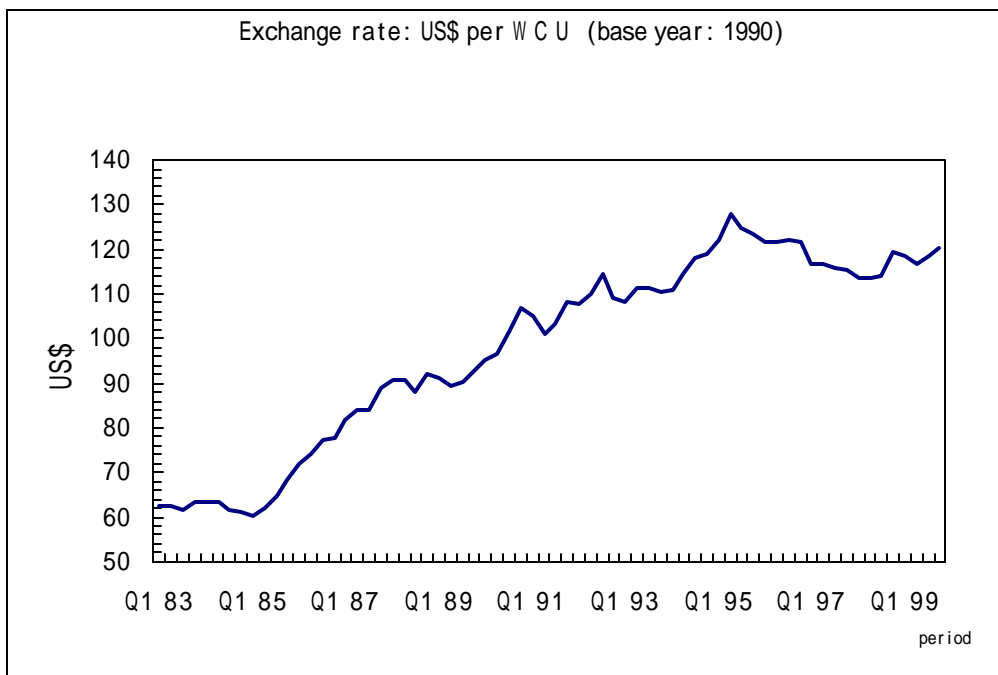
This paper tries to apply this framework to actual data, and thus assess the implications of a country trying to link its currency to the WCU. There are obviously a number of difficulties in trying to do this. Quite apart from the CPI/ GDP deflator issue that we touched upon just now, the world would have been different if the WCU had been used as a unit of account and if some countries had linked their currencies to the WCU, to the extent that the nominal value of the WCU itself might well have

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been quite different. Expectations, too, would have been quite different to the extent that market behavior could have been quite different. Nevertheless, the best we can do is to use the actual data as we know them today. I shall use such data to derive comparable indices of real exchange rates and real interest rates across different currencies. Simulations based on parameters estimated with actual data will not predict accurately what would have happened had a country linked its currency with the WCU. These considerations, however, should not affect the conclusion that a WCU-link will engender greater stability. Indeed, if simulations point to such a conclusion, this conclusion is likely to be even stronger in the real world since capital flows are expected to be less volatile in a world with financial instruments denominated in the WCU.

In the next section I shall compute comparable real exchange rate indices. In the Section 3 I shall compute comparable real interest rate indices. Section 4 will discuss the implications of linking a currency with the WCU and sum up the paper.

2. Computing Comparable Real Exchange Rates

The definition of the WCU allows us to define the standard real exchange rate for some currency A as[4]:

$$\frac{\text{CPI in Country A} \ \times \ \text{Price of A's Currency in US dollars}}{\text{Price of WCU in US dollars}} \qquad [1]$$

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[4]   Alternatively, it can also be defined as:

$$\frac{\text{CPI in Country A}}{\text{Price of WCU in A's currency}}$$

The numerator in [1] shows the price level in country A in US dollar terms. The denominator shows the price level of the key economic zones of the world in a composite way in US dollar terms. If the price level in Country A rises by 1 per cent, while the exchange rate and nominal value of the WCU in US dollars remain unchanged, Country A will lose competitiveness relative to others. Similarly, if the price level in Country A stays put, but the currency has appreciated against the US dollar at the same time as the price of the WCU remains unchanged, Country A's competitiveness also suffers. Finally, if the numerator remains unchanged but the price of the WCU in US dollars rises, either because of higher inflation elsewhere or because of currency appreciation among WCU constituent countries, Country A's competitiveness will have improved.

Based on this index of the real exchange rate, and regressing the exports of a trading country/region against this index of the real exchange rate and the real GDP of OECD countries, we can see that the real exchange rate index is fairly robust in explaining exports performance. In the case of Hong Kong, because exports to China(mainland) are quite important and yet China up till 1994 was on a dual exchange rate system and even today its currency is not fully convertible, it makes sense to take exports to China out. Table 1 shows the results.

Table 1. Dependent Variable: HKTXRY (Hong Kong's Total Exports less Exports to China, year-on-year change) -- 1985 Q1to 1999 Q3

Variable	Coefficient	t-ratio
Constant term	3.9564	0.73159
HKRERY	-0.14478	-2.7759***
HKRERY(-1)	-0.23693	-3.2125***
HKRERY(-2)	-0.27646	-3.9580***
HKRERY(-3)	-0.26337	-4.0306***
HKRERY(-4)	-0.19766	-1.7105*
OCGDPVRY(-1)	2.5257	2.0338**

R-bar squared =   0.79876
DW-statistic   =   2.3203
Notes: 1)   Sum of the "Almon lag" coefficients for: HKRERY
                 Coefficient   :   -1.119
                 t-ratio   :   -4.320***
         2)   AR(1) procedure was used to adjust for serial correlation.
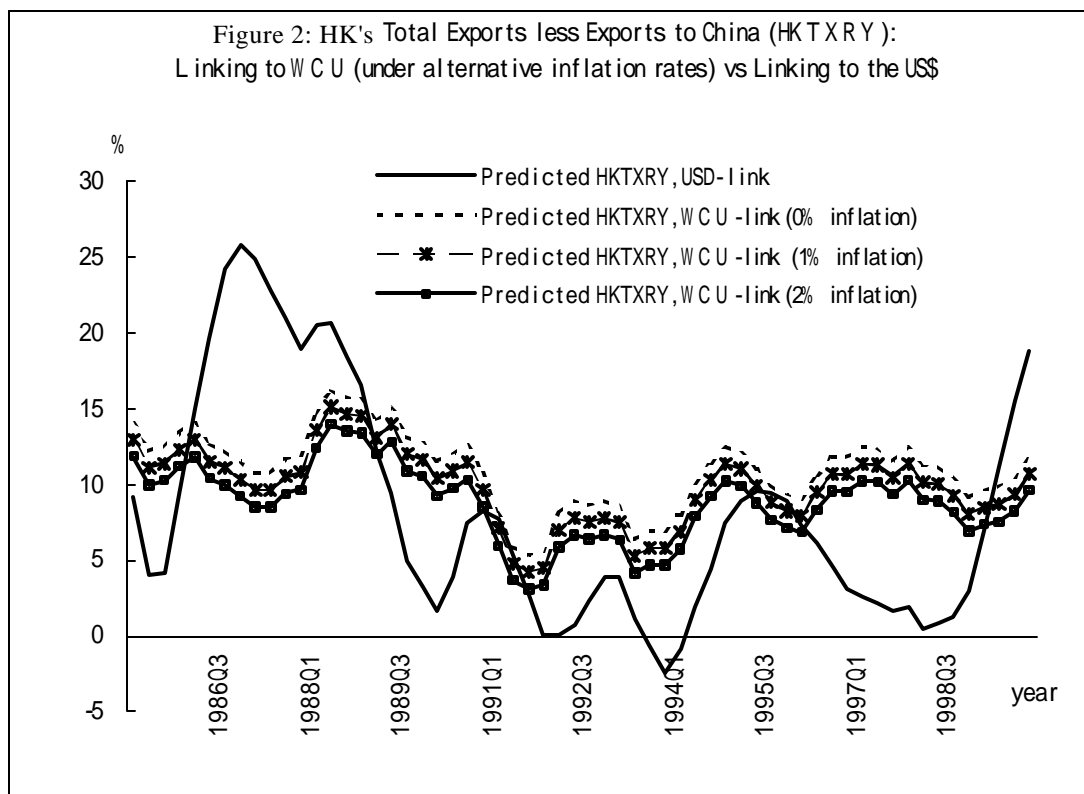*** indicates statistical significance at 1 % level
**   indicates statistical significance at 5 % level
*   indicates statistical significance at 10% level

In this equation, Hong Kong's total exports to destinations other than the Mainland are regressed against the rate of change of the real exchange rate and the rate of growth of OECD countries. The real exchange rate effect is subject to lags. It can be seen that all coefficients carry the right sign and are statistically significant. According to the equation a 10 per cent appreciation in the real exchange rate will reduce real exports to countries other than China by up to 11 per cent after 4 quarters.

If the Hong Kong dollar had been linked to the WCU, we would expect that prices in Hong Kong would have been much more stable. Since the WCU by definition has constant purchasing power over the composite GDP "good," the HK dollar would also likely to have constant purchasing power in Hong Kong. Using

alternative inflation assumptions of 0 per cent, 1 per cent, and 2 per cent, the predicted export performance is shown in Figure 2. We can see that exports growth would have been much more stable.

Figure 2: HK's Total Exports less Exports to China (HKTXRY): Linking to WCU (under alternative inflation rates) vs Linking to the US$

Evidence in the robustness of the WCU as a unit of constant purchasing power can be derived from applying the formula for the real exchange rate based on equation [1] and testing its explanatory power for exports for other countries. Table 2 to Table 5, computed for the United Kingdom, the United States, Japan, and Korea, clearly show that the coefficients on the real exchange rate variable thus defined are always statistically significant and always carry the right sign. Although real exchange rate movements appear to have smaller and statistically less significant effects on real exports for these countries than for Hong Kong, the reason may be that we have not allowed for special factors that affected the particular countries as we did for Hong Kong when we subtracted exports to Mainland China from total exports. Another

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example of such special factors is that in (unreported) regressions done on Indonesia, we found that subtracting US$-denominated oil exports would improve the coefficients significantly.

Table 2. Dependent Variable: UKEXPVRY (UK's Export Volume Index, year-on-year change) -- 1985 Q2to 1999Q3

Variable	Coefficient	t-ratio
Constant term	0.21824	0.0777
UKRERY	-0.03865	-1.4480
UKRERY(-1)	-0.06122	-1.5990
UKRERY(-2)	-0.06769	-1.8338*
UKRERY(-3)	-0.05807	-1.7674*
UKRERY(-4)	-0.03235	-0.60419
OCGDPVRY(-1)	1.9324	2.0334**

R-bar squared =   0.42874
DW-statistic   =   2.0804
Notes: 1)   Sum of the "Almon lag" coefficients for: UKRERY
                    Coefficient   :   -0.2580
                    t-ratio   :   -1.913*
          2)   AR(1) procedure was used to adjust for serial correlation.
**   indicates 5 % significant level
*   indicates 10% significant level

Table 3. Dependent Variable: USEXPVRY (The United States' Export Volume Index, year-on-year change) -- 1985 Q2to 1999Q3

Variable	Coefficient	t-ratio
Constant term	-0.95394	-0.27316
USRERY	-0.03231	-0.89490
USRERY(-1)	-0.05853	-1.0828
USRERY(-2)	-0.07866	-1.4183
USRERY(-3)	-0.09269	-1.9755**
USRERY(-4)	-0.10063	-1.8527*
USRERY(-5)	-0.10248	-1.0153
OCGDPVRY	1.1607	1.5736
OCGDPVRY(-1)	1.2654	2.2823**
OCGDPVRY(-2)	0.31413	0.29178

R-bar squared =   0.59680
DW-statistic   =   1.8605
Notes: 1)   Sum of the "Almon lag" coefficients for: USRERY
                    Coefficient   :   -0.4653
                    t-ratio   :   -2.107**
          2)   Sum of the "Almon lag" coefficients for: OCGDPVRY
                    Coefficient   :   2.740
                    t-ratio   :   2.391**
          3)   AR(1) procedure was used to adjust for serial correlation.
**   indicates significance at 5 % level
*   indicates significance at 10% level

Table 4. Dependent Variable: JEXPVRY (Japan's Export Volume Index, year-on-year change) -- 1985 Q2to 1999 Q3

Variable	Coefficient	t-ratio
Constant term	-3.4879	-1.5298
JRERY(-2)	-0.01624	-0.56666
JRERY(-3)	-0.03012	-0.89457
JRERY(-4)	-0.04165	-1.6601*
JRERY(-5)	-0.05084	-0.94593
OCGDPVRY(-1)	1.0544	1.9095*
OCGDPVRY(-2)	1.0861	2.7342***
OCGDPVRY(-3)	0.09508	0.12424

R-bar squared =   0.50560
DW-statistic   =   1.9654

Notes: 1)   Sum of the "Almon lag" coefficients for JRERY
coefficient: -0.1388
t-ratio: -1.660*

2)   Sum of the "Almon lag" coefficients for OCGDPVRY
Coefficient: -2.23
t-ratio: 2.979***
3)   The AR(1) procedure was used to adjust for serial correlation.
*** indicates significance at 1 % level
** indicates significance at 5 % level
* indicates significance at 10% level

Table 5. Dependent Variable: KEXPVRY (Korea's Export Volume Index, year-on-year change) -- 1984 Q4 to 1999 Q3

Variable	Coefficient	t-ratio
Constant term	4.2562	0.73417
KRERY	-0.12108	-1.2364
KRERY(-1)	-0.14223	-1.4526
OCGDPVRY	3.0553	1.6193

R-bar squared =   0.33912
DW-statistic   =   2.1432
Notes : The AR(1) process was used to adjust for serial correlation. For this equation the Almon distributed lag structure was not used.

3.   Real Interest Rates Based on the WCU

The definition of the WCU also allows us to calculate what I call the real WCU

interest rate for any country. This is an attempt to translate the domestic interest rate

to a globally comparable interest rate, so that we will have a better idea as to how

costly it is for businesses in different countries to borrow. The fact is that even though a country may have a domestic interest rate that is low in nominal terms, in real terms and in comparison to other countries the cost of borrowing may not be low at all, if the currency is appreciating rapidly. For similar reasons, a country whose currency is linked to a strong currency may face back-breaking real cost of borrowing. To convert a domestic interest rate into a WCU interest rate, I adopt the formula:

$$\frac{ \{ \, [\, (1+r) \times \text{WCUperHKD}_{t+4}] - \text{WCUperHKD}_t \, \} }{ \text{WCUperHKD}_t }$$

where r is the domestic nominal interest rate, WCUperHKD_{t+4} is the price of the local currency in terms of the WCU four quarter from the time a HK dollar is borrowed, so the numerator represents the net interest in WCU units. The denominator is the value of the original HK$1 loan in WCU units. The ratio gives the HK dollar interest rate in WCU terms. This real interest rate, based on the WCU concept, is an internationally comparable real interest rate, since a similar comparable rate can be computed for every currency.

Table 6 shows how the real interest rate, computed using the world currency unit concept, explained private sector aggregate demand along with other exogenous variables. The real interest rate HKWCURY is calculated by converting the interest on a HK dollar into WCU units a year ahead and dividing by the principal of one HK dollar expressed in WCU units. The dependent variable is change in Hong Kong's GDP minus government expenditures and public construction. Change in government expenditures, GOVERY, lagged one and two quarters respectively, as well as change in exports, work through the multiplier effect to stimulate private domestic demand. The exports variable include a lead term because spending in the production of exports now will result in exports in a future quarter. The coefficient on HKWCURY

is found to be statistically significant and carry the right sign, as are the exports performance variables. The government expenditures growth variables also have the right sign though are less significant.

Table 6. Dependent Variable: NETDOMDER (Hong Kong Domestic Demand less Government Expenditure and Public construction, year on year change) -- 1984 Q1to 1998 Q4

Variable	Coefficient	t-ratio
Constant term	2.7434	0.72081
GOVERY(-1)	0.21470	1.2948
GOVERY(-2)	0.24071	1.4776
EXPORTRY	0.27211	2.3065**
EXPORTRY(+1)	0.28825	2.5094**
HKWCURY(-2)	-0.70396	-1.8736*

R-bar squared = 0.70610
DW-statistic = 1.7376
Notes : AR(1) process was used to adjust for serial correlation.
** indicates 5 % significant level
* indicates 10% significant level
Data sources: Hong Kong Census and Statistics Department, *"Hong Kong Monthly Digest of Statistics"*, various issues. International Monetary Fund, "*International Financial Statistics"*, various issues.

Under a regime of WCU-linked Hong Kong dollar, the nominal interest rate would automatically be the effective WCU-interest rate for Hong Kong. Since it is effectively a globally diversified real interest rate, we can expect the rate to be relatively low and stable. Under the alternative assumptions that this WCU interest rate were 3 per cent, 4 per cent, and 5 per cent respectively[5], Hong Kong's simulated private sector domestic demand[6], as displayed in Figure 3 along with the predicted private sector domestic demand under the US-dollar link, is found to be generally higher and more stable than otherwise.

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[5] The real interest rates on indexed US dollar bonds historically have usually fallen within the 2 to 3 per cent range. Interest rates on WCU-denominated instruments should not be higher than indexed US dollar bond yields.

[6] The simulated domestic demands are based on coefficients shown in Table 6. Exports growth figures, however, are based on predicted net-of-China exports from Table 1 plus actual China-bound exports.

Figure 3 Predicted net domestic demand under US-dollar link versus under WCU-link (year on year change)
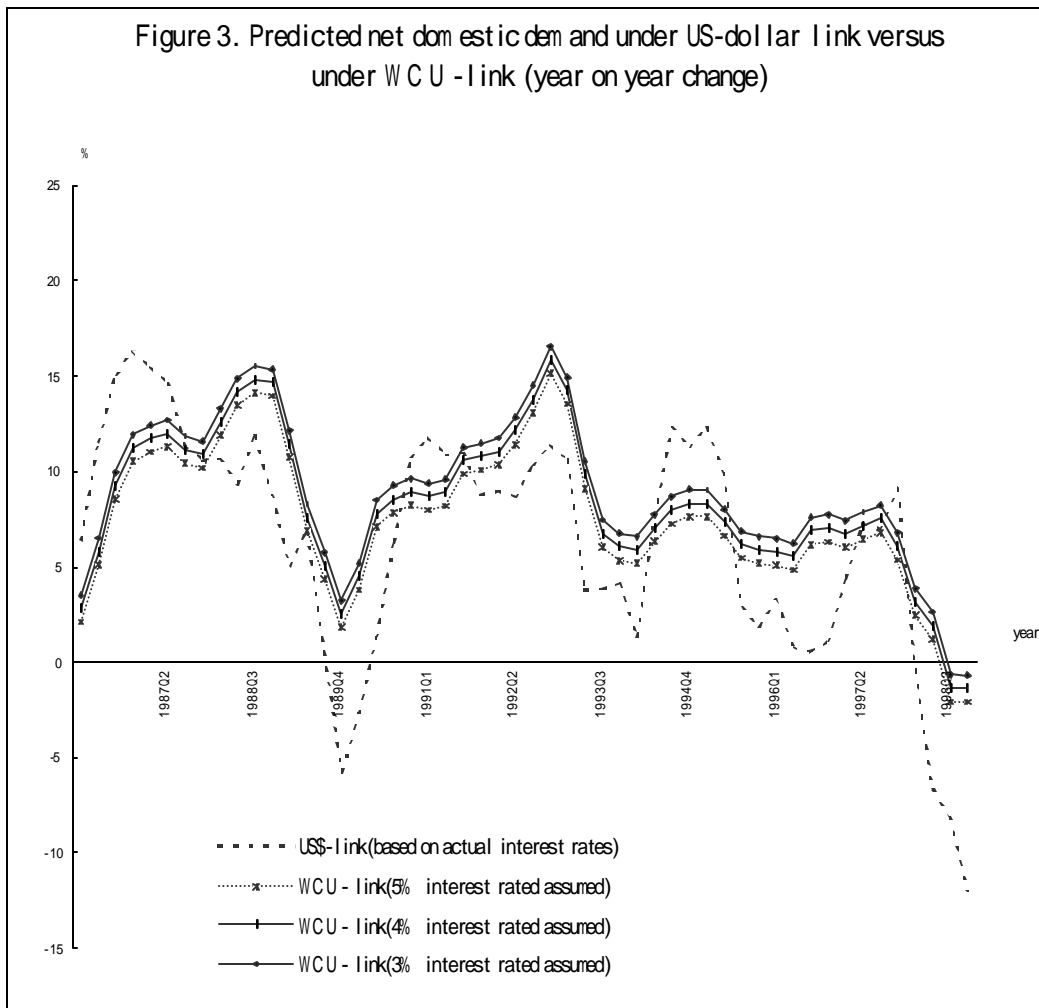
Combining Figure 2 and Figure 3, we can conclude that if the Hong Kong dollar had been linked to the WCU, both Hong Kong's exports and domestic demand would have been much more stable. The greater stability of domestic demand arises not only from the more stable real interest rates, but also from more stable exports.

One remaining question is whether a WCU-based currency board arrangement can be understood and whether it will function smoothly in the market place. In principle, as long as the nominal values of the WCU are based on a transparent formula and are continuously available in the market place, a currency board based on the WCU should operate without difficulty. The currency board requires submission

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of the equivalent of a WCU unit in any of the WCU-constituting currencies(in US dollars, Euro, Yen, Canadian dollars, or Australian dollars) in order to issue the stipulated units of the domestic currency which are backed by one WCU. The currency board also commits to accepting the stipulated units of the domestic currency for the redemption of WCU-constituting currencies at the going rate at any time.

4   Conclusions

The idea of the WCU as discussed in this paper in important ways answer the call made by Mundell(1995) for a "hard SDR" that would protect asset holders against the inroads of inflation. In particular, it addresses the problem, pointed out by him, that reflating the soft SDR by the average rate of inflation of SDR countries would create a distortion in so far as they do not reflect the relative sizes of the national GDPs(pp.490-491).

This paper suggests that linking a currency with the WCU has many potential benefits. The WCU is a unit of constant purchasing power. Currencies linked to the WCU can therefore be expected to engender very low inflation. Because of this characteristic and the fact that it is indirectly linked to several major international currencies at the same time, exchange risks will be reduced for investors who hold assets in countries that have adopted a WCU link, and for investors with assets denominated in these currencies. Countries with currencies linked to the WCU will have more stable real exchange rates, and can also expect to enjoy lower real interest rates.

Empirical testing using the WCU concept in calculating real exchange rates and real interest rates suggest that the concept is eminently robust and workable. It can be inferred that debt instruments denominated in the WCU will be attractive to savers. As Ho(2001) argues, the formation of Japan's asset price bubble in the late 80s and its subsequent burst in the 90s can be traced to the lack of a reliable savings instrument. Exactly because there was no investment vehicles denominated in the WCU at the time, Japanese savers had been compelled to invest in already overpriced assets at home and to accept the risks of huge exchange losses from their overseas investments. The Asian Financial Crisis may also have been avoided if, instead to linking to the US dollar, Asian currencies had been linked to the WCU.

The design of the WCU allows all countries other than the five named to adopt a WCU-exchange standard but does not allow the five named countries/zones to do so. This is however an advantage rather than a disadvantage. Mundell had feared that "the creation of a world currency would confer power on an international bureaucracy, and the major powers may not be willing to take such a step."(p.491) The design of the WCU exactly avoids the need for such a powerful international bureaucracy. All that is required is an ongoing computation of the nominal values of the WCU based on a known formula using official statistics. The five named countries/zones will continue to have their independent monetary policy, implying that their mutual exchange rates will fluctuate. Other countries that maintain a WCU-exchange standard will continue to have their own national currencies, but these currencies will be tied to the WCU. Still other countries may do what they want with their exchange rate regimes, depending on their own circumstances. All countries, those named among the five as well as others, can issue debt instruments denominated

in the WCU. This way, the world's capital market will be much better integrated, and all countries can maintain sovereignty in the sense that they are totally free to adopt a WCU-exchange standard or not.

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List of Variables and their Descriptions

EXPORTRY: HK's Total Exports in 1990 price (year-on-year change)

GOVERY : HK's Government expenditures in 1990 price (year-on- year change)

HKCPI: HK's Consumer Price Index(composite)1990=100

HKRE: Hong Kong's real exchange rate index, equal to HKCPI/HKWCI

HKRERY: Real exchange rate of HK, year-on-year change,
   =(HKRE-HKRE(-4))/HKRE(-4)*100

HKTX: HK's Total Exports less Total Exports to China in 1990 prices

HKTXRY: (HKTX-HKTX(-4))/HKTX(-4)*100

HKWC: Price of WCU in Hong Kong dollars.

HKWCI: Price of WCU, Index 1990=100:
   HKWC/((744.8 +751.5+787.5+832.2)/4)*100

HKWCURY: Implied WCU interest rate per annum for Hong Kong

$$\frac{\{ [(1+r) \times \text{WCUperHKD}_{t+4}] - \text{WCUperHKD}_t \}}{\text{WCUperHKD}_t}$$

JCPI: Japan's CPI index 1995=100

JEXPV: Japan Export Volume Index 1995=100

JEXPVRY: (JEXPV-JEXPV(-4))/JEXPV(-4)*100

JRE: Real exchange rate for Japan, JCPI/JWCI

JRERY: Year-on-year rate of change of real exchange rate
   = (JRE-JRE(-4))/JRE(-4)*100

JWC: Price of WCU in yen

JWCI: Price of WCU in yen, Index 1995=100 :
   JWC/((10898+10841.5+12273.8+12675.7)/4)*100

KCPI: Korea's CPI index 1995=100

KEXPV: Korea's Export Volume Index 1995=100

KEXPVRY: (KEXPV-KEXPV(-4))/KEXPV(-4)*100

KRE: KCPI/KWCI

KWC: Price of WCU in won

KWCI: Price of WCU in won, Index 1995=100 :
    $kwc/((94099.8+97150.8+95942.6+95496)/4)*100$

NETDOMDER: HK's domestic demand less Gov Expend' and Public construction,
    in 1990 price (yr on yr change)

OCGDPV: OECD GDP volume index 1995=100

OCGDPVRY: $(OCGDPV-OCGDPV(-4))/OCGDPV(-4)*100$

r: Local nominal prime rate

UKCPI: UK's CPI index 1995=100

UKEXPV: UK's Export Volume Index 1995=100

UKEXPVRY: $(UKEXPV-UKEXPV(-4))/UKEXPV(-4)*100$

UKRE: Real exchange rate of UK, =UKCPI/UKWCI

UKRERY: $(UKRE-UKRE(-4))/UKRE(-4)*100$

UKWC: Price of WCU in pound sterling

UKWCI: Price of WCU in pound sterling, Index 1995=100:
    $UKWC/((75.6+80.7+78.7+80.1)/4)*100$

USCPI: CPI index for the U.S., 1995=100

USEXPV: United State Export Volume Index 1995=100

USEXPVRY: $(USEXPV-USEXPV(-4))/USEXPV(-4)*100$

USRERY: $(USRE-USRE(-4))/USRE(-4)*100$

USWC: USD per WCU

USWCI: USD per UCW Index 1995=100:
    $USWC/((122+128.2+124.9+123.3)/4)*100$

WCU per HKD: Price of HK dollars in WCU.