**The Administration's Responses to Members' Requests
Raised at the Meeting of the Bills Committee on
Housing (Amendment) Bill 2007 on 17 April 2007**

COMPUTATION AND OPERATION OF THE PROPOSED INCOME INDEX

The computation and operation of the proposed income index and data collection process were explained in the powerpoint presentations at the meetings of 16 March [CB(1)1171/06-07(02)] and 29 March 2007 [CB(1)1272/06-07(01)] and our reply of 27 March 2007 [CB(1)1234/06-07(01)]. Details can also be found in Annex C to the Report on The Review of Domestic Rent Policy. The relevant extracts from the Report are at **Appendix I**.

Tracking "Pure Income Changes"

2. In brief, the proposed income index seeks to track the "pure income change" in the household income of public rental housing (PRH) tenants with a view to determining the rate of rent adjustment. To assess the "pure income change", the effect of the change in household size distribution on household income should be discounted. This is achieved by keeping the household size distribution of PRH tenants constant in any one particular rent review cycle for the purpose of compiling the income index values.

Rent Adjustment

3. For each rent review, the first and second periods have been clearly defined in section 16A(9) of the Housing Amendment Bill 2007, and the respective income index value reflecting the mean household income of PRH tenants over these two periods would be compiled based on the household size distribution of the first period. Specifically, the two index values would be worked out with reference to :

(a) PRH tenants' average monthly household income over the **first period** weighted on the basis of the household size distribution over the **first period**; and

(b)   PRH tenants' average monthly household income over the **second period** weighted also on the basis of the household size distribution over the **first period**.

The rate of rent adjustment would then be determined according to the rate of changes in the income index values between the first and second periods.

Other Calculation Details

4.   Instead of fixing the household size distribution perpetually at one particular period, we would update the pattern of household size distribution of PRH tenants (i.e. re-basing) by making reference to the household size distribution of the corresponding first period of each rent review.   This is to strike a balance between the need to exclude the effect of changes in household size distribution and the need to make reference to a more updated household size distribution pattern in PRH.   Hypothetical examples of income index calculation extracted from the powerpoint presentation of 16 March [CB(1)1171/06-07(02)] are at **Appendix II**.

5.   As explained in our reply of 27 March 2007 [CB(1)1234/06-07(01)], the compilation methodology of the proposed income index could effectively minimize the potential distortion brought about by tenants with extreme income profile.   In calculating the income index, we would exclude additional rent-paying households and households with outlying income levels (estimated to be the top 1% household income in each household size group based on the current profile of PRH tenants' household income).   Comprehensive Social Security Assistance (CSSA) households would also be excluded from the coverage since their "income" is effectively social security allowance and changes in the CSSA amount might not be in line with changes in normal income received by other PRH tenants.

Data Source

6.   For general statistical analysis purposes, the HA has introduced a declaration arrangement to collect monthly household income data from sampled PRH households.   Starting from January 2007, a random sample of some 2,000 PRH households would be drawn each month (i.e. 24,000

households per year) from all PRH estates using probability-based statistical method.   Sampled households are required to report the monthly earnings of their individual household members included in the tenancies within a specified timeframe under section 25 of the Housing Ordinance (Cap. 283).   To mitigate the reporting burden on the part of the sampled households, no PRH household would be selected more than once within a period of 12 months.

7.   The change in the income index would determine the rate of rent adjustment and it is important that representative and reliable information is used to calculate the respective index values for the two periods in a rent review. As the declaration arrangement is designed specifically to suit the needs of the HA and the circumstances of PRH households, we would use the income data collected from this source to calculate the income index.

Overall Statistical Integrity

8.   The Census and Statistics Department (C&SD) has agreed to compile the income index and would implement various quality control measures to ensure the impartiality and objectivity of the entire process of data collection and data input.   These measures include checking the list of sampled households and, on a random basis, the income data provided by tenants, the documentary proof of selected tenants and the accuracy of data input.

Explanatory Note on the Computation and Operation of the Proposed Income Index

Computation Methodology

1. The proposed income index is essentially an income-based rent adjustment mechanism which seeks to track the movement in the household income of PRH tenants for determining the extent of rent adjustments.

2. Changes in the average household income of PRH households between any two periods are affected by two main factors, namely, changes in individual households' income and changes in household size distribution. For an income-based rent adjustment mechanism to operate properly, the impact of the changes in the household size pattern on average household income should be eliminated to enable an assessment of the "pure income change" over time, the extent of which would be used to determine the rate of rent adjustments. The statistical process to assess the "pure income change" of PRH tenants can be expressed by way of an income index. Assuming a biennial rent review cycle, a pair of income indexes for the two years corresponding to a particular rent review cycle should be worked out for assessing the change in the income level of the PRH households during the two-year period in question. **Appendix I** gives hypothetical examples to illustrate the calculation and operation of the proposed income index. A technical note on the mathematical formulae for deriving the income index is set out at **Appendix II**.

Data Collection

Mandatory Declaration System

3. Hitherto the data on household income are based on the General Household Survey conducted by the C&SD. The existing data collection method has two major shortcomings –

   (a) the General Household Survey is a voluntary survey. The sampled households are free to decide whether to participate in it or not. Income information may be a sensitive issue to many people. As with other household surveys, some respondents to the General Household Survey may feel inhibited to disclose their true household income. The statistical imputation from such cases may not meet the requirements of the Authority; and

   (b) the General Household Survey is not specifically designed to suit the needs of the Authority. The statistical concepts adopted by the General Household Survey are not entirely in line with those used by the Authority. A case in point is the concept of household size. For the General Household Survey, household size refers to those household members who are usually living in the flat. As regards the Authority, it includes all the household members on the tenancy record.

4. To ensure the reliability and accuracy of the data for compiling the income index, the Authority should operate its own system of data collection. We propose to adopt a system similar to the "income declaration" under the Housing Subsidy Policy to make the reporting of household income by sampled households mandatory.

Sample Size

5. The income information of PRH tenants will be collected from a sample survey to be conducted by the Authority on a continuous basis throughout a year. The random sample of the survey should be representative of the profile of PRH tenants and comprise around 1 500 – 2 000 households per month. The cumulative sample size of the survey for any given year will therefore be about 18 000 – 24 000 households, which should be large enough for the purpose of compiling the proposed income index with reasonably good precision.

Mode of Data Collection

6. A self-administered questionnaire will be designed for the purpose of obtaining the essential information and data from PRH tenants. The questionnaires will be despatched to the sampled households in batches on a monthly basis. Households selected for participation in the survey are required to submit the duly completed forms to the Housing Department by a specified deadline under section 25 of the Housing Ordinance.

Computation Agent

7. To enhance the impartiality and objectivity of the income index, consideration can be given to engaging an independent party to undertake the computation on behalf of the Authority.

Coverage of the Income Index

8. CSSA and additional rent paying households should be excluded from the coverage of the income index. As the "income" of CSSA household is effectively social security allowance provided by Government, changes in the amount of CSSA allowance should not be included in the calculation of the income index for PRH tenants. As for tenants paying additional rents, they are substantially better off than other PRH households. Their inclusion in the coverage of the income index may distort the outcome of the computation.

9. To deal with the so-called "outliers" (i.e. those households with extremely high and low income levels), we may also consider excluding the top and bottom 1% of the household income in each household size category from the calculation of the index.

Compilation and Operation of the Proposed Income Index

Why Changes in Household Size Distribution Should be Discounted?

1. Movement in the overall household income of PRH tenants is attributable to, inter alia, two main factors –

    (a) changes in individual households' income; and

    (b) changes in the distribution of household size.

2. Income of small households is usually lower than that of large households[22]. Even if the income of individual households remains unchanged, the overall household income of all the PRH tenants (either measured in terms of median or average income) may drop simply due to a surge in the number of small households.

3. The following hypothetical examples illustrate how the median or average income of PRH households is affected by changes in household size distribution –

Example A : *Effects of Changes in Household Size Distribution on Median Household Income*
(assuming no change in the income of individual households)

Period (1)				Period (2)			
Household Number	Household Size	Household Income ($)	Median Household Income by Household Size ($)	Household Number	Household Size	Household Income ($)	Median Household Income by Household Size ($)
1	1-person (27.3%)	4,000		1	1-person (36.4%)	4,000	
2		5,000		2		5,000	
3		5,500	5,000	3		5,000	
4	2-person (27.3%)	6,500		4		5,500	5,000
5		7,500		5	2-person (36.4%)	6,500	
6		8,000	7,500	6		7,500	
7	3-person or above (45.5%)	8,500		7		7,500	
8		9,000		8		8,000	7,500
9		9,500		9	3-person or above (27.3%)	8,500	
10		10,000		10		9,500	
11		11,000	9,500	11		11,000	9,500
Median household income ($)			8,000	Median household income ($)			7,500

[22] As at the first quarter of 2006, the average household income of PRH tenants was $4,685 for 1-person households; $8,892 for 2-person households; $13,564 for 3-person households; $16,124 for 4-person households and $19,383 for 5-person or above households.

4. As can be seen from the above table, the median household income drops from $8,000 in Period 1 to $7,500 in Period 2 even though there is no change in the income of individual households. The decline in the median household income is primarily due to an increase in the number of 1-person and 2-person households in Period 2 rather than a drop in the income of individual households.

Example B : *Effects of Changes in Household Size Distribution on Median Household Income (assuming an increase of $300 in the monthly income of all households)*

Period (1)				Period (2)			
Household Number	Household Size	Household Income ($)	Median Household Income by Household Size ($)	Household Number	Household Size	Household Income ($)	Median Household Income by Household Size ($)
1	1-person (27.3%)	4,000		1	1-person (36.4%)	4,300	
2		5,000		2		5,300	
3		5,500	5,000	3		5,300	
4	2-person (27.3%)	6,500		4		5,800	5,300
5		7,500		5	2-person (36.4%)	6,800	
6		8,000	7,500	6		7,800	
7	3-person or above (45.5%)	8,500		7		7,800	
8		9,000		8		8,300	7,800
9		9,500		9	3-person or above (27.3%)	8,800	
10		10,000		10		9,800	
11		11,000	9,500	11		11,300	9,800
Median household income ($)			8,000	Median household income ($)			7,800

5. Notwithstanding an increase in the income of individual households, the median household income still registers a downward adjustment from $8,000 in Period 1 to $7,800 in Period 2. Again, this is mainly due to an upsurge in the number of small households over the same period.

Example C : Effects of Changes in Household Size Distribution on Average Household Income
(assuming an increase of $300 in the monthly income of all households)

Period (1)				Period (2)			
Household Number	Household Size	Household Income ($)	Average Household Income by Household Size ($)	Household Number	Household Size	Household Income ($)	Average Household Income by Household Size ($)
1	1-person (27.3%)	4,000		1	1-person (36.4%)	4,300	
2		5,000		2		5,300	
3		5,500	4,833	3		5,300	
4	2-person (27.3%)	6,500		4		5,800	5,175
5		7,500		5	2-person (36.4%)	6,800	
6		8,000	7,333	6		7,800	
7	3-person or above (45.5%)	8,500		7		7,800	
8		9,000		8		8,300	7,675
9		9,500		9	3-person or above (27.3%)	8,800	
10		10,000		10		9,800	
11		11,000	9,600	11		11,300	9,967
Average household income ($)			7,689	Average household income ($)			7,398

6. The potential distortion brought about by an increase in the number of small households would also be felt when assessing the average income of all the households. In spite of a rise in the income of individual households, the average household income drops from $7,689 in Period 1 to $7,398 in Period 2.

7. The above illustrations clearly show that the movement in both median or average household income could be affected by changes in household size distribution. It does not necessarily stem from any variations in individual households' income. Nor does it imply any changes in tenants' affordability. For rent adjustment purpose, a more objective and fairer income indicator should therefore discount the effects of the changes in household size distribution and embrace only the changes in the household income of the PRH tenants.

Compilation of the Income Index

8. To discount the effects of household size distribution and track the "pure income change" of the PRH tenants, the household size distribution of PRH tenants would be kept constant in any one particular rent review cycle for the purpose of assessing the weighted average household income of all PRH tenants, so that only the changes in the income of individual households are reflected in the calculation.

9. Based on the household size and income distribution in "Example C" above, the calculation of the respective income indexes for Period 1 and Period 2 is set out below –

	Household Distribution (%) (Period (1))	Average Household Income ($) (Period (1))	Average Household Income ($) (Period (2))
1-person	27.3%	4,833	5,175
2-person	27.3%	7,333	7,675
3-person or above	45.5%	9,600	9,967
Weighted average household income based on household size distribution in Period (1) ($)		7,689 (4,833 x 27.3% + 7,333 x 27.3% + 9,600 x 45.5%)	8,043 (5,175 x 27.3% + 7,675 x 27.3% + 9,967 x 45.5%)
Income index (Period (1) as base year)		100.0	104.6

$$\text{Income index for Period (1) (i.e. base year)} : \frac{\$7,689}{\$7,689} \times 100 = 100$$

$$\text{Income index for Period (2) (i.e. current period)} : \frac{\$8,043}{\$7,689} \times 100 = 104.6$$

10. The change in the income index between Period 1 and Period 2 can be computed as follows –

$$(104.6 - 100.0) / 100.0 \times 100\% = 4.6\% \quad \text{(change in income index = pure income effect)}$$

11. Using the change in the income index as a guide, the rent of all PRH flats would need to be adjusted upwards by 4.6% should a rent review be conducted in Period 2.

Re-basing the Household Size Distribution

12. Instead of fixing the household size distribution perpetually at one particular period, we would make reference to the more updated pattern of household size distribution in PRH each time we conduct a rent review. Such regular "re-basing" could strike a balance between the need to exclude the undue impact of changes in household size distribution in assessing the income index within the two-year rent review cycle and the need to make reference to a more updated pattern of household size distribution in PRH for deriving the income index.

13. Assuming that another rent review exercise is to be conducted in the next period, i.e. Period 3, the household size distribution in Period 2 would be adopted to compile the respective income indexes for both Period 2 and Period 3 as follows –

Income and Household Size Distribution in Period 2 and Period 3

Household Number	Period (2)				Period (3)		
	Household Size	Household Income ($)	Average Household Income ($)		Household Size	Household Income ($)	Average Household Income ($)
1		4,300				3,800	
2	1-person (36.4%)	5,300			1-person (45.5%)	4,800	
3		5,300				4,800	
4		5,800	5,175			5,300	
5		6,800				5,300	4,800
6	2-person (36.4%)	7,800				6,300	
7		7,800			2-person (36.4%)	7,300	
8		8,300	7,675			7,300	
9	3-person or above (27.3%)	8,800				7,800	7,175
10		9,800			3-person or above (18.2%)	8,300	
11		11,300	9,967			10,800	9,550

Calculation of the Respective Income Indexes for Period 2 and Period 3

	Household Distribution (%) (Period (2))	Average Household Income ($) (Period (2))	Average Household Income ($) (Period (3))
1-person	36.4%	5,175	4,800
2-person	36.4%	7,675	7,175
3-person or above	27.3%	9,967	9,550
Weighted average household income based on household size distribution in Period (2) ($)		7,398 (5,175 x 36.4% + 7,675 x 36.4% + 9,967 x 27.3%)	6,966 (4,800 x 36.4% + 7,175 x 36.4% + 9,550 x 27.3%)
Income index (Period (2) as base year)		100.0	94.2

Income index for Period (2) (taking Period 2 as base year) : $\dfrac{\$7,398}{\$7,398} \times 100 = 100$

Income index for Period (3) : $\dfrac{\$6,966}{\$7,398} \times 100 = 94.2$

14. Compared to Period 2, the income index decreases by 5.8% in Period 3. Using this as a guide, the rent of all PRH flats would need to be adjusted downwards by 5.8% should a rent review be conducted in Period 3.

Technical Note on the Mathematical Formulae for Deriving the Income Index

Rate of Change in Average Household Income

1. Assuming that the average household income of the PRH tenants in a particular period, say year 0, is Y_0 and in another period, say year t, is Y_t, the rate of change in the average household income (ΔY) of PRH tenants between these two periods can be expressed by the following equation —

$$\Delta Y = \frac{Y_t - Y_0}{Y_0}$$

2. The average household income of PRH tenants in any period can be computed by aggregating the household incomes of individual tenants and dividing the total income sum by the number of households in PRH. Alternatively, it can be obtained by working out the weighted average household income of PRH tenants, i.e. the average household incomes of PRH tenants of different household sizes weighted by the household size distribution in terms of proportion. Mathematically, the weighted average household income of PRH tenants in year t (Y_t) can be expressed by the following formula —

$$Y_t = \Sigma H_{it} I_{it}$$

Where,

H_{it} = proportion of PRH tenants with household size i (i = 1,2,3,4, etc.) in year t (i.e. household size distribution in year t),

I_{it} = average household income of PRH tenants with household size i in year t (i.e. average income by household size in year t),

The average household income of PRH tenants in year 0 (Y_0) can be expressed as follows —

$$Y_0 = \Sigma H_{i0} I_{i0}$$

Where,

H_{i0} = proportion of PRH tenants with household size i (i = 1,2,3,4, etc.) in year 0 (i.e. household size distribution in year 0),

I_{i0} = average household income of PRH tenants with household size i in year 0 (i.e. average income by household size in year 0)

3. The rate of change in the average household income discussed in paragraph 1 can be expressed as follows —

$$\Delta Y = \frac{Y_t - Y_0}{Y_0}$$

$$\Delta Y = \frac{\Sigma H_{it} I_{it} - \Sigma H_{i0} I_{i0}}{\Sigma H_{i0} I_{i0}}$$

$$\Delta Y = \frac{\Sigma H_{i0}(I_{it} - I_{i0})}{\Sigma H_{i0} I_{i0}} + \frac{\Sigma(H_{it} - H_{i0}) I_{i0}}{\Sigma H_{i0} I_{i0}} + \frac{\Sigma(H_{it} - H_{i0})(I_{it} - I_{i0})}{\Sigma H_{i0} I_{i0}}$$

For PRH, it is found that the value of $\dfrac{\Sigma(H_{it} - H_{i0})(I_{it} - I_{i0})}{\Sigma H_{i0} I_{i0}}$

is small if the time interval between 0 and t is not too far apart from each other and can be ignored.

Thus, the above equation can be approximately expressed as follows —

$$\Delta Y \cong \begin{array}{c}\text{Income change}\\ \text{due to pure}\\ \text{income effect}\end{array} \left(\frac{\Sigma H_{i0}(I_{it} - I_{i0})}{\Sigma H_{i0} I_{i0}}\right) + \begin{array}{c}\text{Income change}\\ \text{due to household}\\ \text{size effect}\end{array} \left(\frac{\Sigma(H_{it} - H_{i0}) I_{i0}}{\Sigma H_{i0} I_{i0}}\right)$$

Income index

4. According to the above equation, the income component of any change in the average household income between two periods is given by the following formula —

$$\frac{\Sigma H_{i0}(I_{it} - I_{i0})}{\Sigma H_{i0} I_{i0}} \quad \text{or} \quad \frac{\Sigma H_{i0} I_{it}}{\Sigma H_{i0} I_{i0}} - \frac{\Sigma H_{i0} I_{i0}}{\Sigma H_{i0} I_{i0}}$$

5. The above statistical formula can be expressed by way of an income index (ID) for the purpose of guiding rent adjustments between two periods, say, every t years (the time interval corresponding to a rent review cycle of t years apart). The income index for year 0 (ID_0) can be compiled by using the following formula —

$$ID_0 = \frac{\Sigma H_{i0} I_{i0}}{\Sigma H_{i0} I_{i0}} \times 100$$

The income index for year t (ID_t) is —

$$ID_t = \frac{\Sigma H_{i0} I_{it}}{\Sigma H_{i0} I_{i0}} \times 100$$

6. It can be seen from the above formulae that there are two parameters we have to work out for compiling the income indexes for each cycle of rent adjustment, namely $\Sigma H_{i0}I_{i0}$ and $\Sigma H_{i0}I_{it}$. In specific terms,

$\Sigma H_{i0}I_{i0}$ = weighted average household income of PRH tenants in year 0

$\Sigma H_{i0}I_{it}$ = weighted average household income of PRH tenants in year t calculated by adopting the household size distribution in year 0 (instead of the household size distribution in year t)

Extent of Rent Adjustments Calculated Using the Income Index

7. The extent of rent adjustments calculated using the income index would be equivalent to the extent of the changes in household income between year 0 and year t. In percentage terms, this can be computed using the following formula —

$$\frac{ID_t - ID_0}{ID_0} \times 100\%$$

怎樣計算入息指數

假設第一次檢討的第一期間及第二期間的住戶家庭人口分布如下：

第一次檢討	第一期間			第二期間		
住戶編號	住戶人數	住戶入息 (元)	住戶平均入息 (元)	住戶人數	住戶入息 (元)	住戶平均入息 (元)
1	一人	4,000		一人	4,300	
2	(27.3%)	5,000		(36.4%)	5,300	
3		5,500	4,833		5,300	
4	二人	6,500			5,800	5,175
5	(27.3%)	7,500		二人	6,800	
6		8,000	7,333	(36.4%)	7,800	
7	三人或以上	8,500			7,800	
8	(45.5%)	9,000			8,300	7,675
9		9,500		三人或以上	8,800	
10		10,000		(27.3%)	9,800	
11		11,000	9,600		11,300	9,967
整體住戶平均入息 (元)	7,689			7,398 (-3.8%)		

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為剔除「住戶家庭人口分布」所造成的影響，在計算收入指數時會假設第二期間與第一期間的住戶人口分布相同，即以第一期間為基準年。

第一次檢討	住戶百分比 (第一期間)	住戶平均收入(元) (第一期間)	經調整後的家庭 平均收入(元) (第二期間)
一人	**27.3%**	**4,833**	**5,175**
二人	**27.3%**	**7,333**	**7,675**
三人或以上	**45.5%**	**9,600**	**9,967**
以第一期間住戶人口分布百分比加權的整體住戶平均入息(元)		**7,689**	**8,043**
收入指數 (以第一期間為基準年)		**100.0**	**104.6**

$$第一期間(即基準年)的收入指數：\frac{7,689\,元}{7,689\,元}\times100=100$$

$$第二期間的收入指數：\frac{8,043\,元}{7,689\,元}\times100=104.6$$

收入指數在第一期間與第二期間之間的變動：

(104.6 -100.0) / 100.0 ✕ 100% = 4.6% (收入指數的變動＝純入息變化造成的影響)

假設第二次檢討的第一期間及第二期間的住戶家庭人口分布如下：

| | 第一次檢討的第一期間 | | | 第一次檢討的第二期間 | | | | | |
				第二次檢討的第一期間			第二次檢討的第二期間		
住戶編號	住戶人數	住戶入息 (元)	住戶平均入息 (元)	住戶人數	住戶入息 (元)	住戶平均入息 (元)	住戶人數	住戶入息 (元)	住戶平均入息 (元)
1	一人 (27.3%)	4,000		一人 (36.4%)	4,300		一人 (45.5%)	4,500	
2		5,000			5,300			5,500	
3		5,500	4,833		5,300			5,500	
4	二人 (27.3%)	6,500			5,800	5,175		6,000	
5		7,500		二人 (36.4%)	6,800			6,000	5,500
6		8,000	7,333		7,800		二人 (36.4%)	7,000	
7	三人或以上 (45.5%)	8,500			7,800			7,800	
8		9,000			8,300	7,675		8,000	
9		9,500		三人或以上 (27.3%)	8,800			8,500	7,825
10		10,000			9,800		三人或以上 (18.2%)	9,000	
11		11,000	9,600		11,300	9,967		11,500	10,250
整體住戶平均入息 (元)	7,689			7,398			7,216 (-2.5%)		

假設每兩年檢討租金一次，為反映最新的家庭人口分布變化，在計算第二次檢討的收入指數變化時，便要重定基準年。

第二次檢討	住戶百分比 (第一期間)	住戶平均 收入(元) (第一期間)	經調整後的家庭 平均收入(元) (第二期間)
一人	**36.4%**	**5,175**	**5,500**
二人	**36.4%**	**7,675**	**7,825**
三人或以上	**27.3%**	**9,967**	**10,250**
以第一期間住戶人口分布百分比加權的整體住戶平均入息(元)		**7,398**	**7,649**
收入指數 (以第一期間為基準年)		**100.0**	**103.4**

以第一期間為基準年：

第一期間的收入指數：$\dfrac{7,398}{7,398} \times 100 = 10$

第二期間的收入指數：$\dfrac{7,649}{7,398} \times 100 = 103.4$

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