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ANALYSING EXTERNAL DEMAND FOR THE HONG KONG-DOLLAR CURRENCY

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Abstract

This paper estimates that about 50 – 70% of the Hong Kong-dollar currency in circulation (equivalent to about $100 – 140 billion), mostly in the form of high-denomination banknotes, was being circulated outside Hong Kong at the end of 2009. The large external circulation was mainly a result of increased economic integration between Mainland China and Hong Kong, with a thriving gaming industry in Macao providing an extra boost. In the near future, although economic integration will continue to expand external circulation, an appreciation of the renminbi is likely to reduce it. Simulation results from a cash demand model suggest that a gradual and orderly appreciation of the renminbi is not likely to cause large-scale repatriation of Hong Kong-dollar banknotes back to Hong Kong or pose a significant risk to domestic monetary stability. While some observers raise concerns about a potential increase in counterfeiting activity due to large external circulation, we have found that no clear relationship existed between counterfeiting notes confiscated in Hong Kong and external currency demand in recent years.

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Executive Summary:

- *As a component of narrow money, Hong Kong-dollar currency held by the public has been growing notably faster than nominal GDP since 1997, mainly driven by the issuance of large-value banknotes ($1000 and $500). Considering the increasing use of non-cash payment means including the Octopus Cards and credit cards in Hong Kong, the enormous expansion in the stock of banknotes is puzzling and probably cannot be explained by domestic factors alone. Instead, external demand is likely to be the major driving force behind the sharp expansion in cash.*

- *Updated econometric estimates based on macro-level data suggest that 50 – 70% of Hong Kong dollar currency, equivalent to $100 – 140 billion, may be held outside Hong Kong at the end of 2009. Alternatively, micro-level information obtained from major currency wholesale dealers shows that between 2000 and 2009 the cumulative net shipments of banknotes from Hong Kong to Mainland China and Macao amounted to $139.8 billion, in line with the magnitude estimated by the econometric methods.*

- *A breakdown by destination of currency shipment shows that the net outflows of cash, largely in $1000 notes, were mainly destined for Mainland China before 2006 while Macao also received considerable cash outflows from Hong Kong in 2007 – 2009. Mainland tourist demand, renminbi exchange rate fluctuation, and the boom of the gaming industry in Macao are possible drivers of these developments in the external demand for Hong Kong-dollar currency.*

- *A new model for cash demand confirms that the trend growth in Hong Kong-dollar currency over the past decade was mainly driven by the external demand associated with the economic integration between Mainland China and Hong Kong, while the appreciation of the renminbi exchange rate against the Hong Kong dollar tended to reduce the external demand. Meanwhile, gaming activities in Macao have also had a positive short-term impact on the external demand for Hong Kong-dollar currency.*

- *The large circulation of Hong Kong-dollar currency outside Hong Kong naturally raises the question on the implications for local monetary and financial stability. Simulation results from our cash demand model suggest that a gradual and orderly appreciation of the renminbi is not likely to cause large-scale repatriation of Hong Kong-dollar banknotes back to Hong Kong, or pose a significant risk to domestic monetary stability. While some observers raise concerns about a potential increase in counterfeiting activity due to large external circulation, we have found that no clear relationship existed between counterfeiting notes confiscated in Hong Kong and external currency demand in recent years.*

I. INTRODUCTION

Hong Kong-dollar currency held by the public, a component of narrow money, has been growing notably faster than nominal GDP since 1997. Considering the increasing use of non-cash payment methods in Hong Kong, the sharp expansion in currency is bewildering and probably cannot be explained by domestic factors alone. An earlier study by the HKMA found that as much as half of the outstanding currency was held abroad in 2004.[1] External demand for Hong Kong-dollar currency is therefore likely a potential explanation for the rise in cash.

Past studies show that Mainland China was the main source of external demand for Hong Kong-dollar currency. As economic integration between Hong Kong and the Mainland gathers pace, closer economic links through bilateral trade and tourism are expected to continue to expand the demand for Hong Kong-dollar currency on the Mainland. However, the increased flexibility and appreciation in the renminbi have probably reduced the attractiveness of the Hong Kong dollar relative to the renminbi. The external demand for Hong Kong-dollar cash may therefore be affected.

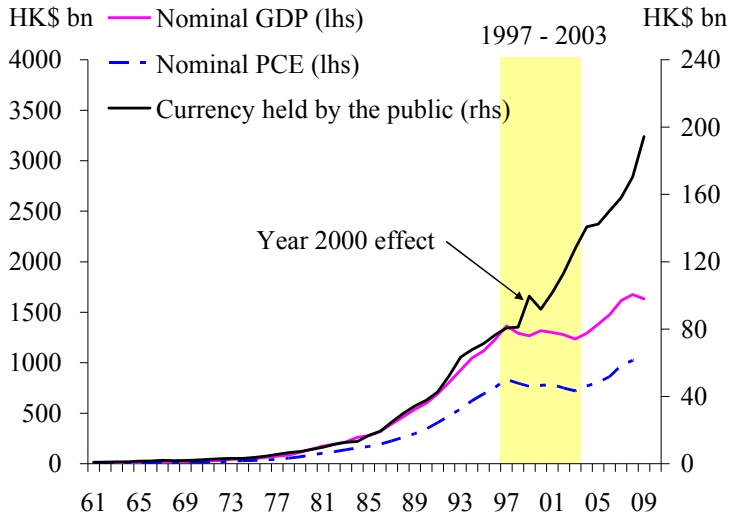
Against this backdrop, this paper quantifies the external demand for Hong Kong-dollar currency and investigates the nature and importance of different factors in driving the external cash demand in recent years. The paper is organised as follows. Section II reviews recent developments in Hong Kong-dollar currency held by the public. Section III updates estimates of the stock of currency circulating outside Hong Kong using various econometric methods and compares them with currency shipment data collected from major currency wholesale dealers. Section IV studies the factors driving the external demand in recent years and presents econometric evidence obtained from a new cash demand equation. Section V discusses the implications of external circulation of Hong Kong-dollar currency for monetary and financial stability in Hong Kong. The final section draws conclusions.

[1] See Ho, Shek and Shi (2005).

II. RECENT DEVELOPMENTS IN HONG KONG-DOLLAR CURRENCY

The time paths of the currency held by the public and nominal GDP (or private consumption expenditure) have visibly diverged after 1997. Following the Asian financial crisis in 1997, Hong Kong fell into a deep recession and a prolonged period of deflation. Economic theory suggests that the demand for currency should contract due to stagnant income growth and lower prices for goods and services. Instead, in reality cash in circulation has grown rapidly after 1997 (Chart 1). Annual growth in the currency also accelerated in the past few years, averaging 6.9% in 1997 – 2007 and rising to 7.9% in 2008 and 14.0% in 2009 (Table 1). At the end of 2009, the stock of Hong Kong-dollar currency held by the public totalled $194.3 billion or $27,656 per person in Hong Kong.

Chart 1: GDP, private consumption expenditure and currency



Note: PCE stands for private consumption expenditure.
Sources: Census and Statistics Department (C&SD) and the HKMA.

Table 1: Hong Kong-dollar currency

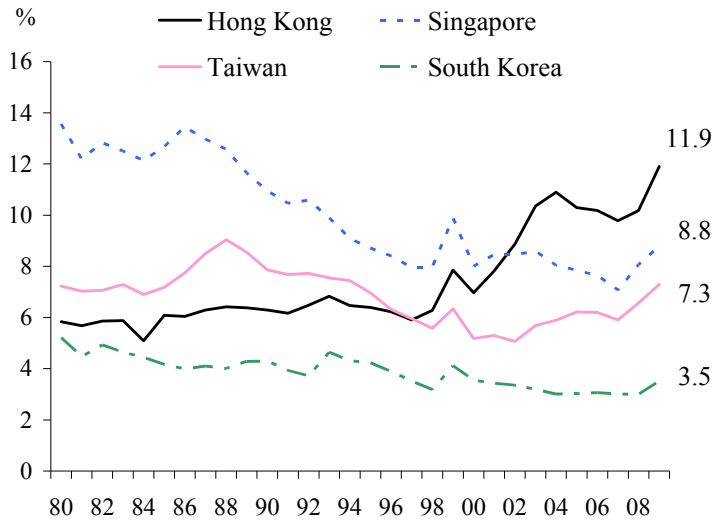
		Currency held by the public		
		Value (period-end) HK$ bn	Per capita holding (period-end) HK$	Annual growth rate* (period-average) %
1962-1974	(a)	3.2	718	10.8
1975-1983	(b)	12.7	2,348	16.6
1984-1996	(c)	76.5	11,832	15.1
1997-2007		158.0	22,727	6.9
2008		170.5	24,393	7.9
2009		194.3	27,656	14.0

Notes: * Annual growth rates are adjusted for the Year 2000 effect.
(a) Fixed exchange rate regime.
(b) Flexible exchange rate regime.
(c) The introduction of the Linked Exchange Rate system in October 1983.
Source: HKMA.

As a result of the spectacular growth in Hong Kong-dollar currency after 1997, **Hong Kong now has the highest currency-to-GDP ratio among the newly industrialised economies** (Chart 2).[2] Except for the decline in 2004 – 2007, the ratio has generally been increasing since 1997, doubling from 5.9% to 11.9% at the end of 2009. The generally upward trend over the last decade was in stark contrast with the situation in other newly industrialised economies, which showed roughly stable or declining currency-to-GDP ratios, due to increasingly common use of non-cash means of payment.

[2] In fact, our calculation shows that over the past decade Hong Kong's currency-to-GDP ratio was consistently higher than the average of the OECD countries (around 7% at the end of 2009).

Chart 2: Currency-to-GDP ratios of selected economies

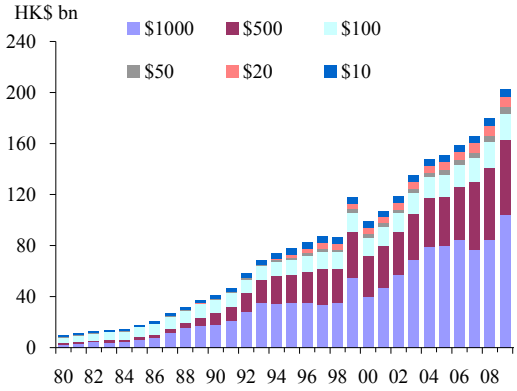


Sources: HKMA and CEIC.

An examination of the denomination structure of Hong Kong-dollar banknotes[3] **reveals that the rise in Hong Kong-dollar currency in the last decade was due largely to the issuance of large-value notes** (Chart 3). The share of the large denominations ($1000 and $500) rose from 71% to 80% in 1997 – 2009 while that of the small denominations ($10, $20 $50 and $100) declined from 29% to 20% (Chart 4). During the same period, the number of $1000 notes per capita tripled, from five pieces to 15 pieces, while $20 notes only doubled from 31 pieces to 61 pieces.

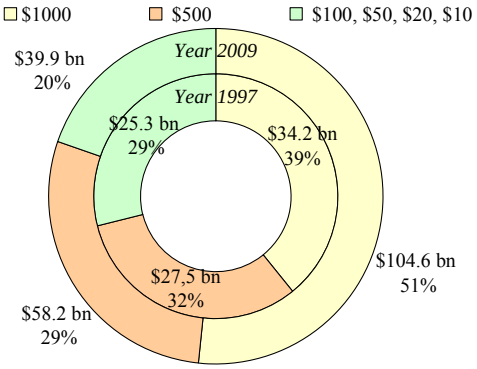
[3] In this paper, currency data by denominations include notes held by banks. Note that these holdings by banks are not a component of Hong Kong dollar money supply which includes currency held by the public only.

Chart 3: Stock of banknotes by Denominations



Source: HKMA.

Chart 4: Share of large and small-value banknotes in 1997 and 2009



Source: HKMA.

Experience appears to suggest that **local residents' cash demand for domestic uses cannot explain either the recent rise in the currency-to-GDP ratio or the greater issuance of large-value banknotes because the more prevalent use of non-cash means of payment in Hong Kong should theoretically reduce the demand for cash**. The number of credit card accounts has more than tripled since 1997, to 12.4 million at the end of 2009,[4] and total card receivables as a percentage of private consumption expenditure (PCE) increased to 7.2% at the end of 2009 from 4.9% at the end of 1999. On the other hand, the rising popularity of Octopus Cards may also have reduced the domestic use of small-value notes and coins in recent years. As a share of PCE, the total transaction value of Octopus Cards rose from about 1% in 1999 to 4% in 2009, although its average transaction value was still less than $10. Introduced in September 1997, Octopus Cards can now be used to settle smaller-value payments in supermarkets and other retail stores, on top of its origin use for paying fares of public transport. Given the increasing use of alternative payment mechanisms, the enormous growth in the stock of banknotes in circulation is therefore unlikely to be due to an increased need by local residents but rather due to external demand. The next section assesses the size of this external demand.

[4] HKMA press releases on the Credit Card Lending Survey.

III. EXTERNAL DEMAND FOR HONG KONG-DOLLAR CURRENCY

Previous studies estimate the size of the external demand indirectly using econometric models. In this section, apart from updating the estimates of the scale of external demand using more recent macro-level data, we also employ micro-level cross-border currency shipment data by banks to assess the extent of external demand.[5]

Macro-level estimates: an update of the external holdings of Hong Kong-dollar currency

Different econometric methods have previously been employed by Greenwood (1990), Hawkins and Leung (1997), Peng and Shi (2002) and Ho, Shek and Shi (2005) to estimate the external demand for Hong Kong-dollar currency. These methods are briefly summarised as follows:

- Currency-to-GDP ratio approach --- This approach estimates a trend for the currency-to-GDP ratio, assuming that the ratio will decrease initially and stabilise afterwards following the development of cashless payment methods and other financial innovations. An above-trend ratio is treated as an indication of external demand.[6]

- Deduction of local demand --- This method estimates local demand for Hong Kong-dollar currency using the sample period 1973 – 1984, during which external circulation is virtually non-existent. The differences between the fitted value of local demand in future periods and the actual stock of Hong Kong-dollar currency are calculated as external demand.

- Estimation of cash demand with external factors --- This approach estimates a demand function for Hong Kong-dollar currency by explicitly taking into account the effect of external demand. For example, researchers have used a time trend, macroeconomic variables in Guangdong or tourism expenditure to measure the effect

[5] At present, there is no formal information system that collects comprehensive data on the total amount of currency flowing into and out of Hong Kong.

[6] For example, in the case of Hong Kong, a trend of the ratio is fitted for the period 1966 – 1984, which is then extrapolated to predict the domestic demand for Hong Kong-dollar currency in future periods. Foreign holdings are calculated as the residual. For more details, see Greenwood (1990).

of Mainland-Hong Kong economic integration on Hong Kong-dollar cash demand.

Table 2 summarises the results of these papers and provides an update of the estimates using more recent data (see Annex A for more estimation details). **Updated estimates show that around 50 – 70% of Hong Kong-dollar cash (held by the public) were circulated outside Hong Kong at the end of 2009**. This amounts to $100 – 140 billion compared with the total stock of $193.4 billion. Furthermore, the results show that **Hong Kong-dollar currency circulating outside Hong Kong has increased over time**.

Table 2: Estimates of Hong Kong-dollar currency abroad

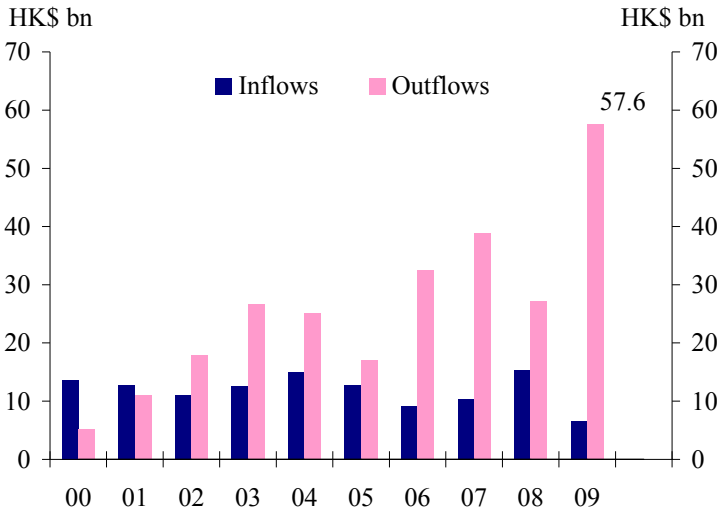
		Estimates of external demand for Hong Kong-dollar currency	
At the end of		Value (HK$ bn)	Share of total currency (%)
Currency-to-GDP ratio approach			
1989	(a)	6	16
2001	(c)	25	25
2004	(d)	64	46
2009		97	50
Deduction of local demand			
1997		16	20
2004	(d)	88	63
2009		124	64
Estimation of cash demand with external factors			
1994	(b)	17	25
2004	(d)	82	59
2009		128	66

Notes: (a) Greenwood (1990).
(b) Hawkins and Leung (1997).
(c) Peng and Shi (2002).
(d) Ho, Shek and Shi (2005).
Other estimates are updates by the authors.

Micro-level evidence: Hong Kong-dollar currency shipment by banks[7]

The model-based macro-level estimation results are corroborated by micro-level information from the cross-border movements in cash via the banking system. **Aggregate currency shipment data suggest that the external demand for Hong Kong-dollar currency expanded in 2000 – 2009**. While gross inflows of currency in 2000 – 2009 fluctuated around $10 billion, gross outflows of cash broadly increased, reaching a record high of $57.6 billion in 2009 (Chart 5). In terms of net flows, the shipment of Hong Kong-dollar cash across the boundary changed from net inflows in 2000 and 2001 to net outflows afterwards.[8] Except for receding net outflows in 2004, 2005 and 2008, net outflows broadly increased from $6.9 billion in 2002 to $51.0 billion in 2009 (Chart 6).

Chart 5: Cross-border movements in Hong Kong-dollar currency through banks

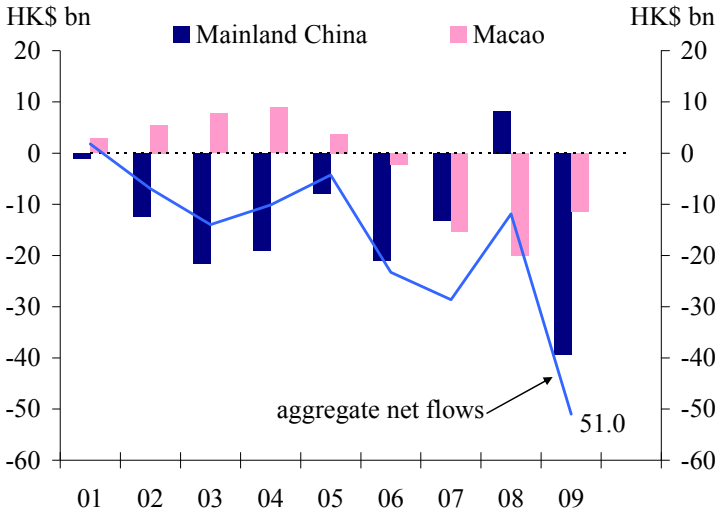


Source: HKMA.

[7] Large shipments of Hong Kong-dollar currency are typically handled by a few commercial banks, which act as banknote brokers specialising in wholesale bulk currency shipment. We have gathered data from major currency wholesale dealers and these data record their total inflows and outflows of Hong Kong-dollar currency vis-à-vis Mainland China (2000 – 2009) and Macao (2001 – 2009). At times, currency flows of selected denominations are also available but they have a shorter time span.

[8] Informal information from some major banks also suggests that there were net inflows into Hong Kong prior to 2000.

Chart 6: Net currency flows by location



Note: Positive values indicate inflows and negative values outflows.
Source: HKMA.

A breakdown by destination of currency shipment shows that the net outflows of cash were mainly destined for Mainland China before 2006 while Macao also received considerable cash outflows from Hong Kong in 2007 – 2009. As shown in Chart 6, net outflows in 2002 – 2006 were mainly driven by currency shipment to Mainland China while Macao registered net inflows. Net currency outflows to Mainland China contracted in 2007 and currency shipment reversed to net inflows in 2008 before returning to net outflows in 2009. Meanwhile, net currency shipment to Macao increased markedly after 2006, replacing Mainland China flows to become the main contributor to aggregate net outflows in 2007 and 2008 (There will be more discussion on the possible reasons for these developments when we analyse the determinants of external demand in the next section).

Currency shipment data also reveal that the rapid rise in the circulation of $1000 notes in recent years was partly due to external demand. Anecdotal evidence and limited data in the past few years indicate that currency shipment to Mainland China and Macao were largely driven by $1000 banknotes. In terms of value, $1000 notes accounted for over 98% of gross outflows to Mainland China in 2007 – 2009 and represented around 56 – 90% of gross outflows to Macao in 2002 – 2009. To Mainlanders, the larger denominations of Hong Kong-dollar banknotes are probably considered to be more convenient means of

payment, given that the largest denomination of renminbi notes is only RMB100. On the other hand, gross inflows of Hong Kong-dollar currency were more diverse in denominations. This may reflect normal recycling of Hong Kong-dollar currency back to Hong Kong after Hong Kong travellers used the currency in these places.

In sum, large net currency shipment from Hong Kong to Mainland China and Macao make it clear that external demand was a key driver of growth in Hong Kong-dollar currency over the past decade. The value of the cumulative net shipments between 2000 and 2009 amounted to a staggering outflow of $139.8 billion, consistent with the model-based estimation results of large external demand.[9] Of course, cash shipment data alone are insufficient to completely measure the stock of currency abroad, in part because they miss much of the cash that is hand-carried by travellers. Nevertheless, they provide a useful starting point for analysing the underlying trend. In particular, banks' shipment data show that Mainland and Macao factors are important in explaining the external demand for Hong Kong-dollar currency. The next section analyses these factors in greater details.

IV. FACTORS DRIVING THE EXTERNAL DEMAND FOR CURRENCY IN RECENT YEARS

Traditionally, closer economic links through bilateral trade and tourism are expected to support the demand for Hong Kong-dollar currency on the Mainland and in Macao, but more recently the expanding scope of renminbi banking business in Hong Kong and the increased flexibility of the renminbi may reduce the attractiveness of the Hong Kong dollar. The boom and bust of the gaming industry in Macao may also contribute to fluctuations of the external demand for Hong Kong-dollar currency. Taking these latest developments into account, we identify three possible major determinants of external demand for Hong Kong-dollar currency below.

[9] Note that the data for Macao in 2000 are missing.

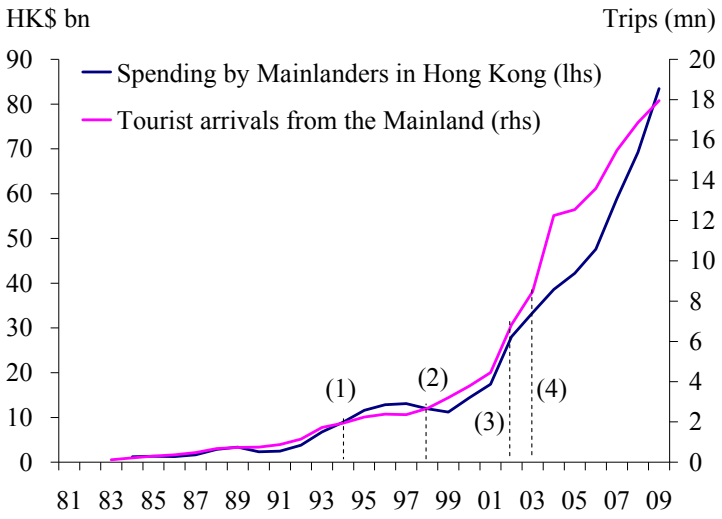
Determinants of external demand

Economic integration between Mainland China and Hong Kong

It is generally expected that there is increasing external demand for Hong Kong-dollar currency associated with cross-border tourist spending, which is mainly originated from two channels. The first channel of demand comes from Mainland residents' travels to Hong Kong, as Hong Kong-dollar notes are a convenient means of paying bills and making purchases in Hong Kong. Secondly, Hong Kong residents often visit Shenzhen and Guangdong, and Hong Kong dollars are accepted as a medium of payment in the southern part of China.[10] In recent years the spending by Hong Kong visitors on the Mainland and that by Mainland visitors in Hong Kong have been increasing and Mainland tourists' expenditure in Hong Kong grew at a much faster rate. Helped by a number of policies including the Individual Visit Scheme introduced in 2003, both tourist arrivals from the Mainland and spending by Mainlanders in Hong Kong have been rapidly rising (Chart 7). As Mainland tourists have normally already exchanged for Hong Kong-dollar cash on the Mainland in advance before their arrival in Hong Kong, external demand for Hong Kong-dollar currency was likely to be supported by Mainland-related tourism expenditure.

[10] Of course, there exist other channels such as bilateral trade and investment, cross-border employment and family contacts. Banknotes may also be transferred to the Mainland because of illegal activity or demands from the underground banking system, money changers or remittance agents. More recently, some observers emphasise that Hong Kong-dollar cash is used for gaming by Mainlanders in Macao casinos.

Chart 7: Mainland travellers



Notes: Before 1995, tourist arrivals exclude arrivals via Macao.
(1) In 1994, Mainland China became Hong Kong's largest source market.
(2) In 1998, the quota for Hong Kong-bound tour group visitors from the Mainland officially increased to 1,500 a day.
(3) In 2002, the Hong Kong Group Tour Scheme quota system was abolished and the number of travel agents authorised to organise tours for Mainlanders increased.
(4) In 2003, the Individual Visit Scheme was implemented.

Source: C&SD.

Table 3 shows that "shopping" expenditure by Mainland visitors accounted for the largest share of the total spending and this type of expenditure more than doubled in 2003 – 2009, while other categories recorded slower rates of increases. Experience tells us that, thanks in part to the variety and good reputation of consumer goods in Hong Kong, Mainlanders' shopping expenditure has been a main source of demand for many big-ticket items sold in Hong Kong. **Because Hong Kong-dollar cash is a more convenient means of payments for higher-value cash transactions**[11]**, growing consumption of "big ticket" items by Mainland visitors may have partly contributed to the sharp rise in $1000 notes**.

[11] This is partly because the largest denomination of Hong Kong dollar notes is HK$1000 while that of renminbi notes is only RMB100.

Table 3: Spending by Mainland visitors in Hong Kong

	Spending by Mainland visitors by category						
(HK$ bn)	Shopping	Hotel bills	Meals	Entertainment	Tours	Others	Total
2002	15.5	3.5	3.8	0.7	0.7	1.9	26.1
2003	20.2	3.3	3.7	0.5	0.3	1.7	29.8
2004	23.1	3.6	4.1	0.7	0.4	2.0	33.9
2005	23.9	4.2	4.9	0.6	0.6	2.3	36.6
2006	26.8	4.8	4.6	0.7	0.3	2.4	39.7
2007	34.3	5.0	4.5	0.9	0.3	2.2	47.2
2008	38.0	6.2	5.1	1.1	0.3	2.5	53.2
2009	48.8	5.5	5.4	1.3	0.3	2.7	64.0

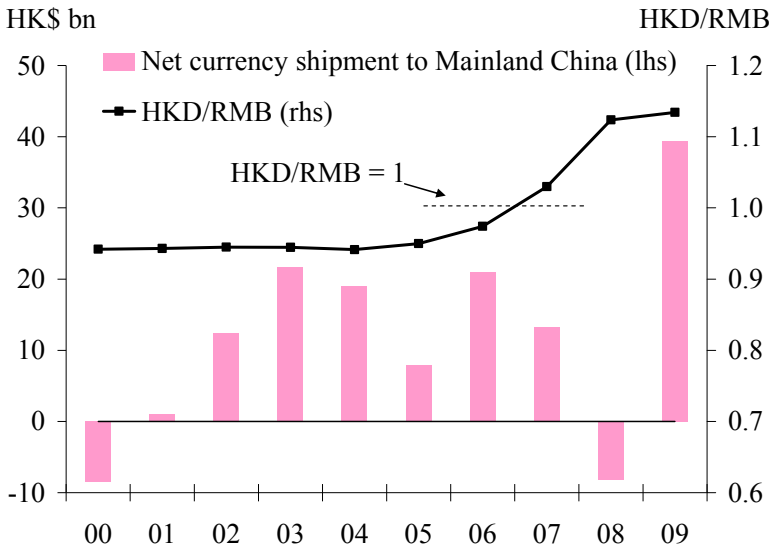
Notes: Overnight visitors only. Same-day visitors are excluded.
Source: C&SD.

The renminbi exchange rate

An appreciation of the renminbi could reduce the incentives for Mainlanders to hold the Hong Kong-dollar cash, as their Hong Kong-dollar holdings could suffer from valuation losses should the renminbi appreciate substantially against the Hong Kong dollar. According to banks' currency shipment statistics, an appreciation of the renminbi in recent years appears to have reduced the external cash demand. Chart 8 shows that the reform of the renminbi exchange rate regime in 2005 coincided with a marked decline in net currency outflows to the Mainland in 2005 although the magnitude of renminbi appreciation was relatively modest. Net currency outflows receded in 2007 or even reversed in 2008, in line with a faster pace of renminbi appreciation.[12]

[12] There was a strong net currency outflow to Mainland China in 2009. This partly reflected an increase in external demand due to a rebound in cross-border tourism expenditure after the global financial crisis. Monthly data also indicate that currency shipment to Mainland China picked up when the renminbi became roughly stable against the US dollar after the onset of the global financial crisis in September 2008. Larger-than-usual net currency shipment in 2009 might also be related to Mainland banks restocking their Hong Kong-dollar cash following large depletion of stock in the previous year.

Chart 8: The renminbi exchange rate and net currency shipment to the Mainland



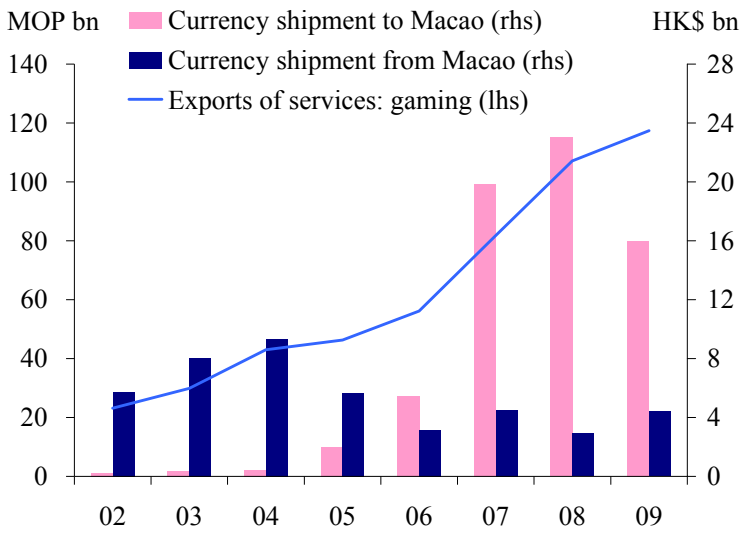
Source: HKMA.

Gaming activity in Macao

In view of the substantial net currency outflows to Macao in 2007 – 2009, external cash demand seems to be positively correlated with gaming activities in Macao. Chart 9 suggests a positive relationship between exports of gaming services and the currency outflows to Macao through banks. Large currency outflows to Macao in 2007 and 2008 were accompanied by faster growth in Macao's exports of gaming services. Currency shipments declined in 2009 as growth in gaming exports decelerated.[13]

[13] Macao has been enjoying a gaming-tourist-building boom since 2004 although growth in gross gaming revenue decelerated in 2009, partly reflecting the negative impact of new visa regulations on Mainland visitors. Imposed in the Summer of 2008, the restrictions limit Mainland officials to just one trip to Macao every three months, and for no more than seven days per trip.

Chart 9: Gaming activity in Macao



Sources: CEIC and HKMA.

External demand for Hong Kong-dollar currency may have increased because Mainland residents prefer the currency for settlement of gaming receipts for the sake of convenience and free convertibility. In 2007, Mainlanders accounted for around 56% of all visitors to Macao, followed by Hong Kong people who had a share of about 30%. The most important gaming revenue reportedly came from VIP rooms where high-rollers from Mainland China gambled. While Mainland tourists may want to enjoy the convenience of the availability of larger denominations of Hong Kong-dollar banknotes as mentioned earlier, Hong Kong-dollar cash is also widely acceptable both in Macao and Hong Kong when these Mainlanders subsequently tour around both places. Compared with Macao pataca, Hong Kong dollar also has wider circulation on the Mainland and enjoys a higher status around the world.

Estimation of a new cash demand function

Taking into account the developments discussed above and other patterns revealed by the currency shipment data, we develop an econometric model (error-correction model) to empirically examine the determinants of external demand for Hong Kong-dollar cash.[14] The variable to be explained is Hong

[14] The selected model makes it possible to analyse both the long-term equilibrium relationship (cointegrating relationship) and the short-term dynamics. The latter is fluctuations in cash demand around the long-run equilibrium values.

Kong-dollar currency held by the non-bank public in real terms, implicitly implying that cash holders base their demand for cash on its purchasing power. For explanatory variables, real private consumption expenditure (excluding consumer durables) in the domestic market[15] is used to capture domestic cash demand, and the level of overnight deposit interest rate is used to proxy the opportunity cost of holding cash. The three external determinants discussed above are also included to capture the impact of external factors. The sample period is from 1995 Q1 to 2009 Q4.

Based on the two-step, Engle-Granger procedure, the estimated long-run (co-integrating) equation, which represents the long-run demand for Hong Kong-dollar currency, is shown in equation (1).

$$rcuy = -2.38 + 0.61\ pce - 0.03\ i + 0.42\ toursp - 0.79\ e_{HKD/RMB} \quad (1)$$

where *rcuy* is the real currency held by the public, *pce* is the real consumption expenditure (excluding consumer durables) in the domestic market, *i* is the overnight deposit interest rate, *toursp* is the estimated sum of spending of Mainland visitors in Hong Kong and Hong Kong visitors on the Mainland which captures the impact of Mainland-Hong Kong economic integration, and $e_{HKD/RMB}$ is the spot Hong Kong-dollar exchange rate against the renminbi. Seasonal adjustment is made where appropriate and all variables are in logarithm except for the deposit interest rate. All the coefficients in equation (1) are statistically significant. (Annex B provides more details on the estimation results.)

As expected, the estimated long-run relationship indicates a positive impact of real consumption expenditure and a negative effect of interest rate on real cash demand. On external factors, economic integration between Mainland China and Hong Kong has a long-term positive effect on real currency demand, while an appreciation of the renminbi exchange rate against the Hong Kong dollar has a negative impact. Meanwhile, exports of gaming services are found to have a positive short-term impact on real currency demand, though there is no long-run relationship between them[16] (see Annex B for more details). Table 4 summarises the quantitative effect of different variables on real currency demand.

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[15] Consequently, non-residents' expenditure in the domestic market is excluded. Consumer durables are also excluded because expenditure on them is not largely settled in cash.

[16] Here the Macao gaming variable is not statistically significant in the long-run equation. However, the shipment data in Chart 9 show that large outflows of Hong Kong dollar currency to Macao occurred only recently in 2007 – 2009. Hence there may be just too few data points to ascertain whether the Macao gaming variable will become statistically significant or not in the long-run equation in the future.

Table 4: Quantitative effects of cash demand determinants

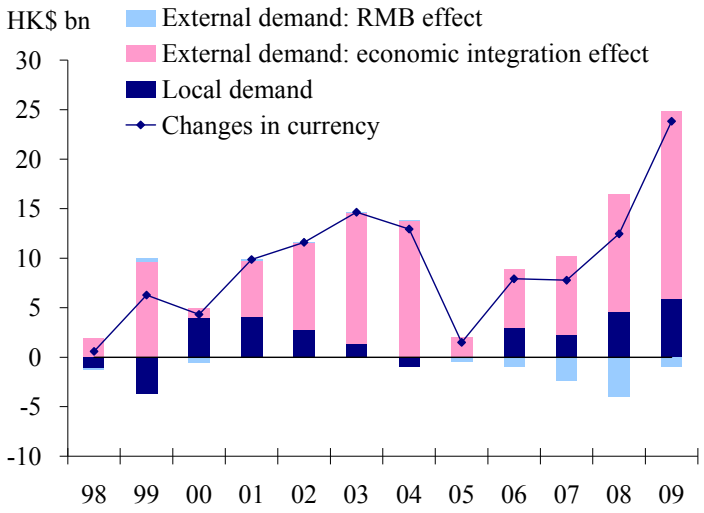
Variables	Hypothetical change	Impact on real currency demand
	Long-term impact on level	
Real private consumption expenditure	↑ 1%	↑ 0.6%
Overnight deposit interest rate	↑ 1 percentage point	↓ 3%
Cross-border tourism expenditure*	↑ 1%	↑ 0.4%
HKD/RMB exchange rate	↑ 1% (HKD depreciates against RMB)	↓ 0.8%
	Short-term impact on growth rate	
Growth in Macao's exports of gaming services	↑ 1 percentage point	↑ 0.05 percentage points

* A proxy for economic integration between Mainland China and Hong Kong.

Simulation results reveal that the changes in Hong Kong-dollar currency over the past decade were mainly contributed by external demand driven by the economic integration effect (Chart 10).[17] The negative impact of renminbi appreciation was relatively small and became more visible in 2006 – 2009. On the other hand, local demand fluctuated with the transaction volume as proxied by private consumption expenditure, moderating during the economic slowdown in 2002 – 2003 and picking up in 2007 – 2008.

[17] Note that the simulation exercise differs from a variance decomposition of equation (1). The effect of the renminbi shown in Chart 10 is calculated using an estimated share of external circulation that assumes external cash demand would not be affected if the Hong Kong dollar-renminbi exchange rate was one-to-one (i.e $e_{HKD/RMB} = 0$).

Chart 10: Contribution to changes in Hong Kong-dollar currency



Source: Authors' calculation.

V. IMPLICATIONS FOR MONETARY AND FINANCIAL STABILITY IN HONG KONG

The large circulation of Hong Kong-dollar currency outside Hong Kong naturally raises the question on the implications for local monetary and financial stability. **Our analysis suggests that the main benefit of large external circulation of Hong Kong-dollar currency is the additional gain from seigniorage, while a gradual and orderly appreciation of the renminbi is not likely to cause large-scale repatriation of Hong Kong-dollar banknotes back to Hong Kong or pose a significant risk to domestic monetary stability.**

Seigniorage

When the three note-issuing banks issue Hong Kong-dollar banknotes in Hong Kong, they are required to submit US dollars to the HKMA in return for Certificates of Indebtedness (CIs). The CIs do not earn any interest, while the US-dollar funds submitted to the HKMA are managed as part of the foreign exchange reserves to generate investment return (the so-called seigniorage). The foreign reserves corresponding to the Hong Kong-dollar currency issued amounted to about US$25.5 billion at the end of 2009. Assuming an annual rate of return at

5%, the seigniorage is estimated to be US$1.3 billion in 2009.[18] **If 50% of Hong Kong-dollar currency is attributable to external demand, the Hong Kong SAR Government earns US$0.65 billion, or roughly HK$5.1 billion in 2009 due to the external circulation of Hong Kong-dollar currency**. This was equivalent to about 4.5% of the total income of the Exchange Fund (which was HK$111.5 billion in 2009), which is a small but non-negligible benefit to Hong Kong.[19]

Impact of renminbi appreciation on the external demand for cash

Following the People's Bank of China's announcement on 19 June 2010 of increased renminbi flexibility, renewed appreciation pressure on the renminbi raises concerns about the potential impact on Hong Kong's monetary stability if the external demand for Hong Kong-dollar banknotes relating to the Mainland shrinks markedly. **Our assessment is that a gradual and orderly appreciation of the renminbi in the future is going to reduce the external demand but its magnitude is not likely to be exceptionally large**. According to our simulation results using the new cash demand model, a 4% appreciation of the renminbi will reduce the share of external stock of Hong Kong-dollar currency by about one percentage point, which is equivalent to around $1.9 billion (Table 5). Using the height of renminbi appreciation in 2008 as an example, a 9% appreciation of the renminbi would result in a $4.5 billion decline in the external demand.[20] Even though a reality check indicates that the actual $8.2 billion net currency inflow from the Mainland through banks was larger than estimated, such magnitude is still relatively small compared with the total stock. Furthermore, this estimated effect may even fade over time because our econometric study covers the period when the renminbi exchange rate crossed the one-to-one threshold against the Hong Kong dollar, which might have excessive psychological effect on the demand for Hong Kong-dollar currency.

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[18] The rate of return assumption [(7.4%+6.8%+0.8%)/3] is based on the average rate of return of a relevant US Government Bond (1 – 3 years) Index in 2007 – 2009. These numbers can be found in the HKMA Annual Reports.

[19] Or around 8.7% of the average income of the Exchange Fund in 2007 – 2009 (which was HK$58.3 billion).

[20] The yearly average HKD/RMB exchange rates were 1.12 in 2008 and 1.03 in 2007. Note that the renminbi exchange rate against the US dollar became roughly stable after the onset of the global financial crisis in September 2008.

Table 5: Renminbi appreciation and external demand for cash

Scenarios	Deviation from the baseline scenario [(b)]	
If HKD/RMB exchange rate increases by [(a)] (%)	Share of external circulation is reduced by (Percentage points)	Currency held by the public is reduced by [(c)] (HK$ bn)
1	0.2	0.4
2	0.5	1.0
3	0.7	1.4
4	1.0	1.9
5	1.3	2.5
6	1.5	2.9
7	1.8	3.5
8	2.0	3.9
9	2.3	4.5
10	2.6	5.1

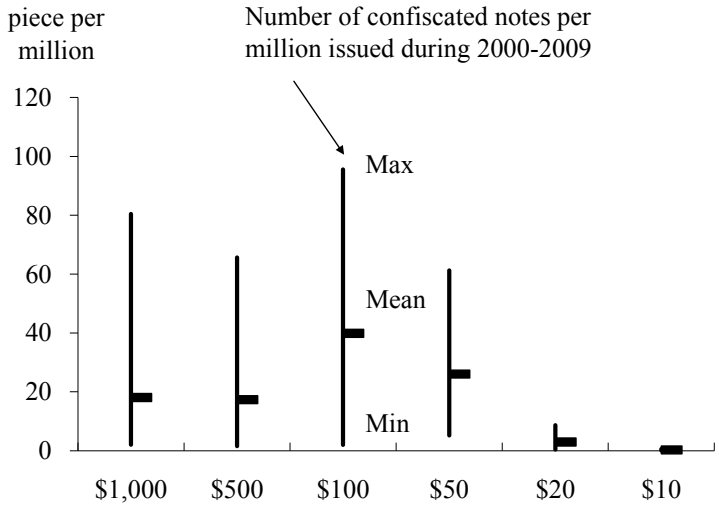
Notes: (a) An increase in HKD/RMB exchange rate represents an appreciation of the renminbi.
(b) Baseline forecast in 2010 assumes the economic integration variable (*toursp*) grew by the average rate in 2004 – 2009.
(c) An approximation only. Numbers obtained by multiplying the numbers in the second column and the value of currency in 2009 ($194.3 billion).

To the extent that continued renminbi appreciation leads to a repatriation of Hong Kong-dollar currency circulating on the Mainland to Hong Kong, a redemption of Certificates of Indebtedness (CIs) in exchange for US dollars could occur should banks consider their holdings of Hong Kong-dollar currency being too large. However, **the impact of such repatriation on the Hong Kong-dollar market exchange rate and interest rates is likely to be small given our assessment that a gradual and orderly appreciation of the renminbi is not going to cause exceptionally large reduction in the external demand. Furthermore, while foreign exchange operations of the HKMA will change the Aggregate Balance to affect market exchange rate and interest rates, CIs are issued or redeemed at a fixed exchange rate of 7.8 without affecting the Aggregate Balance**.

Counterfeiting activity

It is suggested that large stock of external circulation may encourage counterfeiting of Hong Kong-dollar currency because some foreign users may be unfamiliar with the currency. These counterfeit notes abroad might in turn be transferred to Hong Kong to negatively affect Hong Kong's monetary stability. However, **we find no clear and direct relationship between counterfeiting notes confiscated in Hong Kong and currency shipment data by banks or external demand for cash**. Chart 11 shows that $1000 and $500 notes, which are believed to be circulating outside Hong Kong in large quantity, did not have exceptionally higher average confiscation rates in 2000 – 2009. In fact, for the past six years the counterfeit rate in Hong Kong has been low, with less than one piece of fake note in every one million pieces of notes in circulation. In addition, the HKMA and the three note-issuing banks announced the issue of the new 2010 series of Hong Kong banknotes on 20 July 2010. The new banknote series comes with new security features which will further deter counterfeiting activity.

Chart 11: Counterfeiting notes confiscated in 2000 – 2009



Note: Annual figures.
Sources: Hong Kong Police Force and authors' calculation.

VI. CONCLUSIONS

This paper re-examines the question of how much Hong Kong-dollar currency is circulating outside Hong Kong. Our analysis suggests that around 50 – 70% of Hong Kong-dollar currency held by the public, or roughly $100 – 140 billion, was due to external demand at the end of 2009.

Economic integration between Mainland China and Hong Kong continued to drive the external demand for Hong Kong-dollar cash while the appreciation of the renminbi in recent years tended to restrain it. Meanwhile, gaming activities in Macao provided an extra boost in external cash demand in recent years. Given the large estimated stock of Hong Kong-dollar currency held abroad, its implications for monetary and financial stability in Hong Kong should be studied. We find that the large external circulation of Hong Kong-dollar currency provides some benefits from seigniorage, while a gradual and orderly appreciation of the renminbi is not likely to cause large-scale repatriation of Hong Kong-dollar banknotes back to Hong Kong or pose a significant risk to domestic monetary stability. While some observers raise concerns about a potential increase in counterfeiting activity due to large external circulation, we have found that no clear relationship existed between counterfeiting notes confiscated in Hong Kong and external currency demand in recent years.

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Annex A

Updating the estimates of Hong Kong-dollar currency held abroad

This Annex discusses the process of estimation leading to the results reported in Table 2.

Currency-to-GDP ratio approach

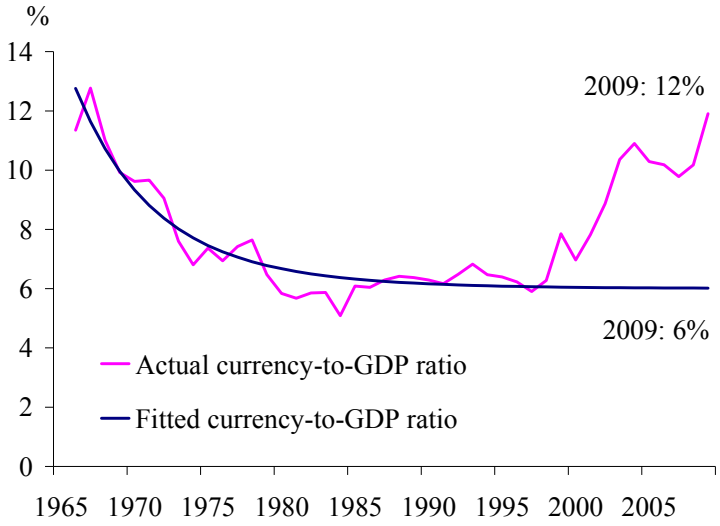
Based on the assumption that the currency-to-GDP ratio would decline over time because of the development of cashless payments and other financial innovations, we estimate a trend of Hong Kong's currency-to-GDP ratio as follows.

$$CR = a + b\ T^{-n}$$

where CR is the currency-to-GDP ratio, and T is the time trend (66, 67,…109) representing the years from 1966 to 2009. The functional form of the equation ensures that the currency-to-GDP ratio will decline asymptotically to a long-run value specified by the parameter a. We follow Peng and Shi (2002) to set a at 6% which is the average currency-to-GDP ratio of three Asian economies (South Korea, Malaysia and Taiwan) in 1990 – 2001. The number also accords well with the stable ratio of around 6% in Hong Kong during 1985 – 1995. The parameter n is set at -12 by trial and error to ensure some initial conditions are met. The parameter b is then estimated by minimising the residual error of the equation. Chart A1 shows the actual and fitted currency-to-GDP ratios. The estimated share of external demand for Hong Kong-dollar cash is calculated to be 50% at the end of 2009. [21]

[21] Share of external demand = 1 – (fitted currency-to-GDP ratio / actual currency-to-GDP ratio).

Chart A1: Actual and fitted currency-to-GDP ratios



Sources: C&SD, HKMA and authors' estimates.

Deduction of local demand

Following Ho, Shek and Shi (2005), the long-term demand function for Hong Kong-dollar cash is estimated based on the Johansen method using the sample period 1973 Q1 – 1984 Q4 as

$$rcuy = 2.980 + 0.661\ pce - 0.015\ i_{3m}$$

where *rcuy* is the real currency held by the public (in logarithm) and *pce* is the real consumption expenditure (in logarithm), and i_{3m} is the three-month time deposit interest rate. Because external circulation of Hong Kong-dollar currency is believed to be minimal before mid-1980s, this demand function is expected to capture the influence of local demand only. The fitted values of *rcuy* from 1985 onwards are then treated as estimates of local Hong Kong-dollar currency demand and their differences from the actual values are estimates of external demand. Finally, the share of external demand for Hong Kong-dollar cash is computed as

1 – exp(fitted value of *rcuy* – actual value of *rcuy*).

Estimation of cash demand with external factors

We simply take the estimated long-run demand function of Hong Kong-dollar cash from Ho, Shek and Shi (2005):

$$rcuy = 3.55 + 0.355\ pce - 0.044\ i_{3m} + 0.4\ toursp$$

where *rcuy*, *pce* and i_{3m} are the same as previously defined, and *toursp* is the estimated sum of spending of Mainland visitors in Hong Kong and Hong Kong visitors on the Mainland (in logarithm) which captures the impact of Mainland-Hong Kong economic integration. Assuming that external demand is zero when the variable *toursp* stays at its end-1984 value (denoted by $toursp_{1984Q4}$), the local demand component *rcuy_local* can be obtained by

$$rcuy\_local = 3.55 + 0.355\ pce - 0.044\ i_{3m} + 0.4\ toursp_{1984Q4}\ .$$

Plugging in the recent values of *pce* and i_{3m}, we compute the share of external demand for Hong Kong-dollar cash as

$$1 - \exp(rcuy\_local - rcuy) = 1 - \exp[0.4(toursp_{1984Q4} - toursp)].$$

Annex B

Details on the new cash demand function

The following table reports the estimated long-run (cointegrating) relationship between real currency demand and a set of explanatory variables employing an error-correction model. Standard statistical tests confirm that all variables are unit-rooted. We adopt the two-step, Engle-Granger approach and first estimate the long-run equation using Fully Modified Ordinary Least Squares (Panel A).[22] The Wald test shows that all estimated coefficients are statistically significant. The Engle-Granger residual-based test statistics reject the null hypothesis that the series are not cointegrated at the 10% significance level (Panel B).

Dependent Variable: Real currency held by the public
Included observations: 60 after adjustments
Sample (adjusted): 1995Q1 2009Q4
Long-run variance (Bartlett kernel, Newey-West fixed bandwidth = 4.0) = 0.003203

Panel A: Estimation result

Variable	Coefficient	Standard error	t-statistic	P-value
Consumption expenditure (excluding consumer durables) in the domestic market	0.6059	0.2202	2.7518	0.0080
Overnight deposit interest rate	-0.0329	0.0060	-5.5224	0.0000
Sum of spending by Hong Kong visitors on the Mainland and that by Mainland visitors in Hong Kong	0.4182	0.0482	8.6783	0.0000
HKD/RMB exchange rate	-0.7920	0.2399	-3.3018	0.0017
Constant	-2.3849	2.4787	-0.9621	0.3402

Panel B: Cointegration test

Null hypothesis: Series are not cointegrated

	Value	Prob.*
Engle-Granger tau-statistic	-4.3945	0.0852
Engle-Granger z-statistic	-29.2479	0.0805

*MacKinnon p-values.

[22] Estimation results using Dynamic Ordinary Least Squares produce similar estimates of coefficients.

After obtaining the long-run relationship, the error-correction model which consists of the deviation from the long run equilibrium value and short-term dynamics is estimated using the method of Ordinary Least Squares. Following the general-to-specific approach, some variables are eliminated in the estimation process if their coefficients are insignificant or of the wrong signs. The following table presents the estimation results.

Dependent variable: Growth rate of real currency held by the public
Sample (adjusted): 1995Q2 2010Q1
Included observations: 60 after adjustments

Panel A: Estimation result

Variable	Coefficient	Robust standard error	t-statistic	P-value
Constant	0.0043	0.0025	1.6984	0.0951
Adjustment coefficient of the deviation from the long run equilibrium value	-0.1970	0.0602	-3.2707	0.0019
Growth rate of real currency (lag 1)	0.3090	0.0989	3.1258	0.0028
Growth rate of real currency (lag 2)	0.2559	0.1068	2.3960	0.0200
Growth rate of Macao's exports of gaming services	0.0499	0.0238	2.0962	0.0407

Panel B: Statistics

Mean: dependent variable	0.0161	
Standard deviation: dependent variable	0.0218	
Adjusted R-squared	0.3854	
Standard errors of regression	0.0171	
F-statistic	10.2505	(p-value = 0.0000)
Durbin-Watson statistic	1.9183	

The table below provides more details about the following explanatory variables.

Spending by Mainland visitors in Hong Kong ● Sources: Hong Kong Tourism Board and authors' estimates [obtained from merging the latest series (1998 – 2009) with a discontinued series (1993 – 2003)].
Spending by Hong Kong visitors on the Mainland ● Source: CEIC [tourism revenue data series (1995 – 2009) from China National Tourism Administration].
Macao's exports of gaming services ● Source: CEIC [quarterly data series (1998 Q1 – 2009 Q4) from Statistics and Census Service, Macao SAR whereas data before 1998 are interpolated based on the estimated share of exports of gaming services in total exports of services].